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

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

Siret N° 348 623 562 00017 - APE 7112B
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History 3123

Foreword

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

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

Version x.y.z

where:

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

1 Scope

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

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

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

2 References

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

3 Definitions, symbols and abbreviations

3.1 Definitions

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

RLM-RS resource: A resource out of the set of resources configured for RLM by higher layer parameter RLM-RS-List [2] as defined in 3GPP TS 38.213 [8].

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

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

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

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

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

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

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

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

3.2 Symbols

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

[…]	Values included in square bracket shall be considered for further studies, because it means that a decision about that value was not taken.
$BW_{Channel}$	Channel bandwidth, defined in TS 38.101-1 [2], 38.101-2 [3] and 38.101-3 [4] subclause 3.2

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

3.3 Abbreviations

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

AoA	Angle of Arrival
AoD	Angle of Departure
BFD	Beam Failure Detection
BFD-RS	BFD Reference Signal
BS	Base Station
BWP	Bandwidth Part
CBD	Candidate Beam Detection
CDF	Cumulative Distribution Function
CC	Component Carrier
CLI	Cross Link Interference
CMR	Channel Measurement Resource
CORESET	Control Resource Set
CP	Cyclic Prefix
CSI	Channel-State Information
CSI-RS	CSI Reference Signal
CSI-RSRP	CSI Reference Signal based Reference Signal Received Power
CSI-RSRQ	CSI Reference Signal based Reference Signal Received Quality
CSI-SINR	CSI Reference Signal based Signal to Noise and Interference Ratio
DC	Dual Connectivity
DCI	Downlink Control Information
DL	Downlink
DMRS	Demodulation Reference Signal
DRX	Discontinuous Reception

E-CID	Enhanced Cell ID
E-UTRA	Evolved UTRA
E-UTRA/5GC	E-UTRA connected to 5GC
E-UTRAN	Evolved UTRAN
EN-DC	E-UTRA – NR Dual Connectivity
FR	Frequency Range
FR1	Frequency Range 1
FR2	Frequency Range 2
HARQ	Hybrid Automatic Repeat Request
HO	Handover
IMR	Interference Measurement Resource
L1-RSRP	Layer 1 RSRP
LMF	Location Management Function
LPP	LTE Positioning Protocol
MAC	Medium Access Control
MCG	Master Cell Group
MG	Measurement Gap
MGL	Measurement Gap Length
MGRP	Measurement Gap Repetition Period
MIB	Master Information Block
MN	Master Node
MR-DC	Multi-Radio Dual Connectivity
NE-DC	NR-E-UTRA Dual Connectivity
NGEN-DC	NG-RAN E-UTRA-NR Dual Connectivity
NR	New Radio
NR/5GC	NR connected to 5GC
NR-DC	NR-NR Dual Connectivity
NSA	Non-Standalone
OCNG	OFDMA Channel Noise Generator
OFDM	Orthogonal Frequency Division Multiplexing
OFDMA	Orthogonal Frequency Division Multiple Access
PCC	Primary Component Carrier
PCell	Primary Cell
PDCCH	Physical Downlink Control Channel
PDSCH	Physical Downlink Shared Channel
PLMN	Public Land Mobile Network
PRACH	Physical RACH
PRS	Positioning Reference Signal
PSCell	Primary Secondary Cell
PSS	Primary Synchronization Signal
pTAG	Primary Timing Advance Group
PUCCH	Physical Uplink Control Channel
PUSCH	Physical Uplink Shared Channel
QCL	Quasi Co-Location
RACH	Random Access Channel
RAT	Radio Access Technology
RedCap	Reduced Capabilities
RLM	Radio Link Monitoring
RLM-RS	Reference Signal for RLM
RMC	Reference Measurement Channel
RMSI	Remaining Minimum System Information
RRC	Radio Resource Control
RRM	Radio Resource Management
RSRP	Reference Signal Received Power
RSRQ	Reference Signal Received Quality
RSSI	Received Signal Strength Indicator
RSTD	Reference Signal Time Difference
RTT	Round Trip Time
SA	Standalone
SCC	Secondary Component Carrier
SCell	Secondary Cell
SCG	Secondary Cell Group

SCS	Subcarrier Spacing
SCS_{SSB}	SSB subcarrier spacing
SDL	Supplementary Downlink
SFN	System Frame Number
SFTD	SFN and Frame Timing DifferenceSI System Information
SIB	System Information Block
SMTC	SSB-based Measurement Timing configuration
SpCell	Special Cell
SRS	Sounding Reference Signal
SRS-RSRP	Sounding Reference Signal based Reference Signal Received Power
SS	System Simulator
SS-RSRP	Synchronization Signal based Reference Signal Received Power
SS-RSRQ	Synchronization Signal based Reference Signal Received Quality
SS-SINR	Synchronization Signal based Signal to Noise and Interference Ratio
SSB	Synchronization Signal Block
SSB_RP	Received (linear) average power of the resource elements that carry NR SSB signals and channels, measured at the UE antenna connector.
SSS	Secondary Synchronization Signal
sTAG	Secondary Timing Advance Group
SUL	Supplementary Uplink
TA	Timing Advance
TAG	Timing Advance Group
TCI	Transmission Configuration Indicator
TTI	Transmission Time Interval
UL	Uplink

3A Requirements for the support of RRM

3A.1 General

3A.1.0 Overview of RRM requirements

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

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

The requirements that are tested include:

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

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

- The configuration of the UE measurement and reporting procedures that are transmitted via dedicated signalling in connected mode and the reporting accuracy of the required measurements.
- Connected mode, the mobility of radio connections that has to be supported.
- Handover decisions that may be based on UE or gNB measurements.

- Inter-RAT RRM, the management of radio resources in connection with inter-RAT mobility, e.g. Inter-RAT handover.

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

- For bands with bandwidth not accommodating all the NR cells required in the test without frequency overlapping, inter band testing shall be done according to clause 3A.5. If the UE does not support the combination given in clause 3A.5, the relevant tests are applicable only to the bands with the necessary bandwidth.

- In case when frequency overlapping occurs due to the frequency channel selection defined for the test (i.e. Cell number as per Annex D), other frequency channels which avoid the frequency overlapping shall be selected. If no suitable selection is found the test is not applicable for the affected band.

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

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

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

2. EN-DC is the default connectivity option used for EN-DC and NGEN-DC test cases.

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

Table 3A.1.1-1: Void

Table 3A.1.1-2: Void

Editor's Note: Any additional test config details needed for NE-DC and NGEN-DC are FFS.

3A.2 Requirements Classification for Statistical Testing

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

3A.3 Antenna Configuration

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

3A.4 NR band groups

3A.4.0 General

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

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

3A.4.1 NR operating bands in FR1

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

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

Group	NR FDD		NR TDD		NR SDL[5]	
	Band group notation	Operating bands	Band group notation	Operating bands	Band group notation	Operating bands
A	NR_FDD_FR1_A	n1, n18, n24, n70, n74[4], n91, n92, n93, n94, n100	NR_TDD_FR1_A	n34, n38[9], n39, n40, n50, n51, n53, n100	NR_SDL_FR1_A	n75, n76
B	NR_FDD_FR1_B	n65, n66, n74[3]	NR_TDD_FR1_B	n38[7]	NR_SDL_FR1_B	-
C	NR_FDD_FR1_C	n30	NR_TDD_FR1_C	n48, n77[1], n78, n79	NR_SDL_FR1_C	-
D	NR_FDD_FR1_D	n28	NR_TDD_FR1_D	n77[2]	NR_SDL_FR1_D	-
E	NR_FDD_FR1_E	n2, n5, n7	NR_TDD_FR1_E	n41	NR_SDL_FR1_E	-
F	NR_FDD_FR1_F	n26[6]	NR_TDD_FR1_F	-	NR_SDL_FR1_F	-
G	NR_FDD_FR1_G	n3, n8, n12, n14, n20, n71	NR_TDD_FR1_G	-	NR_SDL_FR1_G	n29
H	NR_FDD_FR1_H	n25	NR_TDD_FR1_H	-	NR_SDL_FR1_H	-
J	NR_FDD_FR1_J	-	NR_TDD_FR1_J	n47[8]	NR_SDL_FR1_J	-

NOTE 1: Except 3.8 GHz to 4.2 GHz.
NOTE 2: Only 3.8 GHz to 4.2 GHz.
NOTE 3: Except 1475.9 MHz to 1510.9 MHz.
NOTE 4: Only when the band is confined in 1475.9 MHz to 1510.9 MHz.
NOTE 5: These bands are used only in NR carrier aggregation with other NR bands according to NR CA band combinations specified in 3GPP TS 38.101-1 [18] and TS 38.101-3 [20].
NOTE 6: The minimum Io condition is reduced by 0.5 dB when the carrier frequency of the assigned NR channel bandwidth is within 865-894 MHz.
NOTE 7: When this band is only used for V2X SL service, the band is exclusively used for NR V2X in particular regions.
NOTE 8: This band is unlicensed band used for V2X service. There is no expected network deployment in this band.
NOTE 9: When this band is only used for WAN service.

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

Group	NR FDD		NR TDD		NR SDL	
	Band group notation	Power Offset [dB], Δ_{BG_offset}	Band group notation	Power Offset [dB], Δ_{BG_offset}	Band group notation	Operating bands
A	NR_FDD_FR1_A	-	NR_TDD_FR1_A	0.0	NR_SDL_FR1_A	0.0
B	NR_FDD_FR1_B	0.5	NR_TDD_FR1_B	0.5	NR_SDL_FR1_B	-
C	NR_FDD_FR1_C	1.0	NR_TDD_FR1_C	1.0	NR_SDL_FR1_C	-
D	NR_FDD_FR1_D	1.5	NR_TDD_FR1_D	1.5	NR_SDL_FR1_D	-
E	NR_FDD_FR1_E	2.0	NR_TDD_FR1_E	2.0	NR_SDL_FR1_E	-
F	NR_FDD_FR1_F	2.5	NR_TDD_FR1_F	2.5	NR_SDL_FR1_F	-
G	NR_FDD_FR1_G	3.0	NR_TDD_FR1_G	3.0	NR_SDL_FR1_G	-

H	NR_FDD_FR1_H	3.5	NR_TDD_FR1_H	3.5	NR_SDL_FR1_H	-
J	NR_FDD_FR1_J	4.5	NR_TDD_FR1_J	4.5	NR_SDL_FR1_J	-
NOTE: In the test parameters table, only the power configuration for NR_FDD_FR1_A or NR_TDD_FR1_A will be given.						

3A.4.2 NR operating bands in FR2

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

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

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

Table 3A.4.2-2: FFS

3A.5 NR operating band configuration

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

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

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

Band under test	Additional band (s)
n12	n66
n14	n66
n18	n1
n30	n66
n34	n41
n38	n41
n39	n41
n53	n41
n70	n66
NOTE 1: The band under test should contain the inter-frequency (neighbour) cell. NOTE 2: The additional band should contain the serving cell of the test. If more than one inter-frequency cell is needed, that cell should be on the additional band. NOTE 3: The bands and cells referred in this table are NR bands and cells only. For instructions on how to configure the E-UTRA operating band please refer to 3GPP TS 36.521-3 [26]. NOTE 4: The additional bands in this table are to be used in NR SA test cases only. EN-DC test cases cannot make use of additional bands.	

3A.6 UE with Multiband Capability

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

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

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

4 EN-DC with all NR cells in FR1

4.0 General

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

4.1 Void

4.2 Void

4.3 RRC_CONNECTED state mobility

4.3.1 Void

4.3.2 RRC connection mobility control

4.3.2.1 Void

4.3.2.2 Random access

4.3.2.2.1 EN-DC FR1 contention based random access

4.3.2.2.1.1 Test purpose

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

4.3.2.2.1.2 Test applicability

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

4.3.2.2.1.3 Minimum conformance requirement

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

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

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

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

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

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

The UE shall again perform the Random Access Resource selection procedure defined in clause 5.1.2 in TS 38.321 [12], and transmit with the calculated PRACH transmission power when the backoff time expires if all

received Random Access Responses contain Random Access Preamble identifiers that do not match the transmitted Random Access Preamble.

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

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

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

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

4.3.2.2.1.4 Test description

4.3.2.2.1.4.1 Initial conditions

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

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

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

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

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

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

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

4.3.2.2.1.4.2 Test procedure

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

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

2. Set the parameters according to Table 4.3.2.2.1.5-1.

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

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

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

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

   5.1. Repeat steps 1-3.

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

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

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

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

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

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

   6.1. Repeat steps 1-3.

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

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

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

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

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

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

   7.1. Repeat steps 1-3.

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

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

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

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

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

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

   8.1. Repeat steps 1-3.

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

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

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

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

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

   9.1. Repeat steps 1-3.

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

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

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

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

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

4.3.2.2.1.4.3 Message contents

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

Table 4.3.2.2.1.4.3-0: Common Exception messages

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

Common exceptions to the contents of TS 38.508-1 [14]	Table 4.6.3-115 with SSB-Index 0 Table 4.6.3-120 with SSB-Index 0

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

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

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

Derivation Path: TS 38.508-1 [14], table 4.6.3-130			
Information Element	**Value/remark**	**Comment**	**Condition**
RACH-ConfigGeneric ::= SEQUENCE {			
prach-ConfigurationIndex	102		FR1
msg1-FDM	one		FR1
zeroCorrelationZoneConfig	11		
preambleReceivedTargetPower	-120		
preambleTransMax	n6		
powerRampingStep	dB2		
ra-ResponseWindow	sl10		
}			

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

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

4.3.2.2.1.5 Test requirement

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

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

Parameter		Unit	Test-1	Comments
SSB Configuration	Config 1,2		SSB.3 FR1	As defined in clause A.3.1

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

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

Test 1: Correct behaviour when transmitting Random Access Preamble:

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

Test 2: Correct behaviour when receiving Random Access Response:

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

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

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

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

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

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

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

Test 7: Correct behaviour when contention resolution timer expires:

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

Table 4.3.2.2.1.5-2: Absolute power tolerance Test requirements

Conditions	Tolerance
Normal	± 11.1 dB

Table 4.3.2.2.1.5-3: Relative power tolerance Test requirements

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

Table 4.3.2.2.1.5-4: T_e Timing error Test requirements

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

4.3.2.2.2 EN-DC FR1 non-contention based random access

4.3.2.2.2.1 Test purpose

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

4.3.2.2.2.2 Test applicability

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

4.3.2.2.2.3 Minimum conformance requirement

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

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

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

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

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

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

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

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

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

4.3.2.2.2.4 Test description

4.3.2.2.2.4.1 Initial conditions

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

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

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

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

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

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

1. Message contents are defined in clause 4.3.2.2.2.4.3.

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

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

4.3.2.2.2.4.2 Test procedure

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

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

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

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

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

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

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

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

   5.2. Repeat steps 1-3.

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

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

   6.1. Repeat steps 1-3.

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

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

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

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

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

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

7.1. Repeat steps 1-3.

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

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

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

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

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

4.3.2.2.2.4.3 Message contents

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

Table 4.3.2.2.2.4.3-0: Common Exception messages

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

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

Derivation Path: TS 38.508-1 [14], table 4.6.3-128			
Information Element	**Value/remark**	**Comment**	**Condition**
RACH-ConfigCommon::= SEQUENCE {			
rach-ConfigGeneric	RACH-ConfigGeneric		
totalNumberOfRA-Preambles	48		
groupBconfigured SEQUENCE {			

numberOfRA-PreamblesGroupA	48		
}			
rsrp-ThresholdSSB	RSRP_51		Subtest 1
prach-RootSequenceIndex CHOICE {			
l139	0		
}			
msg1-SubcarrierSpacing	kHz 15		15kHz
	kHz 30		30kHz
}			

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

Derivation Path: TS 38.508-1 [14], table 4.6.3-129			
Information Element	**Value/remark**	**Comment**	**Condition**
RACH-ConfigDedicated::= SEQUENCE {			
cfra SEQUENCE {			
occasions SEQUENCE {			
ssb-perRACH-Occasion	oneFourth		
}			
resources CHOICE {			
ssb SEQUENCE {			
ssb-ResourceList SEQUENCE (SIZE(1..maxRA-SSB-Resources)) OF {	1 entry		
ssb[1]	0		
ra-PreambleIndex[1]	50		Subtest 1
}			
ra-ssb-OccasionMaskIndex	1		Subtest 1
}			
csirs SEQUENCE {			
csirs-ResourceList SEQUENCE (SIZE(1..maxRA-CSIRS -Resources)) OF {			
ra-OccasionList	1		Subtest 2
ra-PreambleIndex[1]	50		Subtest 2
}			
rsrp-ThresholdCSI-RS	RSRP_51		Subtest 2
}			
}			
}			
}			

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

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

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

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

Table 4.3.2.2.2.4.3-5: CellGroupConfig for Non-Contention Based Random Access

Derivation Path: TS 38.508-1 [14], table 4.6.3-19 with Condition CFRA			
Information Element	**Value/remark**	**Comment**	**Condition**
CellGroupConfig ::= SEQUENCE {			
spCellConfig SEQUENCE {			
servCellIndex	ServCellIndex		
reconfigurationWithSync SEQUENCE {			
newUE-Identity	1		
}			
spCellConfigDedicated SEQUENCE {			
uplinkConfig SEQUENCE {			
initialUplinkBWP SEQUENCE {			
srs-Config	SRS-Config		
}			
firstActiveUplinkBWP-Id	BWP-Id		
}			
}			
}			
}			

4.3.2.2.2.5 Test requirement

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

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

Parameter			Unit	Test-1	Test-2	Comments
SSB Configuration		Config 1,2		SSB.3 FR1	SSB.3 FR1	As defined in clause A.3.1
		Config 3,4		SSB.4 FR1	SSB.4 FR1	
CSI-RS Configuration		Config 1,2		N/A	CSI-RS.1.1 FDD	As defined in clause A.1.4
		Config 3,4			CSI-RS.2.1 TDD	
Duplex Mode for Cell 2		Config 1,2		FDD	FDD	
		Config 3,4		TDD	TDD	
TDD Configuration		Config 3,4		TDDConf.2.1	TDDConf.2.1	
OCNG Pattern Note 1				OCNG pattern 1	OCNG pattern 1	As defined in clause A.2.1
PDSCH parameters Note 4		Config 1,2		SR1.1 FDD	SR1.1 FDD	As defined in clause A.1.1
		Config 3,4		SR2.1 TDD	SR2.1 TDD	
RMSI CORESET reference channel		Config 1,2		CR.1.1 FDD	CR.1.1 FDD	
		Config 3,4		CR.2.1 TDD	CR.2.1 TDD	
Dedicated CORESET reference channel		Config 1,2		CCR.1.1 FDD	CCR.1.1 FDD	
		Config 3,4		CCR.2.1 TDD	CCR.2.1 TDD	
NR RF Channel Number				1	1	
EPRE ratio of PSS to SSS			dB	0	0	
EPRE ratio of PBCH_DMRS to SSS			dB			
EPRE ratio of PBCH to PBCH_DMRS			dB			
EPRE ratio of PDCCH_DMRS to SSS			dB			
EPRE ratio of PDCCH to PDCCH_DMRS			dB			
EPRE ratio of PDSCH_DMRS to SSS			dB			
EPRE ratio of PDSCH to PDSCH_DMRS			dB			
SSB with index 0	$\hat{E}_s / I_{ot}$		dB	3	3	Power of SSB with index 0 is set to be above configured *rsrp-ThresholdSSB*
	N_{oc}	Config 1,2	dBm/15kHz	-98	-98	
		Config 3,4		-101	-101	
	$\hat{E}_s / N_{oc}$		dB	3	3	
	SS-RSRP Note 3	Config 1,2	dBm/15kHz	-95	-95	
		Config 3,4		-98	-98	
	SS-RSRP Note 3		dBm/ SCS	-95	-95	
	$\hat{E}_s / I_{ot}$		dB	-17	-17	

Parameter			Unit	Test-1	Test-2	Comments
SSB with index 1	N_{oc}	Config 1,2	dBm/15kHz	-98	-98	Power of SSB with index 1 is set to be below configured *rsrp-ThresholdSSB*
		Config 3,4		-101	-101	
	$\hat{E}_s / N_{oc}$		dB	-17	-17	
	SS-RSRP Note 3	Config 1,2	dBm/15kHz	-115	-115	
		Config 3,4		-118	-118	
	SS-RSRP Note 3		dBm/ SCS	-115	-115	
Io Note 2		Config 1,2	dBm	-65.3/9.36MHz	-65.3/9.36MHz	For symbols without SSB index 1
		Config 3,4		-62.2/38.16MHz	-62.2/38.16MHz	
ss-PBCH-BlockPower			dBm/ SCS	-5	-5	As defined in clause 6.3.2 in TS 38.331 [13]
Configured UE transmitted power ($P_{\text{CMAX, f, c}}$)			dBm	23	23	As defined in clause 6.2.4 in TS 38.101-1 [2]
PRACH Configuration				PRACH.2 FR1	PRACH.3 FR1	As defined in clause A.7.1
Propagation Condition			-	AWGN	AWGN	

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

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

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

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

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

Test 3: Correct behaviour when receiving Random Access Response:

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

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

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

Table 4.3.2.2.2.5-2: Absolute power tolerance Test requirements

Conditions	Tolerance
Normal	± 11.1 dB

Table 4.3.2.2.2.5-3: Relative power tolerance Test requirements

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

Table 4.3.2.2.2.5-4: T_e Timing error Test requirements

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

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

4.3.2.2.3.1 Test purpose

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

4.3.2.2.3.2 Test applicability

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

4.3.2.2.3.3 Minimum conformance requirement

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

The UE shall have capability to calculate MsgA PRACH transmission power according to the PRACH power formula defined in clause 7.4 of TS 38.213 [3] and the MsgA PUSCH power formula of clause 7.1.1 of TS 38.213 [8] and apply this power level at the first MsgA or additional MsgA repetitions. The absolute power applied to the first preamble shall have an accuracy as specified in Table 6.3.4.2-1 of TS 38.101-1 [2] for frequency range 1 and in Table 6.3.4.2-1 of TS 38.101-2 [3] for frequency range 2. The relative power applied to additional preambles shall have an accuracy as specified in Table 6.3.4.3-1 of TS 38.101-1 [2] for frequency range 1 and clause 6.3.4.3 of TS38.101-2 [3] for frequency range 2.

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

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

4.3.2.2.3.3.1 Correct behaviour when transmitting MsgA

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

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

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

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

4.3.2.2.3.3.2 Correct behaviour when receiving MsgB

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

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

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

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

4.3.2.2.3.3.3 Correct behaviour when not receiving MsgB

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

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

4.3.2.2.3.4 Test description

4.3.2.2.3.4.1 Initial conditions

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

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

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

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

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

Parameter	Value	Comment
Test environment	NC	As specified in TS 38.508-1 [14] clause 4.1.
Test frequencies	As specified in Annex E, Table E.1-1 and TS 38.508-1 [14] clause 4.3.1.	
Channel bandwidth	As specified by the test configuration selected from Table 4.3.2.2.3.4.1-1.	
Propagation conditions	AWGN	As specified in clause C.2.2.

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

1. Message contents are defined in clause 4.3.2.2.3.4.3.

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

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

4.3.2.2.3.4.2 Test procedure

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

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

2. Set the parameters according to Table 4.3.2.2.3.5-1.

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

4. Test 1: Correct behaviour when transmitting MsgA:

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

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

5. Test 2: Correct behaviour when receiving MsgB:

   5.1. Repeat steps 1-3.

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

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

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

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

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

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

   6.1. Repeat steps 1-3.

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

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

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

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

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

4.3.2.2.3.4.3 Message contents

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

Table 4.3.2.2.3.4.3-0: Common Exception messages

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

4.3.2.2.3.5 Test requirement

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

Table 4.3.2.2.3.5-1: General test parameters

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

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

Test 1: Correct behaviour when transmitting MsgA:

- The MsgA shall be one of the Random Access Preambles associated with SSB index 0.
- The power of the first preamble shall be -22 dBm within the accuracy specified in Table 4.3.2.2.3.5-2.
- The power of the first MsgA PUSCH transmission shall be 6.6 dBm for test configuration 1 and 9.6 dBm for test configuration 2 within the accuracy specified in Table 4.3.2.2.3.5-2A.

Test 2: Correct behaviour when receiving MsgB:

- The power of the first preamble shall be -22 dBm within the accuracy specified in Table 4.3.2.2.3.5-2.
- The relative power for preamble ramping step shall be 2 dB within the accuracy specified in Table 4.3.2.2.3.5-3.
- The transmit timing of all MsgA PRACH transmissions shall be within the accuracy specified in Table 4.3.2.2.3.5-4.
- The power of the first MsgA PUSCH transmission shall be 6.6 dBm for test configuration 1 and 9.6 dBm for test configuration 2 within the accuracy specified in Table 4.3.2.2.3.5-2A.

Test 3: Correct behaviour when not receiving MsgB:

- The power of the first preamble shall be -22 dBm within the accuracy specified in Table 4.3.2.2.3.5-2.
- The relative power for preamble ramping step shall be 2 dB within the accuracy specified in Table 4.3.2.2.3.5-3.
- The transmit timing of all MsgA PRACH transmissions shall be within the accuracy specified in Table 4.3.2.2.3.5-4.
- The power of the first MsgA PUSCH transmission shall be 6.6 dBm for test configuration 1 and 9.6 dBm for test configuration 2 within the accuracy specified in Table 4.3.2.2.3.5-2A.

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

Conditions	Tolerance
Normal	± 11.1 dB

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

Conditions	Tolerance
Normal	± 11.1 dB

Table 4.3.2.2.3.5-3: Relative power tolerance Test requirements

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

Table 4.3.2.2.3.5-4: T_e Timing error Test requirements

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

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

4.3.2.2.4.1 Test purpose

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

4.3.2.2.4.2 Test applicability

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

4.3.2.2.4.3 Minimum conformance requirement

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

The UE shall have capability to calculate MsgA PRACH transmission power according to the PRACH power formula defined in clause 7.4 of TS 38.213 [3] and the MsgA PUSCH power formula of clause 7.1.1 of TS 38.213 [8] and apply this power level at the first MsgA or additional MsgA repetitions. The absolute power applied to the first preamble shall have an accuracy as specified in Table 6.3.4.2-1 of TS 38.101-1 [2] for frequency range 1 and in Table 6.3.4.2-1 of TS 38.101-2 [3] for frequency range 2. The relative power applied to additional preambles shall have an accuracy as specified in Table 6.3.4.3-1 of TS 38.101-1 [2] for frequency range 1 and clause 6.3.4.3 of TS38.101-2 [3] for frequency range 2.

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

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

4.3.2.2.4.3.1 Correct behaviour when transmitting MsgA

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

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

4.3.2.2.4.3.2 Correct behaviour when receiving MsgB

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

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

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

4.3.2.2.4.3.3 Correct behaviour when not receiving MsgB

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

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

4.3.2.2.4.4 Test description

4.3.2.2.4.4.1 Initial conditions

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

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

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

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

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

Parameter	Value	Comment

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

1. Message contents are defined in clause 4.3.2.2.4.4.3.

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

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

4.3.2.2.4.4.2 Test procedure

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

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

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

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

4. Test 1: Correct behaviour when transmitting MsgA:

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

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

5. Test 2: Correct behaviour when receiving MsgB:

   5.1. Repeat steps 1-3.

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

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

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

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

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

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

6.1. Repeat steps 1-3.

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

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

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

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

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

4.3.2.2.4.4.3 Message contents

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

Table 4.3.2.2.4.4.3-0: Common Exception messages

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

4.3.2.2.4.5 Test requirement

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

Table 4.3.2.2.4.5-1: General test parameters

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

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

Test 1: Correct behaviour when transmitting MsgA:

- The MsgA shall be one of the Random Access Preambles associated with SSB index 0.
- The MsgA shall arrive on a PRACH occasion which belongs to the PRACH occasions corresponding to the SSB with index 0.
- The selected PRACH occasion shall belong to the PRACH occasions permitted by the restrictions given by the *msgA-SSB-SharedRO-MaskIndex*.
- The power of the first preamble shall be -22 dBm within the accuracy specified in Table 4.3.2.2.4.5-2.
- The power of the first MsgA PUSCH transmission shall be 6.6 dBm for test configuration 1 and 9.6 dBm for test configuration 2 within the accuracy specified in Table 4.3.2.2.4.5-2A.

Test 2: Correct behaviour when receiving MsgB:

- The power of the first preamble shall be -22 dBm within the accuracy specified in Table 4.3.2.2.4.5-2.
- The relative power for preamble ramping step shall be 2 dB within the accuracy specified in Table 4.3.2.2.4.5-3.
- The transmit timing of all PRACH transmissions shall be within the accuracy specified in Table 4.3.2.2.4.5-4.
- The power of the first MsgA PUSCH transmission shall be 6.6 dBm for test configuration 1 and 9.6 dBm for test configuration 2 within the accuracy specified in Table 4.3.2.2.4.5-2A.

Test 3: Correct behaviour when not receiving MsgB:

- The power of the first preamble shall be -22 dBm within the accuracy specified in Table 4.3.2.2.4.5-2.

- The relative power for preamble ramping step shall be 2 dB within the accuracy specified in Table 4.3.2.2.4.5-3.
- The transmit timing of all PRACH transmissions shall be within the accuracy specified in Table 4.3.2.2.4.5-4.
- The power of the first MsgA PUSCH transmission shall be 6.6 dBm for test configuration 1 and 9.6 dBm for test configuration 2 within the accuracy specified in Table 4.3.2.2.4.5-2A.

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

Conditions	Tolerance
Normal	± 11.1 dB

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

Conditions	Tolerance
Normal	± 11.1 dB

Table 4.3.2.2.4.5-3: Relative power tolerance Test requirements

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

Table 4.3.2.2.4.5-4: T_e Timing error Test requirements

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

4.3.2.3 Void

4.4 Timing

4.4.1 UE transmit timing

4.4.1.0 Minimum conformance requirements

4.4.1.0.1 Minimum conformance requirements for UE transmit timing accuracy

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

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

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

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

Table 4.4.1.0.1-1: T_e Timing Error Limit

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

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

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

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

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

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

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

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

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

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

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

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

4.4.1.1 EN-DC FR1 UE transmit timing accuracy

4.4.1.1.1 Test purpose

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

4.4.1.1.2 Test applicability

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

4.4.1.1.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 4.4.1.0.1.

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

4.4.1.1.4 Test Description

4.4.1.1.4.1 Initial Conditions

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

Table 4.4.1.1.4.1-1: Supported test configurations for FR1 PSCell

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

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

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

Parameter	Value	Comment
Test environment	NC	As specified in TS 38.508-1 [14] clause 4.1.
Test frequencies	As specified in Annex E.1.1, Table E.2-1 and TS 38.508-1 [14] clause 4.3.1.	
Channel bandwidth	As specified by the test configuration selected from Table 4.4.1.1.4.1-1	

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

1. Message contents are defined in clause 6 4.4.1.1.4.3.

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

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

4.4.1.1.4.2 Test procedure

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

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

Following will be the test sequence for this test:

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

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

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

4. The UE shall transmit RRCConnectionReconfigurationComplete message.

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

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

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

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

Table 4.4.1.1.4.2-1: Adjustment Value for DL Timing

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

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

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

4.4.1.1.4.3 Message contents

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

Table 4.4.1.1.4.3-0: Common Exception messages

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

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

Derivation Path: TS 38.331 [6], clause 6.3.2			
Information Element	**Value/remark**	**Comment**	**Condition**
SRS-Config ::= SEQUENCE {			
srs-ResourceSetToAddModList SEQUENCE (SIZE(0..maxNrofSRS-ResourceSets)) OF SEQUENCE {			
SRS-ResourceSet[1] SEQUENCE {		entry 1	
resourceType CHOICE {			
periodic SEQUENCE {			
}			
}			
}			
}			
srs-ResourceToAddModList SEQUENCE (SIZE(1..maxNrofSRS-Resources)) OF SEQUENCE {			
SRS-Resource[1] SEQUENCE {		entry 1	
freqHopping SEQUENCE {			
c-SRS	14		SCS15
	25		SCS30
}			
groupOrSequenceHopping	neither		
resourceType CHOICE {			
periodic SEQUENCE {			
periodicityAndOffset-p CHOICE {			
sl1	0		Test 1
sl320	3		Test 2 and SCS15

sl640	5		Test 2 and SCS30
}			
}			
}			
}			
}			
}			

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

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

4.4.1.1.5 Test Requirements

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

Parameter	Unit	Config	Test1	Test2	Band Group
SSB ARFCN		1,2,3,4,5,6	Freq1	Freq1	
Duplex Mode		1,4	FDD		
		2,3,5,6	TDD		
TDD configuration		1,4	Not Applicable		
		2,5	TDDConf.1.1		
		3,6	TDDConf.2.1		
$BW_{channel}$	MHz	1,4	10: $N_{RB,c}$ = 52		
		2,5	10: $N_{RB,c}$ = 52		
		3,6	40: $N_{RB,c}$ = 106		
Initial BWP Configuration		1,2,3,4,5,6	DLBWP.0.1 ULBWP.0.1		
Dedicated BWP Configuration		1,2,3,4,5,6	DLBWP.1.1 ULBWP.1.1		
DRx Cycle	ms	1,2,3,4,5,6	N/A	DRX.8[Note5]	
PDSCH Reference measurement channel		1,4	SR.1.1 FDD		
		2,5	SR.1.1 TDD		
		3,6	SR.2.1 TDD		
RMSI CORESET Reference Channel		1,4	CR.1.1 FDD		
		2,5	CR.1.1 TDD		
		3,6	CR.2.1 TDD		
Dedicated CORESET Reference Channel		1,4	CCR.1.1 FDD		
		2,5	CCR.1.1 TDD		
		3,6	CCR.2.1 TDD		
OCNG Patterns		1,2,3,4,5,6	OP.1		
SSB configuration		1,4	SSB.1 FR1		
		2,5	SSB.1 FR1		
		3,6	SSB.2 FR1		
SMTC configuration		1,2,3,4,5,6	SMTC.2		
TRS configuration		1,4	TRS.1.1 FDD		

Parameter	Unit	Config	Test1	Test2	Band Group
		2,5	TRS.1.1 TDD		
		3,6	TRS.1.2 TDD		
PDSCH/PDCCH subcarrier spacing	kHz	1,2,4,5	15		
		3,6	30		
EPRE ratio of PSS to SSS	dB	1,2,3,4,5,6	0	0	
EPRE ratio of PBCH DMRS to SSS					
EPRE ratio of PBCH to PBCH DMRS					
EPRE ratio of PDCCH DMRS to SSS					
EPRE ratio of PDCCH to PDCCH DMRS					
EPRE ratio of PDSCH DMRS to SSS					
EPRE ratio of PDSCH to PDSCH					
EPRE ratio of OCNG DMRS to SSS(Note 1)					
EPRE ratio of OCNG to OCNG DMRS (Note 1)					
N_{oc} Note2	dBm/15 kHz	1,2,3,4,5,6	-98	-98	
N_{oc} Note2	dBm/SCS	1,2,4,5	-98	-98	
		3,6	-95	-95	
$\hat{E}_s / I_{ot}$		1,2,3,4,5,6	3.3	3.3	
$\hat{E}_s / N_{oc}$		1,2,3,4,5,6	3.3	3.3	
SS-RSRP Note3	dBm/SCS	1,2,4,5	-95	-95	
		3,6	-92	-92	
Io Note3	dBm/9.36MHz	1,2,4,5	-65.08	-65.08	
	dBm/38.1MHz	3,6	-61.99	-61.99	
Propagation condition		1,2,3,4,5,6	AWGN		
SRS Config		1,2,4,5	SRSConf.1 Note6	SRSConf.3 Note6	
		3, 6	SRSConf.1 Note6	SRSConf.2 Note6	

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

Table 4.4.1.1.5-2: SRS Configuration for Timing Accuracy Test

	Field	SRSConf.1	SRSConf.2	SRSConf.3	Comments
SRS-ResourceSet	srs-ResourceSetId	0	0	0	
	srs-ResourceIdList	0	0	0	
	resourceType	Periodic	Periodic	Periodic	
	Usage	Codebook	Codebook	Codebook	
	SRS-ResourceSetId	0	0	0	
SRS-Resource	nrofSRS-Ports	Port1	Port1	Port1	
	transmissionComb	n2	n2	n2	
	combOffset-n2	0	0	0	
	cyclicShift-n2	0	0	0	
	resourceMapping startPosition	0	0	0	
	resourceMapping nrofSymbols	n1	n1	n1	
	resourceMapping	n1	n1	n1	

	repetitionFactor				
	freqDomainPosition	0	0	0	
	freqDomainShift	0	0	0	
	freqHopping c-SRS	14 for test configuration 1,2,4,5 25 for test configuration 3,6	25	14	Matches $N_{RB,c}$
	freqHopping b-SRS	0	0	0	
	freqHopping b-hop	0	0	0	
	groupOrSequenceHopping	Neither	Neither	Neither	
	resourceType	Periodic	Periodic	Periodic	
	periodicityAndOffset-p	sl1	sl640,5	sl320, 3	Offset to align with DRx periodicity
	sequenceId	0	0	0	Any 10 bit number

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

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

Table 4.4.1.1.5-4: T_e Timing Error Limit

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

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

Frequency Range	SCS of uplink signals (KHz)	T_q	T_p	Maximum Adjustment Rate
1	15	$6.0*64*T_c$	$1.9*64*T_c$	$6.6*64*T_c$
	30	$6.0*64*T_c$	$1.9*64*T_c$	$6.6*64*T_c$
	60	$6.0*64*T_c$	$1.9*64*T_c$	$6.6*64*T_c$
NOTE: T_c is the basic timing unit defined in TS 38.211 [6].				

4.4.2 UE timer accuracy

4.4.3 Timing advance

4.4.3.0 Minimum conformance requirements

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

4.4.3.0.1 Minimum conformance requirements for timing advance adjustment accuracy

The UE shall adjust the timing of its transmissions with a relative accuracy better than or equal to the UE Timing Advance adjustment accuracy requirement in Table 4.4.3.0.1-1, to the signalled timing advance value compared to the timing of preceding uplink transmission. The timing advance command step is defined in TS38.213 [8].

Table 4.4.3.0.1-1: UE Timing Advance adjustment accuracy

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

4.4.3.0.2 Minimum conformance requirements for timing advance adjustment delay

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

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

4.4.3.1 EN-DC FR1 timing advance adjustment accuracy

4.4.3.1.1 Test purpose

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

4.4.3.1.2 Test applicability

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

4.4.3.1.3 Minimum conformance requirement

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

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

4.4.3.1.4 Test description

4.4.3.1.4.1 Initial conditions

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

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

Test Case ID	Description
4.4.3.1.4.1-1	LTE FDD, NR: 15 kHz SSB SCS, 10MHz bandwidth, FDD
4.4.3.1.4.1-2	LTE FDD, NR: 15 kHz SSB SCS, 10MHz bandwidth, TDD
4.4.3.1.4.1-3	LTE FDD, NR: 30 kHz SSB SCS, 40MHz bandwidth, TDD

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

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

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

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

Table 4.4.3.1.4.1-3: General test parameters for timing advance

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

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

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

4.4.3.1.4.2 Test Procedure

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

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

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

3. SS shall transmit an RRCConnectionReconfiguration message.

4. The UE shall transmit RRCConnectionReconfigurationComplete message.

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

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

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

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

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

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

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

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

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

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

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

4.4.3.1.4.3 Message Contents

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

Table 4.4.3.1.4.3-0: Common Exception messages

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

Table 4.4.3.1.4.3-1: srs-Config setup

Derivation Path: TS 38.508-1, Table 4.6.3-182			
Information Element	**Value/remark**	**Comment**	**Condition**
SRS-Config ::= SEQUENCE {			
srs-ResourceSetToAddModList SEQUENCE (SIZE(0..maxNrofSRS-ResourceSets)) OF SEQUENCE {	1 entry		
SRS-ResourceSet[1] SEQUENCE {		entry 1	
resourceType CHOICE {			
periodic SEQUENCE {			
}			
}			
}			
}			
srs-ResourceToAddModList SEQUENCE (SIZE(1..maxNrofSRS-Resources)) OF SEQUENCE {	1 entry		
SRS-Resource[1] SEQUENCE {		entry 1	
freqHopping SEQUENCE {			
c-SRS	12		Config 1,2,4,5
	24		Config 3,6
}			
groupOrSequenceHopping	neither		
resourceType CHOICE {			
periodic SEQUENCE {			
periodicityAndOffset-p CHOICE {			
sl5	2	Once every 5 Slots	SCS15
sl5	4	Once every 5 Slots	SCS30
}			
}			
}			
}			
}			
}			

4.4.3.1.5 Test Requirement

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

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

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

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

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

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

Parameter		**Unit**	**Test1**	
			T1	**T2**
Duplex mode	Config 1,4		FDD	
	Config 2,3,5,6		TDD	
TDD configuration	Config 1,4		Not Applicable	
	Config 2,5		TDDConf.1.1	
	Config 3,6		TDDConf.2.1	
$BW_{channel}$	Config 1,4	MHz	10: $N_{RB,c} = 52$	
	Config 2,5		10: $N_{RB,c} = 52$	
	Config 3,6		40: $N_{RB,c} = 106$	
BWP BW	Config 1,4	MHz	10: $N_{RB,c} = 52$	
	Config 2,5		10: $N_{RB,c} = 52$	

Parameter		Unit	Test1	
			T1	T2
	Config 3,6		40: $N_{RB,c}$ = 106	
DRx Cycle		ms	Not Applicable	
PDSCH Reference measurement channel	Config 1,4		SR.1.1 FDD	
	Config 2,5		SR.1.1 TDD	
	Config 3,6		SR2.1 TDD	
RMSI CORESET Reference Channel	Config 1,4		CR.1.1 FDD	
	Config 2,5		CR.1.1 TDD	
	Config 3,6		CR2.1 TDD	
Dedicated CORESET Reference Channel	Config 1,4		CCR.1.1 FDD	
	Config 2,5		CCR.1.1 TDD	
	Config 3,6		CCR2.1 TDD	
OCNG Patterns			OCNG pattern 1	
TRS configuration	Config 1,4		TRS.1.1 FDD	
	Config 2,5		TRS.1.1 TDD	
	Config 3,6		TRS.1.2 TDD	
SMTC configuration	Config 1,2,4,5		SMTC.1 FR1	
	Config 3,6		SMTC.2 FR1	
PDSCH/PDCCH subcarrier spacing	Config 1,2,4,5	kHz	15 kHz	
	Config 3,6		30 kHz	
PUCCH/PUSCH subcarrier spacing	Config 1,2,4,5	kHz	15 kHz	
	Config 3,6		30 kHz	
EPRE ratio of PSS to SSS		dB	0	
EPRE ratio of PBCH DMRS to SSS				
EPRE ratio of PBCH to PBCH DMRS				
EPRE ratio of PDCCH DMRS to SSS				
EPRE ratio of PDCCH to PDCCH DMRS				
EPRE ratio of PDSCH DMRS to SSS				
EPRE ratio of PDSCH to PDSCH				
EPRE ratio of OCNG DMRS to SSS(Note 1)				
EPRE ratio of OCNG to OCNG DMRS (Note 1)				
N_{oc} Note2		dBm/15kHz	-98	
N_{oc} Note2	Config 1,2,4,5	dBm/SCS	-98	
	Config 3,6		-95	
$\hat{E}_s / I_{ot}$		dB	3	
$\hat{E}_s / N_{oc}$		dB	3	
Io Note3	Config 1,2,4,5	dBm/ 9.36MHz	-67.57	
	Config 3,6	dBm/ 38.16MHz	-62.58	
Propagation condition		-	AWGN	

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

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

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

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

Field		Value	Comment
c-SRS	Config 1,2,4,5	12	Frequency hopping is disabled
	Config 3,6	24	
b-SRS		0	
b-hop		0	
freqDomainPosition		0	Frequency domain position of SRS
freqDomainShift		0	
groupOrSequenceHopping		neither	No group or sequence hopping
SRS-PeriodicityAndOffset		sl5@2 for SCS 15kHz	Once every 5 slots

	sl5@4 for SCS 30kHz	
pathlossReferenceRS	ssb-Index=0	SSB #0 is used for SRS path loss estimation
Usage	Codebook	Codebook based UL transmission
startPosition	0	resourceMapping setting. SRS on last symbol of slot, and 1symbols for SRS without repetition.
nrofSymbols	n1	
repetitionFactor	n1	
combOffset-n2	0	transmissionComb setting
cyclicShift-n2	0	
nrofSRS-Ports	port1	Number of antenna ports used for SRS transmission
NOTE: For further information see clause 6.3.2 in TS 38.331.		

Table 4.4.3.1.5-3: UE Timing Advance adjustment accuracy

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

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

4.5 Signaling characteristics

4.5.1 Radio link monitoring

4.5.1.00 General

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

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

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

4.5.1.0 Minimum conformance requirements

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

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

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

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

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

For FR1,

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

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

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

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

4.5.1.0.2 Void

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

[TS 38.133, clause 8.1.3.1]

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

[TS 38.133, clause 8.1.3.2]

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

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

For FR1,

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

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

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

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

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

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

[TS 38.133, clause 8.1.3.3]

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

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

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

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

- If the UE supports *simultaneousRxDataSSB-DiffNumerology* the UE shall be able to perform CSI-RS measurement without restrictions.
- If the UE does not support *simultaneousRxDataSSB-DiffNumerology*, UE is required to measure one of but not both CSI-RS for RLM and SSB. Longer measurement period for CSI-RS based RLM is expected, and no requirements are defined.

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

[TS 38.133, clauses 8.1.4 and 8.1.5]

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

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

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

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

[TS 38.133, clause 8.1.6]

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

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

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

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

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

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

[TS 38.133, clause 8.1.3.1]

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

[TS 38.133, clause 8.1.3.2]

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

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

For FR1,

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

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

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

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

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

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

[TS 38.133, clause 8.1.3.3]

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

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

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

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

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

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

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

[TS 38.133, clauses 8.1.4 and 8.1.5]

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

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

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

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

[TS 38.133, clause 8.1.6]

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

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

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

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

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

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

4.5.1.1.1 Test purpose

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

4.5.1.1.2 Test applicability

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

4.5.1.1.3 Minimum conformance requirement

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

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

4.5.1.1.4 Test description

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

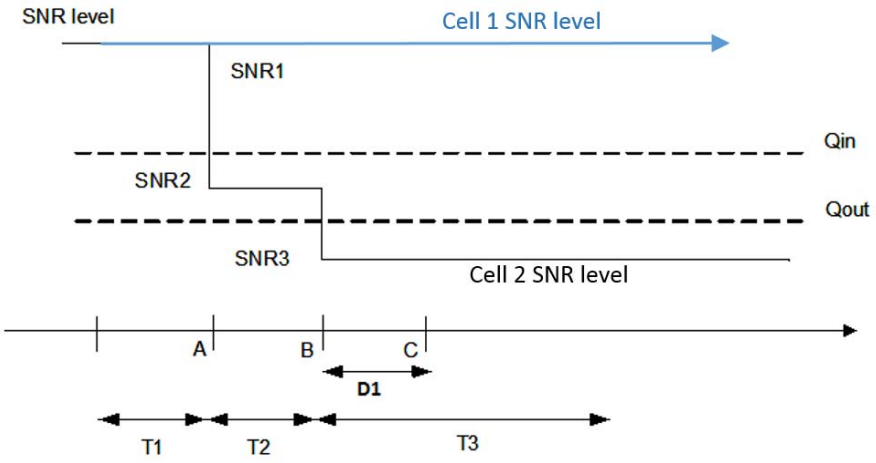


Figure 4.5.1.1.4-1: SNR variation for out-of-sync testing

4.5.1.1.4.1 Initial conditions

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

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

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

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

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

Parameter	Value		Comment
Test environment	NC		As specified in TS 38.508-1 [14] clause 4.1.
Test frequencies	As specified in Annex E.1.1, Table E.2-1 and TS 38.508-1 [14] clause 4.3.1.		
Channel bandwidth	As specified by the test configuration selected from Table 4.5.1.1.4.1-1		
Propagation conditions	AWGN		As specified in clause C.2.2.
	TE Part	A.3.1.7.1	As specified in TS 38.508-1 [14] Annex A.

Connection Diagram	DUT Part	A.3.2.3.4	
Exceptions to connection diagram	For 4Rx capable UEs without any 2 Rx RF bands use A.3.2.5.2 for DUT part and A.3.1.7.4 for TE Part		

Table 4.5.1.1.4.1-3: Void

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

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

Parameter		Unit	Value
			Test 1
Active E-UTRA PCell			Cell 1
E-UTRA RF Channel Number			1
Active PSCell			Cell 2
RF Channel Number			2
Duplex mode	Config 1, 4		FDD
	Config 2, 3, 5, 6		TDD
$BW_{channel}$	Config 1, 4	MHz	10: $N_{RB,c}$ = 52
	Config 2, 5		10: $N_{RB,c}$ = 52
	Config 3, 6		40: $N_{RB,c}$ = 106
DL initial BWP configuration	Config 1, 2, 3, 4, 5, 6		DLBWP.0.1
DL dedicated BWP configuration	Config 1, 2, 3, 4, 5, 6		DLBWP.1.1
UL initial BWP configuration	Config 1, 2, 3, 4, 5, 6		ULBWP.0.1
UL dedicated BWP configuration	Config 1, 2, 3, 4, 5, 6		ULBWP.1.1
TDD Configuration	Config 1, 4		Not Applicable
	Config 2, 5		TDDConf.1.1
	Config 3, 6		TDDConf.2.1
RMSI CORESET Reference Channel	Config 1, 4		CR.1.1 FDD
	Config 2, 5		CR.1.1 TDD
	Config 3, 6		CR.2.1 TDD
Dedicated CORESET Reference Channel	Config 1, 4		CCR.1.3 FDD
	Config 2, 5		CCR.1.3 TDD
	Config 3, 6		CCR.2.2 TDD
SSB Configuration	Config 1, 4		SSB.1 FR1
	Config 2, 5		SSB.1 FR1
	Config 3, 6		SSB.2 FR1
SMTC Configuration	Config 1, 2, 4, 5		SMTC.1
	Config 3, 6		SMTC.1
PDSCH/PDCCH subcarrier spacing	Config 1, 2, 4, 5		15 KHz
	Config 3, 6		30 KHz
PRACH Configuration	Config 1, 2, 4, 5		Table A.7.1-1, PRACH.1 FR1
	Config 3, 6		Table A.7.1-1, PRACH.1 FR1
SSB index assigned as RLM RS			0
OCNG parameters			OP.1
CP length			Normal
Correlation Matrix and Antenna Configuration			2x2 Low
Out of sync transmission parameters	DCI format		1-0
	Number of Control OFDM symbols		2
	Aggregation level	CCE	8
	Ratio of hypothetical PDCCH RE energy to average SSS RE energy	dB	4

Parameter			Unit	Value
				Test 1
	Ratio of hypothetical PDCCH DMRS energy to average SSS RE energy		dB	4
	DMRS precoder granularity			REG bundle size
	REG bundle size			6
DRX				*OFF*
Gap pattern ID				*gp0*
Layer 3 filtering				*Enabled*
T310 timer			ms	*0*
T311 timer			ms	1000
N310				1
N311				1
CSI-RS configuration		Config 1, 4		CSI-RS.1.1 FDD
		Config 2, 5		CSI-RS.1.1 TDD
		Config 3, 6		CSI-RS.2.1 TDD
CSI-RS for tracking		Config 1, 4		TRS.1.1 FDD
		Config 2, 5		TRS.1.1 TDD
		Config 3, 6		TRS.1.2 TDD
T1			s	0.2
T2			s	0.48
T3			s	0.48
D1			s	0.44
NOTE 1: All configurations are assigned to the UE prior to the start of time period T1. NOTE 2: UE-specific PDCCH is not transmitted after T1 starts. NOTE 3: E-UTRAN is in non-DRX mode under test.				

4.5.1.1.4.2 Test Procedure

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

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

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

3. The UE shall transmit *RRCReconfigurationComplete* message.

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

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

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

7. If the SS:

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

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

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

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

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

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

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

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

4.5.1.1.4.3 Message Contents

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

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

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

Table 4.5.1.1.4.3-2: Void

Table 4.5.1.1.4.3-3: *RLF-TimersAndConstant*

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

4.5.1.1.5 Test Requirement

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

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

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

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

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

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

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

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

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

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

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

4.5.1.2.1 Test purpose

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

4.5.1.2.2 Test applicability

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

4.5.1.2.3 Minimum conformance requirements

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

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

4.5.1.2.4 Test description

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

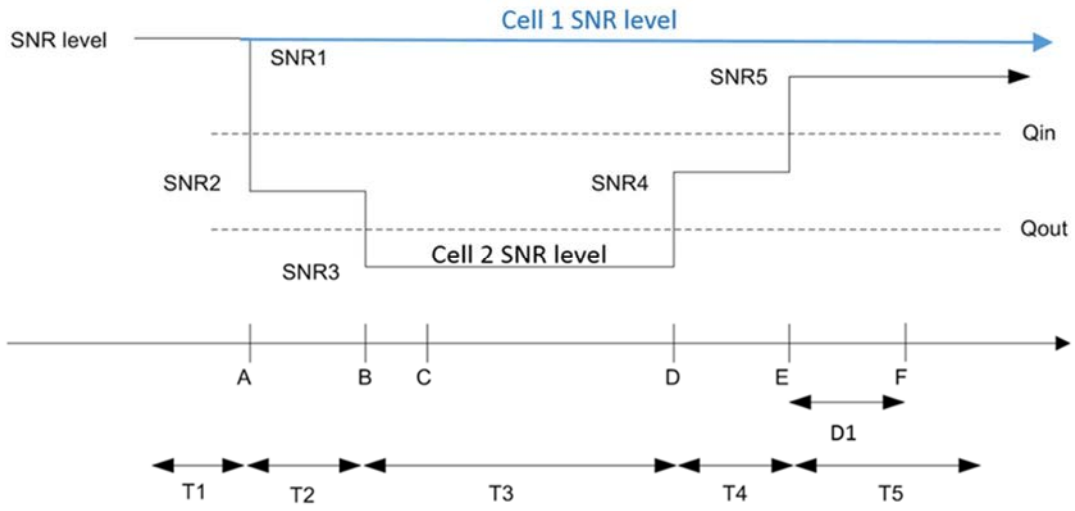


Figure 4.5.1.2.4-1: SNR variation for in-sync testing

4.5.1.2.4.1 Initial conditions

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

Table 4.5.1.2.4.1-1: Supported test configurations for FR1 PSCell

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

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

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

Parameter	Value		Comment
Test environment	NC		As specified in TS 38.508-1 [14] clause 4.1.
Test frequencies	As specified in Annex E.1.1, Table E.2-1 and TS 38.508-1 [14] clause 4.3.1.		
Channel bandwidth	As specified by the test configuration selected from Table 4.5.1.2.5-1		
Propagation conditions	AWGN		As specified in clause C.2.2.
	TE Part	A.3.1.7.1	As specified in TS 38.508-1 [14] Annex A.

Connection Diagram	DUT Part	A.3.2.3.4	
Exceptions to connection diagram	For 4Rx capable UEs without any 2 Rx RF bands use A.3.2.5.2 for DUT part and A.3.1.7.4 for TE Part		

Table 4.5.1.2.4.1-3: Void

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

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

Parameter		Unit	Value
			Test 1
Active E-UTRA PCell			Cell 1
E-UTRA RF Channel Number			1
Active PSCell			Cell 2
RF Channel Number			2
Duplex mode	Config 1, 4		FDD
	Config 2, 3, 5, 6		TDD
$BW_{channel}$	Config 1, 4	MHz	10: $N_{RB,c}$ = 52
	Config 2, 5		10: $N_{RB,c}$ = 52
	Config 3, 6		40: $N_{RB,c}$ = 106
DL initial BWP configuration	Config 1, 2, 3, 4, 5, 6		DLBWP.0.1
DL dedicated BWP configuration	Config 1, 2, 3, 4, 5, 6		DLBWP.1.1
UL initial BWP configuration	Config 1, 2, 3, 4, 5, 6		ULBWP.0.1
UL dedicated BWP configuration	Config 1, 2, 3, 4, 5, 6		ULBWP.1.1
TDD Configuration	Config 1, 4		Not Applicable
	Config 2, 5		TDDConf.1.1
	Config 3, 6		TDDConf.2.1
RMSI CORESET Reference Channel	Config 1, 4		CR.1.1 FDD
	Config 2, 5		CR.1.1 TDD
	Config 3, 6		CR.2.1 TDD
Dedicated CORESET Reference Channel	Config 1, 4		CCR.1.1 FDD
	Config 2, 5		CCR.1.1 TDD
	Config 3, 6		CCR.2.1 TDD
SSB Configuration	Config 1, 4		SSB.1 FR1
	Config 2, 5		SSB.1 FR1
	Config 3, 6		SSB.2 FR1
SMTC Configuration	Config 1, 2, 4, 5		SMTC.1
	Config 3, 6		SMTC.1
PDSCH/PDCCH subcarrier spacing	Config 1, 2, 4, 5		15 KHz
	Config 3, 6		30 KHz
PRACH Configuration	Config 1, 2, 4, 5		Table A.7.1-1, PRACH.1 FR1
	Config 3, 6		Table A.7.1-1, PRACH.1 FR1
SSB index assigned as RLM RS			0
OCNG parameters			OP.1
CP length			Normal
Correlation Matrix and Antenna Configuration			2x2 Low

Parameter		Unit	Value
			Test 1
In sync transmission parameters	DCI format		1-0
	Number of Control OFDM symbols		2
	Aggregation level	CCE	4
	Ratio of hypothetical PDCCH RE energy to average SSS RE energy	dB	0
	Ratio of hypothetical PDCCH DMRS energy to average SSS RE energy	dB	0
	DMRS precoder granularity		REG bundle size
	REG bundle size		6
Out of sync transmission parameters	DCI format		1-0
	Number of Control OFDM symbols		2
	Aggregation level	CCE	8
	Ratio of hypothetical PDCCH RE energy to average SSS RE energy	dB	4
	Ratio of hypothetical PDCCH DMRS energy to average SSS RE energy	dB	4
	DMRS precoder granularity		REG bundle size
	REG bundle size		6
DRX			*OFF*
Gap pattern ID			N.A.
Layer 3 filtering			*Enabled*
T310 timer		ms	1000
T311 timer		ms	1000
N310			1
N311			1
CSI-RS for CSI reporting	Config 1, 4		CSI-RS.1.1 FDD
	Config 2, 5		CSI-RS.1.1 TDD
	Config 3, 6		CSI-RS.2.1 TDD
CSI-RS for tracking	Config 1, 4		TRS.1.1 FDD
	Config 2, 5		TRS.1.1 TDD
	Config 3, 6		TRS.1.2 TDD
T1		s	0.2
T2		s	0.2
T3		s	0.24
T4		s	0.2
T5		s	0.88
D1		s	0.84
NOTE 1: All configurations are assigned to the UE prior to the start of time period T1. NOTE 2: UE-specific PDCCH is not transmitted after T1 starts. NOTE 3: E-UTRAN is in non-DRX mode under test.			

4.5.1.2.4.2 Test procedure

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

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

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

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

4. When T2 expires, the SS shall change the SNR value to T3 as specified in Table 4.5.1.2.5-1. T3 starts.
5. When T3 expires, the SS shall change the SNR value to T4 as specified in Table 4.5.1.2.5-1. T4 starts.
6. When T4 expires, the SS shall change the SNR value to T5 as specified in Table 4.5.1.2.5-1. T5 starts.
7. If the SS detects uplink power equal to or higher than the minimum output power defined in TS 38.521-1 [17] clause 6.3.1.5 in the subframe according the configured CSI reporting during the period from time point A to time point F (D1 after the start of time duration T5) the number of successful tests is increased by one.

   Otherwise the number of failed tests is increased by one.
8. If the iteration fails, the SS shall first attempt to release and add the PSCell, by ensuring the UE is in state RRC_CONNECTED with generic procedure parameters *Connectivity* EN-DC, DC bearer MCG and SCG, Connected without release *On* and Test Mode *On* according to TS 38.508-1 [6] clause 4.5. If that also fails, then the UE is switched OFF/ON to proceed with the next iteration.
9. Repeat steps 2-7 for all subtests until the confidence level according to Tables G.2.3-1 in Annex G clause G.2 is achieved.

4.5.1.2.4.3 Message Contents

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

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

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

Table 4.5.1.2.4.3-2: Void

Table 4.5.1.2.4.3-3: *RLF-TimersAndConstant*

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

4.5.1.2.5 Test Requirement

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

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

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

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

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

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

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

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

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

4.5.1.3.1 Test purpose

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

4.5.1.3.2 Test applicability

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

4.5.1.3.3 Minimum conformance requirement

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

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

4.5.1.3.4 Test description

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

and to send periodic CSI during the period when On-duration timer is running. Time alignment timers shall be set to "infinity" so that UL timing alignment is maintained during the test.

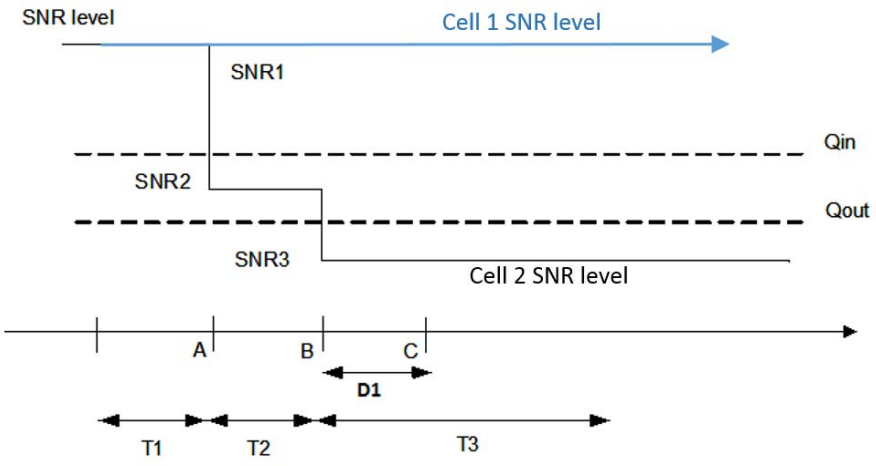


Figure 4.5.1.3.4-1: SNR variation for out-of-sync testing

4.5.1.3.4.1 Initial conditions

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

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

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

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

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

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

Table 4.5.1.3.4.1-3: Void

1. Message contents are defined in clause 4.5.1.3.4.3.

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

3. The test parameters are given in Table 4.5.1.3.4.1-4.

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

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

Parameter		Unit	Value
			Test 1
Active E-UTRA PCell			Cell 1
E-UTRA RF Channel Number			1
Active PSCell			Cell 2
RF Channel Number			2
Duplex mode	Config 1, 4		FDD
	Config 2, 3, 5, 6		TDD
$BW_{channel}$	Config 1, 4	MHz	10: $N_{RB,c}$ = 52
	Config 2, 5		10: $N_{RB,c}$ = 52
	Config 3, 6		40: $N_{RB,c}$ = 106
DL initial BWP configuration	Config 1, 2, 3, 4, 5, 6		DLBWP.0.1
DL dedicated BWP configuration	Config 1, 2, 3, 4, 5, 6		DLBWP.1.1
UL initial BWP configuration	Config 1, 2, 3, 4, 5, 6		ULBWP.0.1
UL dedicated BWP configuration	Config 1, 2, 3, 4, 5, 6		ULBWP.1.1
TDD Configuration	Config 1, 4		Not Applicable
	Config 2, 5		TDDConf.1.1
	Config 3, 6		TDDConf.2.1
RMSI CORESET Reference Channel	Config 1, 4		CR.1.1 FDD
	Config 2, 5		CR.1.1 TDD
	Config 3, 6		CR.2.1 TDD
Dedicated CORESET Reference Channel	Config 1, 4		CCR.1.3 FDD
	Config 2, 5		CCR.1.3 TDD
	Config 3, 6		CCR.2.2 TDD
SSB Configuration	Config 1, 4		SSB.1 FR1
	Config 2, 5		SSB.1 FR1
	Config 3, 6		SSB.2 FR1
SMTC Configuration	Config 1, 2, 4, 5		SMTC.1
	Config 3, 6		SMTC.1
PDSCH/PDCCH subcarrier spacing	Config 1, 2, 4, 5		15 KHz
	Config 3, 6		30 KHz
PRACH Configuration	Config 1, 2, 4, 5		Table A.7.1-1, PRACH.1 FR1
	Config 3, 6		Table A.7.1-1, PRACH.1 FR1
SSB index assigned as RLM RS			0
OCNG parameters			OP.1
CP length			Normal
Correlation Matrix and Antenna Configuration			2x2 Low
Out of sync transmission parameters	DCI format		1-0
	Number of Control OFDM symbols		2
	Aggregation level	CCE	8
	Ratio of hypothetical PDCCH RE energy to average SSS RE energy	dB	4
	Ratio of hypothetical PDCCH DMRS energy to average SSS RE energy	dB	4
	DMRS precoder granularity		REG bundle size
	REG bundle size		6

Parameter		Unit	Value
			Test 1
DRX Configuration			DRX.3
Gap pattern ID			N.A.
Layer 3 filtering			*Enabled*
T310 timer		ms	*0*
T311 timer		ms	1000
N310			1
N311			1
CSI-RS configuration for CSI reporting	Config 1, 4		CSI-RS.1.1 FDD
	Config 2, 5		CSI-RS.1.1 TDD
	Config 3, 6		CSI-RS.2.1 TDD
CSI-RS for tracking	Config 1, 4		TRS.1.1 FDD
	Config 2, 5		TRS.1.1 TDD
	Config 3, 6		TRS.1.2 TDD
T1		s	0.2
T2		s	0.68
T3		s	0.68
D1		s	0.64
NOTE 1: All configurations are assigned to the UE prior to the start of time period T1. NOTE 2: UE-specific PDCCH is not transmitted after T1 starts. NOTE 3: E-UTRAN is in non-DRX mode under test.			

4.5.1.3.4.2 Test Procedure

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

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

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

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

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

5. If the SS:

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

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

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

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

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

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

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

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

4.5.1.3.4.3 Message Contents

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

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

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

Table 4.5.1.3.4.3-1: Void

Table 4.5.1.3.4.3-2: RLF-TimersAndConstant

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

4.5.1.3.5 Test Requirement

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

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

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

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

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

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

Parameter		Unit	Test 1		
			T1	T2	T3
EPRE ratio of PDCCH DMRS to SSS		dB	4		
EPRE ratio of PDCCH to PDCCH DMRS		dB	0		
EPRE ratio of PBCH DMRS to SSS		dB	0		
EPRE ratio of PBCH to PBCH DMRS		dB			
EPRE ratio of PSS to SSS		dB			
EPRE ratio of PDSCH DMRS to SSS		dB			
EPRE ratio of PDSCH to PDSCH DMRS		dB			
EPRE ratio of OCNG DMRS to SSS		dB			
EPRE ratio of OCNG to OCNG DMRS		dB			
SNR on RLM-RS	Config 1, 4	dB	1.8	-6.2	-15.8
	Config 2, 5		1.8	-6.2	-15.8

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

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

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

4.5.1.4.1 Test purpose

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

4.5.1.4.2 Test applicability

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

4.5.1.4.3 Minimum conformance requirements

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

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

4.5.1.4.4 Test Description

There are two cells, Cell 1 is the E-UTRAN PCell, and Cell 2 is the PSCell, in the test. The E-UTRAN PCell setting refers to Table A.3.7.2.1-1. The test consists of five successive time periods, with time duration of T1, T2, T3, T4 and T5 respectively. Figure 4.5.1.4.4-1 shows the variation of the downlink SNR in the active Cell 2 to emulate out-of-sync and in-sync states. Prior to the start of the time duration T1, the UE shall be fully synchronized to Cell 1 and Cell 2. The UE shall be configured for periodic CSI reporting with a reporting periodicity of 5 ms. In the test, DRX configuration is enabled and DRX inactivity timer has already been expired, i.e. UE tries to decode PDCCH and to send periodic CSI during the period when On-duration timer is running. Time alignment timers shall be set to "infinity" so that UL timing alignment is maintained during the test.

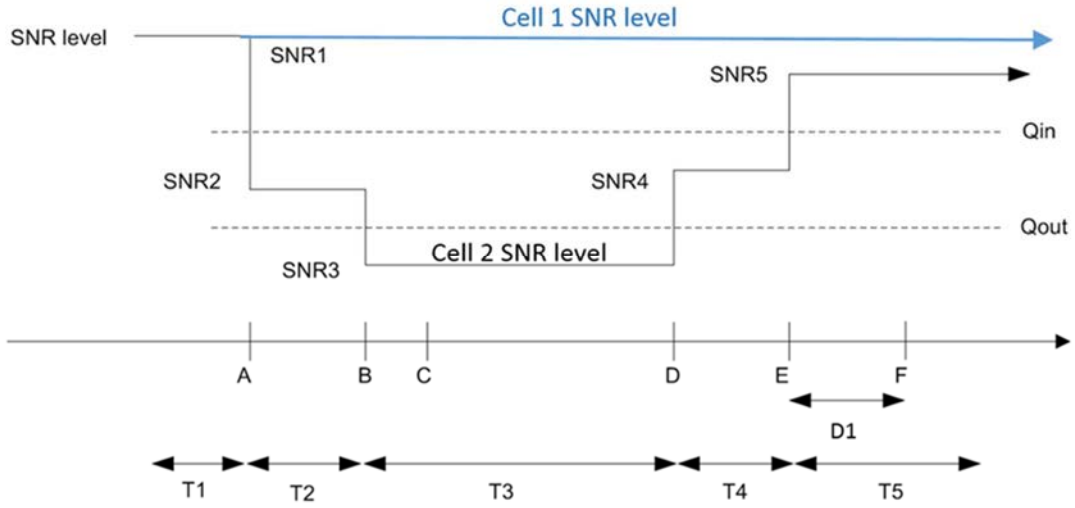


Figure 4.5.1.4.4-1 - SNR variation for in-sync testing

4.5.1.4.4.1 Initial Conditions

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

Table 4.5.1.4.4.1-1: Supported test configurations for FR1 PSCell

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

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

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

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

Table 4.5.1.4.4.1-3: Void

1. Message contents are defined in clause 4.5.1.4.4.3.

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

3. The general test parameters are given in Table 4.5.1.4.4.1-4 below.

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

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

Parameter			Unit	Value
				Test 1
Active E-UTRA PCell				Cell 1
E-UTRA RF Channel Number				1
Active PSCell				Cell 2
RF Channel Number				2
Duplex mode		Config 1, 4		FDD
		Config 2, 3, 5, 6		TDD
$BW_{channel}$		Config 1, 4	MHz	10: $N_{RB,c}$ = 52
		Config 2, 5		10: $N_{RB,c}$ = 52
		Config 3, 6		40: $N_{RB,c}$ = 106
DL initial BWP configuration		Config 1, 2, 3, 4, 5, 6		DLBWP.0.1
DL dedicated BWP configuration		Config 1, 2, 3, 4, 5, 6		DLBWP.1.1
UL initial BWP configuration		Config 1, 2, 3, 4, 5, 6		ULBWP.0.1
UL dedicated BWP configuration		Config 1, 2, 3, 4, 5, 6		ULBWP.1.1
TDD Configuration		Config 1, 4		Not Applicable
		Config 2, 5		TDDConf.1.1
		Config 3, 6		TDDConf.2.1
RMSI CORESET Reference Channel		Config 1, 4		CR.1.1 FDD
		Config 2, 5		CR.1.1 TDD
		Config 3, 6		CR.2.1 TDD
Dedicated CORESET Reference Channel		Config 1, 4		CCR.1.1 FDD
		Config 2, 5		CCR.1.1 TDD
		Config 3, 6		CCR.2.1 TDD
SSB Configuration		Config 1, 4		SSB.1 FR1
		Config 2, 5		SSB.1 FR1
		Config 3, 6		SSB.2 FR1
SMTC Configuration		Config 1, 2, 4, 5		SMTC.1
		Config 3, 6		SMTC.1
PDSCH/PDCCH subcarrier spacing		Config 1, 2, 4, 5		15 KHz
		Config 3, 6		30 KHz
PRACH Configuration		Config 1, 2, 4, 5		Table A.7.1-1, PRACH.1 FR1
		Config 3, 6		Table A.7.1-1, PRACH.1 FR1
SSB index assigned as RLM RS				0
OCNG parameters				OP.1
CP length				Normal
Correlation Matrix and Antenna Configuration				2x2 Low
In sync transmission parameters	DCI format			1-0
	Number of Control OFDM symbols			2
	Aggregation level		CCE	4
	Ratio of hypothetical PDCCH RE energy to average SSS RE energy		dB	0
	Ratio of hypothetical PDCCH DMRS energy to average SSS RE energy		dB	0
	DMRS precoder granularity			REG bundle size
	REG bundle size			6
Out of sync transmission parameters	DCI format			1-0
	Number of Control OFDM symbols			2
	Aggregation level		CCE	8

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

4.5.1.4.4.2 Test Procedure

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

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

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

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

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

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

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

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

Otherwise the number of failed tests is increased by one.

8. If the iteration fails, the SS shall first attempt to release and add the PSCell, by ensuring the UE is in state RRC_CONNECTED with generic procedure parameters *Connectivity* EN-DC, DC bearer MCG and SCG, Connected without release *On* and Test Mode *On* according to TS 38.508-1 [6] clause 4.5. If that also fails, then the UE is switched OFF/ON to proceed with the next iteration.

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

4.5.1.4.4.3 Message Contents

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

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

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

Table 4.5.1.4.4.3-1: Void

Table 4.5.1.4.4.3-2: RLF-TimersAndConstant

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

4.5.1.4.5 Test Requirement

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

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

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

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

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

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

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

EPRE ratio of OCNG to OCNG DMRS		dB					
SNR on RLM-RS	Config 1, 4	dB	1.8	-6.2	-15.8	-5.3	1.8
	Config 2, 5		1.8	-6.2	-15.8	-5.3	1.8
	Config 3, 6		1.8	-6.2	-15.8	-5.3	1.8
N_{oc}	Config 1, 4	dBm/15 KHz	-98				
	Config 2, 5		-98				
	Config 3, 6		-98				
Propagation condition			TDL-C 300ns 100Hz				
NOTE 1: OCNG shall be used such that the resources in Cell 2 are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.							
NOTE 2: The signal contains PDCCH for UEs other than the device under test as part of OCNG.							
NOTE 3: SNR levels correspond to the signal to noise ratio over the SSS REs.							
NOTE 4: The SNR in time periods T1, T2, T3, T4 and T5 is denoted as SNR1, SNR2, SNR3, SNR4 and SNR5 respectively in Figure 4.5.1.4.4-1.							
NOTE 5: The SNR values are specified for a UE with 2RX antennas connected under test. For a UE with 4RX antennas connected under test, the SNR during T3 and T4 from D.4.1.1 are -18.0-TT and -8.0-TT, which are -18.8dB and -8.8dB(including test tolerances).							

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

4.5.1.5.1 Test purpose

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

4.5.1.5.2 Test applicability

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

4.5.1.5.3 Minimum conformance requirements

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

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

4.5.1.5.4 Test description

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

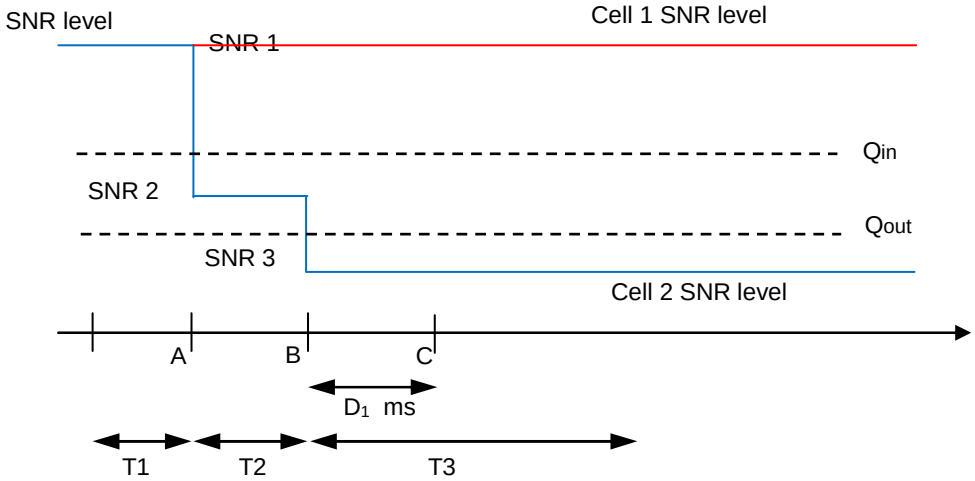


Figure 4.5.1.5.4-1: SNR variation for out-of-sync testing

4.5.1.5.4.1 Initial conditions

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

Table 4.5.1.5.4.1-1: Supported test configurations for FR1 PSCell

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

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

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

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

1. The test parameters are given in Table 4.5.1.5.4.1-3 below.
2. Message contents are defined in clause 4.5.1.5.4.3.
3. There are two cells in the test, where Cell 1 is the E-UTRAN PCell on the E-UTRA carrier, and Cell 2 is the NR PSCell on the NR carrier. Cell 1 is the cell used for connection setup with the power level set according to TS 38.133 [6] Table A.6.1.1-1 for this test. Cell 2 is configured according to clauses C.1.2 and C.1.3.

Table 4.5.1.5.4.1-3: General test parameters for FR1 PSCell for CSI-RS out-of-sync testing in non-DRX mode

Parameter		Unit	Value
			Test 1
Active E-UTRA PCell			Cell 1
E-UTRA RF Channel Number			1
Active PSCell			Cell 2
RF Channel Number			2
Duplex mode	Config 1, 4		FDD
	Config 2, 3, 5, 6		TDD
TDD Configuration	Config 1, 4		Not Applicable
	Config 2, 5		TDDConf.1.1
	Config 3, 6		TDDConf.2.1
DL initial BWP configuration	Config 1, 2, 3, 4, 5, 6		DLBWP.0.1
DL dedicated BWP configuration	Config 1, 2, 3, 4, 5, 6		DLBWP.1.1
UL initial BWP configuration	Config 1, 2, 3, 4, 5, 6		ULBWP.0.1
UL dedicated	Config 1, 2, 3, 4, 5, 6		ULBWP.1.1

Parameter		Unit	Value
			Test 1
BWP configuration			
RMSI CORESET Reference Channel	Config 1, 4		CR.1.1 FDD
	Config 2, 5		CR.1.1 TDD
	Config 3, 6		CR.2.1 TDD
DedicatedCORESET Reference Channel	Config 1, 4		CCR.1.3 FDD
	Config 2, 5		CCR.1.3 TDD
	Config 3, 6		CCR.2.2 TDD
SSB Configuration	Config 1, 4		SSB.1 FR1
	Config 2, 5		SSB.1 FR1
	Config 3, 6		SSB.2 FR1
SMTC Configuration	Config 1, 2, 4, 5		SMTC.1
	Config 3, 6		SMTC.1
PDSCH/PDCCH subcarrier spacing	Config 1, 2, 4, 5		15 KHz
	Config 3, 6		30 KHz
TRS configuration	Config 1, 4		TRS.1.1 FDD
	Config 2, 5		TRS.1.1 TDD
	Config 3, 6		TRS.1.2 TDD
CSI-RS for RLM	Config 1, 4		Resource #4 in TRS.1.1 FDD
	Config 2, 5		Resource #4 in TRS.1.1 TDD
	Config 3, 6		Resource #4 in TRS.1.2 TDD
TCI configuration for PDCCH/PDSCH			TCI.State.2
OCNG parameters			OP.1
CP length			Normal
Correlation Matrix and Antenna Configuration			2x2 Low
Out of sync transmission parameters	DCI format		1-0
	Number of Control OFDM symbols		2
	Aggregation level	CCE	8
	Ratio of hypothetical PDCCH RE energy to average CSI-RS RE energy	dB	4
	Ratio of hypothetical PDCCH DMRS energy to average CSI-RS RE energy	dB	4
	DMRS precoder granularity		REG bundle size
	REG bundle size		6
DRX			*OFF*
Gap pattern ID			*gp0*
Layer 3 filtering			*Enabled*
T310 timer		ms	*0*
T311 timer		ms	1000
N310			1
N311			1
CSI-RS configuration	Config 1, 4		CSI-RS 1.1 FDD
	Config 2, 5		CSI-RS.1.1 TDD
	Config 3, 6		CSI-RS.2.1 TDD
T1		s	0.2
T2		s	0.48
T3		s	0.48
D1		s	0.44
NOTE 1: UE-specific PDCCH is not transmitted after T1 starts. NOTE 2: E-UTRAN is in non-DRX mode under test.			

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

Field	Test 1
	Value
gapOffset	0

NOTE:	E-UTRAN PCell and PSCell are SFN-synchronous and frame boundary aligned.

4.5.1.5.4.2 Test procedure

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

1. Ensure the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity *EN-DC*, DC bearer *MCG_and_SCG*, Connected without release *On* and Test Mode *On* according to TS 38.508-1 [14] clause 4.5.
2. The SS shall transmit an *RRCConnectionReconfiguration* message configuring the UE for inter-frequency measurements.
3. The UE shall transmit *RRCReconfigurationComplete* message.
4. Set the parameters of Cell 2 according to T1 in Table 4.5.1.5.5-1. Propagation conditions are set according to clause C.2.3. T1 starts.
5. When T1 expires the SS shall change the SNR value to T2 as specified in Table 4.5.1.5.5-1. T2 starts.
6. When T2 expires the SS shall change the SNR value to T3 as specified in Table 4.5.1.5.5-1. T3 starts.
7. If the SS:

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

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

   Otherwise the number of failed tests is increased by one.
8. When T3 expires the SS shall change the SNR value to T1 as specified in Table 4.5.1.5.5-1.
9. If the UE has not re-established the connection in at least 1s, the SS shall ensure PSCell is released.
10. The SS then shall transmit *RRCConnectionReconfiguration* message with condition *MCG_and_SCG* according to TS 36.508 [25] Table 4.6.1-8 to add NR cell (PSCell). The UE shall transmit *RRCConnectionReconfigurationComplete* message.
11. If the Reconfiguration fails, switch off and on the UE and ensure the UE is in RRC_CONNECTED with generic procedure parameters Connectivity *EN-DC*, DC bearer *MCG_and_SCG*, Connected without release *On* according to TS 38.508-1 [14] clause 4.5.
12. Repeat steps 4-11 until the confidence level according to Tables G.2.3-1 in Annex G clause G.2 is achieved.

4.5.1.5.4.3 Message contents

Message contents are according to TS 38.508-1 [14] clause 4.6 and 7.3.1 with the following exceptions.

Table 4.5.1.5.4.3-1: Common Exception messages

Default Message Contents	
Common contents of system information blocks exceptions	

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

Table 4.5.1.5.4.3-2: Void

4.5.1.5.5 Test requirement

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

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

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

NOTE 1: OCNG shall be used such that the resources in Cell 2 are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.
NOTE 2: The uplink resources for CSI reporting are assigned to the UE prior to the start of time period T1.
NOTE 3: NZP CSI-RS resource set configuration for CSI reporting are assigned to the UE prior to the start of time period T1.
NOTE 4: Measurement gap configuration is assigned to the UE prior to the start of time period T1.
NOTE 5: The timers and layer 3 filtering related parameters are configured prior to the start of time period T1.
NOTE 6: The signal contains PDCCH for UEs other than the device under test as part of OCNG.
NOTE 7: SNR levels correspond to the signal to noise ratio over the SSS REs.
NOTE 8: The SNR in time periods T1, T2 and T3 is denoted as SNR1, SNR2 and SNR3 respectively in Figure 4.5.1.5.4-1.
NOTE 9: The SNR values are specified for testing a UE which supports 2RX on at least one band. For testing of a UE which supports 4RX on all bands, the SNR during T3 from D.4.1.1 is -18 -TT, which is -18.8dB (including test tolerances).

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

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

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

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

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

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

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

4.5.1.6.1 Test purpose

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

4.5.1.6.2 Test applicability

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

4.5.1.6.3 Minimum conformance requirements

The minimum requirements are specified in clause 4.5.1.0.4. DRX configuration is not used for this test.

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

4.5.1.6.4 Test description

There are two cells configured in this test, the E-UTRA PCell and NR PSCell. This test consists of five successive time periods, with time duration of T1, T2, T3, T4 and T5 respectively. Figure 4.5.1.6.4-1 shows the five different time durations and the corresponding variation of the downlink SNR in the active cell to emulate in-sync states.

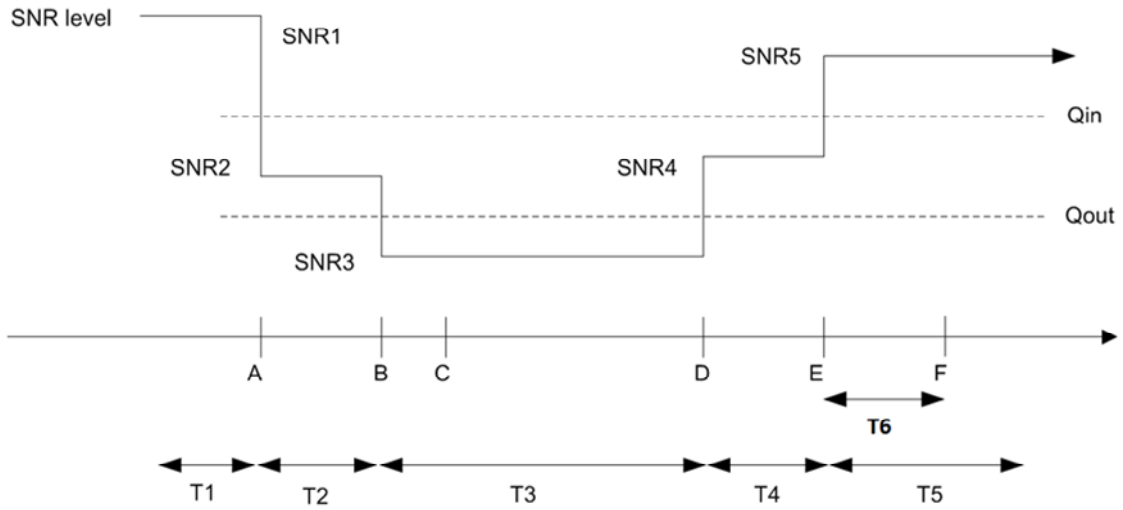


Figure 4.5.1.6.4-1: SNR variation for In-sync testing

4.5.1.6.4.1 Initial conditions

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

Table 4.5.1.6.4.1-1: Supported test configurations for FR1 PSCell

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

Configue the test equipment and the DUT according to the parameters in Table 4.5.1.6.4.1-2.

Table 4.5.1.6.4.1-2: Initial conditions for CSI-RS In-sync radio link monitoring in non-DRX mode

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

1. The test parameters are given in Table 4.5.1.6.4.1-3 below.
2. Message contents are defined in clause 4.5.1.6.4.3.
3. There are two cells in the test, where Cell 1 is the E-UTRAN PCell on the E-UTRA carrier, and Cell 2 is the NR PSCell on the NR carrier. Cell 1 is the cell used for connection setup with the power level set according to Table A.6.1.1-1 for this test. Cell 2 is configured according to clause C.1.2 and C.1.3.

Table 4.5.1.6.4.1-3: General test parameters for FR1 PSCell for CSI-RS In-sync testing in non-DRX mode

Parameter			Unit	Value
				Test 1
Active E-UTRA PCell				Cell 1
E-UTRA RF Channel Number				1
Active PSCell				Cell 2
RF Channel Number				2
Duplex mode		Config 1, 4		FDD
		Config 2, 3, 5, 6		TDD
TDD Configuration		Config 1, 4		Not Applicable
		Config 2, 5		TDDConf.1.1
		Config 3, 6		TDDConf. 2.1
DL initial BWP configuration		Config 1, 2, 3, 4, 5, 6		DLBWP.0.1
DL dedicated BWP configuration		Config 1, 2, 3, 4, 5, 6		DLBWP.1.1
UL initial BWP configuration		Config 1, 2, 3, 4, 5, 6		ULBWP.0.1
UL dedicated BWP configuration		Config 1, 2, 3, 4, 5, 6		ULBWP.1.1
RMSI CORESET Reference Channel		Config 1, 4		CR.1.1 FDD
		Config 2, 5		CR.1.1 TDD
		Config 3, 6		CR.2.1 TDD
Dedicated CORESET Reference Channel		Config 1, 4		CCR.1.1 FDD
		Config 2, 5		CCR.1.1 TDD
		Config 3, 6		CCR.2.1 TDD
SSB Configuration		Config 1, 4		SSB.1 FR1
		Config 2, 5		SSB.1 FR1
		Config 3, 6		SSB.2 FR1
SMTC Configuration		Config 1, 2, 4, 5		SMTC.1
		Config 3, 6		SMTC.1
PDSCH/PDCCH subcarrier spacing		Config 1, 2, 4, 5		15 KHz
		Config 3, 6		30 KHz
TRS configuration		Config 1, 4		TRS.1.1 FDD
		Config 2, 5		TRS.1.1 TDD
		Config 3, 6		TRS.1.2 TDD
CSI-RS for RLM		Config 1, 4		Resource #4 in TRS.1.1 FDD
		Config 2, 5		Resource #4 in TRS.1.1 TDD
		Config 3, 6		Resource #4 in TRS.1.2 TDD
TCI configuration for PDCCH/PDSCH				TCI.State.2
OCNG parameters				OP.1
CP length				Normal
Correlation Matrix and Antenna Configuration				2x2 Low
Out of sync transmission parameters	DCI format			1-0
	Number of Control OFDM symbols			2
	Aggregation level		CCE	8
	Ratio of hypothetical PDCCH RE energy to average CSI-RS RE energy		dB	4
	Ratio of hypothetical PDCCH DMRS energy to average CSI-RS RE energy		dB	4
	DMRS precoder granularity			REG bundle size
	REG bundle size			6
In sync transmission parameters	DCI format			1-0
	Number of Control OFDM symbols			2
	Aggregation level		CCE	4

Parameter		Unit	Value
			Test 1
	Ratio of hypothetical PDCCH RE energy to average CSI-RS RE energy	dB	0
	Ratio of hypothetical PDCCH DMRS energy to average CSI-RS RE energy	dB	0
	DMRS precoder granularity		REG bundle size
	REG bundle size		6
DRX			*OFF*
Gap pattern ID			N.A.
Layer 3 filtering			*Enabled*
T310 timer		ms	1000
T311 timer		ms	1000
N310			1
N311			1
CSI-RS for reporting	Config 1, 4		CSI-RS.1.1 FDD
	Config 2, 5		CSI-RS.1.1 TDD
	Config 3, 6		CSI-RS.2.1 TDD
T1		s	0.2
T2		s	0.2
T3		s	0.44
T4		s	0.2
T5		s	0.88
T6		s	0.84
NOTE 1: UE-specific PDCCH is not transmitted after T1 starts. NOTE 2: E-UTRAN is in non-DRX mode under test.			

4.5.1.6.4.2 Test procedure and Test Mode *On*

Prior to the start of the time duration T1, the UE shall be fully synchronized to Cell 1 and Cell 2. The UE shall be configured for periodic CSI reporting with a reporting periodicity of 5ms. In the test, DRX configuration is not enabled.

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

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

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

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

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

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

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

   Otherwise the number of failed tests is increased by one.

8. If the iteration fails, the SS shall first attempt to release and add the PSCell, by ensuring the UE is in state RRC_CONNECTED with generic procedure parameters *Connectivity* EN-DC, DC bearer MCG and SCG, Connected without release *On* and Test Mode *On* according to TS 38.508-1 [6] clause 4.5. If that also fails, then the UE is switched OFF/ON to proceed with the next iteration.

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

4.5.1.6.4.3 Message contents

Message contents are according to TS 38.508-1 [14] clause 4.6 and 7.3.1 with the following exceptions:

Table 4.5.1.6.4.3-1: Common Exception messages

Default Message Contents	
Common contents of system information blocks exceptions	
Default RRC messages and information elements contents exceptions	Table H.3.4-1 Table H.3.5-4 Table H.3.5-9 with Condition CSI-RS RLM

4.5.1.6.5 Test requirement

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

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

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

NOTE 1: OCNG shall be used such that the resources in Cell 2 are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.
NOTE 2: The uplink resources for CSI reporting are assigned to the UE prior to the start of time period T1.
NOTE 3: NZP CSI-RS resource set configuration for CSI reporting are assigned to the UE prior to the start of time period T1.
NOTE 4: Measurement gap configuration is assigned to the UE prior to the start of time period T1.
NOTE 5: The timers and layer 3 filtering related parameters are configured prior to the start of time period T1.
NOTE 6: The signal contains PDCCH for UEs other than the device under test as part of OCNG.
NOTE 7: SNR levels correspond to the signal to noise ratio over the SSS REs.
NOTE 8: The SNR in time periods T1, T2, T3, T4 and T5 is denoted as SNR1, SNR2, SNR3, SNR4 and SNR5 respectively in figure 4.5.1.6.4-1.
NOTE 9: The SNR values are specified for testing a UE which supports 2RX on at least one band. For testing of a UE which supports 4RX on all bands, the SNR during T3 and T4 from D.4.1.1 are -18.0-TT and -8.0-TT, which are -18.8dB and -8.8dB (including test tolerances).

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

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

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

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

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

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

4.5.1.7.1 Test purpose

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

4.5.1.7.2 Test applicability

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

4.5.1.7.3 Minimum conformance requirements

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

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

4.5.1.7.4 Test description

There are two cells configured in this test, the E-UTRA PCell and NR PSCell. This test consists of three successive time periods, with time duration of T1, T2 and T3 respectively. Figure 4.5.1.7.4-1 shows the three different time durations and the corresponding variation of the downlink SNR in the active cell to emulate out-of-sync states.

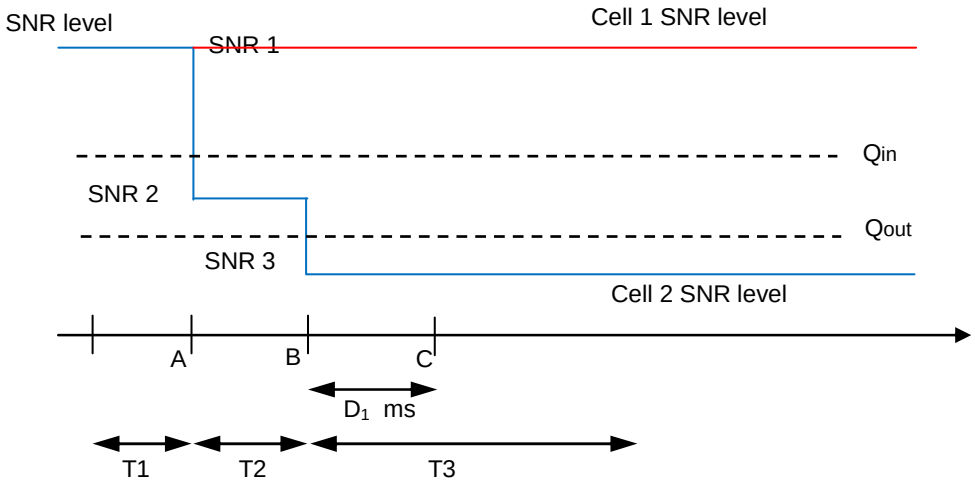


Figure 4.5.1.7.4-1: SNR variation for out-of-sync testing

4.5.1.7.4.1 Initial conditions

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

Table 4.5.1.7.4.1-1: Supported test configurations for FR1 PSCell

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

Configue the test equipment and the DUT according to the parameters in Table 4.5.1.7.4.1-2.

Table 4.5.1.7.4.1-2: Initial conditions for CSI-RS out-of-sync radio link monitoring in DRX mode

Parameter	Value		Comment
Test environment	NC		As specified in TS 38.508-1 [14] clause 4.1.
Test frequencies	As specified in Annex E, table E.2-1 and TS 38.508-1 [14] clause 4.3.1.		
Channel bandwidth	As specified by the test configuration selected from Table 4.5.1.7.4.1-1.		
Propagation conditions	AWGN		As specified in clause C.2.2.
Connection Diagram	TE Part	A.3.1.7.1	As specified in TS 38.508-1 [14] Annex A.
	DUT Part	A.3.2.3.4	
Exceptions to connection diagram	For 4Rx capable UEs without any 2 Rx RF bands use A.3.2.5.2 for DUT part and A.3.1.7.4 for TE Part		

1. The test parameters are given in Table 4.5.1.7.4.1-3 below.
2. Message contents are defined in clause 4.5.1.7.4.3.
3. There are two cells in the test, where Cell 1 is the E-UTRAN PCell on the E-UTRA carrier, and Cell 2 is the NR PSCell on the NR carrier. Cell 1 is the cell used for connection setup with the power level set according to Table A.6.1.1-1 for this test. Cell 2 is configured according to clauses C.1.2 and C.1.3.

Table 4.5.1.7.4.1-3: General test parameters for FR1 PSCell for CSI-RS out-of-sync testing in DRX mode

Parameter		Unit	Value
			Test 1
Active E-UTRA PCell			Cell 1
E-UTRA RF Channel Number			1
Active PSCell			Cell 2
RF Channel Number			2
Duplex mode	Config 1, 4		FDD
	Config 2, 3, 5, 6		TDD
TDD Configuration	Config 1, 4		Not Applicable
	Config 2, 5		TDDConf.1.1
	Config 3, 6		TDDConf.2.1
DL initial BWP configuration	Config 1, 2, 3, 4, 5, 6		DLBWP.0.1
DL dedicated BWP configuration	Config 1, 2, 3, 4, 5, 6		DLBWP.1.1
UL initial BWP configuration	Config 1, 2, 3, 4, 5, 6		ULBWP.0.1
UL dedicated BWP configuration	Config 1, 2, 3, 4, 5, 6		ULBWP.1.1
RMSI CORESET Reference Channel	Config 1, 4		CR.1.1 FDD
	Config 2, 5		CR.1.1 TDD
	Config 3, 6		CR.2.1 TDD
Dedicated CORESET Reference Channel	Config 1, 4		CCR.1.3 FDD
	Config 2, 5		CCR.1.3 TDD
	Config 3, 6		CCR.2.2 TDD
SSB Configuration	Config 1, 4		SSB.1 FR1

Parameter		Unit	Value
			Test 1
	Config 2, 5		SSB.1 FR1
	Config 3, 6		SSB.2 FR1
SMTC Configuration	Config 1, 2, 4, 5		SMTC.1
	Config 3, 6		SMTC.1
PDSCH/PDCCH subcarrier spacing	Config 1, 2, 4, 5		15 KHz
	Config 3, 6		30 KHz
TRS configuration	Config 1, 4		TRS.1.1 FDD
	Config 2, 5		TRS.1.1 TDD
	Config 3, 6		TRS.1.2 TDD
CSI-RS for RLM	Config 1, 4		Resource #4 in TRS.1.1 FDD
	Config 2, 5		Resource #4 in TRS.1.1 TDD
	Config 3, 6		Resource #4 in TRS.1.2 TDD
TCI configuration for PDCCH/PDSCH			TCI.State.2
OCNG parameters			OP.1
CP length			Normal
Correlation Matrix and Antenna Configuration			2x2 Low
Out of sync transmission parameters	DCI format		1-0
	Number of Control OFDM symbols		2
	Aggregation level	CCE	8
	Ratio of hypothetical PDCCH RE energy to average CSI-RS RE energy	dB	4
	Ratio of hypothetical PDCCH DMRS energy to average CSI-RS RE energy	dB	4
	DMRS precoder granularity		REG bundle size
	REG bundle size		6
DRX			DRX.3
Gap pattern ID			N.A.
Layer 3 filtering			*Enabled*
T310 timer		ms	*0*
T311 timer		ms	1000
N310			1
N311			1
CSI-RS for reporting	Config 1, 4		CSI-RS.1.1 FDD
	Config 2, 5		CSI-RS.1.1 TDD
	Config 3, 6		CSI-RS.2.1 TDD
T1		s	0.2
T2		s	1.28
T3		s	1.28
D1		s	1.24
NOTE 1: UE-specific PDCCH is not transmitted after T1 starts. NOTE 2: E-UTRAN is in non-DRX mode under test.			

4.5.1.7.4.2 Test procedure

Prior to the start of the time duration T1, the UE shall be fully synchronized to Cell 1 and Cell 2. The UE shall be configured for periodic CSI reporting with a reporting periodicity of 5ms. In the test, DRX configuration is enabled in PSCell and DRX inactivity timer has already been expired, i.e. UE tries to decode PDCCH and to send periodic CQI during the period when On-duration timer is running. Time alignment timers shall be set to "infinity" so that UL timing alignment is maintained during the test.

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

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

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

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

5. If the SS:

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

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

   Otherwise the number of failed tests is increased by one.

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

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

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

4.5.1.7.4.3 Message contents

Message contents are according to TS 38.508-1 [14] clause 4.6 and 7.3.1 with the following exceptions.

Table 4.5.1.7.4.3-1: Common Exception messages

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

Table 4.5.1.7.4.3-2: RLF-TimersAndConstant

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

4.5.1.7.5 Test requirement

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

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

Parameter	Unit	Test 1		
		T1	T2	T3
EPRE ratio of PDCCH DMRS to SSS	dB	4		
EPRE ratio of PDCCH to PDCCH DMRS	dB	0		

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

NOTE 1: OCNG shall be used such that the resources in Cell 2 are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.
NOTE 2: The uplink resources for CSI reporting are assigned to the UE prior to the start of time period T1.
NOTE 3: NZP CSI-RS resource set configuration for CSI reporting are assigned to the UE prior to the start of time period T1.
NOTE 4: Measurement gap configuration is assigned to the UE prior to the start of time period T1.
NOTE 5: The timers and layer 3 filtering related parameters are configured prior to the start of time period T1.
NOTE 6: The signal contains PDCCH for UEs other than the device under test as part of OCNG.
NOTE 7: SNR levels correspond to the signal to noise ratio over the SSS REs.
NOTE 8: The SNR in time periods T1, T2 and T3 is denoted as SNR1, SNR2 and SNR3 respectively in figure 4.5.1.7.4-1.
NOTE 9: The SNR values are specified for testing a UE which supports 2RX on at least one band. For testing of a UE which supports 4RX on all bands, the SNR during T3 from D.4.1.1 is -18 -TT, which is -18.8dB (including test tolerances).

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

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

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

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

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

- UE output power equal to or less than Transmit OFF power (as defined in TS 38.521-1 [17] clause 6.3.2.5) means no uplink signal.

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

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

4.5.1.8.1 Test purpose

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

4.5.1.8.2 Test applicability

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

4.5.1.8.3 Minimum conformance requirements

The minimum requirements are specified in clause 4.5.1.0.4. DRX configuration is used for this test.

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

4.5.1.8.4 Test description

There are two cells configured in this test, the E-UTRA PCell and NR PSCell. This test consists of five successive time periods, with time duration of T1, T2, T3, T4 and T5 respectively. Figure 4.5.1.8.4-1 shows the five different time durations and the corresponding variation of the downlink SNR in the active cell to emulate in-sync states.

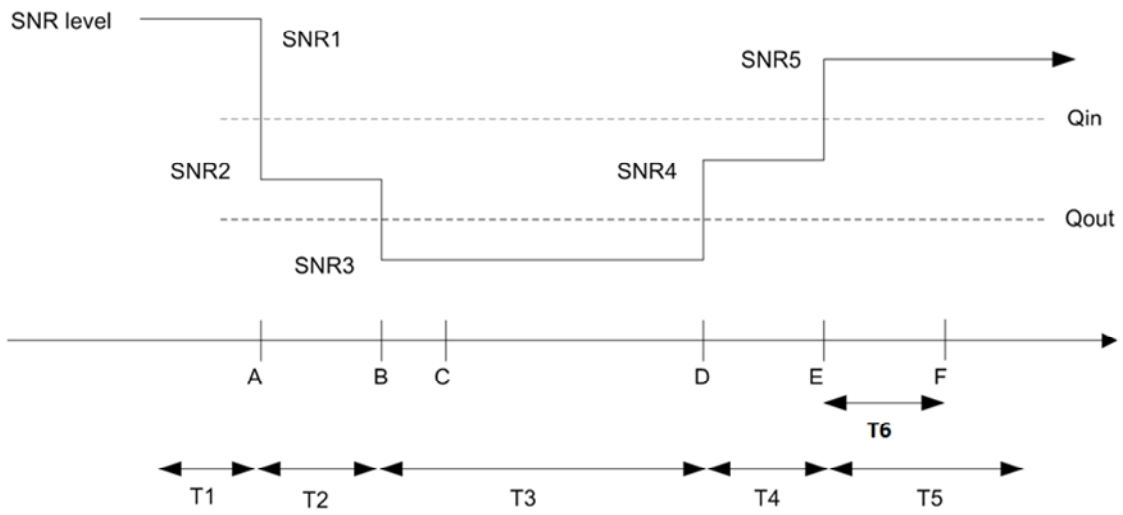


Figure 4.5.1.8.4-1: SNR variation for In-sync testing

4.5.1.8.4.1 Initial conditions

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

Table 4.5.1.8.4.1-1: Supported test configurations for FR1 PSCell

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

Configue the test equipment and the DUT according to the parameters in Table 4.5.1.8.4.1-2.

Table 4.5.1.8.4.1-2: Initial conditions for CSI-RS In-sync radio link monitoring in DRX mode

Parameter	Value		Comment
Test environment	NC		As specified in TS 38.508-1 [14] clause 4.1.
Test frequencies	As specified in Annex E, table E.2-1 and TS 38.508-1 [14] clause 4.3.1.		
Channel bandwidth	As specified by the test configuration selected from Table 4.5.1.8.4.1-1.		
Propagation conditions	AWGN		As specified in clause C.2.2.
Connection Diagram	TE Part	A.3.1.7.1	As specified in TS 38.508-1 [14] Annex A.
	DUT Part	A.3.2.3.4	
Exceptions to connection diagram	For 4Rx capable UEs without any 2 Rx RF bands use A.3.2.5.2 for DUT part and A.3.1.7.4 for TE Part		

1. The test parameters are given in Table 4.5.1.8.4.1-3 below.
2. Message contents are defined in clause 4.5.1.8.4.3.
3. There are two cells in the test, where Cell 1 is the E-UTRAN PCell on the E-UTRA carrier, and Cell 2 is the NR PSCell on the NR carrier. Cell 1 is the cell used for connection setup with the power level set according to Table A.6.1.1-1 for this test. Cell 2 is configured according to clauses C.1.2 and C.1.3.

Table 4.5.1.8.4.1-3: General test parameters for FR1 PSCell for CSI-RS In-sync testing in DRX mode

Parameter		Unit	Value
			Test 1
Active E-UTRA PCell			Cell 1
E-UTRA RF Channel Number			1
Active PSCell			Cell 2
RF Channel Number			2
Duplex mode	Config 1, 4		FDD
	Config 2, 3, 5, 6		TDD
TDD Configuration	Config 1, 4		Not Applicable
	Config 2, 5		TDDConf.1.1
	Config 3, 6		TDDConf.2.1
DL initial BWP configuration	Config 1, 2, 3, 4, 5, 6		DLBWP.0.1
DL dedicated BWP configuration	Config 1, 2, 3, 4, 5, 6		DLBWP.1.1
UL initial BWP configuration	Config 1, 2, 3, 4, 5, 6		ULBWP.0.1
UL dedicated BWP configuration	Config 1, 2, 3, 4, 5, 6		ULBWP.1.1
RMSI CORESET Reference Channel	Config 1, 4		CR.1.1 FDD
	Config 2, 5		CR.1.1 TDD
	Config 3, 6		CR.2.1 TDD
Dedicated CORESET Reference Channel	Config 1, 4		CCR.1.1 FDD
	Config 2, 5		CCR.1.1 TDD
	Config 3, 6		CCR.2.1 TDD
SSB Configuration	Config 1, 4		SSB.1 FR1
	Config 2, 5		SSB.1 FR1
	Config 3, 6		SSB.2 FR1
SMTC Configuration	Config 1, 2, 4, 5		SMTC.1
	Config 3, 6		SMTC.1
PDSCH/PDCCH subcarrier spacing	Config 1, 2, 4, 5		15 KHz
	Config 3, 6		30 KHz
TRS configuration	Config 1, 4		TRS.1.1 FDD
	Config 2, 5		TRS.1.1 TDD

Parameter			Unit	Value
				Test 1
	Config 3, 6			TRS.1.2 TDD
CSI-RS for RLM	Config 1, 4			Resource #4 in TRS.1.1 FDD
	Config 2, 5			Resource #4 in TRS.1.1 TDD
	Config 3, 6			Resource #4 in TRS.1.2 TDD
TCI configuration for PDCCH/PDSCH				TCI.State.2
OCNG parameters				OP.1
CP length				Normal
Correlation Matrix and Antenna Configuration				2x2 Low
Out of sync transmission parameters	DCI format			1-0
	Number of Control OFDM symbols			2
	Aggregation level		CCE	8
	Ratio of hypothetical PDCCH RE energy to average CSI-RS RE energy		dB	4
	Ratio of hypothetical PDCCH DMRS energy to average CSI-RS RE energy		dB	4
	DMRS precoder granularity			REG bundle size
	REG bundle size			6
In sync transmission parameters	DCI format			1-0
	Number of Control OFDM symbols			2
	Aggregation level		CCE	4
	Ratio of hypothetical PDCCH RE energy to average CSI-RS RE energy		dB	0
	Ratio of hypothetical PDCCH DMRS energy to average CSI-RS RE energy		dB	0
	DMRS precoder granularity			REG bundle size
	REG bundle size			6
DRX				DRX.3
Gap pattern ID				*gp0*
Layer 3 filtering				*Enabled*
T310 timer			ms	2000
T311 timer			ms	1000
N310				1
N311				1
CSI for reporting	Config 1, 4			CSI-RS.1.1 FDD
	Config 2, 5			CSI-RS.1.1 TDD
	Config 3, 6			CSI-RS.2.1 TDD
T1			s	0.2
T2			s	0.2
T3			s	1.24
T4			s	0.2
T5			s	1.88
T6			s	1.84
NOTE 1: UE-specific PDCCH is not transmitted after T1 starts. NOTE 2: E-UTRAN is in non-DRX mode under test.				

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

Field	Test 1
	Value

gapOffset	0
NOTE: E-UTRAN PCell and PSCell are SFN-synchronous and frame boundary aligned.	

4.5.1.8.4.2 Test procedure

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

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

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

3. The UE shall transmit *RRCReconfigurationComplete* message.

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

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

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

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

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

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

   Otherwise the number of failed tests is increased by one.

10. If the iteration fails, the SS shall first attempt to release and add the PSCell, by ensuring the UE is in state RRC_CONNECTED with generic procedure parameters *Connectivity* EN-DC, DC bearer MCG and SCG, Connected without release *On* and Test Mode *On* according to TS 38.508-1 [6] clause 4.5. If that also fails, then the UE is switched OFF/ON to proceed with the next iteration.

11. Repeat steps 4-10 for both subtests until the confidence level according to Tables G.2.3-1 in Annex G clause G.2 is achieved.

4.5.1.8.4.3 Message contents

Message contents are according to TS 38.508-1 [14] clause 4.6 and 7.3.1 with the following exceptions:

Table 4.5.1.8.4.3-1: Common Exception messages

Default Message Contents	
Common contents of system information blocks exceptions	

Default RRC messages and information elements contents exceptions	Table H.3.1-1 Table H.3.1-2 with Condition INTER-FREQ, L3 FILTERING NEEDED Table H.3.1-3 with Condition INTER-FREQ MO (where ssbFrequency is set to the ARFCN value of carrier center of High range) Table H.3.1-4 with A3-offset = 0 Table H.3.4-1 Table H.3.4-1a Table H.3.4-4 with condition gapUE Table H.3.4-5 with condition BFD Table H.3.5-4 Table H.3.5-9 with Condition CSI-RS RLM Table H.3.7-1 with condition DRX.3 and Gap

Table 4.5.1.8.4.3-2: Void

Table 4.5.1.8.4.3-3: RLF-TimersAndConstant

Derivation Path: TS 38.508-1 [14], Table 4.6.3-150			
Information Element	**Value/remark**	**Comment**	**Condition**
RLF-TimersAndConstants ::= SEQUENCE {			
t310	ms2000		
}			

4.5.1.8.5 Test requirement

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

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

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

Parameter	Unit	Test 1				
		T1	T2	T3	T4	T5
NOTE 1: OCNG shall be used such that the resources in Cell 2 are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.						
NOTE 2: The uplink resources for CSI reporting are assigned to the UE prior to the start of time period T1.						
NOTE 3: NZP CSI-RS resource set configuration for CSI reporting are assigned to the UE prior to the start of time period T1.						
NOTE 4: Measurement gap configuration is assigned to the UE prior to the start of time period T1.						
NOTE 5: The timers and layer 3 filtering related parameters are configured prior to the start of time period T1.						
NOTE 6: The signal contains PDCCH for UEs other than the device under test as part of OCNG.						
NOTE 7: SNR levels correspond to the signal to noise ratio over the SSS REs.						
NOTE 8: The SNR in time periods T1, T2, T3, T4 and T5 is denoted as SNR1, SNR2, SNR3, SNR4 and SNR5 respectively in figure 4.5.1.8.4-1.						
NOTE 9: The SNR values are specified for testing a UE which supports 2RX on at least one band. For testing of a UE which supports 4RX on all bands, the SNR during T3 and T4 from D.4.1.1 are -18.0-TT and -8.0-TT, which are -18.8dB and -8.8dB(including test tolerances).						

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

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

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

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

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

4.5.2 Interruption

4.5.2.0 Minimum conformance requirements

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

[TS 38.133, clause 8.2.1.2.1]

Interruption on PSCell and the activated SCell if configured due to E-UTRA PCell transitions between active and non-active druing DRX when PSCell or SCell is in non-DRX are allowed with up to 1% probability of missed ACK/NACK when the configured E-UTRA PCell DRX cycle is less than 640 ms, and 0.625% probability of missed ACK/NACK is allowed when the configured E-UTRA PCell DRX cycle is 640 ms or longer. Each interruption shall not exceed X slot as defined in table 4.5.2.0.1-1.

Each interruption shall not exceed X slot as defined in table 4.5.2.0.1-1.

Table 4.5.2.0.1-1: Interruption length X at transition between active and non-active during DRX

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

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

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

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

[TS 38.133, clause 8.2.1.2.5.1]

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

[TS 38.133, clause 8.2.2.2.3]

Interruptions on PCell due to measurements when an SCell is deactivated are allowed with up to 0.5% probability of missed ACK/NACK when the configured *measCycleSCell* [2] is 640 ms or longer. The UE is only allowed to cause interruptions immediately before and immediately after an SMTC. Each interruption shall not exceed requirement in Table 4.5.2.0.2-1 if the PCell is not in the same band as the deactivated SCell. Each interruption shall not exceed requirement in Table 4.5.2.0.2-2 if the PCell is in the same band as the deactivated SCell.

Interruptions on active SCell due to measurements when an SCell is deactivated are allowed with up to 0.5% probability of missed ACK/NACK when the configured *measCycleSCell* [2] is 640 ms or longer. The UE is only allowed to cause interruptions immediately before and immediately after an SMTC. Each interruption shall not exceed requirement in Table 4.5.2.0.2-1 if the active SCell is not in the same band as the deactivated SCell. Each interruption shall not exceed requirement in Table 4.5.2.0.2-2 if the active SCell is in the same band as the deactivated SCell.

[TS 38.133, clause 8.2.2.2.2]

Table 4.5.2.0.2-1: Interruption duration for SCell activation/deactivation for inter-band CA

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

Table 4.5.2.0.2-2: Interruption duration for SCell activation/deactivation for intra-band CA

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

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

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

[TS 38.133 clause 8.2.1.2.5.2]

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

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

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

Each interruption shall not exceed:

- X3 slot, if the PSCell or activated SCell is not in the same band as the E-UTRA deactivated SCC being measured, or

- Y3 slot + SMTC duration, if the PSCell or activated SCell is in the same band as the E-UTRA deactivated SCC being measured, provided the cell specific reference signals from the PSCell or activated SCell and the E-UTRA deactivated SCC being measured are available in the same slot.

Table 4.5.2.0.3-1: Interruption length X3 and Y3 at measurements on deactivated E-UTRA SCC

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

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

4.5.2.0.4 Minimum conformance requirements for interruptions at NR SRS carrier based switching

SRS transmission can be configured on a carrier not configured for PUCCH/PUSCH transmission. When a UE needs to transmit periodic, semi-persistent or aperiodic SRS on a carrier of a serving cell not configured for PUCCH/PUSCH transmission, the UE can perform carrier based switching to one or more carriers not configured for PUCCH/PUSCH transmission from a carrier with PUCCH/PUSCH transmission or from a carrier not configured for PUCCH/PUSCH transmission prior to transmitting SRS, provided that:

- switching is from a configured carrier to an active UL BWP of another activated carrier;

- the carrier of SCells not configured for PUCCH/PUSCH transmission to which SRS carrier based switching is performed is indicated by DCI SRS request field for aperiodic SRS transmission, or indicated by MAC-CE for semi-persistent SRS transmission, or configured via RRC for periodic SRS transmission;

- the serving cell, from which SRS carrier based switching is performed and whose UL transmission may therefore be interrupted, is indicated by srs-SwitchFromServCellIndex and srs-SwitchFromCarrier in TS38.331 [2];

- the SRS switching is not colliding with any other transmission with higher priority defined in TS 38.214 [26].

- the SRS switching is not colliding with any SSB/CSI-RS based L3 measurements and the measurements for RLM/BFD in SCG.

- for UE, which does not support simultaneous reception and transmission for inter-band TDD CA specified in TS 38.331 [2], and is compliant to the requirements for inter-band CA with uplink in one NR band and without simultaneous Rx/Tx specified in TS 38.101 [5], the SRS transmission are not simultaneously scheduled with DL SSB/CSI-RS for L3 or L1 measurements transmission on other carriers.

The UE shall not perform SRS carrier based switching if the above conditions cannot be met.

When SRS carrier based switching is performed between carriers, the UE is allowed interruptions on any active serving cell in SCG if UE is not capable of Per-FR gap, or on active serving cell(s) in SCG in FR1 if UE is capable of Per-FR gap, during the switching to the carrier of a serving cell in FR1 not configured for PUCCH/PUSCH transmission,

- with up to X1 slot as specified in Table 4.5.2.0.4-1.

When SRS carrier based switching is performed between carriers, the UE is allowed interruptions on any active serving cell in SCG if UE is not capable of Per-FR gap, or on active serving cell(s) in SCG in FR2 if UE is capable of Per-FR gap, during the switching to the carrier of a serving cell in FR2 not configured for PUCCH/PUSCH transmission,

- with up to X2 slot as specified in Table 4.5.2.0.4-2.

When SRS carrier based switching is performed between carriers, the UE is allowed interruptions on any active serving cell in SCG if UE is not capable of Per-FR gap, or on active serving cell(s) in SCG in FR1 if UE is capable of Per-FR gap, during the switching from the carrier of a serving cell in FR1 not configured for PUCCH/PUSCH transmission,

- with up to X1 slot as specified in Table 4.5.2.0.4-1.

When SRS carrier based switching is performed between carriers, the UE is allowed interruptions on any active serving cell in SCG if UE is not capable of Per-FR gap, or on active serving cell(s) in SCG in FR2 if UE is capable of Per-FR gap, during the switching from the carrier of a serving cell in FR2 not configured for PUCCH/PUSCH transmission,

- with up to X2 slot as specified in Table 4.5.2.0.4-2.

Table 4.5.2.0.4-1: Interruption length X1 (slot)

μ	NR Slot length (ms) of victim cell	SRS carrier switching time (us)[Note 1]	Interruption length X1 (slots)	
			Sub carrier spacing for aggressor cell (kHz)	
			15	30
0	1	≤ 200	2	2
		300, 500	2	2
		900	3	3
1	0.5	≤ 200	3	2
		300, 500	3	3
		900	4	4
2	0.25	≤ 200	4	3
		300, 500	5	4
		900	7	6
3	0.125	≤ 200	7	5
		300, 500	9	7
		900	12	10
Note1: NR SRS carrier switching time is UE capability indicated by higher layer parameter *SRS-SwitchingTimeNR*.				

Table 4.5.2.0.4-2: Interruption length X2 (slot)

μ	NR Slot length (ms) of victim cell	SRS carrier switching time (us) [Note1]	Interruption length X2 (slots)	
			Sub carrier spacing for aggressor cell (kHz)	
			60	120
0	1	$\leq$ 200	2	2
1	0.5	$\leq$ 200	2	2
2	0.25	$\leq$ 200	3	3
3	0.125	$\leq$ 200	4	4
Note1: NR SRS carrier switching time is UE capability indicated by higher layer parameter *SRS-SwitchingTimeNR*.				

For intra-band SRS carrier switching in FR1 or FR2, interruptions in Table 4.5.2.0.4-1 and in Table 4.5.2.0.4-2 based on SRS carrier switching time $\leq$ 200us shall apply. For inter-band SRS carrier switching in FR1, interruptions in Table 4.5.2.0.4-1 and in Table 4.5.2.0.4-2 shall apply.

The normative reference for this requirement is TS 38.133 [6] clause 4.5.2.0.4.

4.5.2.0.5 Minimum conformance requirements for interruptions at E-UTRA SRS carrier based switching

A PUSCH-less carrier of E-UTRA SCell is a TDD carrier without PUCCH/PUSCH configured. When a UE needs to transmit periodic or aperiodic SRS [23] and/or non-contention based PRACH on a PUSCH-less carrier of E-UTRA SCell, the UE can perform carrier based switching to one or more PUSCH-less carrier of E-UTRA SCells from a E-UTRA carrier with PUSCH or from another PUSCH-less E-UTRA carrier of SCell prior to transmitting SRS and/or PRACH, provided that:

- switching is from a configured E-UTRA carrier to another activated TDD E-UTRA carrier;
- the PUSCH-less carrier of E-UTRA SCells to which SRS carrier based switching is performed is indicated by DCI SRS request field for aperiodic SRS transmission or configured via RRC [15] for periodic SRS transmission;
- the E-UTRA serving cell, from which SRS carrier based switching is performed and whose UL transmission may therefore be interrupted, is indicated by srs-SwitchFromServCellIndex [15];
- the SRS switching is not colliding with any other transmission with higher priority defined in TS36.213 [26];
- the SRS switching is not colliding with PDCCH in subframe 0 and 5 as specified in TS36.213 [26];
- for UE, which does not support simultaneous reception and transmission for inter-band TDD CA specified in TS 36.331 [2], and is compliant to the requirements for inter-band CA with uplink in one E-UTRA band and without simultaneous Rx/Tx specified in TS 36.101 [25], the SRS or RACH transmission are not simultaneously scheduled with DL subframe #0 or DL subframe #5 on other E-UTRA carriers.

The UE shall not perform SRS carrier based switching if the above conditions cannot be met.

When SRS carrier based switching is performed between E-UTRA carriers, the UE is allowed interruptions on any active serving cell in SCG if UE is not capable of Per-FR gap, or on active serving cell(s) in SCG in FR1 if UE is capable of Per-FR gap, during the switching to the PUSCH-less carrier of a serving cell,

- with up to X3 slot as specified in Table 4.5.2.0.5-1.

When SRS carrier based switching is performed between E-UTRA carriers, the UE is allowed interruptions on any active serving cell in SCG if UE is not capable of Per-FR gap, or on active serving cell(s) in SCG in FR1 if UE is capable of Per-FR gap, during the switching from the PUSCH-less carrier of a serving cell,

- with up to X3 slot as specified in Table 4.5.2.0.5-1

Table 4.5.2.0.5-1: Interruption length X3 (slot)

μ	NR Slot length (ms)	Interruption length X3 (slots)
0	1	2
1	0.5	3
2	0.25	5
3	0.125	9

The normative reference for this requirement is TS 38.133 [6] clause 4.5.2.0.5.

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

4.5.2.1.1 Test purpose

The purpose of this test is to verify that when LTE PCell is in DRX and NR PSCell is in non-DRX, NR PSCell interruptions due to transitions from active to non-active and from non-active to active during LTE PCell DRX the UE missed ACK/NACK does not exceed the limits This test will verify the missed ACK/NACK rate for NR PSCell in EN-DC.

4.5.2.1.2 Test applicability

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

4.5.2.1.3 Minimum conformance requirements

The minimum conformance requirements are defined in clause 4.5.2.0.1.

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

4.5.2.1.4 Test description

4.5.2.1.4.1 Initial conditions

This test shall be tested using any of the test configurations in Table 4.5.2.1.4.1-1.

Table 4.5.2.1.4.1-1: Supported test configurations

Configuration	Description
4.5.2.1-1	LTE FDD, NR 15 kHz SSB SCS, 10MHz bandwidth, FDD duplex mode
4.5.2.1-2	LTE FDD, NR 15 kHz SSB SCS, 10MHz bandwidth, TDD duplex mode
4.5.2.1-3	LTE FDD, NR 30 kHz SSB SCS, 40MHz bandwidth, TDD duplex mode
4.5.2.1-4	LTE TDD, NR 15 kHz SSB SCS, 10MHz bandwidth, FDD duplex mode
4.5.2.1-5	LTE TDD, NR 15 kHz SSB SCS, 10MHz bandwidth, TDD duplex mode
4.5.2.1-6	LTE TDD, NR 30 kHz SSB SCS, 40MHz bandwidth, TDD duplex mode
NOTE: The UE is only required to be tested in one of the supported test configurations.	

Configure the test equipment and the DUT according to the parameters in Table 4.5.2.1.4.1-2.

Table 4.5.2.1.4.1-2: Initial conditions for EN-DC FR1 interruptions at transitions between active and non-active during DRX in synchronous EN-DC

Parameter	Value		Comment
Test environment	NC		As specified in TS 38.508-1 [14] clause 4.1.
Test frequencies	As specified in Annex E, Table E.1-1 and TS 38.508-1 [14] clause 4.3.1.		
Channel bandwidth	As specified by the test configuration selected from Table 4.7.1.1.2-1.		
Propagation conditions	AWGN		As specified in clause C.2.2.
Connection Diagram	TE Part	A.3.1.8.2	As specified in TS 38.508-1 [14] Annex A.
	DUT Part	A.3.2.3.4	
Exceptions to connection diagram	N/A		

1. The general test parameter settings are set up according to Table 4.5.2.1.4.1-3.
2. Message contents are defined in clause 4.5.2.1.4.3.
3. There are one E-UTRAN carrier and one NR carrier and two cells in the test. Cell 1 is PCell on the E-UTRAN carrier, Cell 2 is PSCell on the NR carrier, Cell 1 is the cell used for connection setup with the power levels set according to Table A.6.1.1-1 for this test. Cell 2 is configured according to clauses C.1.1 and C.1.2.

Table 4.5.2.1.4.1-3: General test parameters for E-UTRAN - NR FR1 interruptions at transitions between active and non-active during DRX in synchronous EN-DC

Parameter	Unit	Value	Comment
RF Channel Number		1, 2	One is E-UTRAN RF channel and the other is NR RF channel
Active PCell		Cell1	PCell on E-UTRAN RF channel number 1.
Configured PSCell		Cell2	PSCell on NR RF channel number 2.
CP length		Normal	Applicable to Cell1 and Cell 2
DRX		DRX.4	DRX related parameters are defined in TS 38.133 Table A.3.3.4-1
Measurement gap pattern Id		OFF	
T1	s	10	

4.5.2.1.4.2 Test procedure

The test consists of two cells: Cell1 and Cell2. Cell1 is LTE PCell and Cell2 is NR PSCell. The test consists of one time period, with duration of T1. During T1, NR PSCell is continuously scheduled in DL while LTE PCell is not scheduled and has DRX configured. Prior to the start of the time duration T1, the UE shall be fully synchronized to Cell1 and Cell2. Cell1 shall be configured as LTE PCell and Cell2 shall be configured as NR PSCell. Prior to start of T1 the DRX inactivity timer for the LTE PCell has already expired.

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

2. Configure MCG according to TS 36.521-3 [26] clause C.0, C.1 and SCG according to clause C.1.1 and C.1.2 for all downlink physical channels.

3. The SS shall transmit an RRCConnectionReconfiguration message to configure PCell (Cell1) and PSCell (Cell2) on the MCG and SCG as per TS 36.508 [7] clause 4.6 with the message content exceptions defined in clause 4.5.2.1.4.3.

4. The UE shall transmit *RRCConnectionReconfigurationComplete* message.

5. The SS would ensure continuous transmission on PSCell, while not scheduling on PCell at least for 200 ms to ensure inactivity timer is expired on the UE for LTE PCell.

5. Set the parameters according to T1 in Table 4.5.2.1.5-1. Propagation conditions are set according to clause C.2.1. T1 starts.

6. SS schedules on PSCell continuously and UE shall start sending ACK/NACK reports. The SS shall monitor ACK/NACK/DTX on PSCell.

7. If more than 99% of uplink transmissions are received by SS then count a success for the event "ACK/NACK". Otherwise count a fail for the event "ACK/NACK".

8. If no two consecutive DTX is observed by the SS, then count a success for the event "DTX". Otherwise count a fail for the event "DTX".

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

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

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

12. Repeat step 3-9 until a test verdict has been achieved

Each of the events "ACK/NACK" and "DTX" is evaluated independently for the statistic, resulting in an event verdict: pass or fail. Each event is evaluated only until the confidence level according to Table G.2.3-1 in Annex G.2 is achieved. Different events may require different times for a verdict. If all events pass, the test passes. If one event fails, the test fails.

4.5.2.1.4.3 Message contents

Message contents are according to TS 38.508-1 [14] clause 4.6 with the following exceptions:

Table 4.5.2.1.4.3-1: Common Exception messages

Default Message Contents	
Common contents of system information blocks exceptions	

Default RRC messages and information elements contents exceptions	Table H.3.7-2 with Condition DRX.4

4.5.2.1.5 Test requirement

Table 4.5.2.1.5-1 defines the NR cell specific primary level settings including test tolerances for E-UTRAN - NR FR1 interruptions at transitions between active and non-active during DRX in synchronous EN-DC test.

Table 4.5.2.1.5-1: NR Cell specific test parameters for E-UTRAN - NR FR1 interruptions at transitions between active and non-active during DRX in synchronous EN-DC

Parameter		Unit	Cell 2
Frequency Range			FR1
Duplex mode	Config 1,4		FDD
	Config 2,3,5,6		TDD
TDD configuration	Config 1,4		Not Applicable
	Config 2,5		TDDConf.1.1
	Config 3,6		TDDConf.2.1
$BW_{channel}$	Config 1,4		10: $N_{RB,c}$ = 52
	Config 2,5		10: $N_{RB,c}$ = 52
	Config 3,6		40: $N_{RB,c}$ = 106
Initial DL BWP Configuration	Config 1,4		DLBWP.0. 1
	Config 2,5		DLBWP.0.1
	Config 3,6		DLBWP.0.1
Dedicated DL BWP Configuration	Config 1,4		DLBWP.1.1
	Config 2,5		DLBWP.1.1
	Config 3,6		DLBWP.1.1
Initial UL BWP Configuration	Config 1,4		ULBWP.0.1
	Config 2,5		ULBWP.0.1
	Config 3,6		ULBWP.0.1
Dedicated UL BWP Configuration	Config 1,4		ULBWP.1.1
	Config 2,5		ULBWP.1.1
	Config 3,6		ULBWP.1.1
PDSCH Reference measurement channel	Config 1,4		SR.1.1 FDD
	Config 2,5		SR.1.1 TDD
	Config 3,6		SR.2.1 TDD
RMSI CORESET parameters	Config 1,4		CR.1.1 FDD
	Config 2,5		CR.1.1 TDD
	Config 3,6		CR.2.1 TDD
PDCCH CORESET parameters	Config 1,4		CCR.1.1 FDD
	Config 2,5		CCR.1.1 TDD
	Config 3,6		CCR.2.1 TDD
OCNG Patterns			OP.1
SMTC Configuration			SMTC.1
TRS configuration	Config 1,4		TRS.1.1 FDD
	Config 2,5		TRS.1.1 TDD
	Config 3,6		TRS.1.2 TDD
SSB Configuration	Config 1,2,4,5		SSB.1 FR1
	Config 3,6		SSB.2 FR1
Correlation Matrix and Antenna Configuration			1x2 Low
EPRE ratio of PSS to SSS		dB	0
EPRE ratio of PBCH DMRS to SSS			
EPRE ratio of PBCH to PBCH DMRS			
EPRE ratio of PDCCH DMRS to SSS			
EPRE ratio of PDCCH to PDCCH DMRS			
EPRE ratio of PDSCH DMRS to SSS			
EPRE ratio of PDSCH to PDSCH			
EPRE ratio of OCNG DMRS to SSS(Note 1)			
EPRE ratio of OCNG to OCNG DMRS (Note 1)			
N_{oc} Note 2		dBm/15 kHz	-104
SS-RSRP Note 3		dBm/15 kHz	-87
$\hat{E}_s/I_{ot}$		dB	17
$\hat{E}_s/N_{oc}$		dB	17

Parameter		Unit	Cell 2
Io[Note3]	Config 1,2,4,5	dBm/ 9.36MHz	-58.96
	Config 3,6	dBm/ 38.16MHz	-52.86
Time offset to cell1 [Note 4]		µs	3 for intra-band EN-DC, 33 for inter-band EN-DC
Propagation Condition			AWGN
NOTE 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.			
NOTE 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for N_{oc} to be fulfilled.			
NOTE 3: SS-RSRP and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.			
NOTE 4: Receive time difference of signals received between subframe timing boundary of E-UTRA PCell and slot timing boundary of PSCell at the UE antenna connector including time alignment error between the two cells.			

The UE shall be continuously scheduled in NR PSCell during the entire length of T1. UE shall not be scheduled in LTE PCell during T1. During the time duration T1 the UE shall transmit at least 99% of ACK/NACK on NR PSCell.

Interruption on NR PSCell shall not exceed X slots as defined in Table 4.5.2.1.5-2.

Table 4.5.2.1.5-2: Interruption length X at transition between active and non-active during DRX

μ	NR Slot length (ms)	Interruption length X
0	1	1
1	0.5	1

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

4.5.2.2 EN-DC FR1 interruptions at transitions between active and non-active during DRX in asynchronous EN-DC

4.5.2.2.1 Test purpose

The purpose of this test is to verify that when LTE PCell is in DRX and NR PSCell is in non-DRX, NR PSCell interruptions due to transitions from active to non-active and from non-active to active during LTE PCell DRX the UE missed ACK/NACK does not exceed the limits. This test will verify the missed ACK/NACK rate for NR PSCell in EN-DC.

4.5.2.2.2 Test applicability

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

4.5.2.2.3 Minimum conformance requirements

The minimum conformance requirements are defined in clause 4.5.2.0.1.

The normative reference for this requirement is TS 38.133 [6] clause A.4.5.2.2.

4.5.2.2.4 Test description

4.5.2.2.4.1 Initial conditions

This test shall be tested using any of the test configurations in Table 4.5.2.2.4.1-1.

Table 4.5.2.2.4.1-1: Supported test configurations

Configuration	Description

4.5.2.2-1	LTE FDD, NR 15 kHz SSB SCS, 10MHz bandwidth, FDD duplex mode
4.5.2.2-2	LTE FDD, NR 15 kHz SSB SCS, 10MHz bandwidth, TDD duplex mode
4.5.2.2-3	LTE FDD, NR 30 kHz SSB SCS, 40MHz bandwidth, TDD duplex mode
4.5.2.2-4	LTE TDD, NR 15 kHz SSB SCS, 10MHz bandwidth, FDD duplex mode
4.5.2.2-5	LTE TDD, NR 15 kHz SSB SCS, 10MHz bandwidth, TDD duplex mode
4.5.2.2-6	LTE TDD, NR 30 kHz SSB SCS, 40MHz bandwidth, TDD duplex mode
NOTE: The UE is only required to be tested in one of the supported test configurations.	

Configure the test equipment and the DUT according to the parameters in Table 4.5.2.2.4.1-2.

Table 4.5.2.2.4.1-2: Initial conditions for EN-DC FR1 interruptions at transitions between active and non-active during DRX in asynchronous EN-DC

Parameter	Value		Comment
Test environment	NC		As specified in TS 38.508-1 [14] clause 4.1.
Test frequencies	As specified in Annex E, Table E.1-1 and TS 38.508-1 [14] clause 4.3.1.		
Channel bandwidth	As specified by the test configuration selected from Table 4.7.1.1.2-1.		
Propagation conditions	AWGN		As specified in clause C.2.2.
Connection Diagram	TE Part	A.3.1.8.2	As specified in TS 38.508-1 [14] Annex A.
	DUT Part	A.3.2.3.4	
Exceptions to connection diagram	N/A		

1. The general test parameter settings are set up according to Table 4.5.2.2.4.1-3.
2. Message contents are defined in clause 4.5.2.2.4.3.
3. There are one E-UTRAN carrier and one NR carrier and two cells in the test. Cell 1 is PCell on the E-UTRAN carrier, Cell 2 is PSCell on the NR carrier. Cell 1 is the cell used for connection setup with the power levels set according to Table A.6.1.1-1 for this test. Cell 2 is configured according to clauses C.1.1 and C.1.2.

Table 4.5.2.2.4.1-3: General test parameters for E-UTRAN - NR FR1 interruptions at transitions between active and non-active during DRX in asynchronous EN-DC

Parameter	Unit	Value	Comment
RF Channel Number		1, 2	One is E-UTRAN RF channel and the other is NR RF channel
Active PCell		Cell1	PCell on E-UTRAN RF channel number 1.
Configured PSCell		Cell2	PSCell on NR RF channel number 2.
CP length		Normal	Applicable to Cell1 and Cell 2
DRX		DRX.4	DRX related parameters are defined in TS 38.133 table A.3.3.4-1
Measurement gap pattern Id		OFF	
T1	s	10	

4.5.2.2.4.2 Test procedure

The test consists of two cells: Cell1 and Cell2. Cell1 is LTE PCell and Cell2 is NR PSCell. The test consists of one time period, with duration of T1. During T1, NR PSCell is continuously scheduled in DL while LTE PCell is not scheduled and has DRX configured. Prior to the start of the time duration T1, the UE shall be fully synchronized to Cell1 and Cell2. Cell1 shall be configured as LTE PCell and Cell2 shall be configured as NR PSCell. Prior to start of T1 the DRX inactivity timer for the LTE PCell has already expired.

1. Ensure the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity *EN-DC*, DC bearer *MCG_and_SCG*, Connected without release *On* and Test Mode *On* according to TS 38.508-1 [14] clause 4.5.
2. Configure MCG according to TS 36.521-3 [26] clause C.0, C.1 and SCG according to clause C.1.1 and C.1.2 for all downlink physical channels.

3. The SS shall transmit an RRCConnectionReconfiguration message to configure PCell (Cell1) and PSCell (Cell2) on the MCG and SCG as per TS 36.508 [7] clause 4.6 with the message content exceptions defined in clause 4.5.2.2.4.3.

4. The UE shall transmit *RRCConnectionReconfigurationComplete* message.

5. The SS would ensure continuous transmission on PSCell, while not scheduling on PCell at least for 200 ms to ensure inactivity timer is expired on the UE for LTE PCell.

5. Set the parameters according to T1 in Table 4.5.2.2.5-1. Propagation conditions are set according to clause C.2.1. T1 starts.

6. SS schedules on PSCell continuously and UE shall start sending ACK/NACK reports. The SS shall monitor ACK/NACK/DTX on PSCell.

7. If more than 99% of uplink transmissions are received by SS then count a success for the event "ACK/NACK". Otherwise count a fail for the event "ACK/NACK".

8. If no longer than X consecutive DTX is observed by the SS, then count a success for the event "DTX". Otherwise count a fail for the event "DTX". Where

   - For test configuration 4.5.2.2-1 and 4.5.2.2-4:

     - X = interruption length+k1 if k1 $\leq$ interruption length, otherwise X = interruption length.

   - For test configuration other than 4.5.2.2-1 and 4.5.2.2-4:

     - X = interruption length.

   - Interruption length is given in Table 4.5.2.2.5-2.

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

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

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

12. Repeat step 3-9 until a test verdict has been achieved

Each of the events "ACK/NACK" and "DTX" is evaluated independently for the statistic, resulting in an event verdict: pass or fail. Each event is evaluated only until the confidence level according to Table G.2.3-1 in Annex G.2 is achieved. Different events may require different times for a verdict. If all events pass, the test passes. If one event fails, the test fails.

4.5.2.2.4.3 Message contents

Message contents are according to TS 38.508-1 [14] clause 4.6 with the following exceptions:

Table 4.5.2.2.4.3-1: Common Exception messages

Default Message Contents	
Common contents of system information blocks exceptions	
Default RRC messages and information elements contents exceptions	Table H.3.7-2 with Condition DRX.4

4.5.2.2.5 Test requirement

Table 4.5.2.2.5-1 define the NR cell specific primary level settings including test tolerances for E-UTRAN - NR FR1 interruptions at transitions between active and non-active during DRX in asynchronous EN-DC test.

Table 4.5.2.2.5-1: NR Cell specific test parameters for E-UTRAN - NR FR1 interruptions at transitions between active and non-active during DRX in asynchronous EN-DC

Parameter		Unit	Cell 2
Frequency Range			FR1
Duplex mode	Config 1,4		FDD
	Config 2,3,5,6		TDD
TDD configuration	Config 1,4		Not Applicable
	Config 2,5		TDDConf.1.1
	Config 3,6		TDDConf.2.1
$BW_{channel}$	Config 1,4		10: $N_{RB,c}$ = 52
	Config 2,5		10: $N_{RB,c}$ = 52
	Config 3,6		40: $N_{RB,c}$ = 106
Initial DL BWP Configuration	Config 1,4		DLBWP.0.1
	Config 2,5		DLBWP.0.1
	Config 3,6		DLBWP.0.1
Dedicated DL BWP Configuration	Config 1,4		DLBWP.1.1
	Config 2,5		DLBWP.1.1
	Config 3,6		DLBWP.1.1
Initial UL BWP Configuration	Config 1,4		ULBWP.0.1
	Config 2,5		ULBWP.0.1
	Config 3,6		ULBWP.0.1
Dedicated UL BWP Configuration	Config 1,4		ULBWP.1.1
	Config 2,5		ULBWP.1.1
	Config 3,6		ULBWP.1.1
PDSCH Reference measurement channel	Config 1,4		SR.1.1 FDD
	Config 2,5		SR.1.1 TDD
	Config 3,6		SR2.1 TDD
RMSI CORESET parameters	Config 1,4		CR.1.1 FDD
	Config 2,5		CR.1.1 TDD
	Config 3,6		CR2.1 TDD
PDCCH CORESET parameters	Config 1,4		CCR.1.1 FDD
	Config 2,5		CCR.1.1 TDD
	Config 3,6		CCR.2.1 TDD
OCNG Patterns			OP.1
SMTC Configuration			SMTC.1
TRS configuration	Config 1,4		TRS.1.1 FDD
	Config 2,5		TRS.1.1 TDD
	Config 3,6		TRS.1.2 TDD
SSB Configuration	Config 1,2,4,5		SSB.1 FR1
	Config 3,6		SSB.2 FR1
Correlation Matrix and Antenna Configuration			1x2 Low
EPRE ratio of PSS to SSS		dB	0
EPRE ratio of PBCH DMRS to SSS			
EPRE ratio of PBCH to PBCH DMRS			
EPRE ratio of PDCCH DMRS to SSS			
EPRE ratio of PDCCH to PDCCH DMRS			
EPRE ratio of PDSCH DMRS to SSS			
EPRE ratio of PDSCH to PDSCH			
EPRE ratio of OCNG DMRS to SSS(Note 1)			
EPRE ratio of OCNG to OCNG DMRS (Note 1)			
N_{oc} Note 2		dBm/15 kHz	-104
SS-RSRP Note 3		dBm/15 kHz	-87
$\hat{E}_s/I_{ot}$		dB	17
$\hat{E}_s/N_{oc}$		dB	17
N_{oc} Note 2	Config 1,2,4,5	-104	-104
	Config 3,6		-101
Io Note3	Config 1,2,4,5	dBm/ 9.36MHz	-58.96
	Config 3,6	dBm/ 38.16MHz	-52.86
Time offset to Cell1 Note 4	Config 1,2,4,5	µs	500
	Config 3,6		250
Propagation Condition			AWGN

Parameter	Unit	Cell 2
NOTE 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.		
NOTE 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for N_{oc} to be fulfilled.		
NOTE 3: SS-RSRP and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.		
NOTE 4: Receive time difference of signals received between subframe timing boundary of E-UTRA PCell and slot timing boundary of PSCell at the UE antenna connector including time alignment error between the two cells.		

The UE shall be continuously scheduled in NR PSCell during the entire length of T1. UE shall not be scheduled in LTE PCell during T1. During the time duration T1 the UE shall transmit at least 99% of ACK/NACK on NR PSCell.

Interruption on NR PSCell shall not exceed X slots as defined in Table 4.5.2.2.5-2.

Table 4.5.2.2.5-2: Interruption length X at transition between active and non-active during DRX

μ	NR Slot length (ms)	Interruption length X
0	1	2
1	0.5	2

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

4.5.2.3 EN-DC FR1 interruptions during measurements on deactivated NR SCC in synchronous EN-DC

Editor's Note: TT analysis for test configuration with SpCC SCS = 15kHz + SCC SCS = 30kHz or SpCC SCS = 30kHz + SCC SCS = 15kHz are still missing.

4.5.2.3.1 Test purpose

The purpose of this test is to verify E-UTRAN PCell and NR PSCell interruptions during the measurement on the deactivated NR SCC, the UE missed ACK/NACK does not exceed the limits. This test will verify the missed ACK/NACK rate for E-UTRAN PCell and NR PSCell in EN-DC.

4.5.2.3.2 Test applicability

This test applies to all types of E-UTRA UE release 15 and forward supporting EN-DC and 2 DL CA in NR.

4.5.2.3.3 Minimum conformance requirements

The minimum conformance requirements are defined in clause 4.5.2.0.2.

The normative reference for this requirement is TS 38.133 [6] clause A.4.5.2.3.

4.5.2.3.4 Test description

4.5.2.3.4.1 Initial conditions

This test shall be tested using any of the test configurations in this clause. Supported test configurations for LTE PCell and NR PSCell are shown in Table 4.5.2.3.4.1-1. Supported test configurations for NR SCell are shown in Table 4.5.2.3.4.1-1A. Test configuration for LTE PCell and NR PSCell and test configuration for NR SCell are chosen independently.

Table 4.5.2.3.4.1-1: Supported test configurations for LTE PCell and NR PSCell

Config	Description
4.5.2.3-1	LTE FDD, NR 15 kHz SSB SCS, ≥10MHz bandwidth, FDD duplex mode
4.5.2.3-2	LTE FDD, NR 15 kHz SSB SCS, ≥10MHz bandwidth, TDD duplex mode
4.5.2.3-3	LTE FDD, NR 30 kHz SSB SCS, ≥40MHz bandwidth, TDD duplex mode

4.5.2.3-4	LTE TDD, NR 15 kHz SSB SCS, ≥10MHz bandwidth, FDD duplex mode
4.5.2.3-5	LTE TDD, NR 15 kHz SSB SCS, ≥10MHz bandwidth, TDD duplex mode
4.5.2.3-6	LTE TDD, NR 30 kHz SSB SCS, ≥40MHz bandwidth, TDD duplex mode
Note 1: The UE is only required to be tested in one of the supported test configurations Note 2: The UE is only required to be tested in one with smallest aggregated channel bandwidth from supported band combinations which is composed of CCs ≥ the bandwidth ($BW_{channel}$) defined in each test configuration.	

Table 4.5.2.3.4.1-1A: Supported test configurations for NR SCell

$Config_{SCell}$	Description
4.5.2.3-1	NR 15 kHz SSB SCS, ≥10 MHz bandwidth, FDD duplex mode
4.5.2.3-2	NR 15 kHz SSB SCS, ≥10 MHz bandwidth, TDD duplex mode
4.5.2.3-3	NR 30 kHz SSB SCS, ≥40 MHz bandwidth, TDD duplex mode
Note 1: The UE is only required to be tested in one of the supported test configurations Note 2: The UE is only required to be tested in one with smallest aggregated channel bandwidth from supported band combinations which is composed of CCs ≥ the bandwidth ($BW_{channel}$) defined in each test configuration	

Configure the test equipment and the DUT according to the parameters in Table 4.5.2.3.4.1-2.

Table 4.5.2.3.4.1-2: Initial conditions for EN-DC FR1 interruptions during measurements on deactivated NR SCC in synchronous EN-DC

Parameter	Value		Comment
Test environment	NC		As specified in TS 38.508-1 [14] clause 4.1.
Test frequencies	As specified in Annex E, Table E.1-1 and TS 38.508-1 [14] clause 4.3.1.		
Channel bandwidth	As specified by the test configuration selected from Table 4.7.1.1.2-1.		
Propagation conditions	AWGN		As specified in clause C.2.2.
Connection Diagram	TE Part	A.3.1.8.2	As specified in TS 38.508-1 [14] Annex A.
	DUT Part	A.3.2.3.4	
Exceptions to connection diagram	N/A		

1. The general test parameter settings are set up according to Table 4.5.2.3.4.1-3.
2. Message contents are defined in clause 4.5.2.3.4.3.
3. There are one E-UTRAN carrier and two NR carriers and three cells specified in the test. Cell 1 is the PCell on E-UTRAN carrier, Cell 2 is the PSCell on one NR carrier and Cell 3 is the NR SCell on the other NR carrier. Cell 1 is the cell used for connection setup with the power level set according to Table A.6.1.1-1. Cell 2 and Cell 3 shall be configured according to clauses C.1.1 and C.1.2.

Table 4.5.2.3.4.1-3: General test parameters for E-UTRAN - NR interruptions during measurements on deactivated NR SCC in synchronous EN-DC

Parameter	Unit	Value	Comment
RF Channel Number		1, 2, 3	One is E-UTRAN RF channel and the other two are NR RF channels
Active PCell		Cell1	PCell on E-UTRAN RF channel number 1.
Active PSCell		Cell2	PSCell on NR RF channel number 2.
Configured deactivated SCell		Cell3	Deactivated SCell on NR RF channel number 3.
CP length		Normal	Applicable to Cell1, Cell 2 and Cell3
DRX		OFF	
Measurement gap pattern Id		OFF	
SCell measurement cycle (measCycleSCell)	ms	640	
T1	s	10	

4.5.2.3.4.2 Test procedure

The test consists of three cells: Cell1, Cell2 and Cell3. Cell1 is E-UTRAN PCell, Cell2 is NR PSCell and Cell3 is deactivated NR SCell. The test consists of one time period, with duration of T1. Prior to the start of the time duration T1, the UE shall be connected to Cell1 and Cell2 and the RRC message including *measCycleSCell* or *allowInterruptions* for the deactivated NR SCells is received at the UE antenna connector. Cell1 shall be configured as E-UTRAN PCell, Cell2 shall be configured as NR PSCell and Cell3 shall be configured as NR deactivated SCell.. During T1 the UE shall be continuously scheduled on E-UTRAN PCell and NR PSCell.

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

2. Configure MCG according to TS 36.521-3 [26] clause C.0, C.1 and SCG according to clause C.1.1 and C.1.2 for all downlink physical channels.

3. The SS shall configure SCell (Cell 3) on the SCC as per TS 38.508-1 [14] clause 7.5.2, with the message content exceptions defined in clause 4.5.2.3.4.3. NR RRCReconfiguration message is contained in RRCConnectionReconfiguration and NR RRCReconfigurationComplete message is contained in RRCConnectionReconfigurationComplete.

4. Set the parameters according to T1 in Table 4.5.2.3.5-1 and Table 4.5.2.3.5-1A. Propagation conditions are set according to clause C.2.1. T1 starts.

5. SS schedules on PCell and PSCell continuously and UE shall start sending ACK/NACK reports. The SS shall monitor DTX on PCell and ACK/NACK/DTX on PSCell.

6. If more than 99.5% of uplink transmissions on PSCell are received by SS then count a success for the event "ACK/NACK". Otherwise count a fail for the event "ACK/NACK".

6a. If no longer than X consecutive DTX on PCell is observed by the SS, then count a success for the event “PCell DTX”. Otherwise count a fail for the event “PCell DTX”. Where,

- X = 1 for inter-band EN-DC, and X = 3 for intra-band EN-DC.7.If no longer than X consecutive DTX on PSCell is observed by the SS, then count a success for the event "PSCell DTX". Otherwise count a fail for the event "PSCell DTX". Where,

- For test configuration 4.5.2.3-1 and 4.5.2.3-4,

  - X = interruption length+k1 if k1 ≤ interruption length, otherwise X = interruption length.

Note: UE expects that the SS won't use k1 = 3 for test configuration 4.5.2.3-1 and 4.5.2.3-4.

- For test configuration other than 4.5.2.3-1 and 4.5.2.3-4,

  - X = interruption length.

- interruption length is given in Table 4.5.2.3.5-2 for inter-band case and in Table 4.5.2.3.5-3 for intra-band case.

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

8. The SS then shall transmit *RRCConnectionReconfiguration* message with condition MCG_and_SCG according to TS 36.508 [25] Table 4.6.1-8 to add NR cell (PSCell). The UE shall transmit *RRCConnectionReconfigurationComplete* message. If any the reconfiguration fails, switch off and on the UE and ensure the UE is in RRC_CONNECTED with generic procedure parameters Connectivity EN-DC, DC bearer MCG and SCG, Connected without release On according to TS 38.508-1 [14] clause 4.5

9. Repeat step 2-8 until a test verdict has been achieved.

Each of the events "ACK/NACK", "PCell DTX" and "PSCell DTX" is evaluated independently for the statistic, resulting in an event verdict: pass or fail. Each event is evaluated only until the confidence level according to Table G.2.3-1 in Annex G.2 is achieved. Different events may require different times for a verdict.

If all events pass, the test passes. If one event fails, the test fails.

4.5.2.3.4.3 Message contents

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

Table 4.5.2.3.4.3-1: Common Exception messages

Default Message Contents	
Common contents of system information blocks exceptions	
Default RRC messages and information elements contents exceptions	Table H.3.1-2 with Condition Deactivated SCell; Table H.3.1-4 with A3-offset = 15
Specific message contents exceptions for Test Configuration 4.5.2.3-1, 4.5.2.3-2, 4.5.2.3-4 and 4.5.2.3-5	Table H.3.1-3 with Condition Deactivated SCell and SSB.1 FR1 Table 7.3.1-3 in TS 38.508-1 [14] with condition SMTC.1
Specific message contents exceptions for Test Configuration 4.5.2.3-3 and 4.5.2.3-6	Table H.3.1-3 with Condition Deactivated SCell and SSB.2 FR1 Table 7.3.1-3 in TS 38.508-1 [14] with condition SMTC.1

Table 4.5.2.3.4.3-2: *RRCReconfiguration* in step 3: SCell addition

Derivation Path: TS 38.508-1 [14], Table 4.6.1-13 with condition NR_MEAS and SCell_add			
Information Element	**Value/remark**	**Comment**	**Condition**
RRCReconfiguration ::= SEQUENCE {			
criticalExtensions CHOICE {			
rrcReconfiguration ::= SEQUENCE {			
measConfig	MeasConfig-DEFAULT	Measurements configuration	NR_MEAS
nonCriticalExtension SEQUENCE {			
masterCellGroup	CellGroupConfig-SCell(n)	n is number of SCC to be added	SCell_add
}			
}			
}			
}			

Table 4.5.2.3.4.3-3: ServingCellConfig (Cell 3)

Derivation Path: TS 38.508-1 [14], Table 4.6.3-167 with condition MEAS			
Information Element	**Value/remark**	**Comment**	**Condition**
ServingCellConfig ::= SEQUENCE {			
servingCellMO	2	MeasObjectId for SCell in Table H.3.1-2	
}			

4.5.2.3.5 Test requirement

Table 4.5.2.3.5-1 and Table 4.5.2.3.5-1A defines the primary level settings including test tolerances for E-UTRAN - NR FR1 interruptions during measurements on deactivated NR SCC in synchronous EN-DC test configurations for NR PSCell and SCell.

Table 4.5.2.3.5-1: NR cell specific test parameters for NR PSCell for E-UTRAN - NR interruptions during measurements on deactivated NR SCC in synchronous EN-DC

Parameter		Unit	Cell 2
Frequency Range			FR1
Duplex mode	Config 1,4		FDD
	Config 2,3,5,6		TDD
TDD configuration	Config 1,4		Not Applicable
	Config 2,5		TDDConf.1.1
	Config 3,6		TDDConf.2.1
$BW_{channel}$			Note 8
$BW_{occupied}$	Config 1,2,4,5	RB	52 Note 6

Parameter		Unit	Cell 2
	Config 3,6		106 Note 7
Initial DL BWP Configuration			DLBWP.0.1
Dedicated DL BWP Configuration			DLBWP.1.1
Initial UL BWP Configuration			ULBWP.0.1
Dedicated UL BWP Configuration			ULBWP.1.1
PDSCH Reference measurement channel	Config 1,4		SR.1.1 FDD
	Config 2,5		SR.1.1 TDD
	Config 3,6		SR 2.1 TDD
RMSI CORESET parameters	Config 1,4		CR.1.1 FDD
	Config 2,5		CR.1.1 TDD
	Config 3,6		CR 2.1 TDD
PDCCH CORESET parameters	Config 1,4		CCR.1.1 FDD
	Config 2,5		CCR.1.1 TDD
	Config 3,6		CCR.2.1 TDD
TRS configuration	Config 1,4		TRS.1.1 FDD
	Config 2,5		TRS.1.1 TDD
	Config 3,6		TRS.1.2 TDD
OCNG Patterns	Config 1,2,4,5		OP.1 Note 6
	Config 3,6		OP.1 Note 7
SMTC Configuration			SMTC.1
TCI state			TCI.State.0
SSB Configuration	Config 1,2,4,5		SSB.1 FR1
	Config 3,6		SSB.2 FR1
Correlation Matrix and Antenna Configuration			1x2 Low
EPRE ratio of PSS to SSS		dB	0
EPRE ratio of PBCH DMRS to SSS			
EPRE ratio of PBCH to PBCH DMRS			
EPRE ratio of PDCCH DMRS to SSS			
EPRE ratio of PDCCH to PDCCH DMRS			
EPRE ratio of PDSCH DMRS to SSS			
EPRE ratio of PDSCH to PDSCH			
EPRE ratio of OCNG DMRS to SSS Note 1			
EPRE ratio of OCNG to OCNG DMRS Note 1			
N_{oc} Note 2		dBm/15 kHz	-104
SS-RSRP Note 3		dBm/15 kHz	-87
$\hat{E}_s/I_{ot}$		dB	17
$\hat{E}_s/N_{oc}$		dB	17
Io Note3	Config 1,2,4,5	dBm/9.36MHz	-58.96
	Config 3,6	dBm/38.16MHz	-52.86
Time offset to Cell1 Note 4		µs	3 for intra-band EN-DC, 33 for inter-band EN-DC
Time offset to Cell2 Note 5		µs	-
Propagation Condition			AWGN

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

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

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

NOTE 4: Receive time difference of signals received between subframe timing boundary of E-UTRA PCell and slot timing boundary of PSCell at the UE antenna connector including time alignment error between the two cells.

NOTE 5: Receive time difference between slot boundaries of signals received from the two cells at the UE antenna connector including time alignment error between the two cells.

Note 6: All UL/DL transmission shall be confined within $BW_{occupied}$ (i.e. 10 MHz, 52 RBs) from $F_{C,low}$, and Io is independent of the $BW_{channel}$ configured.

Note 7: All UL/DL transmission shall be confined within $BW_{occupied}$ (i.e. 40 MHz, 106 RBs) from $F_{C,low}$, and Io is independent of the $BW_{channel}$ configured.

Note 8: $N_{RB,c}$. is derived from Table 5.3.2-1 in TS38.101-1[2] with configured $BW_{channel}$.

Table 4.5.2.3.5-1A: NR cell specific test parameters for NR SCell for E-UTRAN - NR interruptions during measurements on deactivated NR SCC in synchronous EN-DC

Parameter		Unit	Cell 3
Frequency Range			FR1
Duplex mode	$Config_{SCell}$ 1		FDD
	$Config_{SCell}$ 2,3		TDD
TDD configuration	$Config_{SCell}$ 1		Not Applicable
	$Config_{SCell}$ 2		TDDConf.1.1
	$Config_{SCell}$ 3		TDDConf.2.1
$BW_{channel}$			Note 8
$BW_{occupied}$	$Config_{SCell}$ 1,2	RB	52 Note 6
	$Config_{SCell}$ 3		106 Note 7
Initial DL BWP Configuration			DLBWP.0.1
Dedicated DL BWP Configuration			DLBWP.1.1
Initial UL BWP Configuration			ULBWP.0.1
Dedicated UL BWP Configuration			ULBWP.1.1
PDSCH Reference measurement channel			N/A
RMSI CORESET parameters	$Config_{SCell}$ 1		CR.1.1 FDD
	$Config_{SCell}$ 2		CR.1.1 TDD
	$Config_{SCell}$ 3		CR 2.1 TDD
PDCCH CORESET parameters	$Config_{SCell}$ 1		CCR.1.1 FDD
	$Config_{SCell}$ 2		CCR.1.1 TDD
	$Config_{SCell}$ 3		CCR.2.1 TDD
TRS configuration	$Config_{SCell}$ 1		TRS.1.1 FDD
	$Config_{SCell}$ 2		TRS.1.1 TDD
	$Config_{SCell}$ 3		TRS.1.2 TDD
OCNG Patterns	$Config_{SCell}$ 1,2		OP.1 Note 6
	$Config_{SCell}$ 3		OP.1 Note 7
SMTC Configuration			SMTC.1
TCI state			TCI.State.0
SSB Configuration	$Config_{SCell}$ 1,2		SSB.1 FR1
	$Config_{SCell}$ 3		SSB.2 FR1
Correlation Matrix and Antenna Configuration			1x2 Low
EPRE ratio of PSS to SSS		dB	0
EPRE ratio of PBCH DMRS to SSS			
EPRE ratio of PBCH to PBCH DMRS			
EPRE ratio of PDCCH DMRS to SSS			
EPRE ratio of PDCCH to PDCCH DMRS			
EPRE ratio of PDSCH DMRS to SSS			
EPRE ratio of PDSCH to PDSCH			
EPRE ratio of OCNG DMRS to SSS Note 1			
EPRE ratio of OCNG to OCNG DMRS Note 1			
N_{oc} Note 2		dBm/15 kHz	-104
SS-RSRP Note 3		dBm/15 kHz	-87
$\hat{E}_s/I_{ot}$		dB	17
$\hat{E}_s/N_{oc}$		dB	17
Io Note3	$Config_{SCell}$ 1,2	dBm/9.36MHz	-58.96
	$Config_{SCell}$ 3	dBm/38.16MHz	-52.86
Time offset to Cell1 Note 4		µs	3 + Time offset to Cell2 for intra-band EN-DC, 33 + Time offset to Cell2 for inter-band EN-DC
Time offset to Cell2 Note 5		µs	3
Propagation Condition			AWGN

Parameter	Unit	Cell 3
NOTE 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.		
NOTE 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for N_{oc} to be fulfilled within $BW_{occupied}$.		
NOTE 3: SS-RSRP and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.		
NOTE 4: Receive time difference of signals received between subframe timing boundary of E-UTRA PCell and slot timing boundary of PSCell at the UE antenna connector including time alignment error between the two cells.		
NOTE 5: Receive time difference between slot boundaries of signals received from the two cells at the UE antenna connector including time alignment error between the two cells.		
Note 6: All UL/DL transmission shall be confined within $BW_{occupied}$ (i.e. 10 MHz, 52 RBs) from $F_{C,low}$, and Io is independent of the $BW_{channel}$ configured.		
Note 7: All UL/DL transmission shall be confined within $BW_{occupied}$ (i.e. 40 MHz, 106 RBs) from $F_{C,low}$, and Io is independent of the $BW_{channel}$ configured.		
Note 8: $N_{RB,c}$. is derived from Table 5.3.2-1 in TS38.101-1[2] with configured $BW_{channel}$.		

The UE shall be continuously scheduled in LTE PCell and NR PSCell during the entire length of T1. During the time duration T1 the UE shall transmit at least 99.5% of ACK/NACK on NR PSCell.

If the NR PSCell is not in the same band as the deactivated SCell, the UE is only allowed to cause interruptions on NR PSCell immediately before and immediately after an SMTC. Each interruption on NR PSCell shall not exceed the value defined in Table 4.5.2.3.5-2.

If the NR PSCell is in the same band as the deactivated SCell, the UE is only allowed to cause an interruption on PSCell no earlier than 1 slot before an SMTC and no later than 1 slot after the SMTC. the interruption on NR PSCell shall not exceed the value defined in Table 4.5.2.3.5-3.

Table 4.5.2.3.5-2: Interruption duration if the NR PSCell is not in the same band as the deactivated SCell

μ	NR Slot length (ms)	Interruption length (slot)
0	1	1
1	0.5	1

Table 4.5.2.3.5-3: Interruption duration if the NR PSCell is in the same band as the deactivated SCell

μ	NR Slot length (ms)	Interruption length (slot)
0	1	2+SMTC duration
1	0.5	2+SMTC duration

For synchronous inter-band EN-DC, the UE is only allowed to cause interruptions on E-UTRA PCell immediately before and immediately after an SMTC. Each interruption on E-UTRA PCell shall not exceed 1 subframe.

For synchronous intra-band EN-DC, the UE is only allowed to cause an interruption on E-UTRA PCell no earlier than 1 subframe before an SMTC and no later than 1 subframe after the SMTC. The interruption on E-UTRA PCell shall not exceed SMTC duration + 2 subframes.

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

4.5.2.4 EN-DC FR1 interruptions during measurements on deactivated NR SCC in asynchronous EN-DC

Editor's Note: TT analysis for test configuration with SpCC SCS = 15kHz + SCC SCS = 30kHz or SpCC SCS = 30kHz + SCC SCS = 15kHz are still missing.

4.5.2.4.1 Test purpose

The purpose of this test is to verify E-UTRAN PCell and NR PSCell interruptions during the measurement on the deactivated NR SCC, the UE missed ACK/NACK does not exceed the limits. This test will verify the missed ACK/NACK rate for E-UTRAN PCell and NR PSCell in EN-DC

4.5.2.4.2 Test applicability

This test applies to all types of E-UTRA UE release 15 and forward supporting EN-DC and 2 DL CA in NR.

4.5.2.4.3 Minimum conformance requirements

The minimum conformance requirements are defined in clause 4.5.2.0.2.

The normative reference for this requirement is TS 38.133 [6] clause A.4.5.2.4.

4.5.2.4.4 Test description

4.5.2.4.4.1 Initial conditions

This test shall be tested using any of the test configurations in this clause. Supported test configurations for LTE PCell and NR PSCell are shown in Table 4.5.2.4.4.1-1. Supported test configurations for NR SCell are shown in Table 4.5.2.4.4.1-1A. Test configuration for LTE PCell and NR PSCell and test configuration for NR SCell are chosen independently.

Table 4.5.2.4.4.1-1: Supported test configurations for LTE PCell and NR PSCell

Configuration	Description
4.5.2.4-1	LTE FDD, NR 15 kHz SSB SCS, ≥10MHz bandwidth, FDD duplex mode
4.5.2.4-2	LTE FDD, NR 15 kHz SSB SCS, ≥10MHz bandwidth, TDD duplex mode
4.5.2.4-3	LTE FDD, NR 30 kHz SSB SCS, ≥40MHz bandwidth, TDD duplex mode
4.5.2.4-4	LTE TDD, NR 15 kHz SSB SCS, ≥10MHz bandwidth, FDD duplex mode
4.5.2.4-5	LTE TDD, NR 15 kHz SSB SCS, ≥10MHz bandwidth, TDD duplex mode
4.5.2.4-6	LTE TDD, NR 30 kHz SSB SCS, ≥40MHz bandwidth, TDD duplex mode
Note 1: The UE is only required to be tested in one of the supported test configurations. Note 2: The UE is only required to be tested in one with smallest aggregated channel bandwidth from supported band combinations which is composed of CCs ≥ the bandwidth ($BW_{channel}$) defined in each test configuration	

Table 4.5.2.4.4.1-1A: Supported test configurations for NR SCell

$Config_{SCell}$	Description
1	NR 15 kHz SSB SCS, ≥10 MHz bandwidth, FDD duplex mode
2	NR 15 kHz SSB SCS, ≥10 MHz bandwidth, TDD duplex mode
3	NR 30 kHz SSB SCS, ≥40 MHz bandwidth, TDD duplex mode
Note 1: The UE is only required to be tested in one of the supported test configurations Note 2: The UE is only required to be tested in one with smallest aggregated channel bandwidth from supported band combinations which is composed of CCs ≥ the bandwidth ($BW_{channel}$) defined in each test configuration	

Configure the test equipment and the DUT according to the parameters in Table 4.5.2.4.4.1-2.

Table 4.5.2.4.4.1-2: Initial conditions for EN-DC FR1 interruptions during measurements on deactivated NR SCC in asynchronous EN-DC

Parameter	Value		Comment
Test environment	NC		As specified in TS 38.508-1 [14] clause 4.1.
Test frequencies	As specified in Annex E, Table E.1-1 and TS 38.508-1 [14] clause 4.3.1.		
Channel bandwidth	As specified by the test configuration selected from Table 4.7.1.1.2-1.		
Propagation conditions	AWGN		As specified in clause C.2.2.
Connection Diagram	TE Part	A.3.1.8.2	As specified in TS 38.508-1 [14] Annex A.
	DUT Part	A.3.2.3.4	
Exceptions to connection diagram	N/A		

1. The general test parameter settings are set up according to Table 4.5.2.4.4.1-3.

2. Message contents are defined in clause 4.5.2.4.4.3.

3. There are one E-UTRAN carrier and two NR carriers and three cells specified in the test. Cell 1 is the PCell on E-UTRAN carrier, Cell 2 is the PSCell on one NR carrier and Cell 3 is the SCell on the other NR carrier. Cell 1 is the cell used for connection setup with the power level set according to Table A.6.1.1-1. Cell 2 and Cell 3 shall be configured according to clauses C.1.1 and C.1.2.

Table 4.5.2.4.4.1-3: General test parameters for E-UTRAN - NR interruptions during measurements on deactivated NR SCC in asynchronous EN-DC

Parameter	Unit	Value	Comment
RF Channel Number		1, 2, 3	One is E-UTRAN RF channel and the other two are NR RF channel
Active PCell		Cell1	PCell on E-UTRAN RF channel number 1.
Active PSCell		Cell2	PSCell on NR RF channel number 2.
Configured deactivated SCell		Cell3	Deactivated SCell on NR RF channel number 3.
CP length		Normal	Applicable to Cell1, Cell 2 and Cell3
DRX		OFF	
Measurement gap pattern Id		OFF	
SCell measurement cycle (measCycleSCell)	ms	640	
T1	s	10	

4.5.2.4.4.2 Test procedure

The test consists of three cells: Cell1, Cell2 and Cell3. Cell1 is E-UTRAN PCell, Cell2 is NR PSCell and Cell3 is deactivated NR SCell. The test consists of one time period, with duration of T1. Prior to the start of the time duration T1, the UE shall be connected to Cell1 and Cell2 and the RRC message including *measCycleSCell* or *allowInterruptions* for the deactivated NR SCells is received at the UE antenna connector. Cell1 shall be configured as E-UTRAN PCell, Cell2 shall be configured as NR PSCell and Cell3 shall be configured as NR deactivated SCell.. During T1 the UE shall be continuously scheduled on E-UTRAN PCell and NR PSCell.

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

2. Configure MCG according to TS 36.521-3 [26] clause C.0, C.1 and SCG according to clause C.1.1 and C.1.2 for all downlink physical channels.

3. The SS shall configure SCell (Cell 3) on the SCC as per TS 38.508-1 [14] clause 7.5.2, with the message content exceptions defined in clause 4.5.2.4.4.3. NR RRCReconfiguration message is contained in RRCConnectionReconfiguration and NR RRCReconfigurationComplete message is contained in RRCConnectionReconfigurationComplete.

4. Set the parameters according to T1 in Table 4.5.2.4.5-1 and Table 4.5.2.4.5-1A. Propagation conditions are set according to clause C.2.1. T1 starts.

5. SS schedules on PCell and PSCell continuously and UE shall start sending ACK/NACK reports. The SS shall monitor DTX on PCell and ACK/NACK/DTX on PSCell.

6. If more than 99.5% of uplink transmissions are received by SS then count a success for the event "ACK/NACK". Otherwise count a fail for the event "ACK/NACK".

6a. If no longer than X consecutive DTX on PCell is observed by the SS, then count a success for the event “PCell DTX”. Otherwise count a fail for the event “PCell DTX”. Where,

- For test configuration 4.5.2.4-1, 4.5.2.4-2 and 4.5.2.4-3, X = 3;

- For test configuration 4.5.2.4-4, 4.5.2.4-5 and 4.5.2.4-6, X = 2;

7. If no longer than X consecutive DTX on PSCell is observed by the SS, then count a success for the event "PSCell DTX". Otherwise count a fail for the event "PSCell DTX". Where,

- For test configuration 4.5.2.4-1 and 4.5.2.4-4,

  - X = interruption length+k1 if k1 ≤ interruption length, otherwise X = interruption length

Note: UE expects that the SS won't use k1 = 3 for test configuration 4.5.2.4-1 and 4.5.2.4-4.

- For test configuration other than 4.5.2.4-1 and 4.5.2.4-4,

  - X = interruption length.

- Interruption length is given in Table 4.5.2.4.5-2 for inter-band case and in Table 4.5.2.4.5-3 for intra-band case.

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

9. The SS then shall transmit *RRCConnectionReconfiguration* message with condition MCG_and_SCG according to TS 36.508 [25] Table 4.6.1-8 to add NR cell (PSCell). The UE shall transmit *RRCConnectionReconfigurationComplete* message. If any the reconfiguration fails, switch off and on the UE and ensure the UE is in RRC_CONNECTED with generic procedure parameters Connectivity EN-DC, DC bearer MCG and SCG, Connected without release On according to TS 38.508-1 [14] clause 4.5

10. Repeat step 2-9 until a test verdict has been achieved.

Each of the events "ACK/NACK" "PCell DTX" and "PSCell DTX" is evaluated independently for the statistic, resulting in an event verdict: pass or fail. Each event is evaluated only until the confidence level according to Table G.2.3-1 in Annex G.2 is achieved. Different events may require different times for a verdict.

If all events pass, the test passes. If one event fails, the test fails.

4.5.2.4.4.3 Message contents

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

Table 4.5.2.4.4.3-1: Common Exception messages

Default Message Contents	
Common contents of system information blocks exceptions	
Default RRC messages and information elements contents exceptions	Table H.3.1-2 with Condition Deactivated SCell; Table H.3.1-4 with A3-offset = 15
Specific message contents exceptions for Test Configuration 4.5.2.4-1, 4.5.2.4-2, 4.5.2.4 -4 and 4.5.2.4-5	Table H.3.1-3 with Condition Deactivated SCell and SSB.1 FR1 Table 7.3.1-3 in TS 38.508-1 [14] with condition SMTC.1
Specific message contents exceptions for Test Configuration 4.5.2.4-3 and 4.5.2.4-6	Table H.3.1-3 with Condition Deactivated SCell and SSB.2 FR1 Table 7.3.1-3 in TS 38.508-1 [14] with condition SMTC.1

Table 4.5.2.4.4.3-2: *RRCReconfiguration* in step 3: SCell addition

Derivation Path: TS 38.508-1 [14], Table 4.6.1-13 with condition NR_MEAS and SCell_add			
Information Element	**Value/remark**	**Comment**	**Condition**
RRCReconfiguration ::= SEQUENCE {			
criticalExtensions CHOICE {			
rrcReconfiguration ::= SEQUENCE {			
measConfig	MeasConfig-DEFAULT	Measurements configuration	NR_MEAS
nonCriticalExtension SEQUENCE {			
masterCellGroup	CellGroupConfig-SCell(n)	n is number of SCC to be added	SCell_add
}			
}			
}			
}			

Table 4.5.2.4.4.3-3: ServingCellConfig (Cell 3)

Derivation Path: TS 38.508-1 [14], Table 4.6.3-167 with condition MEAS			
Information Element	**Value/remark**	**Comment**	**Condition**
ServingCellConfig ::= SEQUENCE {			
servingCellMO	2	MeasObjectId for SCell in Table H.3.1-2	
}			

4.5.2.4.5 Test requirement

Table 4.5.2.4.5-1 and Table 4.5.2.4.5-1A defines the primary level settings including test tolerances for E-UTRAN - NR FR1 interruptions during measurements on deactivated NR SCC in asynchronous EN-DC test configurations for NR PSCell and NR SCell.

Table 4.5.2.4.5-1: NR cell specific test parameters for NR PSCell for E-UTRAN - NR interruptions during measurements on deactivated NR SCC in asynchronous EN-DC

Parameter		Unit	Cell 2
Frequency Range			FR1
Duplex mode	Config 1,4		FDD
	Config 2,3,5,6		TDD
TDD configuration	Config 1,4		Not Applicable
	Config 2,5		TDDConf.1.1
	Config 3,6		TDDConf.2.1
$BW_{channel}$			Note 8
$BW_{occupied}$	Config 1,2,4,5	RB	52 Note 6
	Config 3,6		106 Note 7
Initial DL BWP Configuration			DLBWP.0.1
Dedicated DL BWP Configuration			DLBWP.1.1
Initial UL BWP Configuration			ULBWP.0.1
Dedicated UL BWP Configuration			ULBWP.1.1
PDSCH Reference measurement channel	Config 1,4		SR.1.1 FDD
	Config 2,5		SR.1.1 TDD
	Config 3,6		SR 2.1 TDD
RMSI CORESET parameters	Config 1,4		CR.1.1 FDD
	Config 2,5		CR.1.1 TDD
	Config 3,6		CR 2.1 TDD
PDCCH CORESET parameters	Config 1,4		CCR.1.1 FDD
	Config 2,5		CCR.1.1 TDD
	Config 3,6		CCR.2.1 TDD
TRS configuration	Config 1,4		TRS.1.1 FDD
	Config 2,5		TRS.1.1 TDD
	Config 3,6		TRS.1.2 TDD
OCNG Patterns	Config 1,2,4,5		OP.1 Note 6

Parameter		Unit	Cell 2
	Config 3,6		OP.1 Note 7
SMTC Configuration			SMTC.1
TCI state			TCI.State.0
SSB Configuration	Config 1,2,4,5		SSB.1 FR1
	Config 3,6		SSB.2 FR1
Correlation Matrix and Antenna Configuration			1x2 Low
EPRE ratio of PSS to SSS		dB	0
EPRE ratio of PBCH DMRS to SSS			
EPRE ratio of PBCH to PBCH DMRS			
EPRE ratio of PDCCH DMRS to SSS			
EPRE ratio of PDCCH to PDCCH DMRS			
EPRE ratio of PDSCH DMRS to SSS			
EPRE ratio of PDSCH to PDSCH			
EPRE ratio of OCNG DMRS to SSS Note 1			
EPRE ratio of OCNG to OCNG DMRS Note 1			
N_{oc} Note 2		dBm/15 kHz	-104
SS-RSRP Note 3		dBm/15 kHz	-87
$\hat{E}_s/I_{ot}$		dB	17
$\hat{E}_s/N_{oc}$		dB	17
Io Note3	Config 1,2,4,5	dBm/9.36MHz	-58.96
	Config 3,6	dBm/38.16MHz	-52.86
Time offset to Cell1 Note 4	Config 1,2,4,5	µs	500
	Config 3,6		250
Time offset to Cell2 Note 5		µs	N/A
Propagation Condition			AWGN

NOTE 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.
NOTE 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for N_{oc} to be fulfilled within $BW_{occupied}$.
NOTE 3: SS-RSRP and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.
NOTE 4: Receive time difference of signals received between subframe timing boundary of E-UTRA PCell and slot timing boundary of PSCell at the UE antenna connector including time alignment error between the two cells.
NOTE 5: Receive time difference between slot boundaries of signals received from the two cells at the UE antenna connector including time alignment error between the two cells.
Note 6: All UL/DL transmission shall be confined within $BW_{occupied}$ (i.e. 10 MHz, 52 RBs) from $F_{C,low}$, and Io is independent of the $BW_{channel}$ configured.
Note 7: All UL/DL transmission shall be confined within $BW_{occupied}$ (i.e. 40 MHz, 106 RBs) from $F_{C,low}$, and Io is independent of the $BW_{channel}$ configured.
Note 8: $N_{RB,c}$. is derived from Table 5.3.2-1 in TS38.101-1[2] with configured $BW_{channel}$.

Table 4.5.2.4.5-1: NR cell specific test parameters for NR SCell for E-UTRAN - NR interruptions during measurements on deactivated NR SCC in asynchronous EN-DC

Parameter		Unit	Cell 3
Frequency Range			FR1
Duplex mode	$Config_{SCell}$ 1		FDD
	$Config_{SCell}$ 2,3		TDD
TDD configuration	$Config_{SCell}$ 1		Not Applicable
	$Config_{SCell}$ 2		TDDConf.1.1
	$Config_{SCell}$ 3		TDDConf.2.1
$BW_{channel}$			Note 8
$BW_{occupied}$	$Config_{SCell}$ 1,2	RB	52 Note 6
	$Config_{SCell}$ 3		106 Note 7
Initial DL BWP Configuration			DLBWP.0.1
Dedicated DL BWP Configuration			DLBWP.1.1
Initial UL BWP Configuration			ULBWP.0.1
Dedicated UL BWP Configuration			ULBWP.1.1
PDSCH Reference measurement channel			N/A
RMSI CORESET parameters	$Config_{SCell}$ 1		CR.1.1 FDD
	$Config_{SCell}$ 2		CR.1.1 TDD
	$Config_{SCell}$ 3		CR 2.1 TDD

Parameter		Unit	Cell 3
PDCCH CORESET parameters	$Config_{SCell}$ 1		CCR.1.1 FDD
	$Config_{SCell}$ 2		CCR.1.1 TDD
	$Config_{SCell}$ 3		CCR.2.1 TDD
TRS configuration	$Config_{SCell}$ 1		TRS.1.1 FDD
	$Config_{SCell}$ 2		TRS.1.1 TDD
	$Config_{SCell}$ 3		TRS.1.2 TDD
OCNG Patterns	$Config_{SCell}$ 1,2		OP.1 Note 6
	$Config_{SCell}$ 3		OP.1 Note 7
SMTC Configuration			SMTC.1
TCI state			TCI.State.0
SSB Configuration	$Config_{SCell}$ 1,2		SSB.1 FR1
	$Config_{SCell}$ 3		SSB.2 FR1
Correlation Matrix and Antenna Configuration			1x2 Low
EPRE ratio of PSS to SSS		dB	0
EPRE ratio of PBCH DMRS to SSS			
EPRE ratio of PBCH to PBCH DMRS			
EPRE ratio of PDCCH DMRS to SSS			
EPRE ratio of PDCCH to PDCCH DMRS			
EPRE ratio of PDSCH DMRS to SSS			
EPRE ratio of PDSCH to PDSCH			
EPRE ratio of OCNG DMRS to SSS Note 1			
EPRE ratio of OCNG to OCNG DMRS Note 1			
N_{oc} Note 2		dBm/15 kHz	-104
SS-RSRP Note 3		dBm/15 kHz	-87
$\hat{E}_s/I_{ot}$		dB	17
$\hat{E}_s/N_{oc}$		dB	17
Io Note3	$Config_{SCell}$ 1,2	dBm/9.36MHz	-58.96
	$Config_{SCell}$ 3	dBm/38.16MHz	-52.86
Time offset to Cell1 Note 4	$Config_{SCell}$ 1,2	µs	500 + Time offset to Cell2
	$Config_{SCell}$ 3		250 + Time offset to Cell2
Time offset to Cell2 Note 5		µs	3
Propagation Condition			AWGN

NOTE 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.
NOTE 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for N_{oc} to be fulfilled within $BW_{occupied}$.
NOTE 3: SS-RSRP and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.
NOTE 4: Receive time difference of signals received between subframe timing boundary of E-UTRA PCell and slot timing boundary of PSCell at the UE antenna connector including time alignment error between the two cells.
NOTE 5: Receive time difference between slot boundaries of signals received from the two cells at the UE antenna connector including time alignment error between the two cells.
Note 6: All UL/DL transmission shall be confined within $BW_{occupied}$ (i.e. 10 MHz, 52 RBs) from $F_{C,low}$, and Io is independent of the $BW_{channel}$ configured.
Note 7: All UL/DL transmission shall be confined within $BW_{occupied}$ (i.e. 40 MHz, 106 RBs) from $F_{C,low}$, and Io is independent of the $BW_{channel}$ configured.
Note 8: $N_{RB,c}$. is derived from Table 5.3.2-1 in TS38.101-1[2] with configured $BW_{channel}$.

The UE shall be continuously scheduled in LTE PCell and NR PSCell during the entire length of T1. During the time duration T1 the UE shall transmit at least 99.5% of ACK/NACK on NR PSCell.

If the NR PSCell is not in the same band as the deactivated SCell, the UE is only allowed to cause interruptions on NR PSCell immediately before and immediately after an SMTC. Each interruption on NR PSCell shall not exceed the value defined in Table 4.5.2.4.5-2.

If the NR PSCell is in the same band as the deactivated SCell, the UE is only allowed to cause an interruption on PSCell no earlier than 1 slot before an SMTC and no later than 1 slot after the SMTC. the interruption on NR PSCell shall not exceed the value defined in Table 4.5.2.4.5-3.

Table 4.5.2.4.5-2: Interruption duration if the NR PSCell is not in the same band as the deactivated SCell

μ	NR Slot length (ms)	Interruption length (slot)
0	1	1
1	0.5	1

Table 4.5.2.4.5-3: Interruption duration if the NR PSCell is in the same band as the deactivated SCell

μ	NR Slot length (ms)	Interruption length (slot)
0	1	2+SMTC duration
1	0.5	2+SMTC duration

For asynchronous inter-band EN-DC, the UE is only allowed to cause interruptions on E-UTRA PCell immediately before and immediately after an SMTC. Each interruption on E-UTRA PCell shall not exceed 2 subframe.

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

4.5.2.5 EN-DC FR1 interruptions during measurements on deactivated E-UTRAN SCC in synchronous EN-DC

4.5.2.5.1 Test purpose

The purpose of this test is to verify E-UTRAN PCell and NR PSCell interruptions during the measurement on the deactivated E-UTRAN SCC, the UE missed ACK/NACK does not exceed the limits. This test will verify the missed ACK/NACK rate for E-UTRAN PCell and NR PSCell in EN-DC.

4.5.2.5.2 Test applicability

This test applies to all types of E-UTRA UE release 15 and forward supporting EN-DC and 2 DL CA in E-UTRA.

4.5.2.5.3 Minimum conformance requirements

The minimum conformance requirements are defined in clause 4.5.2.0.3.

The normative reference for this requirement is TS 38.133 [6] clause A.4.5.2.5.

4.5.2.5.4 Test description

4.5.2.5.4.1 Initial conditions

This test shall be tested using any of the test configurations in Table 4.5.2.5.4.1-1.

Table 4.5.2.5.4.1-1: Supported test configurations

Configuration	Description
	LTE PCell + NR PSCell Note 2
4.5.2.5-1	LTE FDD, NR 15 kHz SSB SCS, 10MHz bandwidth, FDD duplex mode
4.5.2.5-2	LTE FDD, NR 15 kHz SSB SCS, 10MHz bandwidth, TDD duplex mode
4.5.2.5-3	LTE FDD, NR 30 kHz SSB SCS, 40MHz bandwidth, TDD duplex mode
4.5.2.5-4	LTE TDD, NR 15 kHz SSB SCS, 10MHz bandwidth, FDD duplex mode
4.5.2.5-5	LTE TDD, NR 15 kHz SSB SCS, 10MHz bandwidth, TDD duplex mode
4.5.2.5-6	LTE TDD, NR 30 kHz SSB SCS, 40MHz bandwidth, TDD duplex mode
NOTE.1: The UE is only required to be tested in one of the supported test configurations. NOTE 2: The duplex mode of the LTE SCell is determined based on the band combination to be tested.	

Configure the test equipment and the DUT according to the parameters in Table 4.5.2.5.4.1-2 and Table 4.5.2.5.4.1-3.

Table 4.5.2.5.4.1-2: Initial conditions for EN-DC FR1 interruptions during measurements on deactivated E-UTRAN SCC in synchronous EN-DC

Parameter	Value		Comment
Test environment	NC		As specified in TS 38.508-1 [14] clause 4.1.
Test frequencies	As specified in Annex E, Table E.1-1 and TS 38.508-1 [14] clause 4.3.1.		
Channel bandwidth	As specified by the test configuration selected from Table 4.7.1.1.2-1.		
Propagation conditions	AWGN		As specified in clause C.2.2.
Connection Diagram	TE Part	A.3.1.8.2	As specified in TS 38.508-1 [14] Annex A.
	DUT Part	A.3.2.3.4	
Exceptions to connection diagram	N/A		

1. The general test parameter settings are set up according to Table 4.5.2.5.4.1-3.
2. Message contents are defined in clause 4.5.2.5.4.3.
3. There are two E-UTRAN carriers and one NR carrier and three cells specified in the test. Cell1 and Cell3 is E-UTRAN PCell and E-UTRAN deactivated SCell, Cell2 is NR FR1 PSCell. Cell 1 is the cell used for connection setup with the power level set according to Table A.6.1.1-1. Cell 3 shall be configured according to Table A.6.1.1-1 except for the RF channel number 3. Cell 2 shall be configured according to clause C.1.1 and C.1.2.

Table 4.5.2.5.4.1-3: General test parameters for E-UTRAN - NR FR1 interruptions during measurements on deactivated E-UTRAN SCC in synchronous EN-DC

Parameter	Unit	Value	Comment
RF Channel Number		1, 2. 3	Two E-UTRAN RF channels and one NR RF channel
Active PCell		Cell1	PCell on E-UTRAN RF channel number 1.
Active PSCell		Cell2	PSCell on NR RF channel number 2.
Configured deactivated SCell		Cell3	Deactivated SCell on E-UTRAN RF channel number 3.
CP length		Normal	Applicable to Cell1, Cell2 and Cell3
DRX		OFF	
Measurement gap pattern Id		OFF	
SCell measurement cycle (measCycleSCell)	ms	640	
T1	s	10	

4.5.2.5.4.2 Test procedure

The test consists of three cells: Cell1, Cell2 and Cell3. Cell1 and Cell3 is E-UTRAN PCell and E-UTRAN deactivated SCell, Cell2 is NR FR1 PSCell. The test consists of one time period, with duration of T1. Prior to the start of the time duration T1, the UE shall be connected to Cell1 and Cell2 and the RRC message including *measCycleSCell* or *allowInterruptions* for the deactivated NR SCells is received at the UE antenna connector. Cell1 shall be configured as E-UTRAN PCell, Cell2 shall be configured as NR PSCell and Cell3 shall be configured as E-UTRAN deactivated SCell. During T1 the UE shall be continuously scheduled on E-UTRAN PCell and NR PSCell.

1. Ensure the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity *EN-DC*, DC bearer *MCG_and_SCG*, Connected without release *On* and Test Mode *On* according to TS 38.508-1 [14] clause 4.5.
2. Configure MCG according to TS 36.521-3 [26] clause C.0, C.1 and SCG according to clause C.1.1 and C.1.2 for all downlink physical channels.
3. The SS shall configure SCell (Cell 3) on the SCC as per TS 36.508 [25] clause 5.2A.

4. Set the parameters according to T1 in Tables 4.5.2.5.5-1. Propagation conditions are set according to clause C.2.1. T1 starts.

5. SS schedules on PCell and PSCell continuously and UE shall start sending ACK/NACK reports. The SS shall monitor DTX on PCell and ACK/NACK/DTX on PSCell.

6. If more than 99.5% of uplink transmissions on PSCell are received by SS then count a success for the event "ACK/NACK". Otherwise count a fail for the event "ACK/NACK".

6a. If no longer than X consecutive DTX on PCell is observed by the SS, then count a success for the event “PCell DTX”. Otherwise count a fail for the event “PCell DTX”. Where,

- For test configuration 4.5.2.5-1, 4.5.2.5-2 and 4.5.2.5-3,
  - X = 1 if the PCell is not in the same band as the deactivated SCell, otherwise X = 9.
- For test configuration 4.5.2.5-4, 4.5.2.5-5 and 4.5.2.5-6,
  - X = 1 if the PCell is not in the same band as the deactivated SCell, otherwise X = 5.

7. If no longer than Z consecutive DTX on PSCell is observed by the SS, then count a success for the event "PSCell DTX". Otherwise count a fail for the event "PSCell DTX".

- For test configuration 4.5.2.5-1 and 4.5.2.1-4,
  - Z = interruption length+k1 if k1 $\leq$ interruption length, otherwise Z = interruption length
- For test configuration other than 4.5.2.5-1 and 4.5.2.5-4,
  - Z = interruption length.
- Interruption length is given by "Interruption length X" column in Table 4.5.2.5.5-2 for inter-band case and by "Interruption length Y" column in Table 4.5.2.5.5-2 for intra-band case.

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

9. The SS then shall transmit *RRCConnectionReconfiguration* message with condition MCG_and_SCG according to TS 36.508 [25] Table 4.6.1-8 to add NR cell (PSCell). The UE shall transmit *RRCConnectionReconfigurationComplete* message. If any the reconfiguration fails, switch off and on the UE and ensure the UE is in RRC_CONNECTED with generic procedure parameters Connectivity EN-DC, DC bearer MCG and SCG, Connected without release On according to TS 38.508-1 [14] clause 4.5

10. Repeat step 2-9 until a test verdict has been achieved.

Each of the events "ACK/NACK" "PCell DTX" and "PSCell DTX" is evaluated independently for the statistic, resulting in an event verdict: pass or fail. Each event is evaluated only until the confidence level according to Table G.2.3-1 in Annex G.2 is achieved. Different events may require different times for a verdict.

If all events pass, the test passes. If one event fails, the test fails.

4.5.2.5.4.3 Message contents

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

Table 4.5.2.5.4.3-1: Common Exception messages

Default Message Contents	
Common contents of system information blocks exceptions	
Default RRC messages and information elements contents exceptions	Table H.3.4-10 with A3-offset = 15

Table 4.5.2.5.4.3-2: Void

Table 4.5.2.5.4.3-3: *RRCConnectionReconfiguration* in step 3: SCell addition

Derivation Path: 36.508 Table 4.6.1-8, condition SCell_AddMod			
Information Element	**Value/remark**	**Comment**	**Condition**
RRCConnectionReconfiguration ::= SEQUENCE {			
criticalExtensions CHOICE {			
c1 CHOICE{			
rrcConnectionReconfiguration-r8 ::= SEQUENCE {			
measConfig	MeasConfig-DEFAULT	Table H.3.4-4	E-UTRA_Deactivated_SCell AND GAPLESS
}			
}			
}			
}			

4.5.2.5.5 Test requirement

Table 4.5.2.5.5-1 defines the primary level settings including test tolerances for E-UTRAN - NR FR1 interruptions during measurements on deactivated E-UTRAN SCC in synchronous EN-DC test configurations.

Table 4.5.2.5.5-1: NR cell specific test parameters for E-UTRAN - NR FR1 interruptions during measurements on deactivated E-UTRAN SCC in synchronous EN-DC

Parameter		Unit	Cell 2
Frequency Range			FR1
Duplex mode	Config 1,4		FDD
	Config 2,3,5,6		TDD
TDD configuration	Config 1,4		Not Applicable
	Config 2,5		TDDConf.1.1
	Config 3,6		TDDConf.2.1
$BW_{channel}$	Config 1,4	MHz	10: $N_{RB,c}$ = 52
	Config 2,5		10: $N_{RB,c}$ = 52
	Config 3,6		40: $N_{RB,c}$ = 106
Initial DL BWP Configuration	Config 1,4		DLBWP.0.1
	Config 2,5		DLBWP.0.1
	Config 3,6		DLBWP.0.1
Dedicated DL BWP Configuration	Config 1,4		DLBWP.1.1
	Config 2,5		DLBWP.1.1
	Config 3,6		DLBWP.1.1
Initial UL BWP Configuration	Config 1,4		ULBWP.0.1
	Config 2,5		ULBWP.0.1
	Config 3,6		ULBWP.0.1
Dedicated UL BWP Configuration	Config 1,4		ULBWP.1.1
	Config 2,5		ULBWP.1.1
	Config 3,6		ULBWP.1.1
PDSCH Reference measurement channel	Config 1,4		SR.1.1 FDD
	Config 2,5		SR.1.1 TDD
	Config 3,6		SR.2.1 TDD
RMSI CORESET parameters	Config 1,4		CR.1.1 FDD
	Config 2,5		CR.1.1 TDD
	Config 3,6		CR.2.1 TDD
PDCCH CORESET parameters	Config 1,4		CCR.1.1 FDD
	Config 2,5		CCR.1.1 TDD
	Config 3,6		CCR.2.1 TDD
TRS configuration	Config 1,4		TRS.1.1 FDD
	Config 2,5		TRS.1.1 TDD
	Config 3,6		TRS.1.2 TDD
OCNG Patterns			OP.1

Parameter		Unit	Cell 2
SMTC Configuration			SMTC.1
TCI state			TCI.State.0
SSB Configuration	Config 1,2,4,5		SSB.1 FR1
	Config 3,6		SSB.2 FR1
Correlation Matrix and Antenna Configuration			1x2 Low
EPRE ratio of PSS to SSS		dB	0
EPRE ratio of PBCH DMRS to SSS			
EPRE ratio of PBCH to PBCH DMRS			
EPRE ratio of PDCCH DMRS to SSS			
EPRE ratio of PDCCH to PDCCH DMRS			
EPRE ratio of PDSCH DMRS to SSS			
EPRE ratio of PDSCH to PDSCH			
EPRE ratio of OCNG DMRS to SSS(Note 1)			
EPRE ratio of OCNG to OCNG DMRS (Note 1)			
N_{oc} Note 2		dBm/15 kHz	-104
SS-RSRP Note 3		dBm/15 kHz	-87
$\hat{E}_s/I_{ot}$		dB	17
$\hat{E}_s/N_{oc}$		dB	17
Io Note3	Config 1,2,4,5	dBm/ 9.36MHz	-58.96
	Config 3,6	dBm/ 38.16MHz	-52.86
Time offset to Cell1 Note 4		µs	3 for intra-band EN-DC, 33 for inter-band EN-DC
Propagation Condition			AWGN

NOTE 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.
NOTE 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for N_{oc} to be fulfilled.
NOTE 3: SS-RSRP and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.
NOTE 4: Receive time difference of signals received between subframe timing boundary of E-UTRA PCell and slot timing boundary of PSCell at the UE antenna connector including time alignment error between the two cells.
NOTE 5: For unpaired spectrum, a DL BWP is linked with an UL BWP. DLBWP.0.2 is linked with ULBWP.0.2 defined in TS 38.213 [3] section 12.

The UE shall be continuously scheduled in LTE PCell and NR PSCell during the entire length of T1. During the time duration T1 the UE shall transmit at least 99.5% of ACK/NACK on NR PSCell. The UE is only allowed to cause one interruption on PCell and one interruption on PSCell. Each interruption on NR PSCell shall not exceed X defined in Table 4.5.2.5.5-2 if the NR PSCell is not in the same band as the E-UTRAN deactivated SCell or Y in Table Table 4.5.2.5.5-2 if the NR PSCell is in the same band as the E-UTRAN deactivated SCell.

Table 4.5.2.5.5-2: Interruption length X and Y at measurements on deactivated E-UTRA SCC

μ	NR Slot length (ms)	Interruption length X (slot)	Interruption length Y (slot)
0	1	1	1+SMTC duration
1	0.5	1	1+SMTC duration

Each interruption on E-UTRAN PCell shall not exceed 1 subframe if the PCell is not in the same band as the deactivated SCell, or 5 subframes if the PCell is in the same band as the deactivated SCell.

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

4.5.2.6 EN-DC FR1 interruptions during measurements on deactivated E-UTRAN SCC in asynchronous EN-DC

4.5.2.6.1 Test purpose

The purpose of this test is to verify E-UTRAN PCell and NR PSCell interruptions during the measurement on the deactivated NR SCC, the UE missed ACK/NACK does not exceed the limits. This test will verify the missed ACK/NACK rate for E-UTRAN PCell and NR PSCell in EN-DC.

4.5.2.6.2 Test applicability

This test applies to all types of E-UTRA UE release 15 and forward supporting EN-DC and 2 DL CA in E-UTRA.

4.5.2.6.3 Minimum conformance requirements

The minimum conformance requirements are defined in clause 4.5.2.0.3.

The normative reference for this requirement is TS 38.133 [6] clause A.4.5.2.6.

4.5.2.6.4 Test description

4.5.2.6.4.1 Initial conditions

This test shall be tested using any of the test configurations in Table 4.5.2.6.4.1-1.

Table 4.5.2.6.4.1-1: Supported test configurations for EN-DC FR1 interruptions during measurements on deactivated E-UTRAN SCC in asynchronous EN-DC

Configuration	Description
	LTE PCell + NR PSCell Note 2
4.5.2.6-1	LTE FDD, NR 15 kHz SSB SCS, 10MHz bandwidth, FDD duplex mode
4.5.2.6-2	LTE FDD, NR 15 kHz SSB SCS, 10MHz bandwidth, TDD duplex mode
4.5.2.6-3	LTE FDD, NR 30 kHz SSB SCS, 40MHz bandwidth, TDD duplex mode
4.5.2.6-4	LTE TDD, NR 15 kHz SSB SCS, 10MHz bandwidth, FDD duplex mode
4.5.2.6-5	LTE TDD, NR 15 kHz SSB SCS, 10MHz bandwidth, TDD duplex mode
4.5.2.6-6	LTE TDD, NR 30 kHz SSB SCS, 40MHz bandwidth, TDD duplex mode
NOTE.1: The UE is only required to be tested in one of the supported test configurations. NOTE 2: The duplex mode of the LTE SCell is determined based on the band combination to be tested.	

Configure the test equipment and the DUT according to the parameters in Table 4.5.2.6.4.1-2.

Table 4.5.2.6.4.1-2: Initial conditions for EN-DC FR1 interruptions during measurements on deactivated E-UTRAN SCC in asynchronous EN-DC

Parameter	Value		Comment
Test environment	NC		As specified in TS 38.508-1 [14] clause 4.1.
Test frequencies	As specified in Annex E, table E.2-1 and TS 38.508-1 [14] clause 4.3.1.		
Channel bandwidth	As specified by the test configuration selected from Table 4.5.2.6.4.1-1.		
Propagation conditions	AWGN		As specified in clause C.2.1.
Connection Diagram	TE Part	A.3.1.8.2	As specified in TS 38.508-1 [14] Annex A.
	DUT Part	A.3.2.3.4	
Exceptions to connection diagram	N/A		

1. The general test parameter settings are set up according to Table 4.5.2.6.4.1-3.
2. Message contents are defined in clause 4.5.2.6.4.3.
3. There are two E-UTRAN carriers and one NR carrier and three cells specified in the test. Cell1 and Cell3 is E-UTRAN PCell and E-UTRAN deactivated SCell, Cell2 is NR FR1 PSCell. Cell 1 is the cell used for connection setup with the power level set according to Table A.6.1.1-1. Cell 3 shall be configured according to Table A.6.1.1-1 except for the RF channel number 3. Cell 2 shall be configured according to clauses C.1.1 and C.1.2.

Table 4.5.2.6.4.1-3: General test parameters for EN-DC FR1 interruptions during measurements on deactivated E-UTRAN SCC in asynchronous EN-DC

Parameter	Unit	Value	Comment
RF Channel Number		1, 2, 3	Two E-UTRAN RF channels and one NR RF channel
Active PCell		Cell1	PCell on E-UTRAN RF channel number 1.
Active PSCell		Cell2	PSCell on NR RF channel number 2.
Configured deactivated SCell		Cell3	Deactivated SCell on E-UTRAN RF channel number 3.
CP length		Normal	Applicable to Cell1, Cell 2 and Cell3
DRX		OFF	
Measurement gap pattern Id		OFF	
SCell measurement cycle (measCycleSCell)	ms	640	
T1	s	10	

4.5.2.6.4.2 Test procedure

The test consists of three cells: Cell1, Cell2 and Cell3. Cell1 and Cell3 is E-UTRAN PCell and E-UTRAN deactivated SCell, Cell2 is NR FR1 PSCell. The test consists of one time period, with duration of T1. Prior to the start of the time duration T1, the UE shall be connected to Cell1 and Cell2 and the RRC message including *measCycleSCell* or *allowInterruptions* for the deactivated NR SCells is received at the UE antenna connector. Cell1 shall be configured as E-UTRAN PCell, Cell2 shall be configured as NR PSCell and Cell3 shall be configured as E-UTRAN deactivated SCell. During T1 the UE shall be continuously scheduled on E-UTRAN PCell and NR PSCell.

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

2. Configure MCG according to TS 36.521-3 [26] clause C.0, C.1 and SCG according to clause C.1.1 and C.1.2 for all downlink physical channels.

3. The SS shall configure SCell (Cell 3) on the SCC as per TS 36.508 [25] clause 5.2A.

4. Set the parameters according to T1 in Table 4.5.2.6.5-1. Propagation conditions are set according to clause C.2.1. T1 starts.

5. SS schedules on PCell and PSCell continuously and UE shall start sending ACK/NACK reports. The SS shall monitor DTX on PCell and ACK/NACK/DTX on PSCell.

6. If more than 99.5% of uplink transmissions on PSCell are received by SS then count a success for the event "ACK/NACK". Otherwise count a fail for the event "ACK/NACK".

6a. If no longer than X consecutive DTX on PCell is observed by the SS, then count a success for the event “PCell DTX”. Otherwise count a fail for the event “PCell DTX”. Where,

- For test configuration 4.5.2.6-1, 4.5.2.6-2 and 4.5.2.6-3,
  - X = 1 if the PCell is not in the same band as the deactivated SCell, otherwise X = 9.
- For test configuration 4.5.2.6-4, 4.5.2.6-5 and 4.5.2.6-6,
  - X = 1 if the PCell is not in the same band as the deactivated SCell, otherwise X = 5.

7. If no longer than Xconsecutive DTX on PSCell is observed by the SS, then count a success for the event "PSCell DTX". Otherwise count a fail for the event "PSCell DTX". Where,

- For test configuration 4.5.2.6-1 and 4.5.2.6-4,
  - Z = interruption length+k1 if k1 ≤ interruption length, otherwise Z = interruption length
- For test configuration other than 4.5.2.6-1 and 4.5.2.6-4,
  - Z = interruption length.
- Interruption length is given by Table 4.5.2.6.5-2 for inter-band case and Table 4.5.2.6.5-3 for intra-band case.

7a. The SS shall transmit *RRCConnectionReconfiguration* message with condition SCell_Rel according to 4.5.2.6.4.3-4 to release E-UTRA SCell. The UE shall transmit *RRCConnectionReconfigurationComplete* message.

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

9. The SS then shall transmit *RRCConnectionReconfiguration* message with condition MCG_and_SCG according to TS 36.508 [25] Table 4.6.1-8 to add NR cell (PSCell). The UE shall transmit *RRCConnectionReconfigurationComplete* message. If any the reconfiguration fails, switch off and on the UE and ensure the UE is in RRC_CONNECTED with generic procedure parameters Connectivity EN-DC, DC bearer MCG and SCG, Connected without release On according to TS 38.508-1 [14] clause 4.5

   - switches off and on the UE and ensures the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity *EN-DC*, DC bearer *MCG_and_SCG*, Connected without release *On* TS 38.508-1 [14] clause 4.5.

10. Repeat step 2-9 until a test verdict has been achieved.

Each of the events "ACK/NACK" "PCell DTX" and "PSCell DTX" is evaluated independently for the statistic, resulting in an event verdict: pass or fail. Each event is evaluated only until the confidence level according to Table G.2.3-1 in Annex G.2 is achieved. Different events may require different times for a verdict.

If all events pass, the test passes. If one event fails, the test fails.

4.5.2.6.4.3 Message contents

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

Table 4.5.2.6.4.3-1: Common Exception messages

Default Message Contents	
Common contents of system information blocks exceptions	
Default RRC messages and information elements contents exceptions	Table H.3.4-10 with A3-offset = 15

Table 4.5.2.6.4.3-2: Void

Table 4.5.2.6.4.3-3: *RRCConnectionReconfiguration* in step 3: SCell addition

Derivation Path: 36.508 Table 4.6.1-8, condition SCell_AddMod			
Information Element	**Value/remark**	**Comment**	**Condition**
RRCConnectionReconfiguration ::= SEQUENCE {			
criticalExtensions CHOICE {			
c1 CHOICE{			
rrcConnectionReconfiguration-r8 ::= SEQUENCE {			
measConfig	MeasConfig-DEFAULT	Table H.3.4-4	E-UTRA_Deactivated_SCell AND GAPLESS
}			
}			
}			
}			

Table 4.5.2.6.4.3-4: *RRCConnectionReconfiguration* in step 7a: SCell release

Derivation Path: 36.508 Table 4.6.1-8			
Information Element	**Value/remark**	**Comment**	**Condition**

RRCConnectionReconfiguration ::= SEQUENCE {			
sCellToReleaseList-r10 SEQUENCE (SIZE (1..maxSCell-r10) OF SEQUENCE {	1 entry		
sCellIndex-r10[1]	Cell Index of Cell 3		
}			

4.5.2.6.5 Test requirement

Table 4.5.2.6.5-1 defines the primary level settings including test tolerances for EN-DC FR1 interruptions during measurements on deactivated E-UTRAN SCC in asynchronous EN-DC test configurations.

Table 4.5.2.6.5-1: NR cell specific test parameters for EN-DC FR1 interruptions during measurements on deactivated E-UTRAN SCC in asynchronous EN-DC

Parameter		Unit	Cell 2
Frequency Range			FR1
Duplex mode	Config 1,4		FDD
	Config 2,3,5,6		TDD
TDD configuration	Config 1,4		Not Applicable
	Config 2,5		TDDConf.1.1
	Config 3,6		TDDConf.2.1
$BW_{channel}$	Config 1,4	MHz	10: $N_{RB,c}$ = 52
	Config 2,5		10: $N_{RB,c}$ = 52
	Config 3,6		40: $N_{RB,c}$ = 106
Initial DL BWP Configuration	Config 1,4		DLBWP.0.1
	Config 2,5		DLBWP.0.1
	Config 3,6		DLBWP.0.1
Dedicated DL BWP Configuration	Config 1,4		DLBWP.1.1
	Config 2,5		DLBWP.1.1
	Config 3,6		DLBWP.1.1
Initial UL BWP Configuration	Config 1,4		ULBWP.0.1
	Config 2,5		ULBWP.0.1
	Config 3,6		ULBWP.0.1
Dedicated UL BWP Configuration	Config 1,4		ULBWP.1.1
	Config 2,5		ULBWP.1.1
	Config 3,6		ULBWP.1.1
PDSCH Reference measurement channel	Config 1,4		SR.1.1 FDD
	Config 2,5		SR.1.1 TDD
	Config 3,6		SR.2.1 TDD
RMSI CORESET parameters	Config 1,4		CR.1.1 FDD
	Config 2,5		CR.1.1 TDD
	Config 3,6		CR.2.1 TDD
PDCCH CORESET parameters	Config 1,4		CCR.1.1 FDD
	Config 2,5		CCR.1.1 TDD
	Config 3,6		CCR.2.1 TDD
TRS configuration	Config 1,4		TRS.1.1 FDD
	Config 2,5		TRS.1.1 TDD
	Config 3,6		TRS.1.2 TDD
OCNG Patterns			OP.1
SMTC Configuration			SMTC.1
TCI state			TCI.State.0
SSB Configuration	Config 1,2,4,5		SSB.1 FR1
	Config 3,6		SSB.2 FR1
Correlation Matrix and Antenna Configuration			1x2 Low
EPRE ratio of PSS to SSS		dB	0
EPRE ratio of PBCH DMRS to SSS			
EPRE ratio of PBCH to PBCH DMRS			
EPRE ratio of PDCCH DMRS to SSS			
EPRE ratio of PDCCH to PDCCH DMRS			
EPRE ratio of PDSCH DMRS to SSS			
EPRE ratio of PDSCH to PDSCH			
EPRE ratio of OCNG DMRS to SSS Note 1			
EPRE ratio of OCNG to OCNG DMRS Note 1			

Parameter		Unit	Cell 2
N_{oc} Note 2		dBm/15 kHz	-104
SS-RSRP Note 3		dBm/15 kHz	-87
$\hat{E}_s/I_{ot}$		dB	17
$\hat{E}_s/N_{oc}$		dB	17
Io Note3	Config 1,2,4,5	dBm/ 9.36MHz	-58.96
	Config 3,6	dBm/ 38.16MHz	-52.86
Time offset to Cell1 Note 4	Config 1,2,4,5	µs	500
	Config 3,6		250
Propagation Condition			AWGN

NOTE 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.
NOTE 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for N_{oc} to be fulfilled.
NOTE 3: SS-RSRP and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.
NOTE 4: Receive time difference of signals received between subframe timing boundary of E-UTRA PCell and slot timing boundary of PSCell at the UE antenna connector including time alignment error between the two cells.

The UE shall be continuously scheduled in LTE PCell and NR PSCell during the entire length of T1. During the time duration T1 the UE shall transmit at least 99.5% of ACK/NACK on E-UTRAN PCell and NR PSCell. The UE is only allowed to cause one interruption on PCell and one interruption on PSCell . Each interruption on E-UTRAN PCell and NR PSCell shall not exceed the value defined in Table 4.5.2.6.5-2 and Table 4.5.2.6.5-3.

Table 4.5.2.6.5-2: Interruption duration if the NR PSCell is not in the same band as the E-UTRAN deactivated SCell

μ	NR Slot length (ms)	Interruption length (slot)
0	1	2
1	0.5	2

Table 4.5.2.6.5-3: Interruption duration if the NR PSCell is in the same band as the E-UTRAN deactivated SCell

μ	NR Slot length (ms)	Interruption length (slot)
0	1	2 + SMTC duration
1	0.5	2 + SMTC duration

Each interruption on E-UTRAN PCell shall not exceed 1 subframe if the PCell is not in the same band as the deactivated SCell, or 5 subframes if the PCell is in the same band as the deactivated SCell.

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

4.5.2.7

4.5.2.8 EN-DC FR1 interruptions at NR SRS carrier based switching in asynchronous EN-DC

Editor's Note: This test case is incomplete in following aspects:

- Message contents are missing.
- TT analysis is missing.
- Test Procedure is FFS.

- Test applicability needs to be updated
- Cell mapping is missing in Annex E

4.5.2.8.1 Test purpose

The purpose of this test is to verify E-UTRAN PCell and NR PSCell interruptions during carrier-based switching to one carrier not configured for PUCCH/PUSCH transmission from a CC with PUCCH/PUSCH transmission, when a UE needs to transmit aperiodic SRS.

4.5.2.8.2 Test applicability

This test applies to all types of E-UTRA UE release 16 and forward supporting EN-DC and 2 DL CA in NR.

4.5.2.8.3 Minimum conformance requirements

The minimum conformance requirements are defined in clause 4.5.2.0.4.

The normative reference for this requirement is TS 38.133 [6] clause A.4.5.2.8.

4.5.2.8.4 Test description

4.5.2.8.4.1 Initial conditions

This test shall be tested using any of the test configurations in Table 4.5.2.8.4.1-1.

Table 4.5.2.8.4.1-1: Supported test configurations for EN-DC FR1 interruptions at SRS carrier based switching in asynchronous EN-DC

Configuration	Description
	LTE PCell + NR PSCell Note 2
4.5.2.8-1	LTE FDD, NR 15 kHz SSB SCS, 10MHz bandwidth, FDD duplex mode
4.5.2.8-2	LTE FDD, NR 15 kHz SSB SCS, 10MHz bandwidth, TDD duplex mode
4.5.2.8-3	LTE FDD, NR 30 kHz SSB SCS, 40MHz bandwidth, TDD duplex mode
4.5.2.8-4	LTE TDD, NR 15 kHz SSB SCS, 10MHz bandwidth, FDD duplex mode
4.5.2.8-5	LTE TDD, NR 15 kHz SSB SCS, 10MHz bandwidth, TDD duplex mode
4.5.2.8-6	LTE TDD, NR 30 kHz SSB SCS, 40MHz bandwidth, TDD duplex mode
NOTE.1: The UE is only required to be tested in one of the supported test configurations. NOTE 2: The duplex mode of the LTE SCell is determined based on the band combination to be tested.	

Configure the test equipment and the DUT according to the parameters in Table 4.5.2.8.4.1-2.

Table 4.5.2.8.4.1-2: Initial conditions for EN-DC FR1 interruptions at SRS carrier based switching in asynchronous EN-DC

Parameter	Value		Comment
Test environment	NC		As specified in TS 38.508-1 [14] clause 4.1.
Test frequencies	As specified in Annex E, table E.2-1 and TS 38.508-1 [14] clause 4.3.1.		
Channel bandwidth	As specified by the test configuration selected from Table 4.5.2.8.4.1-1.		
Propagation conditions	AWGN		As specified in clause C.2.1.
Connection Diagram	TE Part	A.3.1.8.2	As specified in TS 38.508-1 [14] Annex A.
	DUT Part	A.3.2.3.4	
Exceptions to connection diagram	N/A		

1. The general test parameter settings are set up according to Table 4.5.2.8.4.1-3.
2. Message contents are defined in clause 4.5.2.8.4.3.

3. There are two NR carriers and one E-UTRA carrier, and three cells specified in the test. Each cell is on a different carrier. Cell1 Is E-UTRAN PCell, Cell2 is NR FR1 PSCell and Cell 3 is NR activated Scell. Cell 1 is the cell used for connection setup with the power level set according to Table A.6.1.1-1. Cell 2 and Cell 3 shall be configured according to clauses C.1.1 and C.1.2.

Table 4.5.2.8.4.1-3: General test parameters for EN-DC FR1 interruptions at SRS carrier based switching in asynchronous EN-DC

Parameter	Unit	Value	Comment
RF Channel Number		1, 2, 3	One is E-UTRAN RF channel and the other two are NR RF channels
Active PCell		Cell1	PCell on E-UTRAN RF channel number 1.
Configured PSCell		Cell2	Configured PSCell on NR RF channel number 2.
Configured SCell		Cell3	Configured activated secondary cell on NR RF channel number 3.
CP length		Normal	Applicable to Cell1, Cell2 and Cell3.
DRX		OFF	Continuous monitoring of primary cell
Filter coefficient		0	L3 filtering is not used
T1	s	5	
T2	ms	40	UE shall perform SRS switching during T2

4.5.2.8.4.2 Test procedure

TBD

4.5.2.8.4.3 Message contents

TBD

4.5.2.8.5 Test requirement

Table 4.5.2.8.5-1 defines the primary level settings including test tolerances for EN-DC FR1 interruptions at SRS carrier based switching in asynchronous EN-DC.

Table 4.5.2.8.5-1: NR cell specific test parameters for EN-DC FR1 interruptions at SRS carrier based switching in asynchronous EN-DC

Parameter		Unit	Cell2	Cell3
Frequency Range			FR1	FR1
Duplex mode	Config 1,4		FDD	TDD
	Config 2,3,5,6		TDD	TDD
TDD configuration	Config 1,4		Not Applicable	[TDDConfig.1.2]
	Config 2,5		[TDDConf.1.2]	[TDDConfig.1.2]
	Config 3,6		[TDDConf.2.3]	[TDDConfig.2.3]
$BW_{channel}$	Config 1,2,4,5	MHz	10: $N_{RB,c}$ = 52	10: $N_{RB,c}$ = 52
	Config 3,6		40: $N_{RB,c}$ = 106	40: $N_{RB,c}$ = 106
DL Initial BWP configuration	Config 1-6		DLBWP.0.1	DLBWP.0.1
DL dedicated BWP configuration	Config 1-6		DLBWP.1.1	DLBWP.1.1
UL Initial BWP configuration	Config 1-6		ULBWP.0.1	-
UL dedicated BWP configuration	Config 1-6		ULBWP.1.1	-
PDSCH Reference measurement channel	Config 1,4		SR.1.1 FDD	SR.1.1 TDD
	Config 2,5		SR.1.1 TDD	SR.1.1 TDD
	Config 3,6		SR.2.1 TDD	SR.2.1 TDD
RMSI CORESET Reference Channel	Config 1,4		CR.1.1 FDD	CR.1.1 TDD
	Config 2,5		CR.1.1 TDD	CR.1.1 TDD

	Config 3,6		CR.2.1 TDD	CR.2.1 TDD
RMC CORESET Reference Channel	Config 1,4		CCR.1.1 FDD	CCR.1.1 TDD
	Config 2,5		CCR.1.1 TDD	CCR.1.1 TDD
	Config 3,6		CCR.2.1 TDD	CCR.2.1 TDD
OCNG Patterns			OP.1	OP.1
TRS configuration	Config 1,4		TRS.1.1 FDD	TRS.1.1 TDD
	Config 2,5		TRS.1.1 TDD	TRS.1.1 TDD
	Config 3,6		TRS.1.2 TDD	TRS.1.2 TDD
SMTC configuration			SMTC.1	SMTC.1
SSB configuration	Config 1,2,4,5		SSB.1 FR1	SSB.1 FR1
	Config 3,6		SSB.2 FR1	SSB.2 FR1
PDSCH/PDCCH subcarrier spacing	Config 1,2,4,5	kHz	15 kHz	15 kHz
	Config 3,6		30 kHz	30 kHz
SRS Configuration	Config 1,2,4,5	kHz	-	SRS.1 TDD
	Config 3,6		-	SRS.2 TDD
PUCCH/PUSCH subcarrier spacing	Config 1,2,4,5	kHz	15 kHz	-
	Config 3,6		30 kHz	-
EPRE ratio of PSS to SSS		dB	0	0
EPRE ratio of PBCH DMRS to SSS				
EPRE ratio of PBCH to PBCH DMRS				
EPRE ratio of PDCCH DMRS to SSS				
EPRE ratio of PDCCH to PDCCH DMRS				
EPRE ratio of PDSCH DMRS to SSS				
EPRE ratio of PDSCH to PDSCH				
EPRE ratio of OCNG DMRS to SSS (Note 1)				
EPRE ratio of OCNG to OCNG DMRS (Note 1)				
N_{oc} Note2		dBm/15kHz	-104	-104
N_{oc} Note2	Config 1,2,4,5	dBm/SCS	-104	-104
	Config 3,6		-101	-101
SS-RSRP Note3	Config 1,2,4,5	dBm/SCS	-87	-87
	Config 3,6		-84	-84
$\hat{E}_s / I_{ot}$		dB	17	17
$\hat{E}_s / N_{oc}$		dB	17	17
Io Note3	Config 1,2,4,5	dBm/ 9.36MHz	-58.96	-58.96
	Config 3,6	dBm/ 38.16MHz	-52.86	-52.86
Time offset to Cell1 Note 4		µs	-	3
Propagation condition		-	AWGN	AWGN

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

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

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

Note 4: Receive time difference between slot boundaries of signals received from the two cells at the UE antenna connector including time alignment error between the two cells.

During the time duration T2, the interruption on NR PSCell during the switching from NR PSCell to NR SCell shall not exceed the value as defined in Table 4.5.2.8.5-2 dependent on the applied SRS carrier switching time.

Table 4.5.2.8.5-2: Interruption length on NR active serving cells at NR SRS carrier switching (slot)

μ	NR Slot length (ms) of victim cell	SRS carrier switching time (us)[Note 1]	Interruption length X1 (slots)	
			Sub carrier spacing for aggressor cell (kHz)	
			15	30
0	1	≤ 200	2	2
		300, 500	2	2
		900	3	3
1	0.5	≤ 200	3	2
		300, 500	3	3
		900	4	4
Note1: NR SRS carrier switching time is UE capability indicated by higher layer parameter *SRS-SwitchingTimeNR*.				

During the time duration T2, the interruption on E-UTRAN PCell during the switching from NR PSCell to NR SCell shall not exceed the value as defined in Table 4.5.2.8.5-3 dependent on the applied SRS carrier switching time.

Table 4.5.2.8.5-3: Interruption length on E-UTRAN active serving cells at NR SRS carrier switching

NR SRS carrier switching time (us)[note1]	Interruption length X1 (subframes)
≤500	2
900	3
Note1: NR SRS carrier switching time is UE capability indicated by higher layer parameter *SRS-SwitchingTimeNR*.	

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

4.5.2.9 EN-DC FR1 interruptions at E-UTRA SRS carrier based switching

Editor's Note: This test case is incomplete in following aspects:

- Message contents are missing.
- TT analysis is missing.
- Test Procedure is FFS.
- Test applicability needs to be updated
- Cell mapping is missing in Annex E

4.5.2.9.1 Test purpose

The purpose of this test is to verify the active serving cell in SCG interruptions during carrier-based switching to one PUSCH-less SCCs from a CC with PUSCH, when a UE needs to transmit aperiodic SRS.

4.5.2.9.2 Test applicability

This test applies to all types of E-UTRA UE release 16 and forward supporting EN-DC and 2DL CA in E-UTRA.

4.5.2.9.3 Minimum conformance requirements

The minimum conformance requirements are defined in clause 4.5.2.0.5.

The normative reference for this requirement is TS 38.133 [6] clause A.4.5.2.9.

4.5.2.9.4 Test description

4.5.2.9.4.1 Initial conditions

This test shall be tested using any of the test configurations in Table 4.5.2.9.4.1-1.

Table 4.5.2.9.4.1-1: Supported test configurations for EN-DC FR1 interruptions at E-UTRA SRS carrier based switching supported test configurations

Configuration	Description
	LTE PCell + NR PSCell Note 2
4.5.2.9-1	LTE FDD, NR 15 kHz SSB SCS, 10MHz bandwidth, FDD duplex mode
4.5.2.9-2	LTE FDD, NR 15 kHz SSB SCS, 10MHz bandwidth, TDD duplex mode
4.5.2.9-3	LTE FDD, NR 30 kHz SSB SCS, 40MHz bandwidth, TDD duplex mode
4.5.2.9-4	LTE TDD, NR 15 kHz SSB SCS, 10MHz bandwidth, FDD duplex mode
4.5.2.9-5	LTE TDD, NR 15 kHz SSB SCS, 10MHz bandwidth, TDD duplex mode
4.5.2.9-6	LTE TDD, NR 30 kHz SSB SCS, 40MHz bandwidth, TDD duplex mode
NOTE.1: The UE is only required to be tested in one of the supported test configurations. NOTE 2: The duplex mode of the LTE SCell is determined based on the band combination to be tested.	

Configure the test equipment and the DUT according to the parameters in Table 4.5.2.9.4.1-2.

Table 4.5.2.9.4.1-2: Initial conditions for EN-DC FR1 interruptions at E-UTRA SRS carrier based switching supported test configurations

Parameter	Value		Comment
Test environment	NC		As specified in TS 38.508-1 [14] clause 4.1.
Test frequencies	As specified in Annex E, table E.2-1 and TS 38.508-1 [14] clause 4.3.1.		
Channel bandwidth	As specified by the test configuration selected from Table 4.5.2.9.4.1-1.		
Propagation conditions	AWGN		As specified in clause C.2.1.
Connection Diagram	TE Part	A.3.1.8.2	As specified in TS 38.508-1 [14] Annex A.
	DUT Part	A.3.2.3.4	
Exceptions to connection diagram	N/A		

1. The general test parameter settings are set up according to Table 4.5.2.9.4.1-3 and SRS parameters are given in Table 4.5.2.9.4.1-4.

2. Message contents are defined in clause 4.5.2.9.4.3.

3. There are two E-UTRA carriers and one NR carrier, and three cells specified in the test. Each cell is on a different carrier. Cell1 is E-UTRA PCell, Cell2 is NR FR1 PSCell and Cell 3 is E-UTRA activated SCell. Cell 1 is the cell used for connection setup with the power level set according to Table A.6.1.1-1. Cell 3 shall be configured according to clauses C.1.1 and C.1.2.

Table 4.5.2.9.4.1-3: General test parameters for EN-DC FR1 interruptions at E-UTRA SRS carrier based switching supported test configurations

Parameter	Unit	Value	Comment
RF Channel Number		1, 2, 3	One is NR RF channel and the other two are E-UTRAN RF channels
Active PCell		Cell1	PCell on E-UTRAN RF channel number 1.
Active PSCell		Cell2	PSCell on NR RF channel number 2.
Activated SCell		Cell3	SCell on E-UTRAN RF channel number 3.
CP length		Normal	Applicable to Cell1, Cell2 and Cell3
DRX		OFF	
Measurement gap pattern Id		OFF	
T1	s	0.2	
T2	s	0.2	UE shall perform SRS switching during T2

Table 4.5.2.9.4.1-4: Sounding Reference Symbol Configuration for E-UTRAN – NR interruptions at E-UTRA SRS carrier based switching

Field	Value	Comment
srsBandwidthConfiguration	bw5	
srsSubframeConfiguration	Sc8	Once every 5 subframes
ackNackSrsSimultaneousTransmission	FALSE	
srsMaxUpPTS	N/A	Not applicable for E-UTRAN FDD
srsBandwidth	0	No hopping
srsHoppingBandwidth	hbw0	
frequencyDomainPosition	0	
Duration	TRUE	Indefinite duration
Srs-ConfigurationIndex	47	SRS periodicity of 40ms.
transmissionComb	0	
cyclicShift	cs0	No cyclic shift
SRS-AntennaPort	an1	Number of antenna ports used for SRS transmission
Note: For further information see clause 6.3.2 in TS 36.331.		

4.5.2.9.4.2 Test procedure

TBD

4.5.2.9.4.3 Message contents

TBD

4.5.2.9.5 Test requirement

Table 4.5.2.9.5-1 defines the primary level settings including test tolerances for EN-DC FR1 interruptions at E-UTRA SRS carrier based switching.

Table 4.5.2.9.5-1: NR cell specific test parameters for EN-DC FR1 interruptions at E-UTRA SRS carrier based switching

Parameter		Unit	Cell2
Frequency Range			FR1
Duplex mode	Config 1,4		FDD
	Config 2,3,5,6		TDD
TDD configuration	Config 1,4		Not Applicable
	Config 2,5		[TDDConf.1.2]
	Config 3,6		[TDDConf.2.3]
$BW_{channel}$	Config 1,4	MHz	10: $N_{RB,c}$ = 52
	Config 2,5		10: $N_{RB,c}$ = 52
	Config 3,6		40: $N_{RB,c}$ = 106
Initial DL BWP Configuration	Config 1,4		DLBWP.0.1
	Config 2,5		DLBWP.0.1
	Config 3,6		DLBWP.0.1
Dedicated DL BWP Configuration	Config 1,4		DLBWP.1.1
	Config 2,5		DLBWP.1.1
	Config 3,6		DLBWP.1.1
Initial UL BWP Configuration	Config 1,4		ULBWP.0.1
	Config 2,5		ULBWP.0.1
	Config 3,6		ULBWP.0.1
Dedicated UL BWP Configuration	Config 1,4		ULBWP.1.1
	Config 2,5		ULBWP.1.1
	Config 3,6		ULBWP.1.1
PDSCH Reference measurement channel	Config 1,4		SR.1.1 FDD
	Config 2,5		SR.1.1 TDD
	Config 3,6		SR.2.1 TDD

RMSI CORESET parameters	Config 1,4		CR.1.1 FDD
	Config 2,5		CR.1.1 TDD
	Config 3,6		CR.2.1 TDD
PDCCH CORESET parameters	Config 1,4		CCR.1.1 FDD
	Config 2,5		CCR.1.1 TDD
	Config 3,6		CCR.2.1 TDD
TRS configuration	Config 1,4		TRS.1.1 FDD
	Config 2,5		TRS.1.1 TDD
	Config 3,6		TRS.1.2 TDD
OCNG Patterns			OP.1
SMTC Configuration			SMTC.1
TCI state			TCI.State.0
SSB Configuration	Config 1,2,4,5		SSB.1 FR1
	Config 3,6		SSB.2 FR1
Correlation Matrix and Antenna Configuration			1x2 Low
EPRE ratio of PSS to SSS		dB	0
EPRE ratio of PBCH DMRS to SSS			
EPRE ratio of PBCH to PBCH DMRS			
EPRE ratio of PDCCH DMRS to SSS			
EPRE ratio of PDCCH to PDCCH DMRS			
EPRE ratio of PDSCH DMRS to SSS			
EPRE ratio of PDSCH to PDSCH			
EPRE ratio of OCNG DMRS to SSS(Note 1)			
EPRE ratio of OCNG to OCNG DMRS (Note 1)			
N_{oc} Note 2		dBm/15 kHz	-104
SS-RSRP Note 3		dBm/15 kHz	-87
$\hat{E}_s/I_{ot}$		dB	17
$\hat{E}_s/N_{oc}$		dB	17
Io Note3	Config 1,2,4,5	dBm/9.36MHz	-58.96
	Config 3,6	dBm/38.16MHz	-52.86
Time offset to Cell1 Note 4		µs	33
Propagation Condition			AWGN

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

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

Note 3: SS-RSRP and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.

Note 4: Receive time difference of signals received between subframe timing boundary of E-UTRA PCell and slot timing boundary of PSCell at the UE antenna connector including time alignment error between the two cells

The UE shall be continuously scheduled in NR PSCell throughout the test and during the time duration T2, Each interruption on NR PSCell shall not exceed X defined in Table A.4.5.2.9.2-1.

Table 4.5.2.9.5-2: Interruption length X (slot) E-UTRAN – NR at E-UTRA SRS carrier based switching

μ	NR Slot length (ms)	Interruption length X3 (slots)
0	1	2
1	0.5	3

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

4.5.3 SCell activation and deactivation delay

4.5.3.0 Minimum conformance requirements

4.5.3.0.1 Minimum conformance requirements for SCell activation and deactivation delay

The requirements in this clause shall apply for the UE configured with one downlink SCell in EN-DC, or in standalone NR carrier aggregation or in NE-DC or in NR-DC and when one SCell is being activated.

The delay within which the UE shall be able to activate the deactivated SCell depends upon the specified conditions.

Upon receiving SCell activation command in slot *n*, the UE shall be capable to transmit valid CSI report and apply actions related to the activation command for the SCell being activated no later than in slot n + $\frac{T_{HARQ}+T_{activation_time}+T_{CSI_Reporting}}{NR\ slot\ length}$, where:

T_{HARQ} (in ms) is the timing between DL data transmission and acknowledgement as specified in 38.213 [8].

$T_{activation_time}$ is the SCell activation delay in millisecond.

If the SCell is known and belongs to FR1, $T_{activation_time}$ is:

- $T_{FirstSSB}$ + 5ms, if the SCell measurement cycle is equal to or smaller than 160ms.
- $T_{FirstSSB_MAX}$ + T_{rs} + 5ms, if the SCell measurement cycle is larger than 160ms.

If the SCell is unknown and belongs to FR1, provided that the side condition Ês/Iot ≥ -2dB is fulfilled, $T_{activation_time}$ is:

- $T_{FirstSSB_MAX}$ + T_{SMTC_MAX} + 2*T_{rs} + 5ms.

If the SCell being activated belongs to FR2, and if there is at least one active serving cell on that FR2 band, then $T_{activation_time}$ is $T_{FirstSSB}$ + 5ms provided:

- The UE is provided with SMTC for the target SCell, and
- The SSBs in the serving cell(s) and the SSBs in the SCell fulfil the condition defined in TS 38.133 [6] clause 3.6.3.
- The parameter *ssb-PositionsInBurst* is same for the serving cell(s) and the SCell.

If the SCell being activated belongs to FR2 and if there is at least one active serving cell on that FR2 band, if the UE is not provided with any SMTC for the target SCell, $T_{activation_time}$ is 3ms, provided

- the RS (s) of SCell being activated is (are) QCL-TypeD with RS (s) of one active serving cell on that FR2 band.

If the SCell being activated belongs to FR2 and if there is no active serving cell on that FR2 band provided that PCell or PSCell is FR1:

If the target SCell is known to UE and semi-persistent CSI-RS is used for CSI reporting, then $T_{activation_time}$ is:

- 3 ms + max($T_{uncertainty_MAC}$ +$T_{FineTiming}$ + 2ms, $T_{uncertainty_SP}$), where $T_{uncertainty_MAC}$=0 and $T_{uncertainty_SP}$=0, if UE receives the SCell activation command, semi-persistent CSI-RS activation command and TCI state activation command at the same time.

If the target SCell is known to UE and periodic CSI-RS is used for CSI reporting, then $T_{activation_time}$ is:

- max($T_{uncertainty_MAC}$ + 5ms + $T_{FineTiming}$, $T_{uncertainty_RRC}$ + $T_{RRC_delay-THARQ}$), where $T_{uncertainty_MAC}$=0 if UE receives the SCell activation command and TCI state activation commands at the same time.

If the PCell/PSCell and the target SCell are configured as FR1-FR2 CA or if the PCell/PSCell and the target SCell are in a FR2 band pair with independent beam management, and the target SCell is unknown to UE and semi-persistent CSI-RS is used for CSI reporting, provided that the side condition Ês/Iot ≥ -2dB is fulfilled, then $T_{activation_time}$ is:

- 6ms + $T_{FirstSSB_MAX}$ + 15*T_{SMTC_MAX} + 8*T_{rs} + $T_{L1\text{-}RSRP,\ measure}$ + $T_{L1\text{-}RSRP,\ report}$ + T_{HARQ} + max($T_{uncertainty_MAC}$ + $T_{FineTiming}$ + 2ms, $T_{uncertainty_SP}$)

If the PCell/PSCell and the target SCell are configured as FR1-FR2 CA or if the PCell/PSCell and the target SCell are in a FR2 band pair with independent beam management, and the target SCell is unknown to UE and periodic CSI-RS is used for CSI reporting, provided that the side condition $\hat{E}s/Iot \geq$ -2dB is fulfilled, then $T_{activation_time}$ is:

- 3ms + $T_{FirstSSB_MAX}$ + 15*T_{SMTC_MAX} + 8*T_{rs} + $T_{L1\text{-}RSRP,\ measure}$ + $T_{L1\text{-}RSRP,\ report}$ + max ((T_{HARQ} + $T_{uncertainty_MAC}$ + 5ms + $T_{FineTiming}$), ($T_{uncertainty_RRC}$ + T_{RRC_delay})).

Where,

T_{SMTC_MAX}:

- In FR1, in case of intra-band SCell activation, T_{SMTC_MAX} is the longer SMTC periodicity between active serving cells and SCell being activated provided the cell specific reference signals from the active serving cells and the SCells being activated or released are available in the same slot; in case of inter-band SCell activation, T_{SMTC_MAX} is the SMTC periodicity of SCell being activated.

- In FR2, T_{SMTC_MAX} is the longer SMTC periodicity between active serving cells and SCell being activated provided that in Rel-15 only support FR2 intra-band CA.

- T_{SMTC_MAX} is bounded to a minimum value of 10ms.

T_{rs} is the SMTC periodicity of the SCell being activated if the UE has been provided with an SMTC configuration for the SCell in SCell addition message, otherwise T_{rs} is the SMTC configured in the measObjectNR having the same SSB frequency and subcarrier spacing. If the UE is not provided SMTC configuration or measurement object on this frequency, the requirement which involves T_{rs} is applied with T_{rs} = 5ms assuming the SSB transmission periodicity is 5ms. There is no requirements if the SSB transmission periodicity is not 5ms.

$T_{FirstSSB}$: Is the time to the end of the first complete SSB burst indicated by the SMTC, or within 5ms if SMTC is not configured, after n + $\frac{T_{HARQ}+3ms}{NR\ slot\ length}$.

$T_{FirstSSB_MAX}$: Is the time to the end of the first complete SSB burst indicated by the SMTC, or within 5ms if SMTC is not configured, after slot n + $\frac{T_{HARQ}+3ms}{NR\ slot\ length}$, further fulfilling:

- In FR1, in case of intra-band SCell activation, the occasion when all active serving cells and SCells being activated or released are transmitting SSB bursts in the same slot; in case of inter-band SCell activation, the first occasion when the SCell being activated is transmitting SSB burst.

- In FR2, the occasion when all active serving cells and SCells being activated or released are transmitting SSB bursts in the same slot.

$T_{FineTiming}$ is the time period between UE finish processing the last activation command for PDCCH TCI, PDSCH TCI (when applicable) and the timing of first complete available SSB corresponding to the TCI state

$T_{L1\text{-}RSRP,\ measure}$ is L1-RSRP measurement delay $T_{L1\text{-}RSRP_Measurement_Period_SSB}$ ms or $T_{L1\text{-}RSRP_Measurement_Period_CSI\text{-}RS}$ based on applicability as defined in TS 38.133 [6] clause 9.5 assuming M=1.

$T_{L1\text{-}RSRP,report}$ is delay of acquiring CSI reporting resources.

$T_{uncertainty_MAC}$ is the time period between reception of the last activation command for PDCCH TCI, PDSCH TCI (when applicable) relative to

- SCell activation command for known case;

- First valid L1-RSRP reporting for unknown case.

$T_{uncertainty_SP}$ is the time period between reception of the activation command for semi-persistent CSI-RS resource set for CQI reporting relative to

- SCell activation command for known case;

- First valid L1-RSRP reporting for unknown case.

$T_{uncertainty_RRC}$ is the time period between reception of the RRC configuration message for TCI of periodic CSI-RS for CQI reporting (when applicable) relative to

- SCell activation command for known case;
- First valid L1-RSRP reporting for unknown case.

T_{RRC_delay} is the RRC procedure delay as specified in [13].

Longer delays for RRM measurement requirements, and in case of FR2 also SSB based RLM/BFD/CBD/L1-RSRP measurement requirements, can be expected during the cell detection time for unknown SCell activation.

When *absoluteFrequencySSB* is not configured in *DownlinkConfigCommon* for target SCell but SMTC for target SCell is configured, no requirement would be applied.$T_{CSI_reporting}$ is the delay (in ms) including uncertainty in acquiring the first available downlink CSI reference resource, UE processing time for CSI reporting and uncertainty in acquiring the first available CSI reporting resources as specified in TS 38.331 [13].

SCell in FR1 is known if it has been meeting the following conditions:

- During the period equal to max(5 measCycleSCell, 5 DRX cycles) for FR1 before the reception of the SCell activation command:
  - the UE has sent a valid measurement report for the SCell being activated and
  - the SSB measured remains detectable according to the cell identification conditions specified in TS 38.133 [6] section 9.2 and 9.3.
- the SSB measured during the period equal to max(5 measCycleSCell, 5 DRX cycles) also remains detectable during the SCell activation delay according to the cell identification conditions specified in TS 38.133 [6] section 9.2 and 9.3.

Otherwise SCell in FR1 is unknown.

The requirements for FR1 unknown SCell activation specified in this clause apply when one of the following conditions is met

- ‘ssb-PositionInBurst' indicates only one SSB is being actually transmitted, or
- ‘ssb-PositionInBurst' indicates multiple SSBs and TCI indication is provided in same MAC PDU with SCell activation.

For the first SCell activation in FR2 bands, the SCell is known if it has been meeting the following conditions:

- During the period equal to 4s for UE supporting power class1 and 3s for UE supporting power class 2/3/4 before UE receives the last activation command for PDCCH TCI, PDSCH TCI (when applicable) and semi-persistent CSI-RS for CQI reporting (when applicable):
  - the UE has sent a valid L3-RSRP measurement report with SSB index
  - SCell activation command is received after L3-RSRP reporting and no later than the time when UE receives MAC-CE command for TCI activation
- During the period from L3-RSRP reporting to the valid CQI reporting, the reported SSBs with indexes remain detectable according to the cell identification conditions specified in TS 38.133 [6] clause 9.2 and 9.3, and the TCI state is selected based on one of the latest reported SSB indexes.

Otherwise, the first SCell in FR2 band is unknown. The requirement for unknown SCell applies provided that the activation commands for PDCCH TCI, PDSCH TCI (when applicable), semi-persistent CSI-RS for CQI reporting (when applicable), and configuration message for TCI of periodic CSI-RS for CQI reporting (when applicable) are based on the latest valid L1-RSRP reporting.

If the UE has been provided with higher layer in TS 38.331 [13] signalling of *smtc2* prior to the activation command, T_{SMTC_Scell} follows *smtc1* or *smtc2* according to the physical cell ID of the target cell being activated. T_{SMTC_MAX} follows *smtc1* or *smtc2* according to the physical cell IDs of the target cells being activated and the active serving cells.

In addition to CSI reporting defined above, UE shall also apply other actions related to the activation command specified in [13] for a SCell at the first opportunities for the corresponding actions once the SCell is activated.

The starting point of an interruption window on spCell or any activated SCell, as specified in TS 38.133[6] clause 8.2, shall not occur before slot n+1+$\frac{T_{HARQ}}{NR\ slot\ length}$ and not occur after slot slot n+1+$\frac{T_{HARQ}+3ms+T_X}{NR\ slot\ length}$, where NR slot length is with respect to the numerology used in the SCell being activated, and T_X is:

- $T_{FirstSSB}$, for any scenario where $T_{activation_time}$ includes $T_{FirstSSB}$;
- $T_{FirstSSB_MAX}$, for any scenario where $T_{activation_time}$ includes $T_{FirstSSB_MAX}$;
- $T_{uncertainty_MAC}$ +$T_{FineTiming}$, for any scenario where $T_{activation_time}$ includes $T_{FineTiming}$.

The length of the interruption window may be different for different victim cells, and depends on the applicable scenario and on the frequency band relation between the aggressor cell and the victim cell.

The requirements in this clause and requriements on interruption due to SCell activation in clause 8.2 apply provided that the SSB of the to-be-activated SCell is within the first active DL BWP of the SCell.Starting from the slot specified in clause 4.3 of TS 38.213 [8] (timing for secondary Cell activation/deactivation) and until the UE has completed the SCell activation, the UE shall report out of range if the UE has available uplink resources to report CQI for the SCell.

Starting from the slot specified in clause 4.3 of TS 38.213 [8] (timing for secondary Cell activation/deactivation) and until the UE has completed a first L1-RSRP measurement, the UE shall report lowest valid L1 SS-RSRP range if the UE has available uplink resources to report L1-RSRP for the SCell.

Upon receiving SCell deactivation command or upon expiry of the *sCellDeactivationTimer* in slot *n*, the UE shall accomplish the deactivation actions for the SCell being deactivated no later than in slot $n + \frac{T_{HARQ}+3ms}{NR\ slot\ length}$.

The starting point of an interruption on SpCell or any activated SCell in the same cell group as SCell being deactivated for NR standalone, EN-DC, NE-DC or NR-DC mode specified in clause 8.2 shall not occur before slot n+1+$\frac{T_{HARQ}}{NR\ slot\ length}$ and not occur after slot n+1+$\frac{T_{HARQ}+3ms}{NR\ slot\ length}$. where NR slot length is with respect to the numerology used in the SCell being deactivated.

Upon expiry of the *sCellDeactivationTimer* in slot *n*, the UE shall accomplish the deactivation actions for the SCell being deactivated no later than in slot $n + \frac{3ms}{NR\ slot\ length}$. The starting point of an interruption window on spCell or any activated SCell, as specified in TS 38.133 [6] clause 8.2, shall not occur before slot n+1 and not occur after slot n+1+ $\frac{3ms}{NR\ slot\ length}$, where NR slot length is with respect to the numerology used in the SCell being deactivated.

The length of the interruption window may be different for different victim cells, and depends on the applicable scenario and on the frequency band relation between the aggressor cell and the victim cell.

The normative reference for this requirement is TS 38.133 [6] clause 8.3.

4.5.3.1 EN-DC FR1 SCell activation and deactivation of known SCell in non-DRX for 160ms SCell measurement cycle

Editor's Note: TT analysis for test configuration with SpCC SCS = 15kHz + SCC SCS = 30kHz or SpCC SCS = 30kHz + SCC SCS = 15kHz are still missing.

4.5.3.1.1 Test purpose

This test is to verify that the SCell activation and deactivation times are within the requirements, when the SCell in FR1 is known by the UE at the time of activation.

4.5.3.1.2 Test applicability

This test applies to all types of NR UE supporting E-UTRA and EN-DC from Release 15 onwards and supporting 2DL CA in NR.

4.5.3.1.3 Minimum conformance requirements

The minimum conformance requirements are defined in clause 4.5.3.0.1.

The normative reference for this requirement is TS 38.133 [6] clause A.4.5.3.1.

4.5.3.1.4 Test description

4.5.3.1.4.1 Initial conditions

This test shall be tested using any of the test configurations in this clause. The supported test configurations for LTE PCell and NR PSCell are shown in Table 4.5.3.1.4.1-1. Supported test configurations for NR SCell are shown in table Table 4.5.3.1.4.1-1A below. Test configuration for LTE PCell and NR PSCell and test configuration for NR SCell are chosen independently.

Table 4.5.3.1.4.1-1: supported test configurations for LTE PCell and NR PSCell

Config	Description
4.5.3.1-1	LTE FDD, NR 15 kHz SSB SCS, ≥10MHz bandwidth, FDD duplex mode
4.5.3.1-2	LTE FDD, NR 15 kHz SSB SCS, ≥10MHz bandwidth, TDD duplex mode
4.5.3.1-3	LTE FDD, NR 30 kHz SSB SCS, ≥40MHz bandwidth, TDD duplex mode
4.5.3.1-4	LTE TDD, NR 15 kHz SSB SCS, ≥10MHz bandwidth, FDD duplex mode
4.5.3.1-5	LTE TDD, NR 15 kHz SSB SCS, ≥10MHz bandwidth, TDD duplex mode
4.5.3.1-6	LTE TDD, NR 30 kHz SSB SCS, ≥40MHz bandwidth, TDD duplex mode
Note 1: The UE is only required to be tested in one of the supported test configurations Note 2: The UE is only required to be tested in one with smallest aggregated channel bandwidth from supported band combinations which is composed of CCs ≥ the bandwidth ($BW_{channel}$) defined in each test configuration.	

Table 4.5.3.1.4.1-1A: supported test configurations for NR SCell

$Config_{SCell}$	Description
1	NR 15 kHz SSB SCS, ≥10 MHz bandwidth, FDD duplex mode
2	NR 15 kHz SSB SCS, ≥10 MHz bandwidth, TDD duplex mode
3	NR 30 kHz SSB SCS, ≥40 MHz bandwidth, TDD duplex mode
Note 1: The UE is only required to be tested in one of the supported test configurations Note 2: The UE is only required to be tested in one with smallest aggregated channel bandwidth from supported band combinations which is composed of CCs ≥ the bandwidth ($BW_{channel}$) defined in each test configuration,	

Configure the test equipment and the DUT according to the parameters in Table 4.5.3.1.4.1-2 and Table 4.5.3.1.4.1-3.

Table 4.5.3.1.4.1-2: Initial conditions for known FR1 SCell activation case

Parameter	Value		Comment
Test environment	NC		As specified in TS 38.508-1 [14] clause 4.1.
Test frequencies	As specified in Annex E, Table E.1-1 and TS 38.508-1 [14] clause 4.3.1.		
Channel bandwidth	As specified by the test configuration selected from Table 4.5.3.1.5-1		
Propagation conditions	AWGN		As specified in clause C.2.2.
Connection Diagram	TE Part	A.3.1.7.1	As specified in TS 38.508-1 [14] Annex A.
	DUT Part	A.3.2.3.1	
Exceptions to connection diagram	N/A		

Table 4.5.3.1.4.1-3: General test parameters for known FR1 SCell activation case, 160ms SCell measurement cycle

Parameter	Unit	Value	Comment
RF Channel Number		1,2,3	One E-UTRAN radio channel (1) and two NR radio channel (2,3) are used for this test
Active PCell		Cell 1	Primary cell on E-UTRAN RF channel number 1. As specified in section A.3.7.2.1 of TS38.133 [6]
Active PSCell		Cell 2	Primary secondary cell on NR RF channel number 2.
Configured deactivated SCell		Cell 3	Configured deactivated secondary cell on NR RF channel number 3
CP length		Normal	
DRX		OFF	Continuous monitoring of primary cell
Cell-individual offset for cells on E-UTRA RF channel number	dB	0	Individual offset for cells on primary component carrier.
Cell-individual offset for cells on NR channel number	dB	0	Individual offset for cells on secondary component carrier.
SCell measurement cycle (measCycleSCell)	ms	160	
Cell3 timing offset to cell2	µs	0	
Time alignment error between cell3 and cell2	µs	≤ Time alignment error as specified in TS 38.104 [28] clause 6.5.3.1.	The value of time alignment error depends upon the type of carrier aggregation.
T1	s	7	During this time the PSCell shall be known and the SCell configured and detected.
T2	s	1	During this time the UE shall activate the SCell.
T3	s	1	During this time the UE shall deactivate the SCell.
T_{HARQ}	ms	k_1*NR slot length	k1 is a number of slots and is indicated by the PDSCH-to-HARQ-timing-indicator field in the DCI format, if present, or provided by dl-DataToUL-ACK, the value of k should be the minimum value defined in TS 38.213 [8]
$T_{CSI_Reporting}$	ms	15	the delay (in ms) including uncertainty in acquiring the first available downlink CSI reference resource, UE processing time for CSI reporting (clause 5.2.2.5 in TS 38.214) and uncertainty in acquiring the first available CSI reporting resources as specified in TS 38.331 [13]
K	slot	$k_1+3\cdot N_{\text{slot}}^{\text{subframe},\mu}+1$	As specified in section 4.3 of TS 38.213 [8]

1. Message contents are defined in clause 4.5.3.1.4.3.
2. Cell 1 is the E-UTRA serving cell (PCell) for the EN-DC setup. The power levels and settings for Cell 1 are set according to Annex A.6. Cell 2 and Cell 3 are NR FR1 cells. Cell 2 is the PSCell and Cell 3 is the deactivated SCell.

4.5.3.1.4.2 Test procedure

The test consists of three successive time periods, with duration of T1, T2 and T3, respectively. There are three carriers, E-UTRA has one cell, NR has two cells. All cells have constant signal levels throughout the test. Before the test starts the UE is connected to Cell 1 (PCell) on E-UTRA and Cell 2 (PSCell) on NR, but is not aware of Cell 3 (SCell) on NR. The UE is monitoring the PCell and PSCell. The UE shall be continuously scheduled in the PCell and PSCell throughout the whole test.

The point in time at which the MAC message is received at the UE antenna connector, in a slot # denoted m, defines the start of time period T2. The UE shall be able to report valid CSI in PSCell for the activated SCell at latest in slot m + $\frac{T_{\text{HARQ}}+T_{\text{activation_time}}+T_{\text{CSI_Reporting}}}{\text{NR slot length}}$. The UE shall start reporting CSI in PSCell after at least one CSI-RS transmission

occasion for channel measurement and reporting after slot (m+k) and shall report CQI index 0 (out-of-range) until the SCell activation has been completed. Any PCell or PSCell interruption due to activation of SCell shall occur in the slot $m + 1 + \frac{T_{\text{HARQ}}}{\text{NR slot length}}$ to $m + 1 + \frac{T_{\text{HARQ}+3\text{ms}+T_X}}{\text{NR slot length}} + N_{\text{interruption}}$. Any E-UTRA PCell interruption due to activation of SCell shall occur in the subframe $m_1 + 1 + \frac{T_{\text{HARQ}}}{\text{EUTRA slot length}}$ to subframe $m_2 + 1 + \frac{T_{\text{HARQ}+3\text{ms}+T_X}}{\text{EUTRA slot length}} + N_{\text{interruption}}$, where m_1 and m_2 are the index of the first and last subframe of E-UTRA PCell which overlaps with slot m, and $N_{\text{interruption}}$ is the interruption length given in TS 36.133 [23] section 7.32.

Time period T3 starts when a MAC message for deactivation of SCell, sent from the test equipment to the UE in a slot # denoted n, is received at the UE antenna connector. The UE shall carry out deactivation of the SCell in a slot n + $\frac{T_{\text{HARQ}}+3ms}{NR\ slot\ length}$. The starting point of any PSCell interruption due to the deactivation shall occur in the slot n + 1 + $\frac{T_{\text{HARQ}}}{NR\ slot\ length}$ to n + 1 + $\frac{T_{\text{HARQ}}+3\text{ms}}{NR\ slot\ length}$. The starting point of any E-UTRA PCell interruption due to the deactivation shall occur in the subframe $n_1 + 1 + \frac{T_{\text{HARQ}}}{EUTRA\ subframe\ length}$ to subframe $n_2 + 1 + \frac{T_{\text{HARQ}}+3\text{ms}}{EUTRA\ subframe\ length}$, where n_1 and n_2 are the index of the first and last subframe of E-UTRA PCell which overlaps with slot n.

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

2. Set the parameters according to T1 in Tables 4.5.3.1.5**-**1 and A.6.1.1-1. Propagation conditions are set according to Annex C clauses C.2.2.

3. T1 starts. Immediately after, the SS shall configure SCell (Cell 3) on the SCC as per TS 38.508-1 [14] clause 7.5.2, with the message content exceptions defined in clause 4.5.3.1.4.3. NR RRCReconfiguration message is contained in RRCConnectionReconfiguration and NR RRCReconfigurationComplete message is contained in RRCConnectionReconfigurationComplete.

3a. The UE send a *MeasurementReport* message embedded in *ULInformationTransferMRDC.*

4. The SS shall configure transmission of PDSCH with a maximum number of 1 HARQ transmission.

5. The SS activates SCC by sending the activation MAC-CE (Refer TS 38.321 [12], clauses 5.9, 6.1.3.10) in a slot # denoted m and T2 starts in slot m. If the SS receives ACK for MAC-CE sent by the UE, the test proceeds to step 6, otherwise go to step 9.

6. After at least one CSI-RS transmission occasion for channel measurement, the UE shall start sending CSI reports for SCell and the SS shall monitor CSI reports for SCell sent from the UE and ACK/NACK sent in PSCell according to the following criteria:

   - If the first CSI report for SCell is received by the SS no later than slot s=m + 1 + $\frac{T_{\text{HARQ}}+3\text{ms}+T_(\text{CSI_Reporting})}{NR\ slot\ length}$,

     - or slot s′=$m + 1 + \frac{T_{HARQ}+3ms+T_(CSI_Reporting)+T_X}{NR\ slot\ length} + N_{interruption} + 1$ if the slot s was subject to interruption,

     - or the next CSI report occasion if there is no CSI report occasion in slots s or s',

   - and CSI report with non-zero CQI index is received by the SS earlier than or equal to slot m + $\frac{T_{\text{HARQ}}+T_{\text{activation_time}}+T_{\text{CSI_Reporting}}}{\text{NR slot length}}$,

     - or the next available uplink resource if there are no uplink resources for reporting the valid CSI in a slot m + $\frac{T_{\text{HARQ}}+T_{\text{activation_time}}+T_{\text{CSI_Reporting}}}{\text{NR slot length}}$

   - and DTX is not observed by the SS outside the slot $m + 1 + \frac{T_{\text{HARQ}}}{\text{NR slot length}}$ to $m + 1 + \frac{T_{HARQ}+3ms+T_X}{NR\ slot\ length} + N_{interruption} + \frac{T_{HARQ}}{NR\ slot\ length}$ up to the end of T2

   - Then the number of successes for the event "Activation" is increased by one. Otherwise, count a fail for the event "Activation" and go to step 9.

7. When T2 expires, the SS deactivate SCC by sending the deactivation MAC-CE (Refer TS 38.321 [12], clauses 5.9, 6.1.3.10) in a slot # denoted n and T3 starts in slot n. If the SS receives ACK for MAC-CE sent by the UE, the test proceeds to step 8, otherwise go to step 9.

8. The UE shall stop sending CSI reports for SCell and the SS shall monitor CSI reports for SCell sent from the UE and ACK/NACK sent in PSCell during SCell deactivation.

   - If the last CSI report is received by the SS earlier than or equal to slot n + $\frac{\mathrm{T_{HARQ}}+3ms}{NR\ slot\ length}$

   - and DTX is not observed by the SS outside the slot n + 1 + $\frac{\mathrm{T_{HARQ}}}{NR\ slot\ length}$ to $n + 1 + \frac{T_{HARQ}+3ms}{NR\ slot\ length} + N_{interruption} + \frac{T_{HARQ}}{NR\ slot\ length}$ up to the end of T3,

   - Then the number of successes for the event "Deactivation" is increased by one. Otherwise, count a fail for the event "Deactivation".

9. When T3 expires, or Activation in step 5 was not acknowledged, or a fail was counted for the event "Activation" in step 6, or Deactivation in step 7 was not acknowledged, the SS shall transmit an *RRCConnectionReconfiguration* message with condition EN-DC_PSCell_Rel according to TS 36.508[25] Table 4.6.1-8 to release NR PSCell. The UE shall transmit an *RRCConnectionReconfigurationComplete* message.

10. Set Cell 3 physical cell identity = ((current cell 3 physical cell identity + 1) mod 1008) for next iteration of the test procedure loop.

11. The SS shall transmit an *RRCConnectionReconfiguration* message with condition MCG and SCG according to TS 36.508 [25] Table 4.6.1-8 to ensure the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity EN-DC, DC bearer MCG and SCG, Connected without release *On* and Test Mode *On* according to TS 38.508-1 [14] clause 4.5. The UE shall transmit an RRCConnectionReconfigurationComplete message.

12. Repeat steps 2-11 until a test verdict has been achieved.

Each of the events "Activation" and "Deactivation" is evaluated independently for the statistic, resulting in an event verdict: pass or fail. Each event is evaluated only until the confidence level according to Table G.2.3-1 in Annex G.2 is achieved. Different events may require different times for a verdict.
If all events pass, the test passes. If one event fails, the test fails.

4.5.3.1.4.3 Message contents

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

Table 4.5.3.1.4.3-1: Common Exception messages

Default Message Contents	
Common contents of system information blocks exceptions	
Default RRC messages and information elements contents exceptions	Table H.3.1-7 with Condition Deactivated SCell

Table 4.5.3.1.4.3-2: *RRCReconfiguration* in step 3: SCell addition

Derivation Path: TS 38.508-1 [14], Table 4.6.1-13 with condition EN-DC_MEAS and EN-DC_SCell_add			
Information Element	**Value/remark**	**Comment**	**Condition**
RRCReconfiguration ::= SEQUENCE {			
criticalExtensions CHOICE {			
rrcReconfiguration ::= SEQUENCE {			
secondaryCellGroup	CellGroupConfig-SCell	Table 4.5.3.1.4.3-5	
measConfig	MeasConfig	Table 4.5.3.1.4.3-2A	

}			
}			
}			

Table 4.5.3.1.4.3-2A: MeasConfig (Table 4.5.3.1.4.3-2)

Derivation path: Table H.3.1-2 with condition Deactivated SCell			
Information Element	**Value/Remark**	**Comment**	**Condition**
measConfig ::= SEQUENCE {			
measObjectToAddModList SEQUENCE (SIZE (1..maxNrofMeasId)) OF SEQUENCE {	2 entries		
measObject[2] CHOICE {			
measObjectNR	MeasObjectNR for SCell	entry 2 Table 4.5.3.1.4.3-3	
}			
}			
reportConfigToAddModList SEQUENCE (SIZE (1..maxReportConfigId)) OF ReportConfigToAddMod {	1 entry		
ReportConfigToAddMod[1] SEQUENCE {		entry 1	
reportConfigId	ReportConfigId		
reportConfig CHOICE {			
reportConfigNR	ReportConfigNR	Table 4.5.3.1.4.3-4	
}			
}			
}			
}			

Table 4.5.3.1.4.3-3: MeasObjectNR for SCell

Derivation Path: Table H.3.1-3 with condition Deactivated SCell and Synchronous cells			
Information Element	**Value/remark**	**Comment**	**Condition**
MeasObjectNR::= SEQUENCE {			
smtc1	SSB-MTC specified in TS 38.508-1 [14] Table 7.3.1-3 with condition SMTC.1		
measCycleSCell-v1530	sf160		
}			

Table 4.5.3.1.4.3-4: ReportConfigNR

Derivation Path: Table H.3.1-4			
Information Element	**Value/remark**	**Comment**	**Condition**
ReportConfigNR::= SEQUENCE {			
reportType CHOICE {			
eventTriggered SEQUENCE {			
eventId CHOICE {			
eventA3 SEQUENCE {			
a3-Offset CHOICE {			
rsrp	-30	To ensure reporting can always be triggered	
}			
}			
}			
}			
}			
}			

Table 4.5.3.1.4.3-5: CellGroupConfig-SCell (Table 4.5.3.1.4.3-2)

Derivation Path: TS 38.508-1 [14], Table 4.6.3-19 with condition MEAS and SCell_add			
Information Element	**Value/remark**	**Comment**	**Condition**

CellGroupConfig ::= SEQUENCE {			
spCellConfig SEQUENCE {			
servCellIndex	ServCellIndex of NR SpCell		
reconfigurationWithSync	Not present		
rlf-TimersAndConstants	Not present		
rlmInSyncOutOfSyncThreshold	Not present		
spCellConfigDedicated	ServingCellConfig-SpCell	Table 4.5.3.1.4.3-6	
}			
sCellToAddModList SEQUENCE (SIZE (1..maxNrofSCells)) OF SCellConfig {	1 entry		
SCellConfig[1] SEQUENCE {		entry 1	
sCellConfigDedicated	ServingCellConfig-SCell	Table 4.5.3.1.4.3-7	
smtc	SSB-MTC specified in TS 38.508-1 [14] Table 7.3.1-3 with condition SMTC.1		
}			
}			
}			

Table 4.5.3.1.4.3-6: ServingCellConfig-SpCell (Table 4.5.3.1.4.3-5)

Derivation Path: TS 38.508-1 [14], Table 4.6.3-167 with condition MEAS			
Information Element	**Value/remark**	**Comment**	**Condition**
ServingCellConfig ::= SEQUENCE {			
csi-MeasConfig	CSI-MeasConfig for RRM specified in TS 38.508-1 [14] Table 7.3.1-6		
servingCellMO	1		
}			

Table 4.5.3.1.4.3-7: ServingCellConfig-SCell (Table 4.5.3.1.4.3-5)

Derivation Path: TS 38.508-1 [14], Table 4.6.3-167 with condition No_UL			
Information Element	**Value/remark**	**Comment**	**Condition**
ServingCellConfig ::= SEQUENCE {			
csi-MeasConfig	CSI-MeasConfig for RRM specified in TS 38.508-1 [14] Table 7.3.1-6		
servingCellMO	2		
}			

4.5.3.1.5 Test requirement

Table 4.5.3.1.5-1 and Table 4.5.3.1.5-1A defines the primary level settings including test tolerances for all tests.

Table 4.5.3.1.5-1: Cell specific test parameters for for NR PSCell known FR1 SCell activation case, 160ms SCell measurement cycle

Parameter		Unit	Cell 2		
			T1	T2	T3
SSB ARFCN			freq1		
Duplex mode	Config 1,4		FDD		
	Config 2,3,5,6		TDD		
TDD configuration	Config 1,4		Not Applicable		
	Config 2,5		TDDConf.1.1		
	Config 3,6		TDDConf.2.1		
$BW_{channel}$		MHz	Note 7		
$BW_{occupied}$	Config 1,2,4,5	RB	52 Note 5		
	Config 3,6		106 Note 6		

DL initial BWP configuration			DLBWP.0.1
DL dedicated BWP configuration			DLBWP.1.1
UL initial BWP configuration			ULBWP.0.1
UL dedicated BWP configuration			ULBWP.1.1
DRX Cycle		ms	Not Applicable
PDSCH Reference measurement channel	Config 1,4		SR.1.1 FDD
	Config 2,5		SR.1.1 TDD
	Config 3,6		SR.2.1 TDD
RMSI CORESET Reference Channel	Config 1,4		CR.1.1 FDD
	Config 2,5		CR.1.1 TDD
	Config 3,6		CR.2.1 TDD
RMC CORESET Reference Channel	Config 1,4		CCR.1.1 FDD
	Config 2,5		CCR.1.1 TDD
	Config 3,6		CCR.2.1 TDD
TRS configuration	Config 1,4		TRS.1.1 FDD
	Config 2,5		TRS.1.1 TDD
	Config 3,6		TRS.1.2 TDD
OCNG Patterns	Config 1,2,4,5		OP.1 Note 5
	Config 3,6		OP.1 Note 6
SMTC configuration			SMTC.1
SSB configuration	Config 1,2,4,5		SSB.1 FR1
	Config 3,6		SSB.2 FR1
CSI-RS configuration for CSI reporting	Config 1,4		CSI-RS.1.1 FDD
	Config 2,5		CSI-RS.1.1 TDD
	Config 3,6		CSI-RS.2.1 TDD
PDSCH/PDCCH subcarrier spacing	Config 1,2,4,5	kHz	15
	Config 3,6		30
reportConfigType	Config 1-6		periodic
reportQuantity	Config 1-6		cri-RI-PMI-CQI
CSI reporting periodicity	Config 1,2,4,5	slot	5
	Config 3,6		10
CSI reporting offset	Config 1,2,4,5	slot	2
	Config 3,6		4
EPRE ratio of PSS to SSS		dB	0
EPRE ratio of PBCH DMRS to SSS			
EPRE ratio of PBCH to PBCH DMRS			
EPRE ratio of PDCCH DMRS to SSS			
EPRE ratio of PDCCH to PDCCH DMRS			
EPRE ratio of PDSCH DMRS to SSS			
EPRE ratio of PDSCH to PDSCH			
EPRE ratio of OCNG DMRS to SSS Note 1			
EPRE ratio of OCNG to OCNG DMRS Note 1			
N_{oc} Note2		dBm/15kHz	-104
N_{oc} Note2	Config 1,2,4,5	dBm/SCS	-104
	Config 3,6		-101
$\hat{E}_s / I_{ot}$		dB	17
$\hat{E}_s / N_{oc}$		dB	17
SS-RSRP Note3	Config 1,2,4,5	dBm/SCS	-87
	Config 3,6		-84
SCH_RP Note 3		dBm/15 kHz	-87
Io Note3	Config 1,2,4,5	dBm/9.36MHz	-58.96
	Config 3,6	dBm/38.16MHz	-52.87
Propagation condition		-	AWGN

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

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

NOTE 3: SS-RSRP, Io and SCH_RP levels have been derived from other parameters for information purposes. They are not settable parameters themselves.
NOTE 4: The uplink resources for CSI reporting are assigned to the UE prior to the start of time period T2.]
NOTE 5: All UL/DL transmission shall be confined within $BW_{occupied}$ (i.e. 10 MHz, 52 RBs) from $F_{C,low}$, and Io is independent of the $BW_{channel}$ configured.
NOTE 6: All UL/DL transmission shall be confined within $BW_{occupied}$ (i.e. 40 MHz, 106 RBs) from $F_{C,low}$, and Io is independent of the $BW_{channel}$ configured.
NOTE 7: $N_{RB,c}$. is derived from Table 5.3.2-1 in TS38.101-1[2] with configured $BW_{channel}$.

Table 4.5.3.1.5-1A: Cell specific test parameters for NR SCell for known FR1 SCell activation case, 160ms SCell measurement cycle

Parameter		Unit	Cell 3		
			T1	T2	T3
SSB ARFCN			freq2		
Duplex mode	$Config_{SCell}$ 1		FDD		
	$Config_{SCell}$ 2,3		TDD		
TDD configuration	$Config_{SCell}$ 1		Not Applicable		
	$Config_{SCell}$ 2		TDDConf.1.1		
	$Config_{SCell}$ 3		TDDConf.2.1		
$BW_{channel}$		MHz	Note 7		
$BW_{occupied}$	$Config_{SCell}$ 1,2	RB	52 Note 5		
	$Config_{SCell}$ 3		106 Note 6		
DL initial BWP configuration			DLBWP.0.1		
DL dedicated BWP configuration			DLBWP.1.1		
UL initial BWP configuration			ULBWP.0.1		
UL dedicated BWP configuration			ULBWP.1.1		
DRX Cycle		ms	Not Applicable		
PDSCH Reference measurement channel	$Config_{SCell}$ 1		SR.1.1 FDD		
	$Config_{SCell}$ 2		SR.1.1 TDD		
	$Config_{SCell}$ 3		SR.2.1 TDD		
RMSI CORESET Reference Channel	$Config_{SCell}$ 1		CR.1.1 FDD		
	$Config_{SCell}$ 2		CR.1.1 TDD		
	$Config_{SCell}$ 3		CR.2.1 TDD		
RMC CORESET Reference Channel	$Config_{SCell}$ 1		CCR.1.1 FDD		
	$Config_{SCell}$ 2		CCR.1.1 TDD		
	$Config_{SCell}$ 3		CCR.2.1 TDD		
TRS configuration	$Config_{SCell}$ 1		TRS.1.1 FDD		
	$Config_{SCell}$ 2		TRS.1.1 TDD		
	$Config_{SCell}$ 3		TRS.1.2 TDD		
OCNG Patterns	$Config_{SCell}$ 1,2		OP.1 Note 5		
	$Config_{SCell}$ 3		OP.1 Note 6		
SMTC configuration			SMTC.1		
SSB configuration	$Config_{SCell}$ 1,2		SSB.1 FR1		
	$Config_{SCell}$ 3		SSB.2 FR1		
CSI-RS configuration for CSI reporting	$Config_{SCell}$ 1		CSI-RS.1.1 FDD		
	$Config_{SCell}$ 2		CSI-RS.1.1 TDD		
	$Config_{SCell}$ 3		CSI-RS.2.1 TDD		
PDSCH/PDCCH subcarrier spacing	$Config_{SCell}$ 1,2	kHz	15		
	$Config_{SCell}$ 3		30		
reportConfigType			N/A		
reportQuantity			N/A		
CSI reporting periodicity		slot	N/A		
CSI reporting offset		slot	N/A		
EPRE ratio of PSS to SSS		dB	0		
EPRE ratio of PBCH DMRS to SSS					
EPRE ratio of PBCH to PBCH DMRS					
EPRE ratio of PDCCH DMRS to SSS					
EPRE ratio of PDCCH to PDCCH DMRS					
EPRE ratio of PDSCH DMRS to SSS					

EPRE ratio of PDSCH to PDSCH EPRE ratio of OCNG DMRS to SSS Note1 EPRE ratio of OCNG to OCNG DMRS Note 1			
N_{oc} Note2		dBm/15kHz	-104
N_{oc} Note2	Config$_{SCell}$ 1,2	dBm/SCS	-104
	Config$_{SCell}$ 3		-101
$\hat{E}_s / I_{ot}$		dB	17
$\hat{E}_s / N_{oc}$		dB	17
SS-RSRP Note3	Config$_{SCell}$ 1,2	dBm/SCS	-87
	Config$_{SCell}$ 3		-84
SCH_RP Note 3		dBm/15 kHz	-87
Io Note3	Config$_{SCell}$ 1,2	dBm/9.36MHz	-58.96
	Config$_{SCell}$ 3	dBm/38.16MHz	-52.87
Propagation condition		-	AWGN

NOTE 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.
NOTE 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for N_{oc} to be fulfilled within $BW_{occupied}$.
NOTE 3: SS-RSRP, Io and SCH_RP levels have been derived from other parameters for information purposes. They are not settable parameters themselves.
NOTE 4: The uplink resources for CSI reporting are assigned to the UE prior to the start of time period T2.]
NOTE 5: All UL/DL transmission shall be confined within $BW_{occupied}$ (i.e. 10 MHz, 52 RBs) from $F_{C,low}$, and Io is independent of the $BW_{channel}$ configured.
NOTE 6: All UL/DL transmission shall be confined within $BW_{occupied}$ (i.e. 40 MHz, 106 RBs) from $F_{C,low}$, and Io is independent of the $BW_{channel}$ configured.
NOTE 7: $N_{RB,c}$. is derived from Table 5.3.2-1 in TS38.101-1[2] with configured $BW_{channel}$.

During T2 the UE shall send the first CSI report for SCell no later than the first available uplink resource after at least one CSI-RS transmission occasion for channel measurement and reporting after slot m + $\frac{T_{\text{HARQ}}+3ms}{\text{NR slot length}}$. UE is allowed to postpone CSI report to next available UL resource if an available uplink resource is subject to interruption. Whether CSI report in slot m + 1 + $\frac{T_{\text{HARQ}}+3ms+T_{\text{CSI_Reporting}}}{\text{NR slot length}}$ was interrupted or not is checked by monitoring ACK/NACK sent in PCell in slot m + 1 + $\frac{T_{\text{HARQ}}+3ms+T_{\text{CSI_Reporting}}}{\text{NR slot length}}$.

During T2 the UE shall start sending CSI reports for SCell with non-zero CQI index at latest in a slot m + $\frac{T_{\text{HARQ}}+T_{\text{activtion_time}}+T_{\text{CSI_Reporting}}}{NR\ slot\ length}$, $T_{\text{activation_time}} = T_{\text{FirstSSB}}$ + 5ms, as defined in TS 38.133 [6] section 8.3.

Figures 4.5.3.1.5-1 shows the deriviation of the Test procedure requreiment for DTX during T2, based on the core requirements for interruption.

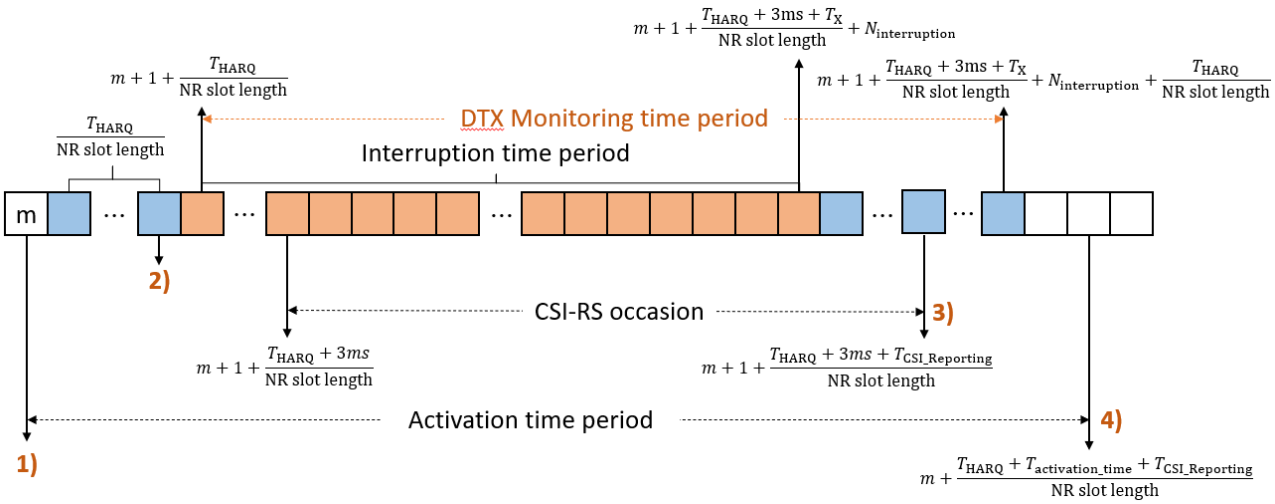


Figure 4.5.3.1.5-1: Procedure derivation for Activation

1) Activation command for SCell
2) ACK for MAC-CE for SCell1 activation
3) First CSI report timing (could be invalid CQI)
4) First non-zero CSI report transmission

During T3 the UE shall stop sending CSI reports for SCell at latest in a slot n + $\frac{T_{HARQ}+3ms}{NR\ slot\ length}$, as defined in TS 38.133 [6] section 8.3.

During T2 interruption of PSCell during SCell activation shall not happen outside the slot $m + 1 + \frac{T_{HARQ}}{\text{NR slot length}}$ to $m + 1 + \frac{T_{HARQ}+3ms+T_X}{\text{NR slot length}} + N_{interruption}$, and interruption of E-UTRA PCell during SCell activation shall not happen outside the subframe $m_1 + 1 + \frac{T_{HARQ}}{\text{EUTRA slot length}}$ to subframe $m_2 + 1 + \frac{T_{HARQ}+3ms+T_X}{\text{EUTRA slot length}} + N_{interruption}$, as defined in TS 38.133 [6] section 8.3.

During T3 the starting point of interruption of PSCell during SCell deactivation shall not happen outside the slot n + $1 + \frac{T_{HARQ}}{NR\ slot\ length}$ to n + $1 + \frac{T_{HARQ}+3ms}{NR\ slot\ length}$, as defined in TS 38.133 [6] section 8.3, and the starting point of interruption of E-UTRA PCell during SCell deactivation shall not happen outside the subframe $n_1 + 1 + \frac{T_{HARQ}}{EUTRA\ subframe\ length}$ to subframe $n_2 + 1 + \frac{T_{HARQ}+3ms}{EUTRA\ subframe\ length}$.

Figures 4.5.3.1.5-2 shows the deriviation of the Test procedure requreiment for NR PSCell DTX during T3, based on the core requirements for interruption.

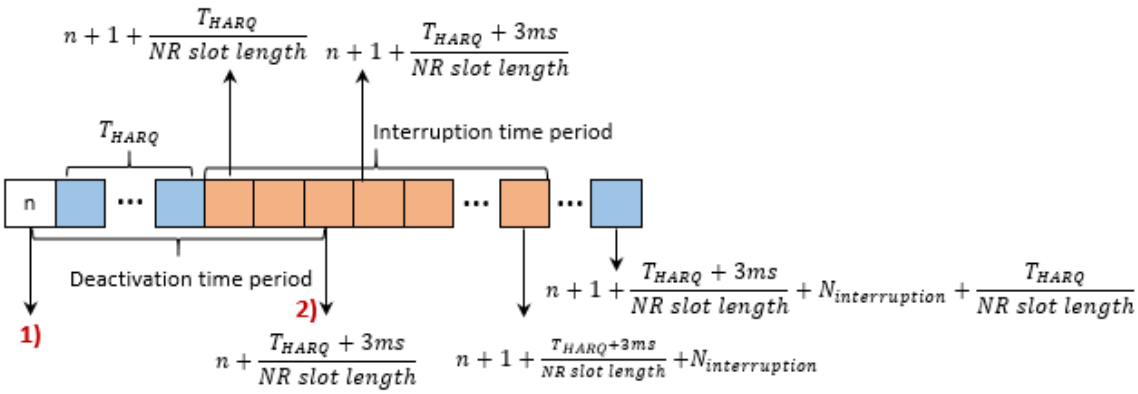


Figure 4.5.3.1.5-2: Procedure derivation for Deactivation

1) Deactivation command for SCell

2) Latest slot stop sending CSI reports for Scell

The interruption of PSCell shall not be more than the values specified for EN-DC in TS 38.133 [6] clause 8.2.1.2.4.

All of the above test requirements shall be fulfilled in order for the observed SCell activation delay and SCell deactivation delay to be counted as correct. The rate of correct observed SCell activation delay and SCell deactivation delay during repeated tests shall be at least 90 %.

NOTE: During T2 if there are no uplink resources for reporting the valid CSI in a slot m + $\frac{T_{HARQ}+T_{activtion_time}+T_{CSI_Reporting}}{NR\ slot\ length}$ as defined in TS 38.133 [6] section 8.3 then the UE shall use the next available uplink resource for reporting the corresponding valid CSI.

4.5.3.2 EN-DC FR1 SCell activation and deactivation of known SCell in non-DRX for 640ms SCell measurement cycle

Editor's Note: TT analysis for test configuration with SpCC SCS = 15kHz + SCC SCS = 30kHz or SpCC SCS = 30kHz + SCC SCS = 15kHz are still missing.

4.5.3.2.1 Test purpose

This test is to verify that the SCell activation and deactivation times are within the requirements, when the SCell in FR1 is known by the UE at the time of activation.

4.5.3.2.2 Test applicability

This test applies to all types of NR UE supporting E-UTRA and EN-DC from Release 15 onwards and supporting 2DL CA in NR.

4.5.3.2.3 Minimum conformance requirements

The minimum conformance requirements are defined in clause 4.5.3.0.1.

The normative reference for this requirement is TS 38.133 [6] clause A.4.5.3.2.

4.5.3.2.4 Test description

4.5.3.2.4.1 Initial conditions

Same initial conditions as described in section 4.5.3.1.4.1 with following exception:

- The listed parameter values in Tables 4.5.3.2.4.1-2 will replace the values of corresponding parameters in Tables 4.5.3.1.4.1-3.

Table 4.5.3.2.4.1-1: Void

Table 4.5.3.2.4.1-2: General test parameters for known FR1 SCell activation case, 640ms SCell measurement cycle

Parameter	Unit	Value	Comment
SCell measurement cycle (measCycleSCell)	ms	640	

4.5.3.2.4.2 Test procedure

Same test procedure as described in section 4.5.3.1.4.2:

4.5.3.2.4.3 Message contents

Same message contents as described in section 4.5.3.1.4.3 with following exception:

- Table 4.5.3.1.4.3-3 is replaced by Table 4.5.3.2.4.3-1.

Table 4.5.3.2.4.3-1: MeasObjectNR for SCell

Derivation Path: Table H.3.1-3 with condition Deactivated SCell and Synchronous cells			
Information Element	**Value/remark**	**Comment**	**Condition**
MeasObjectNR::= SEQUENCE {			
smtc1	SSB-MTC specified in TS 38.508-1 [14] Table 7.3.1-3 with condition SMTC.1		
}			

4.5.3.2.5 Test requirement

Same test requirement as described in section 4.5.3.1.5, except $T_{activation_time}$ will be replaced with the value $T_{FirstSSB_MAX} + T_{rs} + 5ms$.

4.5.3.3 EN-DC FR1 SCell activation and deactivation of unknown SCell in non-DRX

Editor's Note: TT analysis for test configuration with SpCC SCS = 15kHz + SCC SCS = 30kHz or SpCC SCS = 30kHz + SCC SCS = 15kHz are still missing.

4.5.3.3.1 Test purpose

This test is to verify that the SCell activation and deactivation times are within the requirements, when the SCell in FR1 is unknown by the UE at the time of activation.

4.5.3.3.2 Test applicability

This test applies to all types of NR UE supporting E-UTRA and EN-DC from Release 15 onwards and supporting 2DL CA in NR.

4.5.3.3.3 Minimum conformance requirements

The minimum conformance requirements are defined in clause 4.5.3.0.1.

The normative reference for this requirement is TS 38.133 [6] clause A.4.5.3.3.

4.5.3.3.4 Test description

4.5.3.3.4.1 Initial conditions

Same initial conditions as described in section 4.5.3.1.4.1 with following exception:

- The listed parameter values in Tables 4.5.3.3.4.1-2 will replace the values of corresponding parameters in Tables 4.5.3.1.4.1-3.

Table 4.5.3.3.4.1-1: Void

Table 4.5.3.3.4.1-2: General test parameters for unknown FR1 SCell activation case, 160ms SCell measurement cycle

Parameter	Unit	Value	Comment
T1	ms	100	During this time the PSCell shall be known and the SCell configured, but not detected.

4.5.3.3.4.2 Test procedure

Same test procedure as described in section 4.5.3.1.4.2, except step 3and step 5 are replaced by following steps:

3. T1 starts. Immediately after, the SS shall configure SCell (Cell 3) on the SCC as per TS 38.508-1 [14] clause 7.5.2, with the message content exceptions defined in clause 4.5.3.1.4.3. NR RRCReconfiguration message is contained in RRCConnectionReconfiguration and NR RRCReconfigurationComplete message is contained in RRCConnectionReconfigurationComplete. The SCell (Cell 3) shall be powered OFF till T2 starts.

5. The SS activates SCC by sending the activation MAC-CE (Refer TS 38.321 [12], clauses 5.9, 6.1.3.10) in a slot # denoted m, power ON the SCell (Cell3), T2 starts in slot m. If the SS receives ACK for MAC-CE sent by the UE, the test proceeds to step 6, otherwise go to step 9.

and:

- Step 3a is removed.

4.5.3.3.4.3 Message contents

Message contents are according to TS 38.508-1 [14] clause 7.3 with condition SCELL_CSI_ON_SPCELL with the following exceptions:

Table 4.5.3.3.4.3-1: *RRCReconfiguration* in step 3: SCell addition

Derivation Path: TS 38.508-1 [14], Table 4.6.1-13 with condition EN-DC_SCell_add			
Information Element	**Value/remark**	**Comment**	**Condition**
RRCReconfiguration ::= SEQUENCE {			
criticalExtensions CHOICE {			
rrcReconfiguration ::= SEQUENCE {			
secondaryCellGroup	CellGroupConfig	Table 4.5.3.3.4.3-2	
}			
}			
}			

Table 4.5.3.3.4.3-2: CellGroupConfig (Table 4.5.3.3.4.3-1)

Derivation Path: TS 38.508-1 [14], Table 4.6.3-19 with condition SCell_add			
Information Element	**Value/remark**	**Comment**	**Condition**
CellGroupConfig ::= SEQUENCE {			
spCellConfig SEQUENCE {			
servCellIndex	ServCellIndex of NR SpCell		
spCellConfigDedicated	ServingCellConfig-SpCell	Table 4.5.3.3.4.3-3	
}			
sCellToAddModList SEQUENCE (SIZE (1..maxNrofSCells)) OF SCellConfig {	1 entry		

SCellConfig[1] SEQUENCE {		entry 1	
sCellConfigDedicated	ServingCellConfig-SCell	Table 4.5.3.3.4.3-4	
smtc	SSB-MTC specified in TS 38.508-1 [14] Table 7.3.1-3 with condition SMTC.1		
}			
}			
}			

Table 4.5.3.3.4.3-3: ServingCellConfig-SpCell (Table 4.5.3.3.4.3-2)

Derivation Path: TS 38.508-1 [14], Table 4.6.3-167			
Information Element	**Value/remark**	**Comment**	**Condition**
ServingCellConfig ::= SEQUENCE {			
csi-MeasConfig	CSI-MeasConfig for RRM specified in TS 38.508-1 [14] Table 7.3.1-6		
}			

Table 4.5.3.3.4.3-4: ServingCellConfig-SCell (Table 4.5.3.3.4.3-2)

Derivation Path: TS 38.508-1 [14], Table 4.6.3-167 with condition No_UL			
Information Element	**Value/remark**	**Comment**	**Condition**
ServingCellConfig ::= SEQUENCE {			
csi-MeasConfig	CSI-MeasConfig for RRM specified in TS 38.508-1 [14] Table 7.3.1-6		
}			

4.5.3.3.5 Test requirement

Same test requirement as described in section 4.5.3.1.5, except $T_{activation_time}$ will be replaced with the value $T_{FirstSSB_MAX}$ + T_{SMTC_MAX} + 2*T_{rs} + 5ms

4.5.3.5 Direct SCell activation at SCell addition of known SCell in FR1

Editor's note: This test case is incomplete. The following aspects are missing:

- Test Tolerances and measurement uncertainty are missing

- CSI-RS configurations are missing

4.5.3.5.1 Test purpose

The purpose of this test is to verify that the direct SCell activation time is within the requirements, when the SCell in FR1 is known by the UE at the time of activation.

4.5.3.5.2 Test applicability

This test applies to all types of NR UE supporting E-UTRA and EN-DC from Release 15 onwards and supporting 2DL CA in NR.

4.5.3.5.3 Minimum conformance requirements

The minimum conformance requirements are defined in clause 4.5.3.0.1.

The normative reference for this requirement is TS 38.133 [6] clause A.4.5.3.5.

4.5.3.5.4 Test description

4.5.3.5.4.1 Initial conditions

This test shall be tested using any of the test configurations in this clause. The supported test configurations for LTE PCell and NR PSCell are shown in Table 4.5.3.5.4.1-1. Supported test configurations for NR SCell are shown in Table 4.5.3.5.4.1-1A below. Test configuration for LTE PCell and NR PSCell and test configuration for NR SCell are chosen independently.

Table 4.5.3.5.4.1-1: known FR1 direct SCell activation supported test configurations for LTE PCell and NR PSCell

Config	Description
4.5.3.5-1	LTE FDD, NR 15 kHz SSB SCS, ≥10 MHz bandwidth, FDD duplex mode
4.5.3.5-2	LTE FDD, NR 15 kHz SSB SCS, ≥10 MHz bandwidth, TDD duplex mode
4.5.3.5-3	LTE FDD, NR 30 kHz SSB SCS, ≥40 MHz bandwidth, TDD duplex mode
4.5.3.5-4	LTE TDD, NR 15 kHz SSB SCS, ≥10 MHz bandwidth, FDD duplex mode
4.5.3.5-5	LTE TDD, NR 15 kHz SSB SCS, ≥10 MHz bandwidth, TDD duplex mode
4.5.3.5-6	LTE TDD, NR 30 kHz SSB SCS, ≥40 MHz bandwidth, TDD duplex mode
Note 1: The UE is only required to be tested in one of the supported test configurations Note 2: The UE is only required to be tested in one with smallest aggregated channel bandwidth from supported band combinations which is composed of CCs ≥ the bandwidth ($BW_{channel}$) defined in each test configuration.	

Table 4.5.3.5.4.1-1A: supported test configurations for NR SCell

$Config_{SCell}$	Description
1	NR 15 kHz SSB SCS, ≥10 MHz bandwidth, FDD duplex mode
2	NR 15 kHz SSB SCS, ≥10 MHz bandwidth, TDD duplex mode
3	NR 30 kHz SSB SCS, ≥40 MHz bandwidth, TDD duplex mode
Note 1: The UE is only required to be tested in one of the supported test configurations Note 2: The UE is only required to be tested in one with smallest aggregated channel bandwidth from supported band combinations which is composed of CCs ≥ the bandwidth ($BW_{channel}$) defined in each test configuration,	

Configure the test equipment and the DUT according to the parameters in Table 4.5.3.5.4.1-2 and Table 4.5.3.5.4.1-3.

Table 4.5.3.5.4.1-2: Initial conditions for known FR1 SCell activation case

Parameter	Value		Comment
Test environment	NC		As specified in TS 38.508-1 [14] clause 4.1.
Test frequencies	As specified in Annex E, Table E.1-1 and TS 38.508-1 [14] clause 4.3.1.		
Channel bandwidth	As specified by the test configuration selected from Table 4.5.3.5.5-1		
Propagation conditions	AWGN		As specified in clause C.2.2.
Connection Diagram	TE Part	A.3.1.7.1	As specified in TS 38.508-1 [14] Annex A.
	DUT Part	A.3.2.3.1	
Exceptions to connection diagram	N/A		

Table 4.5.3.5.4.1-3: General test parameters for known FR1 direct SCell activation

Parameter	Unit	Value	Comment
RF Channel Number		1,2,3	One E-UTRAN radio channel (1) and two NR radio channel (2,3) are used for this test
Active PCell		Cell 1	Primary cell on E-UTRAN RF channel number 1. As specified in clause A.3.7.2.1

Active PSCell		Cell 2	Primary secondary cell on NR RF channel number 2.
SCell		Cell 3	Secondary cell on NR RF channel number 3
CP length		Normal	
DRX		OFF	Continuous monitoring of primary cell
CQI/PMI periodicity and offset configuration index		0	CQI reporting for SCell every four slots.
Cell-individual offset for cells on E-UTRA RF channel number	dB	0	Individual offset for cells on primary component carrier.
Cell-individual offset for cells on NR channel number	dB	0	Individual offset for cells on secondary component carrier.
SCell measurement cycle (measCycleSCell)	ms	160	
Cell3 timing offset to cell2	µs	0	
Time alignment error between cell3 and cell2	µs	≤ Time alignment error as specified in TS 38.104 [13] clause 6.5.3.1.	The value of time alignment error depends upon the type of carrier aggregation.
T1	s	7	During this time the Cell 3 shall be known.
T2	s	1	During this time the UE shall activate the SCell.
T_{HARQ}	ms	k_1×NR slot length	k_1 is a number of slots indicated by the PDSCH-to-HARQ_feedback timing indicator field in a corresponding DCI format or provided by *dl-DataToUL-ACK* if the PDSCH-to-HARQ feedback timing field is not present in the DCI format, the value is defined in 38.213 [3]
$T_{CSI_Reporting}$	ms	2	the delay uncertainty in acquiring the first available CSI reporting resources as specified in TS 38.331 [2]
k	ms	$k_1 + 3 \cdot N_{\text{slot}}^{\text{subframe},\ \mu} + 1$	As specified in clause 4.3 of TS 38.213 [3]

1.Message contents are defined in clause 4.5.3.5.4.3.

2.Cell 1 is the E-UTRA serving cell (PCell) for the EN-DC setup. The power levels and settings for Cell 1 are set according to Annex A.6. Cell 2 and Cell 3 are NR FR1 cells. Cell 2 is the PSCell and Cell 3 is the known activated SCell.

4.5.3.5.4.2 Test procedure

The test consists of two successive time periods, with duration of T1 and T2, respectively. There are three carriers, E-UTRA has one cell, NR has two cells. All cells have constant signal levels throughout the test. Before the test starts the UE is connected to Cell 1 (PCell) on E-UTRA and Cell 2 (PSCell) on NR but is not aware of Cell 3 (SCell) on NR. The UE is monitoring the PCell and PSCell. The UE shall be continuously scheduled in the PCell and PSCell throughout the whole test.

The point in time at which the RRC message for direct SCell activation is received at the UE antenna connector, in a slot # denoted m, defines the start of time period T2. The test equipment sends the RRCConnectionReconfiguration message for the activation of the SCell within time period specified in TS 38.133 [6] clause 8.3.2 for known cell definition to ensure the configured SCell is known. The NR shall be using an *RRCConnectionReconfiguration* message with parameter *sCellState* set to *activated* for the SCell (Cell 3), which causes the SCell to become configured and activated on radio channel 3 (SCC). The UE shall be able to report valid CSI in PSCell for the activated SCell at latest in slot m + $\frac{N_{\text{direct}}}{\text{NR slot length}}$, where N_{direct} is the time taken for direct SCell activation as defined in TS 38.133 [6] clause 8.3.4. The UE shall start reporting CSI in PSCell in slot (m+k+$T_{RRC_process}$), where $T_{RRC_process}$ is the RRC procedure delay as specified in clause 11.2 of TS 36.331 [29] if the corresponding RRC message is embedded in E-UTRA RRC message, otherwise it is

the RRC procedure delay defined in clause 12 of TS 38.331 [13]. It shall report CQI index 0 (out-of-range) until the SCell activation has been completed. Any PSCell interruption due to activation of SCell shall occur in the slot $m + 1$ to slot $m + 1 + \frac{T_{RRC_Process}+T_1+T_X}{NR\ slot\ length} + N_{\text{interruption}}$, as defined in TS 38.133 [6] clause 8.3.4, where $N_{\text{interruption}}$ is the interruption length given in TS 38.133 [6] clause 8.2. Any E-UTRA PCell interruption due to activation of SCell shall occur in the subframe $m_1 + 1$ to subframe $m_2 + 1 + \frac{T_{RRC_Process}+T_1+T_X}{NR\ slot\ length} + N_{\text{interruption}}$, where m_1 and m_2 are the index of the first and last subframe of E-UTRA PCell which overlaps with slot m, Tx is the time to the end of the first complete the SSB burst as specified in TS 36.133 [6] clause 8.3.4, and $N_{\text{interruption}}$ is the interruption length given in TS 36.133 [6] clause 7.32.

1. Ensure the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity EN-DC, DC bearer MCG and SCG, Connected without release *On* and Test Mode *On* according to TS 38.508-1 [14] clause 4.5.

2. Set the parameters according to T1 in Tables 4.5.3.5.5-1 and A.6.1.1-1. Propagation conditions are set according to Annex C clauses C.2.2.

3. T1 starts. Immediately after, the SS shall configure SCell (Cell 3) on the SCC as per TS 38.508-1 [14] clause 7.5.2, with the message content exceptions defined in clause 4.5.3.5.4.3. NR RRCReconfiguration message is contained in RRCConnectionReconfiguration and NR RRCReconfigurationComplete message is contained in RRCConnectionReconfigurationComplete.

    a. The UE send a *MeasurementReport* message embedded in *ULInformationTransferMRDC.*

4. The SS shall configure transmission of PDSCH with a maximum number of 1 HARQ transmission.

5. The UE shall start reporting CSI in PSCell in slot ($m+k+T_{RRC_process}$) and shall report CQI index 0 (out-of-range) until the SCell activation has been completed, and the SS shall monitor CSI reports for SCell sent from the UE according to the following criteria:

   - If the first CSI report for SCell is received by the SS no later than slot $m + 1 + \frac{T_{HARQ}+T_1+TRRC_process+T_(CSI_Reporting)}{NR\ slot\ length}$,

     - or slot $m + 1 + \frac{T_{HARQ}+TRRC_process+T_(CSI_Reporting)+T_1+T_X}{NR\ slot\ length} + N_{interruption} + 1$ if the slot $m + 1 + \frac{T_{HARQ}+T_1+TRRC_process+T_(CSI_Reporting)}{NR\ slot\ length}$ was subject to interruption,

   - and CSI report with non-zero CQI index is received by the SS earlier than or equal to slot $m + \frac{N_{\text{direct}}}{\text{NR slot length}}$,

     - or the next available uplink resource if there are no uplink resources for reporting the valid CSI in a slot $m + \frac{N_{\text{direct}}}{\text{NR slot length}}$

   - and DTX is not observed by the SS outside the slot $m + 1 + \frac{T_{\text{HARQ}}}{\text{NR slot length}}$ to $m + 1 + \frac{T_{HARQ}+TRRC_process+T_1+T_X}{NR\ slot\ length} + N_{interruption} + \frac{T_{HARQ}}{NR\ slot\ length}$ up to the end of T2

   - Then the number of successes for the event "Activation" is increased by one. Otherwise, count a fail for the event "Activation" and go to step 6.

6. When T2 expires or a fail was counted for the event "Activation" in step 5, the SS shall transmit an *RRCConnectionReconfiguration* message with condition EN-DC_PSCell_Rel according to TS 36.508[25] Table 4.6.1-8 to release NR PSCell. The UE shall transmit an *RRCConnectionReconfigurationComplete* message.

7. Set Cell 3 physical cell identity = ((current cell 3 physical cell identity + 1) mod 1008) for next iteration of the test procedure loop.

8. The SS shall transmit an *RRCConnectionReconfiguration* message with condition MCG and SCG according to TS 36.508 [25] Table 4.6.1-8 to ensure the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity EN-DC, DC bearer MCG and SCG, Connected without release *On* and

Test Mode *On* according to TS 38.508-1 [14] clause 4.5. The UE shall transmit an *RRCConnectionReconfigurationComplete* message.

9. Repeat steps 2-8 until a test verdict has been achieved.

The event "Activation" is evaluated independently for the statistic, resulting in an event verdict: pass or fail. Each event is evaluated only until the confidence level according to Table G.2.3-1 in Annex G.2 is achieved.

4.5.3.5.4.3 Message contents

Message contents are according to TS 38.508-1 [14] clause 7.3 with the following exceptions:

Table 4.5.3.5.4.3-1: Common Exception messages

Default Message Contents	
Common contents of system information blocks exceptions	
Default RRC messages and information elements contents exceptions	Table H.3.1-7 with Condition Deactivated SCell

Table 4.5.3.5.4.3-2: *RRCReconfiguration* in step 3: SCell addition

Derivation Path: TS 38.508-1 [14], Table 4.6.1-13 with condition EN-DC_MEAS and EN-DC_SCell_add			
Information Element	**Value/remark**	**Comment**	**Condition**
RRCReconfiguration ::= SEQUENCE {			
criticalExtensions CHOICE {			
rrcReconfiguration ::= SEQUENCE {			
secondaryCellGroup	CellGroupConfig-SCell	Table 4.5.3.5.4.3-5	
measConfig	MeasConfig	Table 4.5.3.5.4.3-2A	
}			
}			
}			

Table 4.5.3.5.4.3-2A: MeasConfig (Table 4.5.3.1.4.3-2)

Derivation path: Table H.3.1-2 with condition Deactivated SCell			
Information Element	**Value/Remark**	**Comment**	**Condition**
measConfig ::= SEQUENCE {			
measObjectToAddModList SEQUENCE (SIZE (1..maxNrofMeasId)) OF SEQUENCE {	2 entries		
measObject[2] CHOICE {			
measObjectNR	MeasObjectNR for SCell	entry 2 Table 4.5.3.5.4.3-3	
}			
}			
reportConfigToAddModList SEQUENCE (SIZE (1..maxReportConfigId)) OF ReportConfigToAddMod {	1 entry		
ReportConfigToAddMod[1] SEQUENCE {		entry 1	
reportConfigId	ReportConfigId		
reportConfig CHOICE {			
reportConfigNR	ReportConfigNR	Table 4.5.3.5.4.3-4	
}			
}			
}			
}			

Table 4.5.3.5.4.3-3: MeasObjectNR for SCell

Derivation Path: Table H.3.1-3 with condition Deactivated SCell and Synchronous cells			
Information Element	**Value/remark**	**Comment**	**Condition**
MeasObjectNR::= SEQUENCE {			
smtc1	SSB-MTC specified in TS 38.508-1 [14] Table 7.3.1-3 with condition SMTC.1		
measCycleSCell-v1530	sf160		
}			

Table 4.5.3.5.4.3-4: ReportConfigNR

Derivation Path: Table H.3.1-4			
Information Element	**Value/remark**	**Comment**	**Condition**
ReportConfigNR::= SEQUENCE {			
reportType CHOICE {			
eventTriggered SEQUENCE {			
eventId CHOICE {			
eventA3 SEQUENCE {			
a3-Offset CHOICE {			
rsrp	-30	To ensure reporting can always be triggered	
}			
}			
}			
}			
}			
}			

Table 4.5.3.5.4.3-5: CellGroupConfig-SCell (Table 4.5.3.5.4.3-2)

Derivation Path: TS 38.508-1 [14], Table 4.6.3-19 with condition MEAS and SCell_add			
Information Element	**Value/remark**	**Comment**	**Condition**
CellGroupConfig ::= SEQUENCE {			
spCellConfig SEQUENCE {			
servCellIndex	ServCellIndex of NR SpCell		
reconfigurationWithSync	Not present		
rlf-TimersAndConstants	Not present		
rlmInSyncOutOfSyncThreshold	Not present		
spCellConfigDedicated	ServingCellConfig-SpCell	Table 4.5.3.5.4.3-6	
}			
sCellToAddModList SEQUENCE (SIZE (1..maxNrofSCells)) OF SCellConfig {	1 entry		
SCellConfig[1] SEQUENCE {		entry 1	
sCellConfigDedicated	ServingCellConfig-SCell	Table 4.5.3.5.4.3-7	
smtc	SSB-MTC specified in TS 38.508-1 [14] Table 7.3.1-3 with condition SMTC.1		
sCellState-r16	activated		
}			
}			
}			

Table 4.5.3.5.4.3-6: ServingCellConfig-SpCell (Table 4.5.3.5.4.3-5)

Derivation Path: TS 38.508-1 [14], Table 4.6.3-167 with condition MEAS			
Information Element	**Value/remark**	**Comment**	**Condition**

ServingCellConfig ::= SEQUENCE {			
csi-MeasConfig	CSI-MeasConfig for RRM specified in TS 38.508-1 [14] Table 7.3.1-6		
servingCellMO	1		
}			

Table 4.5.3.5.4.3-7: ServingCellConfig-SCell (Table 4.5.3.5.4.3-5)

Derivation Path: TS 38.508-1 [14], Table 4.6.3-167 with condition No_UL			
Information Element	**Value/remark**	**Comment**	**Condition**
ServingCellConfig ::= SEQUENCE {			
csi-MeasConfig	CSI-MeasConfig for RRM specified in TS 38.508-1 [14] Table 7.3.1-6		
servingCellMO	2		
}			

4.5.3.5.5 Test requirement

Table 4.5.3.5.5-1 and Table 4.5.3.5.5-1A defines the primary level settings including test tolerances for all tests.

Table 4.5.3.5.5-1: Cell specific test parameters for NR PSCell for known FR1 direct SCell activation

Parameter		**Unit**	**Cell 2**		
			T1	**T2**	**T3**
SSB ARFCN			**freq1**		
Duplex mode	Config 1,4		FDD		
	Config 2,3,5,6		TDD		
TDD configuration	Config 1,4		Not Applicable		
	Config 2,5		TDDConf.1.1		
	Config 3,6		TDDConf.2.1		
$BW_{channel}$	Config 1,4	MHz	10: $N_{RB,c}$ = 52		
	Config 2,5		10: $N_{RB,c}$ = 52		
	Config 3,6		40: $N_{RB,c}$ = 106		
DL initial BWP configuration	Config 1,2,3,4,5,6		DLBWP.0.1		
DL dedicated BWP configuration	Config 1,2,3,4,5,6		DLBWP.1.1		
UL initial BWP configuration	Config 1,2,3,4,5,6		ULBWP.0.1		
UL dedicated BWP configuration	Config 1,2,3,4,5,6		ULBWP.1.1		
DRx Cycle		ms	Not Applicable		
PDSCH Reference measurement channel	Config 1,4		SR.1.1 FDD		
	Config 2,5		SR.1.1 TDD		
	Config 3,6		SR.2.1 TDD		
RMSI CORESET Reference Channel	Config 1,4		CR.1.1 FDD		
	Config 2,5		CR.1.1 TDD		
	Config 3,6		CR.2.1 TDD		
RMC CORESET Reference Channel	Config 1,4		CCR.1.1 FDD		
	Config 2,5		CCR.1.1 TDD		
	Config 3,6		CCR.2.1 TDD		
TRS configuration	Config 1,4		TRS.1.1 FDD		
	Config 2,5		TRS.1.1 TDD		
	Config 3,6		TRS.1.2 TDD		
OCNG Patterns			OP.1		
SMTC configuration			SMTC.1		
SSB configuration	Config 1,2,4,5		SSB.1 FR1		
	Config 3,6		SSB.2 FR1		

PDSCH/PDCCH subcarrier spacing	Config 1,2,4,5	kHz	15 kHz
	Config 3,6		30kHz
EPRE ratio of PSS to SSS		dB	0
EPRE ratio of PBCH DMRS to SSS			
EPRE ratio of PBCH to PBCH DMRS			
EPRE ratio of PDCCH DMRS to SSS			
EPRE ratio of PDCCH to PDCCH DMRS			
EPRE ratio of PDSCH DMRS to SSS			
EPRE ratio of PDSCH to PDSCH			
EPRE ratio of OCNG DMRS to SSS Note 1			
EPRE ratio of OCNG to OCNG DMRS Note 1			
N_{oc} Note2		dBm/15kHz	-104
N_{oc} Note2	Config 1,2,4,5	dBm/SCS	-104
	Config 3,6		-101
$\hat{E}_s / I_{ot}$		dB	17
$\hat{E}_s / N_{oc}$		dB	17
SS-RSRP Note3	Config 1,2,4,5	dBm/SCS	-87
	Config 3,6		-84
SCH_RP Note 3		dBm/15 kHz	-87
Propagation condition		-	AWGN

Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.

Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for N_{oc} to be fulfilled.

Note 3: SS-RSRP and SCH_RP levels have been derived from other parameters for information purposes. They are not settable parameters themselves.

Note 4: The uplink resources for CSI reporting are assigned to the UE prior to the start of time period T2.

Table 4.5.3.5.5-1A: Cell specific test parameters for NR SCell for known FR1 direct SCell activation

Parameter		Unit	Cell 3		
			T1	T2	T3
SSB ARFCN			**freq2**		
Duplex mode	$Config_{SCell}$ 1		FDD		
	$Config_{SCell}$ 2,3		TDD		
TDD configuration	$Config_{SCell}$ 1		Not Applicable		
	$Config_{SCell}$ 2		TDDConf.1.1		
	$Config_{SCell}$ 3		TDDConf.2.1		
$BW_{channel}$	$Config_{SCell}$ 1	MHz	10: $N_{RB,c}$ = 52		
	$Config_{SCell}$ 2		10: $N_{RB,c}$ = 52		
	$Config_{SCell}$ 3		40: $N_{RB,c}$ = 106		
DL initial BWP configuration	$Config_{SCell}$ 1,2,3		DLBWP.0.1		
DL dedicated BWP configuration	$Config_{SCell}$ 1,2,3		DLBWP.1.1		
UL initial BWP configuration	$Config_{SCell}$ 1,2,3		ULBWP.0.1		
UL dedicated BWP configuration	$Config_{SCell}$ 1,2,3		ULBWP.1.1		
DRX Cycle		ms	Not Applicable		
PDSCH Reference measurement channel	$Config_{SCell}$ 1		SR.1.1 FDD		
	$Config_{SCell}$ 2		SR.1.1 TDD		
	$Config_{SCell}$ 3		SR.2.1 TDD		
RMSI CORESET Reference Channel	$Config_{SCell}$ 1		CR.1.1 FDD		
	$Config_{SCell}$ 2		CR.1.1 TDD		

	$Config_{SCell}$ 3		CR.2.1 TDD
RMC CORESET Reference Channel	$Config_{SCell}$ 1		CCR.1.1 FDD
	$Config_{SCell}$ 2		CCR.1.1 TDD
	$Config_{SCell}$ 3		CCR.2.1 TDD
TRS configuration	$Config_{SCell}$ 1		TRS.1.1 FDD
	$Config_{SCell}$ 2		TRS.1.1 TDD
	$Config_{SCell}$ 3		TRS.1.2 TDD
OCNG Patterns			OP.1
SMTC configuration			SMTC.1
SSB configuration	$Config_{SCell}$ 1,2		SSB.1 FR1
	$Config_{SCell}$ 3		SSB.2 FR1
PDSCH/PDCCH subcarrier spacing	$Config_{SCell}$ 1,2	kHz	15
	$Config_{SCell}$ 3		30
EPRE ratio of PSS to SSS		dB	0
EPRE ratio of PBCH DMRS to SSS			
EPRE ratio of PBCH to PBCH DMRS			
EPRE ratio of PDCCH DMRS to SSS			
EPRE ratio of PDCCH to PDCCH DMRS			
EPRE ratio of PDSCH DMRS to SSS			
EPRE ratio of PDSCH to PDSCH			
EPRE ratio of OCNG DMRS to SSS Note 1			
EPRE ratio of OCNG to OCNG DMRS Note 1			
N_{oc} Note2		dBm/15kHz	-104
N_{oc} Note2	$Config_{SCell}$ 1,2	dBm/SCS	-104
	$Config_{SCell}$ 3		-101
$\hat{E}_s / I_{ot}$		dB	17
$\hat{E}_s / N_{oc}$		dB	17
SS-RSRP Note3	$Config_{SCell}$ 1,2	dBm/SCS	-87
	$Config_{SCell}$ 3		-84
SCH_RP Note 3		dBm/15 kHz	-87
Propagation condition		-	AWGN

Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.

Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for N_{oc} to be fulfilled.

Note 3: SS-RSRP and SCH_RP levels have been derived from other parameters for information purposes. They are not settable parameters themselves.

Note 4: The uplink resources for CSI reporting are assigned to the UE prior to the start of time period T2.

During T2 the UE shall send the first CSI report for SCell in the first available uplink resource after slot ($m+k+T_{RRC_process}$). UE is allowed to postpone CSI report to next available uplink resource if an available uplink resource is subject to interruption. Whether CSI report in slot ($m+k+T_{RRC_process}$) was interrupted is checked by monitoring ACK/NACK sent in PCell in slot ($m+k+T_{RRC_process}$).

During T2 the UE shall start sending CSI reports for SCell with non-zero CQI index at latest in a slot $m + \frac{N_{direct}}{NR\ slot\ length}$. $N_{direct} = T_{RRC_Process} + T_1 + T_{activation_time} + T_{CSI_Reporting}$ - 3ms, where $T_{RRC_Process}$ = 20 ms and other components are defined in TS 38.133 [6] clause 8.3.4.

During T2 interruption of PSCell during direct SCell activation shall not happen outside the slot $m + 1$ to $m + 1 + \frac{T_{RRC_Process}+T_1+T_X}{NR\ slot\ length} + N_{\text{interruption}}$, and interruption of E-UTRA PCell during SCell activation shall not happen outside the subframe $m_1 + 1$ to subframe $m_2 + 1 + \frac{T_{RRC_Process}+T_1+T_X}{NR\ slot\ length} + N_{\text{interruption}}$, as defined in TS 38.133 [6] clause 8.3.4.

The interruption of PSCell shall not be more than the values specified for EN-DC in TS 38.133 [6] clause 8.2.1.2.8.

All the above test requirements shall be fulfilled for the observed direct SCell activation delay to be counted as correct. The rate of correct observed direct SCell activation delay during repeated tests shall be at least 90%.

NOTE: During T2 if there are no uplink resources for reporting the valid CSI in a slot $m + \frac{T_{RRC_Process}+T_1+T_X}{NR\ slot\ length}$ as defined in TS 38.133 [6] clause 8.3.4 then the UE shall use the next available uplink resource for reporting the corresponding valid CSI.

4.5.4 UE UL carrier RRC reconfiguration delay

4.5.4.1 EN-DC FR1 UE UL carrier RRC reconfiguration delay

4.5.4.1.1 Test purpose

This test is to verify that when the UE receives a RRC message implying NR UL or Supplementary UL (SUL) carrier configuration, the UE is ready to start transmission on the newly configured carrier within the time limits specified for configuring and deconfiguring carrier. This test will verify the UE being configured or deconfigured with a SUL carrier or NR UL carrier RRC reconfiguration delay requirements in TS 38.133 clause 8.4.

4.5.4.1.2 Test applicability

This test applies to all types of NR UE supporting E-UTRA and EN-DC from Release 15 onwards. This test is applicable to UE that supports SUL.

4.5.4.1.3 Minimum conformance requirements

When the UE receives a RRC message implying NR UL or supplementary UL (SUL) carrier configuration, the UE shall be ready to start transmission on the newly configured carrier within $T_{UL_carrier_config}$ from the end of the slot n.

Where

- Slot n is the last slot overlapping with the PDSCH containing the RRC command.
- $T_{UL_carrier_deconfig}$ equals the maximum RRC procedure delay defined in clause 11.2 in TS 36.331 [16] if the corresponding RRC message is embedded in E-UTRA RRC message, otherwise it equals the maximum RRC procedure delay defined in clause 12 in TS 38.331 [2].

When the UE receives a RRC message implying NR UL or supplementary UL (SUL) carrier deconfiguration RRC signalling, the UE shall stop UL signalling on the deconfigured UL carrier within $T_{UL_carrier_config}$ from the end of slot n.

Where

- Slot n is the last slot overlapping with the PDSCH containing the RRC command.
- $T_{UL_carrier_deconfig}$ equals the maximum RRC procedure delay defined in clause 11.2 in TS 36.331 [16] if the corresponding RRC message is embedded in E-UTRA RRC message, otherwise it equals the maximum RRC procedure delay defined in clause 12 in TS 38.331 [2].

The normative reference for this requirement is TS 38.133 [6] clause A.4.5.4.1.

4.5.4.1.4 Test description

4.5.4.1.4.1 Initial conditions

This test can be run in one of the configurations defined in Table 4.5.4.1.4.1-1.

Table 4.5.4.1.4.1-1: Supported test configurations for FR1 PSCell (Cell2) and SCell (Cell3)

Configuration	PSCell (Cell2)	SCell (Cell3)
4.5.4.1-1	15 kHz SSB SCS, ≥10 MHz bandwidth, FDD duplex mode	DL and UL: 15kHz SSB SCS, ≥10 MHz bandwidth, FDD duplex mode; SUL: 15kHz SCS, ≥10 MHz bandwidth, SUL duplex mode

Configuration	PSCell (Cell2)	SCell (Cell3)
4.5.4.1-2	15 kHz SSB SCS, ≥10 MHz bandwidth, FDD duplex mode	DL and UL: 15kHz SSB SCS, ≥10 MHz bandwidth, TDD duplex mode; SUL: 15kHz SCS, ≥10 MHz bandwidth, SUL duplex mode
4.5.4.1-3	15 kHz SSB SCS, ≥10 MHz bandwidth, FDD duplex mode	DL and UL: 30kHz SSB SCS, ≥40 MHz bandwidth, TDD duplex mode; SUL: 30kHz SCS, ≥40 MHz bandwidth, SUL duplex mode
4.5.4.1-4	15 kHz SSB SCS, ≥10 MHz bandwidth, TDD duplex mode	DL and UL: 15kHz SSB SCS, ≥10 MHz bandwidth, FDD duplex mode; SUL: 15kHz SCS, ≥10 MHz bandwidth, SUL duplex mode
4.5.4.1-5	15 kHz SSB SCS, ≥10 MHz bandwidth, TDD duplex mode	DL and UL: 15kHz SSB SCS, ≥10 MHz bandwidth, TDD duplex mode; SUL: 15kHz SCS, ≥10 MHz bandwidth, SUL duplex mode
4.5.4.1-6	15 kHz SSB SCS, ≥10 MHz bandwidth, TDD duplex mode	DL and UL: 30kHz SSB SCS, ≥40 MHz bandwidth, TDD duplex mode; SUL: 30kHz SCS, ≥40 MHz bandwidth, SUL duplex mode
4.5.4.1-7	30 kHz SSB SCS, ≥40 MHz bandwidth, TDD duplex mode	DL and UL: 15kHz SSB SCS, ≥10 MHz bandwidth, FDD duplex mode; SUL: 15kHz SCS, ≥10 MHz bandwidth, SUL duplex mode
4.5.4.1-8	30 kHz SSB SCS, ≥40 MHz bandwidth, TDD duplex mode	DL and UL: 15kHz SSB SCS, ≥10 MHz bandwidth, TDD duplex mode; SUL: 15kHz SCS, ≥10 MHz bandwidth, SUL duplex mode
4.5.4.1-9	30 kHz SSB SCS, ≥40 MHz bandwidth, TDD duplex mode	DL and UL: 30kHz SSB SCS, ≥40 MHz bandwidth, TDD duplex mode; SUL: 30kHz SCS, ≥40 MHz bandwidth, SUL duplex mode
Note 1: The UE is only required to be tested in one of the supported test configurations Note 2: The UE is only required to be tested in one with smallest aggregated channel bandwidth from supported band combinations which is composed of CCs ≥ the bandwidth ($BW_{channel}$) defined in each test configuration.		

Configure the test equipment and the DUT according to the parameters in Table 4.5.4.1.4.1-2.

Table 4.5.4.1.4.1-2: Initial conditions for EN-DC FR1 UE UL carrier RRC reconfiguration delay

Parameter	Value		Comment
Test environment	NC		As specified in TS 38.508-1 [14] clause 4.1.
Test frequencies	As specified in Annex E, Table E.2-1 and TS 38.508-1 [14] clause 4.3.1.		
Channel bandwidth	As specified by the test configuration selected from Table 4.5.4.1.4.1-1.		
Propagation conditions	AWGN		As specified in clause C.2.2.
Connection Diagram	TE Part	A.3.1.8.2	As specified in TS 38.508-1 [14] Annex A.
	DUT Part	A.3.2.3.4	
Exceptions to connection diagram	N/A		

1. Message contents are defined in clause 4.5.4.1.4.3.
2. The power levels and settings for Cell 1 are set according to Annex A.6, Table A.6.1.1-1. Cell 2 is NR FR1 PSCell. Cell 3 is NR FR1 SCell. The connection setup is done according to the settings in clause C.1.3, and the downlink signal levels as per clause C.1.2
3. The test parameters are given in Table 4.5.4.1.4.1-3 below.
4. Downlink signals for NR cell are initially set up according to clauses C.1.2 and C.1.3.

Table 4.5.4.1.4.1-3: General test parameters for EN-DC FR1 UE UL carrier RRC reconfiguration delay

Parameter	Unit	Test configuration	Value	Comment
RF Channel Number		Config 1, 2, 3, 4, 5, 6, 7, 8, 9	1, 2, 3	Three radio channels are used for these two tests.
Active cell		Config 1,2, 3, 4, 5, 6, 7, 8, 9	Cell 1: E-UTRAN PCell Cell 2: FR1 PSCell Cell 3: FR1 SCell	E-UTRAN PCell on RF channel number 1 FR1 PSCell on RF channel number 2 FR1 SCell on RF channel number 3
CP length		Config 1,2, 3, 4, 5, 6, 7, 8, 9	Normal	
DRX		Config 1,2, 3, 4, 5, 6, 7, 8, 9	OFF	
Measurement gap pattern Id		Config 1,2, 3, 4, 5, 6, 7, 8, 9	OFF	
Filter coefficient		Config 1,2, 3, 4, 5, 6, 7, 8, 9	0	L3 filtering is not used
T1	s	Config 1,2, 3, 4, 5, 6, 7, 8, 9	5	
T2	s	Config 1,2, 3, 4, 5, 6, 7, 8, 9	5	
T3	s	Config 1,2, 3, 4, 5, 6, 7, 8, 9	5	

4.5.4.1.4.2 Test procedure

There are three cells: E-UTRAN PCell (Cell 1), FR1 PSCell (Cell 2) and FR1 SCell (Cell 3). For SCell, both NR uplink and supplementary uplink are broadcast by *ServingCellConfigCommonSIB*. The test case consists of two tests: Test 1 and Test 2.

In Test 1, the test consists of three time periods, with duration of T1, T2 and T3 respectively. During time duration T1, NR uplink of Cell 3 is configured to UE. At the start of T2, a supplementary uplink of Cell 3 is configured to UE through *RRCReconfiguration*, then UE shall start transmission on both the NR uplink and supplementary uplink. At the start of T3, the supplementary uplink is released through *RRCReconfiguration*.

In Test 2, the test consists of three time periods, with duration of T1, T2 and T3 respectively. During time duration T1, supplementary uplink on Cell 3 is configured to UE. At the start of T2, a NR uplink is configured to UE through *RRCReconfiguration*, then UE shall start transmission on both the NR uplink and supplementary uplink. At the start of T3, the NR uplink is released through *RRCReconfiguration*.

1. Ensure the UE is in state RRC_CONNECTED with generic procedure parameters *Connectivity* EN-DC, DC bearer MCG and SCG, Connected without release *On* and Test Mode *On* according to TS 38.508-1 [14] clause 4.5.

2. Setup E-UTRAN PCell (Cell 1) according to parameters given in Table A.6.1.1-1 and setup FR1 PSCell (Cell 2) according to parameters given in Table 4.5.4.1.5-1.

3. For SCell (Cell 3), both NR uplink and supplementary uplink are broadcast by *ServingCellConfigCommonSIB*.

4. For Test 1: NR uplink of Cell 3 is configured to UE during T1

   4.1. During time duration T1, NR uplink of Cell 3 is configured to UE. Setup FR1 SCell (Cell 3) according to parameters given in Table 4.5.4.1.5-2.

   4.2 T2 starts when a supplementary uplink of SCell (Cell 3) is configured to UE through *RRCConnectionReconfiguration*, then UE shall start transmission on both the NR uplink and supplementary uplink on SCell (Cell 3) within 20ms. If UE transmits data on both the NR uplink and supplementary uplink on SCell (Cell 3) within 20ms from the start of T2, then count a success for the event "reconfiguration" otherwise count a failure for event "reconfiguration".

   4.3 T3 starts when the supplementary uplink is released through *RRCConnectionReconfiguration*, then UE shall transmit data only on the NR uplink carrier on SCell (Cell 3) within 20ms. If UE stop transmitting data on supplementary uplink carrier on SCell (Cell 3) within 20ms from the start of T3, then count a success for the event "deconfiguration" otherwise count a failure for event "deconfiguration".

5. For Test 2: Supplementary uplink on Cell 3 is configured to UE during T1

   5.1. Repeat steps 1-3.

   5.2. During time duration T1, Supplementary uplink of Cell 3 is configured to UE. Setup FR1 SCell (Cell 3) according to parameters given in Table 4.5.4.1.5-2.

   5.3. T2 starts when a NR uplink of SCell (Cell 3) is configured to UE through *RRCConnectionReconfiguration*, then UE shall start transmission on both the NR uplink and supplementary uplink on SCell (Cell 3) within 20ms. If UE transmits data on both the NR uplink and supplementary uplink on SCell (Cell 3) within 20ms from the start of T2, then count a success for the event "reconfiguration" otherwise count a failure for event "reconfiguration".

   5.4 T3 starts when the NR uplink is released through *RRCConnectionReconfiguration*, then UE shall transmit data only on the supplementary uplink carrier on SCell (Cell 3) within 20ms. If UE stop transmitting data on NR uplink carrier on SCell (Cell 3) within 20ms from the start of T3, then count a success for the event "deconfiguration" otherwise count a failure for event "deconfiguration".

6. Repeat steps 1-5 until a test verdict has been achieved.

Each of the events "reconfiguration" and "deconfiguration" is evaluated independently for the statistic, resulting in an event verdict: pass or fail. Each event is evaluated only until the confidence level according to Table G.2.3-1 in Annex G.2 is achieved. Different events may require different times for a verdict.

If all events pass, the test passes. If one event fails, the test fails.

4.5.4.1.4.3 Message contents

Message contents are according to TS 38.508-1 [14] clause 4.6 with the following exceptions:

Table 4.5.4.1.4.3-1: Common Exception messages

Default Message Contents	
Common contents of system information blocks exceptions	
Default RRC messages and information elements contents exceptions	Table H.3.8-1 Table H.3.8-2

4.5.4.1.5 Test requirements

Table 4.5.4.1.5-1 and 4.5.4.1.5-2 defines the primary level settings including test tolerances for the EN-DC FR1 UE UL carrier RRC reconfiguration delay test with all NR cells in FR1.

Table 4.5.4.1.5-1: NR Cell specific test parameters for EN-DC FR1 UE UL carrier RRC reconfiguration delay on PSCell (Cell 2)

Parameter	Unit	Test Configuration	Test 1			Test 2		
			T1	T2	T3	T1	T2	T3
Channel number		Conf 1, 2, 3, 4, 5, 6, 7, 8, 9	2			2		
TDD configuration		Conf 1, 2, 3	N/A			N/A		
		Conf 4, 5, 6	TDD Conf.1.1			TDD Conf.1.1		
		Conf 7, 8, 9	TDD Conf.2.1			TDD Conf.2.1		
$BW_{channel}$	MHz	Conf 1, 2, 3	Note 6			Note 6		
		Conf 4, 5, 6	Note 6			Note 6		
		Conf 7, 8, 9	Note 6			Note 6		
$BW_{occupied}$	RB	Conf 1, 2, 3	52 Note 4			52 Note 4		
		Conf 4, 5, 6	52 Note 4			52 Note 4		
		Conf 7, 8, 9	106 Note 5			106 Note 5		
PDSCH reference measurement channel as defined in A.3.1.1		Conf 1, 2, 3	SR.1.1 FDD			SR.1.1 FDD		
		Conf 4, 5, 6	SR.1.1 TDD			SR.1.1 TDD		
		Conf 7, 8, 9	SR 2.1 TDD			SR 2.1 TDD		
		Conf 1, 2, 3	CR.1.1 FDD			CR.1.1 FDD		

Parameter	Unit	Test Configuration	Test 1			Test 2		
			T1	T2	T3	T1	T2	T3
RMSI CORESET reference measurement channel as defined in A.3.1.2		Conf 4, 5, 6	CR.1.1 TDD			CR.1.1 TDD		
		Conf 7, 8, 9	CR.2.1 TDD			CR.2.1 TDD		
RMC CORESET reference measurement channel as defined in A.3.1.3		Conf 1, 2, 3	CCR.1.1 FDD			CCR.1.1 FDD		
		Conf 4, 5, 6	CCR.1.1 TDD			CCR.1.1 TDD		
		Conf 7, 8, 9	CCR.2.1 TDD			CCR.2.1 TDD		
OCNG Pattern Note 1		Conf 1, 2, 3, 4, 5, 6	OP.1 Note 4			OP.1 Note 4		
		Conf 7, 8, 9	OP.1 Note 5			OP.1 Note 5		
SSB configuration		Conf 1, 2, 3, 4, 5, 6	SSB.1 FR1			SSB.1 FR1		
		Conf 7, 8, 9	SSB.2 FR1			SSB.2 FR1		
SMTC configuration		Conf 1, 2, 3, 4, 5, 6, 7, 8, 9	SMTC.1			SMTC.1		
CSI-RS for tracking		Conf 1	TRS.1.1 FDD			TRS.1.1 FDD		
		Conf 2	TRS.1.1 TDD			TRS.1.1 TDD		
		Conf 3	TRS.1.2 TDD			TRS.1.2 TDD		
		Conf 4	TRS.1.1 FDD			TRS.1.1 FDD		
		Conf 5	TRS.1.1 TDD			TRS.1.1 TDD		
		Conf 6	TRS.1.2 TDD			TRS.1.2 TDD		
		Conf 7	TRS.1.1 FDD			TRS.1.1 FDD		
		Conf 8	TRS.1.1 TDD			TRS.1.1 TDD		
		Conf 9	TRS.1.2 TDD			TRS.1.2 TDD		
DL initial BWP configuration		Conf 1, 2, 3, 4, 5, 6, 7, 8, 9	DLBWP.0.1			DLBWP.0.1		
DL dedicated BWP configuration		Conf 1, 2, 3, 4, 5, 6, 7, 8, 9	DLBWP.1.1			DLBWP.1.1		
UL dedicated BWP configuration		Conf 1, 2, 3, 4, 5, 6, 7, 8, 9	ULBWP.1.1			ULBWP.1.1		
EPRE ratio of PSS to SSS	dB	Conf 1, 2, 3, 4, 5, 6, 7, 8, 9	0			0		
EPRE ratio of PBCH_DMRS to SSS								
EPRE ratio of PBCH to PBCH_DMRS								
EPRE ratio of PDCCH_DMRS to SSS								
EPRE ratio of PDCCH to PDCCH_DMRS								
EPRE ratio of PDSCH_DMRS to SSS								
EPRE ratio of PDSCH to PDSCH_DMRS								
EPRE ratio of OCNG DMRS to SSS								
EPRE ratio of OCNG to OCNG DMRS								
N_{oc} Note 2	dBm / 15kHz	Conf 1, 2, 3, 4, 5, 6, 7, 8, 9	-102			-102		
	dBm/ SCS	Conf 1,2,3,4,5,6	-102			-102		
		Conf 7,8,9	-99			-99		
$\hat{E}_s / N_{oc}$	dB	Conf 1, 2, 3, 4, 5, 6, 7, 8, 9	16	16	16	16	16	16
$\hat{E}_s / I_{ot}$ Note 3	dB	Conf 1, 2, 3, 4, 5, 6, 7, 8, 9	16	16	16	16	16	16
SS-RSRP Note 3	dBm/ SCS	Conf 1,2,3,4,5,6	-86	-86	-86	-86	-86	-86
		Conf 7,8,9	-83	-83	-83	-83	-83	-83

Parameter	Unit	Test Configuration	Test 1			Test 2		
			T1	T2	T3	T1	T2	T3
Io Note 3	dBm/ 9.36 MHz	Conf 1,2,3,4,5,6	-57.94	-57.94	-57.94	-57.94	-57.94	-57.94
	dBm/ 38.16MHz	Conf 7,8,9	-51.84	-51.84	-51.84	-51.84	-51.84	-51.84
Propagation Condition		Conf 1, 2, 3, 4, 5, 6, 7, 8, 9	AWGN			AWGN		
Antenna configuration		Conf 1, 2, 3, 4, 5, 6, 7, 8, 9	1 x 2			1 x 2		
NOTE 1: OCNG shall be used such that both cells are fully allocated, and a constant total transmitted power spectral density is achieved for all OFDM symbols.								
NOTE 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for N_{oc} to be fulfilled within $BW_{occupied}$.								
NOTE 3: $\hat{E}_s/I_{ot}$, Io, and SS-RSRP levels have been derived from other parameters for information purposes. They are not settable parameters themselves.								
NOTE 4: All UL/DL transmission shall be confined within $BW_{occupied}$ (i.e. 10 MHz, 52 RBs) from $F_{C,low}$, and Io is independent of the $BW_{channel}$ configured.								
NOTE 5: All UL/DL transmission shall be confined within $BW_{occupied}$ (i.e. 40 MHz, 106 RBs) from $F_{C,low}$, and Io is independent of the $BW_{channel}$ configured.								
NOTE 6: $N_{RB,c}$. is derived from Table 5.3.2-1 in TS38.101-1[2] with configured $BW_{channel}$.								

Table 4.5.4.1.5-2: NR Cell specific test parameters for EN-DC FR1 UE UL carrier RRC reconfiguration delay on SCell (Cell 3)

Parameter	Unit	Test Configuration	Test 1			Test 2		
			T1	T2	T3	T1	T2	T3
Channel number		Conf 1, 2, 3, 4, 5, 6, 7, 8, 9	3			3		
TDD configuration		Conf 1, 4, 7	N/A			N/A		
		Conf 2, 5, 8	TDDConf.1.1			TDDConf.1.1		
		Conf 3, 6, 9	TDDConf.2.1			TDDConf.2.1		
$BW_{channel}$	MHz	Conf 1, 4, 7	Note 6			Note 6		
		Conf 2, 5, 8	Note 6			Note 6		
		Conf 3, 6, 9	Note 6			Note 6		
$BW_{occupied}$	RB	Conf 1, 4, 7	52 Note 4			52 Note 4		
		Conf 2, 5, 8	52 Note 4			52 Note 4		
		Conf 3, 6, 9	106 Note 5			106 Note 5		
PUSCH parameters for NR UL carrier		Conf 1, 4, 7	G-FR1-A3-10 in [28]	G-FR1-A3-10 in [28]	G-FR1-A3-10 in [28]	N/A	G-FR1-A3-10 in [28]	N/A
		Conf 2, 5, 8	G-FR1-A3-10 in [28]	G-FR1-A3-10 in [28]	G-FR1-A3-10 in [28]	N/A	G-FR1-A3-10 in [28]	N/A
		Conf 3, 6, 9	G-FR1-A3-14 in [28]	G-FR1-A3-14 in [28]	G-FR1-A3-14 in [28]	N/A	G-FR1-A3-14 in [28]	N/A
PUCCH parameters For NR UL carrier		Conf 1, 4, 7	Table 8.3.3.1.2-1 in [28]	Table 8.3.3.1.2-1 in [28]	Table 8.3.3.1.2-1 in [28]	N/A	N/A	N/A
		Conf 2, 5, 8	Table 8.3.3.1.2-1 in [28]	Table 8.3.3.1.2-1 in [28]	Table 8.3.3.1.2-1 in [28]	N/A	N/A	N/A
		Conf 3, 6, 9	Table 8.3.3.1.2-2 in [28]	Table 8.3.3.1.2-2 in [28]	Table 8.3.3.1.2-2 in [28]	N/A	N/A	N/A
PUSCH parameters for supplementary UL		Conf 1, 4, 7	N/A	G-FR1-A3-10 in [28]	N/A	G-FR1-A3-10 in [28]	G-FR1-A3-10 in [28]	G-FR1-A3-10 in [28]

Parameter	Unit	Test Configuration	Test 1			Test 2		
			T1	T2	T3	T1	T2	T3
		Conf 2, 5, 8	N/A	G-FR1-A3-10 in [28]	N/A	G-FR1-A3-10 in [28]	G-FR1-A3-10 in [28]	G-FR1-A3-10 in [28]
		Conf 3, 6, 9	N/A	G-FR1-A3-14 in [28]	N/A	G-FR1-A3-14 in [28]	G-FR1-A3-14 in [28]	G-FR1-A3-14 in [28]
PUCCH parameters for supplementary UL		Conf 1, 4, 7	N/A	N/A	N/A	Table 8.3.3.1.2-1 in [28]	Table 8.3.3.1.2-1 in [28]	Table 8.3.3.1.2-1 in [28]
		Conf 2, 5, 8	N/A	N/A	N/A	Table 8.3.3.1.2-1 in [28]	Table 8.3.3.1.2-1 in [28]	Table 8.3.3.1.2-1 in [28]
		Conf 3, 6, 9	N/A	N/A	N/A	Table 8.3.3.1.2-2 in [28]	Table 8.3.3.1.2-2 in [28]	Table 8.3.3.1.2-2 in [28]
PDSCH reference measurement channel as defined in A.3.1.1		Conf 1, 4, 7	SR.1.1 FDD			SR.1.1 FDD		
		Conf 2, 5, 8	SR.1.1 TDD			SR.1.1 TDD		
		Conf 3, 6, 9	SR 2.1 TDD			SR 2.1 TDD		
RMSI CORESET reference measurement channel as defined in A.3.1.2		Conf 1, 4, 7	CR.1.1 FDD			CR.1.1 FDD		
		Conf 2, 5, 8	CR.1.1 TDD			CR.1.1 TDD		
		Conf 3, 6, 9	CR.2.1 TDD			CR.2.1 TDD		
RMC CORESET reference measurement channel as defined in A.3.1.3		Conf 1, 4, 7	CCR.1.1 FDD			CCR.1.1 FDD		
		Conf 2, 5, 8	CCR.1.1 TDD			CCR.1.1 TDD		
		Conf 3, 6, 9	CCR.2.1 TDD			CCR.2.1 TDD		
OCNG Pattern Note 1		Conf 1, 2, 4, 5, 7, 8	OP.1 Note 4			OP.1 Note 4		
		Conf 3, 6, 9	OP.1 Note 5			OP.1 Note 5		
SSB configuration		Conf 1, 2, 4, 5, 7,8	SSB.1 FR1			SSB.1 FR1		
		Conf 3, 6, 9	SSB.2 FR1			SSB.2 FR1		
SMTC configuration		Conf 1, 2, 3, 4, 5, 6, 7, 8, 9	SMTC.1			SMTC.1		
CSI-RS for tracking		Conf 1	TRS.1.1 FDD			TRS.1.1 FDD		
		Conf 2	TRS.1.1 TDD			TRS.1.1 TDD		
		Conf 3	TRS.1.2 TDD			TRS.1.2 TDD		
		Conf 4	TRS.1.1 FDD			TRS.1.1 FDD		
		Conf 5	TRS.1.1 TDD			TRS.1.1 TDD		
		Conf 6	TRS.1.2 TDD			TRS.1.2 TDD		
		Conf 7	TRS.1.1 FDD			TRS.1.1 FDD		
		Conf 8	TRS.1.1 TDD			TRS.1.1 TDD		
		Conf 9	TRS.1.2 TDD			TRS.1.2 TDD		
DL initial BWP configuration		Conf 1, 2, 3, 4, 5, 6, 7, 8, 9	DLBWP.0.1			DLBWP.0.1		
DL dedicated BWP configuration		Conf 1, 2, 3, 4, 5, 6, 7, 8, 9	DLBWP.1.1			DLBWP.1.1		
UL dedicated BWP configuration		Conf 1, 2, 3, 4, 5, 6, 7, 8, 9	ULBWP.1.1			ULBWP.1.1		
EPRE ratio of PSS to SSS	dB	Conf 1, 2, 3, 4, 5, 6, 7, 8, 9	0			0		
EPRE ratio of PBCH_DMRS to SSS								
EPRE ratio of PBCH to PBCH_DMRS								
EPRE ratio of PDCCH_DMRS to SSS								
EPRE ratio of PDCCH to PDCCH_DMRS								

Parameter	Unit	Test Configuration	Test 1			Test 2		
			T1	T2	T3	T1	T2	T3
EPRE ratio of PDSCH_DMRS to SSS								
EPRE ratio of PDSCH to PDSCH_DMRS								
EPRE ratio of OCNG DMRS to SSS								
EPRE ratio of OCNG to OCNG DMRS								
N_{oc} Note 2	dBm / 15kHz	Conf 1, 2, 3, 4, 5, 6, 7, 8, 9	-102			-102		
	dBm/ SCS	Conf 1, 2, 4, 5, 7,8	-102			-102		
		Conf 3, 6, 9	-99			-99		
$\hat{E}_s / N_{oc}$	dB	Conf 1, 2, 3, 4, 5, 6, 7, 8, 9	16	16	16	16	16	16
$\hat{E}_s / I_{ot}$ Note 3	dB	Conf 1, 2, 3, 4, 5, 6, 7, 8, 9	16	16	16	16	16	16
SS-RSRP Note 3	dBm/ SCS	Conf 1, 2, 4, 5, 7,8	-86	-86	-86	-86	-86	-86
		Conf 3, 6, 9	-83	-83	-83	-83	-83	-83
Io Note 3	dBm/ 9.36 MHz	Conf 1, 2, 4, 5, 7,8	-57.94	-57.94	-57.94	-57.94	-57.94	-57.94
	dBm/ 38.16MHz	Conf 3, 6, 9	-51.84	-51.84	-51.84	-51.84	-51.84	-51.84
Propagation Condition		Conf 1, 2, 3, 4, 5, 6, 7, 8, 9	AWGN			AWGN		
Antenna configuration		Conf 1, 2, 3, 4, 5, 6, 7, 8, 9	1 x 2			1 x 2		

NOTE 1: OCNG shall be used such that both cells are fully allocated, and a constant total transmitted power spectral density is achieved for all OFDM symbols.
NOTE 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for N_{oc} to be fulfilled within $BW_{occupied}$.
NOTE 3: $\hat{E}_s / I_{ot}$, Io, and SS-RSRP levels have been derived from other parameters for information purposes. They are not settable parameters themselves.
NOTE 4: All UL/DL transmission shall be confined within $BW_{occupied}$ (i.e. 10 MHz, 52 RBs) from $F_{C,low}$, and Io is independent of the $BW_{channel}$ configured.
NOTE 5: All UL/DL transmission shall be confined within $BW_{occupied}$ (i.e. 40 MHz, 106 RBs) from $F_{C,low}$, and Io is independent of the $BW_{channel}$ configured.
NOTE 6: $N_{RB,c}$. is derived from Table 5.3.2-1 in TS38.101-1[2] with configured $BW_{channel}$.

In test 1 the UE shall be ready to start transmission on the supplementary uplink carrier on SCell within 20ms from the start of T2.

In test 1 the UE shall stop the transmission on the supplementary uplink carrier on SCell within 20ms from the start of T3.

In test 2 the UE shall be ready to start transmission on the NR uplink carrier on SCell within 20ms from the start of T2.

In test 2 the UE shall stop the transmission on the NR uplink carrier on SCell within 20ms from the start of T3.

All of the above test requirements shall be fulfilled in order for the observed UE UL carrier configuration delay and UE UL carrier release delay to be counted as correct. The rate of correct observed UE UL carrier configuration delay and UE UL carrier release delay during repeated tests shall be at least 90 %.

4.5.5 Link recovery procedures

4.5.5.0 Minimum conformance requirements

4.5.5.0.1 Minimum conformance requirements for SSB-based beam failure detection

UE shall be able to evaluate whether the downlink radio link quality on the configured SSB resource in set $\bar{q}_0$ estimated over the last $T_{Evaluate_BFD_SSB}$ ms period becomes worse than the threshold $Q_{out_LR_SSB}$ within $T_{Evaluate_BFD_SSB}$ ms period.

The value of $T_{Evaluate_BFD_SSB}$ is defined in Table 4.5.5.0.1-1 for FR1.

For FR1,

- $P = \frac{1}{1-\frac{T_{SSB}}{MRGP}}$, when in the monitored cell there are measurement gaps configured for intra-frequency, inter-frequency or inter-RAT measurements, which are overlapping with some but not all occasions of the SSB.
- P=1 when in the monitored cell there are no measurement gaps overlapping with any occasion of the SSB.

Longer evaluation period would be expected if the combination of BFD-RS resource, SMTC occasion and measurement gap configurations does not meet pervious conditions.

For either an FR1 or FR2 serving cell, longer evaluation period would be expected during the period $T_{identify_CGI}$ when the UE is requested to decode an NR CGI.

For either an FR1 or FR2 serving cell, longer BFD evaluation period would be expected during the period $T_{identify_CGI,E-UTRAN}$ when the UE is requested to decode an LTE CGI.

Table 4.5.5.0.1-1: Evaluation period $T_{Evaluate_BFD_SSB}$ for FR1

Configuration	$T_{Evaluate_BFD_SSB}$ (ms)
no DRX	$Max(50, Ceil(5 \times P) \times T_{SSB})$
DRX cycle ≤ 320ms	$Max(50, Ceil(7.5 \times P) \times Max(T_{DRX}, T_{SSB}))$
DRX cycle > 320ms	$Ceil(5 \times P) \times T_{DRX}$
NOTE: T_{SSB} is the periodicity of SSB in the set $\bar{q}_0$. T_{DRX} is the DRX cycle length.	

The UE is required to be capable of measuring SSB for BFD without measurement gaps. The UE is required to perform the SSB measurements with measurement restrictions as described in the following clauses.

For FR1, when the SSB for BFD measurement is in the same OFDM symbol as CSI-RS for RLM, BFD, CBD or L1-RSRP measurement:

- If SSB and CSI-RS have same SCS, UE shall be able to measure the SSB for BFD measurement without any restriction;
- If SSB and CSI-RS have different SCS:
  - If UE supports *simultaneousRxDataSSB-DiffNumerology*, UE shall be able to measure the SSB for BFD measurement without any restriction;
  - If UE does not support *simultaneousRxDataSSB-DiffNumerology*, UE is required to measure one of but not both SSB for BFD measurement and CSI-RS. Longer measurement period for SSB based BFD measurement is expected, and no requirements are defined.

The normative reference for this requirement is TS 38.133 [6] clauses 8.5.2.2 and 8.5.2.3.

4.5.5.0.2 Minimum conformance requirements for CSI-RS-based beam failure detection

UE shall be able to evaluate whether the downlink radio link quality on the CSI-RS resource in set $\bar{q}_0$ estimated over the last $T_{Evaluate_BFD_CSI-RS}$ ms period becomes worse than the threshold $Q_{out_LR_CSI-RS}$ within $T_{Evaluate_BFD_CSI-RS}$ ms period.

The value of $T_{Evaluate_BFD_CSI-RS}$ is defined in Table 4.5.5.0.2-1 for FR1.

For FR1:

- $P = \frac{1}{1-\frac{T_{CSI-RS}}{MRGP}}$, when in the monitored cell there are measurement gaps configured for intra-frequency, inter-frequency or inter-RAT measurements, which are overlapping with some but not all occasions of the CSI-RS.
- P = 1 when in the monitored cell there are no measurement gaps overlapping with any occasion of the CSI-RS.

Longer evaluation period would be expected if the combination of the BFD-RS resource, SMTC occasion and measurement gap configurations does not meet pervious conditions.

For either an FR1 or FR2 serving cell, longer evaluation period would be expected during the period $T_{identify_CGI}$ when the UE is requested to decode an NR CGI.

For either an FR1 or FR2 serving cell, longer BFD evaluation period would be expected during the period $T_{identify_CGI,E-UTRAN}$ when the UE is requested to decode an LTE CGI.

The values of M_{BFD} used in Table 4.5.5.0.2-1 is defined as:

- M_{BFD} = 10, if the CSI-RS resource(s) in set $\overline{q}_0$ used for BFD is transmitted with Density = 3 and over the bandwidth $\geqslant$ 24 PRBs.

The values of P_{BFD} used in Table 4.5.5.0.2-1 is defined as:

For each CSI-RS resource in the set $\overline{q}_0$ configured for PCell or PSCell in EN-DC or NE-DC or SA; or PCell in NR-DC

- P_{BFD} = 1,

For each CSI-RS resource in the set $\overline{q}_0$ configured for PSCell in NR-DC

P_{BFD} = 2 if UE is configured for beam failure detection on SCell, 1 otherwise.

For each CSI-RS resource in the set $\overline{q}_0$ configured for a SCell

- P_{BFD} = Z in EN-DC or NE-DC or SA.
- P_{BFD} = 2* Z in NR-DC.

Where Z is the number of band(s) on which UE is performing beam failure detection only for SCell

Table 4.5.5.0.2-1: Evaluation period $T_{Evaluate_BFD_CSI-RS}$ for FR1

Configuration	$T_{Evaluate_BFD_CSI-RS}$ (ms)
no DRX	Max(50, Ceil（$M_{BFD} \times P \times P_{BFD}$) $\times T_{CSI-RS}$)
DRX cycle ≤ 320ms	Max(50, Ceil (1.5 × $M_{BFD} \times P \times P_{BFD}$) × Max($T_{DRX}$, T_{CSI-RS}))
DRX cycle > 320ms	Ceil ($M_{BFD} \times P \times P_{BFD}$) $\times T_{DRX}$
NOTE: T_{CSI-RS} is the periodicity of CSI-RS resource in the set $\overline{q}_0$. T_{DRX} is the DRX cycle length.	

The UE is required to be capable of measuring CSI-RS for BFD without measurement gaps. The UE is required to perform the CSI-RS measurements with measurement restrictions as described in the following clauses.

For both FR1 and FR2, when the CSI-RS for BFD measurement is in the same OFDM symbol as SSB for RLM, BFD, CBD or L1-RSRP measurement, UE is not required to receive CSI-RS for BFD measurement in the PRBs that overlap with an SSB.

For FR1, when the SSB for RLM, BFD, CBD or L1-RSRP measurement is within the active BWP and has same SCS than CSI-RS for BFD measurement, the UE shall be able to perform CSI-RS measurement without restrictions.

For FR1, when the SSB for RLM, BFD, CBD or L1-RSRP measurement is within the active BWP and has different SCS than CSI-RS for BFD measurement, the UE shall be able to perform CSI-RS measurement with restrictions according to its capabilities:

- If the UE supports *simultaneousRxDataSSB-DiffNumerology* the UE shall be able to perform CSI-RS measurement without restrictions.
- If the UE does not support *simultaneousRxDataSSB-DiffNumerology*, UE is required to measure one of but not both CSI-RS for BFD measurement and SSB. Longer measurement period for CSI-RS based BFD measurement is expected, and no requirements are defined.

For FR1, when the CSI-RS for BFD measurement is in the same OFDM symbol as another CSI-RS for RLM, BFD, CBD or L1-RSRP measurement, UE shall be able to measure the CSI-RS for BFD measurement without any restriction.

The normative reference for this requirement is TS 38.133 [6] clauses 8.5.3.2 and 8.5.3.3.

4.5.5.0.3 Scheduling availability of UE during beam failure detection and candidate beam detection

[TS 38.133, clause 8.5.7.1]

There are no scheduling restrictions due to beam failure detection performed on SSB and CSI-RS configured for BFD with the same SCS as PDSCH or PDCCH in FR1.

[TS 38.133, clause 8.5.8.1]

There are no scheduling restrictions due to L1-RSRP measurement performed on SSB and CSI-RS configured as link recovery detection resource with the same SCS as PDSCH or PDCCH in FR1.

The normative reference for this requirement is TS 38.133 [6] clauses 8.5.7.1 and 8.5.8.1.

4.5.5.0.4 Requirements for Beam Failure Recovery in SCell

For the UE not provided with a configuration of PUCCH transmission with a link recovery request (LRR) as described in clause 9.2.4 in TS 38.213 [3], if beam recovery procedure is triggered for any of SCells, the UE shall transmit preamble for UL-SCH resource application, followed by MAC CE providing one index for at least one corresponding SCell with radio link quality is worse than $Q_{out,LR}$, and the index q_{new} for a periodic CSI-RS configuration or for a SSB provided by higher layer, as described in clause 5.17 of TS38.321 [7], if any, for a corresponding SCell.

The normative reference for this requirement is TS 38.133 [6] clauses 8.5.9.

4.5.5.1 EN-DC FR1 SSB-based beam failure detection and link recovery in non-DRX

4.5.5.1.1 Test purpose

The purpose of this test is to verify that the UE properly detects SSB-based beam failure in the set q_0 configured for a serving PSCell and that the UE performs correct SSB-based link recovery based on beam candidate set q_1. The purpose is to test the downlink monitoring for beam failure detection within the UEs active DL BWP of the PSCell, during the evaluation period, and link recovery, when no DRX is used. This test will partly verify the SSB based beam failure detection and link recovery for an FR1 serving cell requirements in TS 38.133 [6] clause 8.5.

4.5.5.1.2 Test applicability

This test applies to all types of E-UTRA UE release 15 and forward, supporting EN-DC and link recovery.

4.5.5.1.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 4.5.5.0.1.

The normative reference for this requirement is TS 38.133 [6] clause A.4.5.5.1.

4.5.5.1.4 Test description

The test consists of five successive time periods, with time duration of T1, T2, T3, T4 and T5 respectively. Figure 4.5.5.1.4-1 shows the variation of the downlink SNR of the PCell and the SNR of the SSB in set q_0 in the active PSCell to emulate SSB based beam failure. Figure 4.5.5.1.4-1 additionally shows the variation of the downlink L1-RSRP of the SSB in set q_1 of the candidate beam used for link recovery.

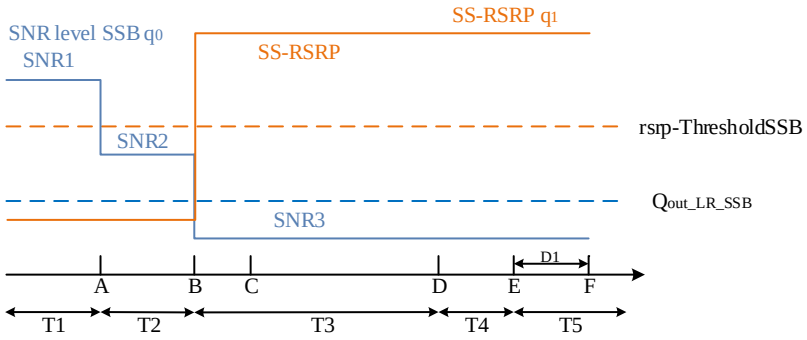


Figure 4.5.5.1.4-1: SNR and L1-RSRP variation for SSB-based beam failure detection and link recovery testing in non-DRX mode

4.5.5.1.4.1 Initial conditions

This test shall be tested using any of the test configurations in Table 4.5.5.1.4.1-1.

Table 4.5.5.1.4.1-1: Supported test configurations for EN-DC FR1 SSB-based beam failure detection and link recovery in non-DRX

Configuration	Description
4.5.5.1-1	LTE FDD, NR 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode
4.5.5.1-2	LTE FDD, NR 15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode
4.5.5.1-3	LTE FDD, NR 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode
4.5.5.1-4	LTE TDD, NR 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode
4.5.5.1-5	LTE TDD, NR 15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode
4.5.5.1-6	LTE TDD, NR 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode
NOTE: The UE is only required to pass in one of the supported test configurations in FR1.	

Configure the test equipment and the DUT according to the parameters in Table 4.5.5.1.4.1-2.

Table 4.5.5.1.4.1-2: Initial conditions for EN-DC FR1 SSB-based beam failure detection and link recovery in non-DRX

Parameter	Value		Comment
Test environment	NC		As specified in TS 38.508-1 [14] clause 4.1.
Test frequencies	As specified in Annex E, table E.2-1 and TS 38.508-1 [14] clause 4.3.1 and 4.4.2.		
Channel bandwidth	As specified by the test configuration selected from Table 4.5.5.1.4.1-1.		
Propagation conditions	AWGN		As specified in clause C.2.2.
Connection Diagram	TE Part	A.3.1.7.1	As specified in TS 38.508-1 [14] Annex A.
	DUT Part	A.3.2.3.4	
Exceptions to connection diagram	For 4Rx capable UEs without any 2 Rx RF bands use A.3.2.5.2 for DUT part and A.3.1.8.4 for TE Part		

1. The general test parameter settings are set up according to Table 4.5.5.1.4.1-3.
2. Message contents are defined in clause 4.5.5.1.4.3.

3. Cell 1 is the E-UTRA serving cell (PCell) for the EN-DC setup. The power levels and settings for Cell 1 are set according to Annex A.6. Cell 2 is the NR cell (PSCell) with the power level set according to clauses C.1.2 and C.1.3 for this test

Table 4.5.5.1.4.1-3: General test parameters for FR1 PSCell for SSB-based beam failure detection and link recovery testing in non-DRX mode

Parameter		Unit	Value	Comment
Active E-UTRA PCell			Cell 1	
E-UTRA RF Channel Number			1	
Active PSCell			Cell 2	
RF Channel Number			2	
Duplex mode	Config 1, 4		FDD	
	Config 2, 3, 5, 6		TDD	
BWchannel	Config 1, 4	MHz	10: NRB,c = 52	
	Config 2, 5		10: NRB,c = 52	
	Config 3, 6		40: NRB,c = 106	
DL initial BWP configuration	Config 1, 2, 3, 4, 5, 6		DLBWP.0.1	
DL dedicated BWP configuration	Config 1, 2, 3, 4, 5, 6		DLBWP.1.1	
UL initial BWP configuration	Config 1, 2, 3, 4, 5, 6		ULBWP.0.1	
UL dedicated BWP configuration	Config 1, 2, 3, 4, 5, 6		ULBWP.1.1	
TDD Configuration	Config 1, 4		Not Applicable	
	Config 2, 5		TDDConf.1.1	
	Config 3, 6		TDDConf.2.1	
CORESET Reference Channel	Config 1, 4		CR.1.1 FDD	
	Config 2, 5		CR.1.1 TDD	
	Config 3, 6		CR.2.1 TDD	
SSB Configuration	Config 1, 4		SSB.3 FR1	
	Config 2, 5		SSB.3 FR1	
	Config 3, 6		SSB.4 FR1	
SMTC Configuration	Config 1, 2, 4, 5		SMTC.1	
	Config 3, 6		SMTC.1	
PDSCH/PDCCH subcarrier spacing	Config 1, 2, 4, 5		15 KHz	
	Config 3, 6		30 KHz	
PRACH Configuration	Config 1, 2, 4, 5		PRACH.2 FR1	CFRA for BFR
	Config 3, 6		PRACH.2 FR1	CFRA for BFR
SSB Index assigned as BFD RS (q_0)			0	
SSB Index assigned as CBD RS (q_1)			1	
OCNG parameters			OP.1	
CP length			Normal	
Correlation Matrix and Antenna Configuration			2x2 Low	
Beam failure detection transmission parameters	DCI format		1-0	
	Number of Control OFDM symbols		2	
	Aggregation level	CCE	8	
	Ratio of hypothetical PDCCH RE energy to average CSI-RS RE energy	dB	0	

Parameter		Unit	Value	Comment
	Ratio of hypothetical PDCCH DMRS energy to average CSI-RS RE energy	dB	0	
	DMRS precoder granularity		REG bundle size	
	REG bundle size		6	
DRX			OFF	
Gap pattern ID			gp0	
gapOffset			0	
rlmInSyncOutOfSyncThreshold			absent	When the field is absent, the UE applies the value 0.
rsrp-ThresholdSSB	Config 1, 2, 4, 5	dBm/SCS kHz	-98	Threshold used for $Q_{in_LR_SSB}$
	Config 3, 6	dBm/SCS kHz	-95	Threshold used for $Q_{in_LR_SSB}$
powerControlOffsetSS			db0	Used for deriving rsrp-ThresholdCSI-RS
beamFailureInstanceMaxCount			n1	see TS 38.321 [12], clause 5.17
beamFailureDetectionTimer			pbfd4	see TS 38.321 [12], clause 5.17
CSI-RS configuration for CSI reporting	Config 1, 4		CSI-RS.1.1 FDD	
	Config 2, 5		CSI-RS.1.1 TDD	
	Config 3, 6		CSI-RS.2.1 TDD	
CSI-RS for tracking	Config 1, 4		TRS.1.1 FDD	
	Config 2, 5		TRS.1.1 TDD	
	Config 3, 6		TRS.1.2 TDD	
SSB Index assigned as RLM RS			0,1	
T310 timer		ms	1000	
N310			2	
T1		s	0.2	During this time the UE shall be fully synchronized to cell 1
T2		s	0.37	
T3		s	0.24	
T4		s	0	
T5		s	0.17	
D1		s	0.13	
NOTE 1: All configurations are assigned to the UE prior to the start of time period T1. NOTE 2: UE-specific PDCCH is not transmitted after T1 starts. NOTE 3: E-UTRAN is in non-DRX mode under test.				

4.5.5.1.4.2 Test procedure

Prior to the start of the time duration T1, the UE shall be fully synchronized to cell 1 and cell 2. The UE shall be configured for periodic CSI reporting with a reporting periodicity of 5 ms. In the test, DRX configuration is not enabled. The UE is configured to perform inter-frequency measurements using GP ID #0 (40ms).

1. Ensure the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity *EN-DC*, DC bearer MCG and SCG, Connected without release *On* and Test Mode *On* according to TS 38.508-1 [14] clause 4.5.

2. The SS sends an *RRCReconfiguration* (embeded in *RRCConnectionReconfiguration* message) message to the UE to configure inter-frequency measurement.

3. The UE sends an RRCReconfigurationComplete (embeded in RRCConnectionReconfigurationComplete message) message.

4. Set the parameters of NR Cell according to T1 in Table 4.5.5.1.5-1. Propagation conditions are set according to clause C.2.3. T1 starts.

5. When T1 expires the SS shall change the SNR value to T2 as specified in Table 4.5.5.1.5-1. T2 starts.

6. When T2 expires the SS shall change the SNR value to T3 as specified in Table 4.5.5.1.5-1. T3 starts.

7. When T3 expires the SS shall change the SNR value to T4 as specified in Table 4.5.5.1.5-1. T4 starts.

8. When T4 expires the SS shall change the SNR value to T5 as specified in Table 4.5.5.1.5-1. T5 starts.

9. If the SS:

   a) detects uplink power on NR carrier equal to or higher than minimum output power defined in TS 38.521-1 [17] clause 6.3.1.5 in each slot configured for CSI transmission (according CSI reporting on PUCCH) during the period from time point A to time point B; and

   b) does not detect preamble on a beam associated with the candidate beam set $q_1$before time point B; and

   c) detects preamble on a beam associated with the candidate beam set q_1 before time point F (D1 after the star of T5),the number of successful tests is increased by one.

   Otherwise the number of failed tests is increased by one.

10. If the iteration or random access procedure for BFD fails, the SS shall first attempt to release and add the PSCell, by ensuring the UE is in state RRC_CONNECTED with generic procedure parameters *Connectivity* EN-DC, DC bearer MCG and SCG, Connected without release *On* and Test Mode *On* according to TS 38.508-1 [6] clause 4.5. If that also fails, then the UE is switched OFF/ON to proceed with the next iteration.

11. Repeat steps 2-10 for all subtests until the confidence level according to Tables G.2.3-1 in Annex G clause G.2 is achieved.

4.5.5.1.4.3 Message contents

Message contents are according to TS 38.508-1 [14] clause 7.3 with the following exceptions:

Table 4.5.5.1.4.3-1: Common Exception messages for EN-DC FR1 SSB-based beam failure detection and link recovery in non-DRX

Default Message Contents	
Common contents of system information blocks exceptions	
Default RRC messages and information elements contents exceptions	Table H.3.1-1 Table H.3.1-2 with Condition INTER-FREQ, L3 FILTERING NEEDED, Table H.3.1-3 with Condition INTER-FREQ MO (where ssbFrequency is set to the ARFCN value of carrier center of High range) Table H.3.1-4 with A3-offset = 0 Table H.3.1-8 with Condition SSB BFD Table H.3.1-10 with Condition SSB Table H.3.1-10A Table H.3.4-4 with Condition gapUE Table H.3.4-5 with Condition BFD Table H.3.5-4 Table 7.3.1-3 in TS 38.508-1 [14] with condition SMTC.1

Table 4.5.5.1.4.3-2: PDCCH *Search Space* for BFR

Derivation Path: TS 38.508-1 [14], Table 4.6.3-162			
Information Element	**Value/remark**	**Comment**	**Condition**
SearchSpace ::= SEQUENCE {			
searchSpaceId	3	BFR	
controlResourceSetId	2	BFR	
monitoringSlotPeriodicityAndOffset CHOICE {			
sl1	NULL		
}			
monitoringSymbolsWithinSlot	10000000000000	Symbols 0 and 1	
nrofCandidates SEQUENCE {			
aggregationLevel1	n0		
aggregationLevel2	n0		
aggregationLevel4	n0		
aggregationLevel8	n1	AL8	
aggregationLevel16	n0		
}			
searchSpaceType CHOICE {			
ue-Specific SEQUENCE {			USS
dci-Formats	formats0-0-And-1-0	DCI Format 1_0	
}			
}			
}			

Table 4.5.5.1.4.3-3: *RLF-TimersAndConstants*

Derivation Path: TS 38.508-1 [14], Table 4.6.3-150			
Information Element	**Value/remark**	**Comment**	**Condition**
RLF-TimersAndConstants ::= SEQUENCE {			
n310	n2		
}			

Table 4.5.5.1.4.3-4: *PDCCH-Config*

Derivation Path: TS 38.501-1 [14],Table 4.6.3-95			
Information Element	**Value/remark**	**Comment**	**Condition**
PDCCH-Config ::= SEQUENCE {			
controlResourceSetToAddModList SEQUENCE(SIZE (1..3)) OF ControlResourceSet {	2 entries		
ControlResourceSet[2]	ControlResourceSet	entry 2, BFR	
}			
controlResourceSetToReleaseList	Not present		
searchSpacesToAddModList SEQUENCE(SIZE (1..10)) OF SearchSpace {	2 entries		
SearchSpace[2]	SearchSpace	entry 2, BFR	
}			
searchSpacesToReleaseList	Not present		
downlinkPreemption	Not present		
tpc-PUSCH	Not present		
tpc-PUCCH	Not present		
tpc-SRS	Not present		
}			

Table 4.5.5.1.4.3-5: ControlResourceSet for BFR

Derivation Path: TS 38.501-1 [14],Table 7.3.1-15			
Information Element	**Value/remark**	**Comment**	**Condition**
ControlResourceSet ::= SEQUENCE {			
controlResourceSetId	2		
duration	2		

cce-REG-MappingType CHOICE {			
interleaved ::= SEQUENCE {			
reg-BundleSize	n6		
interleaverSize	n2		
shiftIndex	0		
}			
tci-StatesPDCCH-ToAddList	Not present		
}			

4.5.5.1.5 Test requirements

Tables 4.5.5.1.4.1-3 and 4.5.5.1.5-1 define the primary level settings including test tolerances for EN-DC FR1 SSB-based beam failure detection and link recovery in non-DRX.

Table 4.5.5.1.5-1: Cell specific test parameters for FR1 PSCell for SSB-based beam failure detection and link recovery testing in non-DRX mode

Parameter		Unit	Test 1				
			T1	T2	T3	T4	T5
EPRE ratio of PDCCH DMRS to SSS		dB	0				
EPRE ratio of PDCCH to PDCCH DMRS		dB					
EPRE ratio of PBCH DMRS to SSS		dB					
EPRE ratio of PBCH to PBCH DMRS		dB					
EPRE ratio of PSS to SSS		dB					
EPRE ratio of PDSCH DMRS to SSS		dB					
EPRE ratio of PDSCH to PDSCH DMRS		dB					
EPRE ratio of OCNG DMRS to SSS		dB					
EPRE ratio of OCNG to OCNG DMRS		dB					
SNR_SSB of set q_0	Config 1, 4	dB	5.8	-2.2	-12.8	-12.8	-12.8
	Config 2, 5		5.8	-2.2	-12.8	-12.8	-12.8
	Config 3, 6		5.8	-2.2	-12.8	-12.8	-12.8
SNR_SSB of set q1	Config 1, 4	dB	-10.2	-10.2	10.2	10.2	10.2
	Config 2, 5		-10.2	-10.2	10.2	10.2	10.2
	Config 3, 6		-10.2	-10.2	10.2	10.2	10.2
SSB_RP of set q_1	Config 1, 4	dBm/SCS kHz	-108.2	-108.2	−87.8	−87.8	−87.8
	Config 2, 5		-108.2	-108.2	−87.8	−87.8	−87.8
	Config 3, 6		-105.2	-105.2	−84.8	−84.8	−84.8
N_{oc}	Config 1, 4	dBm/15 kHz	-98				
	Config 2, 5		-98				
	Config 3, 6		-98				
Propagation condition			TDL-C 300ns 100Hz				

NOTE 1: OCNG shall be used such that the resources in Cell 1 are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.
NOTE 2: The uplink resources for CSI reporting are assigned to the UE prior to the start of time period T1.
NOTE 3: NZP CSI-RS resource set configuration for CSI reporting are assigned to the UE prior to the start of time period T1.
NOTE 4: Measurement gap configuration is assigned to the UE prior to the start of time period T1.
NOTE 5: The timers and layer 3 filtering related parameters are configured prior to the start of time period T1.
NOTE 6: The signal contains PDCCH for UEs other than the device under test as part of OCNG.
NOTE 7: SNR levels correspond to the signal to noise ratio over the SSS REs.
NOTE 8: The SNR in time periods T1, T2, T3, T4 and T5 is denoted as SNR1, SNR2 and SNR3 respectively in figure 4.5.5.1.4-1.
NOTE 9: The SNR values are specified for a UE with 2RX antennas connected under test. For a UE with 4RX antennas connected under test, the SNR for RS in set q0 during T3, T4, and T5 from D.4.1.1, is -15dB-TT = -15.8dB (including test tolerances).

The UE behaviour during time durations T1, T2, T3, T4 and T5 shall be as follows:

During the time duration T1 and T2, the UE shall transmit uplink signal at least in all subframes configured for CSI transmission on Cell 1.

During the period from time point A to time point B the UE shall transmit uplink signal in Cell 1 in all uplink slots configured for CSI transmission according to the configured periodic CSI reporting for Cell 1.

During T3 the UE shall detect beam failure and initiate link recovery. During T4 and T5 the UE measures and evaluate beam candidate from beam candidate set q_1.

No later than time point F occurring no later than D1 = 130 ms after the start of T5, the UE shall transmit preamble on a beam associated with the candidate beam set q_1. The UE shall not transmit preamble on a beam associated with the candidate beam set q_1 earlier than time point B.

Test is concluded once the test equipment has received the initial preamble transmission from the UE. The rate of correct events observed during repeated tests shall be at least 90%.

4.5.5.2 EN-DC FR1 SSB-based beam failure detection and link recovery in DRX

4.5.5.2.1 Test purpose

The purpose of this test is to verify that the UE properly detects SSB-based beam failure in the set q_0 configured for a serving PSCell and that the UE performs correct SSB-based link recovery based on beam candidate set q_1. The purpose is to test the downlink monitoring for beam failure detection within the UEs active DL BWP of the PSCell, during the evaluation period, and link recovery, when DRX is used. This test will partly verify the SSB based beam failure detection and link recovery for an FR1 serving cell requirements in TS 38.133 [6] clause 8.5.

4.5.5.2.2 Test applicability

This test applies to all types of E-UTRA UE release 15 and forward, supporting EN-DC FR1, link recovery and long DRX cycle.

4.5.5.2.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 4.5.5.0.1.

The normative reference for this requirement is TS 38.133 [6] clause A.4.5.5.2.

4.5.5.2.4 Test description

The test consists of five successive time periods, with time duration of T1, T2, T3, T4 and T5 respectively.
Figure 4.5.5.2.4-1 shows the variation of the downlink SNR of the PCell and the SNR of the SSB in set q_0 in the active PSCell to emulate SSB based beam failure. Figure 4.5.5.2.4-1 additionally shows the variation of the downlink L1-RSRP of the SSB in set q_1 of the candidate beam used for link recovery.

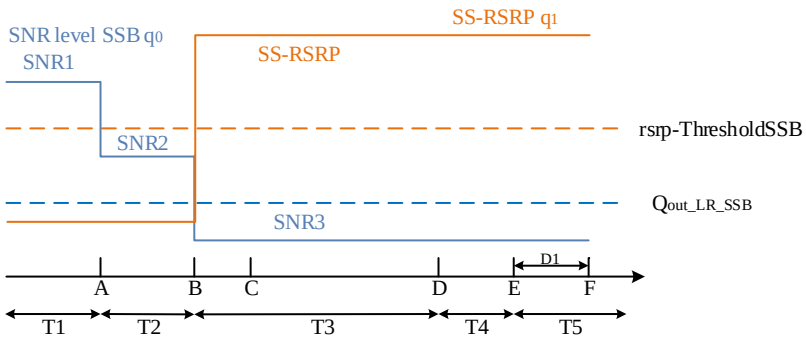


Figure 4.5.5.2.4-1: SNR and L1-RSRP variation for SSB-based beam failure detection and link recovery testing in DRX mode

4.5.5.2.4.1 Initial conditions

This test shall be tested using any of the test configurations in Table 4.5.5.2.4.1-1.

Table 4.5.5.2.4.1-1: Supported test configurations for SSB-based beam failure detection and link recovery testing in DRX mode

Configuration	Description
4.5.5.2-1	LTE FDD, NR 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode
4.5.5.2-2	LTE FDD, NR 15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode
4.5.5.2-3	LTE FDD, NR 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode
4.5.5.2-4	LTE TDD, NR 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode
4.5.5.2-5	LTE TDD, NR 15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode
4.5.5.2-6	LTE TDD, NR 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode
NOTE: The UE is only required to pass in one of the supported test configurations in FR1.	

Configure the test equipment and the DUT according to the parameters in Table 4.5.5.2.4.1-2.

Table 4.5.5.2.4.1-2: Initial conditions for EN-DC FR1 SSB-based beam failure detection and link recovery in DRX

Parameter	Value		Comment
Test environment	NC		As specified in TS 38.508-1 [14] clause 4.1.
Test frequencies	As specified in Annex E, table E.2-1 and TS 38.508-1 [14] clause 4.3.1 and 4.4.2.		
Channel bandwidth	As specified by the test configuration selected from Table 4.5.5.2.4.1-1.		
Propagation conditions	AWGN		As specified in clause C.2.2.
Connection Diagram	TE Part	A.3.1.7.1	As specified in TS 38.508-1 [14] Annex A.
	DUT Part	A.3.2.3.4	
Exceptions to connection diagram	For 4Rx capable UEs without any 2 Rx RF bands use A.3.2.5.2 for DUT part and A.3.1.8.4 for TE Part		

1. The general test parameter settings are set up according to Table 4.5.5.2.4.1-3.
2. Message contents are defined in clause 4.5.5.2.4.3.
3. Cell 1 is the E-UTRA serving cell (PCell) for the EN-DC setup. The power levels and settings for Cell 1 are set according to Annex A.6. Cell 2 is the NR cell (PSCell) with the power level set according to clauses C.1.2 and C.1.3 for this test

Table 4.5.5.2.4.1-3: General test parameters for FR1 PCell for SSB-based beam failure detection and link recovery testing in DRX mode

Parameter		Unit	Value	Comment
			Test 1	
Active E-UTRA PCell			Cell 1	
E-UTRA RF Channel Number			1	
Active PSCell			Cell 2	
RF Channel Number			2	
Duplex mode	Config 1, 4		FDD	
	Config 2, 3, 5, 6		TDD	
BWchannel	Config 1, 4	MHz	10: NRB,c = 52	
	Config 2, 5		10: NRB,c = 52	
	Config 3, 6		40: NRB,c = 106	
DL initial BWP configuration	Config 1, 2, 3, 4, 5, 6		DLBWP.0.1	
DL dedicated BWP configuration	Config 1, 2, 3, 4, 5, 6		DLBWP.1.1	
UL initial BWP configuration	Config 1, 2, 3, 4, 5, 6		ULBWP.0.1	
UL dedicated BWP configuration	Config 1, 2, 3, 4, 5, 6		ULBWP.1.1	
TDD Configuration	Config 1, 4		Not Applicable	
	Config 2, 5		TDDConf.1.1	
	Config 3, 6		TDDConf.2.1	
	Config 1, 4		CR. 1.1 FDD	

Parameter		Unit	Value	Comment
			Test 1	
CORESET Reference Channel	Config 2, 5		CR. 1.1 TDD	
	Config 3, 6		CR. 2.1 TDD	
SSB Configuration	Config 1, 4		SSB.3 FR1	
	Config 2, 5		SSB.3 FR1	
	Config 3, 6		SSB.4 FR1	
SMTC Configuration	Config 1, 2, 4, 5		SMTC.1	
	Config 3, 6		SMTC.1	
PDSCH/PDCCH subcarrier spacing	Config 1, 2, 4, 5		15 KHz	
	Config 3, 6		30 KHz	
PRACH Configuration	Config 1, 2, 4, 5		PRACH.2 FR1	CFRA for BFR
	Config 3, 6		PRACH.2 FR1	CFRA for BFR
SSB Index assigned as BFD RS (q_0)			0	
SSB Index assigned as CBD RS (q_1)			1	
OCNG parameters			OP.1	
CP length			Normal	
Correlation Matrix and Antenna Configuration			2x2 Low	
Beam failure detection transmission parameters	DCI format		1-0	
	Number of Control OFDM symbols		2	
	Aggregation level	CCE	8	
	Ratio of hypothetical PDCCH RE energy to average CSI-RS RE energy	dB	0	
	Ratio of hypothetical PDCCH DMRS energy to average CSI-RS RE energy	dB	0	
	DMRS precoder granularity		REG bundle size	
	REG bundle size		6	
DRX			DRX.7	
Gap pattern ID			N.A.	
rlmInSyncOutOfSyncThreshold			absent	When the field is absent, the UE applies the value 0.
rsrp-ThresholdSSB	Config 1, 2, 4, 5	dBm/SCS kHz	-98	Threshold used for $Q_{in_LR_SSB}$
	Config 3, 6	dBm/SCS kHz	-95	Threshold used for $Q_{in_LR_SSB}$
powerControlOffsetSS			db0	Used for deriving rsrp-ThresholdCSI-RS

Parameter		Unit	Value	Comment
			Test 1	
beamFailureInstanceMaxCount			n1	see TS 38.321 [12], clause 5.17
beamFailureDetectionTimer			pbfd4	see TS 38.321 [12], clause 5.17
CSI-RS configuration for CSI reporting	Config 1, 4		CSI-RS.1.1 FDD	
	Config 2, 5		CSI-RS.1.1 TDD	
	Config 3, 6		CSI-RS.2.1 TDD	
CSI-RS for tracking	Config 1, 4		TRS.1.1 FDD	
	Config 2, 5		TRS.1.1 TDD	
	Config 3, 6		TRS.1.2 TDD	
SSB Index assigned as RLM RS			0,1	
T310 Timer		ms	1000	
N310			2	
T1		s	1	During this time the UE shall be fully synchronized to cell 1
T2		s	5.17	
T3		s	3.24	
T4		s	0	
T5		s	1.97	
D1		s	1.93	
NOTE 1: All configurations are assigned to the UE prior to the start of time period T1. NOTE 2: UE-specific PDCCH is not transmitted after T1 starts. NOTE 3: E-UTRAN is in non-DRX mode under test.				

4.5.5.2.4.2 Test procedure

Prior to the start of the time duration T1, the UE shall be fully synchronized to cell 1 and cell 2. The UE shall be configured for periodic CSI reporting with a reporting periodicity of 5 ms. In the test, DRX configuration is enabled in PSCell and DRX inactivity timer has already been expired, i.e. UE tries to decode PDCCH and to send periodic CQI during the period when On-duration timer is running. Time alignment timers shall be set to "infinity" so that UL timing alignment is maintained during the test.

1. Ensure the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity *EN-DC*, DC bearer MCG and SCG, Connected without release *On* and Test Mode *On* according to TS 38.508-1 [14] clause 4.5.

2. Set the parameters of NR Cell 1 according to T1 in Table 4.5.5.2.5-1. Propagation conditions are set according to clause C.2.3. T1 starts.

3. When T1 expires the SS shall change the SNR value to T2 as specified in Table 4.5.5.2.5-1. T2 starts.

4. When T2 expires the SS shall change the SNR value to T3 as specified in Table 4.5.5.2.5-1. T3 starts.

5. When T3 expires the SS shall change the SNR value to T4 as specified in Table 4.5.5.2.5-1. T4 starts.

6. When T4 expires the SS shall change the SNR value to T5 as specified in Table 4.5.5.2.5-1. T5 starts.

7. If the SS:

   a) detects uplink power on NR carrier equal to or higher than minimum output power defined in TS 38.521-1 [17] clause 6.3.1.5 in each slot configured for CSI transmission (according CSI reporting on PUCCH) during the period from time point A to time point B; and

   b) does not detect preamble on a beam associated with the candidate beam set $q_1$before time point B; and

   c) detects preamble on a beam associated with the candidate beam set q_1 before time point F (D1 after the start of T5), the number of successful tests is increased by one.

   Otherwise the number of failed tests is increased by one.

8. If the iteration or random access procedure for BFD fails, the SS shall first attempt to release and add the PSCell, by ensuring the UE is in state RRC_CONNECTED with generic procedure parameters *Connectivity* EN-DC, DC bearer MCG and SCG, Connected without release *On* and Test Mode *On* according to TS 38.508-1 [6] clause 4.5. If that also fails, then the UE is switched OFF/ON to proceed with the next iteration.

9. Repeat steps 2-8 for all subtests until the confidence level according to Tables G.2.3-1 in Annex G clause G.2 is achieved.

4.5.5.2.4.3 Message contents

Message contents are according to TS 38.508-1 [14] clause 7.3 with the following exceptions:

Table 4.5.5.2.4.3-1: Common Exception messages for EN-DC FR1 SSB-based beam failure detection and link recovery in DRX

Default Message Contents	
Common contents of system information blocks exceptions	
Default RRC messages and information elements contents exceptions	Table H.3.1-8 with Condition SSB BFD Table H.3.1-10 with Condition SSB Table H.3.1-10A Table H.3.5-4 Table H.3.7-1 with Condition DRX.7 Table 7.3.1-3 in TS 38.508-1 [14] with condition SMTC.1

Table 4.5.5.2.4.3-2: PDCCH *Search Space* for BFR

Derivation Path: TS 38.508-1 [14], Table 4.6.3-162			
Information Element	**Value/remark**	**Comment**	**Condition**
SearchSpace ::= SEQUENCE {			
searchSpaceId	3	BFR	
controlResourceSetId	2	BFR	
monitoringSlotPeriodicityAndOffset CHOICE {			
sl1	NULL		
}			
monitoringSymbolsWithinSlot	10000000000000	Symbols 0 and 1	
nrofCandidates SEQUENCE {			
aggregationLevel1	n0		
aggregationLevel2	n0		
aggregationLevel4	n0		
aggregationLevel8	n1	AL8	
aggregationLevel16	n0		
}			
searchSpaceType CHOICE {			
ue-Specific SEQUENCE {			USS
dci-Formats	formats0-0-And-1-0	DCI Format 1_0	
}			
}			
}			

Table 4.5.5.2.4.3-3: *RLF-TimersAndConstants*

Derivation Path: TS 38.508-1 [14], Table 4.6.3-150			
Information Element	**Value/remark**	**Comment**	**Condition**
RLF-TimersAndConstants ::= SEQUENCE {			
n310	n2		
}			

Table 4.5.5.2.4.3-4: *PDCCH-Config*

Derivation Path: TS 38.501-1 [14],Table 4.6.3-95

Information Element	Value/remark	Comment	Condition
PDCCH-Config ::= SEQUENCE {			
controlResourceSetToAddModList SEQUENCE(SIZE (1..3)) OF ControlResourceSet {	2 entries		
ControlResourceSet[2]	ControlResourceSet	entry 2, BFR	
}			
controlResourceSetToReleaseList	Not present		
searchSpacesToAddModList SEQUENCE(SIZE (1..10)) OF SearchSpace {	2 entries		
SearchSpace[2]	SearchSpace	entry 2, BFR	
}			
searchSpacesToReleaseList	Not present		
downlinkPreemption	Not present		
tpc-PUSCH	Not present		
tpc-PUCCH	Not present		
tpc-SRS	Not present		
}			

Table 4.5.5.2.4.3-5: ControlResourceSet for BFR

Derivation Path: TS 38.501-1 [14],Table 7.3.1-15			
Information Element	**Value/remark**	**Comment**	**Condition**
ControlResourceSet ::= SEQUENCE {			
controlResourceSetId	2		
duration	2		
cce-REG-MappingType CHOICE {			
interleaved ::= SEQUENCE {			
reg-BundleSize	n6		
interleaverSize	n2		
shiftIndex	0		
}			
tci-StatesPDCCH-ToAddList	Not present		
}			

4.5.5.2.5 Test requirements

Tables 4.5.5.2.4.1-3 and 4.5.5.2.5-1 define the primary level settings including test tolerances for EN-DC FR1 SSB-based beam failure detection and link recovery in DRX.

Table 4.5.5.2.5-1: Cell specific test parameters for FR1 PSCell for SSB-based beam failure detection and link recovery testing in DRX mode

Parameter		Unit	Test 1				
			T1	T2	T3	T4	T5
EPRE ratio of PDCCH DMRS to SSS		dB	0				
EPRE ratio of PDCCH to PDCCH DMRS		dB					
EPRE ratio of PBCH DMRS to SSS		dB					
EPRE ratio of PBCH to PBCH DMRS		dB					
EPRE ratio of PSS to SSS		dB					
EPRE ratio of PDSCH DMRS to SSS		dB					
EPRE ratio of PDSCH to PDSCH DMRS		dB					
EPRE ratio of OCNG DMRS to SSS		dB					
EPRE ratio of OCNG to OCNG DMRS		dB					
SNR_SSB of set q_0	Config 1, 4	dB	5.8	-2.2	-12.8	-12.8	-12.8
	Config 2, 5		5.8	-2.2	-12.8	-12.8	-12.8
	Config 3, 6		5.8	-2.2	-12.8	-12.8	-12.8
SNR_SSB of set q1	Config 1, 4	dB	-10.2	-10.2	10.2	10.2	10.2
	Config 2, 5		-10.2	-10.2	10.2	10.2	10.2
	Config 3, 6		-10.2	-10.2	10.2	10.2	10.2
SSB_RP of set q_1	Config 1, 4	dBm/SCS kHz	-108.2	-108.2	−87.8	−87.8	−87.8
	Config 2, 5		-108.2	-108.2	−87.8	−87.8	−87.8
	Config 3, 6		-105.2	-105.2	−84.8	−84.8	−84.8

Parameter		Unit	Test 1				
			T1	T2	T3	T4	T5
N_{oc}	Config 1, 4	dBm/15 kHz	-98				
	Config 2, 5		-98				
	Config 3, 6		-98				
Propagation condition			TDL-C 300ns 100Hz				
NOTE 1: OCNG shall be used such that the resources in Cell 1 are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.							
NOTE 2: The uplink resources for CSI reporting are assigned to the UE prior to the start of time period T1.							
NOTE 3: NZP CSI-RS resource set configuration for CSI reporting are assigned to the UE prior to the start of time period T1.							
NOTE 4: Void							
NOTE 5: The timers and layer 3 filtering related parameters are configured prior to the start of time period T1.							
NOTE 6: The signal contains PDCCH for UEs other than the device under test as part of OCNG.							
NOTE 7: SNR levels correspond to the signal to noise ratio over the SSS REs.							
NOTE 8: The SNR in time periods T1, T2, T3, T4 and T5 is denoted as SNR1, SNR2 and SNR3 respectively in figure 4.5.5.2.4-1.							
NOTE 9: The SNR values are specified for a UE with 2RX antennas connected under test. For a UE with 4RX antennas connected under test, the SNR for RS in set q0 during T3, T4, and T5 from D.4.1.1, is -15dB-TT = -15.8dB (including test tolerances).							

The UE behaviour during time durations T1, T2, T3, T4 and T5 shall be as follows:

During the time duration T1 and T2, the UE shall transmit uplink signal at least in all subframes configured for CSI transmission on Cell 1.

During the period from time point A to time point B the UE shall transmit uplink signal in Cell 1 in all uplink slots configured for CSI transmission according to the configured periodic CSI reporting for Cell 1.

During T3 the UE shall detect beam failure and initiate link recovery. During T4 and T5 the UE measures and evaluate beam candidate from beam candidate set q_1.

No later than time point F occurring no later than D1 = 1930 ms after the start of T5, the UE shall transmit preamble on a beam associated with the candidate beam set q_1. The UE shall not transmit preamble on a beam associated with the candidate beam set q_1 earlier than time point B.

Test is concluded once the test equipment has received the initial preamble transmission from the UE. The rate of correct events observed during repeated tests shall be at least 90%.

4.5.5.3 EN-DC FR1 CSI-RS-based beam failure detection and link recovery in non-DRX

4.5.5.3.1 Test purpose

The purpose of this test is to verify that the UE properly detects CSI-RS-based beam failure in the set q_0 configured for a serving PSCell and that the UE performs correct CSI-RS-based link recovery based on beam candidate set q_1. The purpose is to test the downlink monitoring for beam failure detection within the UEs active DL BWP of the PSCell, during the evaluation period, and link recovery, when no DRX is used. This test will partly verify the CSI-RS based beam failure detection and link recovery for an FR1 serving cell requirements in TS 38.133 [6] clause 8.5.

4.5.5.3.2 Test applicability

This test applies to all types of E-UTRA UE release 15 and forward, supporting EN-DC, CSI-RS based RLM and link recovery.

4.5.5.3.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 4.5.5.0.2.

The normative reference for this requirement is TS 38.133 [6] clause A.4.5.5.3.

4.5.5.3.4 Test description

The test consists of five successive time periods, with time duration of T1, T2, T3, T4 and T5 respectively. Figure 4.5.5.3.4-1 shows the variation of the downlink SNR of the PSCell and the SNR of the CSI-RS in set q_0 in the active PSCell to emulate CSI-RS based beam failure. Figure 4.5.5.3.4-1 additionally shows the variation of the downlink L1-RSRP of the CSI-RS in set q_1 of the candidate beam used for link recovery.

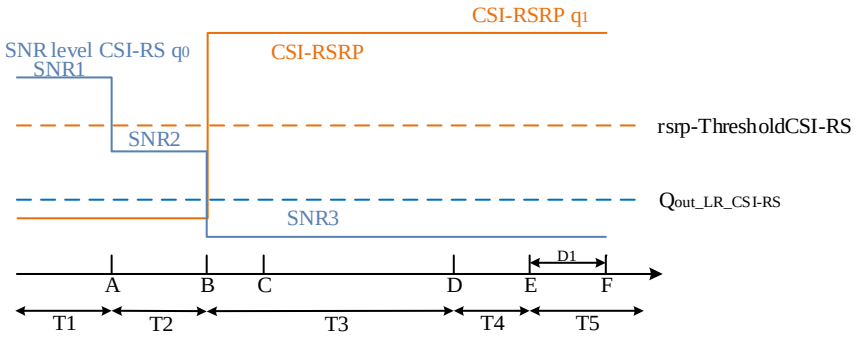


Figure 4.5.5.3.4-1: SNR and L1-RSRP variation for CSI-RS-based beam failure detection and link recovery testing in non-DRX mode

4.5.5.3.4.1 Initial conditions

This test shall be tested using any of the test configurations in Table 4.5.5.3.4.1-1.

Table 4.5.5.3.4.1-1: Supported test configurations for EN-DC FR1 CSI-RS-based beam failure detection and link recovery in non-DRX

Configuration	Description
4.5.5.3-1	LTE FDD, NR 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode
4.5.5.3-2	LTE FDD, NR 15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode
4.5.5.3-3	LTE FDD, NR 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode
4.5.5.3-4	LTE TDD, NR 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode
4.5.5.3-5	LTE TDD, NR 15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode
4.5.5.3-6	LTE TDD, NR 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode
NOTE: The UE is only required to pass in one of the supported test configurations in FR1.	

Configure the test equipment and the DUT according to the parameters in Table 4.5.5.3.4.1-2.

Table 4.5.5.3.4.1-2: Initial conditions for EN-DC FR1 CSI-RS-based beam failure detection and link recovery in non-DRX

Parameter	Value		Comment
Test environment	NC		As specified in TS 38.508-1 [14] clause 4.1.
Test frequencies	As specified in Annex E, table E.2-1 and TS 38.508-1 [14] clause 4.3.1 and 4.4.2.		
Channel bandwidth	As specified by the test configuration selected from Table 4.5.5.3.4.1-1.		
Propagation conditions	AWGN		As specified in clause C.2.2.
Connection Diagram	TE Part	A.3.1.7.1	As specified in TS 38.508-1 [14] Annex A.
	DUT Part	A.3.2.3.4	
Exceptions to connection diagram	For 4Rx capable UEs without any 2Rx RF bands use A.3.2.5.2 for DUT part and A.3.1.8.4 for TE Part		

1. The general test parameter settings are set up according to Table 4.5.5.3.4.1-3.
2. Message contents are defined in clause 4.5.5.3.4.3.

3. Cell 1 is the E-UTRA serving cell (PCell) for the EN-DC setup. The power levels and settings for Cell 1 are set according to Annex A.6. Cell 2 is the NR cell (PSCell) with the power level set according to clauses C.1.2 and C.1.3 for this test

Table 4.5.5.3.4.1-3: General test parameters for FR1 PSCell for CSI-RS-based beam failure detection and link recovery testing in non-DRX mode

Parameter		Unit	Value	Comment
			Test 1	
Active PCell			Cell 1	
RF Channel Number			1	
Active PSCell			Cell 2	
RF Channel Number			2	
Duplex mode	Config 1, 4		FDD	
	Config 2, 3, 5, 6		TDD	
BWchannel	Config 1, 4	MHz	10: NRB,c = 52	
	Config 2, 5		10: NRB,c = 52	
	Config 3, 6		40: NRB,c = 106	
DL initial BWP configuration	Config 1, 2, 3, 4, 5, 6		DLBWP.0.1	
DL dedicated BWP configuration	Config 1, 2, 3, 4, 5, 6		DLBWP.1.1	
UL initial BWP configuration	Config 1, 2, 3, 4, 5, 6		ULBWP.0.1	
UL dedicated BWP configuration	Config 1, 2, 3, 4, 5, 6		ULBWP.1.1	
TDD Configuration	Config 1, 4		Not Applicable	
	Config 2, 5		TDDConf.1.1	
	Config 3, 6		TDDConf.2.1	
CORESET Reference Channel	Config 1, 4		CR.1.1 FDD	
	Config 2, 5		CR.1.1 TDD	
	Config 3, 6		CR.2.1 TDD	
SSB Configuration	Config 1, 4		SSB.3 FR1	
	Config 2, 5		SSB.3 FR1	
	Config 3, 6		SSB.4 FR1	
SMTC Configuration	Config 1, 2, 4, 5		SMTC.1	
	Config 3, 6		SMTC.1	
PDSCH/PDCCH subcarrier spacing	Config 1, 2, 4, 5		15 KHz	
	Config 3, 6		30 KHz	
PRACH Configuration	Config 1, 2, 4, 5		PRACH.4 FR1	
	Config 3, 6		PRACH.4 FR1	
csi-RS-Index assigned as beam failure detection RS in set q_0			0	
OCNG parameters			OP.1	
CP length			Normal	
Correlation Matrix and Antenna Configuration			2x2 Low	
Beam failure detection transmission parameters	DCI format		1-0	
	Number of Control OFDM symbols		2	
	Aggregation level	CCE	8	
	Ratio of hypothetical PDCCH RE energy to average CSI-RS RE energy	dB	0	
	Ratio of hypothetical PDCCH DMRS energy to average CSI-RS RE energy	dB	0	

Parameter		Unit	Value	Comment
			Test 1	
	DMRS precoder granularity		REG bundle size	
	REG bundle size		6	
DRX			OFF	
Gap pattern ID			N.A.	
csi-RS-Index assigned as candidate beam detection RS in set q_1			1	
rlmInSyncOutOfSyncThreshold			absent	When the field is absent, the UE applies the value 0.
rsrp-ThresholdSSB	Config 1, 2, 4, 5	dBm/SCS kHz	-98	Threshold used for $Q_{in_LR_SSB}$
	Config 3, 6	dBm/SCS kHz	-95	Threshold used for $Q_{in_LR_SSB}$
powerControlOffsetSS			db0	Used for deriving rsrp-ThresholdCSI-RS
beamFailureInstanceMaxCount			n1	see TS 38.321 [12], clause 5.17
beamFailureDetectionTimer			pbfd4	see TS 38.321 [12], clause 5.17
CSI-RS configuration for q_0 and q_1	Config 1, 4		CSI-RS.1.2 FDD	
	Config 2, 5		CSI-RS.1.2 TDD	
	Config 3, 6		CSI-RS.2.2 TDD	
CSI-RS configuration for CSI reporting	Config 1, 4		CSI-RS.1.1 FDD	
	Config 2, 5		CSI-RS.1.1 TDD	
	Config 3, 6		CSI-RS.2.1 TDD	
TRS configuration	Config 1, 4		TRS.1.1 FDD	
	Config 2, 5		TRS.1.1 TDD	
	Config 3, 6		TRS.1.2 TDD	
csi-RS-Index assigned as RLM RS	Config 1, 4		CSI-RS.1.2 FDD	
	Config 2, 5		CSI-RS.1.2 TDD	
	Config 3, 6		CSI-RS.2.2 TDD	
T310 Timer		ms	1000	
N310			2	
T1		s	1	During this time the UE shall be fully synchronized to cell 1
T2		s	0.18	
T3		s	0.14	
T4		s	0	
T5		s	0.08	
D1		s	0.04	
NOTE: UE-specific PDCCH is not transmitted after T1 starts.				

4.5.5.3.4.2 Test procedure

Prior to the start of the time duration T1, the UE shall be fully synchronized to cell 1 and cell 2. The UE shall be configured for periodic CSI reporting with a reporting periodicity of 5 ms. In the test, DRX configuration is not enabled.

1. Ensure the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity *EN-DC*, DC bearer MCG and SCG, Connected without release *On* and Test Mode *On* according to TS 38.508-1 [14] clause 4.5.

2. Set the parameters of NR Cell according to T1 in Table 4.5.5.3.5-1. Propagation conditions are set according to clause C.2.3. T1 starts.

3. When T1 expires the SS shall change the SNR value to T2 as specified in Table 4.5.5.3.5-1. T2 starts.

4. When T2 expires the SS shall change the SNR value to T3 as specified in Table 4.5.5.3.5-1. T3 starts.

5. When T3 expires the SS shall change the SNR value to T4 as specified in Table 4.5.5.3.5-1. T4 starts.
6. When T4 expires the SS shall change the SNR value to T5 as specified in Table 4.5.5.3.5-1. T5 starts.
7. If the SS:

   a) detects uplink power on NR carrier equal to or higher than minimum output power defined in TS 38.521-1 [17] clause 6.3.1.5 in each slot configured for CSI transmission (according CSI reporting on PUCCH) during the period from time point A to time point B; and

   b) does not detect preamble on a beam associated with the candidate beam set $q_1$before time point B, and

   c) detects preamble on a beam associated with the candidate beam set q_1 before time point F (D1 after the start of T5), the number of successful tests is increased by one.

   Otherwise the number of failed tests is increased by one.

8. If the iteration or random access procedure for BFD fails, the SS shall first attempt to release and add the PSCell, by ensuring the UE is in state RRC_CONNECTED with generic procedure parameters *Connectivity* EN-DC, DC bearer MCG and SCG, Connected without release *On* and Test Mode *On* according to TS 38.508-1 [6] clause 4.5. If that also fails, then the UE is switched OFF/ON to proceed with the next iteration.
9. Repeat steps 2-8 for all subtests until the confidence level according to Tables G.2.3-1 in Annex G clause G.2 is achieved.

4.5.5.3.4.3 Message contents

Message contents are according to TS 38.508-1 [14] clause 7.3 with the following exceptions.

Table 4.5.5.3.4.3-1: Common Exception messages for EN-DC FR1 CSI-RS-based beam failure detection and link recovery in non-DRX

Default Message Contents	
Common contents of system information blocks exceptions	
Default RRC messages and information elements contents exceptions	Table H.3.1-8 with Condition CSI-RS BFD Table H.3.1-10 with Condition CSI-RS Table H.3.1-10A Table H.3.5-4 Table 7.3.1-3 in TS 38.508-1 [14] with condition SMTC.1

Table 4.5.5.3.4.3-2: PDCCH *Search Space* for BFR

Derivation Path: TS 38.508-1 [14], Table 4.6.3-162			
Information Element	**Value/remark**	**Comment**	**Condition**
SearchSpace ::= SEQUENCE {			
searchSpaceId	4	BFR	
controlResourceSetId	2	BFR	
monitoringSlotPeriodicityAndOffset CHOICE {			
sl1	NULL		
}			
monitoringSymbolsWithinSlot	10000000000000	Symbols 0 and 1	
nrofCandidates SEQUENCE {			
aggregationLevel1	n0		
aggregationLevel2	n0		
aggregationLevel4	n0		
aggregationLevel8	n1	AL8	
aggregationLevel16	n0		
}			
searchSpaceType CHOICE {			
ue-Specific SEQUENCE {			USS
dci-Formats	formats0-0-And-1-0	DCI Format 1_0	
}			
}			

}			

Table 4.5.5.3.4.3-3: *RLF-TimersAndConstants*

Derivation Path: TS 38.508-1 [14], Table 4.6.3-150			
Information Element	**Value/remark**	**Comment**	**Condition**
RLF-TimersAndConstants ::= SEQUENCE {			
n310	n2		
}			

Table 4.5.5.3.4.3-4: *NZP-CSI-RS-Resource*

Derivation Path: TS 38.508-1 [14], Table 4.6.3-85			
Information Element	**Value/remark**	**Comment**	**Condition**
NZP-CSI-RS-Resource ::= SEQUENCE {			
powerControlOffsetSS	db0		
}			

Table 4.5.5.3.4.3-4: *PDCCH-Config*

Derivation Path: TS 38.501-1 [14],Table 4.6.3-95			
Information Element	**Value/remark**	**Comment**	**Condition**
PDCCH-Config ::= SEQUENCE {			
controlResourceSetToAddModList SEQUENCE(SIZE (1..3)) OF ControlResourceSet {	2 entries		
ControlResourceSet[2]	ControlResourceSet	entry 2, BFR	
}			
controlResourceSetToReleaseList	Not present		
searchSpacesToAddModList SEQUENCE(SIZE (1..10)) OF SearchSpace {	2 entries		
SearchSpace[2]	SearchSpace	entry 2, BFR	
}			
searchSpacesToReleaseList	Not present		
downlinkPreemption	Not present		
tpc-PUSCH	Not present		
tpc-PUCCH	Not present		
tpc-SRS	Not present		
}			

Table 4.5.5.3.4.3-5: ControlResourceSet for BFR

Derivation Path: TS 38.501-1 [14],Table 7.3.1-15			
Information Element	**Value/remark**	**Comment**	**Condition**
ControlResourceSet ::= SEQUENCE {			
controlResourceSetId	2		
duration	2		
cce-REG-MappingType CHOICE {			
interleaved ::= SEQUENCE {			
reg-BundleSize	n6		
interleaverSize	n2		
shiftIndex	0		
}			
tci-StatesPDCCH-ToAddList	Not present		
}			

4.5.5.3.5 Test requirements

Tables 4.5.5.3.4.1-3 and 4.5.5.3.5-1 define the primary level settings including test tolerances for EN-DC FR1 CSI-RS-based beam failure detection and link recovery in non-DRX.

Table 4.5.5.3.5-1: Cell specific test parameters for FR1 PSCell for CSI-RS-based beam failure detection and link recovery testing in non-DRX mode

Parameter		Unit	Test 1				
			T1	T2	T3	T4	T5
EPRE ratio of PDCCH DMRS to SSS		dB	0				
EPRE ratio of PDCCH to PDCCH DMRS		dB					
EPRE ratio of PBCH DMRS to SSS		dB					
EPRE ratio of PBCH to PBCH DMRS		dB					
EPRE ratio of PSS to SSS		dB					
EPRE ratio of PDSCH DMRS to SSS		dB					
EPRE ratio of PDSCH to PDSCH DMRS		dB					
EPRE ratio of OCNG DMRS to SSS		dB					
EPRE ratio of OCNG to OCNG DMRS		dB					
SNR_CSI-RS of set q0	Config 1, 4	dB	5.8	-2.2	-12.8	-12.8	-12.8
	Config 2, 5		5.8	-2.2	-12.8	-12.8	-12.8
	Config 3, 6		5.8	-2.2	-12.8	-12.8	-12.8
SNR_CSI-RS of set q1	Config 1, 4	dB	-10.2	-10.2	10.2	10.2	10.2
	Config 2, 5		-10.2	-10.2	10.2	10.2	10.2
	Config 3, 6		-10.2	-10.2	10.2	10.2	10.2
CSI-RS_RP of set q_1	Config 1, 4	dBm/SCS kHz	-108.2	-108.2	−87.8	−87.8	−87.8
	Config 2, 5		-108.2	-108.2	−87.8	−87.8	−87.8
	Config 3, 6		-105.2	-105.2	−84.8	−84.8	−84.8
N_{oc}	Config 1, 4	dBm/15 kHz	-98				
	Config 2, 5		-98				
	Config 3, 6		-98				
Propagation condition			TDL-C 300ns 100Hz				

NOTE 1: OCNG shall be used such that the resources in Cell 1 are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.
NOTE 2: The uplink resources for CSI reporting are assigned to the UE prior to the start of time period T1.
NOTE 3: NZP CSI-RS resource set configuration for CSI reporting are assigned to the UE prior to the start of time period T1.
NOTE 4: Void.
NOTE 5: The timers and layer 3 filtering related parameters are configured prior to the start of time period T1.
NOTE 6: The signal contains PDCCH for UEs other than the device under test as part of OCNG.
NOTE 7: SNR levels correspond to the signal to noise ratio over the REs carrying CSI-RS.
NOTE 8: The SNR in time periods T1, T2, T3, T4 and T5 is denoted as SNR1, SNR2 and SNR3 respectively in figure 4.5.5.3.4-1.
NOTE 9: The SNR values are specified for a UE with 2RX antennas connected under test. For a UE with 4RX antennas connected under test, the SNR for RS in set q0 during T3, T4, and T5 from D.4.1.1, is -15dB-TT = -15.8dB (including test tolerances).

The UE behaviour during time durations T1, T2, T3, T4 and T5 shall be as follows:

During the time duration T1 and T2, the UE shall transmit uplink signal at least in all subframes configured for CSI transmission on Cell 1.

During the period from time point A to time point B the UE shall transmit uplink signal in Cell 1 in all uplink slots configured for CSI transmission according to the configured periodic CSI reporting for Cell 1.

During T3 the UE shall detect beam failure and initiate link recovery. During T4 and T5 the UE measures and evaluate beam candidate from beam candidate set q_1.

No later than time point F occurring no later than D1 = 40 ms after the start of T5, the UE shall transmit preamble on a beam associated with the candidate beam set q_1. The UE shall not transmit preamble on a beam associated with the candidate beam set q_1 earlier than time point B.

Test is concluded once the test equipment has received the initial preamble transmission from the UE. The rate of correct events observed during repeated tests shall be at least 90%.

4.5.5.4 EN-DC FR1 CSI-RS-based beam failure detection and link recovery in DRX

4.5.5.4.1 Test purpose

The purpose of this test is to verify that the UE properly detects CSI-RS-based beam failure in the set q_0 configured for a serving PSCell and that the UE performs correct CSI-RS-based link recovery based on beam candicate set q_1. The purpose is to test the downlink monitoring for beam failure detection within the UEs active DL BWP of the PSCell, during the evaluation period, and link recovery, when DRX is used. This test will partly verify the CSI-RS based beam failure detection and link recovery for an FR1 serving cell requirements in TS 38.133 [6] clause 8.5.

4.5.5.4.2 Test applicability

This test applies to all types of E-UTRA UE release 15 and forward supporting EN-DC FR1, CSI-RS based RLM, link recovery and long DRX cycle.

4.5.5.4.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 4.5.5.0.2.

The normative reference for this requirement is TS 38.133 [6] clause A.4.5.5.4.

4.5.5.4.4 Test description

The test consists of five successive time periods, with time duration of T1, T2, T3, T4 and T5 respectively. Figure 4.5.5.4.4-1 shows the variation of the downlink SNR of the PSCell and the SNR of the CSI-RS in set q_0 in the active PSCell to emulate CSI-RS based beam failure. Figure 4.5.5.4.4-1 additionally shows the variation of the downlink L1-RSRP of the CSI-RS in set q_1 of the candidate beam used for link recovery.

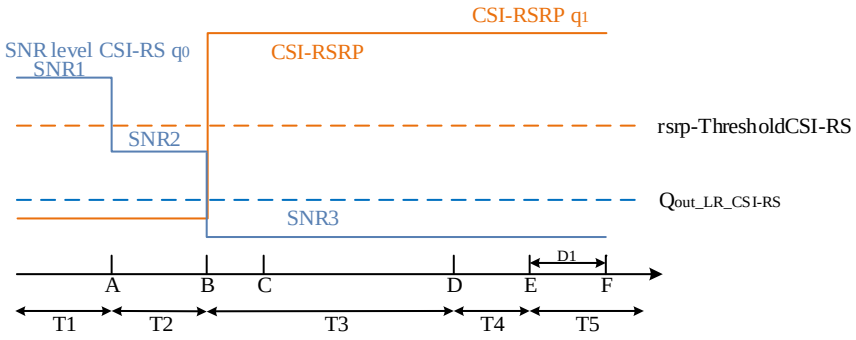


Figure 4.5.5.4.4-1: SNR and L1-RSRP variation for EN-DC FR1 CSI-RS-based beam failure detection and link recovery in DRX

4.5.5.4.4.1 Initial conditions

This test shall be tested using any of the test configurations in Table 4.5.5.4.4.1-1.

Table 4.5.5.4.4.1-1: Supported test configurations for EN-DC FR1 CSI-RS-based beam failure detection and link recovery in DRX

Configuration	Description
4.5.5.4-1	LTE FDD, NR 15 kHz SSB SCS, 10MHz bandwidth, FDD duplex mode
4.5.5.4-2	LTE FDD, NR 15 kHz SSB SCS, 10MHz bandwidth, TDD duplex mode
4.5.5.4-3	LTE FDD, NR 30 kHz SSB SCS, 40MHz bandwidth, TDD duplex mode
4.5.5.4-4	LTE TDD, NR 15 kHz SSB SCS, 10MHz bandwidth, FDD duplex mode
4.5.5.4-5	LTE TDD, NR 15 kHz SSB SCS, 10MHz bandwidth, TDD duplex mode
4.5.5.4-6	LTE TDD, NR 30kHz SSB SCS, 40MHz bandwidth, TDD duplex mode
NOTE: The UE is only required to pass in one of the supported test configurations in FR1	

Configure the test equipment and the DUT according to the parameters in Table 4.5.5.4.4.1-2.

Table 4.5.5.4.4.1-2: Initial conditions for EN-DC FR1 CSI-RS-based beam failure detection and link recovery in DRX

Parameter	Value		Comment
Test environment	NC		As specified in TS 38.508-1 [14] clause 4.1.
Test frequencies	As specified in Annex E, table E.2-1 and TS 38.508-1 [14] clause 4.3.1 and 4.4.2.		
Channel bandwidth	As specified by the test configuration selected from Table 4.5.5.4.4.1-1.		
Propagation conditions	AWGN		As specified in clause C.2.2.
Connection Diagram	TE Part	A.3.1.7.1	As specified in TS 38.508-1 [14] Annex A.
	DUT Part	A.3.2.3.4	
Exceptions to connection diagram	For 4Rx capable UEs without any 2Rx RF bands use A.3.2.5.2 for DUT part and A.3.1.8.4 for TE Part		

1. The general test parameter settings are set up according to Table 4.5.5.4.4.1-3.
2. Message contents are defined in clause 4.5.5.4.4.3.
3. There are two cells in the test, where Cell 1 is the E-UTRAN PCell on the E-UTRA carrier, and Cell 2 is the NR PSCell on the NR carrier. Cell 1 is the cell used for connection setup with the power level set according to Table A.6.1.1-1, Cell 2 is configured according to clauses C.1.2 and C.1.3.

Table 4.5.5.4.4.1-3: General test parameters for EN-DC FR1 CSI-RS-based beam failure detection and link recovery in DRX

Parameter		Unit	Value	Comment
			Test 1	
Active PCell			Cell 1	
RF Channel Number			1	
Active PSCell			Cell 2	
RF Channel Number			2	
Duplex mode	Config 1, 4		FDD	
	Config 2, 3, 5, 6		TDD	
BWchannel	Config 1, 4	MHz	10: NRB,c = 52	
	Config 2, 5		10: NRB,c = 52	
	Config 3, 6		40: NRB,c = 106	
DL initial BWP configuration	Config 1, 2, 3, 4, 5, 6		DLBWP.0.1	
DL dedicated BWP configuration	Config 1, 2, 3, 4, 5, 6		DLBWP.1.1	
UL initial BWP configuration	Config 1, 2, 3, 4, 5, 6		ULBWP.0.1	
UL dedicated BWP configuration	Config 1, 2, 3, 4, 5, 6		ULBWP.1.1	
TDD Configuration	Config 1, 4		Not Applicable	
	Config 2, 5		TDDConf.1.1	
	Config 3, 6		TDDConf.2.1	
CORESET Reference Channel	Config 1, 4		CR.1.1 FDD	
	Config 2, 5		CR.1.1 TDD	
	Config 3, 6		CR.2.1 TDD	
SSB Configuration	Config 1, 4		SSB.3 FR1	
	Config 2, 5		SSB.3 FR1	
	Config 3, 6		SSB.4 FR1	
SMTC Configuration	Config 1, 2, 4, 5		SMTC.1	
	Config 3, 6		SMTC.1	
PDSCH/PDCCH subcarrier spacing	Config 1, 2, 4, 5		15 KHz	
	Config 3, 6		30 KHz	
PRACH Configuration	Config 1, 2, 4, 5		PRACH.4 FR1	
	Config 3, 6		PRACH.4 FR1	

Parameter		Unit	Value	Comment
			Test 1	
csi-RS-Index assigned as beam failure detection RS in set q_0			0	
OCNG parameters			OP.1	
CP length			Normal	
Correlation Matrix and Antenna Configuration			2x2 Low	
Beam failure detection transmission parameters	DCI format		1-0	
	Number of Control OFDM symbols		2	
	Aggregation level	CCE	8	
	Ratio of hypothetical PDCCH RE energy to average CSI-RS RE energy	dB	0	
	Ratio of hypothetical PDCCH DMRS energy to average CSI-RS RE energy	dB	0	
	DMRS precoder granularity		REG bundle size	
	REG bundle size		6	
DRX			DRX.7	
Gap pattern ID			N.A.	
csi-RS-Index assigned as candidate beam detection RS in set q_1			1	
rlmInSyncOutOfSyncThreshold			absent	When the field is absent, the UE applies the value 0.
rsrp-ThresholdSSB	Config 1, 2, 4, 5	dBm/SCS kHz	-98	Threshold used for $Q_{in_LR_SSB}$
	Config 3, 6	dBm/SCS kHz	-95	Threshold used for $Q_{in_LR_SSB}$
powerControlOffsetSS			db0	Used for deriving rsrp-ThresholdCSI-RS
beamFailureInstanceMaxCount			n1	see TS 38.321 [12], clause 5.17
beamFailureDetectionTimer			pbfd4	see TS 38.321 [12], clause 5.17
CSI-RS configuration for q_0 and q_1	Config 1, 4		CSI-RS.1.2 FDD	
	Config 2, 5		CSI-RS.1.2 TDD	
	Config 3, 6		CSI-RS.2.2 TDD	
CSI-RS configuration for CSI reporting	Config 1, 4		CSI-RS.1.1 FDD	
	Config 2, 5		CSI-RS.1.1 TDD	
	Config 3, 6		CSI-RS.2.1 TDD	
TRS configuration	Config 1, 4		TRS.1.1 FDD	
	Config 2, 5		TRS.1.1 TDD	
	Config 3, 6		TRS.1.2 TDD	
csi-RS-Index assigned as RLM RS	Config 1, 4		CSI-RS.1.2 FDD	
	Config 2, 5		CSI-RS.1.2 TDD	

Parameter		Unit	Value	Comment
			Test 1	
	Config 3, 6		CSI-RS.2.2 TDD	
T310 Timer		ms	1000	
N310			2	
T1		s	1	During this time the UE shall be fully synchronized to cell 1
T2		s	8.37	
T3		s	6.44	
T4		s	0	
T5		s	1.97	
D1		s	1.93	
NOTE: UE-specific PDCCH is not transmitted after T1 starts.				

Table 4.5.5.4.4.1-4: Void

Table 4.5.5.4.4.1-5: Void

Table 4.5.5.4.4.1-6: Void

4.5.5.4.4.2 Test procedure

Prior to the start of the time duration T1, the UE shall be fully synchronized to Cell 1 and Cell 2. The UE shall be configured for periodic CSI reporting with a reporting periodicity of 5 ms. In the test, DRX configuration is enabled in PSCell and DRX inactivity timer has already been expired, i.e. UE tries to decode PDCCH and to send periodic CQI during the period when On-duration timer is running. Time alignment timers shall be set to “infinity” so that UL timing alignment is maintained during the test.

1. Ensure the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity EN-DC, DC bearer MCG and SCG, Connected without release *On* and Test Mode *On* according to TS 38.508-1 [14] clause 4.5.

2. Set the parameters of FR1 PSCell according to T1 in Table 4.5.5.4.5-1. Propagation conditions are set according to Annex C.2.3. T1 starts.

3. When T1 expires the SS shall change the SNR value to T2 as specified in Table 4.5.5.4.5-1. T2 starts.

4. When T2 expires the SS shall change the SNR value to T3 as specified in Table 4.5.5.4.5-1. T3 starts.

5. When T3 expires the SS shall change the SNR value to T4 as specified in Table 4.5.5.4.5-1. T4 starts.

6. When T4 expires the SS shall change the SNR value to T5 as specified in Table 4.5.5.4.5-1. T5 starts.

7. If the SS:

   a) detects uplink power on NR carrier equal to or higher than minimum output power defined in TS 38.521-1 [17] clause 6.3.1.5 in each slot configured for CSI transmission (according CSI reporting on PUCCH) during the period from time point A to time point B

   and

   b) does not detect preamble on a beam associated with the candidate beam set $q_1$before time point B

   and

   c) detects preamble on a beam associated with the candidate beam set q_1 before time point F (D1 after the start of T5),

   the number of successful tests is increased by one.

   Otherwise the number of failed tests is increased by one.

8. If the iteration or random access procedure for BFD fails, the SS shall first attempt to release and add the PSCell, by ensuring the UE is in state RRC_CONNECTED with generic procedure parameters *Connectivity* EN-DC, DC bearer MCG and SCG, Connected without release *On* and Test Mode *On* according to TS 38.508-1 [6] clause 4.5. If that also fails, then the UE is switched OFF/ON to proceed with the next iteration.

9. Repeat steps 2-8 for all subtests until the confidence level according to Tables G.2.3-1 in Annex G clause G.2 is achieved.

4.5.5.4.4.3 Message contents

Message contents are according to TS 38.508-1 [14] clause 7.3 with the following exceptions:

Table 4.5.5.4.4.3-1: Common Exception messages for EN-DC FR1 CSI-RS-based beam failure detection and link recovery in DRX

Default Message Contents	
Common contents of system information blocks exceptions	
Default RRC messages and information elements contents exceptions	Table H.3.1-8 with Condition CSI-RS BFD Table H.3.1-10 with Condition CSI-RS Table H.3.1-10A Table H.3.5-4 Table H.3.7-1 with Condition DRX.7 Table 7.3.1-3 in TS 38.508-1 [14] with condition SMTC.1

Table 4.5.5.4.4.3-2: PDCCH *Search Space* for BFR

Derivation Path: TS 38.508-1 [14], Table 4.6.3-162			
Information Element	**Value/remark**	**Comment**	**Condition**
SearchSpace ::= SEQUENCE {			
searchSpaceId	3	BFR	
controlResourceSetId	2	BFR	
monitoringSlotPeriodicityAndOffset CHOICE {			
sl1	NULL		
}			
monitoringSymbolsWithinSlot	10000000000000	Symbols 0 and 1	
nrofCandidates SEQUENCE {			
aggregationLevel1	n0		
aggregationLevel2	n0		
aggregationLevel4	n0		
aggregationLevel8	n1	AL8	
aggregationLevel16	n0		
}			
searchSpaceType CHOICE {			
ue-Specific SEQUENCE {			USS
dci-Formats	formats0-0-And-1-0	DCI Format 1_0	
}			
}			
}			

Table 4.5.5.4.4.3-3: *RLF-TimersAndConstants*

Derivation Path: TS 38.508-1 [14], Table 4.6.3-150			
Information Element	**Value/remark**	**Comment**	**Condition**
RLF-TimersAndConstants ::= SEQUENCE {			
n310	n2		
}			

Table 4.5.5.4.4.3-4: *NZP-CSI-RS-Resource*

Derivation Path: TS 38.508-1 [14], Table 4.6.3-85

Information Element	Value/remark	Comment	Condition
NZP-CSI-RS-Resource ::= SEQUENCE {			
powerControlOffsetSS	db0		
}			

Table 4.5.5.4.4.3-5: *PDCCH-Config*

Derivation Path: TS 38.501-1 [14],Table 4.6.3-95			
Information Element	**Value/remark**	**Comment**	**Condition**
PDCCH-Config ::= SEQUENCE {			
controlResourceSetToAddModList SEQUENCE(SIZE (1..3)) OF ControlResourceSet {	2 entries		
ControlResourceSet[2]	ControlResourceSet	entry 2, BFR	
}			
controlResourceSetToReleaseList	Not present		
searchSpacesToAddModList SEQUENCE(SIZE (1..10)) OF SearchSpace {	2 entries		
SearchSpace[2]	SearchSpace	entry 2, BFR	
}			
searchSpacesToReleaseList	Not present		
downlinkPreemption	Not present		
tpc-PUSCH	Not present		
tpc-PUCCH	Not present		
tpc-SRS	Not present		
}			

Table 6.5.5.4.4.3-6: ControlResourceSet for BFR

Derivation Path: TS 38.501-1 [14],Table 7.3.1-15			
Information Element	**Value/remark**	**Comment**	**Condition**
ControlResourceSet ::= SEQUENCE {			
controlResourceSetId	2		
duration	2		
cce-REG-MappingType CHOICE {			
interleaved ::= SEQUENCE {			
reg-BundleSize	n6		
interleaverSize	n2		
shiftIndex	0		
}			
tci-StatesPDCCH-ToAddList	Not present		
}			

4.5.5.4.5 Test requirement

Tables 4.5.5.4.4.1-3 and 4.5.5.4.5-1 define the primary level settings including test tolerances for EN-DC FR1 CSI-RS-based beam failure detection and link recovery in DRX.

Table 4.5.5.4.5-1: Cell specific test parameters for EN-DC FR1 CSI-RS-based beam failure detection and link recovery in DRX

Parameter	Unit	Test 1				
		T1	T2	T3	T4	T5
EPRE ratio of PDCCH DMRS to SSS	dB	0				
EPRE ratio of PDCCH to PDCCH DMRS	dB					
EPRE ratio of PBCH DMRS to SSS	dB					
EPRE ratio of PBCH to PBCH DMRS	dB					
EPRE ratio of PSS to SSS	dB					
EPRE ratio of PDSCH DMRS to SSS	dB					
EPRE ratio of PDSCH to PDSCH DMRS	dB					
EPRE ratio of OCNG DMRS to SSS	dB					

EPRE ratio of OCNG to OCNG DMRS		dB					
SNR_CSI-RS of set q0	Config 1, 4	dB	5.8	-2.2	-12.8	-12.8	-12.8
	Config 2, 5		5.8	-2.2	-12.8	-12.8	-12.8
	Config 3, 6		5.8	-2.2	-12.8	-12.8	-12.8
SNR_CSI-RS of set q1	Config 1, 4	dB	-10.2	-10.2	10.2	10.2	10.2
	Config 2, 5		-10.2	-10.2	10.2	10.2	10.2
	Config 3, 6		-10.2	-10.2	10.2	10.2	10.2
CSI-RS_RP of set q_1	Config 1, 4	dBm/SCS kHz	-108.2	-108.2	−87.8	−87.8	−87.8
	Config 2, 5		-108.2	-108.2	−87.8	−87.8	−87.8
	Config 3, 6		-105.2	-105.2	−84.8	−84.8	−84.8
N_{oc}	Config 1, 4	dBm/15 kHz	-98				
	Config 2, 5		-98				
	Config 3, 6		-98				
Propagation condition			TDL-C 300ns 100Hz				

Note 1: OCNG shall be used such that the resources in Cell 1 are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.
Note 2: The uplink resources for CSI reporting are assigned to the UE prior to the start of time period T1.
Note 3: NZP CSI-RS resource set configuration for CSI reporting are assigned to the UE prior to the start of time period T1.
Note 4: Void.
Note 5: The timers and layer 3 filtering related parameters are configured prior to the start of time period T1.
Note 6: The signal contains PDCCH for UEs other than the device under test as part of OCNG.
Note 7: SNR levels correspond to the signal to noise ratio over the REs carrying CSI-RS.
Note 8: The SNR in time periods T1, T2, T3, T4 and T5 is denoted as SNR1, SNR2 and SNR3 respectively in figure 4.5.5.3.4-1.
Note 9: The SNR values are specified for a UE with 2RX antennas connected under test. For a UE with 4RX antennas connected under test, the SNR for RS in set q0 during T3, T4, and T5 from D.4.1.1, is -15dB-TT = -15.8dB (including test tolerances).

The UE behaviour during time durations T1, T2, T3, T4 and T5 shall be as follows:

During the time duration T1 and T2, the UE shall transmit uplink signal at least in all subframes configured for CSI transmission on Cell 1.

During the period from time point A to time point B the UE shall transmit uplink signal in Cell 1 in all uplink slots configured for CSI transmission according to the configured periodic CSI reporting for Cell 1.

During T3 the UE shall detect beam failure and initiate link recovery. During T4 and T5 the UE measures and evaluate beam candidate from beam candidate set q_1.

No later than time point F occurring no later than D1 = 1930 ms after the start of T5, the UE shall transmit preamble on a beam associated with the candidate beam set q_1. The UE shall not transmit preamble on a beam associated with the candidate beam set q_1 earlier than time point B.

Test is concluded once the test equipment has received the initial preamble transmission from the UE. The rate of correct events observed during repeated tests shall be at least 90%.

4.5.5.5 EN-DC FR1 Scell CSI-RS-based beam failure detection and SSB-based link recovery in non-DRX

4.5.5.5.1 Test purpose

The purpose of this test is to verify that the UE properly detects CSI-RS-based beam failure in the set q_0 configured for a serving SCell and that the UE performs correct SSB-based link recovery based on beam candidate set q_1. The purpose is to test the downlink monitoring for beam failure detection within the UEs active DL BWP of the SCell without *schedulingRequestID-BFR-SCell-r16* configuration, during the evaluation period, and link recovery, when no DRX is used. This test will partly verify the beam failure detection and link recovery for an FR1 serving cell requirements in TS 38.133 [6] clause 8.5.

4.5.5.5.2 Test applicability

This test applies to all types of E-UTRA UE release 16 and forward supporting EN-DC FR1, CSI-RS based RLM, and SSB link recovery.

4.5.5.5.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 4.5.5.0.2.

The normative reference for this requirement is TS 38.133 [6] clause A.4.5.5.4.

4.5.5.5.4 Test description

The test consists of five successive time periods, with time duration of T1, T2, T3, T4 and T5 respectively. Figure 4.5.5.5.4-1 shows the SNR of the CSI-RS in set q_0 in the active SCell to emulate beam failure. Figure 4.5.5.5.4-1 additionally shows the variation of the downlink L1-RSRP of the SSB in set q_1 of the candidate beam used for link recovery.

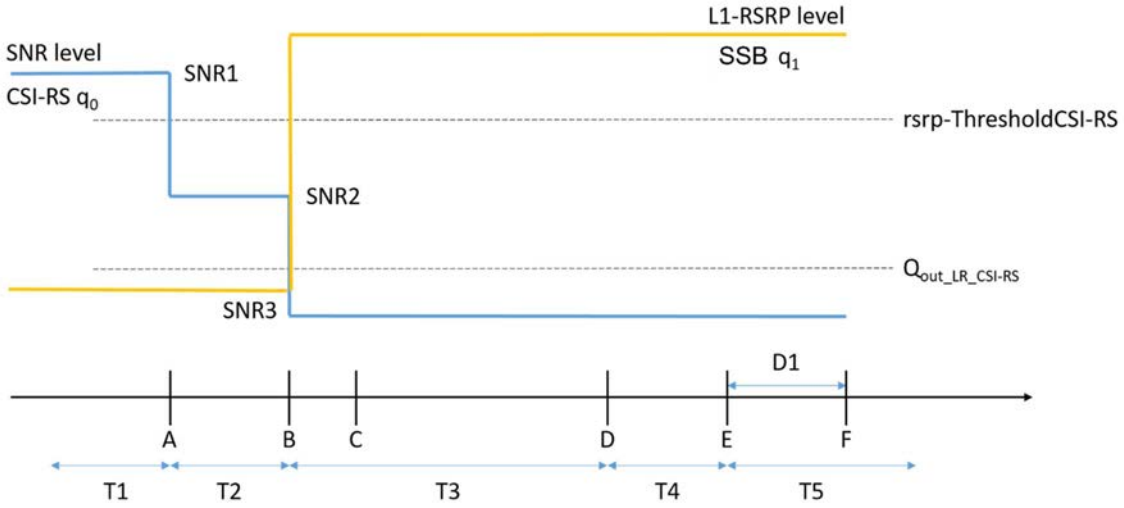


Figure 4.5.5.5.4-1: SNR and L1-RSRP variation for EN-DC FR1 CSI-RS-based beam failure detection and link recovery in DRX

4.5.5.5.4.1 Initial conditions

This test shall be tested using any of the test configurations in Table 4.5.5.4.4.1-1.

Table 4.5.5.5.4.1-1: Supported test configurations for EN-DC FR1 Scell CSI-RS-based beam failure detection and link recovery in DRX

Configuration	Description
4.5.5.5-1	LTE FDD, NR 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode
4.5.5.5-2	LTE FDD, NR 15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode
4.5.5.5-3	LTE FDD, NR 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode
4.5.5.5-4	LTE TDD, NR 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode
4.5.5.5-5	LTE TDD, NR 15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode
4.5.5.5-6	LTE TDD, NR 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode
Note: The UE is only required to pass in one of the supported test configurations in FR1	

Configure the test equipment and the DUT according to the parameters in Table 4.5.5.5.4.1-2.

Table 4.5.5.5.4.1-2: Initial conditions for EN-DC FR1 Scell CSI-RS-based beam failure detection and link recovery in DRX

Parameter	Value	Comment
Test environment	NC	As specified in TS 38.508-1 [14] clause 4.1.
Test frequencies	As specified in Annex E, table E.2-1 and TS 38.508-1 [14] clause 4.3.1 and 4.4.2.	

Channel bandwidth	As specified by the test configuration selected from Table 4.5.5.5.4.1-1.		
Propagation conditions	AWGN		As specified in Annex C.2.2.
Connection Diagram	TE Part	A.3.1.7.1	As specified in TS 38.508-1 [14] Annex A.
	DUT Part	A.3.2.3.4	
Exceptions to connection diagram	For 4Rx capable UEs without any 2Rx RF bands use A.3.2.5.2 for DUT part and A.3.1.8.4 for TE Part		

1. The general test parameter settings are set up according to Table 4.5.5.5.4.1-3.

2. Message contents are defined in clause 4.5.5.5.4.3.

3. Cell 1 is the E-UTRA serving cell (PCell) for the EN-DC setup. The power levels and settings for Cell 1 are set according to Annex A.6. Cell 2 is the NR cell (PSCell) and Cell 3 is the NR cell (SCell) with the power level set according to Annex C.1.2 and C.1.3 for this test

Table 4.5.5.5.4.1-3: General test parameters for EN-DC FR1 CSI-RS-based beam failure detection and link recovery in DRX

Parameter		Unit	Value	Comment
			Test 1	
Active PCell			Cell 1	
E-UTRA RF Channel Number			1	
Active PSCell			Cell 2	
RF Channel Number for PSCell			2	
Active SCell			Cell 3	
RF Channel Number for SCell			3	
Duplex mode	Config 1, 4		FDD	
	Config 2, 3, 5, 6		TDD	
BW channel	Config 1, 4	MHz	10: NRB,c = 52	
	Config 2, 5		10: NRB,c = 52	
	Config 3, 6		40: NRB,c = 106	
DL initial BWP configuration	Config 1, 2, 3, 4, 5, 6		DLBWP.0.1	
DL dedicated BWP configuration	Config 1, 2, 3, 4, 5, 6		DLBWP.1.1	
UL initial BWP configuration	Config 1, 2, 3, 4, 5, 6		ULBWP.0.1	
UL dedicated BWP configuration	Config 1, 2, 3, 4, 5, 6		ULBWP.1.1	
TDD Configuration	Config 1, 4		Not Applicable	
	Config 2, 5		TDDConf.1.1	
	Config 3, 6		TDDConf.2.1	
CORESET Reference Channel	Config 1, 4		CR.1.1 FDD	A. 1.2
	Config 2, 5		CR.1.1 TDD	
	Config 3, 6		CR.2.1 TDD	
SSB Configuration	Config 1, 4		SSB.1 FR1	A.3
	Config 2, 5		SSB.1 FR1	
	Config 3, 6		SSB.2 FR1	
SMTC Configuration	Config 1, 2, 3, 4, 5, 6		SMTC.1	A.4
PDSCH/PDCCH	Config 1, 2, 4, 5	kHz	15	

subcarrier spacing	Config 3, 6		30	
PRACH Configuration	Config 1, 2, 4, 5		PRACH.2 FR1	Table A.7.1-1
	Config 3, 6		PRACH.2 FR1	Table A.7.1-1
csi-RS-Index assigned as beam failure detection RS in set q_0 in activated SCell			0	
OCNG parameters			OP.1	A.2.1
CP length			Normal	
Correlation Matrix and Antenna Configuration			2x2 Low	
Beam failure detection transmission parameters	DCI format		1-0	
	Number of Control OFDM symbols		2	
	Aggregation level	CCE	8	
	Ratio of hypothetical PDCCH RE energy to average CSI-RS RE energy	dB	0	
	Ratio of hypothetical PDCCH DMRS energy to average CSI-RS RE energy	dB	0	
	DMRS precoder granularity		REG bundle size	
	REG bundle size		6	
DRX			OFF	
Gap pattern ID			N.A.	
schedulingRequestID-BFR-SCell-r16			absent	When the field is absent, the random access procedure will be triggered for SCell BFR
SSB Index assigned as CBD RS (q1) in activated SCell			0	
rlmInSyncOutOfSyncThreshold			absent	When the field is absent, the UE applies the value 0. (TS 38.133 [6] Table 8.1.1-1).
rsrp-ThresholdBFRSSB	Config 1, 2, 4, 5	dBm/SCS kHz	-98	Threshold used for $Q_{in_LR_SSB}$
	Config 3, 6		-95	
powerControlOffsetSS			db0	Used for deriving rsrp-ThresholdCSI-RS
beamFailureInstanceMaxCount			n1	see TS 38.321 [7], clause 5.17
beamFailureDetectionTimer			pbfd4	see TS 38.321 [7], clause 5.17
CSI-RS configuration for q_0 in activated SCell	Config 1, 4		CSI-RS.1.2 FDD	A.1.4
	Config 2, 5		CSI-RS.1.2 TDD	
	Config 3, 6		CSI-RS.2.2 TDD	
CSI-RS configuration for CSI reporting	Config 1, 4		CSI-RS.1.1 FDD	A.1.4
	Config 2, 5		CSI-RS.1.1 TDD	
	Config 3, 6		CSI-RS.2.1 TDD	
TRS configuration	Config 1, 4		TRS.1.1 FDD	
	Config 2, 5		TRS.1.1 TDD	

	Config 3, 6		TRS.1.2 TDD	
csi-RS-Index assigned as RLM RS in PSCell	Config 1, 4		CSI-RS.1.2 FDD	A.1.4
	Config 2, 5		CSI-RS.1.2 TDD	
	Config 3, 6		CSI-RS.2.2 TDD	
T310 Timer		ms	1000	
N310			2	
T1		s	1	During this time the UE shall be fully synchronized to cell 1
T2		s	0.18	
T3		s	0.14	
T4		s	0	
T5		s	0.17	
D1		s	0.13	
Note 1: UE-specific PDCCH is not transmitted after T1 starts.				

4.5.5.5.4.2 Test procedure

Same test procedure as described in section 4.5.5.3.4.2, except following exception and steps 7 and 8:

Prior to the start of the time duration T1, the UE shall be fully synchronized to cell 1, cell 2 and cell 3. The UE shall be configured for periodic CSI reporting with a reporting periodicity of 5 ms. In the test, DRX configuration is not enabled.

7. If the SS:

   a) detects uplink power on the PCell equal to or higher than minimum output power defined in TS 38.521-1 [17] clause 6.3.1.5 in each slot configured for CSI transmission (according CSI reporting on PUCCH) during the period from time point A to time point B

   and

   b) does not detect preamble on the PCell before time point B

   and

   c) detects preamble on the preconfigured PRACH resource before time point F (D1 after the start of T5).

   And

   d) SS transmits a RAR to UE after receiving the preamble transmitted by the UE. SS detects the MAC-CE on the PCell transmitted by the UE providing the index for the activated SCell, and the index for the SSB provided by higher layer.

   the number of successful tests is increased by one.

Otherwise the number of failed tests is increased by one.

8. If the iteration or random access procedure for BFD fails, the SS shall first attempt to release and add the FR1 SCell, by ensuring the UE is in state RRC_CONNECTED with generic procedure parameters *Connectivity* EN-DC, DC bearer MCG and SCG, Connected without release *On* and Test Mode *On* according to TS 38.508-1 [6] clause 4.5. If that also fails, then the UE is switched OFF/ON to proceed with the next iteration.

4.5.5.5.4.3 Message contents

Same message contents as described in section 4.5.5.3.4.3 with following exceptions:

Table 4.5.5.5.4.3-1: Common Exception messages for EN-DC FR1 CSI-RS-based beam failure detection and link recovery in non-DRX

Default Message Contents	
Common contents of system information blocks exceptions	
Default RRC messages and information elements contents exceptions	Table H.3.1-10 with Condition SSB CBD

4.5.5.5.5 Test requirements

Table 4.5.5.5.5-1: Cell specific test parameters for FR1 PSCell and SCell for beam failure detection and link recovery testing in non-DRX mode

Parameter		Unit	Cell2	Test 1 Cell3				
			T1 to T5	T1	T2	T3	T4	T5
EPRE ratio of PDCCH DMRS to SSS		dB	0	0				
EPRE ratio of PDCCH to PDCCH DMRS		dB						
EPRE ratio of PBCH DMRS to SSS		dB						
EPRE ratio of PBCH to PBCH DMRS		dB						
EPRE ratio of PSS to SSS		dB						
EPRE ratio of PDSCH DMRS to SSS		dB						
EPRE ratio of PDSCH to PDSCH DMRS		dB						
EPRE ratio of OCNG DMRS to SSS		dB						
EPRE ratio of OCNG to OCNG DMRS		dB						
SNR_SSB of set q_0	Config 1, 4	dB	5.8	5.8	-2.2	-12.8	-12.8	-12.8
	Config 2, 5		5.8	5.8	-2.2	-12.8	-12.8	-12.8
	Config 3, 6		5.8	5.8	-2.2	-12.8	-12.8	-12.8
SNR_CSI-RS of set q_1	Config 1, 4	dB	-10.2	-10.2	-10.2	10.2	10.2	10.2
	Config 2, 5		-10.2	-10.2	-10.2	10.2	10.2	10.2
	Config 3, 6		-10.2	-10.2	-10.2	10.2	10.2	10.2
SSB_RP of set q1	Config 1, 4	dBm/SCS kHz	-108.2	-108.2	-108.2	-87.8	-87.8	-87.8
	Config 2, 5		-108.2	-108.2	-108.2	-87.8	-87.8	-87.8
	Config 3, 6		-105.2	-105.2	-105.2	-84.8	-84.8	-84.8
N_{oc}	Config 1, 4	dBm/15 kHz	-98	-98				
	Config 2, 5		-98	-98				
	Config 3, 6		-98	-98				
Propagation condition			TDL-C 300ns 100Hz	TDL-C 300ns 100Hz				

Note 1:	OCNG shall be used such that the resources in Cell 1 are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.
Note 2:	The uplink resources for CSI reporting are assigned to the UE prior to the start of time period T1.
Note 3:	NZP CSI-RS resource set configuration for CSI reporting are assigned to the UE prior to the start of time period T1.
Note 4:	Void
Note 5:	The timers and layer 3 filtering related parameters are configured prior to the start of time period T1.
Note 6:	The signal contains PDCCH for UEs other than the device under test as part of OCNG.
Note 7:	SNR levels correspond to the signal to noise ratio over the REs carrying CSI-RS.
Note 8:	The SNR in time periods T1, T2, T3, T4 and T5 is denoted as SNR1, SNR2 and SNR3 respectively in figure A.4.5.5.1.1-1.
Note 9:	The SNR values are specified for testing a UE which supports 2RX on at least one band. For testing of a UE which supports 4RX on all bands, the SNR during T3 is modified as specified in clause [A.3.6].

The UE behaviour during time durations T1, T2, T3, T4 and T5 shall be as follows:

During the time duration T1 and T2, the UE shall transmit uplink signal at least in all subframes configured for CSI transmission on Cell 2.

During the period from time point A to time point B the UE shall transmit uplink signal in Cell 2 in all uplink slots configured for CSI transmission according to the configured periodic CSI reporting for Cell 2.

During T3 the UE shall detect beam failure and initiate link recovery. During T4 and T5 the UE measures and evaluate beam candidate from beam candidate set q_1.

No later than time point F occurring no later than D1 = 120+10 ms after the start of T5, the UE shall transmit preamble for UL-SCH resource application, followed by MAC-CE on the assigned uplink resources containing a beam associated with the candidate beam set q_1. The UE shall not transmit preamble earlier than time point B.

During T5, the System Simulator shall transmit a Random Access Response to UE after the System Simulator receives the preamble from UE. The UE shall transmit the msg.3 containing candidate beam set q1 for SCell BFR if UE receives the Random Access Response.

Test is concluded once the test equipment has received the initial preamble transmission from the UE. The rate of correct events observed during repeated tests shall be at least 90%.

4.5.5.6 EN-DC FR1 Scell CSI-RS-based beam failure detection and SSB-based link recovery in DRX

4.5.5.6.1 Test purpose

The purpose of this test is to verify that the UE properly detects CSI-RS based beam failure in the set q_0 configured for a serving SCell and that the UE performs correct SSB-based link recovery based on beam candidate set q_1. The purpose is to test the downlink monitoring for beam failure detection within the UEs active DL BWP of the SCell without *schedulingRequestID-BFR-SCell-r16* configuration, during the evaluation period, and link recovery, when DRX is used. This test will partly verify the beam failure detection and link recovery for an FR1 serving cell requirements in TS 38.133 [6] clause 8.5.

4.5.5.6.2 Test applicability

This test applies to all types of E-UTRA UE release 16 and forward supporting EN-DC FR1, CSI-RS based RLM, and SSB link recovery and long DRX cycle.

4.5.5.6.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 4.5.5.0.2.

The normative reference for this requirement is TS 38.133 [6] clause A.4.5.5.4.

4.5.5.6.4 Test description

The test consists of five successive time periods, with time duration of T1, T2, T3, T4 and T5 respectively. Figure 4.5.5.6.4.1-1 shows the SNR of the CSI-RS in set q_0 in the active SCell to emulate beam failure. Figure 4.5.5.6.4.1-1

additionally shows the variation of the downlink L1-RSRP of the CSI-RS in set q_1 of the candidate beam used for link recovery.

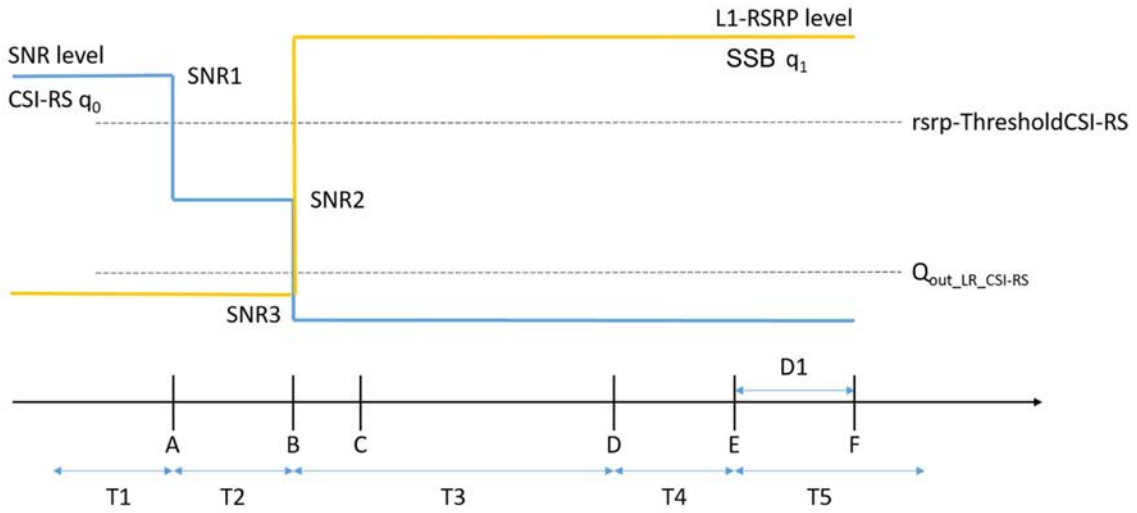


Figure 4.5.5.6.4.1-1: SNR and L1-RSRP variation for beam failure detection and LR testing for SCell in DRX mode

4.5.5.6.4.1 Initial conditions

This test shall be tested using any of the test configurations in Table 4.5.5.6.4.1-1.

Table 4.5.5.6.4.1-1: Supported test configurations for FR1 PCell and SCell

Configuration	Description
4.5.5.6-1	LTE FDD, NR 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode
4.5.5.6-2	LTE FDD, NR 15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode
4.5.5.6-3	LTE FDD, NR 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode
4.5.5.6-4	LTE TDD, NR 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode
4.5.5.6-5	LTE TDD, NR 15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode
4.5.5.6-6	LTE TDD, NR 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode
Note: The UE is only required to pass in one of the supported test configurations in FR1	

Configure the test equipment and the DUT according to the parameters in Table 4.5.5.6.4.1-2.

Table 4.5.5.6.4.1-2: Initial conditions for EN-DC FR1 SCell CSI-RS-based beam failure detection and link recovery in DRX

Parameter	Value		Comment
Test environment	NC		As specified in TS 38.508-1 [14] clause 4.1.
Test frequencies	As specified in Annex E, table E.2-1 and TS 38.508-1 [14] clause 4.3.1 and 4.4.2.		
Channel bandwidth	As specified by the test configuration selected from Table 4.5.5.4.4.1-1.		
Propagation conditions	AWGN		As specified in Annex C.2.2.
Connection Diagram	TE Part	A.3.1.7.1	As specified in TS 38.508-1 [14] Annex A.
	DUT Part	A.3.2.3.4	
Exceptions to connection diagram	For 4Rx capable UEs without any 2Rx RF bands use A.3.2.5.2 for DUT part and A.3.1.8.4 for TE Part		

1. The general test parameter settings are set up according to Table 4.5.5.6.4.1-3.

2. Message contents are defined in clause 4.5.5.6.4.3.

3. Cell 1 is the E-UTRA serving cell (PCell) for the EN-DC setup. The power levels and settings for Cell 1 are set according to Annex A.6. Cell 2 is the NR cell (PSCell) and Cell 3 is the NR cell (SCell) with the power level set according to Annex C.1.2 and C.1.3 for this test

Table 4.5.5.6.4.1-3: General test parameters for FR1 SCell for beam failure detection and link recovery testing in DRX mode

Parameter		Unit	Value	Comment
			Test 1	
Active PCell			Cell 1	
E-UTRA RF Channel Number			1	
Active PSCell			Cell 2	
RF Channel Number for PSCell			2	
Active SCell			Cell 3	
RF Channel Number for SCell			3	
Duplex mode	Config 1, 4		FDD	
	Config 2, 3, 5, 6		TDD	
BWchannel	Config 1, 4	MHz	10: NRB,c = 52	
	Config 2, 5		10: NRB,c = 52	
	Config 3, 6		40: NRB,c = 106	
DL initial BWP configuration	Config 1, 2, 3, 4, 5, 6		DLBWP.0.1	
DL dedicated BWP configuration	Config 1, 2, 3, 4, 5, 6		DLBWP.1.1	
UL initial BWP configuration	Config 1, 2, 3, 4, 5, 6		ULBWP.0.1	
UL dedicated BWP configuration	Config 1, 2, 3, 4, 5, 6		ULBWP.1.1	
TDD Configuration	Config 1, 4		Not Applicable	
	Config 2, 5		TDDConf.1.1	
	Config 3, 6		TDDConf.2.1	
CORESET Reference Channel	Config 1, 4		CR.1.1 FDD	A.1.2
	Config 2, 5		CR.1.1 TDD	
	Config 3, 6		CR.2.1 TDD	
SSB Configuration	Config 1, 4		SSB.1 FR1	A.3
	Config 2, 5		SSB.1 FR1	
	Config 3, 6		SSB.2 FR1	
SMTC Configuration	Config 1, 2, 3, 4, 5, 6		SMTC.1	A.4
PDSCH/PDCCH subcarrier spacing	Config 1, 2, 4, 5	kHz	15	
	Config 3, 6		30	
PRACH Configuration	Config 1, 2, 4, 5		PRACH.2 FR1	
	Config 3, 6		PRACH.2 FR1	
csi-RS-Index assigned as beam failure detection RS in set q_0 in activated SCell			0	
OCNG parameters			OP.1	A.2.1
CP length			Normal	
Correlation Matrix and Antenna Configuration			2x2 Low	
Beam failure detection transmission parameters	DCI format		1-0	
	Number of Control OFDM symbols		2	
	Aggregation level	CCE	8	

		Ratio of hypothetical PDCCH RE energy to average CSI-RS RE energy	dB	0	
		Ratio of hypothetical PDCCH DMRS energy to average CSI-RS RE energy	dB	0	
		DMRS precoder granularity		REG bundle size	
		REG bundle size		6	
DRX				DRX.7	A.5
Gap pattern ID				N.A.	
schedulingRequestID-BFR-SCell-r16				absent	When the field is absent, the random access procedure will be triggered for SCell BFR
SSB Index assigned as CBD RS (q1) in activated SCell				1	
rlmInSyncOutOfSyncThreshold				absent	When the field is absent, the UE applies the value 0. ((TS 38.133 [6] Table 8.1.1-1).
rsrp-ThresholdBFR	Config 1, 2, 4, 5		dBm/SCS	-98	Threshold used for $Q_{in_LR_SSB}$
	Config 3, 6			-95	
powerControlOffsetSS				db0	Used for deriving rsrp-ThresholdCSI-RS
beamFailureInstanceMaxCount				n1	see TS 38.321 [7], clause 5.17
beamFailureDetectionTimer				pbfd4	see TS 38.321 [7], clause 5.17
CSI-RS configuration for q_0 in activated SCell	Config 1, 4			CSI-RS.1.2 FDD	A.1.4
	Config 2, 5			CSI-RS.1.2 TDD	
	Config 3, 6			CSI-RS.2.2 TDD	
CSI-RS configuration for CSI reporting	Config 1, 4			CSI-RS.1.1 FDD	A.1.4
	Config 2, 5			CSI-RS.1.1 TDD	
	Config 3, 6			CSI-RS.2.1 TDD	
TRS configuration	Config 1, 4			TRS.1.1 FDD	
	Config 2, 5			TRS.1.1 TDD	
	Config 3, 6			TRS.1.2 TDD	
csi-RS-Index assigned as RLM RS in PSCell	Config 1, 4			CSI-RS.1.2 FDD	A.1.4
	Config 2, 5			CSI-RS.1.2 TDD	

	Config 3, 6		CSI-RS.2.2 TDD	
T310 Timer		ms	1000	
N310			2	
T1		s	1	During this time the UE shall be fully synchronized to cell 1
T2		s	8.37	
T3		s	6.44	
T4		s	0	
T5		s	1.97	
D1		s	1.93	
Note 1: UE-specific PDCCH is not transmitted after T1 starts.				

4.5.5.6.4.2 Test procedure

Same test procedure as described in section 4.5.5.4.4.2, except following exception and steps 7 and 8:

Prior to the start of the time duration T1, the UE shall be fully synchronized to Cell 1, Cell 2 and Cell 3. The UE shall be configured for periodic CSI reporting with a reporting periodicity of 5 ms. In the test, DRX configuration is enabled in PSCell and DRX inactivity timer has already been expired, i.e. UE tries to decode PDCCH and to send periodic CQI during the period when On-duration timer is running. Time alignment timers shall be set to “infinity” so that UL timing alignment is maintained during the test.

7. If the SS:

   a) detects uplink power on the PCell equal to or higher than minimum output power defined in TS 38.521-1 [17] clause 6.3.1.5 in each slot configured for CSI transmission (according CSI reporting on PUCCH) during the period from time point A to time point B

   and

   b) does not detect preamble on the PCell before time point B

   and

   c) detects preamble on the preconfigured PRACH resource before time point F (D1 after the start of T5).

   And

   d) SS transmits a RAR to UE after receiving the preamble transmitted by the UE. SS detects the MAC-CE on the PCell transmitted by the UE providing the index for the activated SCell, and the index for the SSB provided by higher layer.

   the number of successful tests is increased by one.

Otherwise the number of failed tests is increased by one.

8. If the iteration or random access procedure for BFD fails, the SS shall first attempt to release and add the FR1 SCell, by ensuring the UE is in state RRC_CONNECTED with generic procedure parameters *Connectivity* EN-DC, DC bearer MCG and SCG, Connected without release *On* and Test Mode *On* according to TS 38.508-1 [6] clause 4.5. If that also fails, then the UE is switched OFF/ON to proceed with the next iteration.

4.5.5.6.4.3 Message contents

Same message contents as described in section 4.5.5.4.4.3 with following exceptions:

Table 4.5.5.6.4.3-1: Common Exception messages for EN-DC FR1 CSI-RS-based beam failure detection and link recovery in DRX

Default Message Contents

Common contents of system information blocks exceptions	
Default RRC messages and information elements contents exceptions	Table H.3.1-10 with Condition SSB CBD

4.5.5.6.5 Test requirement

Tables 4.5.5.6.4.1-3 and 4.5.5.6.5-1 define the primary level settings including test tolerances for EN-DC FR1 CSI-RS-based beam failure detection and link recovery in DRX.

Table 4.5.5.6.5-1: Cell specific test parameters for FR1 SCell for beam failure detection and link recovery testing in DRX mode

Parameter		Unit	Cell2	Test 1 Cell3				
			T1 to T5	T1	T2	T3	T4	T5
EPRE ratio of PDCCH DMRS to SSS		dB	0	0				
EPRE ratio of PDCCH to PDCCH DMRS		dB						
EPRE ratio of PBCH DMRS to SSS		dB						
EPRE ratio of PBCH to PBCH DMRS		dB						
EPRE ratio of PSS to SSS		dB						
EPRE ratio of PDSCH DMRS to SSS		dB						
EPRE ratio of PDSCH to PDSCH DMRS		dB						
EPRE ratio of OCNG DMRS to SSS		dB						
EPRE ratio of OCNG to OCNG DMRS		dB						
SNR_SSB of set q_0	Config 1, 4	dB	5.8	5.8	-2.2	-12.8	-12.8	-12.8
	Config 2, 5		5.8	5.8	-2.2	-12.8	-12.8	-12.8
	Config 3, 6		5.8	5.8	-2.2	-12.8	-12.8	-12.8
SNR_CSI-RS of set q_1	Config 1, 4	dB	-10.2	-10.2	-10.2	10.2	10.2	10.2
	Config 2, 5		-10.2	-10.2	-10.2	10.2	10.2	10.2
	Config 3, 6		-10.2	-10.2	-10.2	10.2	10.2	10.2
SSB_RP of set q1	Config 1, 4	dBm/SCS kHz	-108.2	-108.2	-108.2	-87.8	-87.8	-87.8
	Config 2, 5		-108.2	-108.2	-108.2	-87.8	-87.8	-87.8
	Config 3, 6		-105.2	-105.2	-105.2	-84.8	-84.8	-84.8
N_{oc}	Config 1, 4	dBm/ 15 kHz	-98	-98				
	Config 2, 5		-98	-98				
	Config 3, 6		-98	-98				
Propagation condition			TDL-C 300ns 100Hz	TDL-C 300ns 100Hz				

Note 1: OCNG shall be used such that the resources in Cell 1 are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.
Note 2: The uplink resources for CSI reporting are assigned to the UE prior to the start of time period T1.
Note 3: NZP CSI-RS resource set configuration for CSI reporting are assigned to the UE prior to the start of time period T1.
Note 4: Void
Note 5: The timers and layer 3 filtering related parameters are configured prior to the start of time period T1.
Note 6: The signal contains PDCCH for UEs other than the device under test as part of OCNG.
Note 7: SNR levels correspond to the signal to noise ratio over the REs carrying CSI-RS.
Note 8: The SNR in time periods T1, T2, T3, T4 and T5 is denoted as SNR1, SNR2 and SNR3 respectively in figure A.4.5.5.1.1-1.
Note 9: The SNR values are specified for testing a UE which supports 2RX on at least one band. For testing of a UE which supports 4RX on all bands, the SNR during T3 is modified as specified in clause A.3.6.

The UE behaviour during time durations T1, T2, T3, T4 and T5 shall be as follows:

During the time duration T1 and T2, the UE shall transmit uplink signal at least in all subframes configured for CSI transmission on Cell 2.

During the period from time point A to time point B the UE shall transmit uplink signal in Cell 2 in all uplink slots configured for CSI transmission according to the configured periodic CSI reporting for Cell 2.

During T3 the UE shall detect beam failure and initiate link recovery. During T4 and T5 the UE measures and evaluate beam candidate from beam candidate set q_1.

No later than time point F occurring no later than D1 = 120+10 ms after the start of T5, the UE shall transmit preamble for UL-SCH resource application, followed by MAC-CE on the assigned uplink resources containing a beam associated with the candidate beam set q_1. The UE shall not transmit preamble earlier than time point B.

During T5, the System Simulator shall transmit a Random Access Response to UE after the System Simulator receives the preamble from UE. The UE shall transmit the msg.3 containing candidate beam set q1 for SCell BFR if UE receives the Random Access Response.

Test is concluded once the test equipment has received the initial preamble transmission from the UE. The rate of correct events observed during repeated tests shall be at least 90%.

4.5.5.7 EN-DC FR1 PSCell TRP specific SSB-based beam failure detection and link recovery in non-DRX

Editor's Note: This test case is incomplete in following aspects:

- TT analysis has not been provided
- TS 38.522 applicability spec update is pending

4.5.5.7.1 Test Purpose

The purpose of this test is to verify that the UE properly detects the TRP specific SSB-based beam failure in the set (q0,0), (q0,1) configured for a serving PSCell and that the UE performs correct SSB-based link recovery based on beam candidate set (q1,0) and (q1,1). The purpose is to test the downlink monitoring for beam failure detection within the UEs active DL BWP of the PSCell with *schedulingRequestID-BFR-r17* configured, during the evaluation period, and link recovery, when no DRX is used. This test will partly verify the SSB based beam failure detection and link recovery for an FR1 serving cell requirements in TS 38.133 [6] clause 8.5.

4.5.5.7.2 Test applicability

This test applies to all types of E-UTRA UE release 17 and forward, supporting EN-DC and link recovery.

4.5.5.7.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 4.5.5.0.1.

The normative reference for this requirement is TS 38.133 [6] clause A.4.5.5.7.

4.5.5.7.4 Test description

The test consists of five successive time periods, with time duration of T1, T2, T3, T4 and T5 respectively. Figure 4.5.5.7.1-1 shows the variation of the downlink SNR of the PSCell and the SNR of the SSB in set q0 in the active PSCell to emulate SSB based beam failure. Figure 4.5.5.7.1-1 additionally shows the variation of the downlink L1-RSRP of the SSB in set q1 of the candidate beam used for link recovery.

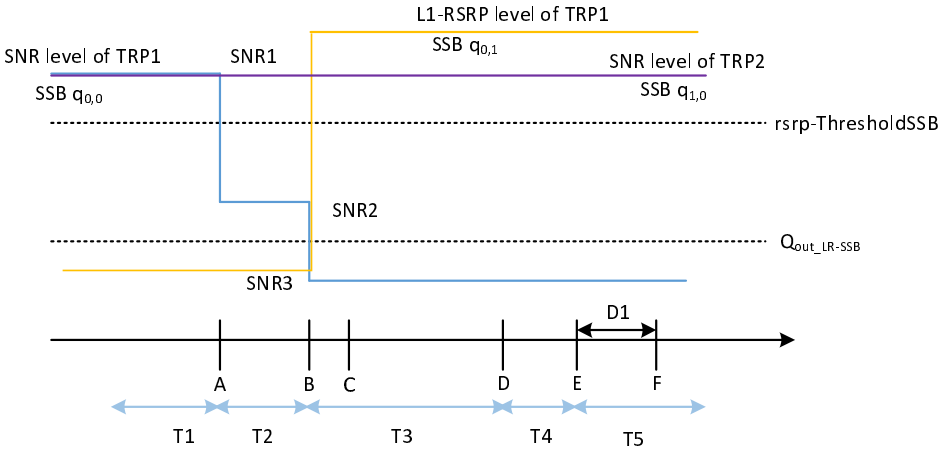


Figure 4.5.5.7.4-1: SNR and L1-RSRP variation SSB for SSB-based beam failure detection and link recovery testing in non-DRX mode

4.5.5.7.4.1 Initial conditions

This test shall be tested using any of the test configurations in Table 4.5.5.7.4.1-1.

Table 4.5.5.7.4.1-1: Supported test configurations for FR1 PCell

Configuration	Description
1	LTE FDD, NR 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode
2	LTE FDD, NR 15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode
3	LTE FDD, NR 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode
4	LTE TDD, NR 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode
5	LTE TDD, NR 15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode
6	LTE TDD, NR 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode
Note: The UE is only required to pass in one of the supported test configurations in FR1	

Configure the test equipment and the DUT according to the parameters in Table 4.5.5.7.4.1-2.

Table 4.5.5.7.4.1-2: Initial conditions for TRP specific EN-DC FR1 SSB-based beam failure detection and link recovery in non-DRX

Parameter	Value		Comment
Test environment	NC		As specified in TS 38.508-1 [14] clause 4.1.
Test frequencies	As specified in Annex E, table E.2-1 and TS 38.508-1 [14] clause 4.3.1 and 4.4.2.		
Channel bandwidth	As specified by the test configuration selected from Table 4.5.5.7.4.1-1.		
Propagation conditions	AWGN		As specified in clause C.2.2.
Connection Diagram	TE Part	A.3.1.7.1	As specified in TS 38.508-1 [14] Annex A.
	DUT Part	A.3.2.3.4	
Exceptions to connection diagram	For 4Rx capable UEs without any 2 Rx RF bands use A.3.2.5.2 for DUT part and A.3.1.8.4 for TE Part		

1. The general test parameter settings are set up according to Table 4.5.5.7.4.1-3.
2. Message contents are defined in clause 4.5.5.7.4.3.
3. Cell 1 is the E-UTRA serving cell (PCell) for the EN-DC setup. The power levels and settings for Cell 1 are set according to Annex A.6. Cell 2 is the NR cell (PSCell) with the power level set according to clauses C.1.2 and C.1.3 for this test

Table 4.5.5.7.4.1-3: General test parameters for FR1 PSCell for SSB-based beam failure detection and link recovery testing in non-DRX mode

Parameter		Unit	Value	Comment
			Test 1	
Active E-UTRA PCell			Cell 1	
E-UTRA RF Channel Number			1	
Active PSCell			Cell 2	
RF Channel Number for PSCell			2	
Duplex mode	Config 1, 4		FDD	
	Config 2, 3, 5, 6		TDD	
BW channel	Config 1, 4	MHz	10: NRB,c = 52	
	Config 2, 5		10: NRB,c = 52	
	Config 3, 6		40: NRB,c = 106	
DL initial BWP configuration	Config 1, 2, 3, 4, 5, 6		DLBWP.0.1	
DL dedicated BWP configuration	Config 1, 2, 3, 4, 5, 6		DLBWP.1.1	
UL initial BWP configuration	Config 1, 2, 3, 4, 5, 6		ULBWP.0.1	
UL dedicated BWP configuration	Config 1, 2, 3, 4, 5, 6		ULBWP.1.1	
TDD Configuration	Config 1, 4		Not Applicable	
	Config 2, 5		TDDConf.1.1	
	Config 3, 6		TDDConf.2.1	
CORESET Reference Channel	Config 1, 4		CR.1.1 FDD	
	Config 2, 5		CR.1.1 TDD	
	Config 3, 6		CR.2.1 TDD	
SSB Configuration for TRP0	Config 1, 4		SSB.3 FR1	
	Config 2, 5		SSB.3 FR1	
	Config 3, 6		SSB.4 FR1	
SSB Configuration for TRP1	Config 1, 4		SSB.7 FR1	
	Config 2, 5		SSB.7 FR1	
	Config 3, 6		SSB.8 FR1	
SMTC Configuration	Config 1, 2, 3, 4, 5, 6		SMTC.1	
PDSCH/PDCCH subcarrier spacing	Config 1, 2, 4, 5	kHz	15	
	Config 3, 6		30	
PRACH Configuration	Config 1, 2, 4, 5		PRACH.2 FR1	CFRA for BFR
	Config 3, 6		PRACH.2 FR1	CFRA for BFR
SSB Index assigned as BFD RS (q0,0)			0	
SSB Index assigned as CBD RS (q1,0)			1	
SSB Index assigned as BFD RS (q0,1)			2	
SSB Index assigned as CBD RS (q1,1)			3	
OCNG parameters			OP.1	
CP length			Normal	
Correlation Matrix and Antenna Configuration			2x2 Low	
Beam failure detection transmission parameters	DCI format		1-0	
	Number of Control OFDM symbols		2	
	Aggregation level	CCE	8	
	Ratio of hypothetical PDCCH RE energy to average CSI-RS RE energy	dB	0	

	Ratio of hypothetical PDCCH DMRS energy to average CSI-RS RE energy	dB	0	
	DMRS precoder granularity		REG bundle size	
	REG bundle size		6	
DRX			OFF	
Gap pattern ID			gp0	
gapOffset			0	
schedulingRequestID-BFR- r17			Configured	
Periodicity of PUCCH for SR configuration for BFR on PSCell	Config 1, 2, 4, 5	slot	5	5ms
	Config 3, 6		10	
rlmInSyncOutOfSyncThreshold			absent	When the field is absent, the UE applies the value 0.
rsrp-ThresholdBFR	Config 1, 2, 4, 5	dBm/SCS	-98	Threshold used for $Q_{in_LR_SSB}$
	Config 3, 6		-95	
powerControlOffsetSS			db0	Used for deriving rsrp-ThresholdCSI-RS
beamFailureInstanceMaxCount			n1	see TS 38.321 [12], clause 5.17
beamFailureDetectionTimer			pbfd4	see TS 38.321 [12], clause 5.17
SSB Index assigned as RLM RS			0,1,2,3	
T310 Timer		ms	1000	
N310			2	
T1		s	1	During this time the the UE shall be fully synchronized to cell 1
T2		s	0.37	
T3		s	0.24	
T4		s	0	
T5		s	0.17	
D1		s	0.13	
Note 1: All configurations are assigned to the UE prior to the start of time period T1. Note 2: UE-specific PDCCH is not transmitted after T1 starts. Note 3: E-UTRAN is in non-DRX mode under test.				

4.5.5.7.4.2 Test procedure

Prior to the start of the time duration T1, the UE shall be fully synchronized to cell 1 and cell 2. The UE shall be configured for periodic CSI reporting with a reporting periodicity of 5 ms. In the test, DRX configuration is not enabled. The UE is configured to perform inter-frequency measurements using GP ID #0 (40ms) in test 1.

1. Ensure the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity *EN-DC*, DC bearer MCG and SCG, Connected without release *On* and Test Mode *On* according to TS 38.508-1 [14] clause 4.5.

2. The SS sends an *RRCReconfiguration* (embeded in *RRCConnectionReconfiguration* message) message to the UE to configure inter-frequency measurement.

3. The UE sends an RRCReconfigurationComplete (embeded in RRCConnectionReconfigurationComplete message) message.

4. Set the parameters of NR Cell according to T1 in Table 4.5.5.7.5-1. Propagation conditions are set according to clause C.2.3. T1 starts.

5. When T1 expires the SS shall change the SNR values of TRP1 and TRP2 to T2 as specified in Table 4.5.5.7.5-1. T2 starts.

6. When T2 expires the SS shall change the SNR values of TRP1 and TRP2 to T3 as specified in Table 4.5.5.7.5-1. T3 starts.

7. When T3 expires the SS shall change the SNR values of TRP1 and TRP2 to T4 as specified in Table 4.5.5.7.5-1. T4 starts.

8. When T4 expires the SS shall change the SNR values of TRP1 and TRP2 to T5 as specified in Table 4.5.5.7.5-1. T5 starts.

9. If the SS:

   a) detects uplink power on NR carrier equal to or higher than minimum output power defined in TS 38.521-1 [17] clause 6.3.1.5 in each slot configured for CSI transmission (according CSI reporting on PUCCH) during the period from time point A to time point B; and

   b) does not detect preamble on a beam associated with the candidate beam set $q_{1,0}$ and $q_{1,1}$ before time point B; and

   c) detects preamble on a beam associated with the candidate beam set $q_{1,0}$ and $q_{1,1}$ before time point F (D1 after the star of T5), the number of successful tests is increased by one.

   Otherwise, the number of failed tests is increased by one.

10. If the iteration or random access procedure for BFD fails, the SS shall first attempt to release and add the PSCell, by ensuring the UE is in state RRC_CONNECTED with generic procedure parameters *Connectivity* EN-DC, DC bearer MCG and SCG, Connected without release *On* and Test Mode *On* according to TS 38.508-1 [6] clause 4.5. If that also fails, then the UE is switched OFF/ON to proceed with the next iteration.

11. Repeat steps 2-10 for all subtests until the confidence level according to Tables G.2.3-1 in Annex G clause G.2 is achieved.

4.5.5.7.4.3 Message contents

Message contents are according to TS 38.508-1 [14] clause 7.3 with the following exceptions:

Table 4.5.5.7.4.3-1: Common Exception messages for EN-DC FR1 SSB-based beam failure detection and link recovery in non-DRX

Default Message Contents	
Common contents of system information blocks exceptions	
Default RRC messages and information elements contents exceptions	Table H.3.1-1 Table H.3.1-2 with Condition INTER-FREQ, L3 FILTERING NEEDED, Table H.3.1-3 with Condition INTER-FREQ MO (where ssbFrequency is set to the ARFCN value of carrier centre of High range) Table H.3.1-4 with A3-offset = 0 Table H.3.1-8A with Condition SSB BFD Table H.3.1-10 with Condition SSB Table H.3.1-10A Table H.3.4-4 with Condition gapUE Table H.3.4-5 with Condition BFD Table H.3.5-4 Table 7.3.1-3 in TS 38.508-1 [14] with condition SMTC.1

Table 4.5.5.7.4.3-2: PDCCH *Search Space* for BFR

Derivation Path: TS 38.508-1 [14], Table 4.6.3-162			
Information Element	**Value/remark**	**Comment**	**Condition**
SearchSpace ::= SEQUENCE {			
searchSpaceId	3	BFR	
controlResourceSetId	2	BFR	
monitoringSlotPeriodicityAndOffset CHOICE {			
sl1	NULL		
}			
monitoringSymbolsWithinSlot	10000000000000	Symbols 0 and 1	
nrofCandidates SEQUENCE {			

Derivation Path: TS 38.508-1 [14], Table 4.6.3-162			
Information Element	**Value/remark**	**Comment**	**Condition**
aggregationLevel1	n0		
aggregationLevel2	n0		
aggregationLevel4	n0		
aggregationLevel8	n1	AL8	
aggregationLevel16	n0		
}			
searchSpaceType CHOICE {			
ue-Specific SEQUENCE {			USS
dci-Formats	formats0-0-And-1-0	DCI Format 1_0	
}			
}			
}			

Table 4.5.5.7.4.3-3: *RLF-TimersAndConstants*

Derivation Path: TS 38.508-1 [14], Table 4.6.3-150			
Information Element	**Value/remark**	**Comment**	**Condition**
RLF-TimersAndConstants ::= SEQUENCE {			
n310	n2		
}			

Table 4.5.5.7.4.3-4: *PDCCH-Config*

Derivation Path: TS 38.501-1 [14],Table 4.6.3-95			
Information Element	**Value/remark**	**Comment**	**Condition**
PDCCH-Config ::= SEQUENCE {			
controlResourceSetToAddModList SEQUENCE(SIZE (1..3)) OF ControlResourceSet {	2 entries		
ControlResourceSet[2]	ControlResourceSet	entry 2, BFR	
}			
controlResourceSetToReleaseList	Not present		
searchSpacesToAddModList SEQUENCE(SIZE (1..10)) OF SearchSpace {	2 entries		
SearchSpace[2]	SearchSpace	entry 2, BFR	
}			
searchSpacesToReleaseList	Not present		
downlinkPreemption	Not present		
tpc-PUSCH	Not present		
tpc-PUCCH	Not present		
tpc-SRS	Not present		
}			

Table 4.5.5.7.4.3-5: ControlResourceSet for BFR

Derivation Path: TS 38.501-1 [14],Table 7.3.1-15			
Information Element	**Value/remark**	**Comment**	**Condition**
ControlResourceSet ::= SEQUENCE {			
controlResourceSetId	2		
duration	2		
cce-REG-MappingType CHOICE {			
interleaved ::= SEQUENCE {			
reg-BundleSize	n6		
interleaverSize	n2		
shiftIndex	0		
}			
tci-StatesPDCCH-ToAddList	Not present		
}			

Table 4.5.5.7.4.3-6: *MAC-CellGroupConfig for R17 BFR*

Derivation Path: TS 38.508-1, Table 4.6.3-68			
Information Element	Value/remark	Comment	Condition
MAC-CellGroupConfig ::= SEQUENCE {			
schedulingRequestID-BFR-r17	Not present		
schedulingRequestID-BFR2-r17	Not present		
schedulingRequestConfig-v1700	SchedulingRequest-Config		
}			

4.5.5.7.5 Test requirements

Tables 4.5.5.7.4.1-3 and 4.5.5.7.5-1 define the primary level settings including test tolerances for EN-DC FR1 SSB-based beam failure detection and link recovery in non-DRX.

Table 4.5.5.7.5-1: Cell specific test parameters for FR1 PSCell for SSB-based beam failure detection and link recovery testing in non-DRX mode

Parameter		Unit	Test 1				
			T1	T2	T3	T4	T5
EPRE ratio of PDCCH DMRS to SSS		dB	0				
EPRE ratio of PDCCH to PDCCH DMRS		dB					
EPRE ratio of PBCH DMRS to SSS		dB					
EPRE ratio of PBCH to PBCH DMRS		dB					
EPRE ratio of PSS to SSS		dB					
EPRE ratio of PDSCH DMRS to SSS		dB					
EPRE ratio of PDSCH to PDSCH DMRS		dB					
EPRE ratio of OCNG DMRS to SSS		dB					
EPRE ratio of OCNG to OCNG DMRS		dB					
SNR_SSB of set q0,0	Config 1, 4	dB	5+TT	-3+TT	-12+TT	-12+TT	-12+TT
	Config 2, 5		5+TT	-3+TT	-12+TT	-12+TT	-12+TT
	Config 3, 6		5+TT	-3+TT	-12+TT	-12+TT	-12+TT
SNR_SSB of set q0,1	Config 7,10	dB	5+TT	5+TT	5+TT	5+TT	5+TT
	Config 8, 11		5+TT	5+TT	5+TT	5+TT	5+TT
	Config 9, 12		5+TT	5+TT	5+TT	5+TT	5+TT
SNR_SSB of set q1,0	Config 1, 4	dB	0.2+TT	0.2+TT	20.2+TT	20.2+TT	20.2+TT
	Config 2, 5		0.2+TT	0.2+TT	20.2+TT	20.2+TT	20.2+TT
	Config 3, 6		0.2+TT	0.2+TT	20.2+TT	20.2+TT	20.2+TT
SNR_SSB of set q1,1	Config 7, 10	dB	0.2+TT	0.2+TT	20.2+TT	20.2+TT	20.2+TT
	Config 8, 11		0.2+TT	0.2+TT	20.2+TT	20.2+TT	20.2+TT
	Config 9, 12		0.2+TT	0.2+TT	20.2+TT	20.2+TT	20.2+TT
SSB_RP of set q1,0	Config 1, 4	dBm/SCS kHz	-108+TT	-108+TT	-88+TT	-88+TT	-88+TT
	Config 2, 5		-108+TT	-108+TT	-88+TT	-88+TT	-88+TT
	Config 3, 6		-105+TT	-105+TT	-85+TT	-85+TT	-85+TT
SSB_RP of set q1,1	Config 7, 10	dBm/SCS	-108+TT	-108+TT	-88+TT	-88+TT	-88+TT

	Config 8, 11	kHz	-108+TT	-108+TT	-88+TT	-88+TT	-88+TT
	Config 9, 12		-105+TT	-105+TT	-85+TT	-85+TT	-85+TT
N_{oc}	Config 1, 4	dBm/15 KHz	-98+TT				
	Config 2, 5		-98+TT				
	Config 3, 6		-98+TT				
Propagation condition			TDL-C 300ns 100Hz				

Note 1: OCNG shall be used such that the resources in Cell 1 are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.
Note 2: The uplink resources for CSI reporting are assigned to the UE prior to the start of time period T1.
Note 3: NZP CSI-RS resource set configuration for CSI reporting are assigned to the UE prior to the start of time period T1.
Note 4: Measurement gap configuration is assigned to the UE prior to the start of time period T1.
Note 5: The timers and layer 3 filtering related parameters are configured prior to the start of time period T1.
Note 6: The signal contains PDCCH for UEs other than the device under test as part of OCNG.
Note 7: SNR levels correspond to the signal to noise ratio over the SSS REs.
Note 8: The SNR in time periods T1, T2, T3, T4 and T5 is denoted as SNR1, SNR2 and SNR3 respectively in figure 4.5.5.7.1-1.
Note 9: The SNR values are specified for testing a UE which supports 2RX on at least one band. For testing of a UE which supports 4RX on all bands, the SNR during T3 is modified as specified in clause A.3.6 of 38.133.

The UE behaviour during time durations T1, T2, T3, T4 and T5 shall be as follows:

During the time duration T1 and T2, the UE shall transmit uplink signal at least in all subframes configured for CSI transmission on Cell 1.

During the period from time point A to time point B the UE shall transmit uplink signal in Cell 2 in all uplink slots configured for CSI transmission according to the configured periodic CSI reporting for Cell 2.

During T3 the UE shall detect beam failure and initiate link recovery. During T4 and T5 the UE measures and evaluate beam candidate from beam candidate set $q_{1,0}$ and $q_{1,1}$.

No later than time point F occurring no later than D1 = 120+10 ms after the start of T5, the UE shall transmit PUCCH with LRR, followed by BFR MAC CE containing a beam associated with the candidate beam set $q_{1,0}$. The UE shall not transmit PUCCH with an LRR with the candidate beam set $q_{1,0}$ earlier than time point B.

Test is concluded once the test equipment has received the initial preamble transmission from the UE. The rate of correct events observed during repeated tests shall be at least 90%.

4.5.5.8 EN-DC FR1 SCell with TRP specific CSI-RS-based beam failure detection and SSB-based link recovery in non-DRX

Editor's Note: This test case is incomplete in following aspects:

- TT analysis has not been provided.
- TS 38.522 applicability spec update is pending

4.5.5.8.1 Test purpose

The purpose of this test is to verify that the UE properly detects the CSI-RS-based beam failure on the TRP using the respective configured BFD set $\bar{q}_{0,0}$ for TRP0 and $\bar{q}_{0,1}$for TRP1. After the BFD is detected for the TRP, the test further verifies whether the UE performs the correct SSB-based link recovery based on the configured beam candidate set $\bar{q}_{1,0}$ for TRP0 and $\bar{q}_{1,1}$ for TRP1. In the test one TRP (TRP0) is provided with schedulingRequestID-BFR-r17 and other TRP (TRP1) is not provided with scheduling request ID. This test will partly verify the beam failure detection and link recovery for an FR1 serving cell requirements in TS 38.133 [6] clause 8.5.

4.5.5.8.2 Test applicability

This test applies to all types of E-UTRA UE release 17 and forward supporting EN-DC FR1, CSI-RS based RLM, and SSB link recovery.

4.5.5.8.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 4.5.5.0.1.

The normative reference for this requirement is TS 38.133 [6] clause A.4.5.5.8.

4.5.5.8.4 Test description

The test consists of five successive time periods, with time duration of T1, T2, T3, T4 and T5 respectively. Figure 4.5.5.8.2-1 shows the SNR of the CSI-RS in set $q_{0,0}$ in the TRP0 to emulate beam failure. Figure 4.5.5.8.2-1 additionally shows the variation of the downlink L1-RSRP of the SSB in set q_{10} and q_{11} of the candidate beam used for link recovery. Prior to the start of the time duration T1, the UE shall be fully synchronized to cell 1, cell 2 and cell3. The UE shall be configured for periodic CSI reporting with a reporting periodicity of 5 ms. In the test, DRX configuration is not enabled.

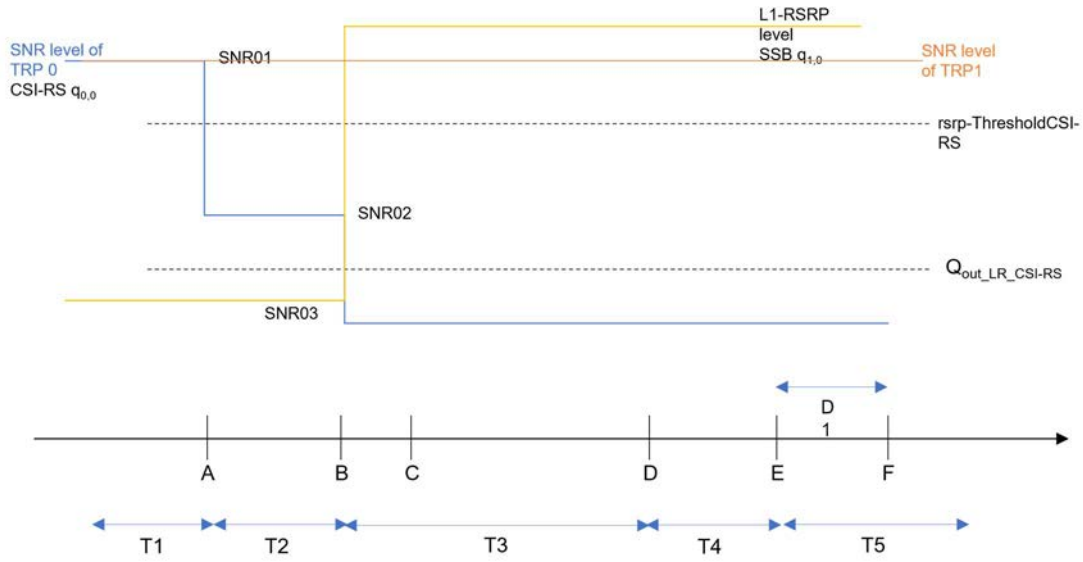


Figure 4.5.5.8.4-1: SNR and L1-RSRP variation for beam failure detection and link recovery testing for TRP0 in non-DRX mode

4.5.5.8.4.1 Initial conditions

This test shall be tested using any of the test configurations in Table 4.5.5.8.4.1-1.

Table 4.5.5.8.4.1-1: Supported test configurations for FR1 PCell and SCell

Configuration	Description
4.5.5.8-1	LTE FDD, NR 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode
4.5.5.8-2	LTE FDD, NR 15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode
4.5.5.8-3	LTE FDD, NR 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode
4.5.5.8-4	LTE TDD, NR 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode
4.5.5.8-5	LTE TDD, NR 15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode
4.5.5.8-6	LTE TDD, NR 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode
NOTE: The UE is only required to pass in one of the supported test configurations in FR1.	

Configure the test equipment and the DUT according to the parameters in Table 4.5.5.8.4.1-2.

Table 4.5.5.8.4.1-2: Initial conditions for TRP specific EN-DC FR1 Scell CSI-RS-based beam failure detection and link recovery in DRX

Parameter	Value	Comment
Test environment	NC	As specified in TS 38.508-1 [14] clause 4.1.
Test frequencies	As specified in Annex E, table E.2-1 and TS 38.508-1 [14] clause 4.3.1 and 4.4.2.	

Channel bandwidth	As specified by the test configuration selected from Table 4.5.5.8.4.1-1.		
Propagation conditions	AWGN		As specified in clause C.2.2.
Connection Diagram	TE Part	A.3.1.7.1	As specified in TS 38.508-1 [14] Annex A.
	DUT Part	A.3.2.3.4	
Exceptions to connection diagram	For 4Rx capable UEs without any 2 Rx RF bands use A.3.2.5.2 for DUT part and A.3.1.8.4 for TE Part		

1. The general test parameter settings are set up according to Table 4.5.5.8.4.1-3.
2. Message contents are defined in clause 4.5.5.8.4.3.
3. Cell 1 is the E-UTRA serving cell (PCell) for the EN-DC setup. The power levels and settings for Cell 1 are set according to Annex A.6. Cell 2 is the NR cell (PSCell) and Cell 3 is the NR cell (SCell) with the power level set according to Annex C.1.2 and C.1.3 for this test

Table 4.5.5.8.4.1-3: General test parameters for TRP specific EN-DC FR1 CSI-RS-based beam failure detection and link recovery in DRX

Parameter		Unit	Value	Comment
			Test 1	Same configuration for both TRP wherever applicable
Active PCell			Cell 1	
E-UTRA RF Channel Number			1	
Active PSCell			Cell 2	
RF Channel Number for PSCell			2	
Active SCell			Cell 3	
RF Channel Number for SCell			3	
Duplex mode	Config 1, 4		FDD	
	Config 2, 3, 5, 6		TDD	
BW channel	Config 1, 4	MHz	10: NRB,c = 52	
	Config 2, 5		10: NRB,c = 52	
	Config 3, 6		40: NRB,c = 106	
DL initial BWP configuration	Config 1, 2, 3, 4, 5, 6		DLBWP.0.1	
DL dedicated BWP configuration	Config 1, 2, 3, 4, 5, 6		DLBWP.1.1	
UL initial BWP configuration	Config 1, 2, 3, 4, 5, 6		ULBWP.0.1	
UL dedicated BWP configuration	Config 1, 2, 3, 4, 5, 6		ULBWP.1.1	
TDD Configuration	Config 1, 4		Not Applicable	
	Config 2, 5		TDDConf.1.1	
	Config 3, 6		TDDConf.2.1	
CORESET Reference Channel	Config 1, 4		CR.1.1 FDD	A.1.2
	Config 2, 5		CR.1.1 TDD	
	Config 3, 6		CR.2.1 TDD	
SSB Configuration	Config 1, 4		SSB.1 FR1	A.3.10 Same configuration for both TRP
	Config 2, 5		SSB.1 FR1	
	Config 3, 6		SSB.2 FR1	
SMTC Configuration	Config 1, 2, 3, 4, 5, 6		SMTC.1	A.4, Same configuration for both TRP
PDSCH/PDCCH subcarrier spacing	Config 1, 2, 4, 5	kHz	15	
	Config 3, 6		30	
PRACH Configuration	Config 1, 2, 4, 5		PRACH.2 FR1	Table A.7.1-1
	Config 3, 6		PRACH.2 FR1	Table A.7.1-1
csi-RS-Index assigned as beam failure detection RS in set q_{00} in activated SCell			0	
csi-RS-Index assigned as beam failure detection RS in set q_{01} in activated SCell			2	
OCNG parameters			OP.1	A.2.1

CP length			Normal	
Correlation Matrix and Antenna Configuration			2x2 Low	
Beam failure detection transmission parameters	DCI format		1-0	
	Number of Control OFDM symbols		2	
	Aggregation level	CCE	8	
	Ratio of hypothetical PDCCH RE energy to average CSI-RS RE energy	dB	0	
	Ratio of hypothetical PDCCH DMRS energy to average CSI-RS RE energy	dB	0	
	DMRS precoder granularity		REG bundle size	
	REG bundle size		6	
DRX			OFF	
Gap pattern ID			N.A.	
schedulingRequestID-BFR-r17			Configured, 1-2	
Periodicity of PUCCH for SR configuration for BFR on SCell	Config 1, 2, 4, 5	slot	5	5ms
	Config 3, 6		10	
schedulingRequestID-BFR2-r17			absent	When the field is absent, the random access procedure will be triggered for TRP BFR
Periodicity of PUCCH for SR configuration for BFR on TRP0		Slot	5	
SSB Index assigned as CBD RS (q10) in activated SCell			1	
SSB Index assigned as CBD RS (q11) in activated SCell			3	
rlmInSyncOutOfSyncThreshold			absent	When the field is absent, the UE applies the value 0.
rsrp-ThresholdBFR	Config 1, 2, 4, 5	dBm/SCS	-98	Threshold used for $Q_{in_LR_SSB}$
	Config 3, 6		-95	
powerControlOffsetSS			db0	Used for deriving rsrp-ThresholdCSI-RS
beamFailureInstanceMaxCount			n1	see TS 38.321 [12], clause 5.17
beamFailureDetectionTimer			pbfd4	see TS 38.321 [12], clause 5.17
BFD-RS (CSI-RS) configuration for q_{00} in activated SCell	Config 1, 4		CSI-RS.1.2 FDD	A.1.4
	Config 2, 5		CSI-RS.1.2 TDD	
	Config 3, 6		CSI-RS.2.2 TDD	
BFD-RS (CSI-RS) configuration for q_{01} in activated SCell	Config 1, 4		CSI-RS.1.7 FDD	A.1.4
	Config 2, 5		CSI-RS.1.6 TDD	
	Config 3, 6		CSI-RS.2.7 TDD	
CSI-RS configuration for CSI reporting	Config 1, 4		CSI-RS.1.1 FDD	A.1.4
	Config 2, 5		CSI-RS.1.1 TDD	
	Config 3, 6		CSI-RS.2.1 TDD	
TRS configuration	Config 1, 4		TRS.1.1 FDD	
	Config 2, 5		TRS.1.1 TDD	
	Config 3, 6		TRS.1.2 TDD	
csi-RS-Index	Config 1, 4		CSI-RS.1.2 FDD	A.1.4

assigned as RLM RS in PSCell	Config 2, 5 Config 3, 6		CSI-RS.1.2 TDD CSI-RS.2.2 TDD	
T310 Timer		ms	1000	
N310			2	
T1		s	1	During this time the UE shall be fully synchronized to cell 1
T2		s	0.18	
T3		s	0.14	
T4		s	0	
T5		s	0.17	
D1		s	0.06	
Note 1: UE-specific PDCCH is not transmitted after T1 starts.				

4.5.5.8.4.2 Test procedure

Prior to the start of the time duration T1, the UE shall be fully synchronized to cell 1, cell 2 and cell 3. The UE shall be configured for periodic CSI reporting with a reporting periodicity of 5 ms. In the test, DRX configuration is not enabled.

1. Ensure the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity *EN-DC*, DC bearer MCG and SCG, Connected without release *On* and Test Mode *On* according to TS 38.508-1 [14] clause 4.5.

2. Set the parameters of NR Cell according to T1 in Table 4.5.5.8.5-1. Propagation conditions are set according to clause C.2.3. T1 starts.

3. When T1 expires the SS shall change the SNR1 and SNR2 values to T2 as specified in Table 4.5.5.8.5-1. T2 starts.

4. When T2 expires the SS shall change the SNR1 and SNR2 values to T3 as specified in Table 4.5.5.8.5-1. T3 starts.

5. When T3 expires the SS shall change the SNR1 and SNR2 values to T4 as specified in Table 4.5.5.8.5-1. T4 starts.

6. When T4 expires the SS shall change the SNR1 and SNR2 values to T5 as specified in Table 4.5.5.8.5-1. T5 starts.

7. If the SS:

   a) detects uplink power on the PCell equal to or higher than minimum output power defined in TS 38.521-1 [17] clause 6.3.1.5 in each slot configured for CSI transmission (according CSI reporting on PUCCH) during the period from time point A to time point B

   and

   b) does not detect preamble on a beam associated with the candidate beam set $q_{1,0}$ and $q_{1,1}$ on the PCell before time point B

   and

   c) detects preamble on a beam associated with the candidate beam set $q_{1,0}$ and $q_{1,1}$ on the preconfigured PRACH resource before time point F (D1 after the start of T5).

   And

   d) SS transmits a RAR to UE after receiving the preamble transmitted by the UE. SS detects the MAC-CE on the PCell transmitted by the UE providing the index for the activated SCell, and the index for the SSB provided by higher layer.

   the number of successful tests is increased by one.

Otherwise the number of failed tests is increased by one.

8. If the iteration or random access procedure for BFD fails, the SS shall first attempt to release and add the FR1 SCell, by ensuring the UE is in state RRC_CONNECTED with generic procedure parameters *Connectivity* EN-DC, DC bearer MCG and SCG, Connected without release *On* and Test Mode *On* according to TS 38.508-1 [6] clause 4.5. If that also fails, then the UE is switched OFF/ON to proceed with the next iteration.

4.5.5.8.4.3 Message contents

Message contents are according to TS 38.508-1 [14] clause 7.3 with the following exceptions:

Table 4.5.5.8.4.3-1: Common Exception messages for TRP specific EN-DC FR1 CSI-RS-based beam failure detection and SSB-based link recovery in non-DRX

Default Message Contents	
Common contents of system information blocks exceptions	
Default RRC messages and information elements contents exceptions	Table H.3.1-8A with Condition SSB BFD Table H.3.1-10 with Condition SSB CBD

Table 4.5.5.8.4.3-2: *MAC-CellGroupConfig for R17 BFR*

Derivation Path: TS 38.508-1, Table 4.6.3-68			
Information Element	Value/remark	Comment	Condition
MAC-CellGroupConfig ::= SEQUENCE {			
schedulingRequestID-BFR-r17	Not present		
schedulingRequestID-BFR2-r17	Not present		
schedulingRequestConfig-v1700	SchedulingRequest-Config		
}			

4.5.5.8.5 Test requirements

Table 4.5.5.8.5-1: Cell specific test parameters for FR1 PSCell and SCell for beam failure detection and link recovery testing in non-DRX mode

Parameter		Unit	Cell2	TRP 0/1 Cell3				
			T1 to T5	T1	T2	T3	T4	T5
EPRE ratio of PDCCH DMRS to SSS		dB	0	0				
EPRE ratio of PDCCH to PDCCH DMRS		dB						
EPRE ratio of PBCH DMRS to SSS		dB						
EPRE ratio of PBCH to PBCH DMRS		dB						
EPRE ratio of PSS to SSS		dB						
EPRE ratio of PDSCH DMRS to SSS		dB						
EPRE ratio of PDSCH to PDSCH DMRS		dB						
EPRE ratio of OCNG DMRS to SSS		dB						
EPRE ratio of OCNG to OCNG DMRS		dB						
SNR_CSI-RS of set q_{00}	Config 1, 4	dB	5+TT	5+TT	-3+TT	-12+TT	-12+TT	-12+TT
	Config 2, 5		5+TT	5+TT	-3+TT	-12+TT	-12+TT	-12+TT
	Config 3, 6		5+TT	5+TT	-3+TT	-12+TT	-12+TT	-12+TT
SNR_CSI-RS of set q_{01}	Config 1, 4		5+TT 5+TT	5+TT 5+TT	5+TT 5+TT	5+TT 5+TT	5+TT 5+TT	5+TT 5+TT

	Config 2, 5		5+TT	5+TT	5+TT	5+TT	5+TT	5+TT
	Config 3, 6							
SNR_SSB of set q_{10}	Config 1, 4	dB	-10+TT	-10+TT	-10+TT	10+TT	10+TT	10+TT
	Config 2, 5		-10+TT	-10+TT	-10+TT	10+TT	10+TT	10+TT
	Config 3, 6		-10+TT	-10+TT	-10+TT	10+TT	10+TT	10+TT
SSB_RP of set q_{10}	Config 1, 4	dBm/SCS kHz	-108+TT	-108+TT	-108+TT	-88+TT	-88+TT	-88+TT
	Config 2, 5		-108+TT	-108+TT	-108+TT	-88+TT	-88+TT	-88+TT
	Config 3, 6		-105+TT	-105+TT	-105+TT	-85+TT	-85+TT	-85+TT
N_{oc}	Config 1, 4	dBm/15 kHz	-98+TT	-98+TT				
	Config 2, 5		-98+TT	-98+TT				
	Config 3, 6		-98+TT	-98+TT				
Propagation condition			TDL-C 300ns 100Hz	TDL-C 300ns 100Hz				

Note 1: OCNG shall be used such that the resources in Cell 1 are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.
Note 2: The uplink resources for CSI reporting are assigned to the UE prior to the start of time period T1.
Note 3: NZP CSI-RS resource set configuration for CSI reporting are assigned to the UE prior to the start of time period T1.
Note 4: Void
Note 5: The timers and layer 3 filtering related parameters are configured prior to the start of time period T1.
Note 6: The signal contains PDCCH for UEs other than the device under test as part of OCNG.
Note 7: SNR levels correspond to the signal to noise ratio over the REs carrying CSI-RS.
Note 8: The SNR in time periods T1, T2, T3, T4 and T5 is denoted as SNR1, SNR2 and SNR3 respectively in figure 4.5.5.8.4-1.
Note 9: The SNR values are specified for testing a UE which supports 2RX on at least one band. For testing of a UE which supports 4RX on all bands, the SNR during T3 is modified as specified in clause in clause A.3.6.

The UE behaviour during time durations T1, T2, T3, T4 and T5 shall be as follows:

During the time duration T1 and T2, the UE shall transmit uplink signal at least in all subframes configured for CSI transmission on Cell 2.

During the period from time point A to time point B the UE shall transmit uplink signal in Cell 2 in all uplink slots configured for CSI transmission according to the configured periodic CSI reporting for Cell 2.

During T3 the UE shall detect beam failure on both TRP0 and TRP 1 and initiate link recovery. During T4 and T5 the UE measures and evaluate beam candidate from beam candidate set $q_{1,0}$ and $q_{1,1.}$

For TRP0, no later than time point F occurring no later than D1 = 60ms after the start of T5, the UE shall transmit PUCCH with LRR, followed by BFR MAC CE containing a beam associated with the candidate beam set $q_{1,0}$. The UE shall not transmit PUCCH with an LRR with the candidate beam set $q_{1,0}$ earlier than time point B.

Test is concluded once the test equipment has received the BFR MAC CE from the UE. The rate of correct events observed during repeated tests shall be at least 90%.

4.5.6 Active BWP switch delay

4.5.6.1 DCI-based and time-based active BWP switch

4.5.6.1.0 Minimum conformance requirements

4.5.6.1.0.1 Minimum conformance requirements for DCI-based and time-based active BWP switch

For DCI-based BWP switch, after the UE receives BWP switching request at DL slot n on a serving cell, UE shall be able to receive PDSCH (for DL active BWP switch) or transmit PUSCH (for UL active BWP switch) on the new BWP on the serving cell on which BWP switch on the first DL or UL slot occurs right after a time duration of $T_{BWPswitchDelay}$ which starts from the beginning of DL slot n.

The UE is not required to transmit UL signals or receive DL signals until the first DL or UL slot occurs right after a time duration of $T_{BWPswitchDelay}$ which starts from the beginning of DL slot n except DCI triggering BWP switch on the cell where DCI-based BWP switch occurs. The UE is not required to follow the requirements defined in this clause when performing a DCI-based BWP switch between the BWPs in disjoint channel bandwidths or in partially overlapping channel bandwidths.

For timer-based BWP switch, the UE shall start BWP switch at DL slot n, where slot n is the first slot of a DL subframe (FR1) or DL half-subframe (FR2) immediately after a BWP-inactivity timer *bwp-InactivityTimer* [13] expires on a serving cell, and the UE shall be able to receive PDSCH (for DL active BWP switch) or transmit PUSCH (for UL active BWP switch) on the new BWP on the serving cell on which BWP switch on the first DL or UL slot occurs right after a time duration of $T_{BWPswitchDelay}$ which starts from the beginning of DL slot n.

The UE is not required to transmit UL signals or receive DL signals during time duration $T_{BWPswitchDelay}$ after *bwp-InactivityTimer* [13] expires on the cell where timer-based BWP switch occurs.

Depending on UE capability *bwp-SwitchingDelay* [13], UE shall finish BWP switch within the time duration $T_{BWPswitchDelay}$ defined in Table 4.5.6.1.0.1-1.

Table 4.5.6.1.0.1-1: BWP switch delay

μ	NR Slot length (ms)	BWP switch delay $T_{BWPswitchDelay}$ (slots)	
		Type 1[Note 1]	Type 2[Note 1]
0	1	1	3
1	0.5	2	5
2	0.25	3	9
3	0.125	6	18
NOTE 1: Depends on UE capability. NOTE 2: If the BWP switch involves changing of SCS, the BWP switch delay is determined by the smaller SCS between the SCS before BWP switch and the SCS after BWP switch.			

Provided the UE does not have the required TCI-state information to receive PDCCH and PDSCH in the new BWP, the UE shall use old TCI-states before the BWP switch until a new MAC CE updating the required TCI-state information for PDCCH and PDSCH is received after the BWP switch.

If UE has the information on the required TCI-state information to receive PDCCH and PDSCH in the new BWP:

- UE shall be able to receive PDCCH and PDSCH with old TCI-states before the delay as specified in TS 38.133 [6] Clause 8.10 in the new BWP.
- UE shall be able to receive PDCCH and PDSCH with new TCI-states after the delay as specified in TS 38.133 [6] Clause 8.10 in the new BWP.

If the BWP switch is triggered within DRX active time, and one of the two BWPs in a BWP switching is a dormant BWP [TS 38.321, 12], UE shall be able to complete active BWP switching within:

- $T_{BWPswitchDelay}$, provided that the BWP switching request is received in any of the first 3 OFDM symbols of a slot corresponding to the serving cell where BWP switching occurs, or
- $T_{BWPswitchDelay}$ + 1, provided that the BWP switching request is received after the first 3 OFDM symbols of a slot corresponding to the serving cell where BWP switching occurs

When either of the DCI-based, timer-based or RRC-based downlink BWP switch and/or uplink BWP switch occur on multiple CCs simultaneously or over partially overlapping period, the interruption requirements described in this section apply for each BWP switch.

When UE receives a DCI indicating UE to switch its active BWP involving changes in any of the parameters listed in Table 4.5.6.1.0.1-3, the UE is allowed to cause interruption of up to X slot to other active serving cells if the UE is not capable of per-FR gap, or if the BWP switching involves SCS changing. When the BWP switch imposes changes in any of the parameters listed in Table 4.5.6.1.0.1-3 and the UE is capable of per-FR gap, the UE is allowed to cause interruption of up to X slot to other active serving cells in the same frequency range wherein the UE is performing BWP switching. X is defined in Table 4.5.6.1.0.1-2. The starting time of interruption is only allowed within the BWP switching delay $T_{BWPswitchDelay}$ as defined in TS 38.133 [6] clause 8.6.2. Interruptions are not allowed during BWP switch involving any other parameter change.

When a BWP timer *bwp-InactivityTimer* defined in TS 38.331 [13] expires, UE is allowed to cause interruption of up to X slot to other active serving cells due to switching its active BWP involving changes in any of the parameters listed in Table 4.5.6.1.0.1-3 if the UE is not capable of per-FR gap, or if the BWP switching involves SCS changing. When the BWP switch imposes changes in any of the parameters listed in Table 4.5.6.1.0.1-3 and the UE is capable of per-FR gap, the UE is allowed to cause interruption of up to X slot to other active serving cells in the same frequency range wherein the UE is performing BWP switching. X is defined in Table 4.5.6.1.0.1-2. The starting time of interruption is only allowed within the BWP switching delay $T_{BWPswitchDelay}$ as defined in TS 38.133 [6] clause 8.6.2. Interruptions are not allowed during BWP switch involving any other parameter change.

Table 4.5.6.1.0.1-2: interruption length X

μ	NR Slot length (ms)	Interruption length X (slots)
0	1	1
1	0.5	1
2	0.25	3
3	0.125	5
NOTE: Void.		

Table 4.5.6.1.0.1-3: Parameters which cause interruption other than SCS

Parameters	Comment
locationAndBandwidth	From TS 38.331 [13]
nrofSRS-Ports	
maxMIMO-Layers-r16	

When either of the DCI-based, timer-based or RRC-based downlink BWP switch and/or uplink BWP switch occur on multiple CCs simultaneously or over partially overlapping period, the interruption requirements described in this section apply for each BWP switch.

DCI-based or timer-based downlink BWP and/or uplink BWP switching due to change in any of the parameters listed in Table 8.2.1.2.7-2 of TS 38.133 [6] or SCS in NR PSCell or in any NR SCell may cause an interruption on PCell or on activated SCell(s) in the MCG. Interruptions are not allowed during BWP switch involving other parameter change.

Uplink BWP switching on a NR PSCell triggered by consistent uplink LBT failures on the NR PSCell may cause an interruption on PCell or on activated SCell(s) in the MCG.

The starting time of interruption due to DCI-based or timer-based downlink BWP and/or uplink BWP switching or due to uplink BWP switching on a NR PSCell triggered by consistent uplink LBT failures on the NR PSCell is only allowed within the BWP switching delay $T_{BWPswitchDelay}$ as defined in clause 8.6.2 of TS 38.133 [6].

RRC-based downlink BWP and/or uplink BWP switching due to change in any of the parameters listed in Table 8.2.1.2.7-2 of TS 38.133 [6] or SCS in NR PSCell or in any NR SCell may cause an interruption on PCell or on activated SCell(s) in the MCG. Interruptions are not allowed during BWP switch involving other parameter change.

The interruption due to RRC-based downlink BWP and/or uplink BWP switching is allowed anywhere within the BWP switching delay ($T_{RRCprocessingDelay} + T_{BWPswitchDelayRRC}$) defined in clause 8.6.3 of TS 38.133 [6]. The interruption due to RRC-based downlink BWP and/or uplink BWP switching defined in this clause is applicable provided that:

- the RRC reconfiguration requires the UE to only switch its active BWP; and
- the BWP switching occurs on only one NR serving cell.

When BWP switch involves SCS changes:

- the UE is allowed to cause interruption on PCell or on any activated SCell(s) regardless of the frequency range of the NR PCell or NR SCell on which the BWP switching occurs.

Otherwise:

- the UE capable of per UE measurement gap [29] is allowed to cause interruption on PCell or on any activated SCell(s) regardless of the frequency range of the NR PSCell or NR SCell on which the BWP switching occurs;
- the UE capable of per FR measurement gap [29] is allowed to cause interruption on PCell or on any activated SCell(s) provided that the NR PSCell or NR SCell on which the BWP switching occurs belongs to FR1.

The interruption on PCell or on any activated SCell(s) shall not exceed:

- 1 subframe in synchronous EN-DC;
- 2 subframes in asynchronous EN-DC.

The normative reference for this requirement is TS 38.133 [6] clauses 8.6.2, 8.2.1.2.7 and TS 36.133 [23] clause 7.32.2.7.

4.5.6.1.1 EN-DC FR1 DCI-based DL active BWP switch in non-DRX in synchronous EN-DC

4.5.6.1.1.1 Test purpose

The purpose of this test is to verify the DL BWP switch delay requirement defined in TS 38.133 [6] clause 8.6, and interruption requirement for E-UTRA victim cell defined in TS 36.133 [23] clause 7.32.2.7.

4.5.6.1.1.2 Test applicability

This test applies to all types of E-UTRA UE release 15 onwards, supporting EN-DC, BWP adaptation of at least 2BWPs, DCI and timer-based active BWP switching delay Type1 or Type2.

4.5.6.1.1.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 4.5.6.1.0.1.

The normative reference for this requirement is TS 38.133 [6] clause A.4.5.6.1.1.

4.5.6.1.1.4 Test description

4.5.6.1.1.4.1 Initial conditions

This test shall be tested using any of the test configurations in Table 4.5.6.1.1.4.1-1.

Table 4.5.6.1.1.4.1-1: Supported test configurations for FR1 DCI-based DL active BWP switch in non-DRX in synchronous EN-DC

Config	Description
4.5.6.1.1-1	LTE FDD, NR 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode
4.5.6.1.1-2	LTE FDD, NR 15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode
4.5.6.1.1-3	LTE FDD, NR 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode
4.5.6.1.1-4	LTE TDD, NR 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode
4.5.6.1.1-5	LTE TDD, NR 15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode

4.5.6.1.1-6	LTE TDD, NR 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode
NOTE 1: The UE is only required to be tested in one of the supported test configurations. NOTE 2: A UE which fulfils the requirements in test case 4.5.6.1.2 can skip the test cases in clause 4.5.6.1.1.	

Configure the test equipment and the DUT according to the parameters in Table 4.5.6.1.1.4.1-2.

Table 4.5.6.1.1.4.1-2: Initial conditions for FR1 DCI-based DL active BWP switch in non-DRX in synchronous EN-DC

Parameter	Value		Comment
Test environment	NC		As specified in TS 38.508-1 [14] clause 4.1.
Test frequencies	As specified in Annex E, Table E.4-1 and TS 38.508-1 [14] clause 4.3.1.		
Channel bandwidth	As specified by the test configuration selected from Table 4.5.6.1.1.4.1-1.		
Propagation conditions	AWGN		As specified in clause C.2.2
Connection Diagram	TE Part	A.3.1.8.2	As specified in TS 38.508-1 [14] Annex A.
	DUT Part	A.3.2.3.4	
Exceptions to connection diagram	- For 4Rx capable UEs without any 2Rx RF bands use A.3.2.5.2 for DUT part and A.3.1.8.4 for TE part.		

1. The general test parameter settings are set up according to Table 4.5.6.1.1.4.1-3.
2. Message contents are defined in clause 4.5.6.1.1.4.3.
3. The test scenario comprises of one E-UTRA PCell (Cell 1), and one NR PSCell (Cell 2). The power levels and settings for Cell 1 are set according to Annex A.6. Cell 2 are configured according to clause C.1.2 and C.1.3.

Table 4.5.6.1.1.4.1-3: General test parameters for DL BWP switch in synchronous EN-DC

Parameter	Unit	Value	Comment
E-UTRA RF Channel Number		1	One E-UTRA radio channel is used for this test
NR RF Channel Number		2	One NR radio channel is used for this test
Active PCell		Cell 1	PCell on RF channel number 1.
Active PSCell		Cell 2	PSCell on RF channel number 2.
CP length		Normal	
DRX		OFF	For both PCell and PSCell
bwp-InactivityTimer	ms	200	
Cell-individual offset for cells on RF channel number 1	dB	0	Individual offset for cells on PCC.
Cell-individual offset for cells on RF channel number 2	dB	0	Individual offset for cells on PSCC.
Cell2 timing offset to cell1	µs	3	Synchronous EN-DC
T1	s	0.2	
T2	s	0.2	
T3	s	0.2	

4.5.6.1.1.4.2 Test procedure

The test consists of 3 successive time periods, with durations of T1, T2, and T3, respectively.

PDCCHs indicating new transmissions shall be sent continuously on E-UTRA PCell (Cell 1) to ensure that the UE will have ACK/NACK sending.

PDCCHs indicating new transmissions shall be sent continuously on PSCell (Cell 2) to ensure that the UE would have ACK/NACK sending except for the time duration when BWP is switching on Cell 2 and the time duration of T2.

Before the test starts,

- UE is connected to Cell 1 (E-UTRA PCell) on radio channel 1 (PCC), and Cell 2 (PSCell) on radio channel 2 (PSCC).

- UE is configured with 2 different UE-specific downlink bandwidth parts for PSCell, BWP-1 and BWP-2, in Cell 2 before starting the test. BWP-1 and BWP-2 always include bandwidth of the initial DL BWP and SSB.
- UE is indicated in *firstActiveDownlinkBWP-Id* that the active DL BWP is BWP-1 in PSCell.
- UE is configured with a *bwp-InactivityTimer* timer value for PSCell.

All cells have constant signal levels throughout the test.

1. Ensure the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity *EN-DC*, DC bearer *MCG_and_SCG*, Connected without release *On* and Test Mode *On* according to TS 38.508-1 [14] clause 4.5.
2. Set the parameters according to Tables 4.5.6.1.1.4.1-3 and 4.5.6.1.1.5-1. Propagation conditions are set according to Annex C clauses C.2.2.
3. The SS shall transmit an *RRCConnectionReconfiguration* message releasing the dedicated configuration of the *initialDownlinkBWP* and the *initialUplinkBWP*. This message also configures 2 different UE-specific bandwidth parts, BWP-1 and BWP-2, and indicates BWP-1 as the active DL BWP using *firstActiveDownlinkBWP-Id*, according to Table 4.5.6.1.1.4.3-2.
4. The UE shall transmit an *RRCConnectionReconfigurationComplete* message.
5. The SS shall send a DCI format 1_1 command for PSCell DL BWP switch.
6. The UE shall receive the DCI format 1_1 command in PSCell's slot # denoted i, then T1 starts and the UE switch its bandwidth part from BWP-1 to BWP-2:
   a) If the UE starts to report valid ACK/NACK for PSCell from the first UL slot that occurs after the beginning of the DL slot (i+$T_{BWPswitchDelay}$+k_1); and
   b) If the UE starts to report valid ACK/NACK for PCell from the first UL slot that occurs after the beginning of the DL slot (i+$T_{BWPswitchDelay}$+ 1 subframe + k); and
   c) If the number of consecutive missing ACK/NACK for PCell is no more than 1.

   Then, the number of successful subtests is increased by one. Otherwise, count a fail for the test, switch off/on the UE and go to step 1.
7. If the UE sends valid ACK/NACK for the PSCell on BWP-2, T2 starts. During T2, the SS shall not transmit DCI format for PDSCH reception on PSCell.
8. T3 starts from the first slot #j of the DL subframe immediately after the slot wherein *bwp-InactivityTimer* timer expires and the SS restarts to send DCI format for PDSCH reception on PSCell. Then, the UE shall switch its bandwidth part from BWP-2 back to the default bandwidth part - BWP-1 on PSCell:
   a) If the UE starts to report valid ACK/NACK for PSCell from the first UL slot that occurs after the beginning of the DL slot (j+$T_{BWPswitchDelay}$+k_1); and
   b) If the UE starts to report valid ACK/NACK for PCell from the first UL slot that occurs after the beginning of the DL slot (j+$T_{BWPswitchDelay}$+ 1 subframe + k); and
   c) If the number of consecutive missing ACK/NACK for PCell is no more than 1

   Then, the number of successful subtests is increased by one. Otherwise, count a fail for the test, switch off/on the UE and go to step 1.
9. Repeat steps 5-8 until the confidence level according to Tables G.2.3-1 in Annex G clause G.2 is achieved.

The SS verifies the DL BWP switch time in PSCell by counting the slots from the time when the BWP switch command is received or *bwp-InactivityTimer* timer expires till an ACK/NACK is received.

The SS verifies that potential interruption to E-UTRA PCell is carried out in the correct time span by monitoring ACK/NACK sent in PCell during BWP switch of PSCell, respectively.

"*k*" is the length (slot) between E-UTRA PCell PDSCH and its corresponding ACK/NACK as specified in TS 36.213 [33].

If all subtests pass, the test passes. If one subtest fails, the test fails.

4.5.6.1.1.4.3 Message contents

Message contents are according to TS 38.508-1 [14] clause 7.3 with the following exceptions:

Table 4.5.6.1.1.4.3-1: Common Exception messages for FR1 DCI-based DL active BWP switch in non-DRX in synchronous EN-DC

Default Message Contents	
Common contents of system information blocks exceptions	
Default RRC messages and information elements contents exceptions	Table H.3.4-1

Table 4.5.6.1.1.4.3-1A: *RRCReconfiguration* (Step3)

Derivation Path: TS 38.508-1 [14], Table 4.6.1-13 with condition EN-DC			
Information Element	**Value/remark**	**Comment**	**Condition**
RRCReconfiguration ::= SEQUENCE {			
criticalExtensions CHOICE {			
rrcReconfiguration SEQUENCE {			
secondaryCellGroup	CellGroupConfig	Table 4.5.6.1.1.4.3-1B	
}			
}			
}			

Table 4.5.6.1.1.4.3-1B: *CellGroupConfig* (Table 4.5.6.1.1.4.3-1A)

Derivation Path: TS 38.508-1 [14], Table 4.6.3-19			
Information Element	**Value/remark**	**Comment**	**Condition**
CellGroupConfig ::= SEQUENCE {			
cellGroupId	1		
spCellConfig SEQUENCE {			
servCellIndex	ServCellIndex of NR PSCell		
spCellConfigDedicated	ServingCellConfig	Table 4.5.6.1.1.4.3-2	
}			
}			

Table 4.5.6.1.1.4.3-2: *ServingCellConfig* (Table 4.5.6.1.1.4.3-1B)

Derivation Path: TS 38.508-1 [14], Table 4.6.3-167			
Information Element	**Value/remark**	**Comment**	**Condition**
ServingCellConfig ::= SEQUENCE {			
initialDownlinkBWP SEQUENCE {			
pdcch-Config CHOICE {			
release	NULL		
}			
pdsch-Config CHOICE {			
release	NULL		
}			
radioLinkMonitoringConfig CHOICE {			
release	NULL		
}			
downlinkBWP-ToAddModList SEQUENCE (SIZE (1..maxNrofBWPs)) OF SEQUENCE {	2 entries		
BWP-Downlink[1]	BWP-Downlink with condition BWP1	entry 1	

		Table 4.5.6.1.1.4.3-3	
BWP-Downlink[2]	BWP-Downlink with condition BWP2	entry 2 Table 4.5.6.1.1.4.3-3	
}			
firstActiveDownlinkBWP-Id	1	According to BWP-1	
bwp-InactivityTimer	ms200		
defaultDownlinkBWP-Id	1	According to BWP-1	
uplinkConfig SEQUENCE {			
initialUplinkBWP SEQUENCE {			
pucch-Config CHOICE {			
release	NULL		
}			
pusch-Config CHOICE {			
release	NULL		
}			
srs-Config CHOICE {			
release	NULL		
}			
uplinkBWP-ToAddModList SEQUENCE (SIZE (1..maxNrofBWPs)) OF SEQUENCE {	2 entries		
BWP-Uplink[1]	BWP-Uplink with condition BWP1	entry 1 Table 4.5.6.1.1.4.3-4	
BWP-Uplink[2]	BWP-Uplink with condition BWP2	entry 2 Table 4.5.6.1.1.4.3-4	
firstActiveUplinkBWP-Id	1	According to BWP-1	
}			
}			
}			

Table 4.5.6.1.1.4.3-3: *BWP-Downlink* (Table 4.5.6.1.1.4.3-2)

Derivation Path: TS 38.508-1 [14], Table 4.6.3-9			
Information Element	**Value/remark**	**Comment**	**Condition**
BWP-Downlink ::= SEQUENCE {			
bwp-Id	1	BWP-1	BWP1
	2	BWP-2	BWP2
bwp-Common SEQUENCE {			
genericParameters	RIV defined in TS 38.214 [9] that corresponds to DLBWP.1.1		BWP1
	RIV defined in TS 38.214 [9] that corresponds to DLBWP.1.3		BWP2
}			
}			

Table 4.5.6.1.1.4.3-4: *BWP-Uplink* (Table 4.5.6.1.1.4.3-2)

Derivation Path: TS 38.508-1 [14], Table 4.6.3-13			
Information Element	**Value/remark**	**Comment**	**Condition**
BWP-Uplink ::= SEQUENCE {			
bwp-Id	1	BWP-1	BWP1
	2	BWP-2	BWP2
bwp-Common SEQUENCE {			

genericParameters	RIV defined in TS 38.214 [9] that corresponds to ULBWP.1.1	BWP-1	BWP1
	RIV defined in TS 38.214 [9] that corresponds to ULBWP.1.3	BWP-2	BWP2
}			
}			

Table 4.5.6.1.1.4.3-5: *Void*

Table 4.5.6.1.1.4.3-6: *PDSCH-TimeDomainResourceAllocationList*

Derivation Path: TS 38.508-1 [14], Table 4.6.3-103			
Information Element	**Value/remark**	**Comment**	**Condition**
PDSCH-TimeDomainResourceAllocationList ::= SEQUENCE(SIZE(1..maxNrofDL-Allocations)) OF PDSCH-TimeDomainResourceAllocation {	4 entries		
PDSCH-TimeDomainResourceAllocation[1] SEQUENCE {		entry 1	
k0	Not present		
mappingType	typeA		
startSymbolAndLength	53	Start symbol(S)=2, Length(L)=12	
}			
PDSCH-TimeDomainResourceAllocation[2] SEQUENCE {		entry 2	
k0	Not present		
mappingType	typeA		
startSymbolAndLength	72	S=2, L=6	
}			
PDSCH-TimeDomainResourceAllocation[3] SEQUENCE {		entry 3	
k0	$T_{BWPswitchDelay}$	Defined in Table 4.5.6.1.0.1-1	The DCI indicating BWP switch
mappingType	typeA		
startSymbolAndLength	53	Start symbol(S)=2, Length(L)=12	
}			
PDSCH-TimeDomainResourceAllocation[4] SEQUENCE {		entry 4	
k0	1		First DCI right after DCI-based BWP switch
mappingType	typeA		
startSymbolAndLength	53	Start symbol(S)=2, Length(L)=12	
}			
}			

Table 4.5.6.1.1.4.3-7: *PDSCH-Config*

Derivation Path: TS 38.508-1 [14], Table 4.6.3-100			
Information Element	**Value/remark**	**Comment**	**Condition**
PDSCH-Config ::= SEQUENCE {			
pdsch-TimeDomainAllocationList	PDSCH-TimeDomainResourceAllocationList		
}			

4.5.6.1.1.5 Test requirements

Tables 4.5.6.1.1.4.1-3 and 4.5.6.1.1.5-1 define the primary level settings including test tolerances.

Table 4.5.6.1.1.5-1: NR Cell specific test parameters for DL BWP switch in synchronous EN-DC

Parameter		Unit	Cell 2
Frequency Range			FR1
Duplex mode	Config 1,4		FDD
	Config 2,3,5,6		TDD
TDD configuration	Config 1,4		Not Applicable
	Config 2,5		TDDConf.1.1
	Config 3,6		TDDConf.2.1
$BW_{channel}$	Config 1,4		10 MHz: $N_{RB,c}$ = 52
	Config 2,5		10 MHz: $N_{RB,c}$ = 52
	Config 3,6		40 MHz: $N_{RB,c}$ = 106
Active BWP ID			1, 2
Initial DL BWP Configuration	Config 1,4		DLBWP.0.2 Note 4
	Config 2,5		
	Config 3,6		
Active DL BWP-1 Configuration	Config 1,4		DLBWP.1.1 Note 4
	Config 2,5		
	Config 3,6		
Active DL BWP-2 Configuration	Config 1,4		DLBWP.1.3 Note 4
	Config 2,5		
	Config 3,6		
Initial UL BWP Configuration	Config 1,4		ULBWP.0.2 Note 4
	Config 2,5		
	Config 3,6		
Active UL BWP-1 Configuration	Config 1,4		ULBWP.1.1 Note 4
	Config 2,5		
	Config 3,6		
Active UL BWP-2 Configuration	Config 1,4		N/A
	Config 2,5		ULBWP.1.3 Note 4
	Config 3,6		ULBWP.1.3 Note 4
PDSCH Reference measurement channel	Config 1,4		SR.1.1 FDD
	Config 2,5		SR.1.1 TDD
	Config 3,6		SR.2.1 TDD
RMSI CORESET parameters	Config 1,4		CR.1.1 FDD
	Config 2,5		CR.1.1 TDD
	Config 3,6		CR.2.1 TDD
Dedicated CORESET parameters	Config 1,4		CCR.1.2 FDD
	Config 2,5		CCR.1.2 TDD
	Config 3,6		CCR.2.4 TDD
OCNG Patterns			OP.1
SSB Configuration	Config 1,2,4,5		SSB.1 FR1
	Config 3,6		SSB.2 FR1
SMTC Configuration			SMTC.1
Correlation Matrix and Antenna Configuration			1x2 Low
TRS Configuration	Config 1,4		TRS.1.1 FDD
	Config 2,5		TRS.1.1 TDD
	Config 3,6		TRS.1.2 TDD
EPRE ratio of PSS to SSS		dB	0
EPRE ratio of PBCH DMRS to SSS			
EPRE ratio of PBCH to PBCH DMRS			
EPRE ratio of PDCCH DMRS to SSS			
EPRE ratio of PDCCH to PDCCH DMRS			
EPRE ratio of PDSCH DMRS to SSS			
EPRE ratio of PDSCH to PDSCH			
EPRE ratio of OCNG DMRS to SSS(Note 1)			
EPRE ratio of OCNG to OCNG DMRS (Note 1)			
N_{oc} Note 2	Config 1,2,4,5	dBm/SCS	-104
	Config 3,6		-101

Parameter		Unit	Cell 2
N_{oc} Note 2		dBm/15kHz	-104
SS-RSRP Note 3	Config 1,2,4,5	dBm/SCS	-87
	Config 3,6		-84
$\hat{E}_s/I_{ot}$		dB	17
$\hat{E}_s/N_{oc}$		dB	17
Io Note3	Config 1,2,4,5	dBm/ 9.36MHz	-58.96
	Config 3,6	dBm/ 38.16MHz	-52.86
Propagation Condition			AWGN
NOTE 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols. NOTE 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for Noc to be fulfilled. NOTE 3: SS-RSRP and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves. NOTE 4: For unpaired spectrum, a DL BWP is linked with an UL BWP. DLBWP.0.2 is linked with ULBWP.0.2; DLBWP.1.1 is linked with ULBWP.1.1; DLBWP.1.3 is linked with ULBWP.1.3 defined in clause 12 of TS 38.213 [8].			

During T1, the UE shall start to send the ACK/NACK for PSCell from the first UL slot that occurs after the beginning of DL slot (i+$T_{BWPswitchDelay}$+k_1).

During T3, the UE shall start to send the ACK/NACK for PSCell from the first UL slot that occurs after the beginning of DL slot (j+$T_{BWPswitchDelay}$+k_1).

Where, k_1 is the timing between DL data receiving and acknowledgement as specified in 38.214 [9].

Depending on UE capability *bwp-SwitchingDelay* [13], UE shall finish BWP switch within the time duration $T_{BWPswitchDelay}$ defined in TS 38.133 [6] Table 8.6.2-1.

All of the above test requirements shall be fulfilled in order for the observed PCell active BWP switch delay to be counted as correct.

The rate of correct events observed during repeated tests shall be at least 90%.

During T1, the start time of E-UTRA PCell interruption during PSCell active BWP switch shall not happen outside the BWP switch delay.

During T3, the start time of E-UTRA PCell interruption of during PSCell active BWP switch shall not happen outside the BWP switch delay.

The interruption of E-UTRA PCell shall not be longer than the interruption duration specified for active BWP switch in TS 36.133 [23] clause 7.32.2.7.

All of the above test requirements shall be fulfilled in order for the observed E-UTRA PCell active BWP switch interruption to be counted as correct.

The rate of correct events observed during repeated tests shall be at least 90%.

NOTE: During T1, T3 if there are no uplink resources for reporting the ACK/NACK in the first UL slot that occurs after the beginning of DL slot (i+ $T_{BWPswitchDelay}$+k_1), (j+ $T_{BWPswitchDelay}$+k_1), then the UE shall use the next available uplink resource for reporting the corresponding ACK/NACK.

4.5.6.1.2 EN-DC FR1 DCI-based DL active BWP switch with SCell in non-DRX in synchronous EN-DC

Editor's Note: TT analysis for test configuration with SpCC SCS = 15kHz + SCC SCS = 30kHz or SpCC SCS = 30kHz + SCC SCS = 15kHz are still missing.

4.5.6.1.2.1 Test purpose

The purpose of this test is to verify the DL BWP switch delay requirement defined in TS 38.133 [6] clause 8.6, and interruption requirements for NR victim cell defined in TS 38.133 [6] clause 8.2.1.2.7 and interruption requirement for E-UTRA victim cell defined in clause 7.32.2.7 of TS 36.133 [23].

4.5.6.1.2.2 Test applicability

This test applies to all types of E-UTRA UE release 15 onwards, supporting EN-DC, BWP adaptation of at least 2BWPs, DCI and timer-based active BWP switching delay Type1 or Type2 and 2DL CA.

4.5.6.1.2.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 4.5.6.1.0.1.

The normative reference for this requirement is TS 38.133 [6] clause A.4.5.6.1.2.

4.5.6.1.2.4 Test description

4.5.6.1.2.4.1 Initial conditions

This test shall be tested using any of the test configurations in this clause. Supported test configurations for LTE PCell and NR PSCell are shown in Table 4.5.6.1.2.4.1-1. Supported test configurations for NR SCell are shown in Table Table 4.5.6.1.2.4.1-1A. Test configuration for LTE PCell and NR PSCell and test configuration for NR SCell are chosen independently.

Table 4.5.6.1.2.4.1-1: Supported test configurations for FR1 DCI-based DL active BWP switch with SCell in non-DRX in synchronous EN-DC for LTE PCell and NR PSCell

Config	Description
4.5.6.1.2-1	LTE FDD, NR 15 kHz SSB SCS, ≥10 MHz bandwidth, FDD duplex mode
4.5.6.1.2-2	LTE FDD, NR 15 kHz SSB SCS, ≥10 MHz bandwidth, TDD duplex mode
4.5.6.1.2-3	LTE FDD, NR 30 kHz SSB SCS, ≥40 MHz bandwidth, TDD duplex mode
4.5.6.1.2-4	LTE TDD, NR 15 kHz SSB SCS, ≥10 MHz bandwidth, FDD duplex mode
4.5.6.1.2-5	LTE TDD, NR 15 kHz SSB SCS, ≥10 MHz bandwidth, TDD duplex mode
4.5.6.1.2-6	LTE TDD, NR 30 kHz SSB SCS, ≥40 MHz bandwidth, TDD duplex mode
Note 1: The UE is only required to be tested in one of the supported test configurations. Note 2: A UE which fulfils the requirements in test case 4.5.6.1.2 can skip the test cases in clause 4.5.6.1.1. Note 3: Void Note 4: The UE is only required to be tested in one with smallest aggregated channel bandwidth from supported band combinations which is composed of CCs ≥ the bandwidth ($BW_{channel}$) defined in each test configuration.	

Table 4.5.6.1.2.4.1-1A: Supported test configurations for FR1 DCI-based DL active BWP switch with SCell in non-DRX in synchronous EN-DC for NR SCell

$Config_{SCell}$	Description
1	NR 15 kHz SSB SCS, ≥10 MHz bandwidth, FDD duplex mode
2	NR 15 kHz SSB SCS, ≥10 MHz bandwidth, TDD duplex mode
3	NR 30 kHz SSB SCS, ≥40 MHz bandwidth, TDD duplex mode
Note 1: The UE is only required to be tested in one of the supported test configurations Note 2: A UE which fulfils the requirements in test case 4.5.6.1.2 can skip the test cases in 4.5.6.1.1. Note 3: The UE is only required to be tested in one with smallest aggregated channel bandwidth from supported band combinations which is composed of CCs ≥ the bandwidth ($BW_{channel}$) defined in each test configuration	

Configure the test equipment and the DUT according to the parameters in Table 4.5.6.1.2.4.1-2.

Table 4.5.6.1.2.4.1-2: Initial conditions for FR1 DCI-based DL active BWP switch with SCell in non-DRX in synchronous EN-DC

Parameter	Value	Comment
Test environment	NC	As specified in TS 38.508-1 [14] clause 4.1.
Test frequencies	As specified in Annex E, Table E.4-1 and TS 38.508-1 [14] clause 4.3.1.	
Channel bandwidth	As specified by the test configuration selected from Table 4.5.6.1.2.4.1-1.	

Propagation conditions	AWGN		As specified in clause C.2.2
Connection Diagram	TE Part	A.3.1.8.2	As specified in TS 38.508-1 [14] Annex A.
	DUT Part	A.3.2.3.4	
Exceptions to connection diagram	- For 4Rx capable UEs without any 2Rx RF bands use A.3.2.5.2 for DUT part and A.3.1.8.4 for TE part.		

1. The general test parameter settings are set up according to Table 4.5.6.1.2.4.1-3.

2. Message contents are defined in clause 4.5.6.1.2.4.3.

3. There are one E-UTRAN carrier and two NR carriers and three cells specified in the test. Cell 1 is the PCell on E-UTRAN carrier, Cell 2 is the PSCell on one NR carrier and Cell 3 is the NR SCell on the other NR carrier. Cell 1 is the cell used for connection setup with the power level set according to Annex A.6. Cell 2 and Cell 3 are configured according to clauses C.1.2 and C.1.3.

Table 4.5.6.1.2.4.1-3: General test parameters for DL BWP switch in synchronous EN-DC

Parameter	Unit	Value	Comment
E-UTRA RF Channel Number		1	One E-UTRA radio channel is used for this test
NR RF Channel Number		2, 3	Two NR radio channel are used for this test
Active PCell		Cell 1	PCell on RF channel number 1.
Active PSCell		Cell 2	PSCell on RF channel number 2.
Active SCell		Cell 3	SCell on RF channel number 3.
CP length		Normal	
DRX		OFF	
bwp-InactivityTimer	ms	200	
Cell-individual offset for cells on RF channel number 1	dB	0	Individual offset for cells on PCC.
Cell-individual offset for cells on RF channel number 2	dB	0	Individual offset for cells on PSCC.
Cell-individual offset for cells on RF channel number 3	dB	0	Individual offset for cells on SCC.
Cell2 timing offset to cell1	µs	3	Synchronous EN-DC
Cell3 timing offset to cell2	µs	3	Synchronous cells
T1	s	0.2	
T2	s	0.2	
T3	s	0.2	

4.5.6.1.2.4.2 Test procedure

The test consists of 3 successive time periods, with durations of T1, T2, and T3, respectively.

PDCCHs indicating new transmissions shall be sent continuously on E-UTRA PCell (Cell 1) and PSCell (Cell 2) to ensure that the UE will have ACK/NACK sending.

PDCCHs indicating new transmissions shall be sent continuously on SCell (Cell 3) to ensure that the UE would have ACK/NACK sending except for the time duration when BWP is switching on Cell 3 and the time duration of T2.

Before the test starts:

- UE is connected to Cell 1 (E-UTRA PCell) on radio channel 1 (PCC), Cell 2 (PSCell) on radio channel 2 (PSCC) and Cell 3 (SCell) on radio channel 3 (SCC).

- UE is configured with 2 different UE-specific downlink bandwidth parts for SCell, BWP-1 and BWP-2, in Cell 3 before starting the test. BWP-1 and BWP-2 always include bandwidth of the initial DL BWP and SSB.

- UE is configured with 1 UE-specific downlink bandwidth parts the same as initial BWP for PSCell, BWP-0 in Cell 2 before starting the test.

- UE is indicated in *firstActiveDownlinkBWP-Id* that the active DL BWP is BWP-1 in SCell.

- UE is indicated in *firstActiveDownlinkBWP-Id* that the active DL BWP is BWP-0 in PSCell.
- UE is configured with a *bwp-InactivityTimer* timer value for SCell.

All cells have constant signal levels throughout the test:

1. Ensure the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity *EN-DC*, DC bearer *MCG_and_SCG*, Connected without release *On* and Test Mode *On* according to TS 38.508-1 [14] clause 4.5.
2. The SS shall configure SCell (Cell 3) on the SCC as per TS 38.508-1 [14] clause 7.5.1. Set the parameters according to Tables 4.5.6.1.2.4.1-3 and 4.5.6.1.2.5-1. Propagation conditions are set according to Annex C clauses C.2.2.
3. The SS shall transmit an *RRCConnectionReconfiguration* message releasing the dedicated configuration of the *initialDownlinkBWP* and the *initialUplinkBWP* of Cell 3. This message also configures 2 different UE-specific bandwidth parts for Cell 3, BWP-1 and BWP-2, and indicates BWP-1 as the active DL BWP using *firstActiveDownlinkBWP-Id*, according to Table 4.5.6.1.2.4.3-2.
4. The UE shall transmit an *RRCConnectionReconfigurationComplete* message.
5. The SS shall send a DCI format 1_1 command for SCell DL BWP switch.
6. The UE shall receive the DCI format 1_1 command in SCell's slot # denoted i, then T1 starts and the UE switch its bandwidth part from BWP-1 to BWP-2:
   a) If the UE starts to report valid ACK/NACK for SCell on PSCell from the first UL slot that occurs after the beginning of the DL slot (i+$T_{BWPswitchDelay}$+k_1); and
   b) If the UE starts to report valid ACK/NACK for PCell from the first UL slot that occurs after the beginning of the DL slot (i+$T_{BWPswitchDelay}$+ 1 subframe + k); and
   c) If the UE starts to report valid ACK/NACK for PSCell from the first UL slot that occurs after the beginning of DL slot (i+$T_{BWPswitchDelay}$+ Interruption length + k_1); and
   d) If the number of consecutive missing ACK/NACK for PCell is no more than 1; and
   e) If the number of consecutive missing ACK/NACK for PSCell is no more than 1.

   Then, the number of successful subtests is increased by one. Otherwise, count a fail for the test, switch off/on the UE and go to step 1.
7. If the UE sends valid ACK/NACK for the SCell on PSCell on BWP-2, T2 starts. During T2, the SS shall not transmit DCI format for PDSCH reception on SCell.
8. T3 starts from the first slot #j of the DL subframe immediately after the slot wherein *bwp-InactivityTimer* timer expires and the SS restarts to send DCI format for PDSCH reception on SCell. Then, the UE shall switch its bandwidth part from BWP-2 back to the default bandwidth part, BWP-1, on SCell:
   a) If the UE starts to report valid ACK/NACK for PCell from the first UL slot that occurs after the beginning of the DL slot (j+$T_{BWPswitchDelay}$+ 1 subframe + k); and
   b) If the UE starts to report valid ACK/NACK for SCell on PSCell from the first UL slot that occurs after the beginning of the DL slot (j+$T_{BWPswitchDelay}$+k_1); and
   c) If the UE starts to report valid ACK/NACK for PSCell from the first UL slot that occurs after the beginning of DL slot (i+$T_{BWPswitchDelay}$+ Interruption length + k_1); and
   d) If the number of consecutive missing ACK/NACK for PCell is no more than 1; and
   e) If the number of consecutive missing ACK/NACK for PSCell is no more than 1.Then, the number of successful subtests is increased by one. Otherwise, count a fail for the test, switch off/on the UE and go to step 1.
9. Repeat steps 5-8 until the confidence level according to Tables G.2.3-1 in Annex G clause G.2 is achieved.

The SS verifies the DL BWP switch time in SCell by counting the slots from the time when the BWP switch command is received or *bwp-InactivityTimer* timer expires till an ACK/NACK is received.

The SS verifies that potential interruption to E-UTRA PCell and NR PSCell is carried out in the correct time span by monitoring ACK/NACK sent in E-UTRA PCell and PSCell during BWP switch of SCell, respectively.

Interruption length is defined in TS 38.133 [6] Table 8.2.1.2.7-1.

k is the length (slot) between E-UTRA PCell PDSCH and its corresponding ACK/NACK as specified in TS 36.213 [33].

k_1 is the timing between NR DL data receiving and acknowledgement as specified in TS 38.214 [9].

If all subtests pass, the test passes. If one subtest fails, the test fails.

4.5.6.1.2.4.3 Message contents

Message contents are according to TS 38.508-1 [14] clause 7.3 with the following exceptions:

Table 4.5.6.1.2.4.3-1: Common Exception messages for FR1 DCI-based DL active BWP switch with SCell in non-DRX in synchronous EN-DC

Default Message Contents	
Common contents of system information blocks exceptions	
Default RRC messages and information elements contents exceptions	Table H.3.4-1

Table 4.5.6.1.2.4.3-1A: *RRCReconfiguration* (Step 3)

Derivation Path: TS 38.508-1 [14], Table 4.6.1-13 with condition EN-DC_SCell_add			
Information Element	**Value/remark**	**Comment**	**Condition**
RRCReconfiguration ::= SEQUENCE {			
criticalExtensions CHOICE {			
rrcReconfiguration SEQUENCE {			
secondaryCellGroup	CellGroupConfig	Table 4.5.6.1.2.4.3-1B	
}			
}			
}			

Table 4.5.6.1.2.4.3-1B: *CellGroupConfig* (Table 4.5.6.1.2.4.3-1A)

Derivation Path: TS 38.508-1 [14], Table 4.6.3-19 with condition SCell_add			
Information Element	**Value/remark**	**Comment**	**Condition**
CellGroupConfig ::= SEQUENCE {			
cellGroupId	1		
sCellToAddModList SEQUENCE (SIZE (1..maxNrofSCells)) OF SCellConfig {	1 entry		
SCellConfig[1] SEQUENCE {		entry 1	
sCellConfigDedicated	ServingCellConfig	Table 4.5.6.1.2.4.3-2	
}			
}			
}			

Table 4.5.6.1.2.4.3-2: *ServingCellConfig* (Table 4.5.6.1.2.4.3-1B)

Derivation Path: TS 38.508-1 [14], Table 4.6.3-167			
Information Element	**Value/remark**	**Comment**	**Condition**
ServingCellConfig ::= SEQUENCE {			
initialDownlinkBWP SEQUENCE {			

pdcch-Config CHOICE {			
release	NULL		
}			
pdsch-Config CHOICE {			
release	NULL		
}			
radioLinkMonitoringConfig CHOICE {			
release	NULL		
}			
downlinkBWP-ToAddModList SEQUENCE (SIZE (1..maxNrofBWPs)) OF SEQUENCE {	2 entries		
BWP-Downlink[1]	BWP-Downlink with condition BWP1	entry 1 Table 4.5.6.1.2.4.3-3	
BWP-Downlink[2]	BWP-Downlink with condition BWP2	entry 2 Table 4.5.6.1.2.4.3-3	
}			
firstActiveDownlinkBWP-Id	1	According to BWP-1	
bwp-InactivityTimer	ms200		
defaultDownlinkBWP-Id	1	According to BWP-1	
}			

Table 4.5.6.1.2.4.3-3: *BWP-Downlink* (Table 4.5.6.1.2.4.3-2)

Derivation Path: TS 38.508-1 [14], Table 4.6.3-9			
Information Element	**Value/remark**	**Comment**	**Condition**
BWP-Downlink ::= SEQUENCE {			
bwp-Id	1	BWP-1	BWP1
	2	BWP-2	BWP2
bwp-Common SEQUENCE {			
genericParameters	RIV defined in TS 38.214 [9] that corresponds to DLBWP.1.3		BWP1
	RIV defined in TS 38.214 [9] that corresponds to DLBWP.1.1		BWP2
}			
}			

Table 4.5.6.1.2.4.3-4: *Void*

Table 4.5.6.1.2.4.3-5: Void

Table 4.5.6.1.2.4.3-6: *PDSCH-TimeDomainResourceAllocationList*

Derivation Path: TS 38.508-1 [14], Table 4.6.3-103			
Information Element	**Value/remark**	**Comment**	**Condition**
PDSCH-TimeDomainResourceAllocationList ::= SEQUENCE(SIZE(1..maxNrofDL-Allocations)) OF PDSCH-TimeDomainResourceAllocation {	4 entries		
PDSCH-TimeDomainResourceAllocation[1] SEQUENCE {		entry 1	
k0	Not present		
mappingType	typeA		
startSymbolAndLength	53	Start symbol(S)=2, Length(L)=12	
}			

PDSCH-TimeDomainResourceAllocation[2] SEQUENCE {		entry 2	
k0	Not present		
mappingType	typeA		
startSymbolAndLength	72	S=2, L=6	
}			
PDSCH-TimeDomainResourceAllocation[3] SEQUENCE {		entry 3	
k0	$T_{BWPswitchDelay}$	Defined in Table 4.5.6.1.0.1-1	The DCI indicating BWP switch
mappingType	typeA		
startSymbolAndLength	53	Start symbol(S)=2, Length(L)=12	
}			
PDSCH-TimeDomainResourceAllocation[4] SEQUENCE {		entry 4	
k0	1		First DCI right after DCI-based BWP switch
mappingType	typeA		
startSymbolAndLength	53	Start symbol(S)=2, Length(L)=12	
}			
}			

Table 4.5.6.1.2.4.3-7: *Void*

Table 4.5.6.1.2.4.3-8: *PDSCH-Config*

Derivation Path: TS 38.508-1 [14], Table 4.6.3-103			
Information Element	**Value/remark**	**Comment**	**Condition**
PDSCH-Config ::= SEQUENCE {			
pdsch-TimeDomainAllocationList	PDSCH-TimeDomainResourceAllocationList		
}			

4.5.6.1.2.5 Test requirements

Tables 4.5.6.1.2.4.1-3 and 4.5.6.1.2.5-1 and 4.5.6.1.2.5-2 define the primary level settings including test tolerances.

Table 4.5.6.1.2.5-1: NR Cell specific test parameters for NR PSCell for DL BWP switch in synchronous EN-DC

Parameter		Unit	Cell 2
Frequency Range			FR1
Duplex mode	Config 1,4		FDD
	Config 2,3,5,6		TDD
TDD configuration	Config 1,4		Not Applicable
	Config 2,5		TDDConf.1.1
	Config 3,6		TDDConf.2.1
$BW_{channel}$			Note 7
$BW_{occupied}$	Config 1,2,4,5	RB	52 Note 5
	Config 3,6		106 Note 6
Active BWP ID			0
Initial DL BWP Configuration			DLBWP.0.2
Active DL BWP-0 Configuration			DLBWP.0.2
Active DL BWP-1 Configuration			N.A.
Active DL BWP-2 Configuration			N.A.

Initial UL BWP Configuration			ULBWP.0.2
Active UL BWP-0 Configuration			ULBWP.0.2
Active UL BWP-1 Configuration			N.A.
Active UL BWP-2 Configuration			N.A.
PDSCH Reference measurement channel	Config 1,4		SR.1.1 FDD
	Config 2,5		SR.1.1 TDD
	Config 3,6		SR.2.1 TDD
RMSI CORESET parameters	Config 1,4		CR.1.1 FDD
	Config 2,5		CR.1.1 TDD
	Config 3,6		CR.2.1 TDD
Dedicated CORESET parameters	Config 1,4		CCR.1.2 FDD
	Config 2,5		CCR.1.2 TDD
	Config 3,6		CCR.2.4 TDD
OCNG Patterns	Config 1,2,4,5		OP.1 Note 5
	Config 3,6		OP.1 Note 6
SSB Configuration	Config 1,2,4,5		SSB.1 FR1
	Config 3,6		SSB.2 FR1
SMTC Configuration			SMTC.1
TRS Configuration	Config 1,4		TRS.1.1 FDD
	Config 2,5		TRS.1.1 TDD
	Config 3,6		TRS.1.2 TDD
Antenna Configuration			1x2
Propagation Condition			AWGN
EPRE ratio of PSS to SSS		dB	0
EPRE ratio of PBCH DMRS to SSS			
EPRE ratio of PBCH to PBCH DMRS			
EPRE ratio of PDCCH DMRS to SSS			
EPRE ratio of PDCCH to PDCCH DMRS			
EPRE ratio of PDSCH DMRS to SSS			
EPRE ratio of PDSCH to PDSCH			
EPRE ratio of OCNG DMRS to SSS Note 1			
EPRE ratio of OCNG to OCNG DMRS Note 1			
N_{oc} Note 2		dBm/15 kHz	-104
SS-RSRP Note 3		dBm/15 kHz	-87
$\hat{E}_s/I_{ot}$		dB	17
$\hat{E}_s/N_{oc}$		dB	17
Io Note3	Config 1,2,4,5	dBm/9.36MHz	-58.96
	Config 3,6	dBm/38.16MHz	-52.86

Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.
Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for N_{oc} to be fulfilled within $BW_{occupied}$.
Note 3: SS-RSRP and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.
Note 4: For unpaired spectrum, a DL BWP is linked with an UL BWP. DLBWP.0.2 is linked with ULBWP.0.2; DLBWP.1.1 is linked with ULBWP.1.1; DLBWP.1.3 is linked with ULBWP.1.3 defined in clause 12 of TS 38.213 [8].
Note 5: All UL/DL transmission shall be confined within $BW_{occupied}$ (i.e. 10 MHz, 52 RBs) from $F_{C,low}$, and Io is independent of the $BW_{channel}$ configured.
Note 6: All UL/DL transmission shall be confined within $BW_{occupied}$ (i.e. 40 MHz, 106 RBs) from $F_{C,low}$, and Io is independent of the $BW_{channel}$ configured.
Note 7: $N_{RB,c}$. is derived from Table 5.3.2-1 in TS38.101-1[2] with configured $BW_{channel}$.

Table 4.5.6.1.2.5-2: NR Cell specific test parameters for NR SCell for DL BWP switch in synchronous EN-DC

Parameter		Unit	Cell 3
Frequency Range			FR1
Duplex mode	$Config_{SCell}$ 1		FDD
	$Config_{SCell}$ 2,3		TDD
TDD configuration	$Config_{SCell}$ 1		Not Applicable

	$Config_{SCell}$ 2		TDDConf.1.1
	$Config_{SCell}$ 3		TDDConf.2.1
$BW_{channel}$			Note 7
$BW_{occupied}$	$Config_{SCell}$ 1,2	RB	52 Note 5
	$Config_{SCell}$ 3		106 Note 6
Active BWP ID			1,2
Initial DL BWP Configuration			DLBWP.0.2
Active DL BWP-0 Configuration			N.A.
Active DL BWP-1 Configuration			DLBWP.1.3
Active DL BWP-2 Configuration			DLBWP.1.1
Initial UL BWP Configuration			N.A.
Active UL BWP-0 Configuration			N.A.
Active UL BWP-1 Configuration			N.A.
Active UL BWP-2 Configuration			N.A.
PDSCH Reference measurement channel	$Config_{SCell}$ 1		SR.1.1 FDD
	$Config_{SCell}$ 2		SR.1.1 TDD
	$Config_{SCell}$ 3		SR.2.1 TDD
RMSI CORESET parameters	$Config_{SCell}$ 1		CR.1.1 FDD
	$Config_{SCell}$ 2		CR.1.1 TDD
	$Config_{SCell}$ 3		CR.2.1 TDD
Dedicated CORESET parameters	$Config_{SCell}$ 1		CCR.1.2 FDD
	$Config_{SCell}$ 2		CCR.1.2 TDD
	$Config_{SCell}$ 3		CCR.2.4 TDD
OCNG Patterns	$Config_{SCell}$ 1,2		OP.1 Note 5
	$Config_{SCell}$ 3		OP.1 Note 6
SSB Configuration	$Config_{SCell}$ 1,2		SSB.1 FR1
	$Config_{SCell}$ 3		SSB.2 FR1
SMTC Configuration			SMTC.1
TRS Configuration	$Config_{SCell}$ 1		TRS.1.1 FDD
	$Config_{SCell}$ 2		TRS.1.1 TDD
	$Config_{SCell}$ 3		TRS.1.2 TDD
Antenna Configuration			1x2
Propagation Condition			AWGN
EPRE ratio of PSS to SSS		dB	0
EPRE ratio of PBCH DMRS to SSS			
EPRE ratio of PBCH to PBCH DMRS			
EPRE ratio of PDCCH DMRS to SSS			
EPRE ratio of PDCCH to PDCCH DMRS			
EPRE ratio of PDSCH DMRS to SSS			
EPRE ratio of PDSCH to PDSCH			
EPRE ratio of OCNG DMRS to SSS Note 1			
EPRE ratio of OCNG to OCNG DMRS Note 1			
N_{oc} Note 2		dBm/15 kHz	-104
SS-RSRP Note 3		dBm/15 kHz	-87
$\hat{E}_s/I_{ot}$		dB	17
$\hat{E}_s/N_{oc}$		dB	17
Io Note3	$Config_{SCell}$ 1,2	dBm/9.36MHz	-58.96
	$Config_{SCell}$ 3	dBm/38.16MHz	-52.86

Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.

Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for N_{oc} to be fulfilled within $BW_{occupied}$.

Note 3: SS-RSRP and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.

Note 4: For unpaired spectrum, a DL BWP is linked with an UL BWP. DLBWP.0.2 is linked with ULBWP.0.2; DLBWP.1.1 is linked with ULBWP.1.1; DLBWP.1.3 is linked with ULBWP.1.3 defined in clause 12 of TS 38.213 [8].

Note 5: All UL/DL transmission shall be confined within $BW_{occupied}$ (i.e. 10 MHz, 52 RBs) from $F_{C,low}$, and Io is independent of the $BW_{channel}$ configured.

Note 6: All UL/DL transmission shall be confined within $BW_{occupied}$ (i.e. 40 MHz, 106 RBs) from $F_{C,low}$, and Io is independent of the $BW_{channel}$ configured.

Note 7: $N_{RB,c}$. is derived from Table 5.3.2-1 in TS38.101-1[2] with configured $BW_{channel}$.

During T1, the UE shall start to send the ACK/NACK for PCell from the first UL slot that occurs after the beginning of DL slot (i+$T_{BWPswitchDelay}$+k_1).

During T3, the UE shall start to send the ACK/NACK for SCell from the first UL slot that occurs after the beginning of DL slot (j+$T_{BWPswitchDelay}$+k_1).

Where, k_1 is the timing between DL data receiving and acknowledgement as specified in [9].

Depending on UE capability *bwp-SwitchingDelay* [13], UE shall finish BWP switch within the time duration $T_{BWPswitchDelay}$ defined in TS 38.133 [6] Table 8.6.2-1.

All of the above test requirements shall be fulfilled in order for the observed SCell active BWP switch delay to be counted as correct.

The rate of correct events observed during repeated tests shall be at least 90%.

During T1, the start of the interruption of E-UTRA PCell during SCell active BWP switch shall not happen outside the BWP switch delay.

During T3, the start of the interruption of E-UTRA PCell during SCell active BWP switch shall not happen outside the BWP switch delay.

The interruption of E-UTRA PCell shall not be longer than the interruption duration specified for active BWP switch in clause 7.32.2.7 of TS 36.133 [23].

During T1, the start of the interruption of PSCell during SCell active BWP switch shall not happen outside the BWP switch delay.

During T3, the start of the interruption of PSCell during SCell active BWP switch shall not happen outside the BWP switch delay.

The interruption of PSCell shall not be longer than the interruption duration specified for active BWP switch in TS 38.133 [6] clause 8.6.2.

All of the above test requirements shall be fulfilled in order for the observed E-UTRA PCell and PSCell active BWP switch interruption to be counted as correct.

The rate of correct events observed during repeated tests shall be at least 90%.

NOTE: During T1, T3 if there are no uplink resources for reporting the ACK/NACK in the first UL slot that occurs after the beginning of DL slot (i+$T_{BWPswitchDelay}$+k_1), (j+$T_{BWPswitchDelay}$+k_1), then the UE shall use the next available uplink resource for reporting the corresponding ACK/NACK.

4.5.6.2 RRC-based active BWP switch

4.5.6.2.0 Minimum conformance requirements

4.5.6.2.0.1 Minimum conformance requirements for RRC-based active BWP switch

For RRC-based BWP switch, after the UE receives RRC reconfiguration involving active BWP switching or parameter change of its active BWP, UE shall be able to receive PDSCH/PDCCH (for DL active BWP switch) or transmit PUSCH (for UL active BWP switch) on the new BWP on the serving cell on which BWP switch occurs on the first DL or UL slot right after a time duration of $\frac{T_{RRCprocessing\,Delay}+T_{BWPswitchDelayRRC}}{NR\ Slot\ length}$ slots which begins from the beginning of DL slot n, where

DL slot n is the last slot overlapping with the PDSCH containing the RRC command, and

NR Slot length is determined by the smaller SCS between the SCS before BWP switch and the SCS after BWP switch if the BWP switch involves changing of SCS.

$T_{RRCprocessingDelay}$ is the length of the RRC procedure delay in ms as defined in clause 11.2 in TS 36.331 [29] if the corresponding RRC message is embedded in E-UTRA RRC message, otherwise it is the length of the RRC procedure delay in ms as defined in clause 12 in TS 38.331 [13], and

$T_{BWPswitchDelayRRC} = 6ms$ is the time used by the UE to perform BWP switch.

The UE is not required to transmit UL signals or receive DL signals during the time defined by $T_{RRCprocessingDelay} + T_{BWPswitchDelayRRC}$ on the cell where RRC-based BWP switch occurs. When $T_{HARQ} > T_{RRCprocessingDelay}$ a longer switching delay is allowed. Where T_{HARQ} is the time between DL data transmission and acknowledgement as specified in TS 38.213 [8].

The normative reference for this requirement is TS 38.133 [6] clauses 8.6.3.

4.5.6.2.1 EN-DC FR1 RRC-based DL active BWP switch in non-DRX in synchronous EN-DC

4.5.6.2.1.1 Test purpose

The purpose of this test is to verify the DL BWP switch delay requirement for RRC-based BWP switch defined in TS 38.133 [6] clause 8.6.3.

4.5.6.2.1.2 Test applicability

This test applies to all types of E-UTRA UE release 15 onwards supporting EN-DC, BWP adaptation of at least 2BWPs.

4.5.6.2.1.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 4.5.6.2.0.1.

The normative reference for this requirement is TS 38.133 [6] clause A.4.5.6.2.1.

4.5.6.2.1.4 Test description

4.5.6.2.1.4.1 Initial conditions

This test shall be tested using any of the test configurations in Table 4.5.6.2.1.4.1-1.

Table 4.5.6.2.1.4.1-1: Supported test configurations for FR1 RRC-based DL active BWP switch in non-DRX in synchronous EN-DC

Config	Description
4.5.6.2.1-1	LTE FDD, NR 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode
4.5.6.2.1-2	LTE FDD, NR 15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode
4.5.6.2.1-3	LTE FDD, NR 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode
4.5.6.2.1-4	LTE TDD, NR 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode
4.5.6.2.1-5	LTE TDD, NR 15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode
4.5.6.2.1-6	LTE TDD, NR 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode
NOTE: The UE is only required to be tested in one of the supported test configurations.	

Configure the test equipment and the DUT according to the parameters in Table 4.5.6.2.1.4.1-2.

Table 4.5.6.2.1.4.1-2: Initial conditions for FR1 RRC-based DL active BWP switch in non-DRX in synchronous EN-DC

Parameter	Value	Comment
Test environment	NC	As specified in TS 38.508-1 [14] clause 4.1.
Test frequencies	As specified in Annex E, Table E.4-1 and TS 38.508-1 [14] clause 4.3.1.	
Channel bandwidth	As specified by the test configuration selected from Table 4.5.6.2.1.4.1-1.	
Propagation conditions	AWGN	As specified in clause C.2.2

Connection Diagram	TE Part	A.3.1.8.2	As specified in TS 38.508-1 [14] Annex A.
	DUT Part	A.3.2.3.4	
Exceptions to connection diagram	- For 4Rx capable UEs without any 2Rx RF bands use A.3.2.5.2 for DUT part and A.3.1.8.4 for TE part.		

1. The general test parameter settings are set up according to Table 4.5.6.2.1.4.1-3.
2. Message contents are defined in clause 4.5.6.2.1.4.3.
3. The test scenario comprises of one E-UTRA PCell (Cell 1) and one NR PSCell (Cell 2). The power levels and settings for Cell 1 are set according to Annex A.6. Cell 2 are configured according to clause C.1.2 and C.1.3.

Table 4.5.6.2.1.4.1-3: General test parameters for DL BWP switch in synchronous EN-DC

Parameter	Unit	Value	Comment
E-UTRA RF Channel Number		1	One E-UTRA radio channel is used for this test
NR RF Channel Number		2	One NR radio channel is used for this test
Active PCell		Cell 1	PCell on RF channel number 1.
Active PSCell		Cell 2	PSCell on RF channel number 2.
CP length		Normal	
DRX		OFF	
Cell-individual offset for cells on RF channel number 1	dB	0	Individual offset for cells on PCC.
Cell-individual offset for cells on RF channel number 2	dB	0	Individual offset for cells on PSCC.
Cell2 timing offset to cell1	µs	3	Synchronous EN-DC
T1	s	0.2	

4.5.6.2.1.4.2 Test procedure

The test consists of 1 time period, with duration of T1.

PDCCHs indicating new transmissions shall be sent continuously on PSCell (Cell 2) to ensure that the UE will have ACK/NACK sending.

Before the test starts:

- UE is connected to Cell 1 (E-UTRA PCell) on radio channel 1 (PCC) and to Cell 2 (PSCell) on radio channel 2 (PSCC).
- UE has bandwidth part BWP-1 in its RRC-configuration for Cell 2 (PSCell).
- UE is indicated in firstActiveDownlinkBWP-Id that the active DL BWP is BWP-1 in PSCell.

All cells have constant signal levels throughout the test:

1. Ensure the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity *EN-DC*, DC bearer *MCG_and_SCG*, Connected without release *On* and Test Mode *On* according to TS 38.508-1 [14] clause 4.5.
2. Set the parameters according to Tables 4.5.6.2.1.4.1-3 and 4.5.6.2.1.5-1. Propagation conditions are set according to Annex C clauses C.2.2.
3. The SS shall send an *RRCConnectionReconfiguration* message releasing the dedicated configuration of the *initialDownlinkBWP* and the *initialUplinkBWP*. This message also configures another UE-specific bandwidth part, BWP-1, and indicates BWP-1 as the active DL BWP using *firstActiveDownlinkBWP-Id*, according to the initial condition of Active BWP-1 in Table 4.5.6.2.1.5-1.
4. The UE shall transmit an *RRCConnectionReconfigurationComplete* message.

5. The SS shall send an *RRCConnectionReconfiguration* message with updated bandwidth part configuration for PSCell DL BWP switch, changing the BWP according to the final condition of Active BWP-1 in Table 4.5.6.2.1.5-1.T1 starts.

6. The UE shall receive the *RRCConnectionReconfiguration* in PSCell's slot # denoted i and reconfigure its bandwidth part with the updated bandwidth part configuration:

7 If the UE starts to report valid ACK/NACK for PSCell from the first UL slot that occurs after the beginning of DL slot $i+X+k_1$then the number of successful tests is increased by one. Otherwise, the number of failure tests is increased by one. Where,

- X = 26 for test configuration 4.5.6.2-1, 4.5.6.2-2, 4.5.6.2-4 and 4.5.6.2-5;

- X = 52 for test configuration 4.5.6.2-3 and 4.5.6.2-6.

8. After the SS receives the ACK/NACK in step 5) or when T1 expires, the SS shall transmit *RRCConnectionReconfiguration* message with condition EN-DC_PSCell_Rel according to TS 36.508 [25] Table 4.6.1-8 to release NR cell (PSCell). The UE shall transmit RRCConnectionReconfigurationComplete message.

9. The SS shall transmit RRCConnectionReconfiguration message with condition MCG_and_SCG according to TS 36.508 [25] Table 4.6.1-8 to add NR cell (PSCell). The UE shall transmit RRCConnectionReconfigurationComplete message. If either of the reconfiguration in step 6 or step 7 fails, switch off and on the UE and go to step 1.

10. Repeat steps 2-9 until the confidence level according to Tables G.2.3-1 in Annex G clause G.2 is achieved.

The SS verifies the DL BWP switch time in PSCell by counting the slots from the time when the RRCConnectionReconfiguration message including updated BWP configuration is sent till the time when a valid ACK/NACK is received.

4.5.6.2.1.4.3 Message contents

Message contents are according to TS 38.508-1 [14] clause 7.3 with the following exceptions:

Table 4.5.6.2.1.4.3-1: Common Exception messages for FR1 RRC-based DL active BWP switch in non-DRX in synchronous EN-DC

Default Message Contents	
Common contents of system information blocks exceptions	
Default RRC messages and information elements contents exceptions	Table H.3.4-1

Table 4.5.6.2.1.4.3-1A: *RRCReconfiguration* (Step 3, Step 5)

Derivation Path: TS 38.508-1 [14], Table 4.6.1-13 with condition EN-DC			
Information Element	**Value/remark**	**Comment**	**Condition**
RRCReconfiguration ::= SEQUENCE {			
criticalExtensions CHOICE {			
rrcReconfiguration SEQUENCE {			
secondaryCellGroup	CellGroupConfig	Table 4.5.6.2.1.4.3-1B	
}			
}			
}			

Table 4.5.6.2.1.4.3-1B: *CellGroupConfig* (Table 4.5.6.2.1.4.3-1A)

Derivation Path: TS 38.508-1 [14], Table 4.6.3-19			
Information Element	**Value/remark**	**Comment**	**Condition**
CellGroupConfig ::= SEQUENCE {			
cellGroupId	1		
spCellConfig SEQUENCE {			

servCellIndex	ServCellIndex of NR PSCell		
spCellConfigDedicated	ServingCellConfig	Table 4.5.6.2.1.4.3-1C	
}			
}			

Table 4.5.6.2.1.4.3-1C: *ServingCellConfig* (Table 4.5.6.2.1.4.3-1B)

Derivation Path: TS 38.508-1 [14], Table 4.6.3-167			
Information Element	**Value/remark**	**Comment**	**Condition**
ServingCellConfig ::= SEQUENCE {			
initialDownlinkBWP SEQUENCE {			
pdcch-Config CHOICE {			
release	NULL		
}			
pdsch-Config CHOICE {			
release	NULL		
}			
radioLinkMonitoringConfig CHOICE {			
release	NULL		
}			
downlinkBWP-ToAddModList SEQUENCE (SIZE (1..maxNrofBWPs)) OF BWP-Downlink {	1 entry		
BWP-Downlink[1] SEQUENCE {	BWP-Downlink	entry 1 Table 4.5.6.2.1.4.3-1D	
}			
firstActiveDownlinkBWP-Id	1	BWP-1	
defaultDownlinkBWP-Id	1	BWP-1	
uplinkConfig SEQUENCE {			
initialUplinkBWP SEQUENCE {			
pucch-Config CHOICE {			
release	NULL		
}			
pusch-Config CHOICE {			
release	NULL		
}			
srs-Config CHOICE {			
release	NULL		
}			
uplinkBWP-ToAddModList SEQUENCE (SIZE (1..maxNrofBWPs)) OF BWP-Uplink {	1 entry		
BWP-Uplink[1]	BWP-Uplink	entry 1 4.5.6.2.1.4.3-1E	
}			
firstActiveUplinkBWP-Id	1	BWP-1	
}			
}			

Table 4.5.6.2.1.4.3-1D: *BWP-Downlink* (Table 4.5.6.2.1.4.3-1C)

Derivation Path: TS 38.508-1 [14], Table 4.6.3-9			
Information Element	**Value/remark**	**Comment**	**Condition**
BWP-Downlink ::= SEQUENCE {			
bwp-Id	1		
bwp-Common SEQUENCE {			
genericParameters	RIV defined in TS 38.214 [9] that corresponds to DLBWP.1.3		Step 3

	RIV defined in TS 38.214 [9] that corresponds to DLBWP.1.1		Step 5
}			
}			

Table 4.5.6.2.1.4.3-1E: *BWP-Uplink* (Table 4.5.6.2.1.4.3-1C)

Derivation Path: TS 38.508-1 [14], Table 4.6.3-13			
Information Element	**Value/remark**	**Comment**	**Condition**
BWP-Uplink ::= SEQUENCE {			
bwp-Id	1		
bwp-Common SEQUENCE {			
genericParameters	RIV defined in TS 38.214 [9] that corresponds to ULBWP.1.3		Step 3
	RIV defined in TS 38.214 [9] that corresponds to ULBWP.1.1		Step 5
}			
}			

Table 4.5.6.2.1.4.3-2: Void

4.5.6.2.1.5 Test requirements

Tables 4.5.6.2.1.4.1-3 and 4.5.6.2.1.5-1 define the primary level settings including test tolerances.

Table 4.5.6.2.1.5-1: NR Cell specific test parameters for DL BWP switch in synchronous EN-DC

Parameter			Unit	Cell 2
Frequency Range				FR1
Duplex mode		Config 1,4		FDD
		Config 2,3,5,6		TDD
TDD configuration		Config 1,4		Not Applicable
		Config 2,5		TDDConf.1.1
		Config 3,6		TDDConf.2.1
$BW_{channel}$		Config 1,4		10 MHz: $N_{RB,c}$ = 52
		Config 2,5		10 MHz: $N_{RB,c}$ = 52
		Config 3,6		40 MHz: $N_{RB,c}$ = 106
Active DL BWP ID				1
Initial DL BWP Configuration		Config 1,4		DLBWP.0.2 Note4
		Config 2,5		
		Config 3,6		
Initial UL BWP Configuration		Config 1,4		ULBWP.0.2 Note4
		Config 2,5		
		Config 3,6		
Initial Condition	Active DL BWP-1 Configuration	Config 1,4		DLBWP.1.3 Note4
		Config 2,5		
		Config 3,6		
	Active UL BWP-1 Configuration	Config 1,4		ULBWP.1.3 Note4
		Config 2,5		
		Config 3,6		
Final Condition	Active DL BWP-1 Configuration	Config 1,4		DLBWP.1.1 Note4
		Config 2,5		
		Config 3,6		
	Active UL BWP-1 Configuration	Config 1,4		ULBWP.1.1 Note4
		Config 2,5		
		Config 3,6		

Parameter		Unit	Cell 2
PDSCH Reference measurement channel	Config 1,4		SR.1.1 FDD
	Config 2,5		SR.1.1 TDD
	Config 3,6		SR.2.1 TDD
RMSI CORESET parameters	Config 1,4		CR.1.1 FDD
	Config 2,5		CR.1.1 TDD
	Config 3,6		CR.2.1 TDD
Dedicated CORESET parameters	Config 1,4		CCR.1.2 FDD
	Config 2,5		CCR.1.2 TDD
	Config 3,6		CCR.2.4 TDD
OCNG Patterns			OP.1
SSB Configuration	Config 1,2,4,5		SSB.1 FR1
	Config 3,6		SSB.2 FR1
SMTC Configuration			SMTC.1
TRS Configuration	Config 1,4		TRS.1.1 FDD
	Config 2,5		TRS.1.1 TDD
	Config 3,6		TRS.1.2 TDD
Antenna Configuration			1x2
Propagation Condition			AWGN
EPRE ratio of PSS to SSS		dB	0
EPRE ratio of PBCH DMRS to SSS			
EPRE ratio of PBCH to PBCH DMRS			
EPRE ratio of PDCCH DMRS to SSS			
EPRE ratio of PDCCH to PDCCH DMRS			
EPRE ratio of PDSCH DMRS to SSS			
EPRE ratio of PDSCH to PDSCH			
EPRE ratio of OCNG DMRS to SSS(Note 1)			
EPRE ratio of OCNG to OCNG DMRS (Note 1)			
N_{oc} Note 2		dBm/15 kHz	-104
SS-RSRP Note 3		dBm/15 kHz	-87
$\hat{E}_s/I_{ot}$		dB	17
$\hat{E}_s/N_{oc}$		dB	17
Io Note3	Config 1,2,4,5	dBm/ 9.36MHz	-58.96
	Config 3,6	dBm/ 38.16MHz	-52.86
NOTE 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols. NOTE 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for N_{oc} to be fulfilled. NOTE 3: SS-RSRP and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves. NOTE 4: For unpaired spectrum, a DL BWP is linked with an UL BWP. DLBWP.0.2 is linked with ULBWP.0.2; DLBWP.1.1 is linked with ULBWP.1.1; DLBWP.1.3 is linked with ULBWP.1.3 defined in clause 12 of TS 38.213 [8].			

During T1, the UE shall be ready for the reception of uplink grant on PSCell from the first DL slot occurs after the beginning of DL slot i + $\frac{T_{\mathrm{RRCprocessingDelay}}+T_{\mathrm{BWPswitchDelayRRC}}}{\mathrm{NR\ Slot\ length}}$, and starts to report valid ACK/NACK for the PSCell from the first UL slot that occurs after the beginning of DL slot i + $\frac{T_{\mathrm{RRCprocessingDelay}}+T_{\mathrm{BWPswitchDelayRRC}}}{\mathrm{NR\ Slot\ length}}$ + k_1

Where,

$T_{\mathrm{RRCprocessingDelay}}$ = 20 ms, is the RRC procedure delay in ms as defined in clause 11.2 in TS 36.331 [29];

$T_{\mathrm{BWPSwitchDelayRRC}}$ = 6 ms, is the time used by the UE to perform BWP switch;

NR slot length = 1ms for SCS = 15kHz, and NR slot length = 0.5 ms for SCS = 30kHz.

k1 is the timing between DL data receiving and acknowledgement as specified in [12].

Which gives $\frac{T_{\mathrm{RRCprocessingDelay}}+T_{\mathrm{BWPswitchDelayRRC}}}{\mathrm{NR\ Slot\ length}}$ =

26 slots, for SCS = 15kHz,

52 slots, for SCS = 30kHz.

All of the above test requirements shall be fulfilled in order for the observed PSCell active BWP switch delay to be counted as correct.

The rate of correct events observed during repeated tests shall be at least 90%.

4.5.7 PSCell addition and release delay

4.5.7.0 Minimum conformance requirements

4.5.7.0.1 NR PSCell Addition Delay Requirement

The requirements in this section shall apply for the UE which is configured with PCell, and may also be configured with one or more SCells.

Upon receiving NR PSCell addition in subframe *n*, the UE shall be capable to transmit PRACH preamble towards NR PSCell no later than in subframe $n + T_{\text{config PSCell}}$:

Where:

$T_{\text{config_PSCell}} = T_{\text{RRC_delay}} + T_{\text{processing}} + T_{\text{search}} + T_{\Delta} + T_{\text{PSCell_DU}} + 2$ ms

$T_{\text{RRC_delay}}$ is the RRC procedure delay as specified in TS 36.331 [29].

$T_{\text{processing}}$ is the SW processing time needed by UE, including RF warm up period. $T_{\text{processing}}$ = 20 ms if NR PSCell is in FR1, $T_{\text{processing}}$ = 40 ms if NR PSCell is in FR2.

T_{search} is the time for AGC settling and PSS/SSS detection.

- For NR PSCell in FR1: if the target cell is a known cell, T_{search} = 0 ms. If the target cell is an unknown cell and the target cell Es/Iot $\geq$ -2 dB, then T_{search} = 3* Trs ms;
- For NR PSCell in FR2: if the target cell is a known cell, T_{search} = 0 ms. If the target cell is an unknown cell and the target cell Es/Iot $\geq$ -2 dB, then T_{search} = 24* Trs ms.

T_{Δ} is time for fine time tracking and acquiring full timing information of the target cell. T_{Δ} = 1*Trs ms for a known or unknown PSCell.

$T_{\text{PSCell_DU}}$ is the delay uncertainty in acquiring the first available PRACH occasion in the NR PSCell. $T_{\text{PSCell_DU}}$ is up to the summation of SSB to PRACH occasion association period and 10 ms. SSB to PRACH occasion associated period is defined in the table 8.1-1 of TS 38.213 [8].

Trs is the SMTC periodicity of the target NR cell if the UE has been provided with an SMTC configuration for the target cell in PSCell addition message, otherwise Trs is the SMTC configured in the measObjectNR having the same SSB frequency and subcarrier spacing. If the UE is not provided SMTC configuration or measurement object on this frequency, the requirement in this section is applied with Trs = 5 ms assuming the SSB transmission periodicity is 5 ms. There is no requirement if the SSB transmission periodicity is not 5 ms.

In FR1 and FR2, the NR PSCell is known if it has been meeting the following conditions:

During the last 5 seconds before the reception of the NR PSCell configuration command:

- the UE has sent a valid measurement report for the NR PSCell being configured and
- One of the SSBs measured from the NR PSCell being configured remains detectable according to the cell identification conditions specified in section 9.3 of TS 38.133 [6],

- One of the SSBs measured from NR PSCell being configured also remains detectable during the NR PSCell configuration delay according to the cell identification conditions specified in section 9.3 of TS 38.133 [6].

otherwise it is unknown.

The PCell interruption specified in section 7.32 is allowed only during the RRC reconfiguration procedure TS 36.331 [29].

4.5.7.0.2 NR PSCell Release Delay Requirement

The requirements in this section shall apply for a UE which is configured with PCell and NR PSCell, and may also be configured with one or more SCells and/or NR SCells.

Upon receiving NR PSCell release in subframe *n*, the UE shall accomplish the release actions specified in TS 36.331 [29] no later than in subframe $n+ T_{RRC_delay}$:

Where

T_{RRC_delay} is the RRC procedure delay as specified in TS 36.331 [29].

The PCell interruption specified in section 7.32 is allowed only during the RRC reconfiguration procedure TS 36.331 [29].

4.5.7.1 EN-DC FR1 addition and release delay of known PSCell

4.5.7.1.1 Test purpose

The purpose of this test is to verify that the PSCell addition and release delay for an NR PSCell is within the specified limits and the CSI transmissions are according to the requirements.

4.5.7.1.2 Test applicability

This test applies to all types of NR UE supporting E-UTRA and EN-DC from Release 15 onwards.

4.5.7.1.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 4.5.7.0.1 and 4.5.7.0.2.

The normative reference for this requirement is TS 38.133 [6] clause A.4.5.7.1.

4.5.7.1.4 Test description

4.5.7.1.4.1 Initial conditions

This test shall be tested using any of the test configurations in Table 4.5.7.1.4.1-1.

Table 4.5.7.1.4.1-1: Test configurations

Test Case ID	Description
4.5.7.1-1	LTE FDD, NR: 15 kHz SSB SCS, 10MHz bandwidth, FDD
4.5.7.1-2	LTE FDD, NR: 15 kHz SSB SCS, 10MHz bandwidth, TDD
4.5.7.1-3	LTE FDD, NR: 30 kHz SSB SCS, 40MHz bandwidth, TDD
4.5.7.1-4	LTE TDD, NR: 15 kHz SSB SCS, 10MHz bandwidth, FDD
4.5.7.1-5	LTE TDD, NR: 15 kHz SSB SCS, 10MHz bandwidth, TDD
4.5.7.1-6	LTE TDD, NR: 30 kHz SSB SCS, 40MHz bandwidth, TDD
NOTE: The UE is only required to be tested in one of the supported test configurations.	

Configure the test equipment and the DUT according to the parameters in Table 4.5.7.1.4.1-2.

Table 4.5.7.1.4.1-2: Initial conditions

Parameter	Value	Comment
Test environment	NC, TL/VL, TL/VH, TH/VL, TH/VH	As specified in TS 38.508-1 [14] clause 4.1.
Test frequencies	As specified in Annex E, Table E.2-1 and TS 38.508-1 [14] clause 4.3.1.	
Channel bandwidth	As specified by the test configuration selected from Table 4.5.7.1.4.1-1.	
Propagation conditions	AWGN	As specified in clause C.2.2.

Connection Diagram	TE Part 2Rx	A.3.1.8.2 with n = 1	As specified in TS 38.508-1 [14] Annex A.
	TE Part 4Rx	A.3.1.8.5 with n = 1	
	DUT Part 2Rx	A.3.2.3.4	
	DUT Part 4Rx	A.3.2.5.2	
Exceptions to connection diagram	N/A		

1. Message contents are defined in clause 4.5.7.1.4.3.

2. Cell 1 is the E-UTRA serving cell (PCell) for the EN-DC setup. The power levels and settings for Cell 1 are set according to Annex A.6. Cell 2 is the NR FR1 cell. Cell 2 is the PSCell. The connection setup is done according to the settings in clause C.1.1.

3 Common test parameters are defined in Table 4.5.7.1.4.1-3.

Table 4.5.7.1.4.1-3: General Test Parameters for PSCell Addition and Release

Parameter		Unit	Value	Comment
RF Channel Number			1, 2	Two radio channels are used for this test. One for E-UTRA cell and second for NR Cell
Initial Condition	Active PCell		Cell1	PCell on RF channel number 1.
	Neighbour cell		Cell2	Neighbour cell on RF channel number 2.
Final Condition	Active PCell		Cell1	PCell on RF channel number 1.
	Neighbour Cell		Cell2	PSCell released on RF channel number 2.
B1	Hysteresis	dB	0	Hysteresis for evaluation of event B1.
	Threshold RSRP (Config 1,2,4,5)	dBm	-99	Actual RSRP threshold for event B1. Needs to take absolute accuracy tolerance in clause 9.11.1 of TS 36.133 [23] into account plus margin.
	Threshold RSRP (Config 3,6)	dBm	-96	Actual RSRP threshold for event B1. Needs to take absolute accuracy tolerance in clause 9.11.1 of TS 36.133 [23] into account plus margin.
	Time to Trigger	S	0	
DRX			OFF	Continuous monitoring of primary cell
Measurement gap pattern Id			0	Gaps are configured before T2 and released before T3.
PRACH configuration on cell2			PRACH.1 FR1	See A.7.1
Cell-individual offset for cells on RF channel number 1		dB	0	Individual offset for cells on primary component carrier.
Cell-individual offset for cells on RF channel number 2		dB	0	Individual offset for cells on carrier frequency of cell2.
T1		s	1	During this time the PCell shall be known and cell2 shall be unknown.
T2		s	1.5	During this time the UE shall identify neighbour cell (cell2) and report event B1.
T3		s	3	During this time the test system transmits the RRC messages to release measurement gap and add PSCell.
T4		s	0.5	During this time the UE adds the PSCell.
T5		s	0.5	During this time the UE sends CSI reports for PSCell.
T6		s	0.5	During this time the UE releases the PSCell.

4.5.7.1.4.2 Test procedure

1. Ensure the UE is in state E-UTRA RRC_CONNECTED with generic procedure parameters *Connectivity* E-UTRA/EPC with Test Mode *On* according to TS 38.508-1 [14] clause 4.5.

2. The SS shall set the parameters according to Table 4.5.7.1.5-1 as appropriate. T1 starts.

3. The SS shall transmit an *RRCConnectionReconfiguration message* with event B1 configured.
4. The UE shall transmit an RRCConnectionReconfigurationComplete message.
5. When T1 expires, the SS shall set T2 parameters according to Table 4.5.7.1.5-1 as appropriate. T2 starts.
6. The UE shall transmit a *MeasurementReport* message triggered by Event B1 for Cell 2 no later than 1.5s from the start of T2.
7. The SS shall transmit an *RRCConnectionReconfiguration* message to release measurement gap. T3 starts.
8. The UE shall transmit an *RRCConnectionReconfigurationComplete* message.
9. During T3 the SS then shall transmit *RRCConnectionReconfiguration* message with condition *MCG_and_SCG* according to TS 36.508 [25] Table 4.6.1-8 to add NR cell (PSCell). T4 starts from the instant when the SS sends the last TTI containing the RRC message.
10. The UE shall transmit an *RRCConnectionReconfigurationComplete* message.
11. The UE shall send a PRACH to PSCell during T4. The UE shall send PRACH no later than 82ms from the start of T4, otherwise increase the number of failed iterations by one, switch off the UE and continue with step 17.
12. T5 starts.
13. During T5 the UE shall send at least one CSI report for PSCell with non-zero CQI index, otherwise increase the number of failed iterations by one, switch off the UE and continue to step 17.
14. The SS shall transmit *RRCConnectionReconfiguration* message with condition EN-DC_PSCell_Rel according to TS 36.508 [25] Table 4.6.1-8 to release NR cell (PSCell) after the UE has send at least one CQI report with non-zero CQI index for PSCell (Cell 2). T6 starts from the instant when the SS sends the last TTI containing the RRC message.
15. The UE shall transmit an *RRCConnectionReconfigurationComplete* message.
16. The UE shall stop sending CSI reports for PSCell no later than 20ms from the start of T6, if so increase the number of passed iterations by one otherwise increase the number of failed iterations by one and switch off the UE.
17. Set Cell 2 physical cell identity = [((current cell 2 physical cell identity + 1) mod 1008)] for next iteration of the test procedure loop.
18. If the UE is not switched off, the SS shall transmit an RRCConnectionRelease message to release the RRC connection then, the SS transmits in Cell 1 a Paging message (including PagingRecord with UE-Identity) for the UE and ensures the UE is in State E-UTRA RRC_CONNECTED with generic parameter Connectivity E-UTRA/EPC. If paging succeeds, go to step 20, otherwise switches off the UE.
19. Switches on the UE and ensures the UE is in state E-UTRA RRC_CONNECTED with generic procedure parameters *Connectivity* E-UTRA/EPC with Test Mode *On* according to TS 38.508-1 [14] clause 4.5.
20. Repeat step 2-19 until a test verdict has been achieved.

4.5.7.1.4.3 Message contents

Message contents are according to TS 38.508-1 [14] clause 7.3 with the following exceptions:

Table 4.5.7.1.4.3-1: Common exception messages

Default Message Contents	
Common contents of system information blocks exceptions	
Default RRC messages and information elements contents exceptions	Table H.3.4-7 for step 3 Table H.3.4-1 for step 6. Table H.3.4-4 with condition INTER-RAT NR and EVENT B1 Table H.3.4-5 with condition Pattern#0

Specific message contents exceptions for Test Configuration 4.5.7.1-1, 4.5.7.1-2, 4.5.7.1-4, 4.5.7.1-5	Table H.3.4-6 with condition SMTC.1 and SSB.1 FR1
Specific message contents exceptions for Test Configuration 4.5.7.1-3, 4.5.7.1-6	Table H.3.4-6 with condition SMTC.1 and SSB.2 FR1

Table 4.5.7.1.4.3-2: Void

Table 4.5.7.1.4.3-3: Void

4.5.7.1.5 Test requirements

Table 4.5.7.1.5-1 defines the primary level settings including test tolerances.

Table 4.5.7.1.5-1: Cell Specific Parameters for PSCell Addition and Release

Parameter	Unit	Config	Test					
			T1	T2	T3	T4	T5	T6
E-UTRA RF Channel Number		1,2,3,4,5,6	1					
NR RF Channel Number		1,2,3,4,5,6	2					
TDD configuration		1,4	Not Applicable					
		2,5	TDDConf.1.1					
		3,6	TDDConf.2.1					
$BW_{channel}$	MHz	1,4	10: $N_{RB,c}$ = 52					
		2,5	10: $N_{RB,c}$ = 52					
		3,6	40: $N_{RB,c}$ = 106					
Initial BWP Configuration		1,2,3	DLBWP.0.1 ULBWP.0.1					
Dedicated BWP Configuration		1,2,3	DLBWP.1.1 ULBWP.1.1					
PDSCH Reference measurement channel		1,4	SR.1.1 FDD					
		2,5	SR.1.1 TDD					
		3,6	SR.2.1 TDD					
RMSI CORESET Reference Channel		1,4	CR.1.1 FDD					
		2,5	CR.1.1 TDD					
		3,6	CR.2.1 TDD					
Dedicated CORESET Reference Channel		1,4	CCR.1.1 FDD					
		2,5	CCR.1.1 TDD					
		3,6	CCR.2.1 TDD					
OCNG Patterns		1,2,3,4,5,6	OP.1					
SSB configuration		1,2,4,5	SSB.1 FR1					
		3,6	SSB.2 FR1					
SMTC configuration		1,2,4,5	SMTC.1					
		3,6	SMTC.1					
TRS Configuration		1,4	TRS.1.1 FDD					
		2,5	TRS.1.1 TDD					
		3,6	TRS.1.2 TDD					
CSI-RS configuration for CSI reporting		1,4	CSI-RS.1.1 FDD					
		2,5	CSI-RS.1.1 TDD					
		3,6	CSI-RS.2.1 TDD					
reportConfigType		1,2,3,4,5,6	periodic					
reportQuantity		1,2,3,4,5,6	cri-RI-PMI-CQI					
CSI reporting periodicity	slot	1,2,4,5	5					
		3,6	10					
CSI reporting offset	slot	1,2,4,5	2					
		3,6	4					

Parameter	Unit	Config	Test					
			T1	T2	T3	T4	T5	T6
EPRE ratio of PSS to SSS	dB	1,2,3,4,5,6	0					
EPRE ratio of PBCH DMRS to SSS								
EPRE ratio of PBCH to PBCH DMRS								
EPRE ratio of PDCCH DMRS to SSS								
EPRE ratio of PDCCH to PDCCH DMRS								
EPRE ratio of PDSCH DMRS to SSS								
EPRE ratio of PDSCH to PDSCH								
EPRE ratio of OCNG DMRS to SSS(Note 1)								
EPRE ratio of OCNG to OCNG DMRS (Note 1)								
N_{oc} Note2	dBm/15 kHz	1,2,4,5	N/A	-88.6				
		3,6	N/A	-88.6				
N_{oc} Note2	dBm/SCS	1,2,4,5	N/A	-88.6				
		3,6	N/A	-85.6				
$\hat{E}_s/I_{ot}$		1,2,3,4,5,6	-infinity	0				
$\hat{E}_s/N_{oc}$		1,2,3,4,5,6	-infinity	0				
SS-RSRP Note3	dBm/SCS	1,2,4,5	-infinity	-88.6				
		3,6	-infinity	-85.6				
Io Note3	dBm/9.36MHz	1,2,4,5	N/A	-57.6				
	dBm/38.1MHz	3,6	N/A	-51.5				
Propagation condition		1,2,3,4,5,6	AWGN					

NOTE 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.

NOTE 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for N_{oc} to be fulfilled.

NOTE 3: SS-RSRP and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.

NOTE 4: SS-RSRP minimum requirements are specified assuming independent interference and noise at each receiver antenna port.

The UE shall transmit the PRACH to PSCell no later than 82 ms Note1 from the start of T4.

The UE shall send at least one CSI report for PSCell with non-zero CQI index during T5.

The UE shall periodically send CSI reports for PSCell after the UE has sent first CQI report with non-zero CQI index during T5.

The UE shall stop sending CSI reports for PSCell no later than 20ms from the start of T6.

All the above test requirements shall be fulfilled in order for the observed PSCell addition delay and PSCell release delay to be counted as correct. The rate of correct observed PSCell addition delay and PSCell release delay during repeated tests shall be at least 90%.

NOTE: The PSCell addition delay can be expressed as follows as specified in clause 4.7.5.0.1:

$$T_{config_PSCell} = T_{RRC_delay} + T_{processing} + T_{search} + T_{\Delta} + T_{PSCell_DU} + 2ms$$

Where:

T_{RRC_delay} = 20ms

$T_{processing}$ = 20ms

T_{search} = 0

T_{Δ} = 20ms

T_{PSCell_DU} = 1*10+10 = 20ms

4.5.8 UL switching

4.5.8.0 Minimum conformance requirements

[TS 38.133, clause 8.2.1.2.14]

The DL interruption requirements at dynamic switching between two uplink carriers specified in this clause are applicable for an uplink band pair of an inter-band EN-DC configuration when the capability *uplinkTxSwitchingPeriod* is present, and is only applicable for uplink switching mechanism specified in clause 6.1.6 of TS 38.214 [9], where E-UTRA UL carrier is capable of one transmit antenna connector and NR UL carrier is capable of two transmit antenna connectors, and the two uplink carriers are in different bands with different carrier frequencies.

When dynamic switching between two uplink carriers is conducted, UE is allowed to cause DL interruption of X OFDM symbols in NR downlink carrier(s) as indicated by *uplinkTxSwitching-DL-Interruption* [13]. The DL interruption starts from the first OFDM symbol which fully or partially overlaps with the UL switching period located in NR carrier. The DL interruption lengths of X for NR carrier(s) are defined in Table 4.5.8.0-1.

No DL interruption is allowed in the NR downlink carrier(s) which is not indicated by *uplinkTxSwitching-DL-Interruption*. No DL interruption is allowed for some inter-band EN-DC configurations as specified in clause 5.5B.4 of TS 38.101-3 [4].

Table 4.5.8.0-1: DL interruption length on NR carrier(s) in the unit of OFDM symbols (X) for switching between two uplink carriers

μ	NR Slot length (ms)	Uplink Tx switching period Note1	
		35us	140us
0	1	2	3
1	0.5	3	6
2	0.25	4	10
Note 1: Uplink Tx switching period depends on UE capability *uplinkTxSwitchingPeriod.*			

4.5.8.1 EN-DC FR1 interruptions at switching between two uplink carriers

4.5.8.1.1 Test purpose

The purpose of this test is to verify DL interruption requirements during UE dynamic switching between two uplink carriers. The test case is applicable for an uplink band pair of an inter-band EN-DC configuration when the capability *uplinkTxSwitchingPeriod* is present.

4.5.8.1.2 Test applicability

This test applies to all types of NR UE supporting E-UTRA and EN-DC from Release 16 onwards supporting dynamic UL Tx switching in case of inter-band EN-DC.

4.5.8.1.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 4.5.8.0.

The normative reference for this requirement is TS 38.133 [6] clause A.4.5.8.

4.5.8.1.4 Test description

4.5.8.1.4.1 Initial conditions

This test shall be tested using any of the test configurations in Table 4.5.8.1.4.1-1.

Table 4.5.8.1.4.1-1: Test configurations

Test Case ID	PSCell (Cell2)
4.5.8.1-1	30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode

Configure the test equipment and the DUT according to the parameters in Table 4.5.8.1.4.1-2.

Table 4.5.8.1.4.1-2: Initial conditions

Parameter	Value		Comment
Test environment	NC		As specified in TS 38.508-1 [14] clause 4.1.
Test frequencies	As specified in Annex E, Table E.2-1 and TS 38.508-1 [14] clause 4.3.1.		
Channel bandwidth	As specified by the test configuration selected from Table 4.5.8.1.4.1-1.		
Propagation conditions	AWGN		As specified in Annex C.2.2.
Connection Diagram	TE Part	A.3.1.8.2	As specified in TS 38.508-1 [14] Annex A.
	DUT Part	A.3.2.3.4	
Exceptions to connection diagram	N/A		

1. The general test parameter settings are set up according to Table 4.5.8.1.4.1-3
2. Message contents are defined in clause 4.5.8.1.4.3.
3. Cell 1 is the E-UTRA serving cell (PCell) for the EN-DC setup. The power levels and settings for Cell 1 are set according to Annex A.6. Cell 2 is the NR FR1 cell. Cell 2 is the PSCell. The connection setup is done according to the settings in Annex C.1.1.

Table 4.5.8.1.4.1-3: General Test Parameters for DL Interruptions at switching between two uplink carriers in EN-DC

Parameter	Unit	Test configuration	Value	Comment
RF Channel Number		Config 1	1, 2	Two radio channels are used for the test.
Active cell		Config 1	Cell 1: E-UTRAN FDD PCell Cell 2: FR1 PSCell	E-UTRAN FDD PCell on RF channel number 1 FR1 PSCell on RF channel number 2
CP length		Config 1	Normal	
DRX		Config 1	OFF	
Measurement gap pattern Id		Config 1	OFF	
Filter coefficient		Config 1	0	L3 filtering is not used

CSI-RS configuration for L1-RSRP reporting		Config 1	CSI-RS.2.5 TDD	
T1	s	Config 1	5	

4.5.8.1.4.2 Test procedure

The test consists of two cells: Cell1 and Cell2. Cell1 is E-UTRAN PCell, Cell2 is NR FR1 PSCell. The test consists of one time period, with duration of T1. Prior to the start of the time duration T1, the UE shall be connected to Cell1 and Cell2 and *uplinkTxSwitching* is indicated to the UE.

UE is configured to transmit SRS on PSCell on the last 2 symbols of special slot. DL interruption is expected to take place prior of the SRS symbols.

1. Ensure the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity EN-DC, DC bearer MCG_and_SCG, Connected without release On and Test Mode On according to TS 38.508-1 [14] clause 4.5.
2. Configure MCG according to TS 36.521-3 [26] Annex C.0, C.1 and SCG according to Annex C.1.1 and C.1.2 for all downlink physical channels.
3. The SS shall transmit an RRCConnectionReconfiguration message to configure PCell (Cell1) and PSCell (Cell2) on the MCG and SCG as per TS 36.508 [7] clause 4.6 with the message content exceptions defined in clause 4.5.8.1.4.3. *UplinkTxSwitching* is configured to the UE.
4. The UE shall transmit *RRCConnectionReconfigurationComplete* message.
5. Set the parameters according to T1 in Tables 4.5.8.1.5-1. T1 starts.
6. SS schedules UL transmission on PCell continuously on the DL slots of PSCell.
7. SS triggers aperiodic CSI-RS for L1-RSRP reporting with power boosting (6dB) on following symbol on the special slot on PSCell.

   - symbol#10 if UE does not report uplinkTxSwitching-DL-Interruption-r16;

   - otherwise,

     - symbol#5 if UE capability uplinkTxSwitchingPeriod is 140us or

     - symbol #8 if UE capability uplinkTxSwitchingPeriod is 35us.
8. After 80ms from the aperiodic CSI-RS transmission, the SS transmits the DCI trigger. The UE shall send L1-RSRP report containing L1-RSRP of CSI-RS#0 at slot 5 from the reception of DCI trigger, if so increase the number of passed iterations by one otherwise increase the number of failed iterations by one and switch off the UE.
9. The SS shall transmit *RRCConnectionReconfiguration* message with condition EN-DC_PSCell_Rel according to TS 36.508 [25] Table 4.6.1-8 to release NR cell (PSCell). The UE shall transmit *RRCConnectionReconfigurationComplete* message.
10. The SS then shall transmit *RRCConnectionReconfiguration* message with condition MCG_and_SCG according to TS 36.508 [25] Table 4.6.1-8 to add NR cell (PSCell). The UE shall transmit *RRCConnectionReconfigurationComplete* message.
11. If any of the reconfigurations fails, switch off and on the UE and ensure the UE is in RRC_CONNECTED with generic procedure parameters Connectivity EN-DC, DC bearer MCG and SCG, Connected without release On according to TS 38.508-1 [14] clause 4.5
12. Repeat step 3-11 until a test verdict has been achieved.

4.5.8.1.4.3 Message contents

Message contents are according to TS 38.508-1 [14] clause 7.3 with the following exceptions:

Table 4.5.8.1.4.3-1: Common exception messages

Default Message Contents	
Common contents of system information blocks exceptions	
Default RRC messages and information elements contents exceptions	Table H.3.1-5

Table 4.5.8.1.4.3-2: CellGroupConfig

Derivation Path: TS 38.508-1 [14], Table 4.6.3-19			
Information Element	**Value/remark**	**Comment**	**Condition**
CellGroupConfig ::= SEQUENCE {			
uplinkTxSwitchingOption-r16	switchedUL		UE reports '*switchedUL*' or '*both*' for capability IE *uplinkTxSwitching-OptionSupport-r16*
	dualUL		UE reports '*dualUL'* for capability IE *uplinkTxSwitching-OptionSupport-r16*
}			

Table 4.5.8.1.4.3-3: ServingCellConfig

Derivation Path: TS 38.508-1 [14], Table 4.6.3-167			
Information Element	**Value/remark**	**Comment**	**Condition**
ServingCellConfig ::= SEQUENCE {			
uplinkConfig SEQUENCE {			
uplinkTxSwitching-r16 CHOICE {			
setup SEQUENCE {			
uplinkTxSwitchingPeriodLocation-r1	1		
uplinkTxSwitchingCarrier-r16	carrier2		
}			
}			
}			
}			

Table 4.5.8.1.4.3-4: TDD-UL-DL-ConfigCommon

Derivation Path: Table 7.3.1-1 with condition TDDConf.2.1			
Information Element	**Value/remark**	**Comment**	**Condition**
TDD-UL-DL-ConfigCommon ::= SEQUENCE {			
pattern1 SEQUENCE {			
nrofDownlinkSymbols	11		
nrofUplinkSymbols	2		
}			
}			

Table 4.5.8.1.4.3-5: SRS-Config

Derivation Path: TS 38.508-1 [14], Table 4.6.3-182			
Information Element	**Value/remark**	**Comment**	**Condition**

SRS-Config ::= SEQUENCE {			
srs-ResourceSetToAddModList SEQUENCE (SIZE(0..maxNrofSRS-ResourceSets)) OF SEQUENCE {			
SRS-ResourceSet[1] SEQUENCE {		entry 1	
resourceType CHOICE {			
periodic SEQUENCE {			
}			
}			
}			
}			
srs-ResourceToAddModList SEQUENCE (SIZE(1..maxNrofSRS-Resources)) OF SEQUENCE {			
SRS-Resource[1] SEQUENCE {		entry 1	
nrofSRS-Ports	ports2		
resourceMapping SEQUENCE {			
startPosition	1		
nrofSymbols	n2		
}			
freqHopping SEQUENCE {			
c-SRS	0		
}			
groupOrSequenceHopping	neither		
resourceType CHOICE {			
periodic SEQUENCE {			
periodicityAndOffset-p CHOICE {			
sl8	3		
}			
}			
}			
}			
}			
}			

Table 4.5.8.1.4.3-6: *CSI-MeasConfig*

Derivation Path: TS 38.508-1 [14], Table 4.6.3-38			
Information Element	**Value/remark**	**Comment**	**Condition**
CSI-MeasConfig::= SEQUENCE {			
nzp-CSI-RS-ResourceToAddModList SEQUENCE (SIZE (1..maxNrofNZP-CSI-RS-Resources)) OF NZP-CSI-RS-Resource {	1 entry		
NZP-CSI-RS-Resource[1] SEQUENCE {		entry 1	
nzp-CSI-RS-ResourceId	0		
resourceMapping SEQUENCE {			
frequencyDomainAllocation CHOICE {			
other	000001		
}			
nrofPorts	p1		
firstOFDMSymbolInTimeDomain	10		UE does not report uplinkTxSwitching-DL-Interruption-r16
	5		UE capability uplinkTxSwitchingPeriod is 140us
	8		UE capability uplinkTxSwitchingPeriod is 35us

firstOFDMSymbolInTimeDomain2	Not present		
cdm-Type	noCDM		
density CHOICE {			
three			
}			
freqBand SEQUENCE {			
startingRB	0		
nrofRBs	106		
}			
}			
powerControlOffset	0		
powerControlOffsetSS	db0		
scramblingID	0		
periodicityAndOffset	Not Present		
qcl-InfoPeriodicCSI-RS	Not Present		
}			
}			
nzp-CSI-RS-ResourceSetToAddModList SEQUENCE (SIZE (1..maxNrofNZP-CSI-RS-ResourceSets)) OF NZP-CSI-RS-ResourceSetId {	1 entry		
NZP-CSI-RS-ResourceSet[1]	NZP-CSI-RS-ResourceSet	entry 1 Table 4.5.8.1.4.3-7	
}			
csi-ResourceConfigToAddModList SEQUENCE (SIZE (1..maxNrofCSI-ResourceConfigurations)) OF CSI-ResourceConfig {	1 entry		
CSI-ResourceConfig[1]		entry 1 Table 4.5.8.1.4.3-8	
}			
csi-ReportConfigToAddModList SEQUENCE (SIZE (1..maxNrofCSI-ReportConfigurations)) OF CSI-ReportConfig {	1 entry		
CSI-ReportConfig[1]	CSI-ReportConfig	entry 1 Table 4.5.8.1.4.3-9	
}			
}			

Table 4.5.8.1.4.3-7: *NZP-CSI-RS-ResourceSet*

Derivation Path: TS 38.508-1 [14], Table 4.6.3-87			
Information Element	**Value/remark**	**Comment**	**Condition**
NZP-CSI-RS-ResourceSet ::= SEQUENCE {			
nzp-CSI-ResourceSetId	0		
nzp-CSI-RS-Resources SEQUENCE (SIZE (1..maxNrofNZP-CSI-RS-ResourcesPerSet)) OF NZP-CSI-RS-ResourceId {	1 entry		
NZP-CSI-RS-ResourceId[1]	0	entry 1	
}			
repetition	off		
aperiodicTriggeringOffset	6		
trs-Info	Not present		
}			

Table 4.5.8.1.4.3-8: *CSI-ResourceConfig*

Derivation Path: TS 38.508-1 [14], Table 4.6.3-41			
Information Element	**Value/remark**	**Comment**	**Condition**
CSI-ResourceConfig ::= SEQUENCE {			
csi-ResourceConfigId	0		
csi-RS-ResourceSetList CHOICE {			
nzp-CSI-RS-SSB SEQUENCE {			

nzp-CSI-RS-ResourceSetList SEQUENCE (SIZE (1..maxNrofNZP-CSI-RS-ResourceSetsPerConfig)) OF NZP-CSI-RS-ResourceSetId {			
NZP-CSI-RS-ResourceSetId [1]	0		
}			
csi-SSB-ResourceSetList	Not present		
}			
}			
bwp-Id	0		
resourceType	aperiodic		
}			

Table 4.5.8.1.4.3-9: *CSI-ReportConfig*

Derivation Path: TS 38.508-1 [14], Table 4.6.3-39			
Information Element	**Value/remark**	**Comment**	**Condition**
CSI-ReportConfig ::= SEQUENCE {			
reportConfigId	0		
carrier	ServCellIndex		
resourcesForChannelMeasurement	0		
csi-IM-ResourcesForInterference	Not present		
nzp-CSI-RS-ResourcesForInterference	Not present		
reportConfigType CHOICE {			
Aperiodic SEQUENCE {			
reportSlotOffsetList SEQUENCE (SIZE (1..maxNrofUL-Allocations)) OF INTEGER {			
INTEGER	5		
INTEGER	5		
}			
}			
}			
reportQuantity CHOICE {			
cri-RSRP	NULL		
}			
reportFreqConfiguration	Not present		
timeRestrictionForChannelMeasurements	Not present		
timeRestrictionForInterferenceMeasurements	Not present		
codebookConfig	Not present		
dummy	Not present		
groupBasedBeamReporting	Not present		
cqi-Table	Not present		
subbandSize	Not present		
non-PMI-PortIndication	Not present		
semiPersistentOnPUSCH-v1530	Not present		
semiPersistentOnPUSCH-v1610	Not present		
aperiodic-v1610 SEQUENCE {			
reportSlotOffsetListDCI-0-2-r16	Not present		
reportSlotOffsetListDCI-0-1-r16 SEQUENCE (SIZE (1..maxNrofUL-Allocations-r16)) OF INTEGER {			
INTEGER	5		
INTEGER	5		
}			
}			
reportQuantity-r16	Not present		
codebookConfig-r16	Not present		
}			

4.5.8.1.5 Test requirements

Table 4.5.8.1.5-1 defines the NR cell specific primary level settings including test tolerances for E-UTRAN – NR FR1 interruptions at switching between two uplink carriers.

Table 4.5.8.1.5-1: NR Cell specific test parameters for DL Interruptions at switching between two uplink carriers in EN-DC (Cell 2)

Parameter		Unit	Cell2
Frequency Range			FR1
Duplex mode	Config 1		TDD
TDD configuration	Config 1		TDDConf.2.1 except that: S='11DL: 1GP:2UL'; *nrofDownlinkSymbols: 11* *nrofUplinkSymbols: 2*
$BW_{channel}$	Config 1		40 MHz: $N_{RB,c}$ = 106
Initial BWP Configuration	Config 1		DLBWP.0.1
DL dedicated BWP configuration	Config 1		DLBWP.1.1
UL dedicated BWP configuration			ULBWP.1.1
SRS configuration			SRSConf.4 in Table 4.5.8.1.5-2
PDSCH Reference measurement channel	Config 1		SR.2.1 TDD
RMSI CORESET parameters	Confiq 1		CR.2.1 TDD
Dedicated CORESET parameters	Config 1		CCR.2.1 TDD
OCNG Patterns			OP.1
SMTC Configuration			SMTC.1
SSB Configuration	Config 1		SSB.2 FR1
Correlation Matrix and Antenna Configuration			2x2 low
EPRE ratio of PSS to SSS		dB	0
EPRE ratio of PBCH DMRS to SSS			
EPRE ratio of PBCH to PBCH DMRS			
EPRE ratio of PDCCH DMRS to SSS			
EPRE ratio of PDCCH to PDCCH DMRS			
EPRE ratio of PDSCH DMRS to SSS			
EPRE ratio of PDSCH to PDSCH			
EPRE ratio of OCNG DMRS to SSS(Note 1)			
EPRE ratio of OCNG to OCNG DMRS (Note 1)			
N_{oc} Note 2		dBm/15 kHz	-104
SS-RSRP Note 3		dBm/SCS	84
$\hat{E}_s/I_{ot}$		dB	17
$\hat{E}_s/N_{oc}$		dB	17
N_{oc} Note 2	Config 1	dBm/SCS	-101
Io Note3	Config 1	dBm/ 38.16MHz	-52.86
Time offset to Cell1 Note 5		µs	0
Propagation Condition			AWGN

Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.
Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for N_{oc} to be fulfilled.
Note 3: SS-RSRP and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.
Note 4: Void
Note 5: Receive time difference between slot boundaries of signals received from the two cells at the UE antenna connector including time alignment error between the two cells.

Table 4.5.8.1.5-2: SRS Configuration for DL Interruptions at switching between two uplink carriers

	Field	SRSConf.4	Comments

SRS-ResourceSet	srs-ResourceSetId	0	
	srs-ResourceIdList	0	
	resourceType	Periodic	
	Usage	Codebook	
SRS-Resource	SRS-ResourceId	0	
	nrofSRS-Ports	Port2	
	transmissionComb	n2	
	combOffset-n2	0	
	cyclicShift-n2	0	
	resourceMapping startPosition	1	
	resourceMapping nrofSymbols	n2	
	resourceMapping repetitionFactor	n1	
	freqDomainPosition	0	
	freqDomainShift	0	
	freqHopping c-SRS	0	Matches $N_{RB,c}$
	freqHopping b-SRS	0	
	freqHopping b-hop	0	
	groupOrSequenceHopping	Neither	
	resourceType	Periodic	
	periodicityAndOffset-p	sl8, 3	Offset to align with DRx periodicity
	sequenceId	0	Any 10 bit number

The UE shall send L1-RSRP report at slot 5 from the reception of DCI trigger. The L1-RSRP report shall include the results of CSI-RS#0. Each L1-RSRP measurement report shall meet the corresponding absolute accuracy requirements in Table 4.5.8.1.5-3.

Table 4.5.8.1.5-3: L1-RSRP absolute accuracy requirements for the reported values

Normal Conditions	T1
Lowest reported value (CSI-RS#0)	62
Highest reported value (CSI-RS#0)	83

The rate of correct events observed during repeated tests shall be at least 90%.

4.6 Measurement procedures

4.6.1 Intra-frequency measurements

4.6.1.0 Minimum conformance requirements

4.6.1.0.1 Minimum conformance requirements for event-triggered reporting without gap

The UE shall be able to identify a new detectable intra frequency cell within $T_{identify_intra_without_index}$ if UE is not indicated to report SSB based RRM measurement result with the associated SSB index(*reportQuantityRsIndexes* or *maxNrofRSIndexesToReport* is not configured), or the UE is indicated that the neighbour cell is synchronous with the serving cell (*deriveSSB-IndexFromCell* is enabled). Otherwise UE shall be able to identify a new detectable intra frequency cell within $T_{identify_intra_with_index}$. The UE shall be able to identify a new detectable intra frequency SS block of an already detected cell within $T_{identify_intra_without_index}$. It is assumed that *deriveSSB-IndexFromCell*is always enabled for FR1 TDD and FR2.

$$T_{identify_intra_without_index} = (T_{PSS/SSS_sync_intra} + T_{SSB_measurement_period_intra})\ ms$$

$$T_{identify_intra_with_index} = (T_{PSS/SSS_sync_intra} + T_{SSB_measurement_period_intra} + T_{SSB_time_index_intra})\ ms$$

Where:

T_{PSS/SSS_sync_intra}: it is the time period used in PSS/SSS detection given in table 4.6.1.0.1-1, 4.6.1.0.1-2, 4.6.1.0.1-4 (deactivated SCell) or 4.6.1.0.1-5 (deactivated SCell)

$T_{SSB_time_index_intra}$: it is the time period used to acquire the index of the SSB being measured given in table 4.6.1.0.1-3 or 4.6.1.0.1-6 (deactivated SCell)

$T_{SSB_measurement_period_intra}$: equal to a measurement period of SSB based measurement given in table 4.6.1.0.1-7, table 4.6.1.0.1-8, table 4.6.1.0.1-9 (deactivated Scell), 4.6.1.0.1-10(deactivated SCell), or 4.6.1.0.1-11 ()

$CSSF_{intra}$: it is a carrier specific scaling factor and is determined

- according to $CSSF_{outside_gap,i}$ in TS 38.133 [6] section 9.1.5.1 for measurement conducted outside measurement gaps, i.e. when intrafrequency SMTC is fully non overlapping or partially overlapping with measurement gaps, or according to $CSSF_{within_gap,i}$ in TS 38.133 [6] section 9.1.5.2 for measurement conducted within measurement gaps, i.e. when intrafrequency SMTC is fully overlapping with measurement gaps.

- if the high layer in TS 38.331 [13] signalling of *smtc2* is configured, the assumed periodicity of intrafrequency SMTC occasions corresponds to the value of higher layer parameter *smtc2*; Otherwise the assumed periodicity of intrafrequency SMTC occasions corresponds to the value of higher layer parameter *smtc1*.

$M_{pss/sss_sync_w/o_gaps}$: For a UE supporting FR2 power class 1, M_{pss/sss_sync}=40. For a UE supporting power class 2, $M_{pss/sss_sync_w/o_gaps}$ =24. For a UE supporting FR2 power class 3, $M_{pss/sss_sync_w/o_gaps}$ =24. For a UE supporting FR2 power class 4, $M_{pss/sss_sync_w/o_gaps}$ = 24

$M_{meas_period_w/o_gaps}$: For a UE supporting power class 1, $M_{meas_period_w/o_gaps}$ =40. For a UE supporting FR2 power class 2, $M_{meas_period_w/o_gaps}$ =24. For a UE supporting power class 3, $M_{meas_period_w/o_gaps}$ =24. For a UE supporting power class 4, $M_{meas_period_w/o_gaps}$ = 24.

When intra-frequency SMTC is fully non overlapping with measurement gaps or intra-frequency SMTC is fully overlapping with MGs, K_p=1

When intra-frequency SMTC is partially overlapping with measurement gaps, K_p = 1/(1- (SMTC period /MGRP)), where SMTC period < MGRP

If the higher layer signalling in TS 38.331 [13] signalling of *smtc2* is present and smtc1 is fully overlapping with measurement gaps and smtc2 is partially overlapping with measurement gaps, requirements are not specified for $T_{identify_intra_without_index}$ or $T_{identify_intra_with_index}$

For FR2,

$K_{layer1_measurement}$=1,

- if all of the reference signals configured for RLM, BFD, CBD or L1-RSRP for beam reporting on any FR2 serving frequency in the same band outside measurement gap are not fully overlapped by intra-frequency SMTC occasions, or

- if all of the reference signal configured for RLM, BFD, CBD or L1-RSRP for beam reporting on any FR2 serving frequency in the same band outside measurement gap and fully-overlapped by intra-frequency SMTC occasions are not overlapped with any of the SSB symbols and the RSSI symbols, and 1 symbol before each consecutive SSB symbols and the RSSI symbols, and 1 symbol after each consecutive SSB symbols and the RSSI symbols, given that *SSB-ToMeasure* and *SS-RSSI-Measurement* are configured, where SSB symbols are indicated by the union set of *SSB-ToMeasure* from all the configured measurement objects on the same serving carrier which can be merged. and RSSI symbols are indicated by *SS-RSSI-Measurement*;

$K_{layer1_measurement}$=1.5, otherwise.

If the above-mentioned reference signal configured for L1-RSRP measurement is aperiodic CSI-RS resource, longer cell identification delay would be expected.

If SCG DRX is in use, intrafrequency cell identification requirements specified in Table 4.6.1.0.1-1, Table 4.6.1.0.1-2, Table 4.6.1.0.1-3, Table 4.6.1.0.1-4, Table 4.6.1.0.1-5 and Table 4.6.1.0.1-6 shall depend on the SCG DRX cycle. Otherwise, the requirements for when DRX is not in use shall apply.

Table 4.6.1.0.1-1: Time period for PSS/SSS detection, (Frequency range FR1)

DRX cycle	T_{PSS/SSS_sync_intra}
No DRX	max(600ms, ceil(5 x K_p) x SMTC period)[Note 1] x $CSSF_{intra}$
DRX cycle≤ 320ms	max(600ms, ceil(M2 [Note 2]x 5 x K_p) x max(SMTC period, DRX cycle)) x $CSSF_{intra}$
DRX cycle>320ms	ceil(5 x K_p) x DRX cycle x $CSSF_{intra}$
NOTE 1: If different SMTC periodicities are configured for different cells, the SMTC period in the requirement is the one used by the cell being identified	
NOTE 2: When *highSpeedMeasFlag-r16* is not configured, M2 = 1.5; When *highSpeedMeasFlag-r16* is configured, M2 = 1.5 if SMTC periodicity > 40 ms; otherwise M2=1.	
NOTE 3: When *highSpeedMeasFlag-r16* is configured, the requirements apply only to UE supporting either *measurementEnhancement-r16* or *intraRAT-MeasurementEnhancement-r16* on measurements of the primary component carrier and do not apply to measurements of a secondary component carrier with active SCell.	
NOTE 4: When highSpeedMeasCA-Scell-r17 is configured and UE supports measurementEnhancementCA-r17, M2 = 1.5 if SMTC periodicity > 40 ms; otherwise M2=1.	

Table 4.6.1.0.1-2: Time period for PSS/SSS detection, (Frequency range FR2)

DRX cycle	T_{PSS/SSS_sync_intra}
No DRX	max(600ms, ceil($M_{pss/sss_sync_w/o_gaps}$ x K_p x $K_{layer1_measurement}$) x SMTC period) [note 1] x $CSSF_{intra}$
DRX cycle≤ 320ms	max(600ms, ceil(1.5 x $M_{pss/sss_sync_w/o_gaps}$ x K_p x $K_{layer1_measurement}$) x max(SMTC period,DRX cycle)) x $CSSF_{intra}$
DRX cycle>320ms	ceil($M_{pss/sss_sync_w/o_gaps}$ x K_p x $K_{layer1_measurement}$) x DRX cycle x $CSSF_{intra}$
NOTE: If different SMTC periodicities are configured for different cells, the SMTC period in the requirement is the one used by the cell being identified.	

Table 4.6.1.0.1-3: Time period for time index detection (Frequency range FR1)

DRX cycle	$T_{SSB_time_index_intra}$
No DRX	max(120ms, ceil(3 x K_p) x SMTC period)[Note 1] x $CSSF_{intra}$
DRX cycle≤ 320ms	max(120ms, ceil (M2 [Note 2] x 3 x K_p) x max(SMTC period,DRX cycle)) x $CSSF_{intra}$
DRX cycle>320ms	Ceil(3 x K_p) x DRX cycle x $CSSF_{intra}$
NOTE 1: If different SMTC periodicities are configured for different cells, the SMTC period in the requirement is the one used by the cell being identified.	
NOTE 2: When *highSpeedMeasFlag-r16* is not configured, M2 = 1.5; When *highSpeedMeasFlag-r16* is configured, M2 = 1.5 if SMTC periodicity > 40 ms; otherwise M2=1.	
NOTE 3: When *highSpeedMeasFlag-r16* is configured, the requirements apply only to UE supporting either *measurementEnhancement-r16* or *[intraRAT-MeasurementEnhancement-r16]* on measurements of the primary component carrier and do not apply to measurements of a secondary component carrier with active SCell.	
NOTE 4: When highSpeedMeasCA-Scell-r17 is configured and UE supports measurementEnhancementCA-r17, M2 = 1.5 if SMTC periodicity > 40 ms; otherwise M2=1	

Table 4.6.1.0.1-4: Time period for PSS/SSS detection, deactivated SCell (Frequency range FR1)

DRX cycle	T_{PSS/SSS_sync_intra}
No DRX	5 x measCycleSCell x $CSSF_{intra}$
DRX cycle≤ 320ms	5 x max(measCycleSCell, 1.5xDRX cycle) x $CSSF_{intra}$

DRX cycle> 320ms	5 x max(measCycleSCell, DRX cycle) x $CSSF_{intra}$

Table 4.6.1.0.1-5: Time period for PSS/SSS detection, deactivated SCell (Frequency range FR2)

DRX cycle	T_{PSS/SSS_sync_intra}
No DRX	$M_{pss/sss_sync_w/o_gaps}$ x measCycleSCell x $CSSF_{intra}$
DRX cycle≤ 320ms	$M_{pss/sss_sync_w/o_gaps}$ x max(measCycleSCell, 1.5xDRX cycle) x $CSSF_{intra}$
DRX cycle> 320ms	$M_{pss/sss_sync_w/o_gaps}$ x max(measCycleSCell, DRX cycle) x $CSSF_{intra}$

Table 4.6.1.0.1-6: Time period for time index detection, deactivated SCell (Frequency range FR1)

DRX cycle	$T_{SSB_time_index_intra}$
No DRX	3 x measCycleSCell x $CSSF_{intra}$
DRX cycle≤ 320ms	3 x max(measCycleSCell, 1.5xDRX cycle) x $CSSF_{intra}$
DRX cycle> 320ms	3 x max(measCycleSCell, DRX cycle) x $CSSF_{intra}$

Table 4.6.1.0.1-7: Time period for PSS/SSS detection, deactivated SCell (FR1), when *highSpeedMeasCA-Scell-r17* is configured

DRX cycle	T_{PSS/SSS_sync_intra}
No DRX	Ceil(5 x K_p) x measCycleSCell x $CSSF_{intra}$
DRX cycle≤ 320ms	Ceil(5 x K_p) x max(measCycleSCell, M2 [Note 1]xDRX cycle) x $CSSF_{intra}$
DRX cycle> 320ms	Ceil(5 x K_p) x max(measCycleSCell, DRX cycle) x $CSSF_{intra}$
NOTE 1: M2 = 1.5 if SMTC periodicity > 40 ms; otherwise M2=1	

Table 4.6.1.0.1-8: Time period for time index detection, deactivated SCell (FR1)，when *highSpeedMeasCA-Scell-r17* is configured

DRX cycle	$T_{SSB_time_index_intra}$
No DRX	Ceil(3 x K_p) x measCycleSCell x $CSSF_{intra}$
DRX cycle≤ 320ms	Ceil(3 x K_p) x max(measCycleSCell, M2 [Note 1]xDRX cycle) x $CSSF_{intra}$
DRX cycle> 320ms	Ceil(3 x K_p)x max(measCycleSCell, DRX cycle) x $CSSF_{intra}$
NOTE 1: M2 = 1.5 if SMTC periodicity > 40 ms; otherwise M2=1	

The measurement period for intra-frequency measurements without gaps is as shown in table 4.6.1.0.1-9, 4.6.1.0.1-10, 4.6.1.0.1-11 (deactivated SCell) or 4.6.1.0.1-12 (deactivated SCell). When *highSpeedMeasFlag-r16* is configured, $T_{SSB_measurement_period_intra}$ is specified in Table 4.6.1.0.1-13.

If the higher layer signalling in TS38.331 [13] signalling of *smtc2* is present and *smtc1* is fully overlapping with measurement and smtc2 is partially overlapping with measurement gaps, requirements are not specified for $T_{SSB_measurement_period_intra}$.

If SCG DRX is in use, intrafrequency measurement period requirements specified in Table 4.6.1.0.1-7, Table 4.6.1.0.1-10, Table 4.6.1.0.1-11 and Table 4.6.1.0.1-12 shall depend on the SCG DRX cycle. Otherwise, the requirements for when DRX is not in use shall apply.

For FR2, a longer measurement period is allowed, if aperiodic CSI-RS resource is measured for L1-RSRP measurement on any FR2 serving frequency in the same band, and the CSI-RS resource is outside measurement gap and overlapped with any of the SSB symbols and the RSSI symbols, and 1 symbol before each consecutive SSB symbols and the RSSI symbols, and 1 symbol after each consecutive SSB symbols and the RSSI symbols. If *SSB-ToMeasure* or *SS-RSSI-Measurement* is configured, the SSB symbols are indicated by the union set of *SSB-ToMeasure* from all the configured measurement objects on the same band which can be merged and the RSSI symbols are indicated by *SS-RSSI-Measurement*.

Table 4.6.1.0.1-9: Measurement period for intrafrequency measurements without gaps (Frequency FR1)

DRX cycle	$T_{SSB_measurement_period_intra}$
No DRX	max(200ms, ceil(5 x K_p) x SMTC period) Note 1 x $CSSF_{intra}$
DRX cycle≤ 320ms	max(200ms, ceil(1.5x 5 x K_p) x max(SMTC period,DRX cycle)) x $CSSF_{intra}$
DRX cycle>320ms	ceil(5 x K_p) x DRX cycle x $CSSF_{intra}$
NOTE: If different SMTC periodicities are configured for different cells, the SMTC period in the requirement is the one used by the cell being identified.	

Table 4.6.1.0.1-10: Measurement period for intrafrequency measurements without gaps (Frequency FR2)

DRX cycle	$T_{SSB_measurement_period_intra}$
No DRX	max(400ms, ceil($M_{meas_period_w/o_gaps}$ x K_p x $K_{layer1_measurement}$) x SMTC period) Note 1 x $CSSF_{intra}$
DRX cycle≤ 320ms	max(400ms, ceil(1.5x $M_{meas_period_w/o_gaps}$ x K_p x $K_{layer1_measurement}$) x max(SMTC period,DRX cycle)) x $CSSF_{intra}$
DRX cycle>320ms	ceil($M_{meas_period_w/o_gaps}$ xK_p x $K_{layer1_measurement}$) x DRX cycle x $CSSF_{intra}$
NOTE: If different SMTC periodicities are configured for different cells, the SMTC period in the requirement is the one used by the cell being identified.	

Table 4.6.1.0.1-11: Measurement period for intrafrequency measurements without gaps (deactivated SCell) (Frequency range FR1)

DRX cycle	$T_{SSB_measurement_period_intra}$
No DRX	5 x measCycleSCell x $CSSF_{intra}$
DRX cycle≤ 320ms	5 x max(measCycleSCell, 1.5xDRX cycle) x $CSSF_{intra}$
DRX cycle> 320ms	5 x max(measCycleSCell, DRX cycle) x $CSSF_{intra}$

Table 4.6.1.0.1-12: Measurement period for intrafrequency measurements without gaps (deactivated SCell) (Frequency range FR2)

DRX cycle	$T_{SSB_measurement_period_intra}$
No DRX	$M_{meas_period\ with_gaps}$ x measCycleSCell x $CSSF_{intra}$
DRX cycle≤ 320ms	$M_{meas_period\ with_gaps}$ x max(measCycleSCell, 1.5xDRX cycle) x $CSSF_{intra}$
DRX cycle> 320ms	$M_{meas_period\ with_gaps}$ x max(measCycleSCell, DRX cycle) x $CSSF_{intra}$

Table 4.6.1.0.1-13: $T_{SSB_measurement_period_intra}$ When *highSpeedMeasFlag-r16* is configured (Frequency range FR1)

DRX cycle	$T_{SSB_measurement_period_intra}$
No DRX Note 2	max(200ms, ceil(5 x K_p) x SMTC period)Note 1 x $CSSF_{intra}$
DRX cycle≤ 160ms	max(200ms, ceil(5 x M2 Note 2 x K_p) x max(SMTC period,DRX cycle)) x $CSSF_{intra}$
160ms < DRX cycle≤ 320ms	ceil(4 x M2 Note 2 x K_p) x max(SMTC period,DRX cycle) x $CSSF_{intra}$
DRX cycle>320ms	ceil(Y Note 3 x K_p) x DRX cycle x $CSSF_{intra}$
NOTE 1: If different SMTC periodicities are configured for different cells, the SMTC period in the requirement is the one used by the cell being identified.	
NOTE 2: M2 = 1.5 if SMTC periodicity > 40 ms, otherwise M2=1.	
NOTE 3: Y=3 when SMTC <= 40ms, Y=5 when SMTC > 40ms.	
NOTE 4: When *highSpeedMeasFlag-r16* is configured, the requirements apply only to UE supporting either *measurementEnhancement-r16* or *[intraRAT-MeasurementEnhancement-r16]* on measurements of the	

	primary component carrier and do not apply to measurements of a secondary component carrier with active SCell.
NOTE 5:	When highSpeedMeasCA-Scell-r17 is configured, the requirements apply to measurements of secondary component carrier with active SCell.

Table 4.6.1.0.1-14**: Measurement period for intra-frequency measurements without gaps (deactivated SCell) (FR1), when highSpeedMeasCA-Scell-r17 is configured**

DRX cycle	$T_{SSB_measurement_period_intra}$
No DRX	ceil(5 x K_p) x measCycleSCell x $CSSF_{intra}$
DRX cycle≤ 160ms	ceil(5 x K_p) x max(measCycleSCell, M2 [Note 1] x DRX cycle) x $CSSF_{intra}$
160ms < DRX cycle≤ 320ms	ceil(4 x K_p) x max(measCycleSCell, M2 [Note 1] x DRX cycle)
DRX cycle>320ms	ceil(Y [Note 2] x K_p) x max(measCycleSCell, DRX cycle) x $CSSF_{intra}$
NOTE 1: M2 = 1.5 if SMTC periodicity > 40 ms, otherwise M2=1 NOTE 2: Y=3 when SMTC <= 40ms, Y=5 when SMTC > 40ms	

The normative reference for this requirement is TS 38.133 [6] clause 9.2.5.1 and 9.2.5.2.

4.6.1.0.2 Minimum conformance requirements for event-triggered measurements with gap

TS 38.133, clause 9.2.2]

The requirements in TS 38.133 [6] Section 9.2 apply, provided:

- The cell being identified or measured is detectable.

An intra-frequency cell shall be considered detectable when for each relevant SSB:

- SS-RSRP related side conditions given in TS 38.133 [6] Sections 10.1.2 and 10.1.3 for FR1 and FR2, respectively, for a corresponding Band,
- SS-RSRQ related side conditions given in TS 38.133 [6] Sections 10.1.7 and 10.1.8 for FR1 and FR2, respectively, for a corresponding Band,
- SS-SINR related side conditions given in TS 38.133 [6] Sections 10.1.12 and 10.1.13 for FR1 and FR2, respectively, for a corresponding Band,
- SSB_RP and SSB Ês/Iot according to Annex B.2.2 for a corresponding Band.

[TS 38.133, clause 9.2.6.2]

The UE shall be able to identify a new detectable intra frequency cell within $T_{identify_intra_without_index}$ if UE is not indicated to report SSB based RRM measurement result with the associated SSB index (*reportQuantityRsIndexes* or *maxNrofRSIndexesToReport* is not configured), or the UE has been indicated that the neighbour cell is synchronous with the serving cell (*deriveSSB-IndexFromCell* is enabled). Otherwise UE shall be able to identify a new detectable intra frequency cell within $T_{identify_intra_with_index.}$ The UE shall be able to identify a new detectable intra frequency SS block of an already detected cell within $T_{identify_intra_without_index.}$ It is assumed that *deriveSSB-IndexFromCell* is always enabled for FR1 TDD and FR2.

$$T_{identify_intra_without_index} = T_{PSS/SSS_sync_intra} + T_{SSB_measurement_period_intra}\ \text{ms}$$

$$T_{identify_intra_with_index} = T_{PSS/SSS_sync_ntra} + T_{SSB_measurement_period_intra} + T_{SSB_time_index_intra}$$

Where:

T_{PSS/SSS_sync_intra}: it is the time period used in PSS/SSS detection given in table 4.6.1.0.2 or 4.6.1.0.2.

$T_{SSB_time_index_intra}$: it is the time period used to acquire the index of the SSB being measured given in table 4.6.1.0.2.

$T_{SSB_measurement_period_intra}$: equal to a measurement period of SSB based measurement given in table 4.6.1.0.2 or 4.6.1.0.2.

$CSSF_{intra}$: it is a carrier specific scaling factor and is determined according to $CSSF_{within_gap,i}$ in TS 38.133 [6] section 9.1.5.2 for measurement conducted within measurement gaps.

$M_{pss/sss_sync_with_gaps}$: For a UE supporting FR2 power class 1, $M_{pss/sss_sync\ with_gaps}$=40. For a UE supporting FR2 power class 2, $M_{pss/sss_sync\ with_gaps}$ =24. For a UE supporting FR2 power class 3, $M_{pss/sss_sync\ with_gaps}$ =24. For a UE supporting power class 4, $M_{pss/sss_sync\ with_gaps}$ =24

$M_{meas_period_with_gaps}$: For a UE supporting power class 1, $M_{meas_period_with_gaps}$ =40. For a UE supporting power class 2, $M_{meas_period_with_gaps}$ =24. For a UE supporting power class 3, $M_{meas_period_with_gaps}$ =24. For a UE supporting power class 4, $M_{meas_period\ with_gaps}$ =24.

If the higher layer signalling in TS 38.331 [13] signalling of *smtc2* is present and smtc1 is fully overlapping with measurement gaps and smtc2 is partially overlapping with measurement gaps, requirements are not specified for $T_{identify_intra_without_index}$ or $T_{identify_intra_with_index}$.

If SCG DRX is in use, intrafrequency cell identification requirements specified in TS 38.133 [6] Table 9.2.6.1-1, Table 9.2.6.1-2, and Table 9.2.5.1-3 shall depend on the SCG DRX cycle. Otherwise, the requirements for when DRX is not in use shall apply.

Table 4.6.1.0.2: Time period for PSS/SSS detection (Frequency range FR1)

DRX cycle	T_{PSS/SSS_sync_intra}
No DRX	max(600ms, 5 x max(MGRP, SMTC period)) x $CSSF_{intra}$
DRX cycle≤ 320ms	max(600ms, ceil(1.5x 5) x max(MGRP, SMTC period,DRX cycle)) x $CSSF_{intra}$
DRX cycle>320ms	5 x max(MGRP, DRX cycle) x $CSSF_{intra}$

Table 4.6.1.0.2-2: Time period for PSS/SSS detection (Frequency range FR2)

DRX cycle	T_{PSS/SSS_sync_intra}
No DRX	max(600ms, $M_{pss/sss_sync_with_gaps}$ x max(MGRP, SMTC period)) x $CSSF_{intra}$
DRX cycle≤ 320ms	max(600ms, ceil(1.5x $M_{pss/sss_sync_with_gaps}$) x max(MGRP, SMTC period, DRX cycle)) x $CSSF_{intra}$
DRX cycle>320ms	$M_{pss/sss_sync_with_gaps}$ x max(MGRP, DRX cycle) x $CSSF_{intra}$

Table 4.6.1.0.2: Time period for time index detection (Frequency range FR1)

DRX cycle	$T_{SSB_time_index_intra}$
No DRX	max(120ms, 3 x max(MGRP, SMTC period)) x $CSSF_{intra}$
DRX cycle≤ 320ms	max(120ms, ceil(1.5x 3) x max(MGRP, SMTC period,DRX cycle) x $CSSF_{intra}$)
DRX cycle>320ms	3 x max(MGRP, DRX cycle) x $CSSF_{intra}$

[TS 38.133, clause 9.2.6.3]

The measurement period for FR1 intrafrequency measurements with gaps is as shown in Table 4.6.1.0.2-4.

The measurement period for FR2 intrafrequency measurements with gaps is as shown in Table 4.6.1.0.2-5.

If SCG DRX is in use, intrafrequency measurement period requirements specified in Table 4.6.1.0.2-4 and Table 4.6.1.0.2-5, shall depend on the SCG DRX cycle. Otherwise, the requirements for when DRX is not in use shall apply.

Table 4.6.1.0.2-4: Measurement period for intrafrequency measurements with gaps (Frequency Range FR1)

DRX cycle	$T_{SSB_measurement_period_intra}$
No DRX	Max(200ms, 5 x max(MGRP, SMTC period)) x $CSSF_{intra}$
DRX cycle≤ 320ms	max(200ms, ceil(1.5x 5) x max(MGRP, SMTC period,DRX cycle)) x $CSSF_{intra}$
DRX cycle>320ms	5 x max(MGRP, DRX cycle) x $CSSF_{intra}$

Table 4.6.1.0.2-5: Measurement period for intrafrequency measurements with gaps (Frequency Range FR2)

DRX cycle	$T_{SSB_measurement_period_intra}$
No DRX	max(400ms, $M_{meas_period\ with_gaps}$ x max(MGRP, SMTC period)) x $CSSF_{intra}$
DRX cycle≤ 320ms	max(400ms, ceil(1.5 x $M_{meas_period\ with_gaps}$) x max(MGRP, SMTC period, DRX cycle)) Note 1 x $CSSF_{intra}$
DRX cycle>320ms	$M_{meas_period\ with_gaps}$ x max(MGRP, DRX cycle) x $CSSF_{intra}$

[TS 38.133, clause 9.2.4.3]

Reported RSRP, RSRQ, and RS-SINR measurements contained in periodically triggered measurement reports shall meet the requirements in TS 38.133 [6] sections 10.1.2.1, 10.1.3.1, 10.1.7.1, 10.1.8.1, 10.1.12.1 and 10.1.13.1, respectively.

The UE shall not send any event triggered measurement reports, as long as no reporting criteria are fulfilled.

The measurement reporting delay is defined as the time between an event that will trigger a measurement report and the point when the UE starts to transmit the measurement report over the air interface. This requirement assumes that the measurement report is not delayed by other RRC signalling on the DCCH. This measurement reporting delay excludes a delay uncertainty resulted when inserting the measurement report to the TTI of the uplink DCCH. The delay uncertainty is: 2 x TTI_{DCCH}. This measurement reporting delay excludes a delay which caused by no UL resources for UE to send the measurement report.

The event triggered measurement reporting delay, measured without L3 filtering shall be less than $T_{identify\ intra\ with\ index}$ or $T_{identify\ intra\ without\ index}$ defined in TS 38.133 [6] clause 9.2.5.1 or clause 9.2.6.2. When L3 filtering is used an additional delay can be expected.

If a cell which has been detectable at least for the time period $T_{identify\ intra\ without\ index}$ or $T_{identify\ intra\ with\ index}$ defined in TS 38.133 [6] clause 9.2.5.1 or clause 9.2.6.2 becomes undetectable for a period and then the cell becomes detectable again and triggers an event, the event triggered measurement reporting delay shall be less than $T_{Measurement_Period,\ Intra}$ provided the timing to that cell has not changed more than ± 3200 Tc while the measurement gap has not been available and the L3 filter has not been used. When L3 filtering is used, an additional delay can be expected.

The normative reference for this requirement is TS 38.133 [6] clause 9.2.2, 9.2.6.2, 9.2.6.3 and 9.2.4.3.

4.6.1.1 EN-DC FR1 event-triggered reporting without gap in non-DRX

4.6.1.1.1 Test purpose

This test is to verify the UE makes correct reporting of an event without gap within the intra-frequency cell search requirements.

4.6.1.1.2 Test applicability

This test applies to all types of E-UTRA UE release 15 and forward, supporting EN-DC.

4.6.1.1.3 Minimum conformance requirements

The minimum conformance requirements are defined in clause 4.6.1.0.1.

The normative reference for this requirement is TS 38.133 [6] clause A.4.6.1.1.

4.6.1.1.4 Test description

4.6.1.1.4.1 Initial conditions

This test shall be tested using any of the test configurations in Table 4.6.1.1.4.1-1.

Table 4.6.1.1.4.1-1: supported test configurations

Test Case ID	Description
4.6.1.1-1	15 kHz SSB SCS, 10MHz bandwidth, FDD duplex mode
4.6.1.1-2	15 kHz SSB SCS, 10MHz bandwidth, TDD duplex mode
4.6.1.1-3	30 kHz SSB SCS, 40MHz bandwidth, TDD duplex mode
NOTE: The UE is only required to be tested in one of the supported test configurations.	

Configure the test equipment and the DUT according to the parameters in Table 4.6.1.1.4.1-2 and Table 4.6.1.1.4.1-3.

Table 4.6.1.1.4.1-2: Initial conditions for EN-DC intra-frequency event triggered reporting without gap for PSCell in FR1

Parameter	Value		Comment
Test environment	NC		As specified in TS 38.508-1 [14] clause 4.1.
Test frequencies	As specified in Annex E, Table E.1-1 and TS 38.508-1 [14] clause 4.3.1.		
Channel bandwidth	As specified by the test configuration selected from Table 4.7.1.1.2-1.		
Propagation conditions	AWGN		As specified in clause C.2.2.
Connection Diagram	TE Part	A.3.1.8.2	As specified in TS 38.508-1 [14] Annex A.
	DUT Part	A.3.2.3.4	
Exceptions to connection diagram	N/A		

Table 4.6.1.1.4.1-3: General test parameters for EN-DC intra-frequency event triggered reporting without gap for PSCell in FR1

Parameter	Unit	Test configuration	Value	Comment
Active cell		1, 2, 3	E-UTRAN Cell 1 and NR Cell 2	
Neighbour cell		1, 2, 3	NR Cell 3	Cell to be identified.
RF Channel Number		1, 2, 3	1: Cell 1 2: Cell 2 and Cell 3	
SSB configuration		1	SSB.1 FR1	
		2	SSB.1 FR1	
		3	SSB.2 FR1	
SMTC configuration		1	SMTC.2	
		2	SMTC.1	
		3	SMTC.1	
A3-Offset	dB	1, 2, 3	-4.5	
CP length		1, 2, 3	Normal	
Hysteresis	dB	1, 2, 3	0	
Time To Trigger	s	1, 2, 3	0	
Filter coefficient		1, 2, 3	0	L3 filtering is not used
DRX		1, 2, 3	N/A	OFF
Time offset between PCell and PSCell		1, 2, 3	3 μs	Synchronous EN-DC
Time offset between serving and neighbour cells		1	3 ms	Asynchronous cells. The timing of Cell 3 is 3ms later than the timing of Cell 2.
		2	3 μs	Synchronous cells
		3	3 μs	Synchronous cells

Parameter	Unit	Test configuration	Value	Comment
T1	s	1, 2, 3	5	
T2	s	1, 2, 3	5	

1. Message contents are defined in clause 4.6.1.1.4.3.

2. Cell 1 is the E-UTRA serving cell (PCell) for the EN-DC setup. The power levels and settings for Cell 1 are set according to Annex A.6. Cell 2 and Cell 3 are NR FR1 cells in the same frequency. Cell 2 is the PSCell and Cell 3 is the neighbour NR Cell.

4.6.1.1.4.2 Test procedure

The test consists of two successive time periods, with time duration of T1, and T2 respectively. During time duration T1, the UE shall not have any timing information of cell 3.

1. Ensure the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity EN-DC, DC bearer MCG and SCG, Connected without release *On* and Test Mode *On* according to TS 38.508-1 [14] clause 4.5.

2. Configure MCG and SCG according to clause C.1 for all downlink physical channels.

3. The SS shall configure the PCell (Cell 1) and PSCell (Cell 2) on the MCG and SCG as per TS 38.508-1 [14] clause 4.5 with the message content exceptions defined in clause 4.6.1.1.4.3.

4. Set the parameters according to T1 in Table 4.6.1.1.4.1-2. Propagation conditions are set according to Annex C clauses C.2.2

5. The SS shall transmit an RRCConnectionReconfiguration message with event A3 configured.

6. The UE shall transmit an RRCConnectionReconfigurationComplete message. T1 starts.

7. When T1 expires, the SS shall switch the power setting from T1 to T2 as specified in Table 4.6.1.1.4.1-2.

8. UE shall transmit a MeasurementReport message triggered by Event A3 for Cell 3 on PCell (Cell 1). If the measurement reporting delay from the beginning of time period T2 is less than 802 the number of successful tests is increased by one. If the UE fails to report the event within the measurement reporting delay requirement then the number of failure tests is increased by one.

9. The SS waits until the MeasurementReport message is received or when T2 expires.

10. The SS shall transmit *RRCConnectionReconfiguration* message with condition EN-DC_PSCell_Rel according to TS 36.508 [25] Table 4.6.1-8 to release NR cell (PSCell). The UE shall transmit *RRCConnectionReconfigurationComplete* message.

11. Set Cell 3 physical cell identity = [((current cell 3 physical cell identity + 1) mod 14 + 2)] for next iteration of the test procedure loop.

12. The SS then shall transmit *RRCConnectionReconfiguration* message with condition MCG_and_SCG according to TS 36.508 [25] Table 4.6.1-8 to add NR cell (PSCell). The UE shall transmit *RRCConnectionReconfigurationComplete* message.

13. If any the reconfiguration fails, switch off and on the UE and ensure the UE is in RRC_CONNECTED with generic procedure parameters Connectivity EN-DC, DC bearer MCG and SCG, Connected without release On according to TS 38.508-1 [14] clause 4.5].

14. Repeat steps 3-13 until the confidence level according to Tables G.2.3-1 in Annex G clause G.2 is achieved.

4.6.1.1.4.3 Message contents

Message contents are according to TS 38.508-1 [14] clause 7.3 with the following exceptions:

Table 4.6.1.1.4.3-1: Common Exception messages for Additional EN-DC FR1 event-triggered reporting without gap in non-DRX test requirement

Default Message Contents	
Common contents of system information blocks exceptions	
Default RRC messages and information elements contents exceptions	Table H.3.1-1 Table H.3.1-2 Table H.3.1-4 with A3-offset = -4.5dB Table H.3.1-5 Table H.3.1-7 Table H.3.4-1 Table H.3.4-1a Table H.3.4-4
Specific message contents exceptions for Test Configuration 4.6.1.1-1 and 4.6.1.1-4	Table H.3.1-3 with Condition SSB.1 FR1Table 7.3.1-3 in TS 38.508-1 [14] with condition SMTC.2
Specific message contents exceptions for Test Configuration 4.6.1.1-2 and 4.6.1.1-5	Table H.3.1-3 with Condition SSB.1 FR1 and Synchronous cells Table 7.3.1-3 in TS 38.508-1 [14] with condition SMTC.1
Specific message contents exceptions for Test Configuration 4.6.1.1-3 and 4.6.1.1-6	Table H.3.1-3 with Condition SSB.2 FR1 and Synchronous cells Table 7.3.1-3 in TS 38.508-1 [14] with condition SMTC.1

4.6.1.1.5 Test requirement

Table 4.6.1.1.5-1 defines the primary level settings including test tolerances for all tests.

Table 4.6.1.1.5-1: NR Cell specific test parameters for EN-DC intra-frequency event triggered reporting without gap for PSCell in FR1

Parameter	Unit	Test configuration	Cell 2		Cell 3	
			T1	T2	T1	T2
TDD configuration		1	N/A		N/A	
		2	TDDConf.1.1		TDDConf.1.1	
		3	TDDConf.2.1		TDDConf.2.1	
PDSCH RMC configuration		1	SR.1.1 FDD		N/A	
		2	SR.1.1 TDD			
		3	SR.2.1 TDD			
RMSI CORESET RMC configuration		1	CR.1.1 FDD		CR.1.1 FDD	
		2	CR.1.1 TDD		CR.1.1 TDD	
		3	CR.2.1 TDD		CR.2.1 TDD	
Dedicated CORESET RMC configuration		1	CCR.1.1 FDD		CCR.1.1 FDD	
		2	CCR.1.1 TDD		CCR.1.1 TDD	
		3	CCR.2.1 TDD		CCR.2.1 TDD	
OCNG Patterns		1, 2, 3	OP.1		OP.1	
TRS configuration		1	TRS.1.1 FDD		N/A	
		2	TRS.1.1 TDD		N/A	
		3	TRS.1.2 TDD		N/A	
Initial BWP configuration		1, 2, 3	DLBWP.0.1 ULBWP.0.1		DLBWP.0.1 ULBWP.0.1	
Active DL BWP configuration		1, 2, 3	DLBWP.1.1		DLBWP.1.1	
Active UL BWP configuration		1, 2, 3	ULBWP.1.1		ULBWP.1.1	
RLM-RS		1, 2, 3	SSB		SSB	
N_{oc} note 2	dBm/SCS	1	-98			
		2	-98			
		3	-95			
N_{oc} note 2	dBm/15 kHz	1	-98			
		2				
		3				
	dB	1	4	-1.46	-Infinity	-1.46

Parameter	Unit	Test configuration	Cell 2		Cell 3	
			T1	T2	T1	T2
$\hat{E}_s/I_{ot}$		2				
		3				
$\hat{E}_s/N_{oc}$	dB	1	4	4	-Infinity	4
		2				
		3				
SS-RSRP note 3	dBm/SCS kHz	1	-94	-94	-Infinity	-94
		2	-94	-94	-Infinity	-94
		3	-91	-91	-Infinity	-91
Io	dBm/9.36 MHz	1	-64.60	-62.25	-Infinity	-62.25
	dBm/9.36 MHz	2	-64.60	-62.25	-Infinity	-62.25
	dBm/38.16 MHz	3	-58.50	-56.16	-Infinity	-56.16
Propagation Condition		1, 2, 3	AWGN			
NOTE 1: The resources for uplink transmission are assigned to the UE prior to the start of time period T2.						
NOTE 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for N_{oc} to be fulfilled.						
NOTE 3: SS-RSRP levels have been derived from other parameters for information purposes. They are not settable parameters themselves.						

The UE shall send one Event A3 triggered measurement report, with a measurement reporting delay less than 800 ms from the beginning of time period T2. The UE is not required to read the neighbour cell SSB index in this test.

The UE shall not send event triggered measurement reports, as long as the reporting criteria are not fulfilled.

The overall delays measured test requirement is expressed as:

$T_{identify_intra_without_index} = (T_{PSS/SSS_sync_intra} + T_{SSB_measurement_period_intra})$ ms

T_{PSS/SSS_sync_intra} = max[600ms, ceil(5 x K_p) x SMTC period] x $CSSF_{intra}$ = 600ms

$T_{SSB_measurement_period_intra}$ = max[200ms, ceil(5 x K_p) x SMTC period] x $CSSF_{intra}$ = 200 ms

Which:

K_p = 1;

SMTC period as defined in Table 4.6.1.1.4.1-3;

$CSSF_{intra}$ = 1

TTI insertion uncertainty = TTI_{DCCH} = 1 ms; 2xTTI_{DCCH} = 2 ms

The overall delays measured shall be less than a total of 802 ms in this test case (note: this gives a total of 800 ms for measurement reporting delay plus 2 ms for TTI insertion uncertainty).

The rate of correct events observed during repeated tests shall be at least 90% with confidence level of 95%.

NOTE: The actual overall delays measured in the test may be up to 2xTTI_{DCCH} higher than the measurement reporting delays above because of TTI insertion uncertainty of the measurement report in DCCH.

4.6.1.2 EN-DC FR1 event-triggered reporting without gap in DRX

4.6.1.2.1 Test purpose

This test is to verify the UE makes correct reporting of an event without gap in DRX within the intra-frequency cell search requirements.

4.6.1.2.2 Test applicability

This test applies to all types of E-UTRA UE release 15 and forward, supporting EN-DC FR1 and long DRX cycle.

4.6.1.2.3 Minimum conformance requirements

The minimum conformance requirements are defined in clause 4.6.1.0.1.

The normative reference for this requirement is TS 38.133 [6] clause A.4.6.1.2.

4.6.1.2.4 Test description

4.6.1.2.4.1 Initial conditions

This test shall be tested using any of the test configurations in Table 4.6.1.2.4.1-1.

Table 4.6.1.2.4.1-1: supported test configurations

Test Case ID	Description
4.6.1.2-1	15 kHz SSB SCS, 10MHz bandwidth, FDD duplex mode
4.6.1.2-2	15 kHz SSB SCS, 10MHz bandwidth, TDD duplex mode
4.6.1.2-3	30 kHz SSB SCS, 40MHz bandwidth, TDD duplex mode
NOTE: The UE is only required to be tested in one of the supported test configurations.	

Configure the test equipment and the DUT according to the parameters in Table 4.6.1.2.4.1-2 and Table 4.6.1.2.4.1-3.

Table 4.6.1.2.4.1-2: Initial conditions for EN-DC intra-frequency event triggered reporting without gap for PSCell in FR1 with DRX

Parameter	Value		Comment
Test environment	NC		As specified in TS 38.508-1 [14] clause 4.1.
Test frequencies	As specified in Annex E, Table E.1-1 and TS 38.508-1 [14] clause 4.3.1.		
Channel bandwidth	As specified by the test configuration selected from Table 4.7.1.1.2-1.		
Propagation conditions	AWGN		As specified in clause C.2.2.
Connection Diagram	TE Part	A.3.1.8.2	As specified in TS 38.508-1 [14] Annex A.
	DUT Part	A.3.2.3.4	
Exceptions to connection diagram	N/A		

Table 4.6.1.2.4.1-3: General test parameters for EN-DC intra-frequency event triggered reporting without gap for PSCell in FR1 with DRX

Parameter	Unit	Test configuration	Value		Comment
			Test 1	Test 2	
Active cell		1, 2, 3	E-UTRAN Cell 1 and NR Cell 2		
Neighbour cell		1, 2, 3	NR Cell 3		Cell to be identified.
RF Channel Number		1, 2, 3	1: Cell 1 2: Cell 2 and Cell 3		
SSB configuration		1	SSB.1 FR1		
		2	SSB.1 FR1		
		3	SSB.2 FR1		
SMTC configuration		1	SMTC.2		
		2	SMTC.1		
		3	SMTC.1		
A3-Offset	dB	1, 2, 3	-4.5		
CP length		1, 2, 3	Normal		
Hysteresis	dB	1, 2, 3	0		
Time To Trigger	s	1, 2, 3	0		

Parameter	Unit	Test configuration	Value		Comment
			Test 1	Test 2	
Filter coefficient		1, 2, 3	0		L3 filtering is not used
DRX		1, 2, 3	DRX.1	DRX.7	Annex A.5 Table A.5-1
Time offset between PCell and PSCell		1, 2, 3	3 μs		Synchronous EN-DC
Time offset between serving and neighbour cells		1	3 ms		Asynchronous cells. The timing of Cell 3 is 3ms later than the timing of Cell 2.
		2	3 μs		Synchronous cells
		3	3 μs		Synchronous cells
T1	s	1, 2, 3	5		
T2	s	1, 2, 3	5	10	

1. Message contents are defined in clause 4.6.1.2.4.3.

2. Cell 1 is the E-UTRA serving cell (PCell) for the EN-DC setup. The power levels and settings for Cell 1 are set according to Annex A.6. Cell 2 and Cell 3 are NR FR1 cells in the same frequency. Cell 2 is the PSCell and Cell 3 is the neighbour NR Cell.

4.6.1.2.4.2 Test procedure

Same test procedure as in subclause 4.6.1.1.4.2 with Step 8 is replaced by following:

8. UE shall transmit a MeasurementReport message triggered by Event A3 for Cell 3 on PCell (Cell 1). If the overall delays measured from the beginning of time period T2 is less than 922 ms for Test 1 or less than 6402 ms for Test 2 then the number of successful tests is increased by one. If the UE fails to report the event within the overall delays measured requirement then the number of failure tests is increased by one.

4.6.1.2.4.3 Message contents

Message contents are according to TS 38.508-1 [14] clause 7.3 with the following exceptions:

Table 4.6.1.2.4.3-1: Common Exception messages for Additional EN-DC FR1 event-triggered reporting without gap in DRX test requirement

Default Message Contents	
Common contents of system information blocks exceptions	
Default RRC messages and information elements contents exceptions	Table H.3.1-1 Table H.3.1-2 Table H.3.1-4 with A3-offset = -4.5dB Table H.3.1-5 Table H.3.1-7 Table H.3.7-1 with Condition DRX.1 for Test 1 Table H.3.7-1 with Condition DRX.7 for Test 2 Table H.3.4-1 Table H.3.4-1a Table H.3.4-2
Specific message contents exceptions for Test Configuration 4.6.1.2-1 and 4.6.1.2-4	Table H.3.1-3 with Condition SSB.1 FR1Table 7.3.1-3 in TS 38.508-1 [14] with condition SMTC.2
Specific message contents exceptions for Test Configuration 4.6.1.2-2 and 4.6.1.2-5	Table H.3.1-3 with Condition SSB.1 FR1 and Synchronous cells Table 7.3.1-3 in TS 38.508-1 [14] with condition SMTC.1
Specific message contents exceptions for Test Configuration 4.6.1.2-3 and 4.6.1.2-6	Table H.3.1-3 with Condition SSB.2 FR1 and Synchronous cells Table 7.3.1-3 in TS 38.508-1 [14] with condition SMTC.1

4.6.1.2.5 Test requirement

Table 4.6.1.2.4.1-2 and Table 4.6.1.2.5-1 defines the primary level settings including test tolerances for all tests.

Table 4.6.1.2.5-1: NR Cell specific test parameters for EN-DC intra-frequency event triggered reporting without gap for PSCell in FR1 with DRX

Parameter	Unit	Test configuration	Cell 2		Cell 3	
			T1	T2	T1	T2
TDD configuration		1	N/A		N/A	
		2	TDDConf.1.1		TDDConf.1.1	
		3	TDDConf.2.1		TDDConf.2.1	
PDSCH RMC configuration		1	SR.1.1 FDD		N/A	
		2	SR.1.1 TDD			
		3	SR.2.1 TDD			
RMSI CORESET RMC configuration		1	CR.1.1 FDD		CR.1.1 FDD	
		2	CR.1.1 TDD		CR.1.1 TDD	
		3	CR.2.1 TDD		CR.2.1 TDD	
Dedicated CORESET RMC configuration		1	CCR.1.1 FDD		CCR.1.1 FDD	
		2	CCR.1.1 TDD		CCR.1.1 TDD	
		3	CCR.2.1 TDD		CCR.2.1 TDD	
OCNG Patterns		1, 2, 3	OP.1		OP.1	
TRS configuration		1	TRS.1.1 FDD		N/A	
		2	TRS.1.1 TDD		N/A	
		3	TRS.1.2 TDD		N/A	
Initial BWP configuration		1, 2, 3	DLBWP. 0.1 ULBWP.0.1		DLBWP. 0.1 ULBWP.0.1	
Active DL BWP configuration		1, 2, 3	DLBWP.1.1		DLBWP.1.1	
Active UL BWP configuration		1, 2, 3	ULBWP.1.1		ULBWP.1.1	
RLM-RS		1, 2, 3	SSB		SSB	
N_{oc} note 2	dBm/SCS	1	-98			
		2	-98			
		3	-95			
N_{oc} note 2	dBm/15 KHz	1	-98			
		2				
		3				
$\hat{E}_s/I_{ot}$	dB	1	4	-1.46	-Infinity	-1.46
		2				
		3				
$\hat{E}_s/N_{oc}$	dB	1	4	4	-Infinity	4
		2				
		3				
SS-RSRP note 3	dBm/SCS KHz	1	-94	-94	-Infinity	-94
		2	-94	-94	-Infinity	-94
		3	-91	-91	-Infinity	-91
Io	dBm/9.36 MHz	1	-64.60	-62.25	-Infinity	-62.25
	dBm/9.36 MHz	2	-64.60	-62.25	-Infinity	-62.25
	dBm/38.16 MHz	3	-58.50	-56.16	-Infinity	-56.16
Propagation Condition		1, 2, 3	AWGN			

NOTE 1: The resources for uplink transmission are assigned to the UE prior to the start of time period T2.

NOTE 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for N_{oc} to be fulfilled.

NOTE 3: SS-RSRP levels have been derived from other parameters for information purposes. They are not settable parameters themselves.

In test 1, the UE shall send one Event A3 triggered measurement report, with a measurement reporting delay less than 922 ms from the beginning of time period T2. The UE is not required to read the neighbour cell SSB index in this test.

The overall delays measured test requirement is expressed in test 1 with DRX 40ms as:

$T_{identify_intra_without_index}$ = (T_{PSS/SSS_sync_intra} + $T_{SSB_measurement_period_intra}$) ms

T_{PSS/SSS_sync_intra} = max[600ms, ceil(1.5 x 5 x K_p) x max(SMTC period, DRX cycle)] x $CSSF_{intra}$ = 600ms

$T_{SSB_measurement_period_intra}$ = max[200ms, ceil(1.5 x 5 x K_p) x max(SMTC period, DRX cycle)] x $CSSF_{intra}$ = 320 ms

Which:

K_p = 1;

SMTC period as defined in Table 4.6.1.2.4.1-3;

DRX cycle = 40;

$CSSF_{intra}$ = 1

TTI insertion uncertainty = TTI_{DCCH} = 1 ms; 2xTTI_{DCCH} = 2 ms

The overall delays measured shall be less than a total of 922 ms in test 1 (note: this gives a total of 920 ms for measurement reporting delay plus 2 ms for TTI insertion uncertainty).

In test 2, the UE shall send one Event A3 triggered measurement report, with a measurement reporting delay less than 6402 ms from the beginning of time period T2. The UE is not required to read the neighbour cell SSB index in this test.

The overall delays measured test requirement is expressed in test 2 with DRX 640ms as:

$T_{identify_intra_without_index}$ = (T_{PSS/SSS_sync_intra} + $T_{SSB_measurement_period_intra}$) ms

T_{PSS/SSS_sync_intra} = ceil(5 x K_p) x DRX cycle x $CSSF_{intra}$= 3200ms

$T_{SSB_measurement_period_intra}$ = ceil(5 x K_p) x DRX cycle x $CSSF_{intra}$ = 3200 ms

Which:

K_p = 1;

DRX cycle = 640;

$CSSF_{intra}$ = 1

TTI insertion uncertainty = TTI_{DCCH} = 1 ms; 2xTTI_{DCCH} = 2 ms

The overall delays measured shall be less than a total of 6402 ms in test 2 (note: this gives a total of 6400 ms for measurement reporting delay plus 2 ms for TTI insertion uncertainty).

The UE shall not send event triggered measurement reports, as long as the reporting criteria are not fulfilled.

The rate of correct events observed during repeated tests shall be at least 90% with confidence level of 95%.

NOTE: The actual overall delays measured in the test may be up to 2xTTI_{DCCH} higher than the measurement reporting delays above because of TTI insertion uncertainty of the measurement report in DCCH.

4.6.1.3 EN-DC FR1 event-triggered reporting with gap in non-DRX

4.6.1.3.1 Test purpose

To verify that the UE makes correct reporting of an event in non-DRX within EN-DC intra-frequency NR cell search requirements in TS 38.133 [6] clause 9.2. This test will partly verify the TDD intra-frequency cell search requirements.

4.6.1.3.2 Test applicability

This test applies to all types of E-UTRA UE release 15 and forward supporting EN-DC, CSI-RS-based RLM and BWP operation without bandwidth restriction.

4.6.1.3.3 Minimum conformance requirements

The minimum conformance requirements are defined in clause 4.6.1.0.2.

The normative reference for this requirement is TS 38.133 [6] clause A.4.6.1.3.

4.6.1.3.4 Test description

4.6.1.3.4.1 Initial conditions

Test 4.6.1.3 can be run in one of the configurations defined in Table 4.6.1.3.4.1-1.

Table 4.6.1.3.4.1-1: Supported test configurations for NR FR1 Cell

Configuration	Description
4.6.1.3-1	LTE FDD, NR: 15 kHz SSB SCS, 10MHz bandwidth, FDD
4.6.1.3-2	LTE FDD, NR: 15 kHz SSB SCS, 10MHz bandwidth, TDD
4.6.1.3-3	LTE FDD, NR: 30 kHz SSB SCS, 40MHz bandwidth, TDD
4.6.1.3-4	LTE TDD, NR: 15 kHz SSB SCS, 10MHz bandwidth, FDD
4.6.1.3-5	LTE TDD, NR: 15 kHz SSB SCS, 10MHz bandwidth, TDD
4.6.1.3-6	LTE TDD, NR: 30 kHz SSB SCS, 40MHz bandwidth, TDD
NOTE: The UE is only required to be tested in one of the supported test configurations.	

Configure the test equipment and the DUT according to the parameters in Table 4.6.1.5.4.1-2.

Table 4.6.1.3.4.1-2: Initial conditions for EN-DC event-triggered reporting in FR1

Parameter	Value		Comment
Test environment	NC		As specified in TS 38.508-1 [14] clause 4.1.
Test frequencies	As specified in Annex E, Table E.2-1 and TS 38.508-1 [14] clause 4.4.2 and 4.3.1.		
Channel bandwidth	As specified by the test configuration selected from Table 4.6.1.3.4.1-1.		
Propagation conditions	AWGN		As specified in clause C.2.2.
Connection Diagram	TE Part	A.3.1.8.2	As specified in TS 38.508-1 [14] Annex A.
	DUT Part	A.3.2.3.4	
Exceptions to connection diagram	N/A		

1. Message contents are defined in clause 4.6.1.3.4.3.
2. The general test parameter settings are set up according to Table 4.6.1.3.4.1-3.
3. Three cells are deployed in the test, which are E-UTRAN PCell (Cell 1), FR1 PSCell (Cell 2) and a FR1 neighbour cell (Cell 3) on the same frequency as the PSCell. Cell 1 is the cell used for connection setup with the power level set according to Table A.6.1.1-1 for this test. Cell 2 is configured according to clauses C.1.1 and C.1.2. Cell 3 is powered OFF.

Table 4.6.1.3.4.1-3: General test parameters for EN-DC intra-frequency event triggered reporting with per-UE gaps for PSCell in FR1

Parameter	Unit	Test configuration	Value	Comment
Active cell		1-6	E-UTRAN Cell 1 and NR Cell 2	
Neighbour cell		1-6	NR Cell 3	Cell to be identified.
RF Channel Number		1-6	1: Cell 1 2: Cell 2 and Cell 3	
Measurement gap type		1-6	Per-UE gaps	
Measurement gap repetition periodicity	ms	1-6	40	
Measurement gap length	ms	1-6	6	

Parameter	Unit	Test configuration	Value	Comment
Measurement gap offset	ms	1-6	39	
SSB configuration		1,4	SSB.1 FR1	
		2,5	SSB.1 FR1	
		3,6	SSB.2 FR1	
SMTC configuration		1,4	SMTC.2	
		2,5	SMTC.1	
		3,6	SMTC.1	
CSI-RS parameters		1,4	CSI-RS.1.2 FDD resource #0	
		2,5	CSI-RS.1.2 TDD resource #0	
		3,6	CSI-RS.2.2 TDD resource #0	
A3-Offset	dB	1-6	-4.5	
CP length		1-6	Normal	
Hysteresis	dB	1-6	0	
Time To Trigger	s	1-6	0	
Filter coefficient		1-6	0	L3 filtering is not used
DRX		1-6	N/A	OFF
Time offset between PCell and PSCell		1-6	3 µs	Synchronous EN-DC
Time offset between serving and neighbour cells		1,4	3 ms	Asynchronous cells. The timing of Cell 3 is 3ms later than the timing of Cell 2.
		2,5	3 µs	Synchronous cells
		3,6	3 µs	Synchronous cells
T1	s	1-6	5	
T2	s	1-6	5	

4.6.1.3.4.2 Test procedure

Three cells are deployed in the test, which are E-UTRAN PCell (Cell 1), FR1 PSCell (Cell 2) and a FR1 neighbour cell (Cell 3) on the same frequency as the PSCell.

In the measurement control information, a measurement object is configured for the frequency of the PSCell, and it is indicated to the UE that event-triggered reporting with Event A3 is used.

The test consists of two successive time periods, with time duration of T1, and T2 respectively. During time duration T1, the UE shall not have any timing information of cell 3.

There are two BWPs configured in Cell 2, BWP1 which contains the cell defining SSB, and BWP2 which does not contain any SSB of Cell 2. During the whole test, BWP2 is always scheduled as the active BWP for the UE.

1. Ensure the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity EN-DC, DC bearer *MCG* and *SCG*, Connected without release *On* and Test Mode *On* according to TS 38.508-1 [14] clause 4.5.

2. Set the parameters of NR cells according to T1 in Table 4.6.1.3.5-1.

3. SS shall transmit an RRCConnectionReconfiguration message with event A3 configured.

4. The UE shall transmit RRCConnectionReconfigurationComplete message. T1 starts.

5. When T1 expires, the SS shall switch the power setting from T1 to T2 as specified in Table 4.6.1.3.5-1. T2 starts.

6. UE shall transmit a MeasurementReport message embedded in E-UTRA RRC message *ULInformationTransferMRDC* triggered by Event A3. If the overall delays measured from the beginning of time period T2 is less than 802 ms then the number of successful tests is increased by one. If the UE fails to report the event within the overall delays measured requirement then the number of failure tests is increased by one.

7. After the SS receive the MeasurementReport message in step 6 or when T2 expires, the SS shall transmit RRCConnectionReconfiguration message with condition EN-DC_PSCell_Rel according to TS 36.508 [25] Table 4.6.1-8 to release NR cell (PSCell). The UE shall transmit RRCConnectionReconfigurationComplete message.

8. Set Cell 3 physical cell identity = ((current cell 3 physical cell identity + 1) mod 14 + 2) for next iteration of the test procedure loop.

9. The SS shall transmit RRCConnectionReconfiguration message with condition MCG_and_SCG according to TS 36.508 [25] Table 4.6.1-8 to add NR cell (PSCell). The UE shall transmit RRCConnectionReconfigurationComplete message. If either of the reconfiguration in step 7 or step 9 fails, the SS switches off and on the UE and ensures the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity EN-DC, DC bearer *MCG* and *SCG*, Connected without release *On* according to TS 38.508-1 [14] clause 4.5.

10. Repeat step 2-9 until the confidence level according to Tables G.2.3-1 in Annex G clause G.2 is achieved.

4.6.1.3.4.3 Message contents

Message contents are according to TS 38.508-1 [14] clause 7.3 with the following exceptions.

Table 4.6.1.3.4.3-1: Common Exception messages for Additional EN-DC FR1 event-triggered reporting with gap in non-DRX test requirement

Default Message Contents	
Common contents of system information blocks exceptions	
Default RRC messages and information elements contents exceptions	Table H.3.1-1 Table H.3.1-2 Table H.3.1-4 with A3-offset = -4.5dB Table H.3.1-5 Table H.3.1-7 with Condition INTRA-FREQ Table H.3.1-8 with Condition CSI-RS RLM Table H.3.4-1 Table H.3.4-1a Table H.3.4-2 Table H.3.4-4 with Condition gapUE Table H.3.4-5 with Condition Pattern #0 Table H.3.5-8
Specific message contents exceptions for Test Configuration 4.6.1.3-1 and 4.6.1.3-4	Table H.3.1-3 with Condition SSB.1 FR1 andTable 7.3.1-3 in TS 38.508-1 [14] with condition SMTC.2
Specific message contents exceptions for Test Configuration 4.6.1.3-2 and 4.6.1.3-5	Table H.3.1-3 with Condition SSB.1 FR1 and Synchronous cells Table 7.3.1-3 in TS 38.508-1 [14] with condition SMTC.1
Specific message contents exceptions for Test Configuration 4.6.1.3-3 and 4.6.1.3-6	Table H.3.1-3 with Condition SSB.2 FR1 and Synchronous cells Table 7.3.1-3 in TS 38.508-1 [14] with condition SMTC.1

Table 4.6.1.3.4.3-2: *ServingCellConfig*

Derivation Path: TS 38.508-1 [14], Table 4.6.3-167			
Information Element	**Value/remark**	**Comment**	**Condition**
ServingCellConfig ::= SEQUENCE {			
downlinkBWP-ToAddModList SEQUENCE (SIZE (1..maxNrofBWPs)) OF SEQUENCE {			
BWP-Downlink[1]	BWP-Downlink with condition BWP-Id1	DLBWP.1.2 configuration	
}			
firstActiveDownlinkBWP-Id	1	Active DL BWP-ID (BWP2)	BWP-Id1

defaultDownlinkBWP-Id	0	Initial BWP (BWP1)	
uplinkConfig SEQUENCE {			
uplinkBWP-ToAddModList SEQUENCE (SIZE (1..maxNrofBWPs)) OF SEQUENCE {			
BWP-Uplink[1]	BWP-Uplink with condition BWP-Id1	ULBWP.1.2 configuration	
}			
firstActiveUplinkBWP-Id	1	Active UL BWP-ID (BWP2)	BWP-Id1
}			
}			

Table 4.6.1.3.4.3-3

Condition	Explanation
BWP-Id1	Active BWP (BWP2)

4.6.1.3.5 Test requirement

Tables 4.6.1.3.4.1-3 and 4.6.1.3.5-1 define the primary level settings including test tolerances for EN-DC intra-frequency event triggered reporting with per-UE gaps for PSCell in FR1.

Table 4.6.1.3.5-1: NR Cell specific test parameters for EN-DC intra-frequency event triggered reporting with per-UE gaps for PSCell in FR1

Parameter	Unit	Test configuration	Cell 2		Cell 3	
			T1	T2	T1	T2
TDD configuration		1,4	N/A		N/A	
		2,5	TDDConf.1.1		TDDConf.1.1	
		3,6	TDDConf.2.1		TDDConf.2.1	
PDSCH RMC configuration		1,4	SR.1.1 FDD		N/A	
		2,5	SR.1.1 TDD			
		3,6	SR.2.1 TDD			
RMSI CORESET RMC configuration		1,4	CR.1.1 FDD		CR.1.1 FDD	
		2,5	CR.1.1 TDD		CR.1.1 TDD	
		3,6	CR.2.1 TDD		CR.2.1 TDD	
Dedicated CORESET RMC configuration		1,4	CCR.1.2 FDD		CCR.1.1 FDD	
		2,5	CCR.1.2 TDD		CCR.1.1 TDD	
		3,6	CCR.2.1 TDD		CCR.2.1 TDD	
OCNG Patterns		1-6	OP.1		OP.1	
TRS configuration		1,4	TRS.1.1 FDD		N/A	
		2,5	TRS.1.1 TDD		N/A	
		3,6	TRS.1.2 TDD		N/A	
Initial BWP configuration		1-6	DLBWP.0.1 ULBWP.0.1		DLBWP.0.1 ULBWP.0.1	
Active DL BWP configuration		1-6	DLBWP.1.2		DLBWP.1.1	
Active UL BWP configuration		1-6	ULBWP.1.2		ULBWP.1.1	
RLM-RS		1-6	CSI-RS		SSB	
N_{oc} Note 2	dBm/SCS	1,4	-98			
		2,5	-98			
		3,6	-95			
N_{oc} Note 2	dBm/15 kHz	1,4	-98			
		2,5				
		3,6				
$\hat{E}_s/I_{ot}$	dB	1,4	4	-1.46	-Infinity	-1.46
		2,5				
		3,6				
$\hat{E}_s/N_{oc}$	dB	1,4	4	4	-Infinity	4
		2,5				
		3,6				
SS-RSRP Note 3	dBm/SCS kHz	1,4	-94	-94	-Infinity	-94

Parameter	Unit	Test configuration	Cell 2		Cell 3	
			T1	T2	T1	T2
		2,5	-94	-94	-Infinity	-94
		3,6	-91	-91	-Infinity	-91
Io	dBm/9.36 MHz	1,4	-64.60	-62.25	-64.60	-62.25
	dBm/9.36 MHz	2,5	-64.60	-62.25	-64.60	-62.25
	dBm/38.16 MHz	3,6	-58.50	-56.16	-58.50	-56.16
Propagation Condition		1-6	AWGN			
NOTE 1: The resources for uplink transmission are assigned to the UE prior to the start of time period T2.						
NOTE 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for N_{oc} to be fulfilled.						
NOTE 3: SS-RSRP levels have been derived from other parameters for information purposes. They are not settable parameters themselves.						

The overall delays measured is defined as the time from the beginning of time period T2, to the moment the UE send one Event A3 triggered measurement report to Cell 1.

The overall delays measured in the test may be up to $2xTTI_{DCCH}$ higher than the measurement reporting delays because of TTI insertion uncertainty of the measurement report in DCCH.

The overall delays measured test requirement is expressed as:

Overall delays measured = measurement reporting delay + TTI insertion uncertainty

Measurement reporting delay = $T_{identify_intra_with_index}$

where,

$T_{identify_intra_with_index} = (T_{PSS/SSS_sync_intra} + T_{SSB_measurement_period_intra})$ ms

T_{PSS/SSS_sync_ntra} = max (600ms, ceil (5 x K_p) x SMTC period)$^{Note\ 1}$ x $CSSF_{intra}$ = max (600ms, ceil (5 x 1) x 20ms) x 1 = 600ms

$T_{SSB_measurement_period_intra}$ = max (200ms, ceil (5 x K_p) x SMTC period)$^{Note\ 1}$ x $CSSF_{intra}$ = max (200ms, ceil (5 x 1) x 20ms) x 1 = 200ms

TTI insertion uncertainty = 2 ms

The overall delays measured shall be less than a total of 802 ms in this test case (note: this gives a total of 800 ms for measurement reporting delay plus 2 ms for TTI insertion uncertainty).

For the test to pass, the total number of successful tests shall be more than 90% of the cases with a confidence level of 95%.

4.6.1.4 EN-DC FR1 event-triggered reporting with gap in DRX

4.6.1.4.1 Test purpose

To verify that the UE makes correct reporting of an event in DRX within EN-DC intra-frequency NR cell search requirements in TS 38.133 [6] clause 9.2. This test will partly verify the intra-frequency cell search requirements.

4.6.1.4.2 Test applicability

This test applies to all types of E-UTRA UE release 15 and forward supporting EN-DC, CSI-RS-based RLM, BWP operation without bandwidth restriction and long DRX cycle.

4.6.1.4.3 Minimum conformance requirements

The minimum conformance requirements are defined in clause 4.6.1.0.2.

The normative reference for this requirement is TS 38.133 [6] clause A.4.6.1.4.

4.6.1.4.4 Test description

4.6.1.4.4.1 Initial conditions

Test 4.6.1.4 can be run in one of the configurations defined in Table 4.6.1.4.4.1-1.

Table 4.6.1.4.4.1-1: Supported test configurations for NR FR1 Cell

Configuration	Description
4.6.1.4-1	LTE FDD, NR: 15 kHz SSB SCS, 10MHz bandwidth, FDD
4.6.1.4-2	LTE FDD, NR: 15 kHz SSB SCS, 10MHz bandwidth, TDD
4.6.1.4-3	LTE FDD, NR: 30 kHz SSB SCS, 40MHz bandwidth, TDD
4.6.1.4-4	LTE TDD, NR: 15 kHz SSB SCS, 10MHz bandwidth, FDD
4.6.1.4-5	LTE TDD, NR: 15 kHz SSB SCS, 10MHz bandwidth, TDD
4.6.1.4-6	LTE TDD, NR: 30 kHz SSB SCS, 40MHz bandwidth, TDD
NOTE: The UE is only required to be tested in one of the supported test configurations.	

Configure the test equipment and the DUT according to the parameters in Table 4.6.1.4.4.1-2.

Table 4.6.1.4.4.1-2: Initial conditions for EN-DC event-triggered reporting in FR1

Parameter	Value		Comment
Test environment	NC		As specified in TS 38.508-1 [14] clause 4.1.
Test frequencies	As specified in Annex E, Table E.2-1 and TS 38.508-1 [14] clause 4.4.2 and 4.3.1.		
Channel bandwidth	As specified by the test configuration selected from Table 4.6.1.4.4.1-1.		
Propagation conditions	AWGN		As specified in clause C.2.2.
Connection Diagram	TE Part	A.3.1.8.2	As specified in TS 38.508-1 [14] Annex A.
	DUT Part	A.3.2.3.4	
Exceptions to connection diagram	N/A		

1. Message contents are defined in clause 4.6.1.4.4.3.
2. The general test parameter settings are set up according to Table 4.6.1.4.4.1-3.
3. Three cells are deployed in the test, which are E-UTRAN PCell (Cell 1), FR1 PSCell (Cell 2) and a FR1 neighbour cell (Cell 3) on the same frequency as the PSCell. Cell 1 is the cell used for connection setup with the power level set according to Table A.6.1.1-1 for this test. Cell 2 is configured according to clauses C.1.1 and C.1.2. Cell 3 is powered OFF.

Table 4.6.1.4.4.1-3: General test parameters for EN-DC intra-frequency event triggered reporting with per-UE gaps for PSCell in FR1 with DRX

Parameter	Unit	Test configuration	Value		Comment
			Test 1	Test 2	
Active cell		1-6	E-UTRAN Cell 1 and NR Cell 2		
Neighbour cell		1-6	NR Cell 3		Cell to be identified.
RF Channel Number		1-6	1: Cell 1 2: Cell 2 and Cell 3		
Measurement gap type		1-6	Per-UE gaps		
Measurement gap repetition periodicity	ms	1-6	40		
Measurement gap length	ms	1-6	6		
Measurement gap offset	ms	1-6	39		
SSB configuration		1,4	SSB.1 FR1		
		2,5	SSB.1 FR1		

Parameter	Unit	Test configuration	Value		Comment
			Test 1	Test 2	
		3,6	SSB.2 FR1		
SMTC configuration		1,4	SMTC.2		
		2,5	SMTC.1		
		3,6	SMTC.1		
CSI-RS parameters		1,4	CSI-RS.1.2 FDD resource #0		
		2,5	CSI-RS.1.2 TDD resource #0		
		3,6	CSI-RS.2.2 TDD resource #0		
A3-Offset	dB	1-6	-4.5		
CP length		1-6	Normal		
Hysteresis	dB	1-6	0		
Time To Trigger	s	1-6	0		
Filter coefficient		1-6	0		L3 filtering is not used
DRX		1-6	DRX.1	DRX.7	
Time offset between PCell and PSCell		1-6	3 μs		Synchronous EN-DC
Time offset between serving and neighbour cells		1,4	3 ms		Asynchronous cells. The timing of Cell 3 is 3ms later than the timing of Cell 2.
		2,5	3 μs		Synchronous cells
		3,6	3 μs		Synchronous cells
T1	s	1-6	5		
T2	s	1-6	5	10	

4.6.1.4.4.2 Test procedure

Three cells are deployed in the test, which are E-UTRAN PCell (Cell 1), FR1 PSCell (Cell 2) and a FR1 neighbour cell (Cell 3) on the same frequency as the PSCell.

In the measurement control information a measurement object is configured for the frequency of the PSCell, and it is indicated to the UE that event-triggered reporting with Event A3 is used.

The test consists of two successive time periods, with time duration of T1, and T2 respectively. During time duration T1, the UE shall not have any timing information of cell 3.

There are two BWPs configured in Cell 2, BWP1 which contains the cell defining SSB, and BWP2 which does not contain any SSB of Cell 2. During the whole test, BWP2 is always scheduled as the active BWP for the UE.

1. Ensure the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity EN-DC, DC bearer *MCG* and *SCG*, Connected without release *On* and Test Mode *On* according to TS 38.508-1 [14] clause 4.5.

2. Set the parameters of NR cells according to T1 in Table 4.6.1.4.5-1.

3. SS shall transmit an RRCConnectionReconfiguration message with event A3 configured.

4. The UE shall transmit RRCConnectionReconfigurationComplete message. T1 starts.

5. When T1 expires, the SS shall switch the power setting from T1 to T2 as specified in Table 4.6.1.4.5-1. T2 starts.

6. UE shall transmit a MeasurementReport message embedded in E-UTRA RRC message *ULInformationTransferMRDC* triggered by Event A3. If the overall delays measured from the beginning of time period T2 is less than 922 ms for Test 1 or less than 6402 ms for Test 2 then the number of successful tests is increased by one. If the UE fails to report the event within the overall delays measured requirement then the number of failure tests is increased by one.

7. After the SS receive the MeasurementReport message in step 6 or when T2 expires, the SS shall transmit RRCConnectionReconfiguration message with condition EN-DC_PSCell_Rel according to TS 36.508 [25]

Table 4.6.1-8 to release NR cell (PSCell). The UE shall transmit RRCConnectionReconfigurationComplete message.

8. Set Cell 3 physical cell identity = ((current cell 3 physical cell identity + 1) mod 14 + 2) for next iteration of the test procedure loop.

9. The SS shall transmit RRCConnectionReconfiguration message with condition MCG_and_SCG according to TS 36.508 [25] Table 4.6.1-8 to add NR cell (PSCell). The UE shall transmit RRCConnectionReconfigurationComplete message. If either of the reconfiguration in step 7 or step 9 fails, the SS switches off and on the UE and ensures the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity EN-DC, DC bearer *MCG* and *SCG*, Connected without release *On* according to TS 38.508-1 [14] clause 4.5.

10. Repeat step 2-9 until the confidence level according to Tables G.2.3-1 in Annex G clause G.2 is achieved.

11. Repeat step 1-10 for each sub-test in Table 4.6.1.4.4.1-3 as appropriate.

4.6.1.4.4.3 Message contents

Message contents are according to TS 38.508-1 [14] clause 7.3 with the following exceptions:

Table 4.6.1.4.4.3-1: Common Exception messages

Default Message Contents	
Common contents of system information blocks exceptions	
Default RRC messages and information elements contents exceptions	Table H.3.1-1 Table H.3.1-2 Table H.3.1-4 with A3-offset = -4.5dB Table H.3.1-5 Table H.3.1-7 with Condition INTRA-FREQ Table H.3.1-8 with Condition CSI-RS RLM Table H.3.4-1 Table H.3.4-1a Table H.3.4-2 Table H.3.7-1 with Condition DRX.1 and Gap for test 1 Table H.3.7-1 with Condition DRX.7 and Gap for test 2 Table H.3.4-4 with Condition gapUE Table H.3.4-5 with Condition Pattern #0 Table H.3.5-8
Specific message contents exceptions for Test Configuration 4.6.1.3-1 and 4.6.1.3-4	Table H.3.1-3 with Condition SSB.1 FR1 andTable 7.3.1-3 in TS 38.508-1 [14] with condition SMTC.2
Specific message contents exceptions for Test Configuration 4.6.1.3-2 and 4.6.1.3-5	Table H.3.1-3 with Condition SSB.1 FR1 and Synchronous cells Table 7.3.1-3 in TS 38.508-1 [14] with condition SMTC.1
Specific message contents exceptions for Test Configuration 4.6.1.3-3 and 4.6.1.3-6	Table H.3.1-3 with Condition SSB.2 FR1 and Synchronous cells Table 7.3.1-3 in TS 38.508-1 [14] with condition SMTC.1

Table 4.6.1.4.4.3-2: *ServingCellConfig*

Derivation Path: TS 38.508-1 [14], Table 4.6.3-167			
Information Element	**Value/remark**	**Comment**	**Condition**
ServingCellConfig ::= SEQUENCE {			
downlinkBWP-ToAddModList SEQUENCE (SIZE (1..maxNrofBWPs)) OF SEQUENCE {			
BWP-Downlink[1]	BWP-Downlink with condition BWP-Id1	DLBWP.1.2 configuration	
}			
firstActiveDownlinkBWP-Id	1	Active DL BWP-ID (BWP2)	BWP-Id1
defaultDownlinkBWP-Id	0	Initial BWP (BWP1)	
uplinkConfig SEQUENCE {			
uplinkBWP-ToAddModList SEQUENCE (SIZE (1..maxNrofBWPs)) OF SEQUENCE {			
BWP-Uplink[1]	BWP-Uplink with condition BWP-Id1	ULBWP.1.2 configuration	

}			
firstActiveUplinkBWP-Id	1	Active UL BWP-ID (BWP2)	BWP-Id1
}			
}			

Table 4.6.1.4.4.3-3

Condition	Explanation
BWP-Id1	Active BWP (BWP2)

4.6.1.4.5 Test requirement

Tables 4.6.1.4.4.1-3 and 4.6.1.4.5-1 define the primary level settings including test tolerances for EN-DC intra-frequency event triggered reporting with per-UE gaps for PSCell in FR1.

Table 4.6.1.4.5-1: NR Cell specific test parameters for EN-DC intra-frequency event triggered reporting with per-UE gaps for PSCell in FR1 with DRX

Parameter	Unit	Test configuration	Cell 2		Cell 3	
			T1	T2	T1	T2
TDD configuration		1,4	N/A		N/A	
		2,5	TDDConf.1.1		TDDConf.1.1	
		3,6	TDDConf.2.1		TDDConf.2.1	
PDSCH RMC configuration		1,4	SR.1.1 FDD		N/A	
		2,5	SR.1.1 TDD			
		3,6	SR.2.1 TDD			
RMSI CORESET RMC configuration		1,4	CR.1.1 FDD		CR.1.1 FDD	
		2,5	CR.1.1 TDD		CR.1.1 TDD	
		3,6	CR.2.1 TDD		CR.2.1 TDD	
Dedicated CORESET RMC configuration		1,4	CCR.1.2 FDD		CCR.1.1 FDD	
		2,5	CCR.1.2 TDD		CCR.1.1 TDD	
		3,6	CCR.2.1 TDD		CCR.2.1 TDD	
OCNG Patterns		1-6	OP.1		OP.1	
TRS configuration		1,4	TRS.1.1 FDD		N/A	
		2,5	TRS.1.1 TDD		N/A	
		3,6	TRS.1.2 TDD		N/A	
Initial BWP configuration		1-6	DLBWP.0.1 ULBWP.0.1		DLBWP.0.1 ULBWP.0.1	
Active DL BWP configuration		1-6	DLBWP.1.2		DLBWP.1.1	
Active UL BWP configuration		1-6	ULBWP.1.2		ULBWP.1.1	
RLM-RS		1-6	CSI-RS		SSB	
N_{oc} Note 2	dBm/SCS	1,4	-98			
		2,5	-98			
		3,6	-95			
N_{oc} Note 2	dBm/15 KHz	1,4	-98			
		2,5				
		3,6				
$\hat{E}_s/I_{ot}$	dB	1,4	4	-1.46	-Infinity	-1.46
		2,5				
		3,6				
$\hat{E}_s/N_{oc}$	dB	1,4	4	4	-Infinity	4
		2,5				
		3,6				
SS-RSRP Note 3	dBm/SCS KHz	1,4	-94	-94	-Infinity	-94
		2,5	-94	-94	-Infinity	-94
		3,6	-91	-91	-Infinity	-91
Io	dBm/9.36 MHz	1,4	-64.60	-62.25	-64.60	-62.25
	dBm/9.36 MHz	2,5	-64.60	-62.25	-64.60	-62.25
	dBm/38.16 MHz	3,6	-58.50	-56.16	-58.50	-56.16

Parameter	Unit	Test configuration	Cell 2		Cell 3	
			T1	T2	T1	T2
Propagation Condition		1-6	AWGN			
NOTE 1: The resources for uplink transmission are assigned to the UE prior to the start of time period T2.						
NOTE 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for N_{oc} to be fulfilled.						
NOTE 3: SS-RSRP levels have been derived from other parameters for information purposes. They are not settable parameters themselves.						

The overall delays measured is defined as the time from the beginning of time period T2, to the moment the UE send one Event A3 triggered measurement report to Cell 1.

The overall delays measured in the test may be up to $2xTTI_{DCCH}$ higher than the measurement reporting delays because of TTI insertion uncertainty of the measurement report in DCCH.

The overall delays measured test requirement is expressed as:

Overall delays measured = measurement reporting delay + TTI insertion uncertainty

Measurement reporting delay = $T_{identify_intra_with_index}$

where,

For Test 1:

$T_{identify_intra_with_index} = (T_{PSS/SSS_sync_ntra} + T_{SSB_measurement_period_intra})$ ms

T_{PSS/SSS_sync_ntra} = max (600ms, ceil(1.5x 5 x K_p) x max (SMTC period,DRX cycle)) x $CSSF_{intra}$ = max (600ms, ceil(1.5 x 5 x 1) x max (20ms, 40ms)) x 1 = 600ms

$T_{SSB_measurement_period_intra}$ = max (200ms, ceil(1.5x 5 x K_p) x max (SMTC period,DRX cycle)) x $CSSF_{intra}$ = max (200ms, ceil(1.5 x 5 x 1) x max (20ms, 40ms)) x1 = 320ms

TTI insertion uncertainty = 2 ms

The overall delays measured shall be less than a total of 922 ms in this test case (note: this gives a total of 920 ms for measurement reporting delay plus 2 ms for TTI insertion uncertainty).

For Test 2:

$T_{identify_intra_with_index} = (T_{PSS/SSS_sync_ntra} + T_{SSB_measurement_period_intra})$ ms

T_{PSS/SSS_sync_ntra} = ceil (5 x K_p) x DRX cycle x $CSSF_{intra}$ = ceil (5 x1) x 640ms x 1 = 3200ms

$T_{SSB_measurement_period_intra}$ = ceil (5 x K_p) x DRX cycle x $CSSF_{intra}$ = ceil (5 x1) x 640ms x 1 = 3200ms

TTI insertion uncertainty = 2 ms

The overall delays measured shall be less than a total of 6402 ms in this test case (note: this gives a total of 6400 ms for measurement reporting delay plus 2 ms for TTI insertion uncertainty).

For the test to pass, the total number of successful tests shall be more than 90% of the cases with a confidence level of 95%.

4.6.1.5 EN-DC FR1 event-triggered reporting without gap in non-DRX with SSB time index detection

4.6.1.5.1 Test purpose

To verify that the UE makes correct reporting of an event in non-DRX within EN-DC intra-frequency NR cell search requirements in TS 38.133 [6] clause 9.2. This test will partly verify the FDD intra-frequency cell search requirements. UE is required to report SSB time index.

4.6.1.5.2 Test applicability

This test applies to all types of E-UTRA UE release 15 and forward supporting EN-DC.

4.6.1.5.3 Minimum conformance requirements

The minimum conformance requirements are defined in clause 4.6.1.0.1.

The normative reference for this requirement is TS 38.133 [6] clause A.4.6.1.5.

4.6.1.5.4 Test description

4.6.1.5.4.1 Initial conditions

Test 4.6.1.5 can be run in one of the configurations defined in Table 4.6.1.5.4.1-1.

Table 4.6.1.5.4.1-1: Supported test configurations for FR1 PSCell

Configuration	Description
4.6.1.5-1	LTE FDD, 15 kHz SSB SCS, 10MHz bandwidth, FDD duplex mode
4.6.1.5-2	LTE TDD, 15 kHz SSB SCS, 10MHz bandwidth, FDD duplex mode
NOTE: The UE is only required to be tested in one of the supported test configurations.	

Configure the test equipment and the DUT according to the parameters in Table 4.6.1.5.4.1-2.

Table 4.6.1.5.4.1-2: Initial conditions for EN-DC event-triggered reporting in FR1

Parameter	Value		Comment
Test environment	NC		As specified in TS 38.508-1 [14] clause 4.1.
Test frequencies	As specified in Annex E, Table E.2-1 and TS 38.508-1 [14] clause 4.4.2 and 4.3.1.		
Channel bandwidth	As specified by the test configuration selected from Table 4.6.1.5.4.1-1.		
Propagation conditions	AWGN		As specified in clause C.2.2.
Connection Diagram	TE Part	A.3.1.8.2	As specified in TS 38.508-1 [14] Annex A.
	DUT Part	A.3.2.3.4	
Exceptions to connection diagram	N/A		

1. Message contents are defined in clause 4.6.1.5.4.3.
2. The general test parameter settings are set up according to Table 4.6.1.5.4.1-3.
3. Three cells are deployed in the test, which are E-UTRAN PCell (Cell 1), FR1 PSCell (Cell 2) and a FR1 neighbour cell (Cell 3) on the same frequency as the PSCell. Cell 1 is the cell used for connection setup with the power level set according to Table A.6.1.1-1 for this test. Cell 2 is configured according to clauses C.1.1 and C.1.2. Cell 3 is powered OFF.

Table 4.6.1.5.4.1-3: General test parameters for EN-DC intra-frequency event triggered reporting without gap for FDD PSCell in FR1 with SSB index reading

Parameter	Unit	Test configuration	Value	Comment
Active cell		1,2	E-UTRAN Cell 1 and NR Cell 2	
Neighbour cell		1,2	NR Cell 3	Cell to be identified.
RF Channel Number		1,2	1: Cell 1 2: Cell 2 and Cell 3	
SSB configuration		1,2	SSB.1 FR1	
SMTC configuration		1,2	SMTC.2	
A3-Offset	dB	1,2	-4.5	
CP length		1,2	Normal	
Hysteresis	dB	1,2	0	
Time To Trigger	s	1,2	0	
Filter coefficient		1,2	0	L3 filtering is not used
DRX		1,2	N/A	OFF
Time offset between PCell and PSCell		1,2	3 μs	Synchronous EN-DC
Time offset between serving and neighbour cells		1,2	3 ms	Asynchronous cells. The timing of Cell 3 is 3ms later than the timing of Cell 2.
T1	s	1,2	5	
T2	s	1,2	5	

4.6.1.5.4.2 Test procedure

Three cells are deployed in the test, which are E-UTRAN PCell (Cell 1), FR1 PSCell (Cell 2) and a FR1 neighbour cell (Cell 3) on the same frequency as the PSCell.

In the measurement control information, a measurement object is configured for the frequency of the PSCell, and it is indicated to the UE that event-triggered reporting with Event A3 is used.

The test consists of two successive time periods, with time duration of T1, and T2 respectively. During time duration T1, the UE shall not have any timing information of cell 3.

1. Ensure the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity EN-DC, DC bearer *MCG* and *SCG*, Connected without release *On* and Test Mode *On* according to TS 38.508-1 [14] clause 4.5.

2. Set the parameters of NR cells according to T1 in Table 4.6.1.5.5-1.

3. SS shall transmit an RRCConnectionReconfiguration message with event A3 configured.

4. The UE shall transmit RRCConnectionReconfigurationComplete message. T1 starts.

5. When T1 expires, the SS shall switch the power setting from T1 to T2 as specified in Table 4.6.1.5.5-1. T2 starts.

6. UE shall transmit a MeasurementReport message embedded in E-UTRA RRC message *ULInformationTransferMRDC* triggered by Event A3. If the overall delays measured from the beginning of time period T2 is less than 922 ms then the number of successful tests is increased by one. If the UE fails to report the event within the overall delays measured requirement then the number of failure tests is increased by one.

7. After the SS receive the MeasurementReport message in step 6 or when T2 expires, the SS shall transmit RRCConnectionReconfiguration message with condition EN-DC_PSCell_Rel according to TS 36.508 [25] Table 4.6.1-8 to release NR cell (PSCell). The UE shall transmit RRCConnectionReconfigurationComplete message.

8. Set Cell 3 physical cell identity = ((current cell 3 physical cell identity + 1) mod 14 + 2) for next iteration of the test procedure loop.

9. The SS shall transmit RRCConnectionReconfiguration message with condition MCG_and_SCG according to TS 36.508 [25] Table 4.6.1-8 to add NR cell (PSCell). The UE shall transmit RRCConnectionReconfigurationComplete message. If either of the reconfiguration in step 7 or step 9 fails, the SS switches off and on the UE and ensures the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity EN-DC, DC bearer *MCG* and *SCG*, Connected without release *On* according to TS 38.508-1 [14] clause 4.5.

10. Repeat step 2-9 until the confidence level according to Tables G.2.3-1 in Annex G clause G.2 is achieved.

4.6.1.5.4.3 Message contents

Message contents are according to TS 38.508-1 [14] clause 7.3 with the following exceptions:

Table 4.6.1.5.4.3-1: Common Exception messages for Additional EN-DC FR1 event-triggered reporting without gap in non-DRX with SSB time index detection test requirement

Default Message Contents	
Common contents of system information blocks exceptions	
Default RRC messages and information elements contents exceptions	Table H.3.1-1 Table H.3.1-2 Table H.3.1-3 with Condition SSB.1 FR1 and Table 7.3.1-3 in TS 38.508-1 [14] with condition SMTC.2Table H.3.1-4 with Condition SSB Index and A3-offset = -4.5dB Table H.3.1-5 Table H.3.1-7 with Condition INTRA-FREQ and SSB Index Table H.3.4-1 Table H.3.4-1a Table H.3.4-2

4.6.1.5.5 Test requirement

Tables 4.6.1.5.4.1-3 and 4.6.1.5.5-1 define the primary level settings including test tolerances for EN-DC FR1 event-triggered reporting without gap in non-DRX with SSB time index detection.

Table 4.6.1.5.5-1: NR Cell specific test parameters for EN-DC intra-frequency event triggered reporting without gap for FDD PSCell in FR1 with SSB index reading

Parameter	Unit	Test configuration	Cell 2		Cell 3	
			T1	T2	T1	T2
TDD configuration		1,2	N/A		N/A	
PDSCH RMC configuration		1,2	SR.1.1 FDD		N/A	
RMSI CORESET RMC configuration		1,2	CR.1.1 FDD		CR.1.1 FDD	
Dedicated CORESET RMC configuration		1,2	CCR.1.1 FDD		CCR.1.1 FDD	
OCNG Patterns		1,2	OP.1		OP.1	
TRS configuration		1,2	TRS.1.1 FDD		N/A	
Initial BWP configuration		1,2	DLBWP.0.1 ULBWP.0.1		DLBWP.0.1 ULBWP.0.1	
Active DL BWP configuration		1,2	DLBWP.1.1		DLBWP.1.1	
Active UL BWP configuration		1,2	ULBWP.1.1		ULBWP.1.1	
RLM-RS		1,2	SSB		SSB	
N_{oc} Note 2	dBm/SCS	1,2	-98			
N_{oc} Note 2	dBm/15 kHz	1,2	-98			
$\hat{E}_s/I_{ot}$	dB	1,2	4	-1.46	-Infinity	-1.46

$\hat{E}_s / N_{oc}$	dB	1,2	4	4	-Infinity	4
SS-RSRP Note 3	dBm/SCS kHz	1,2	-94	-94	-Infinity	-94
Io	dBm/9.36 MHz	1,2	-64.60	-62.25	-64.60	-62.25
Propagation Condition		1,2	AWGN			
NOTE 1: The resources for uplink transmission are assigned to the UE prior to the start of time period T2.						
NOTE 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for N_{oc} to be fulfilled.						
NOTE 3: SS-RSRP levels have been derived from other parameters for information purposes. They are not settable parameters themselves.						

The overall delays measured is defined as the time from the beginning of time period T2, to the moment the UE send one Event A3 triggered measurement report to Cell 1.The UE is required to read the neighbour cell SSB index and report the acquired SSB index in this test.

The overall delays measured in the test may be up to $2xTTI_{DCCH}$ higher than the measurement reporting delays because of TTI insertion uncertainty of the measurement report in DCCH.

The overall delays measured test requirement is expressed as:

Overall delays measured = measurement reporting delay + TTI insertion uncertainty

Measurement reporting delay = $T_{identify_intra_with_index}$

where,

$T_{identify_intra_with_index} = (T_{PSS/SSS_sync_intra} + T_{SSB_measurement_period_intra} + T_{SSB_time_index_intra})$ ms

- T_{PSS/SSS_sync_intra} = max (600ms, ceil (5 x K_p) x SMTC period)$^{Note\ 1}$ x $CSSF_{intra}$ = max (600ms, Ceil(5 x 1) x 20ms) x 1 = 600ms

- $T_{SSB_measurement_period_intra}$ = max (200ms, ceil (5 x K_p) x SMTC period)$^{Note\ 1}$ x $CSSF_{intra}$ = max (200ms, ceil(5 x 1) x 20ms) x 1 = 200ms

- $T_{SSB_time_index_intra}$ = max (120ms, ceil (3 x K_p) x SMTC period)$^{Note\ 1}$ x $CSSF_{intra}$ = max (120ms, ceil (3 x 1) x 20ms) x 1 = 120ms

  TTI insertion uncertainty = 2 ms

The overall delays measured shall be less than a total of 922 ms in this test case (note: this gives a total of 920 ms for measurement reporting delay plus 2 ms for TTI insertion uncertainty).

For the test to pass, the total number of successful tests shall be more than 90% of the cases with a confidence level of 95%.

4.6.1.6 EN-DC FR1 event-triggered reporting with gap in non-DRX with SSB time index detection

4.6.1.6.1 Test purpose

To verify that the UE makes correct reporting of an event in non-DRX within EN-DC intra-frequency NR cell search requirements in TS 38.133 [6] clause 9.2. This test will partly verify the FDD intra-frequency cell search requirements. UE is required to report SSB time index.

4.6.1.6.2 Test applicability

This test applies to all types of E-UTRA UE release 15 and forward supporting EN-DC, CSI-RS-based RLM and BWP operation without bandwidth restriction.

4.6.1.6.3 Minimum conformance requirements

The minimum conformance requirements are defined in clause 4.6.1.0.2.

The normative reference for this requirement is TS 38.133 [6] clause A.4.6.1.6.

4.6.1.6.4 Test description

4.6.1.6.4.1 Initial conditions

Test 4.6.1.6 can be run in one of the configurations defined in Table 4.6.1.6.4.1-1.

Table 4.6.1.6.4.1-1: Supported test configurations for NR FR1 Cell

Configuration	Description
4.6.1.6-1	LTE FDD, 15 kHz SSB SCS, 10MHz bandwidth, FDD duplex mode
4.6.1.6-2	LTE TDD, 15 kHz SSB SCS, 10MHz bandwidth, FDD duplex mode
NOTE: The UE is only required to be tested in one of the supported test configurations.	

Configure the test equipment and the DUT according to the parameters in Table 4.6.1.6.4.1-2.

Table 4.6.1.6.4.1-2: Initial conditions for EN-DC event-triggered reporting in FR1

Parameter	Value		Comment
Test environment	NC		As specified in TS 38.508-1 [14] clause 4.1.
Test frequencies	As specified in Annex E, Table E.2-1 and TS 38.508-1 [14] clause 4.4.2 and 4.3.1.		
Channel bandwidth	As specified by the test configuration selected from Table 4.6.1.6.4.1-1.		
Propagation conditions	AWGN		As specified in clause C.2.2.
Connection Diagram	TE Part	A.3.1.8.2	As specified in TS 38.508-1 [14] Annex A.
	DUT Part	A.3.2.3.4	
Exceptions to connection diagram	N/A		

1. Message contents are defined in clause 4.6.1.6.4.3.
2. The general test parameter settings are set up according to Table 4.6.1.6.4.1-3.
3. Three cells are deployed in the test, which are E-UTRAN PCell (Cell 1), FR1 PSCell (Cell 2) and a FR1 neighbour cell (Cell 3) on the same frequency as the PSCell. Cell 1 is the cell used for connection setup with the power level set according to Table A.6.1.1-1 for this test. Cell 2 is configured according to clauses C.1.1 and C.1.2. Cell 3 is powered OFF.

Table 4.6.1.6.4.1-3: General test parameters for EN-DC intra-frequency event triggered reporting with gap for PSCell in FR1 with SSB index reading

Parameter	Unit	Test configuration	Value	Comment
Active cell		1,2	E-UTRAN Cell 1 and NR Cell 2	
Neighbour cell		1,2	NR Cell 3	Cell to be identified.
RF Channel Number		1,2	1: Cell 1 2: Cell 2 and Cell 3	
Measurement gap type		1,2	Per-UE gaps	
Measurement gap repetition periodicity	ms	1,2	40	
Measurement gap length	ms	1,2	6	
Measurement gap offset	ms	1,2	39	
SSB configuration		1,2	SSB.1 FR1	
SMTC configuration		1,2	SMTC.2	

CSI-RS parameters		1,2	CSI-RS.1.2 FDD resource #0	
A3-Offset	dB	1,2	-4.5	
CP length		1,2	Normal	
Hysteresis	dB	1,2	0	
Time To Trigger	s	1,2	0	
Filter coefficient		1,2	0	L3 filtering is not used
DRX		1,2	N/A	OFF
Time offset between PCell and PSCell		1,2	3 μs	Synchronous EN-DC
Time offset between serving and neighbour cells		1,2	3 ms	Asynchronous cells. The timing of Cell 3 is 3ms later than the timing of Cell 2.
T1	s	1,2	5	
T2	s	1,2	5	

4.6.1.6.4.2 Test procedure

Three cells are deployed in the test, which are E-UTRAN PCell (Cell 1), FR1 PSCell (Cell 2) and a FR1 neighbour cell (Cell 3) on the same frequency as the PSCell.

In the measurement control information, a measurement object is configured for the frequency of the PSCell, and it is indicated to the UE that event-triggered reporting with Event A3 is used.

The test consists of two successive time periods, with time duration of T1, and T2 respectively. During time duration T1, the UE shall not have any timing information of cell 3.

There are two BWPs configured in Cell 2, BWP1 which contains the cell defining SSB, and BWP2 which does not contain any SSB of Cell 2. During the whole test, BWP2 is always scheduled as the active BWP for the UE.

1. Ensure the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity EN-DC, DC bearer *MCG* and *SCG*, Connected without release *On* and Test Mode *On* according to TS 38.508-1 [14] clause 4.5.

2. Set the parameters of NR cells according to T1 in Table 4.6.1.6.5-1.

3. SS shall transmit an RRCConnectionReconfiguration message with event A3 configured.

4. The UE shall transmit RRCConnectionReconfigurationComplete message. T1 starts.

5. When T1 expires, the SS shall switch the power setting from T1 to T2 as specified in Table 4.6.1.6.5-1. T2 starts.

6. UE shall transmit a MeasurementReport message embedded in E-UTRA RRC message *ULInformationTransferMRDC* triggered by Event A3. If the overall delays measured from the beginning of time period T2 is less than 922 ms then the number of successful tests is increased by one. If the UE fails to report the event within the overall delays measured requirement then the number of failure tests is increased by one.

7. After the SS receive the MeasurementReport message in step 6 or when T2 expires, the SS shall transmit RRCConnectionReconfiguration message with condition EN-DC_PSCell_Rel according to TS 36.508 [25] Table 4.6.1-8 to release NR cell (PSCell). The UE shall transmit RRCConnectionReconfigurationComplete message.

8. Set Cell 3 physical cell identity = ((current cell 3 physical cell identity + 1) mod 14 + 2) for next iteration of the test procedure loop.

9. The SS shall transmit RRCConnectionReconfiguration message with condition MCG_and_SCG according to TS 36.508 [25] Table 4.6.1-8 to add NR cell (PSCell). The UE shall transmit RRCConnectionReconfigurationComplete message. If either of the reconfiguration in step 7 or step 9 fails, the SS switches off and on the UE and ensures the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity EN-DC, DC bearer *MCG* and *SCG*, Connected without release *On* according to TS 38.508-1 [14] clause 4.5.

10. Repeat step 2-9 until the confidence level according to Tables G.2.3-1 in Annex G clause G.2 is achieved.

4.6.1.6.4.3 Message contents

Message contents are according to TS 38.508-1 [14] clause 7.3 with the following exceptions:

Table 4.6.1.6.4.3-1: Common Exception messages for Additional EN-DC FR1 event-triggered reporting with gap in non-DRX with SSB time index detection test requirement

Default Message Contents	
Common contents of system information blocks exceptions	
Default RRC messages and information elements contents exceptions	Table H.3.1-1 Table H.3.1-2 Table H.3.1-3 with Condition SSB.1 FR1 Table 7.3.1-3 in TS 38.508-1 [14] with condition SMTC.2Table H.3.1-3 with Condition INTRA-FREQ MO, SSB.1 FR1, SMTC.2 for Configuration 4.6.1.6-1 Table H.3.1-4 with Condition SSB Index and A3-offset = -4.5dB Table H.3.1-5 Table H.3.1-7 with Condition INTRA-FREQ and SSB Index Table H.3.1-8 with Condition CSI-RS RLM Table H.3.4-1 Table H.3.4-1a Table H.3.4-2 Table H.3.4-4 with Condition gapUE Table H.3.4-5 with Condition Pattern #0 Table H.3.5-8

Table 4.6.1.6.4.3-2: *ServingCellConfig*

Derivation Path: TS 38.508-1 [14], Table 4.6.3-167			
Information Element	**Value/remark**	**Comment**	**Condition**
ServingCellConfig ::= SEQUENCE {			
downlinkBWP-ToAddModList SEQUENCE (SIZE (1..maxNrofBWPs)) OF SEQUENCE {			
BWP-Downlink[1]	BWP-Downlink with condition BWP-Id1	DLBWP.1.2 configuration	
}			
firstActiveDownlinkBWP-Id	1	Active DL BWP-ID (BWP2)	BWP-Id1
defaultDownlinkBWP-Id	0	Initial BWP (BWP1)	
uplinkConfig SEQUENCE {			
uplinkBWP-ToAddModList SEQUENCE (SIZE (1..maxNrofBWPs)) OF SEQUENCE {			
BWP-Uplink[1]	BWP-Uplink with condition BWP-Id1	ULBWP.1.2 configuration	
}			
firstActiveUplinkBWP-Id	1	Active UL BWP-ID (BWP2)	BWP-Id1
}			
}			

Condition	Explanation
BWP-Id1	Active BWP (BWP2)

4.6.1.6.5 Test requirement

Tables 4.6.1.6.4.1-3 and 4.6.1.6.5-1 define the primary level settings including test tolerances for EN-DC intra-frequency event triggered reporting with gap for PSCell in FR1 with SSB index reading.

Table 4.6.1.6.5-1: NR Cell specific test parameters for EN-DC intra-frequency event triggered reporting with gap for PSCell in FR1 with SSB index reading

Parameter	Unit	Test configuration	Cell 2		Cell 3	
			T1	T2	T1	T2
TDD configuration		1,2	N/A		N/A	
PDSCH RMC configuration		1,2	SR.1.1 FDD		N/A	
RMSI CORESET RMC configuration		1,2	CR.1.1 FDD		CR.1.1 FDD	
Dedicated CORESET RMC configuration		1,2	CCR.1.2 FDD		CCR.1.1 FDD	
OCNG Patterns		1,2	OP.1		OP.1	
TRS configuration		1,2	TRS.1.1 FDD		N/A	
Initial BWP configuration		1,2	DLBWP.0.1 ULBWP.0.1		DLBWP.0.1 ULBWP.0.1	
Active DL BWP configuration		1,2	DLBWP.1.2		DLBWP.1.1	
Active UL BWP configuration		1,2	ULBWP.1.2		ULBWP.1.1	
RLM-RS		1,2	CSI-RS		SSB	
N_{oc} Note 2	dBm/SCS	1,2	-98			
N_{oc} Note 2	dBm/15 kHz	1,2	-98			
$\hat{E}_s / I_{ot}$	dB	1,2	4	-1.46	-Infinity	-1.46
$\hat{E}_s / N_{oc}$	dB	1,2	4	4	-Infinity	4
SS-RSRP Note 3	dBm/SCS kHz	1,2	-94	-94	-Infinity	-94
Io	dBm/9.36 MHz	1,2	-64.60	-62.25	-64.60	-62.25
Propagation Condition		1,2	AWGN			

NOTE 1: The resources for uplink transmission are assigned to the UE prior to the start of time period T2.

NOTE 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for N_{oc} to be fulfilled.

NOTE 3: SS-RSRP levels have been derived from other parameters for information purposes. They are not settable parameters themselves.

The overall delays measured is defined as the time from the beginning of time period T2, to the moment the UE send one Event A3 triggered measurement report to Cell 1.The UE is required to read the neighbour cell SSB index and report the acquired SSB index in this test.

The overall delays measured in the test may be up to $2xTTI_{DCCH}$ higher than the measurement reporting delays because of TTI insertion uncertainty of the measurement report in DCCH.

The overall delays measured test requirement is expressed as:

Overall delays measured = measurement reporting delay + TTI insertion uncertainty

Measurement reporting delay = $T_{identify_intra_with_index}$

where,

$T_{identify_intra_with_index} = (T_{PSS/SSS_sync_ntra} + T_{SSB_measurement_period_intra} + T_{SSB_time_index_intra})$ ms

T_{PSS/SSS_sync_ntra} = max (600ms, ceil (5 x K_p) x SMTC period)$^{Note\ 1}$ x $CSSF_{intra}$ = max (600ms, Ceil(5 x 1) x 20ms) x 1 = 600ms

$T_{SSB_measurement_period_intra}$ = max (200ms, ceil (5 x K_p) x SMTC period)$^{Note\ 1}$ x $CSSF_{intra}$ = max (200ms, ceil(5 x 1) x 20ms) x 1 = 200ms

$T_{SSB_time_index_intra}$ = max (120ms, ceil (3 x K_p) x SMTC period)$^{Note\ 1}$ x $CSSF_{intra}$ = max (120ms, ceil (3 x 1) x 20ms) x 1 = 120ms

TTI insertion uncertainty = 2 ms

The overall delays measured shall be less than a total of 922 ms in this test case (note: this gives a total of 920 ms for measurement reporting delay plus 2 ms for TTI insertion uncertainty).

For the test to pass, the total number of successful tests shall be more than 90% of the cases with a confidence level of 95%.

4.6.1.7 EN-DC FR1 event-triggered reporting without gap in DRX for UE configured with highSpeedMeasFlag-r16

4.6.1.7.1 Test purpose

This test is to verify that the UE makes correct reporting of an event for UE configured with *highSpeedMeasFlag-r16*. This test will partly verify the intra-frequency cell search requirements in TS 38.133 [6] clause 9.2.5.1 and 9.2.5.2.

4.6.1.7.2 Test applicability

This test applies to all types of E-UTRA UE release 15 and forward, supporting EN-DC FR1 and long DRX cycle.

4.6.1.7.3 Minimum conformance requirements

The minimum conformance requirements are defined in clause 4.6.1.0.1.

The normative reference for this requirement is TS 38.133 [6] clause A.4.6.1.7.

4.6.1.7.4 Test description

4.6.1.7.4.1 Initial conditions

This test shall be tested using any of the test configurations in Table 4.6.1.7.4.1-1.

Table 4.6.1.7.4.1-1: supported test configurations for EN-DC FR1 event-triggered reporting without gap in DRX for UE configured with highSpeedMeasFlag-r16

Configuration	Description
4.6.1.7-1	LTE FDD, NR 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode
4.6.1.7-2	LTE FDD, NR 15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode
4.6.1.7-3	LTE FDD, NR 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode
4.6.1.7-4	LTE TDD, NR 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode
4.6.1.7-5	LTE TDD, NR 15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode
4.6.1.7-6	LTE TDD, NR 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode
NOTE 1: The UE is only required to be tested in one of the supported test configurations. NOTE 2: Target NR Cell 3 has the same SCS, BW and duplex mode as NR serving Cell 2	

Configure the test equipment and the DUT according to the parameters in Table 4.6.1.7.4.1-2 and Table 4.6.1.7.4.1-3.

Table 4.6.1.7.4.1-2: Initial conditions for EN-DC FR1 event-triggered reporting without gap in DRX for UE configured with highSpeedMeasFlag-r16

Parameter	Value	Comment
Test environment	NC	As specified in TS 38.508-1 [14] clause 4.1.
Test frequencies	As specified in Annex E, Table E.1-1 and TS 38.508-1 [14] clause 4.3.1.	

Channel bandwidth	As specified by the test configuration selected from Table 4.7.1.1.2-1.		
Propagation conditions	AWGN		As specified in clause C.2.2.
Connection Diagram	TE Part	A.3.1.8.2	As specified in TS 38.508-1 [14] Annex A.
	DUT Part	A.3.2.3.4	
Exceptions to connection diagram	N/A		

Table 4.6.1.7.4.1-3: General test parameters for EN-DC FR1 event-triggered reporting without gap in DRX for UE configured with highSpeedMeasFlag-r16

Parameter	Unit	Test configuration	Value	Comment
highSpeedMeasFlag-r16		1,2,3,4,5,6	Present	To enable high speed measurement enhancements
Active cell		1, 2, 3,4,5,6	E-UTRAN Cell 1 and NR Cell 2	
Neighbour cell		1, 2, 3,4,5,6	NR Cell 3	Cell to be identified.
RF Channel Number		1, 2, 3,4,5,6	1: Cell 1 2: Cell 2 and Cell 3	
SSB configuration		1,4	SSB.1 FR1	
		2,5	SSB.1 FR1	
		3,6	SSB.2 FR1	
SMTC configuration		1,4	SMTC.2	
		2,5	SMTC.1	
		3,6	SMTC.1	
A3-Offset	dB	1, 2, 3,4,5,6	-4.5	
CP length		1, 2, 3,4,5,6	Normal	
Hysteresis	dB	1, 2, 3,4,5,6	0	
Time To Trigger	s	1, 2, 3,4,5,6	0	
Filter coefficient		1, 2, 3,4,5,6	0	L3 filtering is not used
DRX		1, 2, 3,4,5,6	DRX.7.	640ms DRX cycle
Time offset between PCell and PSCell		1, 2, 3,4,5,6	3 μs	Synchronous EN-DC
Time offset between serving and neighbour cells		1,4	3 ms	Asynchronous cells. The timing of Cell 3 is 3ms later than the timing of Cell 2.
		2,5	3 μs	Synchronous cells
		3,6	3 μs	Synchronous cells
T1	s	1, 2, 3,4,5,6	5	
T2	s	1, 2, 3,4,5,6	6	

1. Message contents are defined in clause 4.6.1.7.4.3.

2. Cell 1 is the E-UTRA serving cell (PCell) for the EN-DC setup. The power levels and settings for Cell 1 are set according to Annex A.6. Cell 2 and Cell 3 are NR FR1 cells in the same frequency. Cell 2 is the PSCell and Cell 3 is the neighbour NR Cell.

4.6.1.7.4.2 Test procedure

Same test procedure as in subclause 4.6.1.1.4.2 with Step 1 and 8 are replaced by following:

1. Ensure the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity EN-DC, DC bearer MCG and SCG, Connected without release *On* and Test Mode *On* according to TS 38.508-1 [14] clause 4.5. UE is configured with *highSpeedMeasFlag-r16.*

8. UE shall transmit a *MeasurementReport* message triggered by Event A3 for Cell 3 on PCell (Cell 1). If the overall delays measured from the beginning of time period T2 is less than 5122 ms then the number of successful tests is increased by one. If the UE fails to report the event within the overall delays measured requirement then the number of failure tests is increased by one.

4.6.1.7.4.3 Message contents

Message contents are according to TS 38.508-1 [14] clause 7.3 with the following exceptions:

Table 4.6.1.7.4.3-0: Common Exception messages for Additional EN-DC FR1 event-triggered reporting without gap in DRX for UE configured with highSpeedMeasFlag-r16 test requirement

Default Message Contents	
Common contents of system information blocks exceptions	
Default RRC messages and information elements contents exceptions	Table H.3.1-1 Table H.3.1-2 Table H.3.1-4 with A3-offset = -4.5dB Table H.3.1-5 Table H.3.1-7 Table H.3.7-1 with Condition DRX.7 Table H.3.4-1 Table H.3.4-1a Table H.3.4-2
Specific message contents exceptions for Test Configuration 4.6.1.2-1 and 4.6.1.2-4	Table H.3.1-3 with Condition SSB.1 FR1 and Table 7.3.1-3 in TS 38.508-1 [14] with condition SMTC.2
Specific message contents exceptions for Test Configuration 4.6.1.2-2 and 4.6.1.2-5	Table H.3.1-3 with Condition SSB.1 FR1 and Synchronous cells Table 7.3.1-3 in TS 38.508-1 [14] with condition SMTC.1
Specific message contents exceptions for Test Configuration 4.6.1.2-3 and 4.6.1.2-6	Table H.3.1-3 with Condition SSB.2 FR1 and Synchronous cells Table 7.3.1-3 in TS 38.508-1 [14] with condition SMTC.1

Table 4.6.1.7.4.3-1: Void

Table 4.6.1.7.4.3-2: Void

Table 4.6.1.7.4.3-3: CellGroupConfig (Step 1)

Derivation Path: TS 38.508-1 [14], Table 4.6.3-19 with condition EN-DC			
Information Element	**Value/remark**	**Comment**	**Condition**
CellGroupConfig ::= SEQUENCE {			
spCellConfig SEQUENCE {			
servCellIndex	ServCellIndex for Cell 2		
reconfigurationWithSync SEQUENCE {			
spCellConfigCommon	ServingCellConfigCommon	Table 4.6.1.7.4.3-4	
}			
}			
}			

Table 4.6.1.7.4.3-4: ServingCellConfigCommon (Table 4.6.1.7.4.3-3)

Derivation Path: TS 38.508-1[14], Table 4.6.3-168 with condition HST			
Information Element	**Value/remark**	**Comment**	**Condition**
ServingCellConfigCommon ::= SEQUENCE {			
highSpeedConfig-r16 SEQUENCE {			
highSpeedMeasFlag-r16	true		
}			

}			

4.6.1.7.5 Test requirement

Table 4.6.1.7.4.1-2 and Table 4.6.1.7.5-1 defines the primary level settings including test tolerances for all tests.

Table 4.6.1.7.5-1: NR Cell specific test parameters for EN-DC FR1 event-triggered reporting without gap in DRX for UE configured with highSpeedMeasFlag-r16

Parameter	Unit	Test configuration	Cell 2		Cell 3	
			T1	T2	T1	T2
TDD configuration		1,4	N/A		N/A	
		2,5	TDDConf.1.1		TDDConf.1.1	
		3,6	TDDConf.2.1		TDDConf.2.1	
PDSCH RMC configuration		1,4	SR.1.1 FDD		N/A	
		2,5	SR.1.1 TDD			
		3,6	SR.2.1 TDD			
RMSI CORESET RMC configuration		1,4	CR.1.1 FDD		CR.1.1 FDD	
		2,5	CR.1.1 TDD		CR.1.1 TDD	
		3,6	CR.2.1 TDD		CR.2.1 TDD	
Dedicated CORESET RMC configuration		1,4	CCR.1.1 FDD		CCR.1.1 FDD	
		2,5	CCR.1.1 TDD		CCR.1.1 TDD	
		3,6	CCR.2.1 TDD		CCR.2.1 TDD	
OCNG Patterns		1, 2, 3,4,5,6	OP.1		OP.1	
TRS configuration		1,4	TRS.1.1 FDD		N/A	
		2,5	TRS.1.1 TDD		N/A	
		3,6	TRS.1.2 TDD		N/A	
Initial BWP configuration		1, 2, 3,4,5,6	DLBWP.0.1 ULBWP.0.1		DLBWP.0.1 ULBWP.0.1	
Active DL BWP configuration		1, 2, 3,4,5,6	DLBWP.1.1		DLBWP.1.1	
Active UL BWP configuration		1, 2, 3,4,5,6	ULBWP.1.1		ULBWP.1.1	
RLM-RS		1, 2, 3,4,5,6	SSB		SSB	
N_{oc} Note 2	dBm/SCS	1,4	-98			
		2,5	-98			
		3,6	-95			
N_{oc} Note 2	dBm/15 kHz	1,4	-98			
		2,5				
		3,6				
$\hat{E}_s/I_{ot}$	dB	1,4	4	-1.46	-Infinity	-1.46
		2,5				
		3,6				
$\hat{E}_s/N_{oc}$	dB	1,4	4	4	-Infinity	4
		2,5				
		3,6				
SS-RSRP Note 3	dBm/SCS kHz	1,4	-94	-94	-Infinity	-94
		2,5	-94	-94	-Infinity	-94
		3,6	-91	-91	-Infinity	-91
Io	dBm/9.36 MHz	1,4	-64.60	-62.25	-64.60	-62.25
	dBm/9.36 MHz	2,5	-64.60	-62.25	-64.60	-62.25
	dBm/38.16 MHz	3,6	-58.50	-56.16	-58.50	-56.16
Propagation Condition		1, 2,4,5	AWGN		AWGN 1944 Hz Note 4	
		3,6	AWGN		AWGN 3334 Hz Note 5	

Parameter	Unit	Test configuration	Cell 2		Cell 3	
			T1	T2	T1	T2
NOTE 1: The resources for uplink transmission are assigned to the UE prior to the start of time period T2. NOTE 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for N_{oc} to be fulfilled. NOTE 3: SS-RSRP levels have been derived from other parameters for information purposes. They are not settable parameters themselves. NOTE 4: The AWGN 1944 Hz condition is a non-fading propagation channel with one tap. Doppler shift is a constant 1944Hz. NOTE 5: The AWGN 3334 Hz condition is a non-fading propagation channel with one tap. Doppler shift is a constant 3334Hz.						

The UE shall send one Event A3 triggered measurement report, with a measurement reporting delay less than $T_{identify_intra_without_index} + 2 \times TTI_{DCCH}$ ms from the beginning of time period T2. The UE is not required to read the neighbour cell SSB index in this test.

NOTE: The actual overall delays measured in the test may be up to $2xTTI_{DCCH}$ higher than the measurement reporting delays because of TTI insertion uncertainty of the measurement report in DCCH.

The overall delays measured test requirement is expressed as:

$T_{identify_intra_without_index} = T_{PSS/SSS_sync_intra} + T_{SSB_measurement_period_intra}$, is the measurement reporting delay.

$T_{PSS/SSS_sync_intra} = ceil(5 \times K_p) \times DRX\ cycle \times CSSF_{intra} = 3200$ ms, is the time period used in PSS/SSS detection defined in 38.133 [6] clause 9.2.5.1

$T_{SSB_measurement_period_intra} = ceil(Y \times K_p) \times DRX\ cycle \times CSSF_{intra} = 1920$ ms, equal to a measurement period of SSB based measurement defined in 38.133 [6] clause 9.2.5.2.

Where:

$K_p = 1$ for intra-frequency SMTC which is fully non-overlapping with measurement gaps;

DRX cycle = 640 as given in Table 4.6.1.7.4.1-3;

$CSSF_{intra} = 1$ when only 1 intra-frequency layer is configured.

Y = 3 for DRX cycle =640 ms and SMTC period = 20 ms as given in Table 4.6.1.7.4.1-3.

$TTI_{DCCH} = 1$ ms, is the TTI insertion uncertainty.

That gives a total of 5122 ms.

The UE shall not send event triggered measurement reports, as long as the reporting criteria are not fulfilled.

The rate of correct events observed during repeated tests shall be at least 90% with confidence level of 95%.

4.6.1.8 EN-DC FR1 event triggered reporting cell without SSB time index detection in DRX for UE configured with highSpeedMeasCA-Scell-r17

Editor's Note: This test case is incomplete in following aspects:

- TT analysis is missing.

4.6.1.8.1 Test purpose

This test is to verify that the UE makes correct reporting of an event for UE configured with highSpeedMeasCA-Scell-r17. This test will partly verify the intra-frequency cell search requirements in TS 38.133 [6] clause 9.2.5.

4.6.1.8.2 Test applicability

This test applies to all types of E-UTRA UE release 16 and forward supporting enhanced NR CA measurement requirements in high-speed scenario.

4.6.1.8.3 Minimum conformance requirements

The minimum conformance requirements are defined in clause 4.6.1.0.1.

The normative reference for this requirement is TS 38.133 [6] clause A.4.6.1.8.

4.6.1.8.4 Test description

4.6.1.8.4.1 Initial conditions

This test shall be tested using any of the test configurations in Table 4.6.1.8.4.1-1.

Table 4.6.1.8.4.1-1: Supported test configurations for EN-DC FR1 event triggered reporting cell without SSB time index detection in DRX for UE configured with highSpeedMeasCA-Scell-r17

Configuration	Description
4.6.1.8-1	LTE FDD, NR 15 kHz SSB SCS, 10MHz bandwidth, FDD duplex mode
4.6.1.8-2	LTE FDD, NR 15 kHz SSB SCS, 10MHz bandwidth, TDD duplex mode
4.6.1.8-3	LTE FDD, NR 30 kHz SSB SCS, 40MHz bandwidth, TDD duplex mode
4.6.1.8-4	LTE TDD, NR 15 kHz SSB SCS, 10MHz bandwidth, FDD duplex mode
4.6.1.8-5	LTE TDD, NR 15 kHz SSB SCS, 10MHz bandwidth, TDD duplex mode
4.6.1.8-6	LTE TDD, NR 30 kHz SSB SCS, 40MHz bandwidth, TDD duplex mode
Note 1: The UE is only required to be tested in one of the supported test configurations Note 2: NR cell3 has the same SCS, BW and duplex mode as NR cell2	

Configure the test equipment and the DUT according to the parameters in Table 4.6.1.8.4.1-2.

Table 4.6.1.8.4.1-2: Initial conditions for EN-DC FR1 event triggered reporting cell without SSB time index detection in DRX for UE configured with highSpeedMeasCA-Scell-r17

Parameter	Value		Comment
Test environment	NC		As specified in TS 38.508-1 [14] clause 4.1.
Test frequencies	As specified in Annex E, table E.2-1 and TS 38.508-1 [14] clause 4.3.1.		
Channel bandwidth	As specified by the test configuration selected from Table 4.6.1.8.4.1-1.		
Propagation conditions	AWGN		As specified in clause C.2.1.
Connection Diagram	TE Part	A.3.1.8.2	As specified in TS 38.508-1 [14] Annex A.
	DUT Part	A.3.2.3.4	
Exceptions to connection diagram	N/A		

1. The general test parameter settings are set up according to Table 4.6.1.8.4.1-3.
2. Message contents are defined in clause 4.6.1.8.4.3.
3. There are four cells: LTE cell 1 as PCell on E-UTRA RF channel 1, NR cell 2 as PSCell in FR1 on NR RF channel 1 and NR cell 3 as deactivated SCell in FR1 on NR RF channel 2 and NR cell 4 as neighbour cell on NR RF channel 2.

Table 4.6.1.8.4.1-3: General test parameters for EN-DC FR1 event triggered reporting cell without SSB time index detection in DRX for UE configured with highSpeedMeasCA-Scell-r17

Parameter	Unit	Test configuration	Value		Comment
			Test 1	Test 2	
E-UTRA RF Channel Number		Config 1,2,3,4,5,6	1		One E-UTRAN carrier frequencies is used.
NR RF Channel Number		Config 1,2,3,4,5,6	1, 2		Two FR1 NR carrier frequencies are used.

Active cell		Config 1,2,3,4,5,6	LTE Cell 1 (PCell) and NR cell 2 (PScell)	LTE Cell 1 is on E-UTRA RF channel number 1. NR Cell 2 is on NR RF channel number 1.
Deactivated Scell		Config 1,2,3,4,5,6	NR cell 3	NR cell 3 is on NR RF channel number 2.
Neighbour cell		Config 1,2,3,4,5,6	NR cell 4	NR cell 4 is on NR RF channel number 2.
A6-Offset	dB	Config 1,2,3,4,5,6	-4.5	
Hysteresis	dB	Config 1,2,3,4,5,6	0	
CP length		Config 1,2,3,4,5,6	Normal	
Measurement gap pattern Id			OFF	
SCell measurement cycle (measCycleSCell)		Config 1,2,3,4,5,6	160 ms	
TimeToTrigger	s	Config 1,2,3,4,5,6	0	
Filter coefficient		Config 1,2,3,4,5,6	0	As specified in clause A.3.3
DRX		Config 1,2,3,4,5,6	DRX.4	
Time offset between PCell and PSCell		Config 1,2,3,4,5,6	3 µs	Synchronous EN-DC
Time offset between PSCell and deactivated SCell		Config 1,4	3 ms	Asynchronous cells. The timing of Cell 3 is 3ms later than the timing of Cell 2.
		Config 2,3,5,6	3 µs	Synchronous cells.
T1	s	Config 1,2,3,4,5,6	5	
T2	s	Config 1,2,3,4,5,6	1	

4.6.1.8.4.2 Test procedure

The test consists of two successive time periods, with time duration of T1, and T2 respectively. During time duration T1, the UE shall not have any timing information of NR cell 3 and cell 4.

1. Ensure the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity EN-DC, DC bearer MCG and SCG, Connected without release *On* and Test Mode *On* according to TS 38.508-1 [14] clause 4.5.

2. Configure MCG and SCG according to clause C.1 for all downlink physical channels.

3. The SS shall configure the PCell (LTE Cell 1), PSCell (NR Cell 2) and the deactivated SCell (NR Cell 3) on the MCG and SCG as per TS 38.508-1 [14] clause 4.5 with the message content exceptions defined in clause 4.6.1.8.4.3.

4. Set the parameters according to T1 in Table 4.6.1.1.4.1-2. Propagation conditions are set according to Annex C clauses C.2.2

5. The SS shall transmit an RRCConnectionReconfiguration message with event A6 configured for NR cell 4.

6. The UE shall transmit an RRCConnectionReconfigurationComplete message. T1 starts.

7. When T1 expires, the SS shall switch the power setting from T1 to T2 as specified in Table 4.6.1.8.4.1-2.

8. UE shall transmit a MeasurementReport message triggered by Event A6 for NR Cell 4 on PCell (LTE Cell 1). If the measurement reporting delay from the beginning of time period T2 is less than 1600 the number of successful tests is increased by one. If the UE fails to report the event within the measurement reporting delay requirement, then the number of failure tests is increased by one.

9. The SS waits until the MeasurementReport message is received or when T2 expires.

10. The SS shall transmit *RRCConnectionReconfiguration* message with condition EN-DC_PSCell_Rel according to TS 36.508 [25] Table 4.6.1-8 to release NR cell (PSCell). The UE shall transmit *RRCConnectionReconfigurationComplete* message.

11. Set Cell 3 physical cell identity = [((current cell 3 physical cell identity + 1) mod 14 + 2)] for next iteration of the test procedure loop.

12. The SS then shall transmit *RRCConnectionReconfiguration* message with condition MCG_and_SCG according to TS 36.508 [25] Table 4.6.1-8 to add NR cell (PSCell). The UE shall transmit *RRCConnectionReconfigurationComplete* message.

13. If any the reconfiguration fails, switch off and on the UE and ensure the UE is in RRC_CONNECTED with generic procedure parameters Connectivity EN-DC, DC bearer MCG and SCG, Connected without release On according to TS 38.508-1 [14] clause 4.5].

14. Repeat steps 3-13 until the confidence level according to Tables G.2.3-1 in Annex G clause G.2 is achieved.

4.6.1.8.4.3 Message contents

Message contents are according to TS 38.508-1 [14] clause 7.3 with the following exceptions:

Table 4.6.1.8.4.3-1: Common Exception messages for Additional EN-DC FR1 event triggered reporting cell without SSB time index detection in DRX for UE configured with highSpeedMeasCA-Scell-r17

Default Message Contents	
Common contents of system information blocks exceptions	
Default RRC messages and information elements contents exceptions	Table H.3.1-1 Table H.3.1-2 Table H.3.1-5 Table H.3.1-7 Table H.3.7-2 with Condition DRX.4 Table H.3.4-1 Table H.3.4-1a Table H.3.4-2
Specific message contents exceptions for Test Configuration 4.6.1.8-1 and 4.6.1.8-4	Table H.3.1-3 with Condition SSB.1 FR1 and Table 7.3.1-3 in TS 38.508-1 [14] with condition SMTC.2
Specific message contents exceptions for Test Configuration 4.6.1.8-2 and 4.6.1.8-5	Table H.3.1-3 with Condition SSB.1 FR1 and Synchronous cells Table 7.3.1-3 in TS 38.508-1 [14] with condition SMTC.1
Specific message contents exceptions for Test Configuration 4.6.1.8-3 and 4.6.1.8-6	Table H.3.1-3 with Condition SSB.2 FR1 and Synchronous cells Table 7.3.1-3 in TS 38.508-1 [14] with condition SMTC.1

Table 4.6.1.8.4.3-2: ReportConfigNR-DEFAULT(a6-offset): NR report configuration for event A6

Derivation Path: 38.508-1 [14] Table 4.6.3-142 with condition EVENT_A6			
Information Element	**Value/remark**	**Comment**	**Condition**
ReportConfigNR::= SEQUENCE {			
reportType CHOICE {			
eventTriggered SEQUENCE {			
eventId CHOICE {			
eventA6 SEQUENCE {			
a6-Offset CHOICE {			
rsrp	-9	The actual value is field value * 0.5 dB.	
}			
hysteresis	0		
timeToTrigger	ms0		
}			
}			
}			
}			
}			

Table 4.6.1.8.4.3-3: ServingCellConfigCommon

Derivation Path: TS 38.508-1[14], Table 4.6.3-168 with condition R17 HST FR1			
Information Element	**Value/remark**	**Comment**	**Condition**
ServingCellConfigCommon ::= SEQUENCE {			
HighSpeedConfig-v1700 SEQUENCE {			
highSpeedMeasCA-Scell-r17	true		
}			
}			

Table 4.6.1.8.4.3-4: MeasObjectNR-DEFAULT: measCycleSCell configuration for SCell intra-frequency measurements

Derivation Path: TS 38.508-1 [14], Table 4.6.3-76			
Information Element	**Value/remark**	**Comment**	**Condition**
MeasObjectNR::= SEQUENCE {			
measCycleSCell-v1530	sf160		
}			

4.6.1.8.5 Test requirement

Table 4.6.1.8.5-1 defines the primary level settings including test tolerances for EN-DC FR1 event triggered reporting.

Table 4.6.1.8.5-1: NR cell specific test parameters for EN-DC FR1 event triggered reporting cell without SSB time index detection in DRX for UE configured with highSpeedMeasCA-Scell-r17

Parameter	Unit	Test configuration	Cell 2		Cell 3		Cell 4	
			T1	T2	T1	T2	T1	T2
NR RF Channel Number		Config 1,2,3,4,5,6	1		2		2	
Duplex mode		Config 1,4	FDD				FDD	
		Config 2,3,5,6	TDD				TDD	
$BW_{channel}$	MHz	Config 1,4	10: $N_{RB,c}$ = 52				10: $N_{RB,c}$ = 52	
		Config 2,5	10: $N_{RB,c}$ = 52				10: $N_{RB,c}$ = 52	
		Config 3,6	40: $N_{RB,c}$ = 106				40: $N_{RB,c}$ = 106	
BWP BW	MHz	Config 1,4	10: $N_{RB,c}$ = 52				10: $N_{RB,c}$ = 52	
		Config 2,5	10: $N_{RB,c}$ = 52				10: $N_{RB,c}$ = 52	
		Config 3,6	40: $N_{RB,c}$ = 106				40: $N_{RB,c}$ = 106	
TDD configuration		Config 2,5	TDDConf.1.1		TDDConf.1.1		TDDConf.1.1	
		Config 3,6	TDDConf.2.1		TDDConf.2.1		TDDConf.2.1	
Initial DL BWP		Config 1,2,3,4,5,6	DLBWP.0.1		DLBWP.0.1		DLBWP.0.1	
Initial UL BWP		Config 1,2,3,4,5,6	ULBWP.0.1		NA		NA	
Dedicated DL BWP		Config 1,2,3,4,5,6	DLBWP.1.1		DLBWP.1.1		DLBWP.1.1	
Dedicated UL BWP		Config 1,2,3,4,5,6	ULBWP.1.1		NA		NA	
TRS configuration		Config 1,4	TRS.1.1 FDD		NA		NA	
		Config 2,5	TRS.1.1 TDD		NA		NA	
		Config 3,6	TRS.1.2 TDD		NA		NA	
OCNG Patterns defined in A.3.2.1.1 (OP.1)		Config 1,2,3,4,5,6	OP.1		OP.1		OP.1	
PDSCH Reference measurement channel		Config 1,4	SR.1.1 FDD		SR.1.1 FDD		SR.1.1 FDD	
		Config 2,5	SR.1.1 TDD		SR.1.1 TDD		SR.1.1 TDD	
		Config 3,6	SR2.1 TDD		SR2.1 TDD		SR2.1 TDD	
RMSI CORESET Reference Channel		Config 1,4	CR.1.1 FDD		CR.1.1 FDD		CR.1.1 FDD	
		Config 2,5	CR.1.1 TDD		CR.1.1 TDD		CR.1.1 TDD	
		Config 3,6	CR2.1 TDD		CR2.1 TDD		CR2.1 TDD	
Dedicated CORESET Reference Channel		Config 1,4	CCR.1.1 FDD		CCR.1.1 FDD		CCR.1.1 FDD	
		Config 2,5	CCR.1.1 TDD		CCR.1.1 TDD		CCR.1.1 TDD	
		Config 3,6	CCR.2.1 TDD		CCR.2.1 TDD		CCR.2.1 TDD	

SSB parameters		Config 1,4	SSB.1 FR1		SSB.5 FR1		SSB.5 FR1	
		Config 2,5	SSB.1 FR1		SSB.5 FR1		SSB.5 FR1	
		Config 3,6	SSB.2 FR1		SSB.6 FR1		SSB.6 FR1	
SMTC configuration defined in A.3.11		Config 1,4	SMTC.2		SMTC.5		SMTC.5	
		Config 2,3,5,6	SMTC.1		SMTC.4		SMTC.4	
PDSCH/PDCCH subcarrier spacing	kHz	Config 1,2,4,5	15					
		Config 3,6	30					
EPRE ratio of PSS to SSS		Config 1,2,3,4,5,6	0		0		0	
EPRE ratio of PBCH DMRS to SSS								
EPRE ratio of PBCH to PBCH DMRS								
EPRE ratio of PDCCH DMRS to SSS								
EPRE ratio of PDCCH to PDCCH DMRS								
EPRE ratio of PDSCH DMRS to SSS								
EPRE ratio of PDSCH to PDSCH								
EPRE ratio of OCNG DMRS to SSS(Note 1)								
EPRE ratio of OCNG to OCNG DMRS (Note 1)								
N_{oc} Note2	dBm/ 15kHz		-98+TT		-98+TT		-98+TT	
N_{oc} Note2	dBm/ SCS	Config 1,2,4,5	-98+TT		-98+TT		-98+TT	
		Config 3,6	-95+TT		-95+TT		-95+TT	
SS-RSRP Note 3	dBm/ SCS	Config 1,2,4,5	-94+TT	-94+TT	-94+TT	-94+TT	-Infinity	-94+TT
		Config 3,6	-91+TT	-91	-91+TT	-91+TT	-Infinity	-91+TT
$\hat{E}_s / I_{ot}$	dB	Config 1,2,3,4,5,6	4+TT	4+TT	4+TT	-1.46+TT	-Infinity	-1.46+TT
$\hat{E}_s / N_{oc}$	dB	Config 1,2,3,4,5,6	4+TT	4+TT	4+TT	4+TT	-Infinity	4+TT
Io Note3	dBm/ 9.36 MHz	Config 1,2,4,5	-64.59+TT	-64.59+TT	-64.59+TT	-62.26+TT	-64.59+TT	-62.26+TT
	dBm/ 38.16 MHz	Config 3,6	-58.49+TT	-58.49+TT	-58.49+TT	-56.15+TT	-58.49+TT	-56.15+TT
Propagation Condition		Config 1,2,4,5	AWGN		AWGN		AWGN 1944Hz Note 5	
		Config 3,6	AWGN		AWGN		AWGN 3334Hz Note 6	

Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.

Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for N_{oc} to be fulfilled.

Note 3: SS-RSRP and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.

Note 4: SS-RSRP minimum requirements are specified assuming independent interference and noise at each receiver antenna port.

Note 5: The AWGN 1944 Hz condition is a non fading propagation channel with one tap. Doppler shift is a constant 1944Hz.

Note 6: The AWGN 3334 Hz condition is a non fading propagation channel with one tap. Doppler shift is a constant 3334Hz.

The UE shall send one Event A6 triggered measurement report, with a measurement reporting delay less than 1600 ms from the beginning of time period T2. The UE shall not send event triggered measurement reports, as long as the

reporting criteria are not fulfilled. The rate of correct events observed during repeated tests shall be at least 90% with the confidence level of 95%.

UE is not required to report SSB time index.

NOTE: The actual overall delays measured in the test may be up to $2xTTI_{DCCH}$ higher than the measurement reporting delays above because of TTI insertion uncertainty of the measurement report in DCCH.

4.6.2 Inter-frequency measurements

4.6.2.0 Minimum conformance requirements for Inter-frequency measurements

The requirements in clause 9.3 apply, provided:

- The cell being identified or measured is detectable.

An inter-frequency cell shall be considered detectable when for each relevant SSB:

- SS-RSRP related side conditions given in clauses 10.1.4 and 10.1.5 for FR1 and FR2, respectively, for a corresponding Band,
- SS-RSRQ related side conditions given in clauses 10.1.9 and 10.1.10 for FR1 and FR2, respectively, for a corresponding Band,
- SS-SINR related side conditions given in clauses 10.1.14 and 10.1.15 for FR1 and FR2, respectively, for a corresponding Band,
- SSB_RP and SSB Ês/Iot according to clause B.2.3 for a corresponding Band.

[TS 38.133-f50, clause 9.3.4]

When measurement gaps are provided, or the UE supports capability of conducting such measurements without gaps, the UE shall be able to identify a new detectable inter frequency cell within $T_{identify_inter_without_index}$ if UE is not indicated to report SSB based RRM measurement result with the associated SSB index (*reportQuantityRsIndexes* or *maxNrofRSIndexesToReport* is not configured). Otherwise UE shall be able to identify a new detectable inter frequency cell within $T_{identify_inter_with_index}$. The UE shall be able to identify a new detectable inter frequency SS block of an already detected cell within $T_{identify_inter_without_index}$.

$$T_{identify_inter_without_index} = (T_{PSS/SSS_sync_inter} + T_{SSB_measurement_period_inter}) \text{ ms}$$

$$T_{identify_inter_with_index} = (T_{PSS/SSS_sync_inter} + T_{SSB_measurement_period_inter} + T_{SSB_time_index_inter}) \text{ ms}$$

Where:

T_{PSS/SSS_sync_inter}: it is the time period used in PSS/SSS detection given in table 9.3.4-1 and table 9.3.4-2 and table 4.6.2.0-4 when *highSpeedMeasInterFreq-r17* is configured and UE supports measurementEnhancementInterFreq-r17.

$T_{SSB_time_index_inter}$: it is the time period used to acquire the index of the SSB being measured given in table 9.3.4-3 and Table 9.3.4.4 [Editor's note: '9.3.4.4' has probably to be deleted!] 4.6.2.0-5 when *highSpeedMeasInterFreq* is configured and UE supports measurementEnhancementInterFreq-r17.

$T_{SSB_measurement_period_inter}$: equal to a measurement period of SSB based measurement given in table 9.3.5-1 and Table [Editor's note: this line has probably to be deleted!]

$T_{SSB_measurement_period_inter}$: equal to a measurement period of SSB based measurement given in table 4.6.2.0-6, table 4.6.2.0-7 and table 4.6.2.0-7 when *highSpeedMeasInterFreq* is configured and UE supports [measurementEnhancementInterFreq-r17.

$CSSF_{inter}$: it is a carrier specific scaling factor and is determined according to $CSSF_{within_gap,i}$ in TS 38.133 section 9.1.5.2 for measurement conducted within measurement gaps.

Table 9.3.4-1: Time period for PSS/SSS detection, (Frequency range FR1)

[Editor's note: should be named Table 4.6.2.0-1]

Condition NOTE1,2	T_{PSS/SSS_sync_inter}
No DRX	Max(600ms, 8 × Max(MGRP, SMTC period)) × $CSSF_{inter}$
DRX cycle ≤ 320ms	Max(600ms, Ceil(8*1.5) × Max(MGRP, SMTC period, DRX cycle)) × $CSSF_{inter}$
DRX cycle > 320ms	8 × DRX cycle × $CSSF_{inter}$
NOTE 1: DRX or non DRX requirements apply according to the conditions described in clause 3.6.1. NOTE 2: In EN-DC operation, the parameters, timers and scheduling requests referred to in clause 3.6.1 are for the secondary cell group. The DRX cycle is the DRX cycle of the secondary cell group.	

Table 4.6.2.0-2 FFS

Table 9.3.4-3: Time period for time index detection (Frequency range FR1)

[Editor's note: should be named Table 4.6.2.0-3]

Condition NOTE1,2	$T_{SSB_time_index_inter}$
No DRX	Max(120ms, 3 × Max(MGRP, SMTC period)) × $CSSF_{inter}$
DRX cycle ≤ 320ms	Max(120ms, Ceil(3 × 1.5) × Max(MGRP, SMTC period, DRX cycle)) × $CSSF_{inter}$
DRX cycle > 320ms	3 × DRX cycle × $CSSF_{inter}$
NOTE 1: DRX or non DRX requirements apply according to the conditions described in clause 3.6.1 NOTE 2: In EN-DC operation, the parameters, timers and scheduling requests referred to in clause 3.6.1 are for the secondary cell group. The DRX cycle is the DRX cycle of the secondary cell group.	

Table 4.6.2.0-4: Time period for PSS/SSS detection when highSpeedMeasInterFreq-r17 is configured (Frequency range FR1)

Condition NOTE1,2	T_{PSS/SSS_sync_inter}
No DRX	max(600ms, N1 × Max(MGRP, SMTC period)) × $CSSF_{inter}$ N1 = 7
DRX cycle ≤ 160ms	max(600ms, ceil(N2) x max(MGRP, SMTC period, DRX cycle)) x $CSSF_{inter}$ N2 = 7 x M2
160ms < DRX cycle ≤ 320ms	ceil(N3) x DRX cycle x $CSSF_{inter}$ N3 = 7 x M2
DRX cycle>320ms	N4 x DRX cycle x $CSSF_{inter}$
NOTE 1: If different SMTC periodicities are configured for different cells, the SMTC period in the requirement is the one used by the cell being identified NOTE 2: M2 = 1.5 if SMTC periodicity > 40 ms, otherwise M2=1 NOTE 3: N4=6 if SMTC periodicity > 40 ms, otherwise N4=5	

Table 4.6.2.0-5: Time period for time index detection when highSpeedMeasInterFreq-r17 is configured (Frequency range FR1)

Condition NOTE1,2	$T_{SSB_time_index_inter}$
No DRX	Max(120ms, 3 × Max(MGRP, SMTC period)) × $CSSF_{inter}$
DRX cycle ≤ 320ms	Max(120ms, Ceil(3 × M2 NOTE3) × Max(MGRP, SMTC period, DRX cycle)) × $CSSF_{inter}$
DRX cycle > 320ms	3 × DRX cycle × $CSSF_{inter}$
NOTE 1: DRX or non DRX requirements apply according to the conditions described in clause 3.6.1 NOTE 2: In EN-DC operation, the parameters, timers and scheduling requests referred to in clause 3.6.1 are for the secondary cell group. The DRX cycle is the DRX cycle of the secondary cell group. NOTE 3: M2 = 1.5 if SMTC periodicity > 40 ms, otherwise M2=1.	

[TS 38.133-f50, clause 9.3.5]

When measurement gaps are provided for inter frequency measurements, or the UE supports capability of conducting such measurements without gaps, the UE physical layer shall be capable of reporting SS-RSRP, SS-RSRQ and SS-SINR measurements to higher layers with measurement accuracy as specified in TS 38.133 subclauses 10.1.4, 10.1.5, 10.1.9, 10.1.10, 10.1.14 and 10.1.15, respectively, as shown in table 4.6.2.0-6. When *highSpeedMeasInterFreq-r17* is configured, and UE supports *measurementEnhancementInterFreq-r17*, $T_{SSB_measurement_period_inter}$ is specified in Table 4.6.2.0-7:

Table 4.6.2.0-6: Measurement period for inter-frequency measurements with gaps (Frequency FR1)

Condition NOTE1,2	$T_{SSB_measurement_period_inter}$
No DRX	Max(200ms, 8 × Max(MGRP, SMTC period)) × $CSSF_{inter}$
DRX cycle ≤ 320ms	Max(200ms, Ceil(8 × 1.5) × Max(MGRP, SMTC period, DRX cycle)) × $CSSF_{inter}$
DRX cycle > 320ms	8 × DRX cycle × $CSSF_{inter}$
NOTE 1: DRX or non DRX requirements apply according to the conditions described in clause 3.6.1 NOTE 2: In EN-DC operation, the parameters, timers and scheduling requests referred to in clause 3.6.1 are for the secondary cell group. The DRX cycle is the DRX cycle of the secondary cell group.	

Table 4.6.2.0-7: Measurement period for inter-frequency measurements with gaps when highSpeedMeasInterFreq-r17 is configured (Frequency range FR1)

Condition NOTE1,2	$T_{SSB_measurement_period_inter}$
No DRX	max(200ms, 7 × Max(MGRP, SMTC period)) × $CSSF_{inter}$
DRX cycle ≤ 160ms	max(200ms, ceil(7 x M2 NOTE3) x max(MGRP, SMTC period, DRX cycle)) x $CSSF_{inter}$
160ms < DRX cycle ≤ 320ms	ceil(7 x M2 NOTE3) x DRX cycle x $CSSF_{inter}$
DRX cycle>320ms	4 x M2 NOTE3 x DRX cycle x $CSSF_{inter}$
NOTE 1: If different SMTC periodicities are configured for different cells, the SMTC period in the requirement is the one used by the cell being identified NOTE 2: In EN-DC operation, the parameters, timers and scheduling requests referred to in clause 3.6.1 are for the secondary cell group. The DRX cycle is the DRX cycle of the secondary cell group. NOTE 3: M2 = 1.5 if SMTC periodicity > 40 ms, otherwise M2=1	

[TS 38.133, clause 9.3.6.3]

Reported SS-RSRP, SS-RSRQ, and SS-SINR measurements contained in event triggered measurement reports shall meet the requirements in sections 10.1.4.1, 10.1.5.1, 10.1.9.1, 10.1.10.1, 10.1.14.1 and 10.1.15.1, respectively.

The UE shall not send any event triggered measurement reports, as long as no reporting criteria are fulfilled.

The measurement reporting delay is defined as the time between an event that will trigger a measurement report and the point when the UE starts to transmit the measurement report over the air interface. This requirement assumes that the measurement report is not delayed by other RRC signalling on the DCCH. This measurement reporting delay excludes a delay uncertainty resulted when inserting the measurement report to the TTI of the uplink DCCH. The delay uncertainty is: $2 \times TTI_{DCCH}$. This measurement reporting delay excludes a delay which caused by no UL resources for UE to send the measurement report.

The event triggered measurement reporting delay, measured without L3 filtering shall be within $T_{identify_inter_without_index}$ if UE is not indicated to report SSB based RRM measurement result with the associated SSB index. Otherwise UE shall be able to identify a new detectable inter frequency cell within $T_{identify_inter_with_index}$. Both $T_{identify_inter_without_index}$ and $T_{identify_inter_with_index}$ are defined in clause 9.3.4. When L3 filtering is used an additional delay can be expected.

If a cell which has been detectable at least for the time period $T_{identify_inter_without_index}$ or $T_{identify_inter_with_index}$ defined in clause 9.3.4 and then triggers the measurement report as per TS 38.331 [2], the event triggered measurement reporting delay shall be less than $T_{SSB_measurement_period_inter}$ defined in clause 9.3.5 provided the timing to that cell has not changed more than ± 3200 Tc while measurement gap has not been available and the L3 filter has not been used. When L3 filtering is used an additional delay can be expected.

The normative reference for this requirement is TS 38.133 [6] clause 9.3.2, 9.3.4, 9.3.5, 9.3.6.3.

4.6.2.1 EN-DC FR1-FR1 event-triggered reporting in non-DRX

4.6.2.1.1 Test purpose

To verify that the UE makes correct reporting of an event in non-DRX within EN-DC inter-frequency NR cell search requirements without SSB time index detection in TS 38.133 [6] clause 9.3.4.

4.6.2.1.2 Test applicability

This test applies to all types of E-UTRA UE release 15 and forward, supporting EN-DC. Test 1 is applicable to UEs not supporting per-FR gap (IndependentGapConfig, as defined in TS 38.306 [11]) and Test 2 is applicable only to UEs supporting per-FR gap and Gap Pattern Id 4.

4.6.2.1.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 4.6.2.0.

The normative reference for this requirement is TS 38.133 [6] clause A.4.6.2.1.

4.6.2.1.4 Test description

4.6.2.1.4.1 Initial conditions

This test shall be tested using any of the test configurations in Table 4.6.2.1.4.1-1. Configure the test equipment and the DUT according to the parameters in Table 4.6.2.1.4.1-2. Test environment parameters are given in Table 4.6.2.1.4.1-3.

Table 4.6.2.1.4.1-1: EN-DC FR1-FR1 event triggered reporting tests in non-DRX supported test configurations

Test Case ID	Description
4.6.2.1-1	LTE FDD, NR 15 kHz SSB SCS, 10MHz bandwidth, FDD duplex mode
4.6.2.1-2	LTE FDD, NR 15 kHz SSB SCS, 10MHz bandwidth, TDD duplex mode
4.6.2.1-3	LTE FDD, NR 30 kHz SSB SCS, 40MHz bandwidth, TDD duplex mode
4.6.2.1-4	LTE TDD, NR 15 kHz SSB SCS, 10MHz bandwidth, FDD duplex mode
4.6.2.1-5	LTE TDD, NR 15 kHz SSB SCS, 10MHz bandwidth, TDD duplex mode
4.6.2.1-6	LTE TDD, NR 30 kHz SSB SCS, 40MHz bandwidth, TDD duplex mode
NOTE 1: The UE is only required to be tested in one of the supported test configurations NOTE 2: The target NR cell3 has the same SCS, BW and duplex mode as NR serving cell2	

Table 4.6.2.1.4.1-2: General test parameters for EN-DC inter-frequency event triggered reporting without SSB time index detection in non-DRX

Parameter	Unit	Test configuration	Value		Comment
			Test 1	Test 2	
E-UTRA RF Channel Number		Config 1,2,3,4,5,6	1		One E-UTRAN TDD carrier frequencies is used.
NR RF Channel Number		Config 1,2,3,4,5,6	1, 2		Two FR1 NR carrier frequencies are used.
Active cell		Config 1,2,3,4,5,6	LTE Cell 1 (PCell) and NR cell 2 (PScell)		LTE Cell 1 is on E-UTRA RF channel number 1. NR Cell 2 is on NR RF channel number 1.
Neighbour cell		Config 1,2,3,4,5,6	NR cell 3		NR cell 3 is on NR RF channel number 2.
Gap Pattern Id		Config 1,2,3,4,5,6	0	4	As specified in TS 38.133 clause 9.1.2-1.
Measurement gap offset		Config 1,2,3,4,5,6	9	9	
A3-Offset	dB	Config 1,2,3,4,5,6	-6		
Hysteresis	dB	Config 1,2,3,4,5,6	0		
CP length		Config 1,2,3,4,5,6	Normal		
TimeToTrigger	s	Config 1,2,3,4,5,6	0		
Filter coefficient		Config 1,2,3,4,5,6	0		L3 filtering is not used

Parameter	Unit	Test configuration	Value		Comment
			Test 1	Test 2	
DRX		Config 1,2,3,4,5,6	OFF		DRX is not used
Time offset between PCell and PSCell		Config 1,2,3,4,5,6	3 µs		Synchronous EN-DC
Time offset between serving and neighbour cells		Config 1,4	3 ms		Asynchronous cells. The timing of Cell 3 is 3ms later than the timing of Cell 2.
		Config 2,3,5,6	3 µs		Synchronous cells.
T1	s	Config 1,2,3,4,5,6	5		
T2	s	Config 1,2,3,4,5,6	1	1	

Table 4.6.2.1.4.1-3: Test Environment test parameters for EN-DC inter-frequency event triggered reporting without SSB time index detection in non-DRX

Parameter	Value		Comment
Test environment	NC		As specified in TS 38.508-1 [14] clause 4.1.
Test frequencies	As specified in Annex E, Table E.2-1 and TS 38.508-1 [14] clause 4.3.1 and 4.4.2.		
Channel bandwidth	As specified by the test configuration selected from Table 4.6.2.1.4.1-1.		
Propagation conditions	AWGN		As specified in clause C.2.2.
Connection Diagram	TE Part	A.3.1.8.2	As specified in TS 38.508-1 [14] Annex A.
	DUT Part	A.3.2.3.4	
Exceptions to connection diagram	For 4Rx capable UEs without any 2Rx RF bands use A.3.2.5.2 for DUT Part. and A.3.1.8.4 for TE Part		

1. Message contents are defined in clause 4.6.2.1.4.3.

2. Cell 1 is the E-UTRA serving cell (PCell) for the EN-DC setup. The power levels and settings for Cell 1 are set according to Annex A.6. Cell 2 and Cell 3 are NR FR1 cells in different frequencies. Cell 2 is the PSCell and Cell 3 is the target cell. The power levels and settings for Cell 2 are set according to clause C.1.2 and clause C.1.3. Cell 3 is switched off during the initial connection setup.

4.6.2.1.4.2 Test procedure

In this test, there are three cells: LTE cell 1 as PCell on E-UTRA RF channel 1, NR cell 2 as PSCell in FR1 on NR RF channel 1 and NR cell 3 as neighbour cell in FR1 on NR RF channel 2.

In test 1 measurement gap pattern configuration # 0 as defined in Table 4.6.2.1.4.1-2 is provided for a UE that does not support per-FR gap and in test 2 measurement gap pattern configuration #4 as defined in Table 4.6.2.1.4.1-2 is provided for UE that support per-FR gap. In the measurement control information, it is indicated to the UE that event-triggered reporting with Event A3 is used. The test consists of two successive time periods, with time duration of T1, and T2 respectively. During time duration T1, the UE shall not have any timing information of NR cell 3.

1. Ensure the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity EN-DC, DC bearer MCG and SCG, Connected without release *On* and Test Mode *On* according to TS 38.508-1 [14] clause 4.5.

2. Set the parameters according to T1 in Table 4.6.2.1.4.1-2.

3. The SS shall transmit an RRCConnectionReconfiguration message on Cell 1.

4. The UE shall transmit RRCConnectionReconfigurationComplete message. T1 starts.

5. When T1 expires, the SS shall switch the power setting from T1 to T2 as specified in Table 4.6.2.1.4.1-2. T2 starts.

6. UE shall transmit a MeasurementReport message triggered by Event A3 embedded in E-UTRA RRC message *ULInformationTransferMRDC*. If the overall delay measured from the beginning of time period T2 is less than 920 ms for Test 1 and 760 ms for Test 2 then the number of successful tests is increased by one. If the UE fails to report the event within the overall delays measured requirement then the number of failure tests is increased by one.

7. After the SS receives the MeasurementReport message in step 6 or when T2 expires, the SS shall transmit RRCConnectionReconfiguration message with condition EN-DC_PSCell_Rel according to TS 36.508 [25] Table 4.6.1-8 to release NR cell (PSCell). The UE shall transmit RRCConnectionReconfigurationComplete message.

8. Set Cell 3 physical cell identity = ((current cell 3 physical cell identity + 1) mod 14 + 2) for next iteration of the test procedure loop.

9. The SS shall transmit RRCConnectionReconfiguration message with condition MCG_and_SCG according to TS 36.508 [25] Table 4.6.1-8 to add NR cell (PSCell). The UE shall transmit RRCConnectionReconfigurationComplete message. If either of the reconfiguration in step 7 or step 9 fails, SS switches off and on the UE and ensures the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity EN-DC, DC bearer MCG and SCG, Connected without release *On* according to TS 38.508-1 [14] clause 4.5.

10. Repeat step 2-9 until the confidence level according to Tables G.2.3-1 in Annex G clause G.2 is achieved.

11. Repeat step 1-10 for each sub-test in Table 4.6.2.1.4.1-2 as appropriate.

4.6.2.1.4.3 Message contents

Message contents are according to TS 38.508-1 [14] clause 7.3 with the following exceptions:

Table 4.6.2.1.4.3-1: Common Exception messages for Additional EN-DC FR1-FR1 event triggered reporting tests in non-DRX test requirement

Default Message Contents	
Common contents of system information blocks exceptions	
Default RRC messages and information elements contents exceptions	Table H.3.1-1 Table H.3.1-2 with Condition INTER-FREQ Table H.3.1-4 with A3-offset = -6dB Table H.3.1-5 Table H.3.1-7 with Condition INTER-FREQ Table H.3.4-1a Table H.3.4-2 Table H.3.4-3 Table H.3.4-4 with Condition gapUE for Test 1 Table H.3.4-4 with Condition gapFR1 for Test 2 Table H.3.4-5 with Condition Pattern #0 and gap offset = 9 for Test 1 Table H.3.4-5 with Condition Pattern #4 and gap offset = 9 for Test 2
Specific message contents exceptions for Test Configuration 4.6.2.1-1 and 4.6.2.1-4	Table H.3.1-3 with Conditions INTER-FREQ MO Table 7.3.1-3 in TS 38.508-1 [14] with condition SMTC.5
Specific message contents exceptions for Test Configuration 4.6.2.1-2 and 4.6.2.1-5	Table H.3.1-3 with Conditions INTER-FREQ MO and Synchronous cells Table 7.3.1-3 in TS 38.508-1 [14] with condition SMTC.4
Specific message contents exceptions for Test Configuration 4.6.2.1-3 and 4.6.2.1-6	Table H.3.1-3 with Conditions INTER-FREQ MO and Synchronous cells Table 7.3.1-3 in TS 38.508-1 [14] with condition SMTC.4

Table 4.6.2.1.4.3-2: SchedulingRequest-Config for E-UTRAN PCell

Derivation Path: 36.508 [25], Table 4.6.3-20			
Information Element	**Value/remark**	**Comment**	**Condition**
SchedulingRequest-Config-DEFAULT ::= CHOICE {			
setup SEQUENCE {			
sr-ConfigIndex	23		TDD
}			
}			

4.6.2.1.5 Test requirement

Table 4.6.2.1.5-1 defines the primary level settings including test tolerances for all tests.

Table 4.6.2.1.5-1: Cell specific test parameters for EN-DC inter-frequency event triggered reporting without SSB time index detection in non-DRX

Parameter	Unit	Test configuration	Cell 2		Cell 3	
			T1	T2	T1	T2
NR RF Channel Number		Config 1,2,3,4,5,6	1		2	
Duplex mode		Config 1,4	FDD			
		Config 2,3,5,6	TDD			
$BW_{channel}$	MHz	Config 1,4	10: $N_{RB,c}$ = 52			
		Config 2,5	10: $N_{RB,c}$ = 52			
		Config 3,6	40: $N_{RB,c}$ = 106			
BWP BW	MHz	Config 1,4	10: $N_{RB,c}$ = 52			
		Config 2,5	10: $N_{RB,c}$ = 52			
		Config 3,6	40: $N_{RB,c}$ = 106			
TDD configuration		Config 2,5	TDDConf.1.1		TDDConf.1.1	
		Config 3,6	TDDConf.2.1		TDDConf.2.1	
Initial DL BWP		Config 1,2,3,4,5,6	DLBWP.0.1		NA	
Initial UL BWP		Config 1,2,3,4,5,6	ULBWP.0.1		NA	
Dedicated DL BWP		Config 1,2,3,4,5,6	DLBWP.1.1		NA	
Dedicated UL BWP		Config 1,2,3,4,5,6	ULBWP.1.1		NA	
OCNG Patterns		Config 1,2,3,4,5,6	OP.1		OP.1	
TRS configuration		Config 1,4	TRS.1.1 FDD		NA	
		Config 2,5	TRS.1.1 TDD		NA	
		Config 3,6	TRS.1.2 TDD		NA	
PDSCH Reference measurement channel		Config 1,4	SR.1.1 FDD		-	
		Config 2,5	SR.1.1 TDD			
		Config 3,6	SR 2.1 TDD			
RMSI CORESET Reference Channel		Config 1,4	CR.1.1 FDD		-	
		Config 2,5	CR.1.1 TDD			
		Config 3,6	CR 2.1 TDD			
Dedicated CORESET Reference Channel		Config 1,4	CCR.1.1 FDD		-	
		Config 2,5	CCR.1.1 TDD			
		Config 3,6	CCR 2.1 TDD			
SSB parameters		Config 1,4	SSB.1 FR1		SSB.5 FR1	
		Config 2,5	SSB.1 FR1		SSB.5 FR1	
		Config 3,6	SSB.2 FR1		SSB.6 FR1	
SMTC configuration		Config 1,4	SMTC.2		SMTC.5	
		Config 2,3,5,6	SMTC.1		SMTC.4	
PDSCH/PDCCH subcarrier spacing	kHz	Config 1,2,4,5	15			
		Config 3,6	30			
EPRE ratio of PSS to SSS		Config 1,2,3,4,5,6	0		0	
EPRE ratio of PBCH DMRS to SSS						
EPRE ratio of PBCH to PBCH DMRS						
EPRE ratio of PDCCH DMRS to SSS						
EPRE ratio of PDCCH to PDCCH DMRS						
EPRE ratio of PDSCH DMRS to SSS						

Parameter	Unit	Test configuration	Cell 2		Cell 3	
			T1	T2	T1	T2
EPRE ratio of PDSCH to PDSCH						
EPRE ratio of OCNG DMRS to SSS(Note 1)						
EPRE ratio of OCNG to OCNG DMRS (Note 1)						
N_{oc} Note2	dBm/15kHz		-98		-98	
N_{oc} Note2	dBm/SCS	Config 1,2,4,5	-98		-98	
		Config 3,6	-95		-95	
SS-RSRP Note 3	dBm/SCS	Config 1,2,4,5	-94	-94	-Infinity	-91
		Config 3,6	-91	-91	-Infinity	-88
$\hat{E}_s / I_{ot}$	dB	Config 1,2,3,4,5,6	4	4	-Infinity	7
$\hat{E}_s / N_{oc}$	dB	Config 1,2,3,4,5,6	4	4	-Infinity	7
Io Note3	dBm/9.36 MHz	Config 1,2,4,5	-64.59	-64.59	-70.05	-62.26
	dBm/38.16MHz	Config 3,6	-58.49	-58.49	-63.94	-56.15
Propagation Condition		Config 1,2,3,4,5,6	AWGN		AWGN	

NOTE 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.
NOTE 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for N_{oc} to be fulfilled.
NOTE 3: SS-RSRP and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.
NOTE 4: SS-RSRP minimum requirements are specified assuming independent interference and noise at each receiver antenna port.

In test 1 with per-UE gap, the UE shall send one Event A3 triggered measurement report, with a measurement reporting delay less than 920 ms from the beginning of time period T2. The UE shall not send event triggered measurement reports, as long as the reporting criteria are not fulfilled. The rate of correct events observed during repeated tests shall be at least 90% with a confidence level of 95%.

In test 2 with per-FR gap, the UE shall send one Event A3 triggered measurement report, with a measurement reporting delay less than 760 ms from the beginning of time period T2. The UE shall not send event triggered measurement reports, as long as the reporting criteria are not fulfilled. The rate of correct events observed during repeated tests shall be at least 90% with a confidence level of 95%.

In test 1 and 2 UE is not required to report SSB time index.

NOTE: The actual overall delays measured in the test may be up to $2xTTI_{DCCH}$ higher than the measurement reporting delays above because of TTI insertion uncertainty of the measurement report in DCCH.

4.6.2.2 EN-DC FR1-FR1 event-triggered reporting in DRX

4.6.2.2.1 Test purpose

The purpose of this test is to verify that the UE makes correct reporting of an event in DRX within EN-DC inter-frequency NR cell search requirements without SSB time index detection in TS 38.133 [6] clause 9.3.4.

4.6.2.2.2 Test applicability

This test applies to all types of E-UTRA UE release 15 and forward, supporting EN-DC FR1 and long DRX cycle. Test 1 and Test 2 are applicable to UEs not supporting per-FR gap (IndependentGapConfig, as defined in TS 38.306 [11]) and Test 3 and Test 4 are applicable only to UEs supporting per-FR gap and Gap Pattern Id 4.

4.6.2.2.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 4.6.2.0.

The normative reference for this requirement is TS 38.133 [6] clause A.4.6.2.2.

4.6.2.2.4 Test description

4.6.2.2.4.1 Initial conditions

This test shall be tested using any of the test configurations in Table 4.6.2.2.4.1-1. Configure the test equipment and the DUT according to the parameters in Table 4.6.2.2.4.1-2. Test environment parameters are given in Table 4.6.2.2.4.1-3.

Table 4.6.2.2.4.1-1: EN-DC FR1-FR1 event triggered reporting tests in DRX supported test configurations

Test Case ID	Description
4.6.2.2-1	LTE FDD, NR 15 kHz SSB SCS, 10MHz bandwidth, FDD duplex mode
4.6.2.2-2	LTE FDD, NR 15 kHz SSB SCS, 10MHz bandwidth, TDD duplex mode
4.6.2.2-3	LTE FDD, NR 30 kHz SSB SCS, 40MHz bandwidth, TDD duplex mode
4.6.2.2-4	LTE TDD, NR 15 kHz SSB SCS, 10MHz bandwidth, FDD duplex mode
4.6.2.2-5	LTE TDD, NR 15 kHz SSB SCS, 10MHz bandwidth, TDD duplex mode
4.6.2.2-6	LTE TDD, NR 30 kHz SSB SCS, 40MHz bandwidth, TDD duplex mode
NOTE 1: The UE is only required to be tested in one of the supported test configurations. NOTE 2: The target NR cell3 has the same SCS, BW and duplex mode as NR serving cell2.	

Table 4.6.2.2.4.1-2: General test parameters for EN-DC inter-frequency event triggered reporting without SSB time index detection in DRX

Parameter	Unit	Test configuration	Value				Comment
			Test 1	Test 2	Test 3	Test 4	
E-UTRA RF Channel Number		Config 1,2,3,4,5,6	1				One E-UTRAN TDD carrier frequencies is used.
NR RF Channel Number		Config 1,2,3,4,5,6	1, 2				Two FR1 NR carrier frequencies are used.
Active cell		Config 1,2,3,4,5,6	LTE Cell 1 (PCell) and NR cell 2 (PScell)				LTE Cell 1 is on E-UTRA RF channel number 1. NR Cell 2 is on NR RF channel number 1.
Neighbour cell		Config 1,2,3,4,5,6	NR cell 3				NR cell 3 is on NR RF channel number 2.
Gap Pattern Id		Config 1,2,3,4,5,6	0		4		As specified in TS 38.133 clause 9.1.2-1.
Measurement gap offset		Config 1,2,3,4,5,6	9		9		
A3-Offset	dB	Config 1,2,3,4,5,6	-6				
Hysteresis	dB	Config 1,2,3,4,5,6	0				
CP length		Config 1,2,3,4,5,6	Normal				
TimeToTrigger	s	Config 1,2,3,4,5,6	0				
Filter coefficient		Config 1,2,3,4,5,6	0				L3 filtering is not used

Parameter	Unit	Test configuration	Value				Comment
			Test 1	Test 2	Test 3	Test 4	
DRX	ms	Config 1,2,3,4,5,6	DRX.1	DRX.7	DRX.1	DRX.7	As specified in A.5
Time offset between PCell and PSCell		Config 1,2,3,4,5,6	3 μs				Synchronous EN-DC
Time offset between serving and neighbour cells		Config 1,4	3ms				Asynchronous cells. The timing of Cell 3 is 3ms later than the timing of Cell 2.
		Config 2,3,5,6	3μs				Synchronous cells.
T1	s	Config 1,2,3,4,5,6	5				
T2	s	Config 1,2,3,4,5,6	1.1	11	1.1	11	

Table 4.6.2.2.4.1-3: Test Environment parameters for EN-DC inter-frequency event triggered reporting without SSB time index detection in DRX

Parameter	Value		Comment
Test environment	NC		As specified in TS 38.508-1 [14] clause 4.1.
Test frequencies	As specified in Annex E, Table E.2-1 and TS 38.508-1 [14] clause 4.3.1 and 4.4.2.		
Channel bandwidth	As specified by the test configuration selected from Table 4.6.2.2.4.1-1.		
Propagation conditions	AWGN		As specified in clause C.2.2.
Connection Diagram	TE Part	A.3.1.8.2	As specified in TS 38.508-1 [14] Annex A.
	DUT Part	A.3.2.3.4	
Exceptions to connection diagram	For 4Rx capable UEs without any 2Rx RF bands use A.3.2.5.1 for DUT Part. and A.3.1.8.4 for TE Part		

1. Message contents are defined in clause 4.6.2.2.4.3.

2. Cell 1 is the E-UTRA serving cell (PCell) for the EN-DC setup. The power levels and settings for Cell 1 are set according to Annex A.6. Cell 2 and Cell 3 are NR FR1 cells in different frequencies. Cell 2 is the PSCell and Cell 3 is the target cell. The power levels and settings for Cell 2 and are set according to clause C.1.2 and clause C.1.3. Cell 3 is switched off during the initial connection setup.

4.6.2.2.4.2 Test procedure

In this test, there are three cells: LTE cell 1 as PCell on E-UTRA RF channel 1, NR cell 2 as PSCell in FR1 on NR RF channel 1 and NR cell 3 as neighbour cell in FR1 on NR RF channel 2.

In test 1&2 measurement gap pattern configuration # 0 as defined in Table 4.6.2.2.4.1-2 is provided for a UE that does not support per-FR gap and in test 3&4 measurement gap pattern configuration #4 as defined in Table 4.6.2.2.4.1-2 is provided for UE that support per-FR gap.

In the measurement control information, it is indicated to the UE that event-triggered reporting with Event A3 is used. The test consists of two successive time periods, with time duration of T1, and T2 respectively. During time duration T1, the UE shall not have any timing information of NR cell 3.

UE needs to be provided at least once every 500ms with new Timing Advance Command MAC control element to restart the Time alignment timer to keep UE uplink time alignment. Furthermore UE is allocated with PUSCH resource at every DRX cycle.

1. Ensure the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity EN-DC, DC bearer MCG and SCG, Connected without release *On* and Test Mode *On* according to TS 38.508-1 [14] clause 4.5.

2. Set the parameters according to T1 in Table 4.6.2.2.4.1-2 and Table 4.6.2.2.5-1.

3. The SS shall transmit an RRCConnectionReconfiguration message on Cell 1.

4. The UE shall transmit RRCConnectionReconfigurationComplete message. T1 starts.

5. When T1 expires, the SS shall switch the power setting from T1 to T2 as specified in Table 4.6.2.2.5-1. T2 starts.

6. UE shall transmit a MeasurementReport message triggered by Event A3 embedded in E-UTRA RRC message *ULInformationTransferMRDC*. If the overall delays measured from the beginning of time period T2 is less than 1080 ms for Test 1, 10240 ms for Test 2, 1080 ms for Test 3 and 10240 ms for Test 4 then the number of successful tests is increased by one. If the UE fails to report the event within the overall delays measured requirement then the number of failure tests is increased by one.

7. After the SS receives the MeasurementReport message in step 6 or when T2 expires, the SS shall transmit RRCConnectionReconfiguration message with condition EN-DC_PSCell_Rel according to TS 36.508 [25] Table 4.6.1-8 to release NR cell (PSCell). The UE shall transmit RRCConnectionReconfigurationComplete message.

8. Set Cell 3 physical cell identity = ((current cell 3 physical cell identity + 1) mod 14 + 2) for next iteration of the test procedure loop.

9. The SS shall transmit RRCConnectionReconfiguration message with condition MCG_and_SCG according to TS 36.508 [25] Table 4.6.1-8 to add NR cell (PSCell). The UE shall transmit RRCConnectionReconfigurationComplete message. If either of the reconfiguration in step 7 or step 9 fails, SS switches off and on the UE and ensures the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity EN-DC, DC bearer MCG and SCG, Connected without release *On* according to TS 38.508-1 [14] clause 4.5.

10. Repeat step 2-9 until the confidence level according to Tables G.2.3-1 in Annex G clause G.2 is achieved.

11. Repeat step 1-10 for each sub-test in Table 4.6.2.2.4.1-2 as appropriate.

4.6.2.2.4.3 Message contents

Message contents are according to TS 38.508-1 [14] clause 7.3 with the following exceptions:

Table 4.6.2.2.4.3-1: Common Exception messages for Additional EN-DC FR1-FR1 event triggered reporting with SSB test requirement

Default Message Contents	
Common contents of system information blocks exceptions	
Default RRC messages and information elements contents exceptions	Table H.3.1-1 Table H.3.1-2 with Condition INTER-FREQ Table H.3.1-4 with A3-offset = -6dB Table H.3.1-5 Table H.3.1-7 with Condition INTER-FREQ Table H.3.7-1 with Condition DRX.1 and Gap and INTER-FREQ for Test 1 and Test 3 Table H.3.7-1 with Condition DRX.7 and Gap and INTER-FREQ for Test 2 and Test 4 Table H.3.4-1a Table H.3.4-2 Table H.3.4-3 Table H.3.4-4 with Condition gapUE for Test 1 and Test 2 Table H.3.4-4 with Condition gapFR1 for Test 3 and Test 4 Table H.3.4-5 with Condition Pattern #0 and gap offset = 9 for Test 1 and Test 2 Table H.3.4-5 with Condition Pattern #4 and gap offset = 9 for Test 3 and Test 4
Specific message contents exceptions for Test Configuration 4.6.2.2-1 and 4.6.2.2-4	Table H.3.1-3 with Conditions INTER-FREQ MO Table 7.3.1-3 in TS 38.508-1 [14] with condition SMTC.5
Specific message contents exceptions for Test Configuration 4.6.2.2-2 and 4.6.2.2-5	Table H.3.1-3 with Conditions INTER-FREQ MO and Synchronous cells Table 7.3.1-3 in TS 38.508-1 [14] with condition SMTC.4
Specific message contents exceptions for Test Configuration 4.6.2.2-3 and 4.6.2.2-6	Table H.3.1-3 with Conditions INTER-FREQ MO and Synchronous cells Table 7.3.1-3 in TS 38.508-1 [14] with condition SMTC.4

Table 4.6.2.2.4.3-2: SchedulingRequest-Config for E-UTRAN PCell

Derivation Path: 36.508 [25], Table 4.6.3-20			
Information Element	**Value/remark**	**Comment**	**Condition**
SchedulingRequest-Config-DEFAULT ::= CHOICE {			
setup SEQUENCE {			
sr-ConfigIndex	23		TDD
}			
}			

4.6.2.2.5 Test requirement

Table 4.6.2.2.5-1 defines the primary level settings including test tolerances for all tests.

Table 4.6.2.2.5-1: Cell specific test parameters for EN-DC inter-frequency event triggered reporting without SSB time index detection

Parameter	Unit	Test configuration	Cell 2		Cell 3	
			T1	T2	T1	T2
NR RF Channel Number		Config 1,2,3,4,5,6	1		2	
Duplex mode		Config 1,4	FDD			
		Config 2,3,5,6	TDD			
$BW_{channel}$	MHz	Config 1,4	10: $N_{RB,c}$ = 52			
		Config 2,5	10: $N_{RB,c}$ = 52			
		Config 3,6	40: $N_{RB,c}$ = 106			
BWP BW	MHz	Config 1,4	10: $N_{RB,c}$ = 52			
		Config 2,5	10: $N_{RB,c}$ = 52			
		Config 3,6	40: $N_{RB,c}$ = 106			
TDD configuration		Config 2,5	TDDConf.1.1		TDDConf.1.1	
		Config 3,6	TDDConf.2.1		TDDConf.2.1	
Initial DL BWP		Config 1,2,3,4,5,6	DLBWP.0.1		NA	
Initial UL BWP		Config 1,2,3,4,5,6	ULBWP.0.1		NA	
Dedicated DL BWP		Config 1,2,3,4,5,6	DLBWP.1.1		NA	
Dedicated UL BWP		Config 1,2,3,4,5,6	ULBWP.1.1		NA	
TRS configuration		Config 1,4	TRS.1.1 FDD		NA	
		Config 2,5	TRS.1.1 TDD		NA	
		Config 3,6	TRS.1.2 TDD		NA	
OCNG Patterns		Config 1,2,3,4,5,6	OP.1		OP.1	
PDSCH Reference measurement channel		Config 1,4	SR.1.1 FDD		-	
		Config 2,5	SR.1.1 TDD			
		Config 3,6	SR 2.1 TDD			
RMSI CORESET Reference Channel		Config 1,4	CR.1.1 FDD		-	
		Config 2,5	CR.1.1 TDD			
		Config 3,6	CR 2.1 TDD			
Dedicated CORESET Reference Channel		Config 1,4	CCR.1.1 FDD		-	
		Config 2,5	CCR.1.1 TDD			
		Config 3,6	CCR 2.1 TDD			
SSB parameters		Config 1,4	SSB.1 FR1		SSB.5 FR1	
		Config 2,5	SSB.1 FR1		SSB.5 FR1	
		Config 3,6	SSB.2 FR1		SSB.6 FR1	
SMTC configuration		Config 1,4	SMTC.2		SMTC.5	
		Config 2,3,5,6	SMTC.1		SMTC.4	
PDSCH/PDCCH subcarrier spacing	kHz	Config 1,2,4,5	15			
		Config 3,6	30			
EPRE ratio of PSS to SSS		Config 1,2,3,4,5,6	0		0	
EPRE ratio of PBCH DMRS to SSS						

Parameter	Unit	Test configuration	Cell 2		Cell 3	
			T1	T2	T1	T2
EPRE ratio of PBCH to PBCH DMRS						
EPRE ratio of PDCCH DMRS to SSS						
EPRE ratio of PDCCH to PDCCH DMRS						
EPRE ratio of PDSCH DMRS to SSS						
EPRE ratio of PDSCH to PDSCH						
EPRE ratio of OCNG DMRS to SSS(Note 1)						
EPRE ratio of OCNG to OCNG DMRS (Note 1)						
N_{oc} Note2	dBm/15kHz		-98		-98	
N_{oc} Note2	dBm/SCS	Config 1,2,4,5	-98		-98	
		Config 3,6	-95		-95	
SS-RSRP Note 3	dBm/SCS	Config 1,2,4,5	-94	-94	-Infinity	-91
		Config 3,6	-91	-91	-Infinity	-88
$\hat{E}_s / I_{ot}$	dB	Config 1,2,3,4,5,6	4	4	-Infinity	7
$\hat{E}_s / N_{oc}$	dB	Config 1,2,3,4,5,6	4	4	-Infinity	7
Io Note3	dBm/9.36MHz	Config 1,2,4,5	-64.59	-64.59	-70.05	-62.26
	dBm/38.16MHz	Config 3,6	-58.49	-58.49	-63.94	-56.15
Propagation Condition		Config 1,2,3,4,5,6	AWGN		AWGN	

NOTE 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.
NOTE 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for N_{oc} to be fulfilled.
NOTE 3: SS-RSRP and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.
NOTE 4: SS-RSRP minimum requirements are specified assuming independent interference and noise at each receiver antenna port.

In test 1 with per-UE gap, the UE shall send one Event A3 triggered measurement report, with a measurement reporting delay less than 1080 ms from the beginning of time period T2. The UE shall not send event triggered measurement reports, as long as the reporting criteria are not fulfilled. The rate of correct events observed during repeated tests shall be at least 90% with a confidence level of 95%.

In test 2 with per-UE gap, the UE shall send one Event A3 triggered measurement report, with a measurement reporting delay less than 10240 ms from the beginning of time period T2. The UE shall not send event triggered measurement reports, as long as the reporting criteria are not fulfilled. The rate of correct events observed during repeated tests shall be at least 90% with a confidence level of 95%.

In test 3 with per-FR gap, the UE shall send one Event A3 triggered measurement report, with a measurement reporting delay less than 1080 ms from the beginning of time period T2. The UE shall not send event triggered measurement reports, as long as the reporting criteria are not fulfilled. The rate of correct events observed during repeated tests shall be at least 90% with a confidence level of 95%.

In test 4 with per-FR gap, the UE shall send one Event A3 triggered measurement report, with a measurement reporting delay less than 10240 ms from the beginning of time period T2. The UE shall not send event triggered measurement reports, as long as the reporting criteria are not fulfilled. The rate of correct events observed during repeated tests shall be at least 90% with a confidence level of 95%.

In test 1, 2, 3 and 4 UE is not required to report SSB time index.

NOTE: The actual overall delays measured in the test may be up to $2xTTI_{DCCH}$ higher than the measurement reporting delays above because of TTI insertion uncertainty of the measurement report in DCCH.

4.6.2.3 Void

4.6.2.4 Void

4.6.2.5 EN-DC FR1-FR1 event-triggered reporting in non-DRX with SSB time index detection

4.6.2.5.1 Test purpose

The purpose of this test is to verify that the UE makes correct reporting of an event in non-DRX within EN-DC inter-frequency NR cell search requirements with SSB time index detection in TS 38.133 [6] clause 9.3.4.

4.6.2.5.2 Test applicability

This test applies to all types of E-UTRA UE release 15 and forward, supporting EN-DC. Test 1 is applicable to UEs not supporting per-FR gap (IndependentGapConfig, as defined in TS 38.306 [11]) and Test 2 is applicable only to UEs supporting per-FR gap and Gap Pattern Id 4.

4.6.2.5.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 4.6.2.0.

The normative reference for this requirement is TS 38.133 [6] clause A.4.6.2.3.

4.6.2.5.4 Test description

4.6.2.5.4.1 Initial conditions

This test shall be tested using any of the test configurations in Table 4.6.2.5.4.1-1. Configure the test equipment and the DUT according to the parameters in Table 4.6.2.5.4.1-2. Test environment parameters are given in Table 4.6.2.5.4.1-3.

Table 4.6.2.5.4.1-1: EN-DC FR1-FR1 event triggered reporting tests in non-DRX with SSB time index detection supported test configurations

Test Case ID	Description
4.6.2.5 -1	LTE FDD, NR 15 kHz SSB SCS, 10MHz bandwidth, FDD duplex mode
4.6.2.5 -2	LTE FDD, NR 15 kHz SSB SCS, 10MHz bandwidth, TDD duplex mode
4.6.2.5 -3	LTE FDD, NR 30 kHz SSB SCS, 40MHz bandwidth, TDD duplex mode
4.6.2.5 -4	LTE TDD, NR 15 kHz SSB SCS, 10MHz bandwidth, FDD duplex mode
4.6.2.5 -5	LTE TDD, NR 15 kHz SSB SCS, 10MHz bandwidth, TDD duplex mode
4.6.2.5 -6	LTE TDD, NR 30 kHz SSB SCS, 40MHz bandwidth, TDD duplex mode
NOTE 1: The UE is only required to be tested in one of the supported test configurations. NOTE 2: The target NR cell3 has the same SCS, BW and duplex mode as NR serving cell2.	

Table 4.6.2.5.4.1-2: General test parameters for EN-DC inter-frequency event triggered reporting with SSB time index detection in non-DRX

Parameter	Unit	Test configuration	Value		Comment
			Test 1	Test 2	
E-UTRA RF Channel Number		Config 1,2,3,4,5,6	1		One E-UTRAN TDD carrier frequencies is used.
NR RF Channel Number		Config 1,2,3,4,5,6	1, 2		Two FR1 NR carrier frequencies are used.

Parameter	Unit	Test configuration	Value		Comment
			Test 1	Test 2	
Active cell		Config 1,2,3,4,5,6	LTE Cell 1 (PCell) and NR cell 2 (PScell)		LTE Cell 1 is on E-UTRA RF channel number 1. NR Cell 2 is on NR RF channel number 1.
Neighbour cell		Config 1,2,3,4,5,6	NR cell 3		NR cell 3 is on NR RF channel number 2.
Gap Pattern Id		Config 1,2,3,4,5,6	0	4	As specified in TS 38.133 clause 9.1.2-1.
Measurement gap offset		Config 1,2,3,4,5,6	9	9	
A3-Offset	dB	Config 1,2,3,4,5,6	-6		
Hysteresis	dB	Config 1,2,3,4,5,6	0		
CP length		Config 1,2,3,4,5,6	Normal		
TimeToTrigger	s	Config 1,2,3,4,5,6	0		
Filter coefficient		Config 1,2,3,4,5,6	0		L3 filtering is not used
DRX		Config 1,2,3,4,5,6	OFF		DRX is not used
Time offset between PCell and PSCell		Config 1,2,3,4,5,6	3 µs		Synchronous EN-DC
Time offset between serving and neighbour cells		Config 1,4	3ms		Asynchronous cells. The timing of Cell 3 is 3ms later than the timing of Cell 2.
		Config 2,3,5,6	3µs		Synchronous cells.
T1	s	Config 1,2,3,4,5,6	5		
T2	s	Config 1,2,3,4,5,6	1.1	1	

Table 4.6.2.5.4.1-3: Test Environment parameters for EN-DC inter-frequency event triggered reporting with SSB time index detection in non-DRX

Parameter	Value		Comment
Test environment	NC		As specified in TS 38.508-1 [14] clause 4.1.
Test frequencies	As specified in Annex E, Table E.2-1 and TS 38.508-1 [14] clause 4.3.1 and 4.4.2.		
Channel bandwidth	As specified by the test configuration selected from Table 4.6.2.5.4.1-1.		
Propagation conditions	AWGN		As specified in clause C.2.2.
Connection Diagram	TE Part	A.3.1.8.2	As specified in TS 38.508-1 [14] Annex A.
	DUT Part	A.3.2.3.4	
Exceptions to connection diagram	- For 4Rx capable UEs without any 2Rx RF bands use A.3.2.5.1 for DUT Part. and A.3.1.8.4 for TE Part		

1. Message contents are defined in clause 4.6.2.5.4.3.

2. Cell 1 is the E-UTRA serving cell (PCell) for the EN-DC setup. The power levels and settings for Cell 1 are set according to Annex A.6. Cell 2 and Cell 3 are NR FR1 cells in different frequencies. Cell 2 is the PSCell and Cell 3 is the target cell. The power levels and settings for Cell 2 and are set according to clause C.1.2 and clause C.1.3. Cell 3 is switched off during the initial connection setup.

4.6.2.5.4.2 Test procedure

In this test, there are three cells: LTE cell 1 as PCell on E-UTRA RF channel 1, NR cell 2 as PSCell in FR1 on NR RF channel 1 and NR cell 3 as neighbour cell in FR1 on NR RF channel 2.

In test 1 measurement gap pattern configuration # 0 as defined in Table 4.6.2.5.4.1-2 is provided for a UE that does not support per-FR gap and in test 2 measurement gap pattern configuration #4 as defined in Table 4.6.2.5.4.1-2 is provided for UE that support per-FR gap.

In the measurement control information, it is indicated to the UE that event-triggered reporting with Event A3 is used. The test consists of two successive time periods, with time duration of T1, and T2 respectively. During time duration T1, the UE shall not have any timing information of NR cell 3.

1. Ensure the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity EN-DC, DC bearer MCG and SCG, Connected without release *On* and Test Mode *On* according to TS 38.508-1 [14] clause 4.5.
2. Set the parameters according to T1 in Table 4.6.2.5.4.1-2.
3. The SS shall transmit an RRCConnectionReconfiguration message on Cell 1.
4. The UE shall transmit RRCConnectionReconfigurationComplete message. T1 starts.
5. When T1 expires, the SS shall switch the power setting from T1 to T2 as specified in Table 4.6.2.5.4.1-2. T2 starts.
6. UE shall transmit a MeasurementReport message triggered by Event A3 embedded in E-UTRA RRC message *ULInformationTransferMRDC*. If the overall delays measured from the beginning of time period T2 is less than 1040 ms for Test 1 and 880 ms for Test 2 then the number of successful tests is increased by one. If the UE fails to report the event within the overall delays measured requirement then the number of failure tests is increased by one.
7. After the SS receives the MeasurementReport message in step 6 or when T2 expires, the SS shall transmit RRCConnectionReconfiguration message with condition EN-DC_PSCell_Rel according to TS 36.508 [25] Table 4.6.1-8 to release NR cell (PSCell). The UE shall transmit RRCConnectionReconfigurationComplete message.
8. Set Cell 3 physical cell identity = ((current cell 3 physical cell identity + 1) mod 14 + 2) for next iteration of the test procedure loop.
9. The SS shall transmit RRCConnectionReconfiguration message with condition MCG_and_SCG according to TS 36.508 [25] Table 4.6.1-8 to add NR cell (PSCell). The UE shall transmit RRCConnectionReconfigurationComplete message. If either of the reconfiguration in step 7 or step 9 fails, switches off and on the UE and ensures the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity EN-DC, DC bearer MCG and SCG, Connected without release *On* according to TS 38.508-1 [14] clause 4.5.)
10. Repeat step 2-9 until the confidence level according to Tables G.2.3-1 in Annex G clause G.2 is achieved.
11. Repeat step 1-10 for each sub-test in Table 4.6.2.5.4.1-2 as appropriate.

4.6.2.5.4.3 Message contents

Message contents are according to TS 38.508-1 [14] clause 7.3 with the following exceptions:

Table 4.6.2.5.4.3-1: Common Exception messages for Additional EN-DC FR1-FR1 event triggered reporting tests in non-DRX with SSB test requirement

Default Message Contents	
Common contents of system information blocks exceptions	

Default RRC messages and information elements contents exceptions	Table H.3.1-1 Table H.3.1-2 with Condition INTER-FREQ Table H.3.1-4 with A3-offset = -6dB and with Condition SSB Index Table H.3.1-5 Table H.3.1-7 with Condition INTER-FREQ and SSB Index Table H.3.4-1a Table H.3.4-2 Table H.3.4-3 Table H.3.4-4 with Condition gapUE for Test 1 Table H.3.4-4 with Condition gapFR1 for Test 2 Table H.3.4-5 with Condition Pattern #0 and gap offset = 9 for Test 1 Table H.3.4-5 with Condition Pattern #4 and gap offset = 9 for Test 2
Specific message contents exceptions for Test Configuration 4.6.2.5-1 and 4.6.2.5-4	Table H.3.1-3 with Conditions INTER-FREQ MO Table 7.3.1-3 in TS 38.508-1 [14] with condition SMTC.5
Specific message contents exceptions for Test Configuration 4.6.2.5-2 and 4.6.2.5-5	Table H.3.1-3 with Conditions INTER-FREQ MO and Synchronous cells Table 7.3.1-3 in TS 38.508-1 [14] with condition SMTC.4
Specific message contents exceptions for Test Configuration 4.6.2.5-3 and 4.6.2.5-6	Table H.3.1-3 with Conditions INTER-FREQ MO and Synchronous cells Table 7.3.1-3 in TS 38.508-1 [14] with condition SMTC.4

Table 4.6.2.5.4.3-2: SchedulingRequest-Config for E-UTRAN PCell

Derivation Path: 36.508 [25], Table 4.6.3-20			
Information Element	**Value/remark**	**Comment**	**Condition**
SchedulingRequest-Config-DEFAULT ::= CHOICE {			
setup SEQUENCE {			
sr-ConfigIndex	23		TDD
}			
}			

4.6.2.5.5 Test requirement

Table 4.6.2.5.5-1 defines the primary level settings including test tolerances for all tests.

Table 4.6.2.5.5-1: Cell specific test parameters for EN-DC inter-frequency event triggered reporting with SSB time index detection

Parameter	Unit	Test configuration	Cell 2		Cell 3	
			T1	T2	T1	T2
NR RF Channel Number		Config 1,2,3,4,5,6	1		2	
Duplex mode		Config 1,4	FDD			
		Config 2,3,5,6	TDD			
$BW_{channel}$	MHz	Config 1,4	10: $N_{RB,c}$ = 52			
		Config 2,5	10: $N_{RB,c}$ = 52			
		Config 3,6	40: $N_{RB,c}$ = 106			
BWP BW	MHz	Config 1,4	10: $N_{RB,c}$ = 52			
		Config 2,5	10: $N_{RB,c}$ = 52			
		Config 3,6	40: $N_{RB,c}$ = 106			
TDD configuration		Config 2,5	TDDConf.1.1		TDDConf.1.1	
		Config 3,6	TDDConf.2.1		TDDConf.2.1	
Initial DL BWP		Config 1,2,3,4,5,6	DLBWP.0.1		NA	
Initial UL BWP		Config 1,2,3,4,5,6	ULBWP.0.1		NA	
Dedicated DL BWP		Config 1,2,3,4,5,6	DLBWP.1.1		NA	
Dedicated UL BWP		Config 1,2,3,4,5,6	ULBWP.1.1		NA	
TRS configuration		Config 1,4	TRS.1.1 FDD		NA	
		Config 2,5	TRS.1.1 TDD		NA	
		Config 3,6	TRS.1.2 TDD		NA	
OCNG Patterns		Config 1,2,3,4,5,6	OP.1		OP.1	

Parameter	Unit	Test configuration	Cell 2		Cell 3	
			T1	T2	T1	T2
PDSCH Reference measurement channel		Config 1,4	SR.1.1 FDD		-	
		Config 2,5	SR.1.1 TDD			
		Config 3,6	SR 2.1 TDD			
RMSI CORESET Reference Channel		Config 1,4	CR.1.1 FDD		-	
		Config 2,5	CR.1.1 TDD			
		Config 3,6	CR 2.1 TDD			
Dedicated CORESET Reference Channel		Config 1,4	CCR.1.1 FDD		-	
		Config 2,5	CCR.1.1 TDD			
		Config 3,6	CCR 2.1 TDD			
SSB parameters		Config 1,4	SSB.1 FR1		SSB.5 FR1	
		Config 2,5	SSB.1 FR1		SSB.5 FR1	
		Config 3,6	SSB.2 FR1		SSB.6 FR1	
SMTC configuration		Config 1,4	SMTC.2		SMTC.5	
		Config 2,3,5,6	SMTC.1		SMTC.4	
PDSCH/PDCCH subcarrier spacing	kHz	Config 1,2,4,5	15			
		Config 3,6	30			
EPRE ratio of PSS to SSS		Config 1,2,3,4,5,6	0		0	
EPRE ratio of PBCH DMRS to SSS						
EPRE ratio of PBCH to PBCH DMRS						
EPRE ratio of PDCCH DMRS to SSS						
EPRE ratio of PDCCH to PDCCH DMRS						
EPRE ratio of PDSCH DMRS to SSS						
EPRE ratio of PDSCH to PDSCH						
EPRE ratio of OCNG DMRS to SSS(Note 1)						
EPRE ratio of OCNG to OCNG DMRS (Note 1)						
N_{oc} Note2	dBm/15kHz		-98		-98	
N_{oc} Note2	dBm/SCS	Config 1,2,4,5	-98		-98	
		Config 3,6	-95		-95	
SS-RSRP Note 3	dBm/SCS	Config 1,2,4,5	-94	-94	-Infinity	-91
		Config 3,6	-91	-91	-Infinity	-88
$\hat{E}_s / I_{ot}$	dB	Config 1,2,3,4,5,6	4	4	-Infinity	7
$\hat{E}_s / N_{oc}$	dB	Config 1,2,3,4,5,6	4	4	-Infinity	7
Io Note3	dBm/9.36MHz	Config 1,2,4,5	-64.59	-64.59	-70.05	-62.26
	dBm/38.16MHz	Config 3,6	-58.49	-58.49	-63.94	-56.15
Propagation Condition		Config 1,2,3,4,5,6	AWGN		AWGN	

NOTE 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.
NOTE 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for N_{oc} to be fulfilled.
NOTE 3: SS-RSRP and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.
NOTE 4: SS-RSRP minimum requirements are specified assuming independent interference and noise at each receiver antenna port.

In test 1 with per-UE gap, the UE shall send one Event A3 triggered measurement report, with a measurement reporting delay less than 1040 ms from the beginning of time period T2. The UE shall not send event triggered measurement

reports, as long as the reporting criteria are not fulfilled. The rate of correct events observed during repeated tests shall be at least 90% with a confidence level of 95%.

In test 2 with per-FR gap, the UE shall send one Event A3 triggered measurement report, with a measurement reporting delay less than 880 ms from the beginning of time period T2. The UE shall not send event triggered measurement reports, as long as the reporting criteria are not fulfilled. The rate of correct events observed during repeated tests shall be at least 90% with a confidence level of 95%.

In test 1 and 2 UE is required to report SSB time index.

NOTE: The actual overall delays measured in the test may be up to $2xTTI_{DCCH}$ higher than the measurement reporting delays above because of TTI insertion uncertainty of the measurement report in DCCH.

4.6.2.6 EN-DC FR1-FR1 event-triggered reporting in DRX with SSB time index detection

4.6.2.6.1 Test purpose

The purpose of this test is to verify that the UE makes correct reporting of an event in DRX within EN-DC inter-frequency NR cell search requirements with SSB time index detection in TS 38.133 [6] clause 9.3.4.

4.6.2.6.2 Test applicability

This test applies to all types of E-UTRA UE release 15 and forward, supporting EN-DC FR1 and long DRX cycle. Test 1 and Test 2 are applicable to UEs not supporting per-FR gap (IndependentGapConfig, as defined in TS 38.306 [11]) and Test 3 and Test 4 are applicable only to UEs supporting per-FR gap and Gap Pattern Id 4.

4.6.2.6.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 4.6.2.0.

The normative reference for this requirement is TS 38.133 [6] clause A. 4.6.2.6.

4.6.2.6.4 Test description

4.6.2.6.4.1 Initial conditions

This test shall be tested using any of the test configurations in Table 4.6.2.6.4.1-1. Configure the test equipment and the DUT according to the parameters in Table 4.6.2.6.4.1-2. Test environment parameters are given in Table 4.6.2.6.4.1-3.

Table 4.6.2.6.4.1-1: EN-DC FR1-FR1 event triggered reporting tests in DRX with SSB time index detection supported test configurations

Test Case ID	Description
4.6.2.6-1	LTE FDD, NR 15 kHz SSB SCS, 10MHz bandwidth, FDD duplex mode
4.6.2.6-2	LTE FDD, NR 15 kHz SSB SCS, 10MHz bandwidth, TDD duplex mode
4.6.2.6-3	LTE FDD, NR 30 kHz SSB SCS, 40MHz bandwidth, TDD duplex mode
4.6.2.6-4	LTE TDD, NR 15 kHz SSB SCS, 10MHz bandwidth, FDD duplex mode
4.6.2.6-5	LTE TDD, NR 15 kHz SSB SCS, 10MHz bandwidth, TDD duplex mode
4.6.2.6-6	LTE TDD, NR 30 kHz SSB SCS, 40MHz bandwidth, TDD duplex mode
NOTE 1: The UE is only required to be tested in one of the supported test configurations. NOTE 2: The target NR cell3 has the same SCS, BW and duplex mode as NR serving cell2.	

Table 4.6.2.6.4.1-2: General test parameters for EN-DC inter-frequency event triggered reporting with SSB time index detection in DRX

Parameter	Unit	Test configuration	Value				Comment
			Test 1	Test 2	Test 3	Test 4	
E-UTRA RF Channel Number		Config 1,2,3,4,5,6	1				One E-UTRAN TDD carrier frequencies is used.

Parameter	Unit	Test configuration	Value				Comment
			Test 1	Test 2	Test 3	Test 4	
NR RF Channel Number		Config 1,2,3,4,5,6	1, 2				Two FR1 NR carrier frequencies are used.
Active cell		Config 1,2,3,4,5,6	LTE Cell 1 (PCell) and NR cell 2 (PScell)				LTE Cell 1 is on E-UTRA RF channel number 1. NR Cell 2 is on NR RF channel number 1.
Neighbour cell		Config 1,2,3,4,5,6	NR cell 3				NR cell 3 is on NR RF channel number 2.
Gap Pattern Id		Config 1,2,3,4,5,6	0		4		As specified in TS 38.133 clause 9.1.2-1.
Measurement gap offset		Config 1,2,3,4,5,6	9		9		
A3-Offset	dB	Config 1,2,3,4,5,6	-6				
Hysteresis	dB	Config 1,2,3,4,5,6	0				
CP length		Config 1,2,3,4,5,6	Normal				
TimeToTrigger	s	Config 1,2,3,4,5,6	0				
Filter coefficient		Config 1,2,3,4,5,6	0				L3 filtering is not used
DRX	ms	Config 1,2,3,4,5,6	DRX. 1	DRX. 7	DRX. 1	DRX. 7	As specified in clause A.5
Time offset between PCell and PSCell		Config 1,2,3,4,5,6	3 µs				Synchronous EN-DC
Time offset between serving and neighbour cells		Config 1,4	3ms				Asynchronous cells. The timing of Cell 3 is 3ms later than the timing of Cell 2.
		Config 2,3,5,6	3µs				Synchronous cells.
T1	s	Config 1,2,3,4,5,6	5				
T2	s	Config 1,2,3,4,5,6	1.3	13.5	1.3	13.5	

Table 4.6.2.6.4.1-3: Test Environment parameters for EN-DC inter-frequency event triggered reporting with SSB time index detection in DRX

Parameter	Value		Comment
Test environment	NC		As specified in TS 38.508-1 [14] clause 4.1.
Test frequencies	As specified in Annex E, Table E.2-1 and TS 38.508-1 [14] clause 4.3.1 and 4.4.2.		
Channel bandwidth	As specified by the test configuration selected from Table 4.6.2.6.4.1-1.		
Propagation conditions	AWGN		As specified in clause C.2.2.
Connection Diagram	TE Part	A.3.1.8.2	As specified in TS 38.508-1 [14] Annex A.
	DUT Part	A.3.2.3.4	
Exceptions to connection diagram	For 4Rx capable UEs without any 2Rx RF bands use A.3.2.5.1 for DUT Part. and A.3.1.8.4 for TE Part		

1. Message contents are defined in clause 4.6.2.6.4.3.

2. Cell 1 is the E-UTRA serving cell (PCell) for the EN-DC setup. The power levels and settings for Cell 1 are set according to Annex A.6. Cell 2 and Cell 3 are NR FR1 cells in different frequencies. Cell 2 is the PSCell and Cell 3 is the target cell. The power levels and settings for Cell 2 and are set according to clause C.1.2 and clause C.1.3. Cell 3 is switched off during the initial connection setup.

4.6.2.6.4.2 Test procedure

In this test, there are three cells: LTE cell 1 as PCell on E-UTRA RF channel 1, NR cell 2 as PSCell in FR1 on NR RF channel 1 and NR cell 3 as neighbour cell in FR1 on NR RF channel 2.

In test 1&2 measurement gap pattern configuration # 0 as defined in Table 4.6.2.6.4.1-2 is provided for a UE that does not support per-FR gap and in test 3&4 measurement gap pattern configuration #4 as defined in Table 4.6.2.6.4.1-2 is provided for UE that support per-FR gap.

In the measurement control information, it is indicated to the UE that event-triggered reporting with Event A3 is used. The test consists of two successive time periods, with time duration of T1, and T2 respectively. During time duration T1, the UE shall not have any timing information of NR cell 3.

UE needs to be provided at least once every 500ms with new Timing Advance Command MAC control element to restart the Time alignment timer to keep UE uplink time alignment. Furthermore UE is allocated with PUSCH resource at every DRX cycle.

1. Ensure the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity EN-DC, DC bearer MCG and SCG, Connected without release *On* and Test Mode *On* according to TS 38.508-1 [14] clause 4.5.

2. Set the parameters according to T1 in Table 4.6.2.6.4.1-2 and Table 4.6.2.6.5-1.

3. The SS shall transmit an RRCConnectionReconfiguration message on Cell 1.

4. The UE shall transmit RRCConnectionReconfigurationComplete message. T1 starts.

5. When T1 expires, the SS shall switch the power setting from T1 to T2 as specified in Table 4.6.2.6.5-1. T2 starts.

6. UE shall transmit a MeasurementReport message triggered by Event A3 embedded in E-UTRA RRC message *ULInformationTransferMRDC*. If the overall delays measured from the beginning of time period T2 is less than 1280 ms for Test 1, 13440 ms for Test 2, 1280 ms for Test 3 and 13440 ms for Test 4 then the number of successful tests is increased by one. If the UE fails to report the event within the overall delays measured requirement then the number of failure tests is increased by one.

7. After the SS receives the MeasurementReport message in step 6 or when T2 expires, the SS shall transmit RRCConnectionReconfiguration message with condition EN-DC_PSCell_Rel according to TS 36.508 [25] Table 4.6.1-8 to release NR cell (PSCell). The UE shall transmit RRCConnectionReconfigurationComplete message.

8. Set Cell 3 physical cell identity = ((current cell 3 physical cell identity + 1) mod 14 + 2) for next iteration of the test procedure loop.]

9. The SS shall transmit RRCConnectionReconfiguration message with condition MCG_and_SCG according to TS 36.508 [25] Table 4.6.1-8 to add NR cell (PSCell). The UE shall transmit RRCConnectionReconfigurationComplete message. If either of the reconfiguration in step 7 or step 9 fails, SS switches off and on the UE and ensures the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity EN-DC, DC bearer MCG and SCG, Connected without release *On* according to TS 38.508-1 [14] clause 4.5.

10. Repeat step 2-9 until the confidence level according to Tables G.2.3-1 in Annex G clause G.2 is achieved.

11. Repeat step 1-10 for each sub-test in Table 4.6.2.6.4.1-2 as appropriate.

4.6.2.6.4.3 Message contents

Message contents are according to TS 38.508-1 [14] clause 7.3 with the following exceptions:

Table 4.6.2.6.4.3-1: Common Exception messages for Additional EN-DC FR1-FR1 event triggered reporting in DRX with SSB test requirement

Default Message Contents	
Common contents of system information blocks exceptions	

Default RRC messages and information elements contents exceptions	Table H.3.1-1 Table H.3.1-2 with Condition INTER-FREQ Table H.3.1-4 with A3-offset = -6dB and with Condition SSB Index Table H.3.1-5 Table H.3.1-7 with Condition INTER-FREQ and SSB Index Table H.3.7-1 with Condition DRX.1 and Gap and INTER-FREQ for Test 1 and Test 3 Table H.3.7-1 with Condition DRX.7 and Gap and INTER-FREQ for Test 2 and Test 4 Table H.3.4-1a Table H.3.4-2 Table H.3.4-3 Table H.3.4-4 with Condition gapUE for Test 1 and Test 2 Table H.3.4-4 with Condition gapFR1 for Test 3 and Test 4 Table H.3.4-5 with Condition Pattern #0 and gap offset = 9 for Test 1 and Test 2 Table H.3.4-5 with Condition Pattern #4 and gap offset = 9 for Test 3 and Test 4
Specific message contents exceptions for Test Configuration 4.6.2.6-1 and 4.6.2.6-4	Table H.3.1-3 with Conditions INTER-FREQ MO Table 7.3.1-3 in TS 38.508-1 [14] with condition SMTC.5
Specific message contents exceptions for Test Configuration 4.6.2.6-2 and 4.6.2.6-5	Table H.3.1-3 with Conditions INTER-FREQ MO and Synchronous cells Table 7.3.1-3 in TS 38.508-1 [14] with condition SMTC.4
Specific message contents exceptions for Test Configuration 4.6.2.6-3 and 4.6.2.6-6	Table H.3.1-3 with Conditions INTER-FREQ MO and Synchronous cells Table 7.3.1-3 in TS 38.508-1 [14] with condition SMTC.4

Table 4.6.2.6.4.3-2: SchedulingRequest-Config for E-UTRAN PCell

Derivation Path: 36.508 [25], Table 4.6.3-20			
Information Element	**Value/remark**	**Comment**	**Condition**
SchedulingRequest-Config-DEFAULT ::= CHOICE {			
setup SEQUENCE {			
sr-ConfigIndex	23		TDD
}			
}			

4.6.2.6.5 Test requirement

Table 4.6.2.6.5-1 defines the primary level settings including test tolerances for all tests.

Table 4.6.2.6.5-1: Cell specific test parameters for EN-DC inter-frequency event triggered reporting with SSB time index detection

Parameter	Unit	Test configuration	Cell 2		Cell 3	
			T1	T2	T1	T2
NR RF Channel Number		Config 1,2,3,4,5,6	1		2	
Duplex mode		Config 1,4	FDD			
		Config 2,3,5,6	TDD			
$BW_{channel}$	MHz	Config 1,4	10: $N_{RB,c}$ = 52			
		Config 2,5	10: $N_{RB,c}$ = 52			
		Config 3,6	40: $N_{RB,c}$ = 106			
BWP BW	MHz	Config 1,4	10: $N_{RB,c}$ = 52			
		Config 2,5	10: $N_{RB,c}$ = 52			
		Config 3,6	40: $N_{RB,c}$ = 106			
OCNG Patterns		Config 1,2,3,4,5,6	OP.1		OP.1	
PDSCH Reference measurement channel		Config 1,4	SR.1.1 FDD		-	
		Config 2,5	SR.1.1 TDD			
		Config 3,6	SR 2.1 TDD			
RMSI CORESET Reference Channel		Config 1,4	CR.1.1 FDD		-	
		Config 2,5	CR.1.1 TDD			
		Config 3,6	CR 2.1 TDD			

Parameter	Unit	Test configuration	Cell 2		Cell 3	
			T1	T2	T1	T2
Dedicated CORESET Reference Channel		Config 1,4	CCR.1.1 FDD		-	
		Config 2,5	CCR.1.1 TDD			
		Config 3,6	CCR 2.1 TDD			
TDD configuration		Config 2,5	TDDConf.1.1			
		Config 3,6	TDDConf.2.1			
Initial DL BWP		Config 1,2,3,4,5,6	DLBWP.0.1			
Initial UL BWP		Config 1,2,3,4,5,6	ULBWP.0.1			
Dedicated DL BWP		Config 1,2,3,4,5,6	DLBWP.1.1			
Dedicated UL BWP		Config 1,2,3,4,5,6	ULBWP.1.1			
TRS configuration		Config 1,4	TRS.1.1 FDD		N/A	
		Config 2,5	TRS.1.1 TDD		N/A	
		Config 3,6	TRS.1.2 TDD		N/A	
SSB parameters		Config 1,4	SSB.1 FR1		SSB.5 FR1	
		Config 2,5	SSB.1 FR1		SSB.5 FR1	
		Config 3,6	SSB.2 FR1		SSB.6 FR1	
SMTC configuration		Config 1,4	SMTC.2		SMTC.5	
		Config 2,3,5,6	SMTC.1		SMTC.4	
PDSCH/PDCCH subcarrier spacing	kHz	Config 1,2,4,5	15			
		Config 3,6	30			
EPRE ratio of PSS to SSS		Config 1,2,3,4,5,6	0		0	
EPRE ratio of PBCH DMRS to SSS						
EPRE ratio of PBCH to PBCH DMRS						
EPRE ratio of PDCCH DMRS to SSS						
EPRE ratio of PDCCH to PDCCH DMRS						
EPRE ratio of PDSCH DMRS to SSS						
EPRE ratio of PDSCH to PDSCH						
EPRE ratio of OCNG DMRS to SSS(Note 1)						
EPRE ratio of OCNG to OCNG DMRS (Note 1)						
N_{oc} Note2	dBm/15kHz		-98		-98	
N_{oc} Note2	dBm/SCS	Config 1,2,4,5	-98		-98	
		Config 3,6	-95		-95	
SS-RSRP Note 3	dBm/SCS	Config 1,2,4,5	-94	-94	-Infinity	-91
		Config 3,6	-91	-91	-Infinity	-88
$\hat{E}_s / I_{ot}$	dB	Config 1,2,3,4,5,6	4	4	-Infinity	7
$\hat{E}_s / N_{oc}$	dB	Config 1,2,3,4,5,6	4	4	-Infinity	7
Io Note3	dBm/9.36MHz	Config 1,2,4,5	-64.59	-64.59	-70.05	-62.26
	dBm/38.16MHz	Config 3,6	-58.49	-58.49	-63.94	-56.15
Propagation Condition		Config 1,2,3,4,5,6	AWGN		AWGN	

Parameter	Unit	Test configuration	Cell 2		Cell 3	
			T1	T2	T1	T2
NOTE 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols. NOTE 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for N_{oc} to be fulfilled. NOTE 3: SS-RSRP and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves. NOTE 4: SS-RSRP minimum requirements are specified assuming independent interference and noise at each receiver antenna port.						

In test 1 with per-UE gap, the UE shall send one Event A3 triggered measurement report, with a measurement reporting delay less than 1280 ms from the beginning of time period T2. The UE shall not send event triggered measurement reports, as long as the reporting criteria are not fulfilled. The rate of correct events observed during repeated tests shall be at least 90% with a confidence level of 95%.

In test 2 with per-UE gap, the UE shall send one Event A3 triggered measurement report, with a measurement reporting delay less than 13440 ms from the beginning of time period T2. The UE shall not send event triggered measurement reports, as long as the reporting criteria are not fulfilled. The rate of correct events observed during repeated tests shall be at least 90%. with a confidence level of 95%.

In test 3 with per-FR gap, the UE shall send one Event A3 triggered measurement report, with a measurement reporting delay less than 1280 ms from the beginning of time period T2. The UE shall not send event triggered measurement reports, as long as the reporting criteria are not fulfilled. The rate of correct events observed during repeated tests shall be at least 90% with a confidence level of 95%.

In test 4 with per-FR gap, the UE shall send one Event A3 triggered measurement report, with a measurement reporting delay less than 13440 ms from the beginning of time period T2. The UE shall not send event triggered measurement reports, as long as the reporting criteria are not fulfilled. The rate of correct events observed during repeated tests shall be at least 90% with a confidence level of 95%.

In test 1, 2, 3 and 4 UE is required to report SSB time index.

NOTE: The actual overall delays measured in the test may be up to $2xTTI_{DCCH}$ higher than the measurement reporting delays above because of TTI insertion uncertainty of the measurement report in DCCH.

4.6.2.7 Void

4.6.2.8 Void

4.6.2.9 EN-DC FR1-FR1 event triggered reporting without SSB time index detection in DRX for UE configured with highSpeedMeasInterFreq-r17

Editor's Note: This test case is incomplete in following aspects:

- TT analysis is missing.

4.6.2.9.1 Test purpose

The purpose of this test is to verify that the UE makes correct reporting of an event for UE configured with highSpeedMeasInterFreq-r17. This test will partly verify the EN-DC inter-frequency NR cell search requirements in TS 38.133 [6] clause 9.3.4.

4.6.2.9.2 Test applicability

This test applies to all types of E-UTRA UE release 16 and forward supporting enhanced inter-frequency NR measurement requirements in high-speed scenario

4.6.2.9.3 Minimum conformance requirements

The minimum conformance requirements are defined in clause 4.6.2.0

The normative reference for this requirement is TS 38.133 [6] clause 4.6.2.9

4.6.2.9.4 Test description

4.6.2.9.4.1 Initial conditions

This test shall be tested using any of the test configurations in Table 4.6.2.9.4.1-1.

Table 4.6.2.9.4.1-1: Supported test configurations for EN-DC FR1-FR1 event triggered reporting without SSB time index detection in DRX for UE configured with highSpeedMeasInterFreq-r17

Configuration	Description
4.6.2.9-1	LTE FDD, NR 15 kHz SSB and CSI-RS SCS, 10 MHz bandwidth, FDD duplex mode
4.6.2.9-2	LTE FDD, NR 15 kHz SSB and CSI-RS SCS, 10 MHz bandwidth, TDD duplex mode
4.6.2.9-3	LTE FDD, NR 30 kHz SSB and CSI-RS SCS, 40 MHz bandwidth, TDD duplex mode
4.6.2.9-4	LTE TDD, NR 15 kHz SSB and CSI-RS SCS, 10 MHz bandwidth, FDD duplex mode
4.6.2.9-5	LTE TDD, NR 15 kHz SSB and CSI-RS SCS, 10 MHz bandwidth, TDD duplex mode
4.6.2.9-6	LTE TDD, NR 30 kHz SSB and CSI-RS SCS, 40 MHz bandwidth, TDD duplex mode
Note 1: The UE is only required to be tested in one of the supported test configurations Note 2: target NR cell3 has the same SCS, BW and duplex mode as NR serving cell2	

Configure the test equipment and the DUT according to the parameters in Table 4.6.2.9.4.1-2.

Table 4.6.2.9.4.1-2: Initial conditions for EN-DC FR1-FR1 event triggered reporting without SSB time index detection in DRX for UE configured with highSpeedMeasInterFreq-r17

Parameter	Value		Comment
Test environment	NC		As specified in TS 38.508-1 [14] clause 4.1.
Test frequencies	As specified in Annex E, table E.2-1 and TS 38.508-1 [14] clause 4.3.1.		
Channel bandwidth	As specified by the test configuration selected from Table 4.6.2.9.4.1-1.		
Propagation conditions	AWGN		As specified in clause C.2.1.
Connection Diagram	TE Part	A.3.1.8.2	As specified in TS 38.508-1 [14] Annex A.
	DUT Part	A.3.2.3.4	
Exceptions to connection diagram	N/A		

1. The general test parameter settings are set up according to Table 4.6.2.9.4.1-3.
2. Message contents are defined in clause 4.6.2.9.4.3.
3. There are three cells in the test, LTE cell 1 as PCell on E-UTRA RF channel 1, NR cell 2 as PSCell in FR1 on NR RF channel 1 and NR cell 3 as neighbour cell in FR1 on NR RF channel 2.

Table 4.6.2.9.4.1-3: General test parameters for EN-DC FR1-FR1 event triggered reporting without SSB time index detection in DRX for UE configured with highSpeedMeasInterFreq-r17

Parameter	Unit	Test configuration	Value		Comment
			Test 1	Test 2	
E-UTRA RF Channel Number		Config 1,2,3,4,5,6	1		One E-UTRAN TDD carrier frequencies is used.
NR RF Channel Number		Config 1,2,3,4,5,6	1, 2		Two FR1 NR carrier frequencies are used.
Active cell		Config 1,2,3,4,5,6	LTE Cell 1 (PCell) and NR cell 2 (PScell)		LTE Cell 1 is on E-UTRA RF channel number 1. NR Cell 2 is on NR RF channel number 1.

Neighbour cell		Config 1,2,3,4,5,6	NR cell 3		NR cell 3 is on NR RF channel number 2.
Gap Pattern Id		Config 1,2,3,4,5,6	0	4	As specified in clause 9.1.2-1.
Measurement gap offset		Config 1,2,3,4,5,6	9	19	
A3-Offset	dB	Config 1,2,3,4,5,6	-6		
Hysteresis	dB	Config 1,2,3,4,5,6	0		
CP length		Config 1,2,3,4,5,6	Normal		
TimeToTrigger	s	Config 1,2,3,4,5,6	0		
Filter coefficient		Config 1,2,3,4,5,6	0		L3 filtering is not used
DRX	ms	Config 1,2,3,4,5,6	DRX.4		As specified in clause A.3.3
Time offset between PCell and PSCell	µs	Config 1,2,3,4,5,6	3		Synchronous EN-DC
Time offset between serving and neighbour cells	ms	Config 1,4	3		Asynchronous cells. The timing of Cell 3 is 3ms later than the timing of Cell 2.
	µs	Config 2,3,5,6	3		Synchronous cells.
T1	s	Config 1,2,3,4,5,6	[5]		
T2	s	Config 1,2,3,4,5,6	[3]		

4.6.2.9.4.2 Test procedure

The test consists of two successive time periods, with time duration of T1, and T2 respectively. During time duration T1, the UE shall not have any timing information of NR cell 3.

1. Ensure the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity EN-DC, DC bearer MCG and SCG, Connected without release *On* and Test Mode *On* according to TS 38.508-1 [14] clause 4.5.

2. Configure MCG and SCG according to clause C.1 for all downlink physical channels.

3. The SS shall configure the PCell (LTE Cell 1), PSCell (NR Cell 2) on the MCG and SCG as per TS 38.508-1 [14] clause 4.5 with the message content exceptions defined in clause 4.6.2.9.4.3.

4. Set the parameters according to T1 in Table 4.6.2.9.4.1-2 and Table 4.6.2.9.5-1. Propagation conditions are set according to Annex C clauses C.2.2.

5. The SS shall transmit an RRCConnectionReconfiguration message on Cell 1 with event A3 configured for NR cell 3.

6. The UE shall transmit RRCConnectionReconfigurationComplete message. T1 starts.

7. When T1 expires, the SS shall switch the power setting from T1 to T2 as specified in Table 4.6.2.9.5-1. T2 starts.

8. UE shall transmit a MeasurementReport message triggered by Event A3 embedded in E-UTRA RRC message *ULInformationTransferMRDC*. If the overall delays measured from the beginning of time period T2 is less than 2240 ms for Test 1 and Test 2, then the number of successful tests is increased by one. If the UE fails to report the event within the overall delays measured requirement, then the number of failure tests is increased by one.

9. After the SS receives the MeasurementReport message in step 6 or when T2 expires, the SS shall transmit RRCConnectionReconfiguration message with condition EN-DC_PSCell_Rel according to TS 36.508 [25] Table 4.6.1-8 to release NR cell (PSCell). The UE shall transmit RRCConnectionReconfigurationComplete message.

10. The SS shall transmit RRCConnectionReconfiguration message with condition MCG_and_SCG according to TS 36.508 [25] Table 4.6.1-8 to add NR cell (PSCell). The UE shall transmit RRCConnectionReconfigurationComplete message. If either of the reconfiguration in step 7 or step 9 fails, SS switches off and on the UE and ensures the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity EN-DC, DC bearer MCG and SCG, Connected without release *On* according to TS 38.508-1 [14] clause 4.5.

11. Repeat step 2-10 until the confidence level according to Tables G.2.3-1 in Annex G clause G.2 is achieved.

12. Repeat step 1-11 for each sub-test in Table 4.6.2.6.4.1-2 as appropriate.

4.6.2.9.4.3 Message contents

Message contents are according to TS 38.508-1 [14] clause 7.3 with the following exceptions:

Table 4.6.2.9.4.3-1: Common Exception messages for EN-DC FR1-FR1 event triggered reporting without SSB time index detection in DRX for UE configured with highSpeedMeasInterFreq-r17

Default Message Contents	
Common contents of system information blocks exceptions	
Default RRC messages and information elements contents exceptions	Table H.3.1-1 Table H.3.1-2 with Condition INTER-FREQ Table H.3.1-4 with A3-offset = -6dB Table H.3.1-5 Table H.3.1-7 with Condition INTER-FREQ Table H.3.7-2 with Condition DRX.4 Table H.3.4-1a Table H.3.4-2 Table H.3.4-3 Table H.3.4-4 with Condition gapUE for Test 1 Table H.3.4-4 with Condition gapFR1 for Test 2 Table H.3.4-5 with Condition Pattern #0 and gap offset = 9 for Test 1 Table H.3.4-5 with Condition Pattern #4 and gap offset = 19 for Test 2
Specific message contents exceptions for Test Configuration 4.6.2.9-1 and 4.6.2.9-4	Table H.3.1-3 with Conditions INTER-FREQ MO Table 7.3.1-3 in TS 38.508-1 [14] with condition SMTC.5
Specific message contents exceptions for Test Configuration 4.6.2.9-2 and 4.6.2.9-5	Table H.3.1-3 with Conditions INTER-FREQ MO and Synchronous cells Table 7.3.1-3 in TS 38.508-1 [14] with condition SMTC.4
Specific message contents exceptions for Test Configuration 4.6.2.9-3 and 4.6.2.9-6	Table H.3.1-3 with Conditions INTER-FREQ MO and Synchronous cells Table 7.3.1-3 in TS 38.508-1 [14] with condition SMTC.4

Table 4.6.1.9.4.3-2: ServingCellConfigCommon

Derivation Path: TS 38.508-1[14], Table 4.6.3-168 with condition R17 HST FR1			
Information Element	**Value/remark**	**Comment**	**Condition**
ServingCellConfigCommon ::= SEQUENCE {			
HighSpeedConfig-v1700 SEQUENCE {			
highSpeedMeasCA-Scell-r17	true		
}			
}			

4.6.2.9.5 Test requirement

Table 4.6.2.9.5-1 defines the primary level settings including test tolerances for EN-DC FR1 interruptions at SRS carrier based switching in asynchronous EN-DC.

Table 4.6.2.9.5-1: NR cell specific test parameters for EN-DC FR1-FR1 event triggered reporting without SSB time index detection in DRX for UE configured with highSpeedMeasInterFreq-r17

Parameter	Unit	Test	Cell 2	Cell 3

		configuration	**T1**	**T2**	**T1**	**T2**
NR RF Channel Number		Config 1,2,3,4,5,6	1		2	
Duplex mode		Config 1,4	FDD			
		Config 2,3,5,6	TDD			
$BW_{channel}$	MHz	Config 1,4	10: $N_{RB,c}$ = 52			
		Config 2,5	10: $N_{RB,c}$ = 52			
		Config 3,6	40: $N_{RB,c}$ = 106			
BWP BW	MHz	Config 1,4	10: $N_{RB,c}$ = 52			
		Config 2,5	10: $N_{RB,c}$ = 52			
		Config 3,6	40: $N_{RB,c}$ = 106			
TDD configuration		Config 2,5	TDDConf.1.1			
		Config 3,6	TDDConf.2.1			
Initial DL BWP		Config 1,2,3,4,5,6	DLBWP.0.1		NA	
Initial UL BWP		Config 1,2,3,4,5,6	ULBWP.0.1		NA	
Dedicated DL BWP		Config 1,2,3,4,5,6	DLBWP.1.1		NA	
Dedicated UL BWP		Config 1,2,3,4,5,6	ULBWP.1.1		NA	
TRS configuration		Config 1,4	TRS.1.1 FDD		NA	
		Config 2,5	TRS.1.1 TDD		NA	
		Config 3,6	TRS.1.2 TDD		NA	
OCNG Patterns defined in A.3.2.1.1 (OP.1)		Config 1,2,3,4,5,6	OP.1		OP.1	
PDSCH Reference measurement channel		Config 1,4	SR.1.1 FDD		-	
		Config 2,5	SR.1.1 TDD			
		Config 3,6	SR.2.1 TDD			
CORESET Reference Channel		Config 1,4	CR.1.1 FDD		-	
		Config 2,5	CR.1.1 TDD			
		Config 3,6	CR.2.1 TDD			
SSB parameters		Config 1,4	SSB.1 FR1		SSB.5 FR1	
		Config 2,5	SSB.1 FR1		SSB.5 FR1	
		Config 3,6	SSB.2 FR1		SSB.6 FR1	
SMTC configuration		Config 1,4	SMTC.2			
		Config 2,3,5,6	SMTC.1			
CSI-RS configuration for RRM		Config 1,4	CSI-RS.RRM.FR1.1 FDD			
		Config 2,5	CSI-RS.RRM.FR1.1 TDD			
		Config 3,6	CSI-RS.RRM.FR1.2 TDD			
PDSCH/PDCCH subcarrier spacing	kHz	Config 1,2,4,5	15			
		Config 3,6	30			
EPRE ratio of PSS to SSS		Config 1,2,3,4,5,6	0		0	
EPRE ratio of PBCH DMRS to SSS						
EPRE ratio of PBCH to PBCH DMRS						
EPRE ratio of PDCCH DMRS to SSS						
EPRE ratio of PDCCH to PDCCH DMRS						
EPRE ratio of PDSCH DMRS to SSS						
EPRE ratio of PDSCH to PDSCH						
EPRE ratio of OCNG DMRS to SSS(Note 1)						

EPRE ratio of OCNG to OCNG DMRS (Note 1)						
N_{oc} Note2	dBm/15kHz		-98+TT		-98+TT	
N_{oc} Note2	dBm/SCS	Config 1,2,4,5	-98+TT		-98+TT	
		Config 3,6	-95+TT		-95+TT	
SS-RSRP Note 3	dBm/SCS	Config 1,2,4,5	-94+TT	-94+TT	-Infinity	-91+TT
		Config 3,6	-91+TT	-91+TT	-Infinity	-88+TT
CSI-RSRP Note 3	dBm/SCS	Config 1,2,4,5	-94+TT	-94+TT	-Infinity	-91+TT
		Config 3,6	-91+TT	-91+TT	-Infinity	-88+TT
$\hat{E}_s/I_{ot}$	dB	Config 1,2,3,4,5,6	4+TT	4+TT	-Infinity	7+TT
$\hat{E}_s/N_{oc}$	dB	Config 1,2,3,4,5,6	4+TT	4+TT	-Infinity	7+TT
Io Note3	dBm/9.36 MHz	Config 1,2,4,5	-64.59+TT	-64.59+TT	-70.05+TT	-62.26+TT
	dBm/38.16 MHz	Config 3,6	-58.49+TT	-58.49+TT	-63.94+TT	-56.15+TT
Propagation Condition		Config 1,2,3,4,5,6	AWGN			

Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.
Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for N_{oc} to be fulfilled.
Note 3: SS-RSRP, CSI-RSRP and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.
Note 4: SS-RSRP minimum requirements are specified assuming independent interference and noise at each receiver antenna port.

In test 1 with per-UE gap, the UE shall send one Event A3 triggered measurement report, with a measurement reporting delay less than 2240 ms from the beginning of time period T2. The UE shall not send event triggered measurement reports, as long as the reporting criteria are not fulfilled.

In test 2 with per-FR gap, the UE shall send one Event A3 triggered measurement report, with a measurement reporting delay less than 2240 ms from the beginning of time period T2. The UE shall not send event triggered measurement reports, as long as the reporting criteria are not fulfilled.

In test 1 and 2 UE is not required to report SSB time index.

The rate of correct events observed during repeated tests shall be at least 90% with the confidence level of 95%.

NOTE: The actual overall delays measured in the test may be up to 2xTTIDCCH higher than the measurement reporting delays above because of TTI insertion uncertainty of the measurement report in DCCH.

4.6.3 Void

4.6.4 L1-RSRP measurement for beam reporting

4.6.4.0 Minimum conformance requirements

4.6.4.0.1 Minimum conformance requirements for SSB-based L1-RSRP measurement for beam reporting

The UE shall be capable of performing L1-RSRP measurements based on the configured SSB resource for L1-RSRP computation, and the UE physical layer shall be capable of reporting L1-RSRP measured over the measurement period of $T_{L1\text{-}RSRP_Measurement_Period_SSB}$.

The value of $T_{L1\text{-}RSRP_Measurement_Period_SSB}$ is defined in Table 9.5.4.1-1 for FR1,

where

- M=1 if higher layer parameter *timeRestrictionForChannelMeasurement* is configured, and M=3 otherwise

For FR1,

- $P=\frac{1}{1-\frac{T_{SSB}}{MRGP}}$, when in the monitored cell there are measurement gaps configured for intra-frequency, inter-frequency or inter-RAT measurements, which are overlapping with some but not all occasions of the SSB; and
- P=1 when in the monitored cell there are no measurement gaps overlapping with any occasion of the SSB.

Where:

T_{SSB} = ssb-periodicityServingCell

$T_{SMTCperiod}$ = the configured SMTC period

If the high layer in TS 38.331 [13] signalling of *smtc2* is configured, $T_{SMTCperiod}$ corresponds to the value of higher layer parameter *smtc2*; Otherwise $T_{SMTCperiod}$ corresponds to the value of higher layer parameter *smtc1*. $T_{SMTCperiod}$ is the shortest SMTC period among all CCs in the same FR2 band, provided the SMTC offset of all CCs in FR2 have the same offset.

Longer evaluation period would be expected if the combination of SSB, SMTC occasion and measurement gap configurations does not meet pervious conditions.

For either an FR1 or FR2 serving cell, longer evaluation period would be expected during the period $T_{identify_CGI}$ when the UE is requested to decode an NR CGI.

For either an FR1 or FR2 serving cell, longer L1 RSRP measurement period would be expected during the period $T_{identify_CGI,E\text{-}UTRAN}$ when the UE is requested to decode an LTE CGI.

Table 9.5.4.1-1: Measurement period $T_{L1\text{-}RSRP_Measurement_Period_SSB}$ for FR1

Configuration	$T_{L1\text{-}RSRP_Measurement_Period_SSB}$ (ms)
non-DRX	$\max(T_{Report}, \text{ceil}(M*P)*T_{SSB})$
DRX cycle ≤ 320ms	$\max(T_{Report}, \text{ceil}(1.5*M*P)*\max(T_{DRX},T_{SSB}))$
DRX cycle > 320ms	$\text{ceil}(M*P)*T_{DRX}$
NOTE 1: T_{SSB} = ssb-periodicityServingCell is the periodicity of the SSB-Index configured for L1-RSRP measurement. T_{DRX} is the DRX cycle length. T_{Report} is configured periodicity for reporting.	
NOTE 2: K = 1 when T_{SSB} ≤ 40 ms and *highSpeedMeasFlag-r16* are configured; otherwise K = 1.5.	

The UE shall send L1-RSRP reports only for report configurations configured for the active BWP.

The UE shall report the L1-RSRP value as a 7-bit value in the range [-140, -44] dBm with 1dB step size according to clause 10.1.19 for FR1 and 10.1.20 for FR2 if *nrofReportedRS* is configured to one. If *nrofReportedRS* is configured to be larger than one, or if *groupBasedBeamReporting* is enabled, the UE shall use differential L1-RSRP based reporting as defined in clause 10.1.19 for FR1 and 10.1.20 for FR2. The differential L1-RSRP is quantized to a 4-bit value with 2dB step size. The mapping between the reported L1-RSRP value and the measured quantity is described in 10.1.6.

In EN-DC and NE-DC operation, when the UE is configured to perform E-UTRA SRS carrier-based switching an additional delay can be expected in FR1 if the UE is capable of per-FR gap, or an additional delay can be expected in both FR1 and FR2 if the UE is not capable of per-FR gap.

Reported L1-RSRP measurements contained in periodic L1-RSRP measurement reports shall meet the requirements in clauses 10.1.19 for FR1 and 10.1.20 for FR2, respectively.

The UE shall only send periodic L1-RSRP measurement reports for an active BWP.

The UE shall transmit the periodic L1-RSRP reporting on PUCCH over the air interface according to the periodicity defined in clause 5.2.1.4 in TS 36.214 [24].

The UE is required to be capable of measuring SSB and CSI-RS for L1-RSRP without measurement gaps. The UE is required to perform the SSB and CSI-RS measurements with measurement restrictions as described in the following clauses.

For FR1, when the SSB for L1-RSRP measurement is in the same OFDM symbol as CSI-RS for RLM/BFD/CBD/L1-RSRP measurement,

- If SSB and CSI-RS have same SCS, UE shall be able to measure the SSB for L1-RSRP measurement without any restriction;
- If SSB and CSI-RS have different SCS,
  - If UE supports simultaneousRxDataSSB-DiffNumerology, UE shall be able to measure the SSB for L1-RSRP measurement without any restriction;
  - If UE does not support simultaneousRxDataSSB-DiffNumerology, UE is required to measure one of but not both SSB for L1-RSRP measurement and CSI-RS. Longer measurement period for SSB based L1-RSRP measurement is expected, and no requirements are defined.

The normative reference for this requirement is TS 38.133 [6] clause 9.5.3.1, 9.5.4.1 and 9.5.5.1.

4.6.4.0.2 Minimum conformance requirements for CSI-RS-based L1-RSRP measurement for beam reporting

The UE shall be capable of performing L1-RSRP measurements based on the configured CSI-RS resource for L1-RSRP computation, and the UE physical layer shall be capable of reporting L1-RSRP measured over the measurement period of $T_{L1\text{-}RSRP_Measurement_Period_CSI\text{-}RS}$.

The value of $T_{L1\text{-}RSRP_Measurement_Period_CSI\text{-}RS}$ is defined in Table 9.5.4.2-1 for FR1, where

- For periodic and semi-persistent CSI-RS resources, M=1 if higher layer parameter *timeRestrictionForChannelMeasurement* is configured, and M=3 otherwise
- For aperiodic CSI-RS resources M=1
- For periodic CSI-RS resources in a resource set configured with higher layer parameter *repetition* set to OFF, N=1. The requirements apply if *qcl-InfoPeriodicCSI-RS* is configured for all the resources in the resource set and for each resource one RS has QCL-TypeD with
  - SSB for L1-RSRP measurement, or
  - another CSI-RS in resource set configured with repetition ON.
- For periodic CSI-RS resources in a resource set configured with higher layer parameter *repetition* set to ON, N=ceil(*maxNumberRxBeam* / $N_{res_per_set}$), where $N_{res_per_set}$ is number of resources in the resource set. The requirements apply provided *qcl-InfoPeriodicCSI-RS* is configured with QCL-TypeD for all resources in the resource set.
- For semi-persistent CSI-RS resources in a resource set configured with higher layer parameter *repetition* set to OFF, N=1. The requirements apply provided TCI state is provided for all resources in the resource set in the MAC CE activating the resource set and for each resource one RS has QCL-TypeD with
  - SSB for L1-RSRP measurement, or
  - another CSI-RS in resource set configured with repetition ON.
- For semi-persistent CSI-RS resources in a resource set configured with higher layer parameter *repetition* set to ON, N=ceil(*maxNumberRxBeam* / $N_{res_per_set}$), where $N_{res_per_set}$ is number of resources in the resource set. The requirements apply provided TCI state is provided with QCL-TypeD for all resources in the resource set in the MAC CE activating the resource set.
- For aperiodic CSI-RS resources in a resource set configured with higher layer parameter *repetition* set to OFF, N=1. The requirements apply provided *qcl-info* is configured for all resources in the resource set and for each resource one RS has QCL-TypeD with
  - SSB for L1-RSRP measurement, or

- another CSI-RS in resource set configured with repetition ON.

- For aperiodic CSI-RS resources in a resource set configured with higher layer parameter *repetition* set to ON, N=1. UE is not required to meet the accuracy requirements in clause 10.1.19.2 and 10.1.20.2 if number of resources in the resource set is smaller than *maxNumberRxBeam*. The requirements apply provided *qcl-info* is configured with QCL-TypeD for all resources in the resource set.

For FR1,

- $P=\frac{1}{1-\frac{T_{CSI-RS}}{MGRP}}$, when in the monitored cell there are measurement gaps configured for intra-frequency, inter-frequency or inter-RAT measurements, which are overlapping with some but not all occasions of the CSI-RS; and

- P=1 when in the monitored cell there are no measurement gaps overlapping with any occasion of the CSI-RS.

Where:

T_{CSI-RS} = the periodicity of CSI-RS configured for L1-RSRP measurement

Longer evaluation period would be expected if the combination of CSI-RS, SMTC occasion and measurement gap configurations does not meet pervious conditions.

For either an FR1 or FR2 serving cell, longer evaluation period would be expected during the period $T_{identify_CGI}$ when the UE is requested to decode an NR CGI.

For either an FR1 or FR2 serving cell, longer L1 RSRP measurement period would be expected during the period $T_{identify_CGI,E-UTRAN}$ when the UE is requested to decode an LTE CGI.

Table 9.5.4.2-1: Measurement period $T_{L1-RSRP_Measurement_Period_CSI-RS}$ for FR1

Configuration	$T_{L1-RSRP_Measurement_Period_CSI-RS}$ (ms)
non-DRX	max(T_{Report}, ceil(M*P)*T_{CSI-RS})
DRX cycle ≤ 320ms	max(T_{Report}, ceil(1.5*M*P)*max(T_{DRX},T_{CSI-RS}))
DRX cycle > 320ms	ceil(M*P)*T_{DRX}
NOTE 1: T_{CSI-RS} is the periodicity of CSI-RS configured for L1-RSRP measurement. T_{DRX} is the DRX cycle length. T_{Report} is configured periodicity for reporting.	
NOTE 2: the requirements are applicable provided that the CSI-RS resource configured for L1-RSRP measurement is transmitted with Density = 3.	
NOTE 3: K = 1 when T_{CSI-RS} ≤ 40 ms and *highSpeedMeasFlag-r16* are configured; otherwise K = 1.5.	

The UE shall send L1-RSRP reports only for report configurations configured for the active BWP.

The UE shall report the L1-RSRP value as a 7-bit value in the range [-140, -44] dBm with 1dB step size according to clause 10.1.19 for FR1 and 10.1.20 for FR2 if *nrofReportedRS* is configured to one. If *nrofReportedRS* is configured to be larger than one, or if *groupBasedBeamReporting* is enabled, the UE shall use differential L1-RSRP based reporting as defined in clause 10.1.19 for FR1 and 10.1.20 for FR2. The differential L1-RSRP is quantized to a 4-bit value with 2dB step size. The mapping between the reported L1-RSRP value and the measured quantity is described in 10.1.6.

In EN-DC and NE-DC operation, when the UE is configured to perform E-UTRA SRS carrier-based switching an additional delay can be expected in FR1 if the UE is capable of per-FR gap, or an additional delay can be expected in both FR1 and FR2 if the UE is not capable of per-FR gap.

Reported L1-RSRP measurements contained in aperiodic triggered, aperiodic triggered periodic and aperiodic triggered semi-persistent L1-RSRP reports shall meet the requirements in clauses 10.1.19 for FR1 and 10.1.20 for FR2, respectively.

The UE shall only send aperiodic L1-RSRP measurement reports, if a DCI trigger has been received.

After the UE receives CSI request in DCI, the UE shall transmit the aperiodic L1-RSRP reporting on PUSCH over the air interface at the time specified according to clause 6.2.1.2 in TS 36.300 [24].

For both FR1 and FR2, when the CSI-RS for L1-RSRP measurement is in the same OFDM symbol as SSB for RLM/BFD/CBD/L1-RSRP measurement, UE is not required to receive CSI-RS for L1-RSRP measurement in the PRBs that overlap with an SSB.

For FR1, when the SSB for RLM/BFD/CBD/L1-RSRP measurement is within the active BWP and has same SCS than CSI-RS for L1-RSRP measurement, the UE shall be able to perform CSI-RS measurement without restrictions.

For FR1, when the SSB for RLM/BFD/CBD/L1-RSRP measurement is within the active BWP and has different SCS than CSI-RS for L1-RSRP measurement, the UE shall be able to perform CSI-RS measurement with restrictions according to its capabilities:

- If the UE supports *simultaneousRxDataSSB-DiffNumerology* the UE shall be able to perform CSI-RS measurement without restrictions.
- If the UE does not support *simultaneousRxDataSSB-DiffNumerology*, UE is required to measure one of but not both CSI-RS for L1-RSRP measurement and SSB. Longer measurement period for CSI-RS based L1-RSRP measurement is expected, and no requirements are defined.

For FR1, when the CSI-RS for L1-RSRP measurement is in the same OFDM symbol as another CSI-RS for RLM/BFD/CBD/L1-RSRP measurement, UE shall be able to measure the CSI-RS for L1-RSRP measurement without any restriction.

The normative reference for this requirement is TS 38.133 [6] clauses 9.5.3.1, 9.5.4.2 and 9.5.5.2.

4.6.4.1 EN-DC FR1 SSB-based L1-RSRP measurement in non-DRX

4.6.4.1.1 Test purpose

To verify that the UE makes correct reporting of L1-RSRP measurement in non-DRX within L1-RSRP measurement requirements in TS 38.133 [6] clause 9.5.4.1.

4.6.4.1.2 Test applicability

This test applies to all types of E-UTRA UE release 15 and forward, supporting EN-DC.

4.6.4.1.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 4.6.4.0.1.

The normative reference for this requirement is TS 38.133 [6] clause A.4.6.4.1.

4.6.4.1.4 Test description

4.6.4.1.4.1 Initial conditions

This test shall be tested using any of the test configurations in Table 4.6.4.1.4.1-1. Configure the test equipment and the DUT according to the parameters in Table 4.6.4.1.4.1-2. Test environment parameters are given in Table 4.6.4.1.4.1-3.

Table 4.6.4.1.4.1-1: EN-DC SSB based L1-RSRP measurement supported test configurations

Test Case ID	Description
4.6.4.1-1	LTE FDD, NR 15 kHz SSB SCS, 10MHz bandwidth, FDD duplex mode
4.6.4.1-2	LTE FDD, NR 15 kHz SSB SCS, 10MHz bandwidth, TDD duplex mode
4.6.4.1-3	LTE FDD, NR 30kHz SSB SCS, 40MHz bandwidth, TDD duplex mode
4.6.4.1-4	LTE TDD, NR 15 kHz SSB SCS, 10MHz bandwidth, FDD duplex mode
4.6.4.1-5	LTE TDD, NR 15 kHz SSB SCS, 10MHz bandwidth, TDD duplex mode
4.6.4.1-6	LTE TDD, NR 30kHz SSB SCS, 40MHz bandwidth, TDD duplex mode
NOTE: The UE is only required to be tested in one of the supported test configurations.	

Table 4.6.4.1.4.1-2: General test parameters for EN-DC SSB based L1-RSRP measurement

Parameter	Config	Unit	Value
SSB GSCN	1~6		freq1
Duplex mode	1,4		FDD
	2,5		TDD
	3,6		TDD
TDD Configuration	1,4		N/A
	2,5		TDDConf.1.1
	3,6		TDDConf.2.1
$BW_{channel}$	1,4	MHz	10: $N_{RB,c}$ = 52
	2,5		10: $N_{RB,c}$ = 52
	3,6		40: $N_{RB,c}$ = 106
PDSCH Reference measurement channel	1,4		SR.1.1 FDD
	2,5		SR.1.1 TDD
	3,6		SR.2.1 TDD
RMSI CORESET Reference Channel	1,4		CR.1.1 FDD
	2,5		CR.1.1 TDD
	3,6		CR.2.1 TDD
Dedicated CORESET Reference Channel	1,4		CCR.1.1 FDD
	2,5		CCR.1.1 TDD
	3,6		CCR.2.1 TDD
SSB configuration	1,4		SSB.3 FR1
	2,5		SSB.3 FR1
	3,6		SSB.4 FR1
OCNG Patterns	1~6		OP.1
Initial BWP Configuration	1~6		DLBWP.0.1 ULBWP.0.1
Dedicated BWP configuration	1~6		DLBWP.1.1 ULBWP.1.1
SMTC configuration	1~6		SMTC.1
TRS Configuration	1,4		TRS.1.1 FDD
	2,5		TRS.1.1 TDD
	3,6		TRS.1.2 TDD
DRX configuration	1~6		Off
reportConfigType	1~6		periodic
reportQuantity	1~6		ssb-Index-RSRP
Number of reported RS	1~6		2
L1-RSRP reporting period	1~6	slot	80
T1	1~6	s	5
T2	1~6	s	1
EPRE ratio of PSS to SSS	1~6	dB	0
EPRE ratio of PBCH DMRS to SSS			
EPRE ratio of PBCH to PBCH DMRS			
EPRE ratio of PDCCH DMRS to SSS			
EPRE ratio of PDCCH to PDCCH DMRS			
EPRE ratio of PDSCH DMRS to SSS			
EPRE ratio of PDSCH to PDSCH DMRS			
EPRE ratio of OCNG DMRS to SSS Note 1			
EPRE ratio of OCNG to OCNG DMRS Note 1			
Propagation condition	1~6		AWGN

NOTE: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.

Table 4.6.4.1.4.1-3: Test Environment parameters for EN-DC SSB based L1-RSRP measurement

Parameter	Value	Comment
Test environment	NC	As specified in TS 38.508-1 [14] clause 4.1.
Test frequencies	As specified in Annex E, Table E.2-1 and TS 38.508-1 [14] clause 4.3.1 and 4.4.2.	
Channel bandwidth	As specified by the test configuration selected from Table 4.6.4.1.4.1-1.	

Propagation conditions	AWGN		As specified in clause C.2.2.
Connection Diagram	TE Part	A.3.1.7.1	As specified in TS 38.508-1 [14] Annex A.
	DUT Part	A.3.2.3.4	
Exceptions to connection diagram	For 4Rx capable UEs without any 2 Rx RF bands use A.3.2.5.2 for DUT part and A.3.1.8.4 for TE Part		

1. Message contents are defined in clause 4.6.4.1.4.3.

2. Cell 1 is the E-UTRA serving cell (PCell) for the EN-DC setup. The power levels and settings for Cell 1 are set according to Annex A.6. Cell 2 is NR FR1 cell (PSCell). Cell 2 is the target for SSB based L1-RSRP measurements. UE is configured to perform RLM, BFD and L1-RSRP measurement based on the SSBs.

4.6.4.1.4.2 Test procedure

Prior to the start of the time duration T1, the UE shall be fully synchronized to PSCell. The UE shall be configured for periodic CSI reporting in PUCCH [format 2] with a reporting periodicity as mentioned in the above table 4.6.4.1.4.1-2. Before the test, UE is configured to perform RLM, BFD and L1-RSRP measurement based on the SSBs.

1. Ensure the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity EN-DC, DC bearer MCG and SCG, Connected without release *On* and Test Mode *On*, according to TS 38.508-1 [14] clause 4.5 and general test parameters set according to Table 4.6.4.1.4.1-2.

2. Set the parameters according to T1 in Table 4.6.4.1.5-1. T1 starts.

5. The UE shall be transmitting CSI on PUCCH with a periodicity of 80 slots.

6. When T1 expires, the SS shall set the parameters according to T2 in 4.6.4.1.5-1. T2 starts.

7. The UE shall start sending L1-RSRP reports. The SS shall check following requirements:

   R1: the UE shall start to transmit valid reports no later than 720 ms for configuration 1, 2, 4 and 5 and no later than 680 ms for configuration 3 and 6 from the beginning of time period T2. A valid report shall meet the absolute L1-RSRP requirement for SSB#1 (Table 4.6.4.1.5-2 for test configurations 1, 2, 4 and 5 and Table 4.6.4.1.5-3 for test configurations 3 and 6) and the relative L1-RSRP requirement for SSB#0 in Table 4.6.4.1.5-4. If the first valid report is received earlier than the specified time, the number of passed iterations for R1 is increased by one. Otherwise, the number of failed iterations for R1 is increased by one.

   R2: the UE shall transmit reports every 80 slots until the end of time period T2. If the reports are received accordingly, the number of passed iterations for R2 is increased by one. Otherwise, the number of failed iterations for R2 is increased by one.

   R3: The L1-RSRP value of SSB#1 reported by the UE is compared to the expected L1-RSRP value for SSB#1. In all consecutive reports after the first valid value is received, if the resulting value is outside the limits in Table 4.6.4.1.5-2 for test configurations 1, 2, 4 and 5 and in Table 4.6.4.1.5-3 for test configurations 3 and 6 or the UE fails to report the measurement value for SSB#1, the number of failed iterations for R3 is increased by one. Otherwise, the number of passed iterations for R3 is increased by one.

   R4: The DIFF RSRP value of SSB#0 reported by the UE is compared to the expected DIFF RSRP value. In all consecutive reports after the first valid value is received, if the resulting value is outside the limits in Table 4.6.4.1.5-4 or the UE fails to report the measurement value for SSB#0, the number of failed iterations for R4 is increased by one. Otherwise, the number of passed iterations for R4 is increased by one.

8. The SS waits until T2 expires.

9. The SS shall transmit *RRCConnectionReconfiguration* message with condition EN-DC_PSCell_Rel according to TS 36.508 [25] Table 4.6.1-8 to release NR cell (PSCell). The UE shall transmit *RRCConnectionReconfigurationComplete* message.

10. The SS then shall transmit *RRCConnectionReconfiguration* message with condition MCG_and_SCG according to TS 36.508 [25] Table 4.6.1-8 to add NR cell (PSCell). The UE shall transmit *RRCConnectionReconfigurationComplete* message.

11. If any the reconfiguration fails, switch off and on the UE and ensure the UE is in RRC_CONNECTED with generic procedure parameters Connectivity EN-DC, DC bearer MCG and SCG, Connected without release On and Test Mode *On* according to TS 38.508-1 [14] clause 4.5.

12. Repeat steps 2-11 until the confidence level according to Tables G.2.3-1 in Annex G clause G.2 is achieved.

4.6.4.1.4.3 Message contents

Message contents are according to TS 38.508-1 [14] clause 7.3 with the following exceptions:

Table 4.6.4.1.4.3-1: Common Exception messages EN-DC SSB based L1-RSRP measurement

Default Message Contents	
Common contents of system information blocks exceptions	
Default RRC messages and information elements contents exceptions	Table H.3.6-2 with conditions PERIODIC and SS-RSRP Table H.3.6-3 with conditions SSB and PERIODIC Table H.3.4-1

Table 4.6.4.1.4.3-2: RadioLinkMonitoringConfig

Derivation Path: TS 38.508-1 [14], Table 4.6.3-133			
Information Element	**Value/remark**	**Comment**	**Condition**
RadioLinkMonitoringConfig ::= SEQUENCE {			
failureDetectionResourcesToAddModList SEQUENCE (SIZE(1..maxNrofFailureDetectionResources)) OF SEQUENCE {	1 entry		
purpose	both	UE is configured to perform RLM and BFD based on the SSBs.	
detectionResource CHOICE {			
ssb-Index	0		
}			
}			
}			

4.6.4.1.5 Test requirement

Table 4.6.4.1.5-1 defines the primary level settings including test tolerances for all tests.

Table 4.6.4.1.5-1: SSB specific test parameters for EN-DC SSB based L1-RSRP measurement

Parameter	Config	Unit	SSB#0		SSB#1	
			T1	T2	T1	T2
N_{oc} Note2	1~6	dBm/15kHz	-94.65			
N_{oc} Note2	1,2,4,5	dBm/SSB SCS	-94.65			
	3,6		-91.65			
$\hat{E}_s / I_{ot}$	1~6	dB	0	0	-Infinity	3.5
SSB RSRP Note3	1,2,4,5	dBm/SSB SCS	-94.65	-94.65	-Infinity	-91.15
	3,6		-91.65	-91.65	-Infinity	-88.14
Io Note3	1,2,4,5	dBm/9.36 MHz	-63.69	-63.69	-66.70	-61.59
	3,6	dBm/38.16 MHz	-57.59	-57.59	-60.61	-55.49
$\hat{E}_s / N_{oc}$	1~6	dB	0	0	-Infinity	3.5

The UE shall send L1-RSRP report every 80 slots. After 640 ms plus 80 slots from the beginning of time period T2, UE shall send L1-RSRP report including the results for both SSB#0 and SSB#1. Each L1-RSRP measurement report shall meet the corresponding absolute accuracy requirements in Table 4.6.4.1.5-2 for for test configurations 1, 2, 4 and 5, the corresponding absolute accuracy requirements in Table 4.6.4.1.5-3 for test configurations 3 and 6 and the corresponding relative accuracy requirements in Table 4.6.4.1.5-4 for all test configurations.

Table 4.6.4.1.5-2: L1-RSRP absolute accuracy requirements for the reported values for test configurations 1, 2, 4 and 5

Normal Conditions	T1	T2
Lowest reported value (SSB#1)	-	55
Highest reported value (SSB#1)	-	75

Table 4.6.4.1.5-3: L1-RSRP absolute accuracy requirements for the reported values for test configurations 3 and 6

Normal Conditions	T1	T2
Lowest reported value (SSB#1)	-	58
Highest reported value (SSB#1)	-	78

Table 4.6.4.1.5-4: L1-RSRP relative accuracy requirements for the reported values for all test configurations

Normal Conditions	T1	T2
Lowest DIFF RSRP reported (SSB#0)	-	0
Highest DIFF RSRP reported (SSB#0)	-	3

For the test to pass, the ratio of successful reported values for each requirement (R1 to R4) shall be more than 90% with a confidence level of 95%. Each requirement is evaluated independently of the others.

NOTE: The actual overall delays measured in the test may be up to $2xTTI_{DCCH}$ higher than the measurement reporting delays above because of TTI insertion uncertainty of the measurement report in DCCH.

4.6.4.2 EN-DC FR1 SSB-based L1-RSRP measurement in DRX

4.6.4.2.1 Test purpose

To verify that the UE makes correct reporting of SSB-based L1-RSRP measurement in DRX within L1-RSRP measurement requirements in TS 38.133 [6] clause 9.5.4.1.

4.6.4.2.2 Test applicability

This test applies to all types of E-UTRA UE release 15 and forward, supporting EN-DC FR1 and long DRX cycle.

4.6.4.2.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 4.6.4.0.1.

The normative reference for this requirement is TS 38.133 [6] clause A.4.6.4.2.

4.6.4.2.4 Test description

4.6.4.2.4.1 Initial conditions

This test shall be tested using any of the test configurations in Table 4.6.4.2.4.1-1. Configure the test equipment and the DUT according to the parameters in Table 4.6.4.2.4.1-2. Test environment parameters are given in Table 4.6.4.2.4.1-3.

Table 4.6.4.2.4.1-1: EN-DC SSB based L1-RSRP measurement in DRX supported test configurations

Config	Description
1	LTE FDD, NR 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode
2	LTE FDD, NR 15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode
3	LTE FDD, NR 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode
4	LTE TDD, NR 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode
5	LTE TDD, NR 15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode
6	LTE TDD, NR 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode
NOTE: The UE is only required to be tested in one of the supported test configurations.	

Table 4.6.4.2.4.1-2: General test parameters for EN-DC SSB based L1-RSRP measurement in DRX

Parameter	Config	Unit	Value
SSB GSCN	1~6		freq1
Duplex mode	1,4		FDD
	2,5		TDD
	3,6		TDD
TDD Configuration	1,4		N/A
	2,5		TDDConf.1.1
	3,6		TDDConf.2.1
$BW_{channel}$	1,4	MHz	10: $N_{RB,c}$ = 52
	2,5		10: $N_{RB,c}$ = 52
	3,6		40: $N_{RB,c}$ = 106
PDSCH Reference measurement channel	1,4		SR.1.1 FDD
	2,5		SR.1.1 TDD
	3,6		SR.2.1 TDD
RMSI CORESET Reference Channel	1,4		CR.1.1 FDD
	2,5		CR.1.1 TDD
	3,6		CR.2.1 TDD
Dedicated CORESET Reference Channel	1,4		CCR.1.1 FDD
	2,5		CCR.1.1 TDD
	3,6		CCR.2.1 TDD
SSB configuration	1,4		SSB.3 FR1
	2,5		SSB.3 FR1
	3,6		SSB.4 FR1
OCNG Patterns	1~6		OP.1
Initial BWP Configuration	1~6		DLBWP.0.1 ULBWP.0.1
Dedicated BWP configuration	1~6		DLBWP.1.1 ULBWP.1.1
SMTC configuration	1~6		SMTC.1
TRS Configuration	1,4		TRS.1.1 FDD
	2,5		TRS.1.1 TDD
	3,6		TRS.1.2 TDD
DRX configuration	1~6		DRX.3
reportConfigType	1~6		periodic
reportQuantity	1~6		ssb-Index-RSRP
Number of reported RS	1~6		2
L1-RSRP reporting period	1~6	slot	80
T1	1~6	s	5
T2	1~6	s	1
EPRE ratio of PSS to SSS	1~6	dB	0
EPRE ratio of PBCH DMRS to SSS			
EPRE ratio of PBCH to PBCH DMRS			
EPRE ratio of PDCCH DMRS to SSS			
EPRE ratio of PDCCH to PDCCH DMRS			
EPRE ratio of PDSCH DMRS to SSS			
EPRE ratio of PDSCH to PDSCH DMRS			

Parameter	Config	Unit	Value
EPRE ratio of OCNG DMRS to SSS Note 1			
EPRE ratio of OCNG to OCNG DMRS Note 1			
Propagation condition	1~6		AWGN
NOTE: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.			

Table 4.6.4.2.4.1-3: Test Environment parameters for EN-DC SSB based L1-RSRP measurement in DRX

Parameter	Value		Comment
Test environment	NC		As specified in TS 38.508-1 [14] clause 4.1.
Test frequencies	As specified in Annex E, Table E.2-1 and TS 38.508-1 [14] clause 4.3.1 and 4.4.2.		
Channel bandwidth	As specified by the test configuration selected from Table 4.6.4.2.4.1-1.		
Propagation conditions	AWGN		As specified in clause C.2.2.
Connection Diagram	TE Part	A.3.1.7.1	As specified in TS 38.508-1 [14] Annex A.
	DUT Part	A.3.2.3.4	
Exceptions to connection diagram	For 4Rx capable UEs without any 2 Rx RF bands use A.3.2.5.2 for DUT part and A.3.1.8.4 for TE Part		

1. Message contents are defined in clause 4.6.4.2.4.3.
2. Cell 1 is the E-UTRA serving cell (PCell) for the EN-DC setup. The power levels and settings for Cell 1 are set according to Annex A.6. Cell 2 is NR FR1 cell (PSCell). Cell 2 is the target for SSB based L1-RSRP measurements. Before the test, UE is configured to perform RLM, BFD and L1-RSRP measurement based on the SSBs. DRX is configured as specified in Table 4.6.4.2.4.1-2.

4.6.4.2.4.2 Test procedure

Same test procedure as in subclause 4.6.4.1.4.2 with tables 4.6.4.1.4.1-2 and 4.6.4.1.5-1 replaced by tables 4.6.4.2.4.1-2 and 4.6.4.2.5-1.

4.6.4.2.4.3 Message contents

Same message content as in subclause 4.6.4.1.4.3 with the following exception:

Table 4.6.4.2.4.3-1: Common Exception messages EN-DC SSB based L1-RSRP measurement in DRX

Default Message Contents	
Common contents of system information blocks exceptions	
Default RRC messages and information elements contents exceptions	Table H.3.7-1 with condition DRX.3

4.6.4.2.5 Test requirement

Table 4.6.4.2.5-1 defines the primary level settings including test tolerances for all tests.

Table 4.6.4.2.5-1: SSB specific test parameters for EN-DC SSB based L1-RSRP measurement in DRX

Parameter	Config	Unit	SSB#0		SSB#1	
			T1	T2	T1	T2
N_{oc} Note2	1~6	dBm/15kHz	-94.65			
N_{oc} Note2	1,2,4,5	dBm/SSB SCS	-94.65			
	3,6		-91.65			

$\hat{E}_s/I_{ot}$	1~6	dB	0	0	-Infinity	3.5
SSB RSRP Note3	1,2,4,5	dBm/SSB SCS	-94.65	-94.65	-Infinity	-91.15
	3,6		-91.65	-91.65	-Infinity	-88.14
Io Note3	1,2,4,5	dBm/9.36 MHz	-63.69	-63.69	-66.70	-61.59
	3,6	dBm/38.16 MHz	-57.59	-57.59	-60.61	-55.49
$\hat{E}_s/N_{oc}$	1~6	dB	0	0	-Infinity	3.5
NOTE 1: The resources for uplink transmission are assigned to the UE prior to the start of time period T2.						
NOTE 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for N_{oc} to be fulfilled.						
NOTE 3: SS-RSRP and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.						

The UE shall send L1-RSRP report every 80 slots. No later than 640ms plus 80 slots from the beginning of time period T2, UE shall send L1-RSRP report including results of both SSB0 and SSB1. Each L1-RSRP measurement report shall meet the corresponding absolute accuracy requirements in Table 4.6.4.2.5-2 for for test configurations 1, 2, 4 and 5, the corresponding absolute accuracy requirements in Table 4.6.4.2.5-3 for test configurations 3 and 6 and the corresponding relative accuracy requirements in Table 4.6.4.2.5-4 for all test configurations.

Table 4.6.4.2.5-2: L1-RSRP absolute accuracy requirements for the reported values for test configurations 1, 2, 4 and 5

Normal Conditions	T1	T2
Lowest reported value (SSB#1)	-	55
Highest reported value (SSB#1)	-	75

Table 4.6.4.2.5-3: L1-RSRP absolute accuracy requirements for the reported values for test configurations 3 and 6

Normal Conditions	T1	T2
Lowest reported value (SSB#1)	-	58
Highest reported value (SSB#1)	-	78

Table 4.6.4.2.5-4: L1-RSRP relative accuracy requirements for the reported values for all test configurations

Normal Conditions	T1	T2
Lowest DIFF RSRP reported (SSB#0)	-	0
Highest DIFF RSRP reported (SSB#0)	-	3

The rate of correct events observed during repeated tests shall be at least 90% with a confidence level of 95%.

NOTE: The actual overall delays measured in the test may be up to $2xTTI_{DCCH}$ higher than the measurement reporting delays above because of TTI insertion uncertainty of the measurement report in DCCH.

4.6.4.3 EN-DC FR1 CSI-RS-based L1-RSRP measurement in non-DRX

4.6.4.3.1 Test purpose

To verify that the UE makes correct reporting of CSI-RS-based L1-RSRP measurement in non-DRX within L1-RSRP measurement requirements in TS 38.133 [6] clause 9.5.4.2.

4.6.4.3.2 Test applicability

This test applies to all types of E-UTRA UE release 15 and forward, supporting EN-DC.

4.6.4.3.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 4.6.4.0.2.

The normative reference for this requirement is TS 38.133 [6] clause A.4.6.4.3.

4.6.4.3.4 Test description

4.6.4.3.4.1 Initial conditions

This test shall be tested using any of the test configurations in Table 4.6.4.3.4.1-1. Configure the test equipment and the DUT according to the parameters in Table 4.6.4.3.4.1-2. Test environment parameters are given in Table 4.6.4.3.4.1-3.

Table 4.6.4.3.4.1-1: EN-DC CSI-RS based L1-RSRP measurement supported test configurations

Test Case ID	Description
4.6.4.3-1	LTE FDD, NR 15 kHz SSB SCS, 10MHz bandwidth, FDD duplex mode
4.6.4.3-2	LTE FDD, NR 15 kHz SSB SCS, 10MHz bandwidth, TDD duplex mode
4.6.4.3-3	LTE FDD, NR 30kHz SSB SCS, 40MHz bandwidth, TDD duplex mode
4.6.4.3-4	LTE TDD, NR 15 kHz SSB SCS, 10MHz bandwidth, FDD duplex mode
4.6.4.3-5	LTE TDD, NR 15 kHz SSB SCS, 10MHz bandwidth, TDD duplex mode
4.6.4.3-6	LTE TDD, NR 30kHz SSB SCS, 40MHz bandwidth, TDD duplex mode
NOTE: The UE is only required to be tested in one of the supported test configurations.	

Table 4.6.4.3.4.1-2: General test parameters for EN-DC CSI-RS based L1-RSRP measurement

Parameter	Config	Unit	Value
SSB GSCN	1~6		freq1
Duplex mode	1,4		FDD
	2,5		TDD
	3,6		TDD
TDD Configuration	1,4		N/A
	2,5		TDDConf.1.1
	3,6		TDDConf.2.1
$BW_{channel}$	1,4	MHz	10: $N_{RB,c}$ = 52
	2,5		10: $N_{RB,c}$ = 52
	3,6		40: $N_{RB,c}$ = 106
PDSCH Reference measurement channel	1,4		SR.1.1 FDD
	2,5		SR.1.1 TDD
	3,6		SR.2.1 TDD
RMSI CORESET Reference Channel	1,4		CR.1.1 FDD
	2,5		CR.1.1 TDD
	3,6		CR.2.1 TDD
Dedicated CORESET Reference Channel	1,4		CCR.1.1 FDD
	2,5		CCR.1.1 TDD
	3,6		CCR.2.1 TDD
SSB configuration	1,4		SSB.3 FR1
	2,5		SSB.3 FR1
	3,6		SSB.4 FR1
CSI-RS configuration	1,4		CSI-RS 1.3 FDD
	2,5		CSI-RS 1.3 TDD
	3,6		CSI-RS 2.3 TDD
OCNG Patterns	1~6		OP.1
TRS Configuration	1,4		TRS.1.1 FDD
	2,5		TRS.1.1 TDD
	3,6		TRS.1.2 TDD
Initial BWP Configuration	1~6		DLBWP.0.1 ULBWP.0.1
Dedicated BWP configuration	1~6		DLBWP.1.1 ULBWP.1.1
SMTC configuration	1~6		SMTC.1
DRX configuration	1~6		Off

Parameter	Config	Unit	Value
reportConfigType	1~6		aperiodic
reportQuantity	1~6		cri-RSRP
Number of reported RS	1~6		2
qcl-Info	1~6		SSB#0 for resource#0
			SSB#1 for resource#1
reportSlotOffsetList	1~6	slots	8
T1	1~6	s	5
EPRE ratio of PSS to SSS	1~6	dB	0
EPRE ratio of PBCH DMRS to SSS			
EPRE ratio of PBCH to PBCH DMRS			
EPRE ratio of PDCCH DMRS to SSS			
EPRE ratio of PDCCH to PDCCH DMRS			
EPRE ratio of PDSCH DMRS to SSS			
EPRE ratio of PDSCH to PDSCH DMRS			
EPRE ratio of OCNG DMRS to SSS Note 1			
EPRE ratio of OCNG to OCNG DMRS Note 1			
Propagation condition	1~6		AWGN
NOTE: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.			

Table 4.6.4.3.4.1-3: Test Environment parameters for EN-DC CSI-RS L1-RSRP measurement

Parameter	Value		Comment
Test environment	NC		As specified in TS 38.508-1 [14] clause 4.1.
Test frequencies	As specified in Annex E, Table E.2-1 and TS 38.508-1 [14] clause 4.3.1 and 4.4.2.		
Channel bandwidth	As specified by the test configuration selected from Table 4.6.4.3.4.1-1.		
Propagation conditions	AWGN		As specified in clause C.2.2.
Connection Diagram	TE Part	A.3.1.7.1	As specified in TS 38.508-1 [14] Annex A.
	DUT Part	A.3.2.3.4	
Exceptions to connection diagram	For 4Rx capable UEs without any 2 Rx RF bands use A.3.2.5.2 for DUT part and A.3.1.8.4 for TE Part		

1. Message contents are defined in clause 4.6.4.3.4.3.

2. Cell 1 is the E-UTRA serving cell (PCell) for the EN-DC setup. The power levels and settings for Cell 1 are set according to Annex A.6. Cell 2 is NR FR1 cell (PSCell). Cell 2 is the target for CSI-RS based L1-RSRP measurements. Before the test, UE is configured to perform RLM and BFD measurement based on the SSBs.

4.6.4.3.4.2 Test procedure

The test consists of a single time period T1, during which the UE is triggered via DCI to report L1-RSRP on aperiodic CSI-RS resources. Prior to the start of the time duration T1, the UE shall be fully synchronized to PSCell. UE is also configured to measure L1-RSRP based on SSB. Upon receiving the DCI trigger, UE provides the report back based on the reporting configuration as defined in table 4.6.4.3.4.1-2.

1. Ensure the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity EN-DC, DC bearer MCG and SCG, Connected without release *On* and Test Mode *On*, according to TS 38.508-1 [14] clause 4.5.

2. Set the parameters according to T1 in Table 4.6.4.3.5-1. T1 starts.

3. After 80ms from the start of the test the SS transmits the DCI trigger in slot 0 for configuration 1,2,4,5 and slot 8 for configuration 3,6. The corresponding CSI-RS set is transmitted with the offset of 0 slots after the DCI trigger.

4. The SS shall check following requirements:

   R1: the UE shall send L1-RSRP report at slot 8 from the reception of DCI trigger. If the report is received at slot 8 from the reception of DCI trigger, the number of passed iterations for R1 is increased by one. Otherwise, the number of failed iterations for R1 is increased by one.

   R2: The L1-RSRP value of CSI-RS#1 reported by the UE is compared to the expected L1-RSRP value for CSI-RS #1. If the resulting value is outside the limits in Table 4.6.4.3.5-2 for test configurations 1, 2, 4 and 5 and in Table 4.6.4.3.5-3 for test configurations 3 and 6 or the UE fails to report the measurement value for CSI-RS #1, the number of failed iterations for R2 is increased by one. Otherwise, the number of passed iterations for R2 is increased by one.

   R3: The DIFF RSRP value of CSI-RS #0 reported by the UE is compared to the expected DIFF RSRP value. If the resulting value is outside the limits in Table 4.6.4.3.5-4 or the UE fails to report the measurement value for CSI-RS #0, the number of failed iterations for R3 is increased by one. Otherwise, the number of passed iterations for R3 is increased by one.

5. Void

6. The SS shall transmit *RRCConnectionReconfiguration* message with condition EN-DC_PSCell_Rel according to TS 36.508 [25] Table 4.6.1-8 to release NR cell (PSCell). The UE shall transmit *RRCConnectionReconfigurationComplete* message.

7. The SS then shall transmit *RRCConnectionReconfiguration* message with condition MCG_and_SCG according to TS 36.508 [25] Table 4.6.1-8 to add NR cell (PSCell). The UE shall transmit *RRCConnectionReconfigurationComplete* message.

8. If any the reconfiguration fails, switch off and on the UE and ensure the UE is in RRC_CONNECTED with generic procedure parameters Connectivity EN-DC, DC bearer MCG and SCG, Connected without release On and Test Mode *On* according to TS 38.508-1 [14] clause 4.5.

9. Repeat steps 2-8 until the confidence level according to Tables G.2.3-1 in Annex G clause G.2 is achieved.

4.6.4.3.4.3 Message contents

Message contents are according to TS 38.508-1 [14] clause 7.3 with the following exceptions:

Table 4.6.4.3.4.3-1: Common Exception messages EN-DC CSI-RS based L1-RSRP measurement

Default Message Contents	
Common contents of system information blocks exceptions	TBD
Default RRC messages and information elements contents exceptions	Table H.3.6-2 with conditions APERIODIC and CSI-RSRP Table H.3.6-3 with conditions CSI-RS and APERIODIC Table H.3.4-1 TS 38.508-1 [14] Table 7.3.1-21 with condition APERIODIC

Table 4.6.4.3.4.3-2: RadioLinkMonitoringConfig

Derivation Path: TS 38.508-1 [14], Table 4.6.3-133			
Information Element	**Value/remark**	**Comment**	**Condition**
RadioLinkMonitoringConfig ::= SEQUENCE {			
failureDetectionResourcesToAddModList SEQUENCE (SIZE(1..maxNrofFailureDetectionResources)) OF SEQUENCE {	1 entry		
purpose	both	UE is configured to perform RLM and BFD based on the SSBs.	
}			
}			

4.6.4.3.5 Test requirement

Table 4.6.4.3.5-1 defines the primary level settings including test tolerances for all tests.

Table 4.6.4.3.5-1: CSI-RS specific test parameters for EN-DC CSI-RS L1-RSRP measurement

Parameter	Config	Unit	CSI-RS#0	CSI-RS#1
N_{oc} Note1	1~6	dBm/15kHz	-94.65	
N_{oc} Note1	1,2,4,5	dBm/SSB SCS	-94.65	
	3,6		-91.65	
$\hat{E}_s / I_{ot}$	1~6	dB	0	3.5
CSI-RS RSRP Note2	1,2,4,5	dBm/SSB SCS	-94.65	-91.15
	3,6		-91.65	-88.14
Io Note2	1,2,4,5	dBm/9.36 MHz	-63.69	-61.59
	3,6	dBm/38.16 MHz	-57.59	-55.49
$\hat{E}_s / N_{oc}$	1~6	dB	0	3.5
NOTE 1: Void. NOTE 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for N_{oc} to be fulfilled. NOTE 3: CSI-RS RSRP and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.				

After 80ms from the beginning of the test, the UE shall send L1-RSRP report at slot 8 from the beginning of T2. The L1-RSRP report shall include the results for both CSI-RS#0 and CSI-RS#1. Each L1-RSRP measurement report shall meet the corresponding absolute accuracy requirements in Table 4.6.4.3.5-2 for for test configurations 1, 2, 4 and 5 and the corresponding absolute accuracy requirements in Table 4.6.4.3.5-3 for test configurations 3 and 6 and the corresponding relative accuracy requirements in Table 4.6.4.3.5-4 for all test configurations.

Table 4.6.4.3.5-2: L1-RSRP absolute accuracy requirements for the reported values for test configurations 1, 2, 4 and 5

Normal Conditions	T1
Lowest reported value (CSI-RS#1)	55
Highest reported value (CSI-RS#1)	75

Table 4.6.4.3.5-3: L1-RSRP absolute accuracy requirements for the reported values for test configurations 3 and 6

Normal Conditions	T1
Lowest reported value (CSI-RS#1)	58
Highest reported value (CSI-RS#1)	78

Table 4.6.4.3.5-4: L1-RSRP relative accuracy requirements for the reported values for all test configurations

Normal Conditions	T1
Lowest DIFF RSRP reported (CSI-RS#0)	0
Highest DIFF RSRP reported (CSI-RS#0)	3

For the test to pass, the ratio of successful reported values for each requirement (R1 to R3) shall be more than 90% with a confidence level of 95%. Each requirement is evaluated independently of the others.

NOTE: The actual overall delays measured in the test may be up to $2xTTI_{DCCH}$ higher than the measurement reporting delays above because of TTI insertion uncertainty of the measurement report in DCCH.

4.6.4.4 EN-DC FR1 CSI-RS-based L1-RSRP measurement in DRX

4.6.4.4.1 Test purpose

To verify that the UE makes correct reporting of CSI-RS-based L1-RSRP measurement in DRX within L1-RSRP measurement requirements in TS 38.133 [6] clause 9.5.4.2.

4.6.4.4.2 Test applicability

This test applies to all types of E-UTRA UE release 15 and forward, supporting EN-DC FR1 and long DRX cycle.

4.6.4.4.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 4.6.4.0.2.

The normative reference for this requirement is TS 38.133 [6] clause A.4.6.4.4.

4.6.4.4.4 Test description

4.6.4.4.4.1 Initial conditions

This test shall be tested using any of the test configurations in Table 4.6.4.4.4.1-1. Configure the test equipment and the DUT according to the parameters in Table 4.6.4.4.4.1-2. Test environment parameters are given in Table 4.6.4.4.4.1-3.

Table 4.6.4.4.4.1-1: EN-DC CSI-RS based L1-RSRP measurement in DRX supported test configurations

Config	Description
1	LTE FDD, NR 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode
2	LTE FDD, NR 15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode
3	LTE FDD, NR 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode
4	LTE TDD, NR 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode
5	LTE TDD, NR 15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode
6	LTE TDD, NR 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode
NOTE: The UE is only required to be tested in one of the supported test configurations.	

Table 4.6.4.4.4.1-2: General test parameters for EN-DC CSI-RS based L1-RSRP measurement in DRX

Parameter	Config	Unit	Value
SSB GSCN	1~6		freq1
Duplex mode	1,4		FDD
	2,5		TDD
	3,6		TDD
TDD Configuration	1,4		N/A
	2,5		TDDConf.1.1
	3,6		TDDConf.2.1
$BW_{channel}$	1,4	MHz	10: $N_{RB,c}$ = 52
	2,5		10: $N_{RB,c}$ = 52
	3,6		40: $N_{RB,c}$ = 106
PDSCH Reference measurement channel	1,4		SR.1.1 FDD
	2,5		SR.1.1 TDD
	3,6		SR.2.1 TDD
RMSI CORESET Reference Channel	1,4		CR.1.1 FDD
	2,5		CR.1.1 TDD
	3,6		CR.2.1 TDD
Dedicated CORESET Reference Channel	1,4		CCR.1.1 FDD
	2,5		CCR.1.1 TDD
	3,6		CCR.2.1 TDD
SSB configuration	1,4		SSB.3 FR1
	2,5		SSB.3 FR1
	3,6		SSB.4 FR1
CSI-RS configuration	1,4		CSI-RS 1.3 FDD
	2,5		CSI-RS 1.3 TDD

Parameter	Config	Unit	Value
	3,6		CSI-RS 2.3 TDD
OCNG Patterns	1~6		OP.1
TRS Configuration	1,4		TRS.1.1 FDD
	2,5		TRS.1.1 TDD
	3,6		TRS.1.2 TDD
Initial BWP Configuration	1~6		DLBWP.0.1 ULBWP.0.1
Dedicated BWP configuration	1~6		DLBWP.1.1 ULBWP.1.1
SMTC configuration	1~6		SMTC.1
DRX configuration	1~6		DRX.3
reportConfigType	1~6		aperiodic
reportQuantity	1~6		cri-RSRP
Number of reported RS	1~6		2
qcl-Info	1~6		SSB#0 for resource#0
			SSB#1 for resource#1
reportSlotOffsetList	1~6	slots	8
T1	1~6	s	5
EPRE ratio of PSS to SSS	1~6	dB	0
EPRE ratio of PBCH DMRS to SSS			
EPRE ratio of PBCH to PBCH DMRS			
EPRE ratio of PDCCH DMRS to SSS			
EPRE ratio of PDCCH to PDCCH DMRS			
EPRE ratio of PDSCH DMRS to SSS			
EPRE ratio of PDSCH to PDSCH DMRS			
EPRE ratio of OCNG DMRS to SSS Note 1			
EPRE ratio of OCNG to OCNG DMRS Note 1			
Propagation condition	1~6		AWGN
NOTE: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.			

Table 4.6.4.4.4.1-3: Test Environment parameters for EN-DC CSI-RS based L1-RSRP measurement in DRX

Parameter	Value		Comment
Test environment	NC		As specified in TS 38.508-1 [14] clause 4.1.
Test frequencies	As specified in Annex E, Table E.2-1 and TS 38.508-1 [14] clause 4.3.1 and 4.4.2.		
Channel bandwidth	As specified by the test configuration selected from Table 4.6.4.4.4.1-1.		
Propagation conditions	AWGN		As specified in clause C.2.2.
Connection Diagram	TE Part	A.3.1.7.1	As specified in TS 38.508-1 [14] Annex A.
	DUT Part	A.3.2.3.4	
Exceptions to connection diagram	For 4Rx capable UEs without any 2 Rx RF bands use A.3.2.5.2 for DUT part and A.3.1.8.4 for TE Part		

1. Message contents are defined in clause 4.6.4.4.4.3.

2. Cell 1 is the E-UTRA serving cell (PCell) for the EN-DC setup. The power levels and settings for Cell 1 are set according to Annex A.6. Cell 2 is NR FR1 cell (PSCell). Cell 2 is the target for CSI-RS based L1-RSRP measurements. Before the test, UE is configured to perform RLM, BFD and L1-RSRP measurement based on the SSBs. DRX is configured as specified in Table 4.6.4.4.4.1-2.

4.6.4.4.4.2 Test procedure

Same test procedure as in subclause 4.6.4.3.4.2 with tables 4.6.4.3.4.1-2 and 4.6.4.3.5-1 replaced by tables 4.6.4.4.4.1-2 and 4.6.4.4.5-1.

4.6.4.4.4.3 Message contents

Same message content as in subclause 4.6.4.3.4.3 with the following exception:

Table 4.6.4.4.4.3-1: Common Exception messages EN-DC CSI-RS based L1-RSRP measurement in DRX

Default Message Contents	
Common contents of system information blocks exceptions	
Default RRC messages and information elements contents exceptions	Table H.3.7-1 with condition DRX.3 and Offset

4.6.4.4.5 Test requirement

Table 4.6.4.4.5-1 defines the primary level settings including test tolerances for all tests.

Table 4.6.4.4.5-1: CSI-RS specific test parameters for EN-DC SSB based L1-RSRP measurement in DRX

Parameter	Config	Unit	CSI-RS#0	CSI-RS#1
N_{oc} Note1	1~6	dBm/15kHz	-94.65	
N_{oc} Note1	1,2,4,5	dBm/SSB SCS	-94.65	
	3,6		-91.65	
$\hat{E}_s / I_{ot}$	1~6	dB	0	3.5
CSI-RS RSRP Note2	1,2,4,5	dBm/SSB SCS	-94.65	-91.15
	3,6		-91.65	-88.14
Io Note2	1,2,4,5	dBm/9.36 MHz	-63.69	-61.59
	3,6	dBm/38.16 MHz	-57.59	-55.49
$\hat{E}_s / N_{oc}$	1~6	dB	0	3.5

NOTE 1: Void.
NOTE 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for N_{oc} to be fulfilled.
NOTE 3: CSI-RS RSRP and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.

After 80ms from the beginning of the test, the UE shall send L1-RSRP report at slot 8 from the reception of DCI triggering the L1-RSRP measurement. The L1-RSRP report shall include the results for both CSI-RS#0 and CSI-RS#1.

Each L1-RSRP measurement report shall meet the corresponding absolute accuracy requirements in Table 4.6.4.4.5-2 for for test configurations 1, 2, 4 and 5, the corresponding absolute accuracy requirements in Table 4.6.4.4.5-3 for test configurations 3 and 6 and the corresponding relative accuracy requirements in Table 4.6.4.4.5-4 for all test configurations.

Table 4.6.4.4.5-2: L1-RSRP absolute accuracy requirements for the reported values for test configurations 1, 2, 4 and 5

Normal Conditions	T1
Lowest reported value (CSI-RS#1)	55
Highest reported value (CSI-RS#1)	75

Table 4.6.4.4.5-3: L1-RSRP absolute accuracy requirements for the reported values for test configurations 3 and 6

Normal Conditions	T1
Lowest reported value (CSI-RS#1)	58
Highest reported value (CSI-RS#1)	78

Table 4.6.4.4.5-4: L1-RSRP relative accuracy requirements for the reported values for all test configurations

Normal Conditions	T1
Lowest DIFF RSRP reported (CSI-RS#0)	0
Highest DIFF RSRP reported (CSI-RS#0)	3

The rate of correct events observed during repeated tests shall be at least 90% with a confidence level of 95%.

NOTE: The actual overall delays measured in the test may be up to $2xTTI_{DCCH}$ higher than the measurement reporting delays above because of TTI insertion uncertainty of the measurement report in DCCH.

4.6.4.5 EN-DC FR1 SSB-based L1-RSRP measurement in DRX for UE configured with highSpeedMeasFlag-r16

Editor's note: This test case is incomplete. The following aspects are either missing or not yet determined:

- The feasibility of configuring different channel models to different SSBs needs further study.
- The TT analysis may need to be redone after concluding if the new test configuration is testable.

4.6.4.5.1 Test purpose

To verify that the UE makes correct reporting of L1-RSRP measurement when UE is configured with *highSpeedMeasFlag-r16*.

To verify the L1-RSRP measurement requirements for UE configured with *highSpeedMeasFlag-r16* in TS 38.133 [6] clause 9.5.4.1.

4.6.4.5.2 Test applicability

This test applies to all types of E-UTRA UE release 15 and forward, supporting EN-DC FR1, HST enhancement and long DRX cycle.

4.6.4.5.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 4.6.4.0.1.

The normative reference for this requirement is TS 38.133 [6] clause A.4.6.4.5.

4.6.4.5.4 Test description

4.6.4.5.4.1 Initial conditions

This test shall be tested using any of the test configurations in Table 4.6.4.5.4.1-1. Configure the test equipment and the DUT according to the parameters in Table 4.6.4.5.4.1-2. Test environment parameters are given in Table 4.6.4.5.4.1-3.

Table 4.6.4.5.4.1-1: Supported test configurations for EN-DC FR1 SSB-based L1-RSRP measurement in DRX for UE configured with highSpeedMeasFlag-r16

Config	Description
4.6.4.5-1	LTE FDD, NR 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode

4.6.4.5-2	LTE FDD, NR 15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode
4.6.4.5-3	LTE FDD, NR 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode
4.6.4.5-4	LTE TDD, NR 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode
4.6.4.5-5	LTE TDD, NR 15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode
4.6.4.5-6	LTE TDD, NR 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode
NOTE: The UE is only required to be tested in one of the supported test configurations.	

Table 4.6.4.5.4.1-2: General test parameters for EN-DC FR1 SSB-based L1-RSRP measurement in DRX for UE configured with highSpeedMeasFlag-r16

Parameter	Config	Unit	Value
SSB GSCN	1~6		freq1
Duplex mode	1,4		FDD
	2,5		TDD
	3,6		TDD
TDD Configuration	1,4		N/A
	2,5		TDDConf.1.1
	3,6		TDDConf.2.1
$BW_{channel}$	1,4	MHz	10: $N_{RB,c}$ = 52
	2,5		10: $N_{RB,c}$ = 52
	3,6		40: $N_{RB,c}$ = 106
PDSCH Reference measurement channel	1,4		SR.1.1 FDD
	2,5		SR.1.1 TDD
	3,6		SR.2.1 TDD
RMSI CORESET Reference Channel	1,4		CR.1.1 FDD
	2,5		CR.1.1 TDD
	3,6		CR.2.1 TDD
Dedicated CORESET Reference Channel	1,4		CCR.1.1 FDD
	2,5		CCR.1.1 TDD
	3,6		CCR.2.1 TDD
SSB configuration	1,4		SSB.3 FR1
	2,5		SSB.3 FR1
	3,6		SSB.4 FR1
OCNG Patterns	1~6		OP.1
Initial BWP Configuration	1~6		DLBWP.0.1 ULBWP.0.1
Dedicated BWP configuration	1~6		DLBWP.1.1 ULBWP.1.1
SMTC configuration	1~6		SMTC.1
TRS Configuration	1,4		TRS.1.1 FDD
	2,5		TRS.1.1 TDD
	3,6		TRS.1.2 TDD
DRX configuration	1~6		DRX.3
reportConfigType	1~6		periodic
reportQuantity	1~6		ssb-Index-RSRP
Number of reported RS	1~6		2
L1-RSRP reporting period	1~6	slot	80
T1	1~6	s	5
T2	1~6	s	2

Parameter	Config	Unit	Value
EPRE ratio of PSS to SSS	1~6	dB	0
EPRE ratio of PBCH DMRS to SSS			
EPRE ratio of PBCH to PBCH DMRS			
EPRE ratio of PDCCH DMRS to SSS			
EPRE ratio of PDCCH to PDCCH DMRS			
EPRE ratio of PDSCH DMRS to SSS			
EPRE ratio of PDSCH to PDSCH DMRS			
EPRE ratio of OCNG DMRS to SSS Note 1			
EPRE ratio of OCNG to OCNG DMRS Note 1			
NOTE: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.			

Table 4.6.4.5.4.1-3: Test Environment parameters for EN-DC FR1 SSB-based L1-RSRP measurement in DRX for UE configured with highSpeedMeasFlag-r16

Parameter	Value		Comment
Test environment	NC		As specified in TS 38.508-1 [14] clause 4.1.
Test frequencies	As specified in Annex E, Table E.2-1 and TS 38.508-1 [14] clause 4.3.1 and 4.4.2.		
Channel bandwidth	As specified by the test configuration selected from Table 4.6.4.5.4.1-1.		
Propagation conditions	AWGN		As specified in clause C.2.2.
Connection Diagram	TE Part	A.3.1.7.1	As specified in TS 38.508-1 [14] Annex A.
	DUT Part	A.3.2.3.4	
Exceptions to connection diagram	For 4Rx capable UEs without any 2 Rx RF bands use A.3.2.5.2 for DUT part and A.3.1.8.4 for TE Part		

1. Message contents are defined in clause 4.6.4.5.4.3.

2. Cell 1 is the E-UTRA serving cell (PCell) for the EN-DC setup. The power levels and settings for Cell 1 are set according to Annex A.6. Cell 2 is NR FR1 cell (PSCell). Cell 2 is the target for SSB based L1-RSRP measurements. Before the test, UE is configured to perform RLM, BFD and L1-RSRP measurement based on the SSBs. DRX is configured as specified in Table 4.6.4.5.4.1-2.

4.6.4.5.4.2 Test procedure

Same test procedure as in subclause 4.6.4.1.4.2 with tables 4.6.4.1.4.1-2 and 4.6.4.1.5-1 replaced by tables 4.6.4.5.4.1-2 and 4.6.4.5.5-1. Step 7 is also replaced by the following step.

7. The UE shall start sending L1-RSRP reports. The SS shall check following requirements:

   R1: the UE shall start to transmit valid reports no later than 720 ms for configuration 1, 2, 4 and 5 and no later than 680 ms for configuration 3 and 6 from the beginning of time period T2. A valid report shall meet the absolute L1-RSRP requirement for SSB#1 (Table 4.6.4.5.5-2 for test configurations 1, 2, 4 and 5 and Table 4.6.4.5.5-3 for test configurations 3 and 6) and the relative L1-RSRP requirement for SSB#0 in Table 4.6.4.5.5-4. If the first valid report is received earlier than the specified time, the number of passed iterations for R1 is increased by one. Otherwise, the number of failed iterations for R1 is increased by one.

   R2: the UE shall transmit reports every 80 slots until the end of time period T2. If the reports are received accordingly, the number of passed iterations for R2 is increased by one. Otherwise, the number of failed iterations for R2 is increased by one.

R3: The L1-RSRP value of SSB#1 reported by the UE is compared to the expected L1-RSRP value for SSB#1. In all consecutive reports after the first valid value is received, if the resulting value is outside the limits in Table 4.6.4.5.5-2 for test configurations 1, 2, 4 and 5 and in Table 4.6.4.5.5-3 for test configurations 3 and 6 or the UE fails to report the measurement value for SSB#1, the number of failed iterations for R3 is increased by one. Otherwise, the number of passed iterations for R3 is increased by one.

R4: The DIFF RSRP value of SSB#0 reported by the UE is compared to the expected DIFF RSRP value. In all consecutive reports after the first valid value is received, if the resulting value is outside the limits in Table 4.6.4.5.5-4 or the UE fails to report the measurement value for SSB#0, the number of failed iterations for R4 is increased by one. Otherwise, the number of passed iterations for R4 is increased by one.

4.6.4.5.4.3 Message contents

In addition to the same message contents as clause 4.6.4.2.4.3, the following exceptions are also needed:

Table 4.6.4.5.4.3-1: Void

Table 4.6.4.5.4.3-2: Void

Table 4.6.4.5.4.3-3: CellGroupConfig (Step 1)

Derivation Path: TS 38.508-1 [14], Table 4.6.3-19 with condition EN-DC			
Information Element	**Value/remark**	**Comment**	**Condition**
CellGroupConfig ::= SEQUENCE {			
spCellConfig SEQUENCE {			
servCellIndex	ServCellIndex for Cell 2		
reconfigurationWithSync SEQUENCE {			
spCellConfigCommon	ServingCellConfigCommon	Table 4.6.4.5.4.3-4	
}			
}			
}			

Table 4.6.4.5.4.3-4: ServingCellConfigCommon (Table 4.6.4.5.4.3-3)

Derivation Path: TS 38.508-1[14], Table 4.6.3-168 with condition HST			
Information Element	**Value/remark**	**Comment**	**Condition**
ServingCellConfigCommon ::= SEQUENCE {			
highSpeedConfig-r16 SEQUENCE {			
highSpeedMeasFlag-r16	true		
}			
}			

4.6.4.5.5 Test requirement

Table 4.6.4.5.5-1 defines the primary level settings including test tolerances for all tests.

Table 4.6.4.5.5-1: SSB specific test parameters for EN-DC FR1 SSB-based L1-RSRP measurement in DRX for UE configured with highSpeedMeasFlag-r16

Parameter	Config	Unit	SSB#0		SSB#1	
			T1	T2	T1	T2
N_{oc} Note2	1~6	dBm/15kHz	-94.65			
N_{oc} Note2	1,2,4,5	dBm/SSB SCS	-94.65			
	3,6		-91.65			
$\hat{E}_s / I_{ot}$	1~6	dB	0	0	-Infinity	3.5

SSB RSRP Note3	1,2,4,5	dBm/SSB SCS	-94.65	-94.65	-Infinity	-91.15
	3,6		-91.65	-91.65	-Infinity	-88.15
Io Note3	1,2,4,5	dBm/9.36 MHz	-63.69	-63.69	-66.70	-61.59
	3,6	dBm/38.16 MHz	-57.59	-57.59	-60.61	-55.49
$\hat{E}_s / N_{oc}$	1~6	dB	0	0	-Infinity	3.5
Propagation conditions	1,2,4,5		AWGN		AWGN 1944 Hz Note4	
	3,6		AWGN		AWGN 3334 Hz Note5	

NOTE 1 The resources for uplink transmission are assigned to the UE prior to the start of time period T2.
NOTE 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for N_{oc} to be fulfilled.
NOTE 3: SS-RSRP and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.
Note 4: The AWGN 1944 Hz condition is a non-fading propagation channel with one tap. Doppler shift is a constant 1944 Hz.
Note 5: The AWGN 3334 Hz condition is a non-fading propagation channel with one tap. Doppler shift is a constant 3334 Hz.

The UE shall send L1-RSRP report every 80 slots. No later than 640ms plus 80 slots from the beginning of time period T2, UE shall send L1-RSRP report including results of both SSB0 and SSB1. Each L1-RSRP measurement report shall meet the corresponding absolute accuracy requirements in Table 4.6.4.5.5-2 for test configurations 1, 2, 4 and 5, the corresponding absolute accuracy requirements in Table 4.6.4.5.5-3 for test configurations 3 and 6 and the corresponding relative accuracy requirements in Table 4.6.4.5.5-4 for all test configurations.

Table 4.6.4.5.5-2: L1-RSRP absolute accuracy requirements for the reported values for test configurations 1, 2, 4 and 5

Normal Conditions	T1	T2
Lowest reported value (SSB#1)	-	55
Highest reported value (SSB#1)	-	75

Table 4.6.4.5.5-3: L1-RSRP absolute accuracy requirements for the reported values for test configurations 3 and 6

Normal Conditions	T1	T2
Lowest reported value (SSB#1)	-	58
Highest reported value (SSB#1)	-	78

Table 4.6.4.5.5-4: L1-RSRP relative accuracy requirements for the reported values for all test configurations

Normal Conditions	T1	T2
Lowest DIFF RSRP reported (SSB#0)	-	0
Highest DIFF RSRP reported (SSB#0)	-	3

The rate of correct events observed during repeated tests shall be at least 90% with a confidence level of 95%.

NOTE: The actual overall delays measured in the test may be up to $2xTTI_{DCCH}$ higher than the measurement reporting delays above because of TTI insertion uncertainty of the measurement report in DCCH.

4.6.5 CLI measurements

4.6.5.0 Minimum conformance requirements

4.6.5.0.1 Minimum conformance requirements for SRS-RSRP measurement

The UE shall be capable of performing SRS-RSRP measurement based on the configured SRS resource, and the UE shall be capable of reporting SRS-RSRP measured over measurement period of $T_{SRS_RSRP_measurement_period}$ for FR1 and FR2.

Table 4.6.5.0.1-1 Measurement period $T_{SRS_RSRP_measurement_period}$

Configuration	$T_{SRS_measurement_period}$ (ms)
No DRX	Max(60, 3 X T_{SRS})
DRX cycle ≤ 320ms	Max(60, Ceil(1.5 X 3) X max(T_{SRS}, T_{DRX}))
DRX cycle > 320ms	3 X T_{DRX}
NOTE: T_{SRS} is SRS measurement periodicity configured *SRS-PeriodicityAndOffset*, and T_{DRX} is the DRX cycle length.	

If the SRS resources configured for measurement are partially or fully overlapping with SMTC window, SSB or CSI-RS configured for RLM, BFD, CBD or L1-RSRP measurement or measurement gaps, requirements are not specified for $T_{SRS_RSRP_measurement_period}$.

When configured by the network, the UE shall be able to perform SRS-RSRP measurements of configured *srs-ResourceConfigCLI*. The requirements apply when the subcarrier spacing for SRS-RSRP measurement resource configuration is the same as the subcarrier spacing of the active DL BWP of serving cell. The UE is not required to measure SRS using different SCS compared to the downlink active BWP SCS of the same carrier.

The requirements apply, provided:

- SRS resources configured for SRS-RSRP measurements are measurable.

An SRS resource configured for SRS-RSRP shall be considered measurable when for each relevant SRS the following conditions are met:

- SRS-RSRP related side conditions given in clauses 10.1.22.1 of TS 38.133 [6] for FR1 and FR2 for a corresponding band,
- SRS_RP and SRS Ês/Iot according to Annex B.2.7 of TS 38.133 [6] for a corresponding band.

The UE shall send SRS-RSRP reports only for report configurations according to *reportType* which is *cliPeriodical* or *cliEventTriggered* when SRS-RSRP report is configured.

The UE shall report the SRS-RSRP value as a 7-bit value in the range [-140, -44] dBm with 1dB step size according to clause 10.1.22.1 of TS 38.133[6] for FR1 and FR2.

The UE shall not send any event triggered measurement reports as long as no reporting criteria is fulfilled.

The measurement reporting delay is defined as the time between an event that will trigger a measurement report and the point when the UE starts to transmit the measurement report over the air interface. This requirement assumes that the measurement report is not delayed by other RRC signalling on the DCCH. This measurement reporting delay excludes a delay uncertainty resulted when inserting the measurement report to the TTI of the uplink DCCH. The delay uncertainty is: 2 x TTI_{DCCH}. This measurement reporting delay excludes a delay which caused by no UL resources for UE to send the measurement report on.

The normative reference for this requirement is TS 38.133 [6] clause 9.7.2.5, 9.7.2.1, 9.7.2.2 and 9.7.2.3.3.

4.6.5.0.2 Minimum conformance requirements for CLI-RSSI measurement with non-DRX

The UE shall be capable of performing CLI-RSSI measurement based on the configured measurement resource within TCLI_RSSI_measurement_period. The UE shall be able to provide a single RSSI sample for each measurement resource configured for CLI-RSSI measurement occurring with a configured periodicity. The CLI-RSSI measurement period TCLI_RSSI_measurement_period corresponds to the CLI-RSSI measurement resource periodicity, which is configured for by higher layers via RSSI-PeriodicityAndOffset.

If the CLI-RSSI measurement resources configured for measurement are partially or fully overlapping with SMTC window, SSB or CSI-RS configured for RLM, BFD, CBD or L1-RSRP measurement or measurement gaps, requirements are not specified for TCLI_RSSI_measurement_period.

The UE shall send CLI-RSSI reports only for report configurations according to *reportType* which is *cliPeriodical* or *cliEventTriggered* when CLI-RSSI report is configured.

The requirements apply, provided:

- The measurement resources configured for CLI-RSSI measurements are measurable.

A measurement resource configured for CLI-RSSI shall be considered measurable when for each relevant CLI-RSSI resource the following conditions are met:

- CLI-RSSI related side conditions given in clauses 10.1.22.2 for FR1 and FR2 for a corresponding band.

The UE shall report the CLI-RSSI value as a 7-bit value in the range [-100, -25] dBm with 1dB step size according to clause 10.1.22.2 of TS 38.133[6] for FR1 and FR2.

The UE shall not send any event triggered measurement reports as long as no reporting criteria is fulfilled.

The measurement reporting delay is defined as the time between an event that will trigger a measurement report and the point when the UE starts to transmit the measurement report over the air interface. This requirement assumes that the measurement report is not delayed by other RRC signalling on the DCCH. This measurement reporting delay excludes a delay uncertainty resulted when inserting the measurement report to the TTI of the uplink DCCH. The delay uncertainty is: 2 x TTI_{DCCH}. This measurement reporting delay excludes a delay which caused by no UL resources for UE to send the measurement report on.

The normative reference for this requirement is TS 38.133 [6] clauses 9.7.3.5, 9.7.3.1 and 9.7.3.3.2.

4.6.5.1 EN-DC FR1 SRS-RSRP measurement with non-DRX

Editor's NOTE: This test case is incomplete in following aspects:

- Message contents are missing.
- TT analysis is missing.
- Test Procedure might need update.
- Test applicability needs to be updated

4.6.5.1.1 Test purpose

To verify that the UE makes correct reporting of SRS-RSRP measurement within SRS-RSRP measurement requirements in TS 38.133 [6] clause 9.7.2.5.

4.6.5.1.2 Test applicability

FFS.

4.6.5.1.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 4.6.5.0.1.

The normative reference for this requirement is TS 38.133 [6] clause A.4.6.5.1.

4.6.5.1.4 Test description

4.6.5.1.4.1 Initial conditions

This test shall be tested using any of the test configurations in Table 4.6.5.1.4.1-1. Configure the test equipment and the DUT according to the parameters in Table 4.6.5.1.4.1-2. Test environment parameters are given in Table 4.6.5.1.4.1-3.

Table 4.6.5.1.4.1-1: EN-DC FR1 SRS-RSRP measurement supported test configurations

Configuration	Description
1	NR 15 kHz SRS SCS, 10 MHz bandwidth, TDD duplex mode

2	NR 30 kHz SRS SCS, 40 MHz bandwidth, TDD duplex mode
NOTE: The UE is only required to be tested in one of the supported test configurations.	

Table 4.6.5.1.4.1-2: General test parameters for EN-DC SRS-RSRP event triggered reporting for PSCell in FR1

Parameter	Unit	Test configuration	Value	Comment
Active cell		1, 2	E-UTRAN Cell 1 and NR Cell 2	
RF Channel Number		1, 2	1: Cell 1 2: Cell 2	
SSB configuration		1	SSB.1 FR1	
		2	SSB.2 FR1	
SMTC configuration		1	SMTC.1	
		2	SMTC.1	
SRS configuration		1	SRSConf.1	Table 4.6.5.1.5-3
		2	SRSConf.2	
CP length		1, 2	Normal	
i1-Threshold	dBm	1	-97	
		2	-95	
Hysteresis	dB	1, 2	0	
Time To Trigger	s	1, 2	0	
Filter coefficient		1, 2	0	L3 filtering is not used
DRX		1, 2	OFF	Non-DRX
Time offset between DL from serving cell and SRS from test system	µs	1,2	17.67	
T1	s	1, 2	5	
T2	s	1, 2	1	

Table 4.6.5.1.4.1-3: Test Environment parameters for EN-DC SRS-RSRP event triggered reporting for PSCell in FR1

Parameter	Value		Comment
Test environment	NC		As specified in TS 38.508-1 [14] clause 4.1.
Test frequencies	As specified in Annex E, Table E.2-1 and TS 38.508-1 [14] clause 4.3.1 and 4.4.2.		
Channel bandwidth	As specified by the test configuration selected from Table 4.6.5.2.4.1-1.		
Propagation conditions	AWGN		As specified in clause C.2.2.
Connection Diagram	TE Part	A.3.1.7.1	As specified in TS 38.508-1 [14] Annex A.
	DUT Part	A.3.2.3.4	
Exceptions to connection diagram	For 4Rx capable UEs without any 2 Rx RF bands use A.3.2.5.2 for DUT part and A.3.1.8.4 for TE Part		

1. Message contents are defined in clause 4.6.5.1.4.3.

2. Cell 1 is the E-UTRA serving cell (PCell) for the EN-DC setup. The power levels and settings for Cell 1 are set according to Annex A.6. Cell 2 is NR FR1 cell (PSCell). Cell 2 is the target for SRS-RSRP measurements. In the measurement control information, a measurement object is configured for the frequency of the PSCell, and it is indicated to the UE that event-triggered reporting with Event I1 is used. The test consists of two successive time periods, with time duration of T1 and T2, respectively.

4.6.5.1.4.2 Test procedure

FFS

4.6.5.1.4.3 Message contents

Message contents are according to TS 38.508-1 [14] clause 7.3 with the following exceptions:

FFS

4.6.5.1.5 Test requirement

Table 4.6.5.1.5-1 defines the primary level settings including test tolerances for all tests.

Table 4.6.5.1.5-1: NR Cell specific test parameters for EN-DC SRS-RSRP event triggered reporting for PSCell in FR1

Parameter	Unit	Test configuration	Cell 2	
			T1	T2
TDD configuration		1	TDDConf.1.1	
		2	TDDConf.2.1	
PDSCH RMC configuration		1	SR.1.1 TDD	
		2	SR.2.1 TDD	
RMSI CORESET RMC configuration		1	CR.1.1 TDD	
		2	CR.2.1 TDD	
Dedicated CORESET RMC configuration		1	CCR.1.1 TDD	
		2	CCR.2.1 TDD	
OCNG Patterns		1, 2	OP.1	
TRS Configuration		1	TRS.1.1 TDD	
		2	TRS.1.2 TDD	
Initial BWP configuration		1, 2	DLBWP.0.1 ULBWP.0.1	
Active DL BWP configuration		1, 2	DLBWP.1.1	
Active UL BWP configuration		1, 2	ULBWP.1.1	
N_{oc} Note 2	dBm/15 kHz	1	-98+TT	
		2		
N_{oc} Note 2	dBm/SCS	1	-98+TT	
		2	-95+TT	
Propagation Condition		1, 2	AWGN	
NOTE 1: The resources for uplink transmission are assigned to the UE prior to the start of time period T2. NOTE 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for N_{oc} to be fulfilled.				

Table 4.6.5.1.5-2: NR Cell specific test parameters for EN-DC FR1 SRS-RSRP event triggered reporting for neighbour cell UE

Parameter	Unit	Test configuration	Neighbour cell UE	
			T1	T2
N_{oc} Note 2	dBm/15 kHz	1	-98+TT	
		2		
N_{oc} Note 2	dBm/SCS	1	-98+TT	
		2	-95+TT	
$\hat{E}_s/I_{ot}$	dB	1	-infinity	4+TT
		2		
$\hat{E}_s/N_{oc}$	dB	1	-infinity	4+TT
		2		
SRS-RSRP Note 3	dBm/SCS kHz	1	-infinity	-94+TT
		2	-infinity	-91+TT
Io	dBm/9.36 MHz	1	-70.05+TT	-64.59+TT
	dBm/38.16 MHz	2	-63.96+TT	-58.50+TT
Propagation Condition		1, 2	AWGN	

NOTE 1: The resources for uplink transmission are assigned to the UE prior to the start of time period T2.
NOTE 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for N_{oc} to be fulfilled.
NOTE 3: SRS-RSRP levels have been derived from other parameters for information purposes. They are not settable parameters themselves.

Table 4.6.5.1.5-3: SRS configuration for measurement reporting

	Field	SRSConf.1	SRSConf.2	Comments
SRS-ResourceSet	srs-ResourceSetId	0	0	
	srs-ResourceIdList	0	0	
	resourceType	Periodic	Periodic	
	Usage	Codebook	Codebook	
SRS-Resource	SRS-ResourceId	0	0	
	nrofSRS-Ports	Port1	Port1	
	transmissionComb	n2	n2	
	combOffset-n2	0	0	
	cyclicShift-n2	0	0	
	resourceMapping startPosition	0	0	
	resourceMapping nrofSymbols	n1	n1	
	resourceMapping repetitionFactor	n1	n1	
	freqDomainPosition	0	0	
	freqDomainShift	0	0	
	freqHopping c-SRS	12	12	
	freqHopping b-SRS	0	0	
	freqHopping b-hop	0	0	
	groupOrSequenceHopping	Neither	Neither	
	resourceType	Periodic	Periodic	
	periodicityAndOffset	sl20, 9	sl40, 19	
	sequenceId	0	0	Any 10 bit number

The UE shall send one Event I1 triggered measurement report, with a measurement reporting delay less than 60 ms from the beginning of time period T2.

The UE shall not send event triggered measurement reports, as long as the reporting criteria are not fulfilled.

The rate of correct events observed during repeated tests shall be at least 90%.

NOTE: The actual overall delays measured in the test may be up to $2xTTI_{DCCH}$ higher than the measurement reporting delays above because of TTI insertion uncertainty of the measurement report in DCCH.

4.6.5.2 EN-DC FR1 CLI-RSSI measurement with non-DRX

Editor's NOTE: This test case is incomplete in following aspects:

- Message contents are missing.
- Test Procedure might need update.
- Test applicability needs to be updated

4.6.5.2.1 Test purpose

To verify that the UE makes correct reporting of CLI-RSSI measurement in non-DRX within CLI-RSSI measurement requirements in TS 38.133 [6] clause 9.7.3.5.

4.6.5.2.2 Test applicability

FFS.

4.6.5.2.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 4.6.5.0.2.

The normative reference for this requirement is TS 38.133 [6] clause A.4.6.5.2.

4.6.5.2.4 Test description

4.6.5.2.4.1 Initial conditions

This test shall be tested using any of the test configurations in Table 4.6.5.2.4.1-1. Configure the test equipment and the DUT according to the parameters in Table 4.6.5.2.4.1-2. Test environment parameters are given in Table 4.6.5.2.4.1-3.

Table 4.6.5.2.4.1-1: EN-DC FR1 CLI-RSSI measurement in non-DRX test configurations

Configuration	Description
1	NR 15 kHz SCS, 10 MHz bandwidth, TDD duplex mode
2	NR 30 kHz SCS, 40 MHz bandwidth, TDD duplex mode
NOTE: The UE is only required to be tested in one of the supported test configurations.	

Table 4.6.5.2.4.1-2: General test parameters for CLI-RSSI event triggered reporting for PSCell in FR1

Parameter	Unit	Test configuration	Value	Comment
Active cell		1, 2	E-UTRAN Cell 1 and NR Cell 2	
RF Channel Number		1, 2	1: Cell 1 2: Cell 2	
SSB configuration		1	SSB.1 FR1	
		2	SSB.2 FR1	
SMTC configuration		1	SMTC.1	
		2	SMTC.1	
CLI-RSSI configuration		1	CLI-RSSIConf.1	Table 4.6.5.2.5-2
		2	CLI-RSSIConf.2	
CP length		1, 2	Normal	
i1-Threshold	dBm	1	-93	
		2	-93	
Hysteresis	dB	1, 2	0	
Time To Trigger	s	1, 2	0	
Filter coefficient		1, 2	0	L3 filtering is not used
DRX		1, 2	OFF	Non-DRX
Time offset between DL from serving cell and OCNG from test system	µs	1,2	17.67	
T1	s	1, 2	5	
T2	s	1, 2	1	

Table 4.6.5.2.4.1-3: Test Environment parameters for EN-DC SSB based L1-RSRP measurement in DRX

Parameter	Value	Comment
Test environment	NC	As specified in TS 38.508-1 [14] clause 4.1.
Test frequencies	As specified in Annex E, Table E.2-1 and TS 38.508-1 [14] clause 4.3.1 and 4.4.2.	
Channel bandwidth	As specified by the test configuration selected from Table 4.6.5.2.4.1-1.	

Propagation conditions	AWGN		As specified in clause C.2.2.
Connection Diagram	TE Part	A.3.1.7.1	As specified in TS 38.508-1 [14] Annex A.
	DUT Part	A.3.2.3.4	
Exceptions to connection diagram	For 4Rx capable UEs without any 2 Rx RF bands use A.3.2.5.2 for DUT part and A.3.1.8.4 for TE Part		

1. Message contents are defined in clause 4.6.5.2.4.3.
2. Cell 1 is the E-UTRA serving cell (PCell) for the EN-DC setup. The power levels and settings for Cell 1 are set according to Annex A.6. Cell 2 is NR FR1 cell (PSCell). Cell 2 is the target for CLI-RSSI measurements. In the measurement control information, a measurement object is configured for the frequency of the PSCell, and it is indicated to the UE that event-triggered reporting with Event I1 is used.

4.6.5.2.4.2 Test procedure

FFS

4.6.5.2.4.3 Message contents

FFS

4.6.5.2.5 Test requirement

Table 4.6.5.2.5-1 defines the primary level settings including test tolerances for all tests.

Table 4.6.5.2.5-1: NR Cell specific test parameters for CLI-RSSI event triggered reporting for PSCell in FR1

Parameter	Unit	Test configuration	Cell 2	
			T1	T2
TDD configuration		1	TDDConf.1.1	
		2	TDDConf.2.1	
PDSCH RMC configuration		1	SR.1.1 TDD	
		2	SR.2.1 TDD	
RMSI CORESET RMC configuration		1	CR.1.1 TDD	
		2	CR.2.1 TDD	
Dedicated CORESET RMC configuration		1	CCR.1.1 TDD	
		2	CCR.2.1 TDD	
OCNG Patterns Note 3		1, 2	OP.1	
TRS Configuration		1	TRS.1.1 TDD	
		2	TRS.1.2 TDD	
Initial BWP configuration		1, 2	DLBWP.0.1 ULBWP.0.1	
Active DL BWP configuration		1, 2	DLBWP.1.1	
Active UL BWP configuration		1, 2	ULBWP.1.1	
N_{oc} on CLI-RSSI measurement resource Note 2	dBm/15 kHz	1	-116	-108
		2		
N_{oc} on CLI-RSSI measurement resource Note 2	dBm/SCS	1	-116	-108
		2	-113	-105
Io on CLI-RSSI measurement resource	dBm/9.36 MHz	1	-88.05	79.55
	dBm/38.16 MHz	2	-81.96	73.5
Io on CLI-RSSI measurement resource	dBm/1.08 MHz	1	-97.43	88.93
	dBm/1.08 MHz	2	-97.44	88.94
Propagation Condition		1, 2	AWGN	

NOTE 1: The resources for uplink transmission are assigned to the UE prior to the start of time period T2.
NOTE 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for N_{oc} to be fulfilled.
NOTE 3: OCNG is not transmitted in the CLI-RSSI measurement resources.

Table 4.6.5.2.5-2: CLI-RSSI measurement resource configuration for measurement reporting

	Field	CLI-RSSIConf.1	CLI-RSSIConf.2
RSSI-Resource	rssi-ResourceId	0	0
	rssi-SCS	15	30
	startPRB	0	0
	nrofPRBs	52	106
	startPosition	3	3
	nrofSymbols	11	11
	rssi-PeriodicityAndOffset	sl20, 9	sl40, 19

The UE shall send one Event I1 triggered measurement report, with a measurement reporting delay less than 20 ms from the beginning of time period T2. The nominal RSSI used to evaluate the requirement shall be based on Io.

The UE shall not send event triggered measurement reports, as long as the reporting criteria are not fulfilled.

The rate of correct events observed during repeated tests shall be at least 90%.

NOTE: The actual overall delays measured in the test may be up to $2xTTI_{DCCH}$ higher than the measurement reporting delays above because of TTI insertion uncertainty of the measurement report in DCCH.

4.6.6

4.6.7 L1-SINR measurement for beam reporting

4.6.7.0 Minimum conformance requirements

4.6.7.0.1 L1-SINR reporting with CSI-RS based CMR and no dedicated IMR configured

The UE shall be capable of performing L1-SINR measurements with the CSI-RS resource configured as CMR and no dedicated resource configured as IMR for L1-SINR computation, and the UE physical layer shall be capable of reporting L1-SINR measured over the measurement period of $T_{L1\text{-}SINR_Measurement_Period_CSI\text{-}RS_CMR_Only}$.

The value of $T_{L1\text{-}SINR_Measurement_Period_CSI\text{-}RS_CMR_Only}$ is defined in Table 9.8.4.1-1 for FR1, where

For the value of M,

- For periodic and semi-persistent CSI-RS resources as CMR, M=1 if higher layer parameter *timeRestrictionForChannelMeasurement* is configured, and M=3 otherwise;

- For aperiodic CSI-RS resources as CMR, M=1.

For the value of P in FR1,

- $P=\frac{1}{1-\frac{T_{CSI-RS}}{MRGP}}$, when in the monitored cell there are measurement gaps configured for intra-frequency, inter-frequency or inter-RAT measurements, which are overlapping with some but not all occasions of the CSI-RS; and

- P=1 when in the monitored cell there are no measurement gaps overlapping with any occasion of the CSI-RS.

Where:

$T_{SMTCperiod}$ = the configured SMTC1 period or SMTC2 period if configured.

$T_{CSI\text{-}RS}$ = the periodicity of CSI-RS configured for L1-SINR measurement

If the high layer in TS 38.331 [2] signaling of *smtc2* is configured, $T_{SMTCperiod}$ corresponds to the value of higher layer parameter *smtc2*; Otherwise $T_{SMTCperiod}$ corresponds to the value of higher layer parameter *smtc1*.

Note: The overlap between CSI-RS for L1-SINR measurement and SMTC means that CSI-RS for L1-SINR measurement is within the SMTC window duration.

Longer evaluation period would be expected if the combination of CSI-RS, SMTC occasion and measurement gap configurations does not meet pervious conditions.

Table 9.8.4.1-1: Measurement period $T_{L1\text{-}SINR_Measurement_Period_CSI\text{-}RS_CMR_Only}$ for FR1

Configuration	$T_{L1\text{-}SINR_Measurement_Period_CSI\text{-}RS_CMR_Only}$ (ms)
non-DRX	$\max(T_{Report}, \text{ceil}(M*P)*T_{CSI\text{-}RS})$
DRX cycle ≤ 320ms	$\max(T_{Report}, \text{ceil}(1.5*M*P)*\max(T_{DRX},T_{CSI\text{-}RS}))$
DRX cycle > 320ms	$\text{ceil}(M*P)*T_{DRX}$
Note 1: $T_{CSI\text{-}RS}$ is the periodicity of CSI-RS configured for L1-SINR measurement. T_{DRX} is the DRX cycle length. T_{Report} is configured periodicity for reporting. Note 2: the requirements are applicable provided that the CSI-RS resource configured for L1-SINR measurement is transmitted with Density = 3.	

The UE shall send L1-SINR reports only for report configurations configured for the active BWP.

The UE shall report the L1-SINR value as a 7-bit value in the range [-23, 40] dB with 0.5dB step size if *nrofReportedRS* is configured to one. If *nrofReportedRS* is configured to be larger than one, or if *groupBasedBeamReporting* is enabled, the UE shall use differential L1-SINR based reporting. The differential L1-SINR is quantized to a 4-bit value with 1dB step size. The mapping between the reported L1-SINR value and the measured quantity is described in 10.1.16.

Reported L1-SINR measurements contained in aperiodic triggered, aperiodic triggered periodic and aperiodic triggered semi-persistent L1-SINR reports shall meet the requirements in clauses 10.1.27 for FR1 and 10.1.28 for FR2, respectively.

The UE shall only send aperiodic L1-SINR measurement reports, if a DCI for triggering report has been received.

After the UE receives CSI request in DCI, the UE shall transmit the aperiodic L1-SINR reporting on PUSCH over the air interface at the time specified according to clause 5.2.1.4 in TS 38.214 [26].

The UE is required to be capable of measuring L1-SINR without measurement gaps. The UE is required to perform the SSB and CSI-RS/CSI-IM measurements with measurement restrictions as described in the following clauses.

For both FR1 and FR2, when the CSI-RS configured for L1-SINR measurement is in the same OFDM symbol as SSB for RLM, BFD, CBD, L1-RSRP or L1-SINR measurement, UE is not required to receive CSI-RS for L1-SINR measurement in the PRBs that overlap with an SSB.

For FR1, when the SSB for RLM, BFD, CBD, L1-RSRP or L1-SINR measurement is within the active BWP and has same SCS than CSI-RS configured for L1-SINR measurement, the UE shall be able to perform CSI-RS measurement without restrictions.

For FR1, when the SSB for RLM, BFD, CBD, L1-RSRP or L1-SINR measurement is within the active BWP and has different SCS than CSI-RS configured for L1-SINR measurement, the UE shall be able to perform CSI-RS measurement with restrictions according to its capabilities:

- If the UE supports *simultaneousRxDataSSB-DiffNumerology*, UE shall be able to perform CSI-RS measurement without restrictions.

- If the UE does not support *simultaneousRxDataSSB-DiffNumerology*, UE is required to measure one of but not both CSI-RS for L1-SINR measurement and SSB. Longer measurement period for CSI-RS based L1-SINR measurement is expected, and no requirements are defined.

For FR1, when the CSI-RS configured for L1-SINR measurement is in the same OFDM symbol as another CSI-RS for RLM, BFD, CBD, L1-RSRP or L1-SINR measurement, UE shall be able to measure the CSI-RS for L1-SINR measurement without any restriction.

The normative reference for this requirement is TS 38.133 [6] clause 9.8.3, 9.8.4.1 and 9.8.5.2.

4.6.7.0.2 L1-SINR reporting with SSB based CMR and dedicated IMR configured

The UE shall be capable of performing L1-SINR measurements with the SSB configured as CMR and dedicated resource configured as IMR for L1-SINR computation, in which the NZP-CSI-RS or CSI-IM resource configured as dedicated IMR shall be 1-to-1 mapped to SSB configured as CMR, with the same periodicity. The UE physical layer shall be capable of reporting L1-SINR measured over the measurement period of $T_{L1\text{-}SINR_Measurement_Period_SSB_CMR_IMR}$.

The requirements in this clause are not applicable if NZP-CSI-RS or CSI-IM resource configured as dedicated IMR is scheduled with different periodicity as SSB configured as CMR.

The value of $T_{L1\text{-}SINR_Measurement_Period_SSB_CMR_IMR}$ is defined in Table 9.8.4.2-1 for FR1, where

For the value of M

- For periodic or semi-persistent NZP CSI-RS or CSI-IM resource as dedicated IMR, M=1 if the higher layer parameters *timeRestrictionForChannelMeasurements* and/or *timeRestrictionForInterferenceMeasurements* are configured, and M=3 otherwise;

P is defined as the maximum value between P_{CMR} and P_{IMR}, i.e., $P = \max(P_{CMR}, P_{IMR})$, where

- the value of P_{CMR} shall be derived in the same way as the value of P used for SSB based L1-RSRP measurement in clause 9.5.4.1, in which the occasions and period of the SSB for CMR shall be used instead.

- the value of P_{IMR} shall be derived in the same way as the value of P used for CSI-RS based L1-RSRP measurement in clause 9.5.4.2, in which the occasions and period of the NZP CSI-RS for NZP-IMR or CSI-IM for ZP-IMR shall be used instead.

Longer evaluation period would be expected if the combination of SSB, SMTC occasion and measurement gap configurations does not meet pervious conditions.

For L1-SINR measurement with SSB as CMR and CSI-RS or CSI-IM as IMR, the requirement shall apply if the CSI-RS is configured as IMR with repetition field as “repetition = OFF” or CSI-IM is configured as IMR.

For L1-SINR measurement with SSB as CMR and CSI-RS/CSI-IM as IMR, no requirement shall apply if SSB occasions for CMR or CSI-RS/CSI-IM occasions for IMR are fully overlapped with the configured measurement gap.

Table 9.8.4.2-1: Measurement period $T_{L1\text{-}SINR_Measurement_Period_SSB_CMR_IMR}$ for FR1

Configuration	$T_{L1\text{-}SINR_Measurement_Period_SSB_CMR_IMR}$ (ms)
non-DRX	$\max(T_{Report}, \text{ceil}(M*P)*T_{SSB})$
DRX cycle ≤ 320ms	$\max(T_{Report}, \text{ceil}(1.5*M*P)*\max(T_{DRX},T_{SSB}))$
DRX cycle > 320ms	$\text{ceil}(M*P)*T_{DRX}$
Note 1: T_{SSB} = ssb-periodicityServingCell is the periodicity of the SSB-Index configured for L1-SINR channel measurement. T_{DRX} is the DRX cycle length. T_{Report} is configured periodicity for reporting.	
Note 2: The requirements are applicable provided that the CSI-RS resource configured for interference measurement shall be 1-to-1 mapped to SSB configured for channel measurement, with the same periodicity.	

The UE shall send L1-SINR reports only for report configurations configured for the active BWP.

The UE shall report the L1-SINR value as a 7-bit value in the range [-23, 40] dB with 0.5dB step size if *nrofReportedRS* is configured to one. If *nrofReportedRS* is configured to be larger than one, or if *groupBasedBeamReporting* is enabled, the UE shall use differential L1-SINR based reporting. The differential L1-SINR is quantized to a 4-bit value with 1dB step size. The mapping between the reported L1-SINR value and the measured quantity is described in 10.1.16.

The UE shall transmit the periodic L1-SINR reporting on PUCCH over the air interface according to the periodicity defined in clause 5.2.1.4 in TS 38.214 [26].

Reported L1-SINR measurements contained in periodic L1-SINR measurement reports shall meet the requirements in clauses 10.1.27 for FR1 and 10.1.28 for FR2, respectively.

For FR1, when the SSB configured as CMR for L1-SINR measurement is in the same OFDM symbol as CSI-RS for RLM, BFD, CBD, L1-RSRP or L1-SINR measurement,

- If SSB and CSI-RS have same SCS, UE shall be able to measure the SSB for L1-SINR measurement without any restriction;

- If SSB and CSI-RS have different SCS,

  - If UE supports *simultaneousRxDataSSB-DiffNumerology*, UE shall be able to measure the SSB for L1-SINR measurement without any restriction;

  - If UE does not support *simultaneousRxDataSSB-DiffNumerology*, UE is required to measure one of but not both SSB for L1-SINR measurement and CSI-RS. Longer measurement period for SSB based L1-SINR measurement is expected, and no requirements are defined.

For both FR1 and FR2, when the CSI-RS configured for L1-SINR measurement is in the same OFDM symbol as SSB for RLM, BFD, CBD, L1-RSRP or L1-SINR measurement, UE is not required to receive CSI-RS for L1-SINR measurement in the PRBs that overlap with an SSB.

For FR1, when the SSB for RLM, BFD, CBD, L1-RSRP or L1-SINR measurement is within the active BWP and has same SCS than CSI-RS configured for L1-SINR measurement, the UE shall be able to perform CSI-RS measurement without restrictions.

For FR1, when the SSB for RLM, BFD, CBD, L1-RSRP or L1-SINR measurement is within the active BWP and has different SCS than CSI-RS configured for L1-SINR measurement, the UE shall be able to perform CSI-RS measurement with restrictions according to its capabilities:

- If the UE supports *simultaneousRxDataSSB-DiffNumerology*, UE shall be able to perform CSI-RS measurement without restrictions.

- If the UE does not support *simultaneousRxDataSSB-DiffNumerology*, UE is required to measure one of but not both CSI-RS for L1-SINR measurement and SSB. Longer measurement period for CSI-RS based L1-SINR measurement is expected, and no requirements are defined.

For FR1, when the CSI-RS configured for L1-SINR measurement is in the same OFDM symbol as another CSI-RS for RLM, BFD, CBD, L1-RSRP or L1-SINR measurement, UE shall be able to measure the CSI-RS for L1-SINR measurement without any restriction.

For both FR1 and FR2, when the CSI-IM configured for L1-SINR measurement is in the same OFDM symbol as SSB for RLM, BFD, CBD, L1-RSRP or L1-SINR measurement, UE is not required to measure CSI-IM for L1-SINR measurement in the PRBs that overlap with an SSB.

For FR1, UE shall be able to measure the CSI-IM configured for L1-SINR measurement without any restriction.

The normative reference for this requirement is TS 38.133 [6] clause 9.8.3, 9.8.4.2 and 9.8.5.

4.6.7.0.3 L1-SINR reporting with CSI-RS based CMR and dedicated IMR configured

The UE shall be capable of performing L1-SINR measurements with the CSI-RS resource configured as CMR and dedicated resource configured as IMR for L1-SINR computation, in which the NZP-CSI-RS or CSI-IM resource configured as dedicated IMR shall be 1-to-1 mapped to CSI-RS resource configured as CMR, with the same periodicity. The UE physical layer shall be capable of reporting L1-SINR measured over the measurement period of $T_{L1\text{-}SINR_Measurement_Period_CSI\text{-}RS_CMR_IMR}$.

The requirements in this clause are not applicable if NZP-CSI-RS or CSI-IM resource configured as dedicated IMR is scheduled with different periodicity as CSI-RS resource configured as CMR.

The value of $T_{L1\text{-}SINR_Measurement_Period_CSI\text{-}RS_CMR_IMR}$ is defined in Table 9.8.4.3-1 for FR1, where

For the value of M,

- M=1 shall be applied if

  - aperiodic NZP-CSI-RS as CMR or dedicated IMR, or

  - aperiodic CSI-IMR as dedicated IMR, or

- periodic and semi-persistent NZP-CSI-RS as CMR or dedicated IMR and the higher layer parameters *timeRestrictionForChannelMeasurement* and/or *timeRestrictionForInterferenceMeasurements* are configured, or

- periodic and semi-persistent CSI-IM as dedicated IMR and the higher layer parameters *timeRestrictionForChannelMeasurement* and/or *timeRestrictionForInterferenceMeasurements* are configured;

- M=3 otherwise.

P is defined as the maximum value between P_{CMR} and P_{IMR}, i.e., $P = \max(P_{CMR}, P_{IMR})$, where

- The value of P_{CMR} and P_{IMR} shall be derived in the same way as the value of P used for CSI-RS based L1-RSRP measurement in clause 9.5.4.2, in which the occasions and period of the CSI-RS for CMR and NZP CSI-RS for NZP-IMR or CSI-IM for ZP-IMR shall be used instead respectively.

Longer evaluation period would be expected if the combination of CSI-RS, SMTC occasion and measurement gap configurations does not meet pervious conditions.

For L1-SINR measurement with CSI-RS as CMR and CSI-RS as IMR, the requirement shall apply only if CSI-RS resources as CMR and IMR are configured with the same repetition field and the number of CSI-RS resources in the resource sets for CMR and IMR are same.

For L1-SINR measurement with CSI-RS as CMR and CSI-IM as IMR, the requirement shall apply only if the number of CSI-RS resources in the resource set for CMR and the number of CSI-IM resources in the resource set for IMR are same.

For L1-SINR measurement with CSI-RS as CMR and CSI-RS/CSI-IM as IMR, no requirement shall apply if CSI-RS occasions for CMR or CSI-RS/CSI-IM occasions for IMR are fully overlapped with the configured measurement gap.

Table 9.8.4.3-1: Measurement period $T_{L1\text{-}SINR_Measurement_Period_CSI\text{-}RS_CMR_IMR}$ for FR1

Configuration	$T_{L1\text{-}SINR_Measurement_Period_CSI\text{-}RS_CMR_IMR}$ (ms)
non-DRX	$\max(T_{Report}, \text{ceil}(M*P)*T_{CSI\text{-}RS})$
DRX cycle ≤ 320ms	$\max(T_{Report}, \text{ceil}(1.5*M*P)*\max(T_{DRX}, T_{CSI\text{-}RS}))$
DRX cycle > 320ms	$\text{ceil}(M*P)*T_{DRX}$
Note 1: $T_{CSI\text{-}RS}$ is the periodicity of CSI-RS configured for L1-SINR measurement. T_{DRX} is the DRX cycle length. T_{Report} is configured periodicity for reporting. Note 2: the requirements are applicable provided that the CSI-RS resource configured for L1-SINR measurement is transmitted with Density = 3. Note 3: The requirements are applicable provided that the CSI-RS resource configured for interference measurement shall be 1-to-1 mapped to CSI-RS configured for channel measurement, with the same periodicity.	

The UE shall send L1-SINR reports only for report configurations configured for the active BWP.

The UE shall report the L1-SINR value as a 7-bit value in the range [-23, 40] dB with 0.5dB step size if *nrofReportedRS* is configured to one. If *nrofReportedRS* is configured to be larger than one, or if *groupBasedBeamReporting* is enabled, the UE shall use differential L1-SINR based reporting. The differential L1-SINR is quantized to a 4-bit value with 1dB step size. The mapping between the reported L1-SINR value and the measured quantity is described in 10.1.16.

Reported L1-SINR measurements contained in aperiodic triggered, aperiodic triggered periodic and aperiodic triggered semi-persistent L1-SINR reports shall meet the requirements in clauses 10.1.27 for FR1 and 10.1.28 for FR2, respectively.

The UE shall only send aperiodic L1-SINR measurement reports, if a DCI for triggering report has been received.

After the UE receives CSI request in DCI, the UE shall transmit the aperiodic L1-SINR reporting on PUSCH over the air interface at the time specified according to clause 5.2.1.4 in TS 38.214 [26].

For both FR1 and FR2, when the CSI-RS configured for L1-SINR measurement is in the same OFDM symbol as SSB for RLM, BFD, CBD, L1-RSRP or L1-SINR measurement, UE is not required to receive CSI-RS for L1-SINR measurement in the PRBs that overlap with an SSB.

For FR1, when the SSB for RLM, BFD, CBD, L1-RSRP or L1-SINR measurement is within the active BWP and has same SCS than CSI-RS configured for L1-SINR measurement, the UE shall be able to perform CSI-RS measurement without restrictions.

For FR1, when the SSB for RLM, BFD, CBD, L1-RSRP or L1-SINR measurement is within the active BWP and has different SCS than CSI-RS configured for L1-SINR measurement, the UE shall be able to perform CSI-RS measurement with restrictions according to its capabilities:

- If the UE supports *simultaneousRxDataSSB-DiffNumerology*, UE shall be able to perform CSI-RS measurement without restrictions.
- If the UE does not support *simultaneousRxDataSSB-DiffNumerology*, UE is required to measure one of but not both CSI-RS for L1-SINR measurement and SSB. Longer measurement period for CSI-RS based L1-SINR measurement is expected, and no requirements are defined.

For FR1, when the CSI-RS configured for L1-SINR measurement is in the same OFDM symbol as another CSI-RS for RLM, BFD, CBD, L1-RSRP or L1-SINR measurement, UE shall be able to measure the CSI-RS for L1-SINR measurement without any restriction.

For both FR1 and FR2, when the CSI-IM configured for L1-SINR measurement is in the same OFDM symbol as SSB for RLM, BFD, CBD, L1-RSRP or L1-SINR measurement, UE is not required to measure CSI-IM for L1-SINR measurement in the PRBs that overlap with an SSB.

For FR1, UE shall be able to measure the CSI-IM configured for L1-SINR measurement without any restriction.

The normative reference for this requirement is TS 38.133 [6] clause 9.8.3, 9.8.4.3 and 9.8.5.

4.6.7.1 EN-DC FR1 CSI-RS based CMR and no dedicated IMR L1-SINR measurement in non-DRX

4.6.7.1.1 Test purpose

To verify that the UE makes correct reporting of L1-SINR measurement based on CSI-RS CMR without dedicated IMR in non-DRX within L1-SINR measurement requirements in TS 38.133 [6] clause 9.8.4.1.

4.6.7.1.2 Test applicability

This test applies to all types of E-UTRA UE release 16 and forward, supporting EN-DC and L1-SINR measurement.

4.6.7.1.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 4.6.7.0.1.

The normative reference for this requirement is TS 38.133 [6] clause A.4.6.7.1.

4.6.7.1.4 Test description

4.6.7.1.4.1 Initial conditions

This test shall be tested using any of the test configurations in Table 4.6.7.1.4.1-1. Configure the test equipment and the DUT according to the parameters in Table 4.6.7.1.4.1-2. Test environment parameters are given in Table 4.6.7.1.4.1-3.

Table 4.6.7.1.4.1-1: EN-DC CSI-RS based CMR without dedicated IMR L1-SINR measurement supported test configurations

Config	Description
1	LTE FDD, NR 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode
2	LTE FDD, NR 15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode
3	LTE FDD, NR 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode
4	LTE TDD, NR 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode
5	LTE TDD, NR 15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode
6	LTE TDD, NR 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode

Note:	The UE is only required to be tested in one of the supported test configurations

Table 4.6.7.1.4.1-2: General test parameters for EN-DC CSI-RS based CMR without dedicated IMR L1-SINR measurement

Parameter	Config	Unit	Value
SSB GSCN	1~6		freq1
Duplex mode	1,4		FDD
	2,5		TDD
	3,6		TDD
TDD Configuration	1,4		N/A
	2,5		TDDConf.1.1
	3,6		TDDConf.2.1
$BW_{channel}$	1,4	MHz	10: $N_{RB,c}$ = 52
	2,5		10: $N_{RB,c}$ = 52
	3,6		40: $N_{RB,c}$ = 106
PDSCH Reference measurement channel	1,4		SR.1.1 FDD
	2,5		SR.1.1 TDD
	3,6		SR.2.1 TDD
RMSI CORESET Reference Channel	1,4		CR.1.1 FDD
	2,5		CR.1.1 TDD
	3,6		CR.2.1 TDD
Dedicated CORESET Reference Channel	1,4		CCR.1.1 FDD
	2,5		CCR.1.1 TDD
	3,6		CCR.2.1 TDD
SSB configuration	1,4		SSB.3 FR1
	2,5		SSB.3 FR1
	3,6		SSB.4 FR1
CSI-RS configuration	1,4		CSI-RS.1.3 FDD
	2,5		CSI-RS.1.3 TDD
	3,6		CSI-RS.2.3 TDD
OCNG Patterns	1~6		OP.1
TRS Configuration	1,4		TRS.1.1 FDD
	2,5		TRS.1.1 TDD
	3,6		TRS.1.2 TDD
Initial BWP Configuration	1~6		DLBWP.0.1 ULBWP.0.1
Dedicated BWP configuration	1~6		DLBWP.1.1 ULBWP.1.1
SMTC configuration	1~6		SMTC.1
DRX configuration	1~6		Off
reportConfigType	1~6		aperiodic
reportQuantity-r16	1~6		cri-SINR-r16
Number of reported RS	1~6		2
qcl-Info	1~6		SSB#0 for resource#0
			SSB#1 for resource#1
reportSlotOffsetList	1~6	slots	26
T1	1~6	s	5
EPRE ratio of PSS to SSS	1~6	dB	0
EPRE ratio of PBCH DMRS to SSS			
EPRE ratio of PBCH to PBCH DMRS			
EPRE ratio of PDCCH DMRS to SSS			
EPRE ratio of PDCCH to PDCCH DMRS			
EPRE ratio of PDSCH DMRS to SSS			
EPRE ratio of PDSCH to PDSCH DMRS			
EPRE ratio of OCNG DMRS to SSS Note 1			
EPRE ratio of OCNG to OCNG DMRS Note 1			
Propagation condition	1~6		AWGN

Note 1:	OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.

Table 4.6.7.1.4.1-3: Test Environment parameters for EN-DC CSI-RS based CMR without dedicated IMR L1-SINR measurement

Parameter	Value		Comment
Test environment	NC		As specified in TS 38.508-1 [14] clause 4.1.
Test frequencies	As specified in Annex E, Table E.2-1 and TS 38.508-1 [14] clause 4.3.1 and 4.4.2.		
Channel bandwidth	As specified by the test configuration selected from Table 4.6.7.1.4.1-1.		
Propagation conditions	AWGN		As specified in Annex C.2.2.
Connection Diagram	TE Part	A.3.1.8.2 with n = 1	As specified in TS 38.508-1 [14] Annex A.
	DUT Part	A.3.2.3.4	
Exceptions to connection diagram	For 4Rx capable UEs without any 2 Rx RF bands use A.3.2.5.2 for DUT part and A.3.1.8.5 for TE Part		

1. Message contents are defined in clause 4.6.7.1.4.3.

2. Cell 1 is the E-UTRA serving cell (PCell) for the EN-DC setup. The power levels and settings for Cell 1 are set according to Annex A.6. Cell 2 is NR FR1 cell (PSCell). Cell 2 is the target for CSI-RS based L1-SINR measurements. Before the test, UE is configured to perform RLM and BFD measurement based on the SSBs.

4.6.7.1.4.2 Test procedure

The test consists of a single time period T1, during which the UE is triggered via DCI to report L1-SINR on aperiodic CSI-RS resources. Prior to the start of the time duration T1, the UE shall be fully synchronized to PSCell. UE is also configured to measure L1-SINR based on SSB. Upon receiving the DCI trigger, UE provides the report back based on the reporting configuration as defined in Table 4.6.7.1.4.1-2.

1. Ensure the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity EN-DC, DC bearer MCG and SCG, Connected without release *On* and Test Mode *On*, according to TS 38.508-1 [14] clause 4.5.

2. Set the parameters according to T1 in Table 4.6.7.1.5-1. T1 starts.

3. After 80ms from the start of the test the SS transmits the DCI trigger in slot 1 for configuration 1,2,4,5 and slot 8 for configuration 3, 6. The corresponding CSI-RS set is transmitted with the offset of 4 slots after the DCI trigger.

4. The UE shall send L1-SINR report at slot 26 from the reception of DCI trigger. The report shall contain L1-SINR of both CSI-RS#0 and CSI-RS#1.

5. The SS shall check following requirements:

   R1: the UE shall send L1-SINR report at slot 26 from the reception of DCI trigger. If the report is received at slot 26 from the reception of DCI trigger, the number of passed iterations for R1 is increased by one. Otherwise, the number of failed iterations for R1 is increased by one.

   R2: The L1-SINR value of CSI-RS#1 reported by the UE is compared to the expected L1-SINR value for CSI-RS #1. If the resulting value is outside the limits in Table 4.6.7.1.5-2 for all test configurations or the UE fails to report the measurement value for CSI-RS #1, the number of failed iterations for R2 is increased by one. Otherwise, the number of passed iterations for R2 is increased by one.

R3: The DIFF SINR value of CSI-RS#0 reported by the UE is compared to the expected DIFF SINR value. If the resulting value is outside the limits in Table 4.6.7.1.5-4 for all test configurations or the UE fails to report the measurement value for CSI-RS #0, the number of failed iterations for R3 is increased by one. Otherwise, the number of passed iterations for R3 is increased by one.

6. The SS shall transmit *RRCConnectionReconfiguration* message with condition EN-DC_PSCell_Rel according to TS 36.508 [25] Table 4.6.1-8 to release NR cell (PSCell). The UE shall transmit *RRCConnectionReconfigurationComplete* message.

7. The SS then shall transmit *RRCConnectionReconfiguration* message with condition MCG_and_SCG according to TS 36.508 [25] Table 4.6.1-8 to add NR cell (PSCell). The UE shall transmit *RRCConnectionReconfigurationComplete* message.

8. If any the reconfiguration fails, switch off and on the UE and ensure the UE is in RRC_CONNECTED with generic procedure parameters Connectivity EN-DC, DC bearer MCG and SCG, Connected without release On and Test Mode *On* according to TS 38.508-1 [14] clause 4.5.

9. Repeat steps 2-8 until the confidence level according to Tables G.2.3-1 in Annex G clause G.2 is achieved.

4.6.7.1.4.3 Message contents

Message contents are according to TS 38.508-1 [14] clause 7.3 with the following exceptions:

Table 4.6.7.1.4.3-1: Common Exception messages EN-DC CSI-RS based CMR without dedicated IMR L1-SINR measurement

Default Message Contents	
Common contents of system information blocks exceptions	
Default RRC messages and information elements contents exceptions	Table H.3.6A-1 with conditions APERIODIC and CSI-SINR Table H.3.6A-2 with conditions CSI-RS and APERIODIC

Table 4.6.7.1.4.3-2: RadioLinkMonitoringConfig

Derivation Path: TS 38.508-1 [14], Table 4.6.3-133			
Information Element	**Value/remark**	**Comment**	**Condition**
RadioLinkMonitoringConfig ::= SEQUENCE {			
failureDetectionResourcesToAddModList SEQUENCE (SIZE(1..maxNrofFailureDetectionResources)) OF SEQUENCE {	1 entry		
purpose	both	UE is configured to perform RLM and BFD based on the SSBs.	
}			
}			

4.6.7.1.5 Test requirement

Table 4.6.7.1.5-1 defines the primary level settings including test tolerances for all tests.

Table 4.6.7.1.5-1: CSI-RS specific test parameters for EN-DC CSI-RS based CMR without dedicated IMR L1-SINR measurement

Parameter	Config	Unit	CSI-RS#0	CSI-RS#1
N_{oc} Note1	1~6	dBm/15kHz	-94.65	
N_{oc} Note1	1,2,4,5	dBm/SSB SCS	-94.65	
	3,6		-91.65	
$\hat{E}_s / I_{ot}$	1~6	dB	0	3
CSI-RS RSRP Note3	1,2,4,5	dBm/SSB SCS	-94.65	-91.65
	3,6		-91.65	-88.65

Io Note2	1,2,4,5	dBm/9.36 MHz	-63.69	-61.93
	3,6	dBm/38.16 MHz	-57.59	-55.84
$\hat{E}_s / N_{oc}$	1~6	dB	0	3
Note 1: xxx?				
Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for N_{oc} to be fulfilled.				
Note 3: CSI-RS RSRP and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.				

After 80ms from the beginning of the test, the UE shall send L1-SINR report at slot 26 from the reception of DCI triggering the L1-SINR measurement. The L1-SINR report shall include the results for both CSI-RS#0 and CSI-RS#1.

Each L1-SINR measurement report shall meet the corresponding absolute accuracy requirements in Table 4.6.7.1.5-2 for all test configurations and the corresponding relative accuracy requirements in Table 4.6.7.1.5-4 for all test configurations.

Table 4.6.7.1.5-2: L1-SINR absolute accuracy requirements for the reported values for all test configurations

Normal Conditions	T1
Lowest reported value (CSI-RS#1)	41
Highest reported value (CSI-RS#1)	64

Table 4.6.7.1.5-3:Void

Table 4.6.7.1.5-4: L1-SINR relative accuracy requirements for the reported values for all test configurations

Normal Conditions	T1
Lowest DIFF SINR reported (CSI-RS#0)	0
Highest DIFF SINR reported (CSI-RS#0)	7

For the test to pass, the ratio of successful reported values for each requirement (R1 to R3) shall be more than 90% with a confidence level of 95%. Each requirement is evaluated independently of the others..

NOTE: The actual overall delays measured in the test may be up to $2xTTI_{DCCH}$ higher than the measurement reporting delays above because of TTI insertion uncertainty of the measurement report in DCCH.

4.6.7.2 EN-DC FR1 SSB based CMR and dedicated IMR L1-SINR measurement in DRX

4.6.7.2.1 Test purpose

To verify that the UE makes correct reporting of SSB-based CMR and CSI-IM based IMR L1-SINR measurement in DRX within L1-SINR measurement requirements based in TS 38.133 [6] clause 9.8.4.2.

4.6.7.2.2 Test applicability

This test applies to all types of E-UTRA UE release 16 and forward, supporting EN-DC FR1 and long DRX cycle and L1-SINR measurement.

4.6.7.2.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 4.6.7.0.2.

The normative reference for this requirement is TS 38.133 [6] clause A.4.6.7.2.

4.6.7.2.4 Test description

4.6.7.2.4.1 Initial conditions

This test shall be tested using any of the test configurations in Table 4.6.7.2.4.1-1. Configure the test equipment and the DUT according to the parameters in Table 4.6.7.2.4.1-2. Test environment parameters are given in Table 4.6.7.2.4.1-3.

Table 4.6.7.2.4.1-1: EN-DC SSB based CMR and CSI-IM based IMR L1-SINR measurement in DRX supported test configurations

Config	Description
1	LTE FDD, NR 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode
2	LTE FDD, NR 15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode
3	LTE FDD, NR 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode
4	LTE TDD, NR 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode
5	LTE TDD, NR 15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode
6	LTE TDD, NR 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode
Note: The UE is only required to be tested in one of the supported test configurations	

Table 4.6.7.2.4.1-2: General test parameters for EN-DC SSB based CMR and CSI-IM based IMR L1-SINR measurement in DRX

Parameter	Config	Unit	Value
SSB GSCN	1~6		freq1
Duplex mode	1,4		FDD
	2,5		TDD
	3,6		TDD
TDD Configuration	1,4		N/A
	2,5		TDDConf.1.1
	3,6		TDDConf.2.1
$BW_{channel}$	1,4	MHz	10: $N_{RB,c}$ = 52
	2,5		10: $N_{RB,c}$ = 52
	3,6		40: $N_{RB,c}$ = 106
PDSCH Reference measurement channel	1,4		SR.1.1 FDD
	2,5		SR.1.1 TDD
	3,6		SR.2.1 TDD
RMSI CORESET Reference Channel	1,4		CR.1.1 FDD
	2,5		CR.1.1 TDD
	3,6		CR.2.1 TDD
Dedicated CORESET Reference Channel	1,4		CCR.1.1 FDD
	2,5		CCR.1.1 TDD
	3,6		CCR.2.1 TDD
SSB configuration	1,4		SSB.3 FR1
	2,5		SSB.3 FR1
	3,6		SSB.4 FR1
CSI-IM configuration	1,4		CSI-IM.1.1 FDD
	2,5		CSI-IM.1.1 TDD
	3,6		CSI-IM.2.1 TDD
OCNG Patterns	1~6		OP.1
Initial BWP Configuration	1~6		DLBWP.0.1 ULBWP.0.1
Dedicated BWP configuration	1~6		DLBWP.1.1 ULBWP.1.1
SMTC configuration	1~6		SMTC.1
TRS Configuration	1,4		TRS.1.1 FDD

	2,5		TRS.1.1 TDD
	3,6		TRS.1.2 TDD
DRX configuration	1~6		DRX.3
reportConfigType	1~6		periodic
reportQuantity-r16	1~6		ssb-Index-SINR-r16
Number of reported RS	1~6		2
L1-SINR reporting period	1~6	slot	80
T1	1~6	s	5
T2	1~6	s	1
EPRE ratio of PSS to SSS	1~6	dB	0
EPRE ratio of PBCH DMRS to SSS			
EPRE ratio of PBCH to PBCH DMRS			
EPRE ratio of PDCCH DMRS to SSS			
EPRE ratio of PDCCH to PDCCH DMRS			
EPRE ratio of PDSCH DMRS to SSS			
EPRE ratio of PDSCH to PDSCH DMRS			
EPRE ratio of OCNG DMRS to SSS Note 1			
EPRE ratio of OCNG to OCNG DMRS Note 1			
Propagation condition	1~6		AWGN
Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.			

Table 4.6.7.2.4.1-3: Test Environment parameters for EN-DC SSB based CMR and CSI-IM based IMR L1-SINR measurement in DRX

Parameter	Value		Comment
Test environment	NC		As specified in TS 38.508-1 [14] clause 4.1.
Test frequencies	As specified in Annex E, Table E.2-1 and TS 38.508-1 [14] clause 4.3.1 and 4.4.2.		
Channel bandwidth	As specified by the test configuration selected from Table 4.6.7.2.4.1-1.		
Propagation conditions	AWGN		As specified in Annex C.2.2.
Connection Diagram	TE Part	A.3.1.8.2 with n = 1TBD	As specified in TS 38.508-1 [14] Annex A.
	DUT Part	A.3.2.3.4TBD	
Exceptions to connection diagram	For 4Rx capable UEs without any 2 Rx RF bands use A.3.2.5.2 for DUT part and A.3.1.8.5 for TE Part		

1. Message contents are defined in clause 4.6.7.2.4.3.

2. Cell 1 is the E-UTRA serving cell (PCell) for the EN-DC setup. The power levels and settings for Cell 1 are set according to Annex A.6. Cell 2 is NR FR1 cell (PSCell). Cell 2 is the target for SSB based CMR and CSI-IM based IMR L1-SINR measurements. Before the test, UE is configured to perform RLM and BFD based on the SSBs. DRX is configured as specified in Table 4.6.7.2.4.1-2.

4.6.7.2.4.2 Test procedure

Prior to the start of the time duration T1, the UE shall be fully synchronized to PSCell. The UE shall be configured for periodic CSI reporting in PUCCH [format 2] with a reporting periodicity as mentioned in the above Table 4.6.7.2.4.1-2. Before the test, UE is configured to perform RLM, BFD and L1-SINR measurement based on the SSBs.

1. Ensure the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity EN-DC, DC bearer MCG and SCG, Connected without release *On* and Test Mode *On*, according to TS 38.508-1 [14] clause 4.5 and general test parameters set according to Table 4.6.7.2.4.1-2.

2. Set the parameters according to T1 in Table 4.6.7.2.5-1. T1 starts.

5. The UE shall be transmitting CSI on PUCCH with a periodicity of 80 slots.

6. When T1 expires, the SS shall set the parameters according to T2 in 4.6.7.2.5-1. T2 starts.

7. The UE shall start sending L1-SINR reports. The SS shall check following requirements:

   R1: the UE shall start to transmit valid reports no later than 720 ms for configuration 1, 2, 4 and 5 and no later than 680 ms for configuration 3 and 6 from the beginning of time period T2. A valid report shall meet the absolute L1-SINR requirement for SSB#1 in Table 4.6.7.2.5-2 for all test configurations and the relative L1-SINR requirement for SSB#0 in Table 4.6.7.2.5-4 for all test configurations. If the first valid report is received earlier than the specified time, the number of passed iterations for R1 is increased by one. Otherwise, the number of failed iterations for R1 is increased by one.

   R2: the UE shall transmit reports every 80 slots until the end of time period T2. If the reports are received accordingly, the number of passed iterations for R2 is increased by one. Otherwise, the number of failed iterations for R2 is increased by one.

   R3: The L1-SINR value of SSB#1 reported by the UE is compared to the expected L1-SINR value for SSB#1. In all consecutive reports after the first valid value is received, if the resulting value is outside the limits in Table 4.6.7.2.5-2 for all test configurations or the UE fails to report the measurement value for SSB#1, the number of failed iterations for R3 is increased by one. Otherwise, the number of passed iterations for R3 is increased by one.

R4: The DIFF SINR value of SSB#0 reported by the UE is compared to the expected DIFF SINR value. In all consecutive reports after the first valid value is received, if the resulting value is outside the limits in Table 4.6.7.2.5-2 for all test configurations or the UE fails to report the measurement value for SSB#0, the number of failed iterations for R4 is increased by one. Otherwise, the number of passed iterations for R4 is increased by one..

8. The SS waits until T2 expires.

9. The SS shall transmit *RRCConnectionReconfiguration* message with condition EN-DC_PSCell_Rel according to TS 36.508 [25] Table 4.6.1-8 to release NR cell (PSCell). The UE shall transmit *RRCConnectionReconfigurationComplete* message.

10. The SS then shall transmit *RRCConnectionReconfiguration* message with condition MCG_and_SCG according to TS 36.508 [25] Table 4.6.1-8 to add NR cell (PSCell). The UE shall transmit *RRCConnectionReconfigurationComplete* message.

11. If any the reconfiguration fails, switch off and on the UE and ensure the UE is in RRC_CONNECTED with generic procedure parameters Connectivity EN-DC, DC bearer MCG and SCG, Connected without release On and Test Mode *On* according to TS 38.508-1 [14] clause 4.5.

12. Repeat steps 2-11 until the confidence level according to Tables G.2.3-1 in Annex G clause G.2 is achieved.

4.6.7.2.4.3 Message contents

Message contents are according to TS 38.508-1 [14] clause 7.3 with the following exceptions:

Table 4.6.7.2.4.3-1: Common Exception messages EN-DC SSB based CMR and CSI-IM based IMR L1-SINR measurement

Default Message Contents	
Common contents of system information blocks exceptions	
Default RRC messages and information elements contents exceptions	Table H.3.6A-1 with conditions PERIODIC and SS-SINR and CSI-IM_IMR Table H.3.6A-2 with conditions SSB and PERIODIC Table H.3.6A-4 with condition PERIODIC Table H.3.7-1 with condition DRX.3

Table 4.6.7.2.4.3-2: RadioLinkMonitoringConfig

Derivation Path: TS 38.508-1 [14], Table 4.6.3-133			
Information Element	**Value/remark**	**Comment**	**Condition**
RadioLinkMonitoringConfig ::= SEQUENCE {			
failureDetectionResourcesToAddModList SEQUENCE (SIZE(1..maxNrofFailureDetectionResources)) OF SEQUENCE {	1 entry		
purpose	both	UE is configured to perform RLM and BFD based on the SSBs.	
detectionResource CHOICE {			
ssb-Index	0		
}			
}			
}			

4.6.7.2.5 Test requirement

Table 4.6.7.2.5-1 defines the primary level settings including test tolerances for all tests.

Table 4.6.7.2.5-1: SSB specific test parameters for EN-DC SSB based CMR and CSI-IM based IMR L1-SINR measurement in DRX

Parameter	Config	Unit	SSB#0		SSB#1	
			T1	T2	T1	T2
N_{oc} Note2	1~6	dBm/15kHz	-94.65+TT			
N_{oc} Note2	1,2,4,5	dBm/SSB SCS	-94.65+TT			
	3,6		-91.65+TT			
$\hat{E}_s / I_{ot}$	1~6	dB	0+TT	0+TT	0+TT	0+TT
SS-RSRP Note3	1,2,4,5	dBm/SSB SCS	-94.65+TT	-94.65+TT	-94.65+TT	-94.65+TT
	3,6		-91.65+TT	-91.65+TT	-91.65+TT	-91.65+TT
Io Note3	1,2,4,5	dBm/9.36 MHz	-63.69+TT	-63.69+TT	-63.69+TT	-63.69+TT
	3,6	dBm/38.16 MHz	-57.59+TT	-57.59+TT	-57.59+TT	-57.59+TT
$\hat{E}_s / N_{oc}$	1~6	dB	0+TT	0+TT	0+TT	0+TT

Note 1: The resources for uplink transmission are assigned to the UE prior to the start of time period T2.

Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for N_{oc} to be fulfilled.

Note 3: SS-RSRP and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.

The UE shall send L1-SINR report every 80 slots. No later than 640ms plus 80 slots from the beginning of time period T2, UE shall send L1-SINR report including results of both SSB#0+CSI-IM#0 and SSB#1+CSI-IM#1. Each L1-SINR measurement report shall meet the corresponding absolute accuracy requirements in Table 4.6.7.2.5-2 for all test configurations and the corresponding relative accuracy requirements in Table 4.6.7.2.5-4 for all test configurations.

Table 4.6.7.2.5-2: L1-SINR absolute accuracy requirements for the reported values for all test configurations

Normal Conditions	T1	T2
Lowest reported value (SSB#1)	-	TBD43
Highest reported value (SSB#1)	-	TBD62

Table 4.6.7.2.5-3: Void

Table 4.6.7.2.5-4: L1-SINR relative accuracy requirements for the reported values for all test configurations

Normal Conditions	T1	T2
Lowest DIFF SINR reported (SSB#0)	-	TBD0
Highest DIFF SINR reported (SSB#0)	-	TBD6

For the test to pass, the ratio of successful reported values for each requirement (R1 to R4) shall be more than 90% with a confidence level of 95%. Each requirement is evaluated independently of the others..

NOTE: The actual overall delays measured in the test may be up to $2xTTI_{DCCH}$ higher than the measurement reporting delays above because of TTI insertion uncertainty of the measurement report in DCCH.

4.6.7.3 EN-DC FR1 CSI-RS based CMR and dedicated IMR L1-SINR measurement in DRX

4.6.7.3.1 Test purpose

To verify that the UE makes correct reporting of CSI-RS-based CMR and dedicated IMR L1-SINR measurement in DRX within L1-SINR measurement requirements in TS 38.133 [6] clause 9.8.4.3.

4.6.7.3.2 Test applicability

This test applies to all types of E-UTRA UE release 16 and forward, supporting EN-DC FR1 and L1-SINR measurement and long DRX cycle.

4.6.7.3.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 4.6.7.0.3.

The normative reference for this requirement is TS 38.133 [6] clause A.4.6.7.3.

4.6.7.3.4 Test description

4.6.7.3.4.1 Initial conditions

This test shall be tested using any of the test configurations in Table 4.6.7.3.4.1-1. Configure the test equipment and the DUT according to the parameters in Table 4.6.7.3.4.1-2. Test environment parameters are given in Table 4.6.7.3.4.1-3.

Table 4.6.7.3.4.1-1: EN-DC CSI-RS based CMR and dedicated IMR L1-SINR measurement in DRX supported test configurations

Config	Description
1	LTE FDD, NR 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode
2	LTE FDD, NR 15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode
3	LTE FDD, NR 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode
4	LTE TDD, NR 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode
5	LTE TDD, NR 15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode
6	LTE TDD, NR 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode

Note:	The UE is only required to be tested in one of the supported test configurations

Table 4.6.7.3.4.1-2: General test parameters for EN-DC CSI-RS based CMR and dedicated IMR L1-SINR measurement in DRX

Parameter	Config	Unit	Value
SSB GSCN	1~6		freq1
Duplex mode	1,4		FDD
	2,5		TDD
	3,6		TDD
TDD Configuration	1,4		N/A
	2,5		TDDConf.1.1
	3,6		TDDConf.2.1
$BW_{channel}$	1,4	MHz	10: $N_{RB,c}$ = 52
	2,5		10: $N_{RB,c}$ = 52
	3,6		40: $N_{RB,c}$ = 106
PDSCH Reference measurement channel	1,4		SR.1.1 FDD
	2,5		SR.1.1 TDD
	3,6		SR.2.1 TDD
RMSI CORESET Reference Channel	1,4		CR.1.1 FDD
	2,5		CR.1.1 TDD
	3,6		CR.2.1 TDD
Dedicated CORESET Reference Channel	1,4		CCR.1.1 FDD
	2,5		CCR.1.1 TDD
	3,6		CCR.2.1 TDD
SSB configuration	1,4		SSB.3 FR1
	2,5		SSB.3 FR1
	3,6		SSB.4 FR1
CSI-RS configuration as CMR	1,4		CSI-RS.1.3 FDD
	2,5		CSI-RS.1.3 TDD
	3,6		CSI-RS.2.3 TDD
CSI-RS configuration as IMR	1,4		CSI-RS.1.2A FDD
	2,5		CSI-RS.1.2A TDD
	3,6		CSI-RS.2.2A TDD
OCNG Patterns	1~6		OP.1
TRS Configuration	1,4		TRS.1.1 FDD
	2,5		TRS.1.1 TDD
	3,6		TRS.1.2 TDD
Initial BWP Configuration	1~6		DLBWP.0.1 ULBWP.0.1
Dedicated BWP configuration	1~6		DLBWP.1.1 ULBWP.1.1
SMTC configuration	1~6		SMTC.1
DRX configuration	1~6		DRX.3
reportConfigType	1~6		aperiodic
reportQuantity-r16	1~6		cri-SINR-r16
Number of reported RS	1~6		2
qcl-Info	1~6		SSB#0 for resource#0
			SSB#1 for resource#1
reportSlotOffsetList	1~6	slots	26
T1	1~6	s	5
EPRE ratio of PSS to SSS	1~6	dB	0
EPRE ratio of PBCH DMRS to SSS			
EPRE ratio of PBCH to PBCH DMRS			
EPRE ratio of PDCCH DMRS to SSS			
EPRE ratio of PDCCH to PDCCH DMRS			
EPRE ratio of PDSCH DMRS to SSS			
EPRE ratio of PDSCH to PDSCH DMRS			
EPRE ratio of OCNG DMRS to SSS[Note 1]			

EPRE ratio of OCNG to OCNG DMRS Note 1			
Propagation condition	1~6		AWGN
Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.			

Table 4.6.7.3.4.1-3: Test Environment parameters for EN-DC CSI-RS based CMR and dedicated IMR L1-SINR measurement in DRX

Parameter	Value		Comment
Test environment	NC		As specified in TS 38.508-1 [14] clause 4.1.
Test frequencies	As specified in Annex E, Table E.2-1 and TS 38.508-1 [14] clause 4.3.1 and 4.4.2.		
Channel bandwidth	As specified by the test configuration selected from Table 4.6.7.3.4.1-1.		
Propagation conditions	AWGN		As specified in Annex C.2.2.
Connection Diagram	TE Part	A.3.1.8.2 with n = 1	As specified in TS 38.508-1 [14] Annex A.
	DUT Part	A.3.2.3.4	
Exceptions to connection diagram	For 4Rx capable UEs without any 2 Rx RF bands use A.3.2.5.2 for DUT part and A.3.1.8.5 for TE Part		

1. Message contents are defined in clause 4.6.7.3.4.3.

2. Cell 1 is the E-UTRA serving cell (PCell) for the EN-DC setup. The power levels and settings for Cell 1 are set according to Annex A.6. Cell 2 is NR FR1 cell (PSCell). Cell 2 is the target for CSI-RS based CMR and dedicated IMR L1-SINR measurements. Before the test, UE is configured to perform RLM and BFD measurement based on the SSBs. DRX is configured as specified in Table 4.6.7.3.4.1-2.

4.6.7.3.4.2 Test procedure

The test consists of a single time period T1, during which the UE is triggered via DCI to report L1-SINR on aperiodic CSI-RS resources. Prior to the start of the time duration T1, the UE shall be fully synchronized to PSCell. UE is also configured to measure L1-SINR based on SSB. Upon receiving the DCI trigger, UE provides the report back based on the reporting configuration as defined in table 4.6.7.3.4.1-2.

1. Ensure the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity EN-DC, DC bearer MCG and SCG, Connected without release *On* and Test Mode *On*, according to TS 38.508-1 [14] clause 4.5.

2. Set the parameters according to T1 in Table 4.6.7.3.5-1. T1 starts.

3. After 80ms from the start of the test the SS transmits the DCI trigger in slot 1 for configuration 1,2,4,5 and slot 8 for configuration 3, 6. The corresponding CSI-RS as CMR and the associated CSI-RS as IMR are transmitted with the offset of 4 slots and 6 slots after the DCI trigger, respectively.

4. The UE shall send L1-SINR report at slot 26 from the reception of DCI trigger. The report shall contain L1-SINR of both CSI-RS#0 and CSI-RS#1.

5. The SS shall check following requirements:

   R1: the UE shall send L1-SINR report at slot 26 from the reception of DCI trigger. If the report is received at slot 26 from the reception of DCI trigger, the number of passed iterations for R1 is increased by one. Otherwise, the number of failed iterations for R1 is increased by one.

   R2: The L1-SINR value of CSI-RS#1 reported by the UE is compared to the expected L1-SINR value for CSI-RS #1. If the resulting value is outside the limits in Table 4.6.7.3.5-2 for all test configurations or the UE fails to report the measurement value for CSI-RS #1, the number of failed iterations for R2 is increased by one. Otherwise, the number of passed iterations for R2 is increased by one.

   R3: The DIFF SINR value of CSI-RS#0 reported by the UE is compared to the expected DIFF SINR value. If the resulting value is outside the limits in Table 4.6.7.3.5-4 for all test configurations or the UE fails to

report the measurement value for CSI-RS #0, the number of failed iterations for R3 is increased by one. Otherwise, the number of passed iterations for R3 is increased by one.

6. The SS shall transmit *RRCConnectionReconfiguration* message with condition EN-DC_PSCell_Rel according to TS 36.508 [25] Table 4.6.1-8 to release NR cell (PSCell). The UE shall transmit *RRCConnectionReconfigurationComplete* message.

7. The SS then shall transmit *RRCConnectionReconfiguration* message with condition MCG_and_SCG according to TS 36.508 [25] Table 4.6.1-8 to add NR cell (PSCell). The UE shall transmit *RRCConnectionReconfigurationComplete* message.

8. If any the reconfiguration fails, switch off and on the UE and ensure the UE is in RRC_CONNECTED with generic procedure parameters Connectivity EN-DC, DC bearer MCG and SCG, Connected without release On and Test Mode *On* according to TS 38.508-1 [14] clause 4.5.

9. Repeat steps 2-8 until the confidence level according to Tables G.2.3-1 in Annex G clause G.2 is achieved.

4.6.7.3.4.3 Message contents

Message contents are according to TS 38.508-1 [14] clause 7.3 with the following exceptions:

Table 4.6.7.3.4.3-1: Common Exception messages EN-DC CSI-RS based CMR and dedicated IMR L1-SINR measurement in DRX

Default Message Contents	
Common contents of system information blocks exceptions	
Default RRC messages and information elements contents exceptions	Table H.3.6A-1 with conditions APERIODIC and CSI-SINR and CSI-RS_IMR Table H.3.6A-2 with conditions CSI-RS and APERIODIC Table H.3.6A-3 with conditions APERIODIC Table H.3.7-1 with condition DRX.3

4.6.7.3.5 Test requirement

Table 4.6.7.3.5-1 defines the primary level settings including test tolerances for all tests.

Table 4.6.7.3.5-1: CSI-RS specific test parameters for EN-DC CSI-RS based CMR and dedicated IMR L1-SINR measurement in DRX

Parameter	Config	Unit	CSI-RS#0	CSI-RS#1
N_{oc} Note1	1~6	dBm/15kHz	-94.65	
N_{oc} Note1	1,2,4,5	dBm/SSB SCS	-94.65	
	3,6		-91.65	
$\hat{E}_s / I_{ot}$	1~6	dB	0.5	3
$\hat{E}_s / N_{oc}$	1~6	dB	0.5	3
CSI-RS RSRP Note2	1,2,4,5	dBm/SSB SCS	-94.15	-91.65
	3,6		-91.14	-88.65
Io Note2	1,2,4,5	dBm/9.36 MHz	-63.43	-61.93
	3,6	dBm/38.16 MHz	-57.33	-55.84

Note 1:	Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for N_{oc} to be fulfilled.
Note 2:	CSI-RS RSRP and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.

After 80ms from the beginning of the test, the UE shall send L1-RSRP report at slot 26 from the reception of DCI triggering the L1-SINR measurement. The L1-SINR report shall include the results for both CSI-RS#0 as CMR + CSI-RS#0 as IMR and CSI-RS#1 as CMR + CSI-RS#1 as IMR.

Each L1-SINR measurement report shall meet the corresponding absolute accuracy requirements in Table 4.6.7.3.5-2 for all configurations and the corresponding relative accuracy requirements in Table 4.6.7.3.5-4 for all test configurations.

Table 4.6.7.3.5-2: L1-SINR absolute accuracy requirements for the reported values for test configurations 1, 2, 4 and 5

Normal Conditions	T1
Lowest reported value (CSI-RS#1)	44
Highest reported value (CSI-RS#1)	61

Table 4.6.7.3.5-3: Void

Table 4.6.7.3.5-4: L1-RSRP relative accuracy requirements for the reported values for all test configurations

Normal Conditions	T1
Lowest DIFF RSRP reported (CSI-RS#0)	0
Highest DIFF RSRP reported (CSI-RS#0)	5

For the test to pass, the ratio of successful reported values for each requirement (R1 to R3) shall be more than 90% with a confidence level of 95%. Each requirement is evaluated independently of the others..

NOTE: The actual overall delays measured in the test may be up to $2xTTI_{DCCH}$ higher than the measurement reporting delays above because of TTI insertion uncertainty of the measurement report in DCCH.

4.7 Measurement performance requirements

4.7.1 SS-RSRP

4.7.1.0 Minimum conformance requirements

4.7.1.0.1 Intra-frequency absolute SS-RSRP measurement accuracy requirements

The intra-frequency SS-RSRP absolute accuracy requirements are defined for the SS-RSRP measured from a cell on the same frequency as that of the PCell or PSCell in FR1.

The accuracy requirements in Table 4.7.1.0.1-1 are valid under the following conditions:

- Conditions defined in 38.101-1 [2] Clause 7.3 for reference sensitivity are fulfilled.
- Conditions for intra-frequency measurements are fulfilled according to Annex B.2.2 for a corresponding Band for each relevant SSB.

Table 4.7.1.0.1-1: SS-RSRP intra frequency absolute accuracy in FR1

Accuracy		Conditions					
			Io [Note 1] range				
Normal condition	Extreme condition	SSB Ês/Iot	NR operating band groups Note 2	Minimum Io			Maximum Io
				dBm / SCS_{SSB}			
dB	dB	dB		SCS_{SSB} = 15 kHz	SCS_{SSB} = 30 kHz	$dBm/BW_{Channel}$	$dBm/BW_{Channel}$
±4.5	±9	≥-6	NR_FDD_FR1_A, NR_TDD_FR1_A, NR_SDL_FR1_A	-121	-118	N/A	-70
			NR_FDD_FR1_B	-120.5	-117.5	N/A	-70
			NR_TDD_FR1_C	-120	-117	N/A	-70
			NR_FDD_FR1_D, NR_TDD_FR1_D	-119.5	-116.5	N/A	-70
			NR_FDD_FR1_E, NR_TDD_FR1_E	-119	-116	N/A	-70
			NR_FDD_FR1_G	-118	-115	N/A	-70
			NR_FDD_FR1_H	-117.5	-114.5	N/A	-70
±8	±11	≥-6	NR_FDD_FR1_A, NR_TDD_FR1_A, NR_SDL_FR1_A, NR_FDD_FR1_B, NR_TDD_FR1_C, NR_FDD_FR1_D, NR_TDD_FR1_D, NR_FDD_FR1_E, NR_TDD_FR1_E, NR_FDD_FR1_G, NR_FDD_FR1_H,	N/A	N/A	-70	-50
NOTE 1: Io is assumed to have constant EPRE across the bandwidth.							
NOTE 2: NR operating band groups in FR1 are as defined in Section 3A.4.1							

The reporting range for SS-RSRP is defined from -156dBm to -31dBm with 1dB resolution. The mapping of the measured quantity to the reported value is defined by Table 4.7.1.0.1-2.

Table 4.7.1.0.1-2: SS-RSRP and CSI-RSRP measurement report mapping

Reported value	Measured quantity value(L3 SS-RSRP)	Measured quantity value(L1 SS-RSRP and CSI-RSRP)	Unit
RSRP_0	SS-RSRP<-156	Not valid	dBm
RSRP_1	-156≤ SS-RSRP<-155	Not valid	dBm
RSRP_2	-155≤ SS-RSRP<-154	Not valid	dBm
RSRP_3	-154≤ SS-RSRP<-153	Not valid	dBm
RSRP_4	-153≤ SS-RSRP<-152	Not valid	dBm
RSRP_5	-152≤ SS-RSRP<-151	Not valid	dBm
RSRP_6	-151≤ SS-RSRP<-150	Not valid	dBm
RSRP_7	-150≤ SS-RSRP<-149	Not valid	dBm
RSRP_8	-149≤ SS-RSRP<-148	Not valid	dBm
RSRP_9	-148≤ SS-RSRP<-147	Not valid	dBm
RSRP_10	-147≤ SS-RSRP<-146	Not valid	dBm
RSRP_11	-146≤ SS-RSRP<-145	Not valid	dBm
RSRP_12	-145≤ SS-RSRP<-144	Not valid	dBm
RSRP_13	-144≤ SS-RSRP<-143	Not valid	dBm
RSRP_14	-143≤ SS-RSRP<-142	Not valid	dBm
RSRP_15	-142≤ SS-RSRP<-141	Not valid	dBm
RSRP_16	-141≤ SS-RSRP<-140	RSRP<-140	dBm
RSRP_17	-140≤ SS-RSRP<-139	-140≤ RSRP<-139	dBm
RSRP_18	-139≤ SS-RSRP<-138	-139≤ RSRP<-138	dBm
…	…		…

Reported value	Measured quantity value(L3 SS-RSRP)	Measured quantity value(L1 SS-RSRP and CSI-RSRP)	Unit
RSRP_111	-46≤ SS-RSRP<-45	-46≤ RSRP<-45	dBm
RSRP_112	-45≤ SS-RSRP<-44	-45≤ RSRP<-44	dBm
RSRP_113	-44≤ SS-RSRP<-43	-44≤ RSRP	dBm
RSRP_114	-43≤ SS-RSRP<-42	Not valid	dBm
RSRP_115	-42≤ SS-RSRP<-41	Not valid	dBm
RSRP_116	-41≤ SS-RSRP<-40	Not valid	dBm
RSRP_117	-40≤ SS-RSRP<-39	Not valid	dBm
RSRP_118	-39≤ SS-RSRP<-38	Not valid	dBm
RSRP_119	-38≤ SS-RSRP<-37	Not valid	dBm
RSRP_120	-37≤ SS-RSRP<-36	Not valid	dBm
RSRP_121	-36≤ SS-RSRP<-35	Not valid	dBm
RSRP_122	-35≤ SS-RSRP<-34	Not valid	dBm
RSRP_123	-34≤ SS-RSRP<-33	Not valid	dBm
RSRP_124	-33≤ SS-RSRP<-32	Not valid	dBm
RSRP_125	-32≤ SS-RSRP<-31	Not valid	dBm
RSRP_126	-31≤ SS-RSRP	Not valid	dBm
RSRP_127[1]	Infinity	Infinity	dBm
NOTE: The value of RSRP_127 is applicable for RSRP threshold configured by the network as defined in TS 38.331 [13], but not for the purpose of measurement reporting.			

The normative reference for this requirement is TS 38.133 [6] clauses 10.1.2.1.1 and 10.1.6.

4.7.1.0.2 Intra-frequency relative SS-RSRP measurement accuracy requirements

The intra-frequency relative accuracy of SS-RSRP is defined as the SS-RSRP measured from one cell compared to the SS-RSRP measured from another cell on the same frequency in FR1.

The accuracy requirements in Table 4.7.1.0.2-1 are valid under the following conditions:

- Conditions defined in 38.101-1 [2] Clause 7.3 for reference sensitivity are fulfilled.
- Conditions for intra-frequency measurements are fulfilled according to Annex B.2.2 for a corresponding Band for each relevant SSB.

Table 4.7.1.0.2-1: SS-RSRP Intra frequency relative accuracy in FR1

Accuracy		Conditions					
Normal condition	Extreme condition	SSB Ês/Iot Note 2	Io Note 1 range				
			NR operating band groups Note 4	Minimum Io			Maximum Io
				dBm / SCS_{SSB}			
dB	dB	dB		SCS_{SSB} = 15 kHz	SCS_{SSB} = 30 kHz	$dBm/BW_{Channel}$	$dBm/BW_{Channel}$
±2	±3	≥-3	NR_FDD_FR1_A, NR_TDD_FR1_A, NR_SDL_FR1_A	-121	-118	N/A	-50
			NR_FDD_FR1_B	-120.5	-117.5	N/A	-50
			NR_TDD_FR1_C	-120	-117	N/A	-50
			NR_FDD_FR1_D, NR_TDD_FR1_D	-119.5	-116.5	N/A	-50
			NR_FDD_FR1_E, NR_TDD_FR1_E	-119	-116	N/A	-50
			NR_FDD_FR1_G	-118	-115	N/A	-50
			NR_FDD_FR1_H	-117.5	-114.5	N/A	-50
±3	±3	≥-6	Note 3	Note 3	Note 3	N/A	Note 3
NOTE 1: Io is assumed to have constant EPRE across the bandwidth. NOTE 2: The parameter SSB Ês/Iot is the minimum SSB Ês/Iot of the pair of cells to which the requirement applies. NOTE 3: The same bands and the same Io conditions for each band apply for this requirement as for the corresponding highest accuracy requirement.							

NOTE 4: NR operating band groups in FR1 are as defined in Section 3A.4.1.

The reporting range for SS-RSRP is defined from -156dBm to -31dBm with 1dB resolution. The mapping of the measured quantity to the reported value is defined by Table 4.7.1.0.1-2.

The normative reference for this requirement is TS 38.133 [6] clauses 10.1.2.1.2 and 10.1.6.

4.7.1.0.3 Inter-frequency absolute SS-RSRP measurement accuracy requirements

The inter-frequency SS-RSRP absolute accuracy requirements in this clause are defined for the SS-RSRP measured from a cell on a different frequency as that of the PCell or PSCell in FR1.

The accuracy requirements in Table 4.7.1.0.3-1 are valid under the following conditions:

- Conditions defined in TS 38.101-1 [2] Clause 7.3 for reference sensitivity are fulfilled.
- Conditions for intra-frequency measurements are fulfilled according to clause B.2.3 for a corresponding Band for each relevant SSB.

Table 4.7.1.0.3-1: SS-RSRP inter frequency absolute accuracy in FR1

Accuracy		Conditions					
			Io [Note 1] range				
Normal condition	Extreme condition	SSB Ês/Iot Note 2	NR operating band groups Note 3	Minimum Io			Maximum Io
				dBm / SCS_{SSB}			
dB	dB	dB		SCS_{SSB} = 15 kHz	SCS_{SSB} = 30 kHz	$dBm/BW_{Channel}$	$dBm/BW_{Channel}$
±4.5	±9	≥6	NR_FDD_FR1_A, NR_TDD_FR1_A, NR_SDL_FR1_A	-121	-118	N/A	-70
			NR_FDD_FR1_B	-120.5	-117.5	N/A	-70
			NR_TDD_FR1_C	-120	-117	N/A	-70
			NR_FDD_FR1_D, NR_TDD_FR1_D	-119.5	-116.5	N/A	-70
			NR_FDD_FR1_E, NR_TDD_FR1_E	-119	-116	N/A	-70
			NR_FDD_FR1_G	-118	-115	N/A	-70
			NR_FDD_FR1_H	-117.5	-114.5	N/A	-70
±8	±11	≥6	NR_FDD_FR1_A, NR_TDD_FR1_A, NR_SDL_FR1_A, NR_FDD_FR1_B, NR_TDD_FR1_C, NR_FDD_FR1_D, NR_TDD_FR1_D, NR_FDD_FR1_E, NR_TDD_FR1_E, NR_FDD_FR1_G, NR_FDD_FR1_H,	N/A	N/A	-70	-50

NOTE 1: Io is assumed to have constant EPRE across the bandwidth.
NOTE 2: Void.
NOTE 3: NR operating band groups in FR1 are as defined in Section 3A.4.1.

The reporting range for SS-RSRP is defined from -156dBm to -31dBm with 1dB resolution. The mapping of the measured quantity to the reported value is defined by Table 4.7.1.0.1-2.

The normative reference for this requirement is TS 38.133 [6] clauses 10.1.4.1.1 and 10.1.6.

4.7.1.0.4 Inter-frequency relative SS-RSRP measurement accuracy requirements

The inter-frequency SS-RSRP relative accuracy requirements in this clause are defined for the SS-RSRP measured from one cell on a frequency in FR1compared to the SS-RSRP measured from another cell on a different frequency in FR1.

The accuracy requirements in Table 4.7.1.0.4-1 are valid under the following conditions:

- Conditions defined in 38.101-1 [2] Clause 7.3 for reference sensitivity are fulfilled.
- Conditions for inter-frequency measurements are fulfilled according to Annex B.2.3 for a corresponding Band for each relevant SSB,
- $\left|RSRP1\right|_{dBm} - RSRP2\left|_{dBm}\right| \leq 27dB$
- | Channel 1_Io -Channel 2_Io | ≤ 20 dB

Table 4.7.1.0.4-1: SS-RSRP inter frequency relative accuracy in FR1

Accuracy		Conditions					
Normal condition	Extreme condition	SSB Ês/Iot Note 2	Io Note 1 range				
			NR operating band groups Note 3	Minimum Io			Maximum Io
				dBm / SCS_{SSB}		dBm/$BW_{Channel}$	dBm/$BW_{Channel}$
dB	dB	dB		SCS_{SSB} = 15 kHz	SCS_{SSB} = 30 kHz		
±4.5	±6	≥6	NR_FDD_FR1_A, NR_TDD_FR1_A, NR_SDL_FR1_A	-121	-118	N/A	-50
			NR_FDD_FR1_B	-120.5	-117.5	N/A	-50
			NR_TDD_FR1_C	-120	-117	N/A	-50
			NR_FDD_FR1_D, NR_TDD_FR1_D	-119.5	-116.5	N/A	-50
			NR_FDD_FR1_E, NR_TDD_FR1_E	-119	-116	N/A	-50
			NR_FDD_FR1_G	-118	-115	N/A	-50
			NR_FDD_FR1_H	-117.5	-114.5	N/A	-50
NOTE 1: Io is assumed to have constant EPRE across the bandwidth. NOTE 2: The parameter SSB Ês/Iot is the minimum SSB Ês/Iot of the pair of cells to which the requirement applies. NOTE 3: NR operating band groups in FR1 are as defined in Section 3A.4.1.							

The reporting range for SS-RSRP is defined from -156dBm to -31dBm with 1dB resolution. The mapping of the measured quantity to the reported value is defined by Table 4.7.1.0.1-2.

The normative reference for this requirement is TS 38.133 [6] clauses 10.1.4.1.2 and 10.1.6.

4.7.1.1 Intra-frequency measurements

4.7.1.1.1 EN-DC FR1 SS-RSRP absolute measurement accuracy

4.7.1.1.1.1 Test purpose

The purpose of this test is to verify that the intra-frequency SS-RSRP absolute measurement accuracy is within the specified limits for all bands.

4.7.1.1.1.2 Test applicability

This test applies to all types of NR UE supporting E-UTRA and EN-DC from Release 15 onwards.

4.7.1.1.1.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 4.7.1.0.1.

The normative reference for this requirement is TS 38.133 [6] clause A.4.7.1.1.

4.7.1.1.1.4 Test description

4.7.1.1.1.4.1 Initial conditions

This test shall be tested using any of the test configurations in Table 4.7.1.1.1.4.1-1.

Table 4.7.1.1.1.4.1-1: EN-DC FR1 SS-RSRP measurement accuracy supported test configurations

Test Case ID	Description
4.7.1.1.1-1	LTE FDD, NR: 15 kHz SSB SCS, 10MHz bandwidth, FDD
4.7.1.1.1-2	LTE FDD, NR: 15 kHz SSB SCS, 10MHz bandwidth, TDD
4.7.1.1.1-3	LTE FDD, NR: 30 kHz SSB SCS, 40MHz bandwidth, TDD
4.7.1.1.1-4	LTE TDD, NR: 15 kHz SSB SCS, 10MHz bandwidth, FDD
4.7.1.1.1-5	LTE TDD, NR: 15 kHz SSB SCS, 10MHz bandwidth, TDD
4.7.1.1.1-6	LTE TDD, NR: 30 kHz SSB SCS, 40MHz bandwidth, TDD
NOTE: The UE is only required to be tested in one of the supported test configurations.	

Configure the test equipment and the DUT according to the parameters in Table 4.7.1.1.1.4.1-2.

Table 4.7.1.1.1.4.1-2: Initial conditions for SS-RSRP intra frequency absolute accuracy in FR1

Parameter	Value		Comment
Test environment	NC, TL/VL, TL/VH, TH/VL, TH/VH		As specified in TS 38.508-1 [14] clause 4.1.
Test frequencies	As specified in Annex E, Table E.2-1 and TS 38.508-1 [14] clause 4.3.1.		
Channel bandwidth	As specified by the test configuration selected from Table 4.7.1.1.1.4.1-1.		
Propagation conditions	AWGN		As specified in clause C.2.2.
Connection Diagram	TE Part 2Rx	A.3.1.8.2 with n = 2 and φ_1 = 5 Hz	As specified in TS 38.508-1 [14] Annex A.
	TE Part 4Rx	A.3.1.8.5 with n = 2 and $\varphi_{1,1}$ = 5 Hz, $\varphi_{1,2}$ = 10 Hz, $\varphi_{1,3}$ = 15 Hz	
	DUT Part 2Rx	A.3.2.3.4	
	DUT Part 4Rx	A.3.2.5.2	
Exceptions to connection diagram	N/A		

1. Message contents are defined in clause 4.7.1.1.1.4.3.

2. Cell 1 is the E-UTRA serving cell (PCell) for the EN-DC setup. The power levels and settings for Cell 1 are set according to Annex A.6. Cell 2 and Cell 3 are NR FR1 cells in the same frequency. Cell 2 is the PSCell and Cell 3 is the target cell for SS-RSRP measurements. The connection setup is done according to the settings in clause C.1.1.

4.7.1.1.1.4.2 Test procedure

1. Ensure the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity EN-DC, DC bearer MCG and SCG, Connected without release *On* and Test Mode *On*, according to TS 38.508-1 [14] clause 4.5.

2. Set the parameters according to Table 4.7.1.1.1.5-1 as appropriate.

3. The SS shall transmit an RRCConnectionReconfiguration message on Cell 1.

4. The UE shall transmit an RRCConnectionReconfigurationComplete message.

5. The UE shall transmit periodically MeasurementReport messages.

6. After 10s wait from Step 3, the SS shall check the SS-RSRP reported values in the periodic MeasurementReport. The SS-RSRP value of Cell 3 reported by the UE is compared to the expected SS-RSRP. If the value is outside the limits in Table 4.7.1.1.1.5-2 or the UE fails to report the measurement value for Cell 3, the number of failed iterations is increased by one. Otherwise, the number of passed iterations is increased by one.

7. The SS shall continue checking the MeasurementReport messages transmitted by the UE until the confidence level according to Table G.2.3-1 in Annex G is achieved.

8. Set the parameters according to each sub-test in Table 4.7.1.1.1.5-1 as appropriate and repeat steps 5-7.

4.7.1.1.1.4.3 Message contents

Message contents are according to TS 38.508-1 [14] clause 7.3 with the following exceptions:

Table 4.7.1.1.1.4.3-1: Common Exception messages for EN-DC FR1 SS-RSRP absolute measurement accuracy

Default Message Contents	
Common contents of system information blocks exceptions	
Default RRC messages and information elements contents exceptions	Table H.3.1-1 Table H.3.1-2 Table H.3.1-5 Table H.3.1-7 Table H.3.4-1 Table H.3.4-1a Table H.3.4-2
Specific message contents exceptions for Test Configuration 4.7.1.1.1.-1 and 4.7.1.1.1-4	Table H.3.1-3 with Condition SSB.1 FR1 and Table 7.3.1-3 in TS 38.508-1 [14] with condition SMTC.2
Specific message contents exceptions for Test Configuration 4.7.1.1.1-2 and 4.7.1.1.1-5	Table H.3.1-3 with Condition SSB.1 FR1 and Synchronous cells Table 7.3.1-3 in TS 38.508-1 [14] with condition SMTC.1
Specific message contents exceptions for Test Configuration 4.7.1.1.1-3 and 4.7.1.1.1-6	Table H.3.1-3 with Condition SSB.2 FR1 and Synchronous cells Table 7.3.1-3 in TS 38.508-1 [14] with condition SMTC.1

Table 4.7.1.1.1.4.3-2: ReportConfigNR-DEFAULT(Periodical) for EN-DC FR1 SS-RSRP Accuracy

Derivation Path: 38.508-1 [14] Table 4.6.3-142 with condition PERIODICAL			
Information Element	**Value/remark**	**Comment**	**Condition**
ReportConfigNR::= SEQUENCE {			
reportType CHOICE {			
periodical SEQUENCE {			PERIODICAL
reportQuantityCell SEQUENCE {			
rsrq	false		
sinr	false		
}			
maxReportCells	2		
}			
}			
}			

4.7.1.1.1.5 Test requirement

Table 4.7.1.1.1.5-1 defines the primary level settings including test tolerances for all tests.

Each SS-RSRP measurement report for each of the tests in Table 4.7.1.1.1.5-1 shall meet the corresponding absolute accuracy requirements in Table 4.7.1.1.1.5-2 for test configurations 1, 2, 4 and 5, and the corresponding absolute accuracy requirements in Table 4.7.1.1.1.5-3 for test configurations 3 and 6.

Table 4.7.1.1.1.5-1: EN-DC FR1 SS-RSRP measurement accuracy test parameters

Parameter		Unit	Test 1		Test 2		Test 3	
			Cell 2	Cell 3	Cell 2	Cell 3	Cell 2	Cell 3
Physical cell ID			489	0	489	0	489	0
SSB ARFCN			freq1		freq1		freq1	
Duplex mode	Config 1,4		FDD					
	Config 2,3,5,6		TDD					
TDD configuration	Config 1,4		Not Applicable					
	Config 2,5		TDDConf.1.1					
	Config 3,6		TDDConf.2.1					
$BW_{channel}$	Config 1,4	MHz	10: $N_{RB,c}$ = 52					
	Config 2,5		10: $N_{RB,c}$ = 52					
	Config 3,6		40: $N_{RB,c}$ = 106					
BWP BW	Config 1,4		10: $N_{RB,c}$ = 52					
	Config 2,5		10: $N_{RB,c}$ = 52					
	Config 3,6		40: $N_{RB,c}$ = 106					
Downlink initial BWP configuration			DLBWP.0					
Downlink dedicated BWP configuration			DLBWP.1					
Uplink dedicated BWP configuration			ULBWP.1					
DRx Cycle		ms	Not Applicable					
TRS Configuration	Config 1,4		TRS.1.1 FDD	-	TRS.1.1 FDD	-	TRS.1.1 FDD	-
	Config 2,5		TRS.1.1 TDD		TRS.1.1 TDD		TRS.1.1 TDD	
	Config 3,6		TRS.2.1 TDD		TRS.2.1 TDD		TRS.2.1 TDD	
PDSCH Reference measurement channel	Config 1,4		SR.1.1 FDD	-	SR.1.1 FDD	-	SR.1.1 FDD	-
	Config 2,5		SR.1.1 TDD		SR.1.1 TDD		SR.1.1 TDD	
	Config 3,6		SR.2.1 TDD		SR.2.1 TDD		SR.2.1 TDD	
RMSI CORESET Reference Channel	Config 1,4		CR.1.1 FDD	-	CR.1.1 FDD	-	CR.1.1 FDD	-
	Config 2,5		CR.1.1 TDD		CR.1.1 TDD		CR.1.1 TDD	
	Config 3,6		CR2.1 TDD		CR2.1 TDD		CR2.1 TDD	
Control Channel RMC	Config 1,4		CCR.1.1 FDD	-	CCR.1. 1 FDD	-	CCR.1.1 FDD	-
	Config 2,5		CCR.1.1 TDD		CCR.1. 1 TDD		CCR.1.1 TDD	
	Config 3,6		CR2.1 TDD		CCR2.1 TDD		CCR2.1 TDD	
SSB configuration	Config 1,4		SSB 1.FR1	SSB.1 FR1	SSB 1.FR1	SSB.1 FR1	SSB 1.FR1	SSB.1 FR1
	Config 2,5		SSB 1.FR1	SSB.1 FR1	SSB 1.FR1	SSB.1 FR1	SSB 1.FR1	SSB.1 FR1
	Config 3,6		SSB 2.FR1	SSB.2 FR1	SSB 2.FR1	SSB.2 FR1	SSB 2.FR1	SSB.2 FR1
Time offset with Cell 2	Config 1,4	ms	-	3	-	3	-	3
	Config 2,3,5,6	µs	-	3	-	3	-	3
SMTC Configuration	Config 1,4		SMTC.2					
	Config 2,3,5,6		SMTC.1					
OCNG Patterns			OP.1					
PDSCH/PDCCH subcarrier spacing	Config 1,2,4,5	kHz	15 kHz					
	Config 3,6		30kHz					
EPRE ratio of PSS to SSS		dB	0	0	0	0	0	0
EPRE ratio of PBCH DMRS to SSS								
EPRE ratio of PBCH to PBCH DMRS								
EPRE ratio of PDCCH DMRS to SSS								
EPRE ratio of PDCCH to PDCCH DMRS								
EPRE ratio of PDSCH DMRS to SSS								
EPRE ratio of PDSCH to PDSCH								
EPRE ratio of OCNG DMRS to SSS(Note 1)								

Parameter			Unit	Test 1		Test 2		Test 3	
				Cell 2	Cell 3	Cell 2	Cell 3	Cell 2	Cell 3
EPRE ratio of OCNG to OCNG DMRS (Note 1)									
N_{oc} Note2	Config 1,2,4,5	Depending on band group	dBm/15KhZ	-107.5		-88		-116 + Δ_{BG_offset}	
	Config 3,6	Depending on band group		-113.8		-94		-116 + Δ_{BG_offset}	
N_{oc} Note2	Config 1,2,4,5		dBm/SCS	-107.4		-88		Same as Noc/15kHz	
	Config 3,6	Depending on band group		-110.8		-91		-113 + Δ_{BG_offset}	
$\hat{E}_s/I_{ot}$			dB	1.88	-5.57	1.88	-5.57	0.09	-5.56
$\hat{E}_s/N_{oc}$			dB	6	1.4	6	1.4	3	-0.8
SS-RSRP Note3	Config 1,2,4,5	Depending on band group	dBm/SCS	-101.5	-106.1	-82	-86.6	-113 + Δ_{BG_offset}	-116.8 + Δ_{BG_offset}
	Config 3,6	Depending on band group		-104.8	-109.4	-85	-89.6	-110+ Δ_{BG_offset}	-113.8+ Δ_{BG_offset}
Io Note3	Config 1,2,4,5	Depending on band group	dBm/ 9.36MHz	-71.68		-52.18		-82.39+ Δ_{BG_offset}	
	Config 3,6	Depending on band group	dBm/ 38.16MHz	-71.71		-51.91		-76.12 + Δ_{BG_offset}	
Propagation condition			-	AWGN					
Antenna configuration				1x2					

NOTE 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.

NOTE 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for N_{oc} to be fulfilled.

NOTE 3: SS-RSRP and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.

NOTE 4: SS-RSRP minimum requirements are specified assuming independent interference and noise at each receiver antenna port.

NOTE 5: Δ_{BG_offset} is defined in clause 3A.4, Table 3A.4.1-2.

Table 4.7.1.1.1.5-2: SS-RSRP Intra frequency absolute accuracy requirements for the reported values for test configurations 1, 2, 4 and 5

Normal Conditions	Test 1 All bands	Test 2 All bands	Test 3	
Lowest reported value (Cell 3)	44	60	Bands NR_FDD_FR1_A, NR_TDD_FR1_A	34
			Bands NR_FDD_FR1_B	34
			Bands NR_TDD_FR1_C	35
			Bands NR_FDD_FR1_D, NR_TDD_FR1_D	35
			Bands NR_FDD_FR1_E, NR_TDD_FR1_E	36
			Bands NR_FDD_FR1_G	37
			Bands NR_FDD_FR1_H	37
Highest reported value (Cell 3)	56	79	Bands NR_FDD_FR1_A, NR_TDD_FR1_A	46
			Bands NR_FDD_FR1_B	46
			Bands NR_TDD_FR1_C	47
			Bands NR_FDD_FR1_D, NR_TDD_FR1_D	47
			Bands NR_FDD_FR1_E, NR_TDD_FR1_E	48
			Bands NR_FDD_FR1_G	49

Normal Conditions	Test 1 All bands	Test 2 All bands	Test 3	
			Bands NR_FDD_FR1_H	49
Extreme Conditions	**Test 1 All bands**	**Test 2 All bands**	**Test 3**	
Lowest reported value (Cell 3)	40	57	Bands NR_FDD_FR1_A, NR_TDD_FR1_A	29
			Bands NR_FDD_FR1_B	30
			Bands NR_TDD_FR1_C	30
			Bands NR_FDD_FR1_D, NR_TDD_FR1_D	31
			Bands NR_FDD_FR1_E, NR_TDD_FR1_E	31
			Bands NR_FDD_FR1_G	33
			Bands NR_FDD_FR1_H	34
Highest reported value (Cell 3)	61	82	Bands NR_FDD_FR1_A, NR_TDD_FR1_A	50
			Bands NR_FDD_FR1_B	51
			Bands NR_TDD_FR1_C	51
			Bands NR_FDD_FR1_D, NR_TDD_FR1_D	52
			Bands NR_FDD_FR1_E, NR_TDD_FR1_E	52
			Bands NR_FDD_FR1_G	53
			Bands NR_FDD_FR1_H	54
NOTE: NR operating band groups are defined in clause 3A.4, Table 3A.4.1-2.				

Table 4.7.1.1.1.5-3: SS-RSRP Intra frequency absolute accuracy requirements for the reported values for test configurations 3 and 6

Normal Conditions	Test 1 All bands	Test 2 All bands	Test 3	
Lowest reported value (Cell 3)	41	57	Bands NR_FDD_FR1_A, NR_TDD_FR1_A	37
			Bands NR_FDD_FR1_B	37
			Bands NR_TDD_FR1_C	38
			Bands NR_FDD_FR1_D, NR_TDD_FR1_D	38
			Bands NR_FDD_FR1_E, NR_TDD_FR1_E	39
			Bands NR_FDD_FR1_G	40
			Bands NR_FDD_FR1_H	40
Highest reported value (Cell 3)	53	76	Bands NR_FDD_FR1_A, NR_TDD_FR1_A	49
			Bands NR_FDD_FR1_B	49
			Bands NR_TDD_FR1_C	50
			Bands NR_FDD_FR1_D, NR_TDD_FR1_D	50
			Bands NR_FDD_FR1_E, NR_TDD_FR1_E	51
			Bands NR_FDD_FR1_G	52
			Bands NR_FDD_FR1_H	52
Extreme Conditions	**Test 1 All bands**	**Test 2 All bands**	**Test 3**	
Lowest reported value (Cell 3)	37	54	Bands NR_FDD_FR1_A, NR_TDD_FR1_A	32
			Bands NR_FDD_FR1_B	33
			Bands NR_TDD_FR1_C	33
			Bands NR_FDD_FR1_D, NR_TDD_FR1_D	34

			Bands NR_FDD_FR1_E, NR_TDD_FR1_E	34
			Bands NR_FDD_FR1_G	35
			Bands NR_FDD_FR1_H	36
Highest reported value (Cell 3)	58	79	Bands NR_FDD_FR1_A, NR_TDD_FR1_A	53
			Bands NR_FDD_FR1_B	54
			Bands NR_TDD_FR1_C	54
			Bands NR_FDD_FR1_D, NR_TDD_FR1_D	55
			Bands NR_FDD_FR1_E, NR_TDD_FR1_E	55
			Bands NR_FDD_FR1_G	56
			Bands NR_FDD_FR1_H	57
NOTE: NR operating band groups are defined in clause 3A.4, Table 3A.4.1-2.				

For the test to pass, the ratio of successful reported values in each test shall be more than 90% with a confidence level of 95%.

4.7.1.1.2 EN-DC FR1 SS-RSRP relative measurement accuracy

4.7.1.1.2.1 Test purpose

The purpose of this test is to verify that the intra-frequency SS-RSRP relative measurement accuracy is within the specified limits for all bands.

4.7.1.1.2.2 Test applicability

This test applies to all types of NR UE supporting E-UTRA and EN-DC from Release 15 onwards.

4.7.1.1.2.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 4.7.1.0.2.

The normative reference for this requirement is TS 38.133 [6] clause A.4.7.1.1.

4.7.1.1.2.4 Test description

4.7.1.1.2.4.1 Initial conditions

This test shall be tested using any of the test configurations in Table 4.7.1.1.2.4.1-1.

Table 4.7.1.1.2.4.1-1: EN-DC FR1 SS-RSRP measurement accuracy supported test configurations

Test Case ID	Description
4.7.1.1.2-1	LTE FDD, NR: 15 kHz SSB SCS, 10MHz bandwidth, FDD
4.7.1.1.2-2	LTE FDD, NR: 15 kHz SSB SCS, 10MHz bandwidth, TDD
4.7.1.1.2-3	LTE FDD, NR: 30 kHz SSB SCS, 40MHz bandwidth, TDD
4.7.1.1.2-4	LTE TDD, NR: 15 kHz SSB SCS, 10MHz bandwidth, FDD
4.7.1.1.2-5	LTE TDD, NR: 15 kHz SSB SCS, 10MHz bandwidth, TDD
4.7.1.1.2-6	LTE TDD, NR: 30 kHz SSB SCS, 40MHz bandwidth, TDD
NOTE: The UE is only required to be tested in one of the supported test configurations.	

Configure the test equipment and the DUT according to the parameters in Table 4.7.1.1.2.4.1-2.

Table 4.7.1.1.2.4.1-2: Initial conditions for SS-RSRP intra frequency relative accuracy in FR1

Parameter	Value	Comment
Test environment	NC, TL/VL, TL/VH, TH/VL, TH/VH	As specified in TS 38.508-1 [14] clause 4.1.
Test frequencies	As specified in Annex E, Table E.2-1 and TS 38.508-1 [14] clause 4.3.1.	

Channel bandwidth	As specified by the test configuration selected from Table 4.7.1.1.2.4.1-1.		
Propagation conditions	AWGN		As specified in clause C.2.2.
Connection Diagram	TE Part 2Rx	A.3.1.8.2 with n = 2 and φ_1 = 5 Hz	As specified in TS 38.508-1 [14] Annex A.
	TE Part 4Rx	A.3.1.8.5 with n = 2 and $\varphi_{1,1}$ = 5 Hz, $\varphi_{1,2}$ = 10 Hz, $\varphi_{1,3}$ = 15 Hz	
	DUT Part 2Rx	A.3.2.3.4	
	DUT Part 4Rx	A.3.2.5.2	
Exceptions to connection diagram	N/A		

1. Message contents are defined in clause 4.7.1.1.2.4.3.
2. Cell 1 is the E-UTRA serving cell (PCell) for the EN-DC setup. The power levels and settings for Cell 1 are set according to Annex A.6. Cell 2 and Cell 3 are NR FR1 cells in the same frequency. Cell 2 is the PSCell and Cell 3 is the target cell for SS-RSRP measurements. The connection setup is done according to the settings in clause C.1.1.

4.7.1.1.2.4.2 Test procedure

1. Ensure the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity EN-DC, DC bearer MCG and SCG, Connected without release *On* and Test Mode *On* according to TS 38.508-1 [14] clause 4.5.
2. Set the parameters according to Table 4.7.1.1.2.5-1 as appropriate.
3. The SS shall transmit an RRCConnectionReconfiguration message on Cell 1.
4. The UE shall transmit an RRCConnectionReconfigurationComplete message.
5. The UE shall transmit periodically MeasurementReport messages.
6. After 10s wait from Step 3, the SS shall check the SS-RSRP reported values of Cell 2 and Cell 3 in the periodic MeasurementReport. The SS-RSRP value of Cell 3 reported by the UE is compared to the reported SS-RSRP of Cell 2. If the resulting value is outside the limits in Table 4.7.1.1.2.5-2 or the UE fails to report the measurement value for Cell 2 or Cell 3, the number of failed iterations is increased by one. Otherwise, the number of passed iterations is increased by one.
7. The SS shall continue checking the MeasurementReport messages transmitted by the UE until the confidence level according to Table G.2.3-1 in Annex G is achieved.
8. Set the parameters according to each sub-test in Table 4.7.1.1.2.5-1 as appropriate and repeat steps 5-7.

4.7.1.1.2.4.3 Message contents

Message contents are same as in clause 4.7.1.1.1.4.3.

4.7.1.1.2.5 Test requirement

Table 4.7.1.1.2.5-1 defines the primary level settings including test tolerances for all tests.

Each SS-RSRP measurement report for each of the tests in Table 4.7.1.1.2.5-1 shall meet the corresponding absolute accuracy requirements in Table 4.7.1.1.2.5-2.

Table 4.7.1.1.2.5-1: Same as Table 4.7.1.1.1.5-1 with the following exceptions:

Parameter	Unit	Test 1		Test 2		Test 3	
		Cell 2	Cell 3	Cell 2	Cell 3	Cell 2	Cell 3

N_{oc} Note2	Config 1,2,4,5	Depending on band group	dBm/15KhZ	-106		-88		-116 + Δ_{BG_offset}	
	Config 3,6	Depending on band group		-113		-94		-116 + Δ_{BG_offset}	
N_{oc} Note2	Config 1,2,4,5		dBm/SCS	Same as Noc/15kHz		Same as Noc/15kHz		Same as Noc/15kHz	
	Config 3,6	Depending on band group		-110		-91		-113 + Δ_{BG_offset}	
$\hat{E}_s/I_{ot}$			dB	1.88	-4.97	1.88	-4.97	-0.01	-4.76
$\hat{E}_s/N_{oc}$			dB	6	2	6	2	3	0
SS-RSRP Note3	Config 1,2,4,5	Depending on band group	dBm/SCS	-100	-104	-82	-86	-113 + Δ_{BG_offset}	-116 + Δ_{BG_offset}
	Config 3,6	Depending on band group		-104	-108	-85	-89	-110 + Δ_{BG_offset}	-113 + Δ_{BG_offset}
Io Note3	Config 1,2,4,5	Depending on band group	dBm/ 9.36MHz	-70.05		-52.05		-82.20+ Δ_{BG_offset}	
	Config 3,6	Depending on band group	dBm/ 38.16MHz	-70.77		-51.77		-75.93 + Δ_{BG_offset}	

Table 4.7.1.1.2.5-2: SS-RSRP Intra frequency relative accuracy requirements for the reported values

	Test 1	**Test 2**	**Test 3**
	All bands	All bands	All bands
Normal Conditions			
Lowest reported value (Cell 3)	RSRP_x - 8	RSRP_x - 8	RSRP_x - 7
Highest reported value (Cell 3)	RSRP_x - 1	RSRP_x - 1	RSRP_x + 1
Extreme Conditions			
Lowest reported value (Cell 3)	RSRP_x - 8	RSRP_x - 8	RSRP_x - 7
Highest reported value (Cell 3)	RSRP_x - 1	RSRP_x - 1	RSRP_x + 1
RSRP_x is the reported value of Cell 2			

For the test to pass, the ratio of successful reported values in each test shall be more than 90% with a confidence level of 95%.

4.7.1.2 Inter-frequency measurements

4.7.1.2.1 EN-DC FR1-FR1 SS-RSRP absolute measurement accuracy

4.7.1.2.1.1 Test purpose

The purpose of this test is to verify that the inter-frequency SS-RSRP absolute measurement accuracy is within the specified limits for all bands.

4.7.1.2.1.2 Test applicability

This test applies to all types of NR UE supporting E-UTRA and EN-DC from Release 15 onwards.

4.7.1.2.1.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 4.7.1.0.3.

The normative reference for this requirement is TS 38.133 [6] clause A.4.7.1.2.

4.7.1.2.1.4 Test description

4.7.1.2.1.4.1 Initial conditions

This test shall be tested using any of the test configurations in Table 4.7.1.2.1.4.1-1.

Table 4.7.1.2.1.4.1-1: EN-DC FR1-FR1 SS-RSRP measurement accuracy supported test configurations

Test Case ID	Description
4.7.1.2.1-1	LTE FDD, NR: 15 kHz SSB SCS, 10MHz bandwidth, FDD
4.7.1.2.1-2	LTE FDD, NR: 15 kHz SSB SCS, 10MHz bandwidth, TDD
4.7.1.2.1-3	LTE FDD, NR: 30 kHz SSB SCS, 40MHz bandwidth, TDD
4.7.1.2.1-4	LTE TDD, NR: 15 kHz SSB SCS, 10MHz bandwidth, FDD
4.7.1.2.1-5	LTE TDD, NR: 15 kHz SSB SCS, 10MHz bandwidth, TDD
4.7.1.2.1-6	LTE TDD, NR: 30 kHz SSB SCS, 40MHz bandwidth, TDD
NOTE: The UE is only required to be tested in one of the supported test configurations.	

Configure the test equipment and the DUT according to the parameters in Table 4.7.1.2.1.4.1-2.

Table 4.7.1.2.1.4.1-2: Initial conditions for SS-RSRP inter frequency absolute accuracy in FR1

Parameter	Value		Comment
Test environment	NC, TL/VL, TL/VH, TH/VL, TH/VH		As specified in TS 38.508-1 [14] clause 4.1.
Test frequencies	As specified in Annex E, Table E.2-1 and TS 38.508-1 [14] clause 4.3.1.		
Channel bandwidth	As specified by the test configuration selected from Table 4.7.1.2.1.4.1-1.		
Propagation conditions	AWGN		As specified in clause C.2.2.
Connection Diagram	TE Part 2Rx	A.3.1.8.2 with n = 2 and φ_1 = 5 Hz	As specified in TS 38.508-1 [14] Annex A.
	TE Part 4Rx	A.3.1.8.5 with n = 2 and $\varphi_{1,1}$ = 5 Hz, $\varphi_{1,2}$ = 10 Hz, $\varphi_{1,3}$ = 15 Hz	
	DUT Part 2Rx	A.3.2.3.4	
	DUT Part 4Rx	A.3.2.5.2	
Exceptions to connection diagram	N/A		

1. Message contents are defined in clause 4.7.1.2.1.4.3.
2. Cell 1 is the E-UTRA serving cell (PCell) for the EN-DC setup. The power levels and settings for Cell 1 are set according to Annex A.6. Cell 2 and Cell 3 are NR FR1 cells in two different FR1 frequencies. Cell 2 is the PSCell and Cell 3 is the target cell for SS-RSRP measurements. The connection setup is done according to the settings in clause C.1.1.

4.7.1.2.1.4.2 Test procedure

Same as in clause 4.7.1.1.1.4.2 but replacing Table 4.7.1.1.1.5-1 and 4.7.1.1.1.5-2 with 4.7.1.2.1.5-1 and 4.7.1.2.1.5-2, respectively.

4.7.1.2.1.4.3 Message contents

Message contents are according to TS 38.508-1 [14] clause 7.3 with the following exceptions:

Table 4.7.1.2.1.4.3-1: Common Exception messages for EN-DC FR1-FR1 SS-RSRP absolute measurement accuracy

Default Message Contents	
Common contents of system information blocks exceptions	

Default RRC messages and information elements contents exceptions	Table H.3.1-1 Table H.3.1-2 with condition INTER-FREQ and GAP NEEDED Table H.3.1-5 Table H.3.1-7 with condition INTER-FREQ Table H.3.4-1 Table H.3.4-1a Table H.3.4-2 Table H.3.4-4 with Condition gapUE Table H.3.4-5 with Condition Pattern#0
Specific message contents exceptions for Test Configuration 4.7.1.1.1.-1 and 4.7.1.1.1-4	Table H.3.1-3 with Conditions INTER-FREQ MO, SSB.1 FR1 Table 7.3.1-3 in TS 38.508-1 [14] with condition SMTC.2
Specific message contents exceptions for Test Configuration 4.7.1.1.1-2 and 4.7.1.1.1-5	Table H.3.1-3 with Conditions INTER-FREQ MO, SSB.1 FR1 and Synchronous cells Table 7.3.1-3 in TS 38.508-1 [14] with condition SMTC.1
Specific message contents exceptions for Test Configuration 4.7.1.1.1-3 and 4.7.1.1.1-6	Table H.3.1-3 with Conditions INTER-FREQ MO, SSB.2 FR1 and Synchronous cells Table 7.3.1-3 in TS 38.508-1 [14] with condition SMTC.1

Table 4.7.1.2.1.4.3-2: ReportConfigNR-DEFAULT(Periodical) for EN-DC FR1-FR1 SS-RSRP Accuracy

Derivation Path: 38.508-1 [14] Table 4.6.3-142 with condition PERIODICAL			
Information Element	**Value/remark**	**Comment**	**Condition**
ReportConfigNR::= SEQUENCE {			
reportType CHOICE {			
periodical SEQUENCE {			PERIODICAL
reportQuantityCell SEQUENCE {			
rsrq	false		
sinr	false		
}			
maxReportCells	2		
}			
}			
}			

4.7.1.2.1.5 Test requirement

Table 4.7.1.2.1.5-1 defines the primary level settings including test tolerances for all tests.

Each SS-RSRP measurement report for each of the tests in Table 4.7.1.2.1.5-1 shall meet the corresponding absolute accuracy requirements in Table 4.7.1.2.1.5-2 for test configurations 1, 2, 4 and 5, and the corresponding absolute accuracy requirements in Table 4.7.1.2.1.5-3 for test configurations 3 and 6.

Table 4.7.1.2.1.5-1: SS-RSRP inter-frequency test parameters

Parameter	**Config**	**Unit**	**Test 1**		**Test 2**	
			Cell 2	**Cell 3**	**Cell 2**	**Cell 3**
SSB ARFCN	1~6		freq1	freq2	freq1	freq2
$BW_{channel}$	1,4	MHz	10: $N_{RB,c}$ = 52		10: $N_{RB,c}$ = 52	
	2,5		10: $N_{RB,c}$ = 52		10: $N_{RB,c}$ = 52	
	3,6		40: $N_{RB,c}$ = 106		40: $N_{RB,c}$ = 106	
Gap pattern ID			0		0	
Duplex mode	1,4		FDD		FDD	
	2,5		TDD		TDD	
	3,6		TDD		TDD	
TDD configuration	1,4		N/A		N/A	
	2,5		TDDConf.1.1		TDDConf.1.1	
	3,6		TDDConf.2.1		TDDConf.2.1	
PDSCH Reference measurement channel	1,4		SR.1.1 FDD	-	SR.1.1 FDD	-
	2,5		SR.1.1 TDD		SR.1.1 TDD	

Parameter		Config	Unit	Test 1		Test 2	
				Cell 2	Cell 3	Cell 2	Cell 3
		3,6		SR.2.1 FDD		SR.2.1 FDD	
RMSI CORESET Reference Channel		1,4		CR.1.1 FDD	-	CR.1.1 FDD	-
		2,5		CR.1.1 TDD	-	CR.1.1 TDD	-
		3,6		CR.2.1 FDD	-	CR.2.1 FDD	-
Dedicated CORESET Reference Channel		1,4		CCR.1.1 FDD	-	CCR.1.1 FDD	-
		2,5		CCR.1.1 TDD	-	CCR.1.1 TDD	-
		3,6		CCR.2.1 TDD	-	CCR.2.1 TDD	-
SSB configuration		1,4		SSB.1 FR1		SSB.1 FR1	
		2,5		SSB.1 FR1		SSB.1 FR1	
		3,6		SSB.2 FR1		SSB.2 FR1	
OCNG Patterns		1~6		OP.1		OP.1	
TRS configuration		1,4		TRS.1.1 FDD	-	TRS.1.1 FDD	-
		2,5		TRS.1.1 TDD		TRS.1.1 TDD	
		3,6		TRS.1.2 TDD		TRS.1.2 TDD	
Initial BWP Configuration		1~6		DLBWP.0.1 ULBWP.0.1		DLBWP.0.1 ULBWP.0.1	
Dedicated BWP configuration		1~6		DLBWP.1.1 ULBWP.1.1		DLBWP.1.1 ULBWP.1.1	
SMTC configuration		1,4		SMTC.2		SMTC.2	
		2,3,5,6		SMTC.1		SMTC.1	
Time offset between Cell 2 and Cell 3		1,4	ms	3		3	
		2,3,5,6	μs	3		3	
EPRE ratio of PSS to SSS EPRE ratio of PBCH DMRS to SSS EPRE ratio of PBCH to PBCH DMRS EPRE ratio of PDCCH DMRS to SSS EPRE ratio of PDCCH to PDCCH DMRS EPRE ratio of PDSCH DMRS to SSS EPRE ratio of PDSCH to PDSCH DMRS EPRE ratio of OCNG DMRS to SSS Note 1 EPRE ratio of OCNG to OCNG DMRS Note 1		1~6	dB	0	0	0	0
N_{oc} Note2	Depending on band group	1,2,4,5	dBm/15kHz	-94.65	-94.65	(N_{oc} for Cell 3 +8dB)	-115+ Δ_{BG_offset}
N_{oc} Note2	Depending on band group	3,6	dBm/15kHz	-96	-96	(N_{oc} for Cell 3 +8dB)	-115+ Δ_{BG_offset}
N_{oc} Note2	Depending on band group	1,2,4,5	dBm/SSB SCS	-94.65	-94.65	(N_{oc} for Cell 3 +8dB)	-115+ Δ_{BG_offset}
	Depending on band group	3,6		-93	-93	(N_{oc} for C 3 +8dB)	-112.00+ Δ_{BG_offset}
$\hat{E}_s/I_{ot}$		1~6	dB	10	10	13	-3
SS-RSRP Note3	Depending on band group	1,2,4,5	dBm/SCS	-84.65	84.65	(RSRP for Cell 3 +25dB)	-118.00+ Δ_{BG_offset}
	Depending on band group	3,6		-83	-83	(RSRP for Cell 3 +25dB)	-115.00+ Δ_{BG_offset}
Io Note3	Depending on band group	1,2,4,5	dBm/9.36MHz	56.28	56.28	(Io for Channel 3 +19.75dB)	-85.28+ Δ_{BG_offset}

Parameter		Config	Unit	Test 1		Test 2	
				Cell 2	Cell 3	Cell 2	Cell 3
	Depending on band group	3,6	dBm/ 38.16MHz	-51.53	-51.53	(Io for Channel 3 +19.75dB)	-79.19+ Δ_{BG_offset}
$\hat{E}_s / N_{oc}$		1~6	dB	10	10	13	-3
Propagation condition		1~6	-	AWGN		AWGN	
Antenna configuration				1x2		1x2	

NOTE 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.
NOTE 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for N_{oc} to be fulfilled.
NOTE 3: RSRP and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.
NOTE 4: RSRP minimum requirements are specified assuming independent interference and noise at each receiver antenna port.
Note 5 The test configuration excludes support for band n51 and it is not required to run this test on band n51 in this release of the specification
NOTE 6: Δ_{BG_offset} is defined in clause 3A.4, Table 3A.4.1-2.

Table 4.7.1.2.1.5-2: SS-RSRP Inter frequency absolute accuracy requirements for the reported values for test configurations 1, 2, 4 and 5

Normal Conditions	Test 1 All bands	Test 2	
Lowest reported value (Cell 3)	62	Bands NR_FDD_FR1_A, NR_TDD_FR1_A	32
		Bands NR_FDD_FR1_B	33
		Bands NR_TDD_FR1_C	33
		Bands NR_FDD_FR1_D, NR_TDD_FR1_D	34
		Bands NR_FDD_FR1_E, NR_TDD_FR1_E	34
		Bands NR_FDD_FR1_G	35
		Bands NR_FDD_FR1_H	36
Highest reported value (Cell 3)	81	Bands NR_FDD_FR1_A, NR_TDD_FR1_A	45
		Bands NR_FDD_FR1_B	45
		Bands NR_TDD_FR1_C	46
		Bands NR_FDD_FR1_D, NR_TDD_FR1_D	46
		Bands NR_FDD_FR1_E, NR_TDD_FR1_E	47
		Bands NR_FDD_FR1_G	48
		Bands NR_FDD_FR1_H	48
Extreme Conditions	**Test 1 All bands**	**Test 2**	
Lowest reported value (Cell 3)	59	Bands NR_FDD_FR1_A, NR_TDD_FR1_A	28
		Bands NR_FDD_FR1_B	28
		Bands NR_TDD_FR1_C	29
		Bands NR_FDD_FR1_D, NR_TDD_FR1_D	29
		Bands NR_FDD_FR1_E, NR_TDD_FR1_E	30
		Bands NR_FDD_FR1_G	31
		Bands NR_FDD_FR1_H	31
Highest reported value (Cell 3)	84	Bands NR_FDD_FR1_A, NR_TDD_FR1_A	49

		Bands NR_FDD_FR1_B	50
		Bands NR_TDD_FR1_C	50
		Bands NR_FDD_FR1_D, NR_TDD_FR1_D	51
		Bands NR_FDD_FR1_E, NR_TDD_FR1_E	51
		Bands NR_FDD_FR1_G	52
		Bands NR_FDD_FR1_H	53
NOTE: NR operating band groups are defined in clause 3A.4, Table 3A.4.1-2.			

Table 4.7.1.2.1.5-3: SS-RSRP Inter frequency absolute accuracy requirements for the reported values for test configurations 3 and 6

Normal Conditions	**Test 1 All bands**	**Test 2**	
Lowest reported value (Cell 3)	64	Bands NR_FDD_FR1_A, NR_TDD_FR1_A	35
		Bands NR_FDD_FR1_B	36
		Bands NR_TDD_FR1_C	36
		Bands NR_FDD_FR1_D, NR_TDD_FR1_D	37
		Bands NR_FDD_FR1_E, NR_TDD_FR1_E	37
		Bands NR_FDD_FR1_G	38
		Bands NR_FDD_FR1_H	39
Highest reported value (Cell 3)	83	Bands NR_FDD_FR1_A, NR_TDD_FR1_A	48
		Bands NR_FDD_FR1_B	48
		Bands NR_TDD_FR1_C	49
		Bands NR_FDD_FR1_D, NR_TDD_FR1_D	49
		Bands NR_FDD_FR1_E, NR_TDD_FR1_E	50
		Bands NR_FDD_FR1_G	51
		Bands NR_FDD_FR1_H	51
Extreme Conditions	**Test 1 All bands**	**Test 2**	
Lowest reported value (Cell 3)	61	Bands NR_FDD_FR1_A, NR_TDD_FR1_A	31
		Bands NR_FDD_FR1_B	31
		Bands NR_TDD_FR1_C	32
		Bands NR_FDD_FR1_D, NR_TDD_FR1_D	32
		Bands NR_FDD_FR1_E, NR_TDD_FR1_E	33
		Bands NR_FDD_FR1_G	34
		Bands NR_FDD_FR1_H	34
Highest reported value (Cell 3)	86	Bands NR_FDD_FR1_A, NR_TDD_FR1_A	52
		Bands NR_FDD_FR1_B	53
		Bands NR_TDD_FR1_C	53
		Bands NR_FDD_FR1_D, NR_TDD_FR1_D	54
		Bands NR_FDD_FR1_E, NR_TDD_FR1_E	54
		Bands NR_FDD_FR1_G	55
		Bands NR_FDD_FR1_H	56
NOTE: NR operating band groups are defined in clause 3A.4, Table 3A.4.1-2			

For the test to pass, the ratio of successful reported values in each test shall be more than 90% with a confidence level of 95%.

4.7.1.2.2 EN-DC FR1-FR1 SS-RSRP relative measurement accuracy

4.7.1.2.2.1 Test purpose

The purpose of this test is to verify that the inter-frequency SS-RSRP absolute measurement accuracy is within the specified limits for all bands.

4.7.1.2.2.2 Test applicability

This test applies to all types of NR UE supporting E-UTRA and EN-DC from Release 15 onwards.

4.7.1.2.2.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 4.7.1.0.4.

The normative reference for this requirement is TS 38.133 [6] clause A.4.7.1.2.

4.7.1.2.2.4 Test description

4.7.1.2.2.4.1 Initial conditions

This test shall be tested using any of the test configurations in Table 4.7.1.2.2.4.1-1.

Table 4.7.1.2.2.4.1-1: EN-DC FR1-FR1 SS-RSRP measurement accuracy supported test configurations

Test Case ID	Description
4.7.1.2.2-1	LTE FDD, NR: 15 kHz SSB SCS, 10MHz bandwidth, FDD
4.7.1.2.2-2	LTE FDD, NR: 15 kHz SSB SCS, 10MHz bandwidth, TDD
4.7.1.2.2-3	LTE FDD, NR: 30 kHz SSB SCS, 40MHz bandwidth, TDD
4.7.1.2.2-4	LTE TDD, NR: 15 kHz SSB SCS, 10MHz bandwidth, FDD
4.7.1.2.2-5	LTE TDD, NR: 15 kHz SSB SCS, 10MHz bandwidth, TDD
4.7.1.2.2-6	LTE TDD, NR: 30 kHz SSB SCS, 40MHz bandwidth, TDD
NOTE: The UE is only required to be tested in one of the supported test configurations.	

Configure the test equipment and the DUT according to the parameters in Table 4.7.1.2.2.4.1-2.

Table 4.7.1.2.2.4.1-2: Initial conditions for SS-RSRP inter frequency relative accuracy in FR1

Parameter	Value		Comment
Test environment	NC, TL/VL, TL/VH, TH/VL, TH/VH		As specified in TS 38.508-1 [14] clause 4.1.
Test frequencies	As specified in Annex E, Table E.2-1 and TS 38.508-1 [14] clause 4.3.1.		
Channel bandwidth	As specified by the test configuration selected from Table 4.7.1.2.2.4.1-1.		
Propagation conditions	AWGN		As specified in clause C.2.2.
Connection Diagram	TE Part 2Rx	A.3.1.8.2 with n = 2 and φ_1 = 5 Hz	As specified in TS 38.508-1 [14] Annex A.
	TE Part 4Rx	A.3.1.8.5 with n = 2 and $\varphi_{1,1}$ = 5 Hz, $\varphi_{1,2}$ = 10 Hz, $\varphi_{1,3}$ = 15 Hz	
	DUT Part 2Rx	A.3.2.3.4	
	DUT Part 4Rx	A.3.2.5.2	
Exceptions to connection diagram	N/A		

1. Message contents are defined in clause 4.7.1.2.2.4.3.
2. Cell 1 is the E-UTRA serving cell (PCell) for the EN-DC setup. The power levels and settings for Cell 1 are set according to Annex A.6. Cell 2 and Cell 3 are NR FR1 cells in two different FR1 frequencies. Cell 2 is the

PSCell and Cell 3 is the target cell for SS-RSRP measurements. The connection setup is done according to the settings in clause C.1.1.

4.7.1.2.2.4.2 Test procedure

Same as in clause 4.7.1.1.2.4.2 but replacing Table 4.7.1.1.2.5-1 and 4.7.1.1.2.5-2 with 4.7.1.2.2.5-1 and 4.7.1.2.2.5-2, respectively.

4.7.1.2.2.4.3 Message contents

Message contents are same as in clause 4.7.1.2.1.4.3.

4.7.1.2.2.5 Test requirement

Table 4.7.1.2.2.5-1 defines the primary level settings including test tolerances for all tests.

Each SS-RSRP measurement report for each of the tests in Table 4.7.1.2.2.5-1 shall meet the corresponding absolute accuracy requirements in Table 4.7.1.2.2.5-2.

Table 4.7.1.2.2.5-1: same as Table 4.7.1.2.1.5-1

Table 4.7.1.2.2.5-2: SS-RSRP Intra frequency relative accuracy requirements for the reported values

	Test 1	Test 2
	All bands	All bands
Normal Conditions		
Lowest reported value (Cell 3)	SS-RSRP_x - 7	SS-RSRP_x - 31
Highest reported value (Cell 3)	SS-RSRP_x + 7	SS-RSRP_x - 18
Extreme Conditions		
Lowest reported value (Cell 3)	SS-RSRP_x - 9	SS-RSRP_x - 33
Highest reported value (Cell 3)	SS-RSRP_x + 9	SS-RSRP_x - 17
SS-RSRP_x is the reported value of Cell 2		

For the test to pass, the ratio of successful reported values in each test shall be more than 90% with a confidence level of 95%.

4.7.2 SS-RSRQ

4.7.2.0 Minimum conformance requirements

4.7.2.0.1 Intra-frequency SS-RSRQ measurement accuracy requirements

The intra-frequency SS-RSRQ accuracy requirements are defined for the SS-RSRQ measured from a cell on the same frequency as that of the PCell or PSCell in FR1.

The accuracy requirements in Table 4.7.2.0.1-1 are valid under the following conditions:

- Conditions defined in clause 7.3 of TS 38.101-1 [2] for reference sensitivity are fulfilled.
- Conditions for intra-frequency measurements are fulfilled according to Annex B.2.2 for a corresponding Band for each relevant SSB.

Table 4.7.2.0.1-1: SS-RSRQ Intra frequency absolute accuracy in FR1

Accuracy		Conditions				
Normal condition	Extreme condition	SSB Ês/Iot	Io [Note 1] range			
			NR operating band groups [Note 3]	Minimum Io		Maximum Io
dB	dB	dB		dBm / SCS_{SSB}	$dBm/BW_{Channel}$	$dBm/BW_{Channel}$

				SCS_{SSB} = 15 kHz	SCS_{SSB} = 30 kHz		
±2.5	±4	≥-3 dB	NR_FDD_FR1_A, NR_TDD_FR1_A, NR_SDL_FR1_A	-121	-118	N/A	-50
			NR_FDD_FR1_B	-120.5	-117.5	N/A	-50
			NR_TDD_FR1_C	-120	-117	N/A	-50
			NR_FDD_FR1_D, NR_TDD_FR1_D	-119.5	-116.5	N/A	-50
			NR_FDD_FR1_E, NR_TDD_FR1_E	-119	-116	N/A	-50
			NR_FDD_FR1_G	-118	-115	N/A	-50
			NR_FDD_FR1_H	-117.5	-114.5	N/A	-50
±3.5	±4	≥-6 dB	Note 2	Note 2	Note 2	Note 2	Note 2
NOTE 1: Io is assumed to have constant EPRE across the bandwidth. NOTE 2: The same bands and the same Io conditions for each band apply for this requirement as for the corresponding highest accuracy requirement. NOTE 3: NR operating band groups in FR1 are as defined in Section 3A.4.1.							

The reporting range of SS-RSRQ is defined from -43 dB to 20 dB with 0.5 dB resolution. The mapping of measured quantity is defined in Table 4.7.2.0.1-2. The range in the signalling may be larger than the guaranteed accuracy range.

Table 4.7.2.0.1-2: SS-RSRQ measurement report mapping

Reported value	Measured quantity value	Unit
SS-RSRQ_0	SS-RSRQ<-43	dB
SS-RSRQ_1	-43≤ SS-RSRQ<-42.5	dB
SS-RSRQ_2	-42.5≤ SS-RSRQ<-42	dB
SS-RSRQ_3	-42≤ SS-RSRQ<-41.5	dB
SS-RSRQ_4	-41.5≤ SS-RSRQ<-41	dB
..	..	…
SS-RSRQ_122	17.5≤ SS-RSRQ<18	dB
SS-RSRQ_123	18≤ SS-RSRQ<18.5	dB
SS-RSRQ_124	18.5≤ SS-RSRQ<19	dB
SS-RSRQ_125	19≤ SS-RSRQ<19.5	dB
SS-RSRQ_126	19.5≤ SS-RSRQ<20	dB
SS-RSRQ_127	20 ≤ SS-RSRQ	dB

The normative reference for this requirement is TS 38.133 [6] clauses 10.1.7.1.1 and 10.1.11.

4.7.2.0.2 Inter-frequency absolute SS-RSRQ measurement accuracy requirements

The inter-frequency SS-RSRQ absolute accuracy requirements in this clause are defined for the SS-RSRQ measured from a cell on a different frequency as that of the PCell or PSCell in FR1.

The accuracy requirements in Table 4.7.2.0.2-1 are valid under the following conditions:

- Conditions defined in 38.101-1 [2] Clause 7.3 for reference sensitivity are fulfilled.
- Conditions for intra-frequency measurements are fulfilled according to Annex B.2.3 for a corresponding Band for each relevant SSB.

Table 4.7.2.0.2-1: SS-RSRQ Inter frequency absolute accuracy in FR1

Accuracy		Conditions			
Normal condition	Extreme condition	SSB Ês/Iot	Io [Note 1] range		
			NR operating band groups [Note 3]	Minimum Io	Maximum Io
dB	dB	dB		dBm / SCS_{SSB}	dBm/$BW_{Channel}$	dBm/$BW_{Channel}$

				SCS_{SSB} = 15 kHz	**SCS_{SSB} = 30 kHz**		
±2.5	±4	≥-3 dB	NR_FDD_FR1_A, NR_TDD_FR1_A, NR_SDL_FR1_A	-121	-118	N/A	-50
			NR_FDD_FR1_B	-120.5	-117.5	N/A	-50
			NR_TDD_FR1_C	-120	-117	N/A	-50
			NR_FDD_FR1_D, NR_TDD_FR1_D	-119.5	-116.5	N/A	-50
			NR_FDD_FR1_E, NR_TDD_FR1_E	-119	-116	N/A	-50
			NR_FDD_FR1_G	-118	-115	N/A	-50
			NR_FDD_FR1_H	-117.5	-114.5	N/A	-50
±3.5	±4	≥-6 dB	Note 2	Note 2	Note 2	Note 2	Note 2
NOTE 1: Io is assumed to have constant EPRE across the bandwidth. NOTE 2: The same bands and the same Io conditions for each band apply for this requirement as for the corresponding highest accuracy requirement. NOTE 3: NR operating band groups in FR1 are as defined in Section 3A.4.1.							

The normative reference for this requirement is TS 38.133 [6] clauses 10.1.9.1.1 and 10.1.11.

4.7.2.0.3 Inter-frequency relative SS-RSRQ measurement accuracy requirements

The inter-frequency SS-RSRQ relative accuracy requirements in this clause are defined for the SS-RSRQ measured from one cell on a frequency in FR1compared to the SS-RSRQ measured from another cell on a different frequency in FR1.

The accuracy requirements in Table 4.7.2.0.3-1 are valid under the following conditions:

- Conditions defined in clause 7.3 of TS 38.101-1 [2] for reference sensitivity are fulfilled.
- Conditions for inter-frequency measurements are fulfilled according to Annex B.2.3 for a corresponding Band for each relevant SSB.
- $|SSB_RP1_{dBm} - SSB_RP2_{dBm}| \leq 27$ dB
- $|$ Channel 1_Io -Channel 2_Io $| \leq 20$ dB

Table 4.7.2.0.3-1: SS-RSRQ Inter frequency relative accuracy in FR1

Accuracy		**Conditions**					
Normal condition	**Extreme condition**	**SSB Ês/Iot** Note 2	**Io** Note 1 **range**				
			NR operating band groups Note 4	**Minimum Io**			**Maximum Io**
dB	**dB**	**dB**		**dBm / SCS_{SSB}**		**$dBm/BW_{Channel}$**	**$dBm/BW_{Channel}$**
				SCS_{SSB} = 15 kHz	**SCS_{SSB} = 30 kHz**		
±3	±4	≥-3 dB	NR_FDD_FR1_A, NR_TDD_FR1_A, NR_SDL_FR1_A	-121	-118	N/A	-50
			NR_FDD_FR1_B	-120.5	-117.5	N/A	-50
			NR_TDD_FR1_C	-120	-117	N/A	-50
			NR_FDD_FR1_D, NR_TDD_FR1_D	-119.5	-116.5	N/A	-50
			NR_FDD_FR1_E, NR_TDD_FR1_E	-119	-116	N/A	-50
			NR_FDD_FR1_G	-118	-115	N/A	-50
			NR_FDD_FR1_H	-117.5	-114.5	N/A	-50
±4	±4	≥-6 dB	Note 3	Note 3	Note 3	Note 3	Note 3
NOTE 1: Io is assumed to have constant EPRE across the bandwidth. NOTE 2: The parameter SSB Ês/Iot is the minimum SSB Ês/Iot of the pair of cells to which the requirement applies.							

NOTE 3: The same bands and the same Io conditions for each band apply for this requirement as for the corresponding highest accuracy requirement.
NOTE 4: NR operating band groups in FR1 are as defined in Section 3A.4.1.

The normative reference for this requirement is TS 38.133 [6] clauses 10.1.9.1.2 and 10.1.11.

4.7.2.1 EN-DC FR1 SS-RSRQ measurement accuracy

4.7.2.1.1 Test purpose

The purpose of this test is to verify that the intra-frequency SS-RSRQ measurement accuracy is within the specified limits for all bands.

4.7.2.1.2 Test applicability

This test applies to all types of NR UE supporting E-UTRA and EN-DC from Release 15 onwards.

4.7.2.1.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 4.7.2.0.1.

The normative reference for this requirement is TS 38.133 [6] clause A.4.7.2.1.

4.7.2.1.4 Test description

4.7.2.1.4.1 Initial conditions

This test shall be tested using any of the test configurations in Table 4.7.2.1.4.1-1.

Table 4.7.2.1.4.1-1: EN-DC FR1 SS-RSRQ measurement accuracy supported test configurations

Test Case ID	Description
4.7.2.1-1	LTE FDD, NR: 15 kHz SSB SCS, 10MHz bandwidth, FDD
4.7.2.1-2	LTE FDD, NR: 15 kHz SSB SCS, 10MHz bandwidth, TDD
4.7.2.1-3	LTE FDD, NR: 30 kHz SSB SCS, 40MHz bandwidth, TDD
4.7.2.1-4	LTE TDD, NR: 15 kHz SSB SCS, 10MHz bandwidth, FDD
4.7.2.1-5	LTE TDD, NR: 15 kHz SSB SCS, 10MHz bandwidth, TDD
4.7.2.1-6	LTE TDD, NR: 30 kHz SSB SCS, 40MHz bandwidth, TDD
NOTE: The UE is only required to be tested in one of the supported test configurations.	

Configure the test equipment and the DUT according to the parameters in Table 4.7.2.1.4.1-2.

Table 4.7.2.1.4.1-2: Initial conditions for SS-RSRQ intra frequency accuracy in FR1

Parameter	Value		Comment
Test environment	NC, TL/VL, TL/VH, TH/VL, TH/VH		As specified in TS 38.508-1 [14] clause 4.1.
Test frequencies	As specified in Annex E, Table E.2-1 and TS 38.508-1 [14] clause 4.3.1.		
Channel bandwidth	As specified by the test configuration selected from Table 4.7.2.1.4.1-1.		
Propagation conditions	AWGN		As specified in clause C.2.2.
Connection Diagram	TE Part 2Rx	A.3.1.8.2 with n = 2 and φ_1 = 5 Hz	As specified in TS 38.508-1 [14] Annex A.
	TE Part 4Rx	A.3.1.8.5 with n = 2 and $\varphi_{1,1}$ = 5 Hz, $\varphi_{1,2}$ = 10 Hz, $\varphi_{1,3}$ = 15 Hz	
	DUT Part 2Rx	A.3.2.3.4	
	DUT Part 4Rx	A.3.2.5.2	

Exceptions to connection diagram	N/A	

1. Message contents are defined in clause 4.7.2.1.4.3.

2. Cell 1 is the E-UTRA serving cell (PCell) for the EN-DC setup. The power levels and settings for Cell 1 are set according to Annex A.6. Cell 2 and Cell 3 are NR FR1 cells in the same frequency. Cell 2 is the PSCell and Cell 3 is the target cell for SS-RSRQ measurements. The connection setup is done according to the settings in clause C.1.3.

4.7.2.1.4.2 Test procedure

1. Ensure the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity EN-DC, DC bearer MCG and SCG, Connected without release *On* and Test Mode *On*, according to TS 38.508-1 [14] clause 4.5.

2. Set the parameters according to Table 4.7.2.1.5-1 as appropriate.

3. The SS shall transmit an RRCConnectionReconfiguration message on Cell 1.

4. The UE shall transmit an RRCConnectionReconfigurationComplete message.

5. The UE shall transmit periodically MeasurementReport messages.

6. After 10s wait from Step 3, the SS shall check the SS-RSRQ reported values in the periodic MeasurementReport. The SS-RSRQ value of Cell 3 reported by the UE is compared to the expected SS-RSRQ. If the value is outside the limits in Table 4.7.2.1.5-2 or the UE fails to report the measurement value for Cell 3, the number of failed iterations is increased by one. Otherwise, the number of passed iterations is increased by one.

7. The SS shall continue checking the MeasurementReport messages transmitted by the UE until the confidence level according to Table G.2.3-1 in Annex G is achieved.

8. Set the parameters according to each sub-test in Table 4.7.2.1.5-1 as appropriate and repeat steps 5-7.

4.7.2.1.4.3 Message contents

Message contents are according to TS 38.508-1 [14] clause 7.3 with the following exceptions:

Table 4.7.2.1.4.3-1: Common Exception messages for EN-DC FR1 SS-RSRQ measurement accuracy

Default Message Contents	
Common contents of system information blocks exceptions	
Default RRC messages and information elements contents exceptions	Table H.3.1-1 Table H.3.1-2 Table H.3.1-5 Table H.3.1-7 Table H.3.4-1 Table H.3.4-1a Table H.3.4-2
Specific message contents exceptions for Test Configuration 4.7.2.1-1 and 4.7.2.1-4	Table H.3.1-3 with Condition SSB.1 FR1 Table 7.3.1-3 in TS 38.508-1 [14] with condition SMTC.2
Specific message contents exceptions for Test Configuration 4.7.2.1-2 and 4.7.2.1-5	Table H.3.1-3 with Condition SSB.1 FR1 and Synchronous cells Table 7.3.1-3 in TS 38.508-1 [14] with condition SMTC.1
Specific message contents exceptions for Test Configuration 4.7.2.1-3 and 4.7.2.1-6	Table H.3.1-3 with Condition SSB.2 FR1 and Synchronous cells Table 7.3.1-3 in TS 38.508-1 [14] with condition SMTC.1

Table 4.7.2.1.4.3-2: ReportConfigNR-DEFAULT(Periodical) for EN-DC FR1 SS-RSRQ Accuracy

Derivation Path: 38.508-1 [14] Table 4.6.3-142 with condition PERIODICAL

Information Element	Value/remark	Comment	Condition
ReportConfigNR::= SEQUENCE {			
reportType CHOICE {			
periodical SEQUENCE {			PERIODICAL
reportQuantityCell SEQUENCE {			
rsrp	false		
sinr	false		
}			
maxReportCells	2		
}			
}			
}			

4.7.2.1.5 Test requirement

Table 4.7.2.1.5-1 defines the primary level settings including test tolerances for all tests.

Each SS-RSRQ measurement report for each of the tests in Table 4.7.2.1.5-1 shall meet the corresponding absolute accuracy requirements in Table 4.7.2.1.5-2.

Table 4.7.2.1.5-1: SS-RSRQ Intra frequency test parameters

Parameter		Unit	Test 1		Test 2		Test 3	
			Cell 2	Cell 3	Cell 2	Cell 3	Cell 2	Cell 3
SSB ARFCN			freq1		freq1		freq1	
Duplex mode	Config 1,4		FDD					
	Config 2,3,5,6		TDD					
TDD configuration	Config 1,4		Not Applicable					
	Config 2,5		TDDConf.1.1					
	Config 3,6		TDDConf.2.1					
$BW_{channel}$	Config 1,4	MHz	10: $N_{RB,c}$ = 52					
	Config 2,5		10: $N_{RB,c}$ = 52					
	Config 3,6		40: $N_{RB,c}$ = 106					
BWP configuration	Initial DL BWP		DLBWP.0.1					
	Dedicated DL BWP		DLBWP.1.1					
	Initial UL BWP		ULBWP.0.1					
	Dedicated UL BWP		ULBWP.1.1					
DRX Cycle		ms	Not Applicable					
PDSCH Reference measurement channel	Config 1,4		SR.1.1 FDD	-	SR.1.1 FDD	-	SR.1.1 FDD	-
	Config 2,5		SR.1.1 TDD		SR.1.1 TDD		SR.1.1 TDD	
	Config 3,6		SR2.1 TDD		SR2.1 TDD		SR2.1 TDD	
RMSI CORESET Reference Channel	Config 1,4		CR.1.1 FDD	-	CR.1.1 FDD	-	CR.1.1 FDD	
	Config 2,5		CR.1.1 TDD		CR.1.1 TDD		CR.1.1 TDD	
	Config 3,6		CR.2.1 TDD		CR.2.1 TDD		CR.2.1 TDD	
Control Channel RMC	Config 1,4		CCR.1.1 FDD	-	CCR.1.1 FDD	-	CCR.1.1 FDD	-
	Config 2,5		CCR.1.1 TDD		CCR.1.1 TDD		CCR.1.1 TDD	
	Config 3,6		CCR.2.1 TDD		CCR.2.1 TDD		CCR.2.1 TDD	
TRS configuration	Config 1,4		TRS.1.1 FDD	-	TRS.1.1 FDD	-	TRS.1.1 FDD	-
	Config 2,5		TRS.1.1 TDD		TRS.1.1 TDD		TRS.1.1 TDD	
	Config 3,6		TRS.1.2 TDD		TRS.1.2 TDD		TRS.1.2 TDD	
OCNG Patterns			OP. 1					
SS-RSSI-Measurement			Not Applicable					

Parameter			Unit	Test 1		Test 2		Test 3	
				Cell 2	Cell 3	Cell 2	Cell 3	Cell 2	Cell 3
Time offset with Cell 2		Config 2,3,5,6	μs	-	3	-	3	-	3
		Config 1,4	ms	-	3	-	3	-	3
STMC configuration		Config 2,3,5,6		SMTC.1					
		Config 1,4		SMTC.2					
SSB configuration		Config 1,2,4,5		SSB.1 FR1					
		Config 3,6		SSB.2 FR1					
PDSCH/PDCCH subcarrier spacing		Config 1,2,4,5	kHz	15 kHz					
		Config 3,6		30kHz					
EPRE ratio of PSS to SSS EPRE ratio of PBCH DMRS to SSS EPRE ratio of PBCH to PBCH DMRS EPRE ratio of PDCCH DMRS to SSS EPRE ratio of PDCCH to PDCCH DMRS EPRE ratio of PDSCH DMRS to SSS EPRE ratio of PDSCH to PDSCH EPRE ratio of OCNG DMRS to SSS(Note 1) EPRE ratio of OCNG to OCNG DMRS (Note 1)			dB	0	0	0	0	0	0
N_{oc} Note2	Config 1,2,4,5	Depending on band group	dBm/15kHz	-86.5		-101		-114+ Δ_{BG_offset}	
	Config 3,6	Depending on band group		-92.6		-		-114+ Δ_{BG_offset}	
N_{oc} Note2	Config 1,2,4,5	Depending on band group	dBm/SCS	-86.5		-101		-114+ Δ_{BG_offset}	
	Config 3,6	Depending on band group		-89.6		-		-111+ Δ_{BG_offset}	
$\hat{E}_s/I_{ot}$			dB	-1.76		-4.7		-5.46	-5.46
$\hat{E}_s/N_{oc}$			dB	3	3	-2.9	-2.9	-4	-4
SS-RSRP Note3	Config 1,2,4,5	Depending on band group	dBm/SCS	-83.5	-83.5	-103.9	-103.9	-118+Δ_{BG_offset}	-118+ Δ_{BG_offset}
	Config 3,6	Depending on band group		-86.6	-86.6	-	-	-115+ Δ_{BG_offset}	-115+ Δ_{BG_offset}
SS-RSRQ Note3			dB	-14.77	-14.77	-16.76	-16.76	-17.34	-17.34
Io Note3	Config 1,2,4,5	Depending on band group	dBm/9.36MHz	-51.57		-70		-83.50+ Δ_{BG_offset}	
	Config 3,6	Depending on band group	dBm/38.16MHz	-51.56		-		-77.40+ Δ_{BG_offset}	
Propagation condition			-	AWGN	AWGN	AWGN	AWGN	AWGN	AWGN
Antenna configuration				1x2	1x2	1x2	1x2	1x2	1x2

NOTE 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.
NOTE 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for N_{oc} to be fulfilled.
NOTE 3: SS-RSRQ, SS-RSRP, and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.
NOTE 4: SS-RSRQ, SS-RSRP minimum requirements are specified assuming independent interference and noise at each receiver antenna port.
NOTE 5: Δ_{BG_offset} is defined in clause 3A.4, Table 3A.4.1-2.
NOTE 6: Subtest 2 is not used when testing with 30kHz SSB SCS.
NOTE 7: The test configuration excludes support for band n51 and it is not required to run this test on band n51 in this release of the specification.

Table 4.7.2.1.5-2: SS-RSRQ Intra frequency absolute accuracy requirements for the reported values

	Test 1	Test 2	Test 3
	All bands	All bands	All bands
Normal Conditions			

Lowest reported value (Cell 3)	SS-RSRQ_52	SS-RSRQ_46	SS-RSRQ_44
Highest reported value (Cell 3)	SS-RSRQ_62	SS-RSRQ_60	SS-RSRQ_59
Extreme Conditions			
Lowest reported value (Cell 3)	SS-RSRQ_49	SS-RSRQ_45	SS-RSRQ_43
Highest reported value (Cell 3)	SS-RSRQ_65	SS-RSRQ_61	SS-RSRQ_60

For the test to pass, the ratio of successful reported values in each test shall be more than 90% with a confidence level of 95%.

4.7.2.2 Inter-Frequency SS-RSRQ measurement accuracy

4.7.2.2.1 EN-DC FR1-FR1 SS-RSRQ absolute measurement accuracy

4.7.2.2.1.1 Test purpose

The purpose of this test is to verify that the inter-frequency SS-RSRQ absolute measurement accuracy is within the specified limits for all bands.

4.7.2.2.1.2 Test applicability

This test applies to all types of NR UE supporting E-UTRA and EN-DC from Release 15 onwards.

4.7.2.2.1.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 4.7.2.0.2.

The normative reference for this requirement is TS 38.133 [6] clause A.4.7.2.2.1.

4.7.2.2.1.4 Test description

4.7.2.2.1.4.1 Initial conditions

This test shall be tested using any of the test configurations in Table 4.7.2.2.1.4.1-1.

Table 4.7.2.2.1.4.1-1: EN-DC FR1-FR1 SS-RSRQ measurement accuracy supported test configurations

Test Case ID	Description
4.7.2.2.1-1	LTE FDD, NR: 15 kHz SSB SCS, 10MHz bandwidth, FDD
4.7.2.2.1-2	LTE FDD, NR: 15 kHz SSB SCS, 10MHz bandwidth, TDD
4.7.2.2.1-3	LTE FDD, NR: 30 kHz SSB SCS, 40MHz bandwidth, TDD
4.7.2.2.1-4	LTE TDD, NR: 15 kHz SSB SCS, 10MHz bandwidth, FDD
4.7.2.2.1-5	LTE TDD, NR: 15 kHz SSB SCS, 10MHz bandwidth, TDD
4.7.2.2.1-6	LTE TDD, NR: 30 kHz SSB SCS, 40MHz bandwidth, TDD
NOTE: The UE is only required to be tested in one of the supported test configurations.	

Configure the test equipment and the DUT according to the parameters in Table 4.7.2.2.1.4.1-2.

Table 4.7.2.2.1.4.1-2: Initial conditions for SS-RSRQ inter frequency accuracy in FR1

Parameter	Value		Comment
Test environment	NC, TL/VL, TL/VH, TH/VL, TH/VH		As specified in TS 38.508-1 [14] clause 4.1.
Test frequencies	As specified in Annex E, Table E.2-1 and TS 38.508-1 [14] clause 4.3.1.		
Channel bandwidth	As specified by the test configuration selected from Table 4.7.2.2.1.4.1-1.		
Propagation conditions	AWGN		As specified in clause C.2.2.
Connection Diagram	TE Part 2Rx	A.3.1.8.2 with n = 2 and φ_1 = 5 Hz	As specified in TS 38.508-1 [14] Annex A.

	TE Part 4Rx	A.3.1.8.5 with n = 2 and $\varphi_{1,1}$ = 5 Hz, $\varphi_{1,2}$ = 10 Hz, $\varphi_{1,3}$ = 15 Hz	
	DUT Part 2Rx	A.3.2.3.4	
	DUT Part 4Rx	A.3.2.5.2	
Exceptions to connection diagram	N/A		

1. Message contents are defined in clause 4.7.2.2.1.4.3.
2. Cell 1 is the E-UTRA serving cell (PCell) for the EN-DC setup. The power levels and settings for Cell 1 are set according to Annex A.6. Cell 2 and Cell 3 are NR FR1 cells in two different FR1 frequencies. Cell 2 is the PSCell and Cell 3 is the target cell for SS-RSRQ measurements. The connection setup is done according to the settings in clause C.1.1.

4.7.2.2.1.4.2 Test procedure

Same as in clause 4.7.2.1.4.2 but replacing Table 4.7.2.1.5-1 and 4.7.2.1.5-2 with 4.7.2.2.1.5-1 and 4.7.2.2.1.5-2, respectively.

4.7.2.2.1.4.3 Message contents

Message contents are according to TS 38.508-1 [14] clause 7.3 with the following exceptions:

Table 4.7.2.2.1.4.3-1: Common Exception messages for EN-DC FR1-FR1 SS-RSRQ absolute measurement accuracy

Default Message Contents	
Common contents of system information blocks exceptions	
Default RRC messages and information elements contents exceptions	Table H.3.1-1 Table H.3.1-2 with condition INTER-FREQ and GAP NEEDED Table H.3.1-5 Table H.3.1-7 with condition INTER-FREQ Table H.3.4-1 Table H.3.4-1a Table H.3.4-2 Table H.3.4-4 with Condition gapUE Table H.3.4-5 with Condition Pattern#0
Specific message contents exceptions for Test Configuration 4.7.2.1.1.-1 and 4.7.2.1.1-4	Table H.3.1-3 with Conditions INTER-FREQ MO, SSB.1 FR1 Table 7.3.1-3 in TS 38.508-1 [14] with condition SMTC.2
Specific message contents exceptions for Test Configuration 4.7.2.1.1-2 and 4.7.2.1.1-5	Table H.3.1-3 with Conditions INTER-FREQ MO, SSB.1 FR1 and Synchronous cells Table 7.3.1-3 in TS 38.508-1 [14] with condition SMTC.1
Specific message contents exceptions for Test Configuration 4.7.2.1.1-3 and 4.7.2.1.1-6	Table H.3.1-3 with Conditions INTER-FREQ MO, SSB.2 FR1 and Synchronous cells Table 7.3.1-3 in TS 38.508-1 [14] with condition SMTC.1

Table 4.7.2.2.1.4.3-2: ReportConfigNR-DEFAULT(Periodical) for EN-DC FR1-FR1 SS-RSRQ Accuracy

Derivation Path: 38.508-1 [14] Table 4.6.3-142 with condition PERIODICAL			
Information Element	**Value/remark**	**Comment**	**Condition**
ReportConfigNR::= SEQUENCE {			
reportType CHOICE {			
periodical SEQUENCE {			PERIODICAL
reportQuantityCell SEQUENCE {			
rsrp	false		
sinr	false		

}			
maxReportCells	2		
}			
}			
}			

4.7.2.2.1.5 Test requirement

Table 4.7.2.2.1.5-1 defines the primary level settings including test tolerances for all tests.

Each SS-RSRP measurement report for each of the tests in Table 4.7.2.2.1.5-1 shall meet the corresponding absolute accuracy requirements in Table 4.7.2.2.1.5-2

Table 4.7.2.2.1.5-1: SS-RSRQ Inter frequency test parameters

Parameter		Unit	Test 1		Test 2		Test 3	
			Cell 2	Cell 3	Cell 2	Cell 3	Cell 2	Cell 3
SSB ARFCN			freq1	freq2	freq1	freq2	freq1	freq2
Duplex mode	Config 1,4		FDD					
	Config 2,3,5,6		TDD					
TDD configuration	Config 1,4		Not Applicable					
	Config 2,5		TDDConf.1.1					
	Config 3,6		TDDConf.2.1					
$BW_{channel}$	Config 1,4	MHz	10: $N_{RB,c}$ = 52					
	Config 2,5		10: $N_{RB,c}$ = 52					
	Config 3,6		40: $N_{RB,c}$ = 106					
Gap pattern ID	Config 1-6		0					
BWP configuration	Initial DL BWP		DLBWP.0.1					
	Dedicated DL BWP		DLBWP.1.1					
	Initial UL BWP		ULBWP.0.1					
	Dedicated UL BWP		ULBWP.1.1					
DRX Cycle		ms	Not Applicable					
PDSCH Reference measurement channel	Config 1,4		SR.1.1 FDD	-	SR.1.1 FDD	-	SR.1.1 FDD	-
	Config 2,5		SR.1.1 TDD		SR.1.1 TDD		SR.1.1 TDD	
	Config 3,6		SR2.1 TDD		SR2.1 TDD		SR2.1 TDD	
RMSI CORESET Reference Channel	Config 1,4		CR.1.1 FDD	-	R.1.1 FDD	-	CR.1.1 FDD	
	Config 2,5		CR.1.1 TDD		CR.1.1 TDD		CR.1.1 TDD	
	Config 3,6		CR2.1 TDD		CR2.1 TDD		CR2.1 TDD	
Dedicated CORESET Reference Channel	Config 1,4		CCR.1.1 FDD	-	CCR.1.1 FDD	-	CCR.1.1 FDD	-
	Config 2,5		CCR.1.1 TDD		CCR.1.1 TDD		CCR.1.1 TDD	
	Config 3,6		CCR2.1 TDD		CCR2.1 TDD		CCR2.1 TDD	
TRS configuration	Config 1,4		TRS.1.1 FDD	-	TRS.1.1 FDD	-	TRS.1.1 FDD	-
	Config 2,5		TRS.1.1 TDD		TRS.1.1 TDD		TRS.1.1 TDD	
	Config 3,6		TRS.1.2 TDD		TRS.1.2 TDD		TRS.1.2 TDD	
OCNG Patterns			OP.1					
SMTC configuration	Config 2,3,5,6		SMTC.1					
	Config 1,4		SMTC.2					
Time offset between Cell 2 and Cell 3	Config 2,3,5,6	µs	3					
	Config 1,4	ms	3					
SSB configuration	Config 1,2,4,5		SSB.1 in FR1					

Parameter			Unit	Test 1		Test 2		Test 3	
				Cell 2	Cell 3	Cell 2	Cell 3	Cell 2	Cell 3
		Config 3,6		SSB.2 in FR1					
PDSCH/PDCCH subcarrier spacing		Config 1,2,4,5	kHz	15 kHz					
		Config 3,6		30 kHz					
EPRE ratio of PSS to SSS EPRE ratio of PBCH DMRS to SSS EPRE ratio of PBCH to PBCH DMRS EPRE ratio of PDCCH DMRS to SSS EPRE ratio of PDCCH to PDCCH DMRS EPRE ratio of PDSCH DMRS to SSS EPRE ratio of PDSCH to PDSCH EPRE ratio of OCNG DMRS to SSS(Note 1) EPRE ratio of OCNG to OCNG DMRS (Note 1)			dB	0	0	0	0	0	0
N_{oc} Note2	Config 1,2,4,5	Depending on band group	dBm/15kHz	-81.68	-81.68	-106	-106	-116 + Δ_{BG_offset}	-116 + Δ_{BG_offset}
N_{oc} Note2	Config 3,6	Depending on band group	dBm/15kHz	-87.80	-87.80	-113	-113	-116+ Δ_{BG_offset}	-116+ Δ_{BG_offset}
N_{oc} Note2	Config 1,2,4,5	Depending on band group	dBm/SCS	-81.68	-81.68	-106	-106	-116 + Δ_{BG_offset}	-116 + Δ_{BG_offset}
	Config 3,6	Depending on band group		-84.8	-84.8	-110	-110	-113+ Δ_{BG_offset}	-113+ Δ_{BG_offset}
$\hat{E}_s / I_{ot}$			dB	-1.75	-1.75	-1.75	-1.75	3	-1.75
$\hat{E}_s / N_{oc}$			dB	-1.75	-1.75	-1.75	-1.75	3	-1.75
SS-RSRP Note 3	Config 1,2,4,5	Depending on band group	dBm/SCS	-83.43	-83.43	-107.75	-107.75	-113+ Δ_{BG_offset}	-117.75 + Δ_{BG_offset}
	Config 3,6	Depending on band group		-86.54	-86.54	-111.75	-111.75	-110+ Δ_{BG_offset}	-114.75 + Δ_{BG_offset}
SS-RSRQ Note3			dB	-14.76	-14.76	-14.76	-14.76	-12.56	-14.76
Io Note3	Config 1,2,4,5	Depending on band group	dBm/Ch BW	-51.51	-51.51	-75.83	-75.83	-83.28+ Δ_{BG_offset}	-85.83+ Δ_{BG_offset}
	Config 3,6	Depending on band group		-51.52	-51.52	-76.73	-76.73	-77.19+ Δ_{BG_offset}	-79.73+ Δ_{BG_offset}
Propagation condition			-	AWGN	AWGN	AWGN	AWGN	AWGN	AWGN
Antenna configuration				1x2	1x2	1x2	1x2	1x2	1x2

NOTE 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.

NOTE 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for N_{oc} to be fulfilled.

NOTE 3: SS-RSRQ, SS-RSRP, and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.

NOTE 4: SS-RSRQ, SS-RSRP minimum requirements are specified assuming independent interference and noise at each receiver antenna port.

NOTE 5: Δ_{BG_offset} is defined in clause 3A.4, Table 3A.4.1-2.

NOTE 6: The test configuration excludes support for band n51 and it is not required to run this test on band n51 in this release of the specification.

Table 4.7.2.2.1.5-2: SS-RSRQ Intra frequency absolute accuracy requirements for the reported values

	Test 1	Test 2	Test 3
	All bands	All bands	All bands
Normal Conditions			
Lowest reported value (Cell 3)	SS-RSRQ_52	SS-RSRQ_52	SS-RSRQ_52
Highest reported value (Cell 3)	SS-RSRQ_62	SS-RSRQ_62	SS-RSRQ_62
Extreme Conditions			
Lowest reported value (Cell 3)	SS-RSRQ_49	SS-RSRQ_49	SS-RSRQ_49
Highest reported value (Cell 3)	SS-RSRQ_65	SS-RSRQ_65	SS-RSRQ_65

For the test to pass, the ratio of successful reported values in each test shall be more than 90% with a confidence level of 95%.

4.7.2.2.2 EN-DC FR1-FR1 SS-RSRQ relative measurement accuracy

4.7.2.2.2.1 Test purpose

The purpose of this test is to verify that the inter-frequency SS-RSRQ relative measurement accuracy is within the specified limits for all bands.

4.7.2.2.2.2 Test applicability

This test applies to all types of NR UE supporting E-UTRA and EN-DC from Release 15 onwards.

4.7.2.2.2.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 4.7.2.0.2.

The normative reference for this requirement is TS 38.133 [6] clause A.4.7.2.2.2.

4.7.2.2.2.4 Test description

4.7.2.2.2.4.1 Initial conditions

This test shall be tested using any of the test configurations in Table 4.7.2.2.2.4.1-1.

Table 4.7.2.2.2.4.1-1: EN-DC FR1-FR1 SS-RSRQ measurement accuracy supported test configurations

Test Case ID	Description
4.7.2.2.2-1	LTE FDD, NR: 15 kHz SSB SCS, 10MHz bandwidth, FDD
4.7.2.2.2-2	LTE FDD, NR: 15 kHz SSB SCS, 10MHz bandwidth, TDD
4.7.2.2.2-3	LTE FDD, NR: 30 kHz SSB SCS, 40MHz bandwidth, TDD
4.7.2.2.2-4	LTE TDD, NR: 15 kHz SSB SCS, 10MHz bandwidth, FDD
4.7.2.2.2-5	LTE TDD, NR: 15 kHz SSB SCS, 10MHz bandwidth, TDD
4.7.2.2.2-6	LTE TDD, NR: 30 kHz SSB SCS, 40MHz bandwidth, TDD
NOTE: The UE is only required to be tested in one of the supported test configurations.	

Configure the test equipment and the DUT according to the parameters in Table 4.7.2.2.2.4.1-2.

Table 4.7.2.2.2.4.1-2: Initial conditions for SS-RSRQ inter frequency accuracy in FR1

Parameter	Value	Comment
Test environment	NC, TL/VL, TL/VH, TH/VL, TH/VH	As specified in TS 38.508-1 [14] clause 4.1.
Test frequencies	As specified in Annex E, Table E.2-1 and TS 38.508-1 [14] clause 4.3.1.	
Channel bandwidth	As specified by the test configuration selected from Table 4.7.2.2.2.4.1-1.	
Propagation conditions	AWGN	As specified in clause C.2.2.

Connection Diagram	TE Part 2Rx	A.3.1.8.2 with n = 2 and φ_1 = 5 Hz	As specified in TS 38.508-1 [14] Annex A.
	TE Part 4Rx	A.3.1.8.5 with n = 2 and $\varphi_{1,1}$ = 5 Hz, $\varphi_{1,2}$ = 10 Hz, $\varphi_{1,3}$ = 15 Hz	
	DUT Part 2Rx	A.3.2.3.4	
	DUT Part 4Rx	A.3.2.5.2	
Exceptions to connection diagram	N/A		

1. Message contents are defined in clause 4.7.2.2.2.4.3.
2. Cell 1 is the E-UTRA serving cell (PCell) for the EN-DC setup. The power levels and settings for Cell 1 are set according to Annex A.6. Cell 2 and Cell 3 are NR FR1 cells in two different FR1 frequencies. Cell 2 is the PSCell and Cell 3 is the target cell for SS-RSRQ measurements. The connection setup is done according to the settings in clause C.1.1.

4.7.2.2.2.4.2 Test procedure

1. Ensure the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity EN-DC, DC bearer MCG and SCG, Connected without release *On* and Test Mode *On*, according to TS 38.508-1 [14] clause 4.5.
2. Set the parameters according to Table 4.7.2.2.2.5-1 as appropriate.
3. The SS shall transmit an RRCConnectionReconfiguration message on Cell 1.
4. The UE shall transmit an RRCConnectionReconfigurationComplete message.
5. The UE shall transmit periodically MeasurementReport messages.
6. After 10s wait from Step 3, the SS shall check the SS-RSRQ reported values in the periodic MeasurementReport. The SS-RSRQ value of Cell 3 reported by the UE is compared to the SS-RSRQ value of Cell 2 reported by the UE. If the difference between both values is outside the limits in Table 4.7.2.2.2.5-2 or the UE fails to report the measurement value for Cell 3 or Cell 2, the number of failed iterations is increased by one. Otherwise, the number of passed iterations is increased by one.
7. The SS shall continue checking the MeasurementReport messages transmitted by the UE until the confidence level according to Table G.2.3-1 in Annex G is achieved.
8. Set the parameters according to each sub-test in Table 4.7.2.2.2.5-1 as appropriate and repeat steps 5-7.

4.7.2.2.2.4.3 Message contents

Message contents are same as in clause 4.7.2.2.1.4.3.

4.7.2.2.2.5 Test requirement

Table 4.7.2.2.2.5-1 defines the primary level settings including test tolerances for all tests.

Each SS-RSRQ measurement report for each of the tests in Table 4.7.2.2.2.5-1 shall meet the corresponding absolute accuracy requirements in Table 4.7.2.2.2.5-2.

Table 4.7.2.2.2.5-1: same as Table 4.7.2.2.2.1.5-1

Table 4.7.2.2.2.5-2: SS-RSRQ Inter frequency relative accuracy requirements for the reported values

	Test 1	Test 2	Test 3
	All bands	All bands	All bands
Normal Conditions			
Lowest reported value (Cell 3)	SS-RSRQ_x - 7	SS-RSRQ_x - 7	SS-RSRQ_x - 11

Highest reported value (Cell 3)	SS-RSRQ_x + 7	SS-RSRQ_x + 7	SS-RSRQ_x + 2
Extreme Conditions			
Lowest reported value (Cell 3)	SS-RSRQ_x - 9	SS-RSRQ_x - 9	SS-RSRQ_x - 13
Highest reported value (Cell 3)	SS-RSRQ_x + 9	SS-RSRQ_x + 9	SS-RSRQ_x + 4
RSRQ_x is the reported value of Cell 2			

For the test to pass, the ratio of successful reported values in each test shall be more than 90% with a confidence level of 95%.

4.7.3 SS-SINR

4.7.3.0 Minimum conformance requirements

4.7.3.0.1 Intra-frequency SS-SINR measurement accuracy requirements

The intra-frequency SS-SINR accuracy requirements are defined for the SS-SINR measured from a cell on the same frequency as that of the PCell or PSCell in FR1.

The accuracy requirements in Table 4.7.3.0.1-1 are valid under the following conditions:

- Conditions defined in clause 7.3 of TS 38.101-1 [2] for reference sensitivity are fulfilled.
- Conditions for intra-frequency measurements are fulfilled according to clause B.2.2 for a corresponding Band.

Table 4.7.3.0.1-1: SS-SINR Intra frequency absolute accuracy in FR1

Accuracy		**Conditions**					
Normal condition	**Extreme condition**	**SSB Ês/Iot** Note 3	**Io** Note 1 **range**				
			NR operating band groups Note 4	**Minimum Io**			**Maximum Io**
dB	**dB**	**dB**		**dBm / SCS_{SSB}**		**dBm/$BW_{Channel}$**	**dBm/$BW_{Channel}$**
				SCS_{SSB} = 15 kHz	**SCS_{SSB} = 30 kHz**		
±3.0	±4	≥-3 dB	NR_FDD_FR1_A, NR_TDD_FR1_A, NR_SDL_FR1_A	-121	-118	N/A	-50
			NR_FDD_FR1_B	-120.5	-117.5	N/A	-50
			NR_TDD_FR1_C	-120	-117	N/A	-50
			NR_FDD_FR1_D, NR_TDD_FR1_D	-119.5	-116.5	N/A	-50
			NR_FDD_FR1_E, NR_TDD_FR1_E	-119	-116	N/A	-50
			NR_FDD_FR1_G	-118	-115	N/A	-50
			NR_FDD_FR1_H	-117.5	-114.5	N/A	-50
±3.5	±4	≥-6 dB	Note 2	Note 2	Note 2	Note 2	Note 2

NOTE 1: Io is assumed to have constant EPRE across the bandwidth.
NOTE 2: The same bands and the same Io conditions for each band apply for this requirement as for the corresponding highest accuracy requirement.
NOTE 3: The requirements apply for SSB Ês/Iot ≤ 25 dB.
NOTE 4: NR operating band groups in FR1 are as defined in Section 3A.4.1.

The reporting range of SS-SINR and CSI-SINR is defined from -23 dB to 40 dB with 0.5 dB resolution. The mapping of measured quantity is defined in Table 4.7.3.0.1-2. The range in the signalling may be larger than the guaranteed accuracy range.

Table 4.7.3.0.1-2: SS-SINR and CSI-RSRP measurement report mapping

Reported value	Measured quantity value (L3 SS-SINR)	Measured quantity value (L1 SS-SINR and L1 CSI-SINR)	Unit
SINR_0	SS-SINR<-23	SINR<-23	dB
SINR_1	-23≤ SS-SINR<-22.5	-23≤SINR<-22.5	dB
SINR_2	-22.5≤ SS-SINR<-22	-22.5≤SINR<-22	dB
SINR_3	-22≤ SS-SINR<-21.5	-22≤SINR<-21.5	dB
SINR_4	-21.5≤ SS-SINR<-21	-21.5≤SINR<-21	dB
..	..	..	…
SINR_123	38≤ SS-SINR<38.5	38≤SINR<38.5	dB
SINR_124	38.5≤ SS-SINR<39	38.5≤SINR<39	dB
SINR_125	39≤ SS-SINR<39.5	39≤SINR<39.5	dB
SINR_126	39.5≤ SS-SINR<40	39.5≤SINR<40	dB
SINR_127	40≤ SS-SINR	40≤SINR	dB

The normative reference for this requirement is TS 38.133 [6] clauses 10.1.12.1.1 and 10.1.16.

4.7.3.0.2 Inter-frequency absolute SS-SINR measurement accuracy requirements

The intra-frequency SS-SINR accuracy requirements are defined for the SS-SINR measured from a cell on a different carrier frequency than that of the PCell or PSCell in FR1.

The accuracy requirements in Table 4.7.3.0.2-1 are valid under the following conditions:

- Conditions defined in clause 7.3 of TS 38.101-1 [2] for reference sensitivity are fulfilled.
- Conditions for inter-frequency measurements are fulfilled according to Annex B.2.3 for a corresponding Band.

Table 4.7.3.0.2-1: SS-SINR Inter frequency absolute accuracy in FR1

Accuracy		Conditions					
			Io [Note 1] range				
Normal condition	Extreme condition	SSB Ês/Iot [Note 3]	NR operating band groups [Note 4]	Minimum Io			Maximum Io
				dBm / SCS_{SSB}			
dB	dB	dB		SCS_{SSB} = 15 kHz	SCS_{SSB} = 30 kHz	$dBm/BW_{Channel}$	$dBm/BW_{Channel}$
±3.0	±4	≥-3 dB	NR_FDD_FR1_A, NR_TDD_FR1_A, NR_SDL_FR1_A	-121	-118	N/A	-50
			NR_FDD_FR1_B	-120.5	-117.5	N/A	-50
			NR_TDD_FR1_C	-120	-117	N/A	-50
			NR_FDD_FR1_D, NR_TDD_FR1_D	-119.5	-116.5	N/A	-50
			NR_FDD_FR1_E, NR_TDD_FR1_E	-119	-116	N/A	-50
			NR_FDD_FR1_G	-118	-115	N/A	-50
			NR_FDD_FR1_H	-117.5	-114.5	N/A	-50
±3.5	±4	≥-6 dB	Note 2	Note 2	Note 2	Note 2	Note 2

NOTE 1: Io is assumed to have constant EPRE across the bandwidth.
NOTE 2: The same bands and the same Io conditions for each band apply for this requirement as for the corresponding highest accuracy requirement.
NOTE 3: The requirements apply for SSB Ês/Iot ≤ 25 dB.
NOTE 4: NR operating band groups in FR1 are as defined in clause 3A.4.1.

The normative reference for this requirement is TS 38.133 [6] clauses 10.1.13.1.1 and 10.1.16.

4.7.3.0.3 Inter-frequency relative SS-SINR measurement accuracy requirements

The inter-frequency SS-SINR relative accuracy requirements in this clause are defined for the SS-SINR measured from one cell on a frequency in FR1compared to the SS-SINR measured from another cell on a different frequency in FR1.

The accuracy requirements in Table 4.7.3.0.3-1 are valid under the following conditions:

- Conditions defined in clause 7.3 of TS 38.101-1 [2] for reference sensitivity are fulfilled.
- Conditions for inter-frequency measurements are fulfilled according to Annex B.2.3 for a corresponding Band.
- $|SSB_RP1_{dBm} - SSB_RP2_{dBm}| \leq 27$ dB
- $|$ Channel 1_Io -Channel 2_Io $| \leq 20$ dB

Table 4.7.3.0.3-1: SS-SINR Inter frequency relative accuracy in FR1

Accuracy		Conditions					
Normal condition	Extreme condition	SSB Ês/Iot Note 2,4	Io Note 1 range				
			NR operating band groups Note 5	Minimum Io			Maximum Io
dB	dB	dB		dBm / SCS_{SSB}		dBm/$BW_{Channel}$	dBm/$BW_{Channel}$
				SCS_{SSB} = 120 kHz	SCS_{SSB} = 240 kHz		
±3.5	±4	≥-3 dB	NR_FDD_FR1_A, NR_TDD_FR1_A, NR_SDL_FR1_A	-121	-118	N/A	-50
			NR_FDD_FR1_B	-120.5	-117.5	N/A	-50
			NR_TDD_FR1_C	-120	-117	N/A	-50
			NR_FDD_FR1_D, NR_TDD_FR1_D	-119.5	-116.5	N/A	-50
			NR_FDD_FR1_E, NR_TDD_FR1_E	-119	-116	N/A	-50
			NR_FDD_FR1_G	-118	-115	N/A	-50
			NR_FDD_FR1_H	-117.5	-114.5	N/A	-50
±4	±4	≥-6 dB	Note 3	Note 3	Note 3	Note 3	Note 3

NOTE 1: Io is assumed to have constant EPRE across the bandwidth.
NOTE 2: The parameter SSB Ês/Iot is the minimum SSB Ês/Iot of the pair of cells to which the requirement applies.
NOTE 3: The same bands and the same Io conditions for each band apply for this requirement as for the corresponding highest accuracy requirement.
NOTE 4: The requirements apply for SSB Ês/Iot ≤ [25] dB.
NOTE 5: NR operating band groups in FR1 are as defined in clause 3.5.2.

The normative reference for this requirement is TS 38.133 [6] clauses 10.1.13.1.2 and 10.1.16.

4.7.3.1 EN-DC FR1 SS-SINR measurement accuracy

4.7.3.1.1 Test purpose

The purpose of this test is to verify that the intra-frequency SS-SINR measurement accuracy is within the specified limits for all bands.

4.7.3.1.2 Test applicability

This test applies to all types of NR UE supporting E-UTRA and EN-DC from Release 15 onwards, which support ss-SINR-Meas.

4.7.3.1.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 4.7.3.0.1.

The normative reference for this requirement is TS 38.133 [6] clause A.4.7.3.1.

4.7.3.1.4 Test description

4.7.3.1.4.1 Initial conditions

This test shall be tested using any of the test configurations in Table 4.7.3.1.4.1-1.

Table 4.7.3.1.4.1-1: EN-DC FR1 SS-SINR measurement accuracy supported test configurations

Test Case ID	Description
4.7.3.1-1	LTE FDD, NR: 15 kHz SSB SCS, 10MHz bandwidth, FDD
4.7.3.1-2	LTE FDD, NR: 15 kHz SSB SCS, 10MHz bandwidth, TDD
4.7.3.1-3	LTE FDD, NR: 30 kHz SSB SCS, 40MHz bandwidth, TDD
4.7.3.1-4	LTE TDD, NR: 15 kHz SSB SCS, 10MHz bandwidth, FDD
4.7.3.1-5	LTE TDD, NR: 15 kHz SSB SCS, 10MHz bandwidth, TDD
4.7.3.1-6	LTE TDD, NR: 30 kHz SSB SCS, 40MHz bandwidth, TDD
NOTE: The UE is only required to be tested in one of the supported test configurations.	

Configure the test equipment and the DUT according to the parameters in Table 4.7.3.1.4.1-2.

Table 4.7.3.1.4.1-2: Initial conditions for SS-SINR intra frequency accuracy in FR1

Parameter	Value		Comment
Test environment	NC, TL/VL, TL/VH, TH/VL, TH/VH		As specified in TS 38.508-1 [14] clause 4.1.
Test frequencies	As specified in Annex E, Table E.2-1 and TS 38.508-1 [14] clause 4.3.1.		
Channel bandwidth	As specified by the test configuration selected from Table 4.7.3.1.4.1-1.		
Propagation conditions	AWGN		As specified in clause C.2.2.
Connection Diagram	TE Part 2Rx	A.3.1.8.2 with n = 2 and φ_1 = 5 Hz	As specified in TS 38.508-1 [14] Annex A.
	TE Part 4Rx	A.3.1.8.5 with n = 2 and $\varphi_{1,1}$ = 5 Hz, $\varphi_{1,2}$ = 10 Hz, $\varphi_{1,3}$ = 15 Hz	
	DUT Part 2Rx	A.3.2.3.4	
	DUT Part 4Rx	A.3.2.5.2	
Exceptions to connection diagram	N/A		

1. Message contents are defined in clause 4.7.3.1.4.3.
2. Cell 1 is the E-UTRA serving cell (PCell) for the EN-DC setup. The power levels and settings for Cell 1 are set according to Annex A.6. Cell 2 and Cell 3 are NR FR1 cells in the same frequency. Cell 2 is the PSCell and Cell 3 is the target cell for SS-SINR measurements. The connection setup is done according to the settings in clause C.1.1.

4.7.3.1.4.2 Test procedure

1. Ensure the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity EN-DC, DC bearer MCG and SCG, Connected without release *On* and Test Mode *On*, according to TS 38.508-1 [14] clause 4.5.
2. Set the parameters according to Table 4.7.3.1.5-1 as appropriate.
3. The SS shall transmit an RRCConnectionReconfiguration message on Cell 1.
4. The UE shall transmit an RRCConnectionReconfigurationComplete message.
5. The UE shall transmit periodically MeasurementReport messages.
6. After 10s wait from Step 3, the SS shall check the SS-SINR reported values in the periodic MeasurementReport. The SS-SINR value of Cell 3 reported by the UE is compared to the expected SS-SINR. If the value is outside

the limits in Table 4.7.3.1.5-2 or the UE fails to report the measurement value for Cell 3, the number of failed iterations is increased by one. Otherwise, the number of passed iterations is increased by one.

7. The SS shall continue checking the MeasurementReport messages transmitted by the UE until the confidence level according to Table G.2.3-1 in Annex G is achieved.

8. Set the parameters according to each sub-test in Table 4.7.3.1.5-1 as appropriate and repeat steps 5-7.

4.7.3.1.4.3 Message contents

Message contents are according to TS 38.508-1 [14] clause 7.3 with the following exceptions:

Table 4.7.3.1.4.3-1: Common Exception messages for EN-DC FR1 SS-SINR measurement accuracy

Default Message Contents	
Common contents of system information blocks exceptions	
Default RRC messages and information elements contents exceptions	Table H.3.1-1 Table H.3.1-2 Table H.3.1-5 Table H.3.1-7 Table H.3.4-1 Table H.3.4-1a Table H.3.4-2
Specific message contents exceptions for Test Configuration 4.7.3.1-1 and 4.7.3.1-4	Table H.3.1-3 with Condition and SS-SINR Table 7.3.1-3 in TS 38.508-1 [14] with condition SMTC.2
Specific message contents exceptions for Test Configuration 4.7.3.1-2 and 4.7.3.1-5	Table H.3.1-3 with Condition Synchronous cells and SS-SINR Table 7.3.1-3 in TS 38.508-1 [14] with condition SMTC.1
Specific message contents exceptions for Test Configuration 4.7.3.1-3 and 4.7.3.1-6	Table H.3.1-3 with Condition Synchronous cells and SS-SINR Table 7.3.1-3 in TS 38.508-1 [14] with condition SMTC.1

Table 4.7.3.1.4.3-2: ReportConfigNR-DEFAULT(Periodical) for EN-DC FR1 SS-SINR Accuracy

Derivation Path: 38.508-1 [14] Table 4.6.3-142 with condition PERIODICAL			
Information Element	**Value/remark**	**Comment**	**Condition**
ReportConfigNR::= SEQUENCE {			
reportType CHOICE {			
periodical SEQUENCE {			PERIODICAL
reportQuantityCell SEQUENCE {			
rsrp	false		
rsrq	false		
sinr	true		
}			
maxReportCells	2		
}			
}			
}			

4.7.3.1.5 Test requirements

Table 4.7.3.1.5-1 defines the primary level settings including test tolerances for all tests.

Each SS-SINR measurement report for each of the tests in Table 4.7.3.1.5-1 shall meet the corresponding absolute accuracy requirements in Table 4.7.3.1.5-2

Table 4.7.3.1.5-1: SS-SINR Intra frequency test parameters

Parameter		Unit	Test 1		Test 2	
			Cell 2	Cell 3	Cell 2	Cell 3
SSB ARFCN			freq1		freq1	
Duplex mode	Config 1,4		FDD			

Parameter			Unit	Test 1		Test 2	
				Cell 2	Cell 3	Cell 2	Cell 3
		Config 2,3,5,6		TDD			
TDD configuration		Config 1,4		Not Applicable			
		Config 2,5		TDDConf.1.1			
		Config 3,6		TDDConf.2.1			
Downlink initial BWP configuration				DLBWP.0.1			
Downlink dedicated BWP configuration				DLBWP.1.1			
Uplink initial BWP configuration				ULBWP.0.1			
Uplink dedicated BWP configuration				ULBWP.1.1			
DRX Cycle configuration			ms	Not Applicable			
TRS configuration		Config 1,4		TRS.1.1 FDD		TRS.1.1 FDD	
		Config 2,5		TRS.1.1 TDD	-	TRS.1.1 TDD	-
		Config 3,6		TRS.1.2 TDD		TRS.1.2 TDD	
PDSCH Reference measurement channel		Config 1,4		SR.1.1 FDD	-	SR.1.1 FDD	-
		Config 2,5		SR.1.1 TDD		SR.1.1 TDD	
		Config 3,6		SR.2.1 TDD		SR2.1 TDD	
RMSI CORESET Reference Channel		Config 1,4		CR.1.1 FDD	-	CR.1.1 FDD	
		Config 2,5		CR.1.1 TDD		CR.1.1 TDD	
		Config 3,6		CR.2.1 TDD		CR.2.1 TDD	
Dedicated CORESET Reference Channel		Config 1,4		CCR.1.1 FDD	-	CCR.1.1 FDD	-
		Config 2,5		CCR.1.1 TDD		CCR.1.1 TDD	
		Config 3,6		CCR.2.1 TDD		CCR.2.1 TDD	
OCNG Patterns				OP.1			
SS-RSSI-Measurement				Not Applicable			
Time offset with Cell 2		Config 2,3,5,6	µs	-	3	-	3
		Config 1,4	ms	-	3	-	3
SMTC configuration		Config 1,4		SMTC.2			
		Config 2,3,5,6		SMTC.1			
SSB configuration		Config 1,2,4,5		SSB.1 FR1			
		Config 3,6		SSB.2 FR1			
PDSCH/PDCCH subcarrier spacing		Config 1,2,4,5	kHz	15			
		Config 3,6		30			
EPRE ratio of PSS to SSS			dB	0	0	0	0
EPRE ratio of PBCH DMRS to SSS							
EPRE ratio of PBCH to PBCH DMRS							
EPRE ratio of PDCCH DMRS to SSS							
EPRE ratio of PDCCH to PDCCH DMRS							
EPRE ratio of PDSCH DMRS to SSS							
EPRE ratio of PDSCH to PDSCH							
EPRE ratio of OCNG DMRS to SSS(Note 1)							
EPRE ratio of OCNG to OCNG DMRS (Note 1)							
N_{oc} Note2		Depending on band group	dBm/15kHz	-93		-116+ Δ_{BG_offset}	
N_{oc} Note2	Config 1,2,4,5		dBm/SCS	-93.2		Same as Noc for 15kHz	
	Config 3,6	Depending on band group		-90.2		-113+ Δ_{BG_offset}	
$\hat{E}_s / I_{ot}$			dB	0	-3.19	-5.46	-5.46
$\hat{E}_s / N_{oc}$			dB	4.54	2.66	-3.5	-3.5
SS-RSRP Note3	Config 1,2,4,5	Depending on band group	dBm/SCS	-88.46	-90.34	-119.5+ Δ_{BG_offset}	-119.5+ Δ_{BG_offset}

Parameter			Unit	Test 1		Test 2	
				Cell 2	Cell 3	Cell 2	Cell 3
	Config 3,6	Depending on band group		-85.65	-87.53	-116.5+ Δ_{BG_offset}	-116.5+ Δ_{BG_offset}
SS-SINR Note3			dB	0	-3.19	-5.1	-5.1
Io Note3	Config 1,2,4,5	Depending on band group	dBm/ 9.36MHz	-57.5		-85.28+ Δ_{BG_offset}	
	Config 3,6	Depending on band group	dBm/ 38.16MHz	-51.59		-79.17+ Δ_{BG_offset}	
Propagation condition			-	AWGN			
Antenna configuration			-	1x2			
NOTE 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.							
NOTE 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for N_{oc} to be fulfilled.							
NOTE 3: SS-SINR, SS-RSRP, and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.							
NOTE 4: SS-SINR, SS-RSRP minimum requirements are specified assuming independent interference and noise at each receiver antenna port.							
NOTE 5: Δ_{BG_offset} is defined in clause 3A.4, Table 3A.4.1-2							
NOTE 6: The test configuration excludes support for band n51 and it is not required to run this test on band n51 in this release of the specification							

Table 4.7.3.1.5-2: SS-SINR Intra frequency absolute accuracy requirements for the reported values

	Test 1	Test 2
	All bands	All bands
Normal Conditions		
Lowest reported value (Cell 3)	SS-SINR_31	SS-SINR_28
Highest reported value (Cell 3)	SS-SINR_49	SS-SINR_45
Extreme Conditions		
Lowest reported value (Cell 3)	SS-SINR_30	SS-SINR_27
Highest reported value (Cell 3)	SS-SINR_50	SS-SINR_46

For the test to pass, the ratio of successful reported values in each test shall be more than 90% with a confidence level of 95%.

4.7.3.2 Inter-Frequency SS-SINR measurement accuracy

4.7.3.2.1 EN-DC FR1-FR1 SS-SINR absolute measurement accuracy

4.7.3.2.1.1 Test purpose

The purpose of this test is to verify that the inter-frequency SS-SINR absolute measurement accuracy is within the specified limits for all bands.

4.7.3.2.1.2 Test applicability

This test applies to all types of NR UE supporting E-UTRA and EN-DC from Release 15 onwards, which support ss-SINR-Meas.

4.7.3.2.1.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 4.7.3.0.2.

The normative reference for this requirement is TS 38.133 [6] clause A.4.7.3.2.1.

4.7.3.2.1.4 Test description

4.7.3.2.1.4.1 Initial conditions

This test shall be tested using any of the test configurations in Table 4.7.3.2.1.4.1-1.

Table 4.7.3.2.1.4.1-1: EN-DC FR1-FR1 SS-SINR measurement accuracy supported test configurations

Test Case ID	Description
4.7.3.2.1-1	LTE FDD, NR: 15 kHz SSB SCS, 10MHz bandwidth, FDD
4.7.3.2.1-2	LTE FDD, NR: 15 kHz SSB SCS, 10MHz bandwidth, TDD
4.7.3.2.1-3	LTE FDD, NR: 30 kHz SSB SCS, 40MHz bandwidth, TDD
4.7.3.2.1-4	LTE TDD, NR: 15 kHz SSB SCS, 10MHz bandwidth, FDD
4.7.3.2.1-5	LTE TDD, NR: 15 kHz SSB SCS, 10MHz bandwidth, TDD
4.7.3.2.1-6	LTE TDD, NR: 30 kHz SSB SCS, 40MHz bandwidth, TDD
NOTE: The UE is only required to be tested in one of the supported test configurations.	

Configure the test equipment and the DUT according to the parameters in Table 4.7.3.2.1.4.1-2.

Table 4.7.3.2.1.4.1-2: Initial conditions for SS-SINR inter frequency accuracy in FR1

Parameter	Value		Comment
Test environment	NC, TL/VL, TL/VH, TH/VL, TH/VH		As specified in TS 38.508-1 [14] clause 4.1.
Test frequencies	As specified in Annex E, Table E.2-1 and TS 38.508-1 [14] clause 4.3.1.		
Channel bandwidth	As specified by the test configuration selected from Table 4.7.3.2.1.4.1-1.		
Propagation conditions	AWGN		As specified in clause C.2.2.
Connection Diagram	TE Part 2Rx	A.3.1.8.2 with n = 2 and φ_1 = 5 Hz	As specified in TS 38.508-1 [14] Annex A.
	TE Part 4Rx	A.3.1.8.5 with n = 2 and $\varphi_{1,1}$ = 5 Hz, $\varphi_{1,2}$ = 10 Hz, $\varphi_{1,3}$ = 15 Hz	
	DUT Part 2Rx	A.3.2.3.4	
	DUT Part 4Rx	A.3.2.5.2	
Exceptions to connection diagram	N/A		

1. Message contents are defined in clause 4.7.3.2.1.4.3.
2. Cell 1 is the E-UTRA serving cell (PCell) for the EN-DC setup. The power levels and settings for Cell 1 are set according to Annex A.6. Cell 2 and Cell 3 are NR FR1 cells in two different FR1 frequencies. Cell 2 is the PSCell and Cell 3 is the target cell for SS-SINR measurements. The connection setup is done according to the settings in clause C.1.1.

4.7.3.2.1.4.2 Test procedure

Same as in clause 4.7.3.1.4.2 but replacing Table 4.7.3.1.5-1 and 4.7.3.1.5-2 with 4.7.3.2.1.5-1 and 4.7.3.2.1.5-2, respectively.

4.7.3.2.1.4.3 Message contents

Message contents are according to TS 38.508-1 [14] clause 7.3 with the following exceptions:

Table 4.7.3.2.1.4.3-1: Common Exception messages for EN-DC FR1-FR1 SS-SINR absolute measurement accuracy

Default Message Contents	
Common contents of system information blocks exceptions	

Default RRC messages and information elements contents exceptions	Table H.3.1-1 Table H.3.1-2 with condition INTER-FREQ Table H.3.1-5 Table H.3.1-7 with condition INTER-FREQ Table H.3.4-1 Table H.3.4-1a Table H.3.4-2 Table H.3.4-4 with Condition gapUE Table H.3.4-5 with Condition Pattern#0
Specific message contents exceptions for Test Configuration 4.7.3.1.1.-1 and 4.7.3.1.1-4	Table H.3.1-3 with Conditions INTER-FREQ MO and SS-SINR Table 7.3.1-3 in TS 38.508-1 [14] with condition SMTC.2
Specific message contents exceptions for Test Configuration 4.7.3.1.1-2 and 4.7.3.1.1-5	Table H.3.1-3 with Conditions INTER-FREQ MO and Synchronous cells and SS-SINR Table 7.3.1-3 in TS 38.508-1 [14] with condition SMTC.1
Specific message contents exceptions for Test Configuration 4.7.3.1.1-3 and 4.7.3.1.1-6	Table H.3.1-3 with Conditions INTER-FREQ MO and Synchronous cells and SS-SINR Table 7.3.1-3 in TS 38.508-1 [14] with condition SMTC.1

Table 4.7.3.2.1.4.3-2: ReportConfigNR-DEFAULT(Periodical) for EN-DC FR1-FR1 SS-SINR Accuracy

Derivation Path: 38.508-1 [14] Table 4.6.3-142 with condition PERIODICAL			
Information Element	**Value/remark**	**Comment**	**Condition**
ReportConfigNR::= SEQUENCE {			
reportType CHOICE {			
periodical SEQUENCE {			PERIODICAL
reportQuantityCell SEQUENCE {			
rsrp	false		
rsrq	false		
sinr	true		
}			
maxReportCells	2		
}			
}			
}			

4.7.3.2.1.5 Test requirements

Table 4.7.3.2.1.5-1 defines the primary level settings including test tolerances for all tests.

Each SS-SINR measurement report for each of the tests in Table 4.7.3.2.1.5-1 shall meet the corresponding absolute accuracy requirements in Table 4.7.3.2.1.5-2.

Table 4.7.3.2.1.5-1: SS-SINR Inter frequency test parameters

Parameter		Unit	Test 1		Test 2		Test 3	
			Cell 2	Cell 3	Cell 2	Cell 3	Cell 2	Cell 3
SSB ARFCN			freq1	freq2	freq1	freq2	freq1	freq2
Duplex mode	Config 1,4		FDD					
	Config 2,3,5,6		TDD					
TDD configuration	Config 1,4		Not Applicable					
	Config 2,5		TDDConf.1.1					
	Config 3,6		TDDConf.2.1					
Downlink initial BWP configuration			DLBWP.0.1					
Downlink dedicated BWP configuration			DLBWP.1.1					
Uplink initial BWP configuration			ULBWP.0.1					
Uplink dedicated BWP configuration			ULBWP.1.1					
DRX Cycle configuration		ms	Not Applicable					
Gap pattern ID			0	-	0	-	0	-
TRS configuration	Config 1, 4		TRS.1.1 FDD		TRS.1.1 FDD		TRS.1.1 FDD	

Parameter			Unit	Test 1		Test 2		Test 3	
				Cell 2	Cell 3	Cell 2	Cell 3	Cell 2	Cell 3
	Config 2, 5			TRS.1.1 TDD	-	TRS.1.1 TDD	-	TRS.1.1 TDD	-
	Config 3, 6			TRS.1.2 TDD		TRS.1.2 TDD		TRS.1.2 TDD	
PDSCH Reference measurement channel	Config 1,4			SR.1.1 FDD	-	SR.1.1 FDD	-	SR.1.1 FDD	-
	Config 2,5			SR.1.1 TDD		SR.1.1 TDD		SR.1.1 TDD	
	Config 3,6			SR.2.1 TDD		SR.2.1 TDD		SR.2.1 TDD	
RMSI CORESET Reference Channel	Config 1,4			CR.1.1 FDD	-	CR.1.1 FDD	-	CR.1.1 FDD	-
	Config 2,5			CR.1.1 TDD		CR.1.1 TDD		CR.1.1 TDD	
	Config 3,6			CR.2.1 TDD		CR.2.1 TDD		CR.2.1 TDD	
Dedicated CORESET Reference Channel	Config 1,4			CCR.1.1 FDD	-	CCR.1.1 FDD	-	CCR.1.1 FDD	-
	Config 2,5			CCR.1.1 TDD		CCR.1.1 TDD		CCR.1.1 TDD	
	Config 3,6			CCR.2.1 TDD		CCR.2.1 TDD		CCR.2.1 TDD	
OCNG Patterns				OP.1					
SS-RSSI-Measurement				Not Applicable					
Time offset with Cell 2	Config 2,3,5,6		µs	-	3	-	3	-	3
	Config 1,4		ms	-	3	-	3	-	3
STMC configuration	Config 2,3,5,6			SMTC.1					
	Config 1,4			SMTC.2					
SSB configuration	Config 1,2,4,5			SSB.1 FR1					
	Config 3,6			SSB.2 FR1					
PDSCH/PDCCH subcarrier spacing	Config 1,2,4,5		kHz	15					
	Config 3,6			30					
EPRE ratio of PSS to SSS EPRE ratio of PBCH DMRS to SSS EPRE ratio of PBCH to PBCH DMRS EPRE ratio of PDCCH DMRS to SSS EPRE ratio of PDCCH to PDCCH DMRS EPRE ratio of PDSCH DMRS to SSS EPRE ratio of PDSCH to PDSCH EPRE ratio of OCNG DMRS to SSS(Note 1) EPRE ratio of OCNG to OCNG DMRS (Note 1)			dB	0	0	0	0	0	0
N_{oc} Note2	Config 1,2,4,5	Depending on band group	dBm/15kHz	-88	-88	-108.5	-108.5	-119.5+ Δ_{BG_offset}	-119.5+ Δ_{BG_offset}
N_{oc} Note2	Config 1,2,4,5		dBm/SCS	-88	-88	-108.5	-108.5	Same as Noc for 15kHz	Same as Noc for 15kHz
	Config 3,6	Depending on band group		-85	-85	-105.5	-105.5	-116.5+ Δ_{BG_offset}	116.5+ Δ_{BG_offset}
$\hat{E}_s / I_{ot}$			dB	-1.75	-1.75	20	20	-3.2	-3.2
$\hat{E}_s / N_{oc}$			dB	-1.75	-1.75	20	20	-3.2	-3.2
SS-RSRP Note3	Config 1,2,4,5	Depending on band group	dBm/SCS	-89.75	-89.75	-88.5	-88.5	-122.7+ Δ_{BG_offset}	-122.7+ Δ_{BG_offset}
	Config 3,6	Depending on band group		-86.75	-86.75	-85.5	-85.5	-119.7+ Δ_{BG_offset}	-119.7+ Δ_{BG_offset}
SS-SINR Note3			dB	-1.75	-1.75	20	20	-3.2	-3.2
Io Note3	Config 1,2,4,5	Depending on band group	dBm/ 9.36MHz	-57.83	-57.83	-60.5	-60.5	-89.85+ Δ_{BG_offset}	-89.85+ Δ_{BG_offset}
	Config 3,6	Depending on band group	dBm/ 38.16MHz	-51.73	-51.73	-54.41	-54.41	-83.75+ Δ_{BG_offset}	-83.75+ Δ_{BG_offset}
Propagation condition			-	AWGN					
Antenna configuration			-	1x2					

Parameter	Unit	Test 1		Test 2		Test 3	
		Cell 2	Cell 3	Cell 2	Cell 3	Cell 2	Cell 3
NOTE 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.							
NOTE 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for N_{oc} to be fulfilled.							
NOTE 3: SS-SINR, SS-RSRP, and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.							
NOTE 4: SS-SINR, SS-RSRP minimum requirements are specified assuming independent interference and noise at each receiver antenna port.							
NOTE 5: Δ_{BG_offset} is defined in clause 3A.4, Table 3A.4.1-2.							
NOTE 6: The test configuration excludes support for band n51 and it is not required to run this test on band n51 in this release of the specification.							

Table 4.7.3.2.1.5-2: SS-SINR Inter frequency absolute accuracy requirements for the reported values

	Test 1	Test 2	Test 3
	All bands	All bands	All bands
Normal Conditions			
Lowest reported value (Cell 3)	SS-SINR_35	SS-SINR_79	SS-SINR_32
Highest reported value (Cell 3)	SS-SINR_51	SS-SINR_94	SS-SINR_49
Extreme Conditions			
Lowest reported value (Cell 3)	SS-SINR_33	SS-SINR_77	SS-SINR_31
Highest reported value (Cell 3)	SS-SINR_53	SS-SINR_96	SS-SINR_50

For the test to pass, the ratio of successful reported values in each test shall be more than 90% with a confidence level of 95%.

4.7.3.2.2 EN-DC FR1-FR1 SS-SINR relative measurement accuracy

4.7.3.2.2.1 Test purpose

The purpose of this test is to verify that the inter-frequency SS-SINR relative measurement accuracy is within the specified limits for all bands.

4.7.3.2.2.2 Test applicability

This test applies to all types of NR UE supporting E-UTRA and EN-DC from Release 15 onwards, which support ss-SINR-Meas.

4.7.3.2.2.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 4.7.3.0.3.

The normative reference for this requirement is TS 38.133 [6] clause A.4.7.3.2.2.

4.7.3.2.2.4 Test description

4.7.3.2.2.4.1 Initial conditions

This test shall be tested using any of the test configurations in Table 4.7.3.2.2.4.1-1.

Table 4.7.3.2.2.4.1-1: EN-DC FR1-FR1 SS-SINR measurement accuracy supported test configurations

Test Case ID	Description
4.7.3.2.2-1	LTE FDD, NR: 15 kHz SSB SCS, 10MHz bandwidth, FDD
4.7.3.2.2-2	LTE FDD, NR: 15 kHz SSB SCS, 10MHz bandwidth, TDD
4.7.3.2.2-3	LTE FDD, NR: 30 kHz SSB SCS, 40MHz bandwidth, TDD
4.7.3.2.2-4	LTE TDD, NR: 15 kHz SSB SCS, 10MHz bandwidth, FDD

4.7.3.2.2-5	LTE TDD, NR: 15 kHz SSB SCS, 10MHz bandwidth, TDD
4.7.3.2.2-6	LTE TDD, NR: 30 kHz SSB SCS, 40MHz bandwidth, TDD
NOTE: The UE is only required to be tested in one of the supported test configurations.	

Configure the test equipment and the DUT according to the parameters in Table 4.7.3.2.2.4.1-2.

Table 4.7.3.2.2.4.1-2: Initial conditions for SS-SINR inter frequency accuracy in FR1

Parameter	Value		Comment
Test environment	NC, TL/VL, TL/VH, TH/VL, TH/VH		As specified in TS 38.508-1 [14] clause 4.1.
Test frequencies	As specified in Annex E, Table E.2-1 and TS 38.508-1 [14] clause 4.3.1.		
Channel bandwidth	As specified by the test configuration selected from Table 4.7.3.2.2.4.1-1.		
Propagation conditions	AWGN		As specified in clause C.2.2.
Connection Diagram	TE Part 2Rx	A.3.1.8.2 with n = 2 and φ_1 = 5 Hz	As specified in TS 38.508-1 [14] Annex A.
	TE Part 4Rx	A.3.1.8.5 with n = 2 and $\varphi_{1,1}$ = 5 Hz, $\varphi_{1,2}$ = 10 Hz, $\varphi_{1,3}$ = 15 Hz	
	DUT Part 2Rx	A.3.2.3.4	
	DUT Part 4Rx	A.3.2.5.2	
Exceptions to connection diagram	N/A		

1. Message contents are defined in clause 4.7.3.2.2.4.3.
2. Cell 1 is the E-UTRA serving cell (PCell) for the EN-DC setup. The power levels and settings for Cell 1 are set according to Annex A.6. Cell 2 and Cell 3 are NR FR1 cells in two different FR1 frequencies. Cell 2 is the PSCell and Cell 3 is the target cell for SS-SINR measurements. The connection setup is done according to the settings in clause C.1.1.

4.7.3.2.2.4.2 Test procedure

1. Ensure the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity EN-DC, DC bearer MCG and SCG, Connected without release *On* and Test Mode *On*, according to TS 38.508-1 [14] clause 4.5.
2. Set the parameters according to Table 4.7.3.2.2.5-1 as appropriate.
3. The SS shall transmit an RRCConnectionReconfiguration message on Cell 1.
4. The UE shall transmit an RRCConnectionReconfigurationComplete message.
5. The UE shall transmit periodically MeasurementReport messages.
6. After 10s wait from Step 3, the SS shall check the SS-SINR reported values in the periodic MeasurementReport. The SS-SINR value of Cell 3 reported by the UE is compared to the SS-SINR value of Cell 2 reported by the UE. If the difference between both values is outside the limits in Table 4.7.3.2.2.5-2 or the UE fails to report the measurement value for Cell 3 or Cell 2, the number of failed iterations is increased by one. Otherwise, the number of passed iterations is increased by one.
7. The SS shall continue checking the MeasurementReport messages transmitted by the UE until the confidence level according to Table G.2.3-1 in Annex G is achieved.
8. Set the parameters according to each sub-test in Table 4.7.3.2.2.5-1 as appropriate and repeat steps 5-7.

4.7.3.2.2.4.3 Message contents

Message contents are same as in clause 4.7.3.2.1.4.3.

4.7.3.2.2.5 Test requirements

Table 4.7.3.2.2.5-1 defines the primary level settings including test tolerances for all tests.

Each SS-SINR measurement report for each of the tests in Table 4.7.3.2.2.5-1 shall meet the corresponding relative accuracy requirements in Table 4.7.3.2.2.5-2

Table 4.7.3.2.2.5-1: same as Table 4.7.3.2.1.5-1

Table 4.7.3.2.2.5-2: SS-SINR Inter frequency relative accuracy requirements for the reported values

	Test 1	Test 2	Test 3
	All bands	All bands	All bands
Normal Conditions			
Lowest reported value (Cell 3)	SS-SINR_x - 10	SS-SINR_x - 10	SS-SINR_x - 11
Highest reported value (Cell 3)	SS-SINR_x + 10	SS-SINR_x + 10	SS-SINR_x + 11
Extreme Conditions			
Lowest reported value (Cell 3)	SS-SINR_x - 12	SS-SINR_x - 12	SS-SINR_x - 12
Highest reported value (Cell 3)	SS-SINR_x + 12	SS-SINR_x + 12	SS-SINR_x + 12
RSRQ_x is the reported value of Cell 2			

For the test to pass, the ratio of successful reported values in each test shall be more than 90% with a confidence level of 95%.

4.7.4 L1-RSRP

4.7.4.0 Minimum conformance requirements

4.7.4.0.1 SSB based absolute L1-RSRP measurement accuracy requirements

Unless otherwise specified, the requirements for absolute accuracy of SSB based L1-RSRP in this clause apply to all SSBs of the serving cell configured for L1-RSRP measurement.

The accuracy requirements in Table 4.7.4.0.1-1 are valid under the following conditions:

- Conditions defined in clause 7.3 of TS 38.101-1 [2] for reference sensitivity are fulfilled.
- Conditions for L1-RSRP measurements are fulfilled according to Annex B.2.4.1 of TS 38.133 [6] for a corresponding Band for each relevant SSB.

Table 4.7.4.0.1-1: SSB based L1-RSRP absolute accuracy in FR1

Accuracy		**Conditions**					
Normal condition	**Extreme condition**	**SSB Ês/Iot**	**Io [Note 1] range**				
			NR operating band groups [Note 2]	**Minimum Io**			**Maximum Io**
dB	**dB**	**dB**		**dBm / SCS_{SSB}**		**dBm/$BW_{Channel}$**	**dBm/$BW_{Channel}$**
				SCS_{SSB} = 15 kHz	**SCS_{SSB} = 30 kHz**		
±5.0	±9.5	≥-3	NR_FDD_FR1_A, NR_TDD_FR1_A, NR_SDL_FR1_A	-121	-118	N/A	-70
			NR_FDD_FR1_B	-120.5	-117.5	N/A	-70
			NR_TDD_FR1_C	-120	-117	N/A	-70
			NR_FDD_FR1_D, NR_TDD_FR1_D	-119.5	-116.5	N/A	-70
			NR_FDD_FR1_E, NR_TDD_FR1_E	-119	-116	N/A	-70
			NR_FDD_FR1_F	-118.5	-115.5	N/A	-70
			NR_FDD_FR1_G	-118	-115	N/A	-70

			NR_FDD_FR1_H	-117.5	-114.5	N/A	-70
±8.5	±11.5	≥-3	NR_FDD_FR1_A, NR_TDD_FR1_A, NR_SDL_FR1_A, NR_FDD_FR1_B, NR_TDD_FR1_C, NR_FDD_FR1_D, NR_TDD_FR1_D, NR_FDD_FR1_E, NR_TDD_FR1_E, NR_FDD_FR1_F, NR_FDD_FR1_G, NR_FDD_FR1_H,	N/A	N/A	-70	-50
NOTE 1: Io is assumed to have constant EPRE across the bandwidth. NOTE 2: NR operating band groups in FR1 are as defined in clause 3A.4.							

The reporting range of SS-RSRP and CSI-RSRP for L1 reporting is defined from -140 to -44 dBm with 1 dB resolution. The mapping of the measured quantity to the reported value is defined by Table 4.7.4.0.1-2. The range in the signalling may be larger than the guaranteed accuracy range.

Table 4.7.4.0.1-2: SS-RSRP and CSI-RSRP measurement report mapping

Reported value	Measured quantity value (L3 SS-RSRP and CSI-RSRP)	Measured quantity value (L1 SS-RSRP and CSI-RSRP)	Unit
RSRP_0	RSRP<-156	Not valid	dBm
RSRP_1	-156≤RSRP<-155	Not valid	dBm
RSRP_2	-155≤RSRP<-154	Not valid	dBm
RSRP_3	-154≤RSRP<-153	Not valid	dBm
RSRP_4	-153≤RSRP<-152	Not valid	dBm
RSRP_5	-152≤RSRP<-151	Not valid	dBm
RSRP_6	-151≤RSRP<-150	Not valid	dBm
RSRP_7	-150≤RSRP<-149	Not valid	dBm
RSRP_8	-149≤RSRP<-148	Not valid	dBm
RSRP_9	-148≤RSRP<-147	Not valid	dBm
RSRP_10	-147≤RSRP<-146	Not valid	dBm
RSRP_11	-146≤RSRP<-145	Not valid	dBm
RSRP_12	-145≤RSRP<-144	Not valid	dBm
RSRP_13	-144≤RSRP<-143	Not valid	dBm
RSRP_14	-143≤RSRP<-142	Not valid	dBm
RSRP_15	-142≤RSRP<-141	Not valid	dBm
RSRP_16	-141≤RSRP<-140	RSRP<-140	dBm
RSRP_17	-140≤RSRP<-139	-140≤RSRP<-139	dBm
RSRP_18	-139≤RSRP<-138	-139≤ RSRP<-138	dBm
…	…		…
RSRP_111	-46≤RSRP<-45	-46≤ RSRP<-45	dBm
RSRP_112	-45≤RSRP<-44	-45≤ RSRP<-44	dBm
RSRP_113	-44≤RSRP<-43	-44≤ RSRP	dBm
RSRP_114	-43≤RSRP<-42	Not valid	dBm
RSRP_115	-42≤RSRP<-41	Not valid	dBm
RSRP_116	-41≤RSRP<-40	Not valid	dBm
RSRP_117	-40≤RSRP<-39	Not valid	dBm
RSRP_118	-39≤RSRP<-38	Not valid	dBm

RSRP_119	-38≤RSRP<-37	Not valid	dBm
RSRP_120	-37≤RSRP<-36	Not valid	dBm
RSRP_121	-36≤RSRP<-35	Not valid	dBm
RSRP_122	-35≤RSRP<-34	Not valid	dBm
RSRP_123	-34≤ RSRP<-33	Not valid	dBm
RSRP_124	-33≤RSRP<-32	Not valid	dBm
RSRP_125	-32≤RSRP<-31	Not valid	dBm
RSRP_126	-31≤RSRP	Not valid	dBm
RSRP_127 (Note)	Infinity	Infinity	dBm
Note: The value of RSRP_127 is applicable for RSRP threshold configured by the network as defined in TS 38.331 [13], but not for the purpose of measurement reporting.			

The normative reference for this requirement is TS 38.133 [6] clauses 10.1.19.1.1 and 10.1.6.

4.7.4.0.2 SSB based relative L1-RSRP measurement accuracy requirements

The relative accuracy of SSB based L1-RSRP is defined as the L1-RSRP measured from one SSB compared to the largest measured value of L1-RSRP among all SSBs of the serving cell.

The accuracy requirements in Table 4.7.4.0.2-1 are valid under the following conditions:

- Conditions defined in clause 7.3 of TS 38.101-1 [2] for reference sensitivity are fulfilled.
- Conditions for L1-RSRP measurements are fulfilled according to Annex B.2.4.1 of TS 38.133 [6] for a corresponding Band for each relevant SSB.

Table 4.7.4.0.2-1: SSB based L1-RSRP relative accuracy in FR1

Accuracy		**Conditions**					
Normal condition	**Extreme condition**	**SSB Ês/Iot** Note 2	**Io** Note 1 **range**				
			NR operating band groups Note 4	**Minimum Io**			**Maximum Io**
dB	**dB**	**dB**		**dBm / SCS_{SSB}**		**dBm/$BW_{Channel}$**	**dBm/$BW_{Channel}$**
				SCS_{SSB} = 15 kHz	**SCS_{SSB} = 30 kHz**		
±3	±4	≥-3	NR_FDD_FR1_A, NR_TDD_FR1_A, NR_SDL_FR1_A	-121	-118	N/A	-50
			NR_FDD_FR1_B	-120.5	-117.5	N/A	-50
			NR_TDD_FR1_C	-120	-117	N/A	-50
			NR_FDD_FR1_D, NR_TDD_FR1_D	-119.5	-116.5	N/A	-50
			NR_FDD_FR1_E, NR_TDD_FR1_E	-119	-116	N/A	-50
			NR_FDD_FR1_F	-118.5	-115.5	N/A	-50
			NR_FDD_FR1_G	-118	-115	N/A	-50
			NR_FDD_FR1_H	-117.5	-114.5	N/A	-50
NOTE 1: Io is assumed to have constant EPRE across the bandwidth. NOTE 2: The parameter SSB Ês/Iot is the minimum SSB Ês/Iot of the pair of SSBs to which the requirement applies. NOTE 3: Void NOTE 4: NR operating band groups in FR1 are as defined in clause 3A.4.							

The reporting range of SS-RSRP and CSI-RSRP for L1 reporting is defined from -140 to -44 dBm with 1 dB resolution. The mapping of the measured quantity to the reported value is defined by Table 4.7.4.0.1-2. The range in the signalling may be larger than the guaranteed accuracy range.

The normative reference for this requirement is TS 38.133 [6] clauses 10.1.19.1.2 and 10.1.6.

4.7.4.0.3 CSI-RS based absolute L1-RSRP measurement accuracy requirements

Unless otherwise specified, the requirements for absolute accuracy of CSI-RS based L1-RSRP in this clause apply to all CSI-RS resources of the serving cell configured for L1-RSRP measurement.

The accuracy requirements in Table 4.7.4.0.3-1 are valid under the following conditions:

- Conditions defined in clause 7.3 of TS 38.101-1 [2] for reference sensitivity are fulfilled.
- Conditions for L1-RSRP measurements are fulfilled according to Annex B.2.4.2 of TS 38.133 [6] for a corresponding Band for each relevant CSI-RS.
- The bandwidth of CSI-RS is 48 PRBs and the density is 3.

The performance with larger bandwidth of CSI-RS is equal to or better than the accuracy requirements in Table 4.7.4.0.3-1.

Table 4.7.4.0.3-1: CSI-RS based L1-RSRP absolute accuracy in FR1

Accuracy		**Conditions**						
Normal condition	**Extreme condition**	**CSI-RS Ês/Iot**	**Io [Note 1] range**					
			NR operating band groups [Note 2]	**Minimum Io**				**Maximum Io**
dB	**dB**	**dB**		**dBm / SCS_{CSI-RS}**			**$dBm/BW_{Channel}$**	**$dBm/BW_{Channel}$**
				SCS_{CSI-RS} = 15 kHz	**SCS_{CSI-RS} = 30 kHz**	**SCS_{CSI-RS} = 60 kHz**		
±5.0	±9.5	≥-3	NR_FDD_FR1_A, NR_TDD_FR1_A, NR_SDL_FR1_A	-121	-118	-115	N/A	-70
			NR_FDD_FR1_B	-120.5	-117.5	-114.5	N/A	-70
			NR_TDD_FR1_C	-120	-117	-114	N/A	-70
			NR_FDD_FR1_D, NR_TDD_FR1_D	-119.5	-116.5	-113.5	N/A	-70
			NR_FDD_FR1_E, NR_TDD_FR1_E	-119	-116	-113	N/A	-70
			NR_FDD_FR1_F	-118.5	-115.5	-112.5	N/A	-70
			NR_FDD_FR1_G	-118	-115	-112	N/A	-70
			NR_FDD_FR1_H	-117.5	-114.5	-111.5	N/A	-70
±8.5	±11.5	≥-3	NR_FDD_FR1_A, NR_TDD_FR1_A, NR_SDL_FR1_A, NR_FDD_FR1_B, NR_TDD_FR1_C, NR_FDD_FR1_D, NR_TDD_FR1_D, NR_FDD_FR1_E, NR_TDD_FR1_E, NR_FDD_FR1_F, NR_FDD_FR1_G, NR_FDD_FR1_H	N/A	N/A	N/A	-70	-50
NOTE 1: Io is assumed to have constant EPRE across the bandwidth. NOTE 2: NR operating band groups in FR1 are as defined in clause 3A.4.								

The reporting range of SS-RSRP and CSI-RSRP for L1 reporting is defined from -140 to -44 dBm with 1 dB resolution. The mapping of the measured quantity to the reported value is defined by Table 4.7.4.0.1-2. The range in the signalling may be larger than the guaranteed accuracy range.

The normative reference for this requirement is TS 38.133 [6] clauses 10.1.19.2.1 and 10.1.6.

4.7.4.0.4 CSI-RS based relative L1-RSRP measurement accuracy requirements

The relative accuracy of CSI-RS based L1-RSRP is defined as the L1-RSRP measured from one CSI-RS compared to the largest measured value of L1-RSRP among all CSI-RS resources of the serving cell.

The accuracy requirements in Table 4.7.4.0.4-1 are valid under the following conditions:

- Conditions defined in clause 7.3 of TS 38.101-1 [2] for reference sensitivity are fulfilled.
- Conditions for L1-RSRP measurements are fulfilled according to Annex B.2.4.2 of TS 38.133 [6] for a corresponding Band for each relevant CSI-RS.
- The bandwidth of CSI-RS is 48 PRBs and the density is 3.

The performance with larger bandwidth of CSI-RS is equal to or better than the accuracy requirements in Table 4.7.4.0.4-1.

Table 4.7.4.0.4-1: CSI-RS based L1-RSRP relative accuracy in FR1

Accuracy		**Conditions**						
Normal condition	**Extreme condition**	**CSI-RS Ês/Iot** Note 2	**Io** Note 1 **range**					
			NR operating band groups Note 4	**Minimum Io**				**Maximum Io**
dB	**dB**	**dB**		**dBm / SCS_{CSI-RS}**			**dBm/$BW_{Channel}$**	**dBm/$BW_{Channel}$**
				SCS_{CSI-RS} = 15 kHz	**SCS_{CSI-RS} = 30 kHz**	**SCS_{CSI-RS} = 60 kHz**		
±3	±4	≥-3	NR_FDD_FR1_A, NR_TDD_FR1_A, NR_SDL_FR1_A	-121	-118	-115	N/A	-50
			NR_FDD_FR1_B	-120.5	-117.5	-114.5	N/A	-50
			NR_TDD_FR1_C	-120	-117	-114	N/A	-50
			NR_FDD_FR1_D, NR_TDD_FR1_D	-119.5	-116.5	-113.5	N/A	-50
			NR_FDD_FR1_E, NR_TDD_FR1_E	-119	-116	-113	N/A	-50
			NR_FDD_FR1_F	-118.5	-115.5	-112.5	N/A	-50
			NR_FDD_FR1_G	-118	-115	-112	N/A	-50
			NR_FDD_FR1_H	-117.5	-114.5	-111.5	N/A	-50

NOTE 1: Io is assumed to have constant EPRE across the bandwidth.
NOTE 2: The parameter CSI-RS Ês/Iot is the minimum CSI-RS Ês/Iot of the pair of CSI-RS resources to which the requirement applies.
NOTE 3: Void
NOTE 4: NR operating band groups in FR1 are as defined in clause 3.5.2.

The reporting range of SS-RSRP and CSI-RSRP for L1 reporting is defined from -140 to -44 dBm with 1 dB resolution. The mapping of the measured quantity to the reported value is defined by Table 4.7.4.0.1-2. The range in the signalling may be larger than the guaranteed accuracy range.

The normative reference for this requirement is TS 38.133 [6] clauses 10.1.19.2.2 and 10.1.6.

4.7.4.1 SSB based L1-RSRP measurements

4.7.4.1.1 EN-DC FR1 SSB-based L1-RSRP absolute measurement accuracy

4.7.4.1.1.1 Test purpose

The purpose of this test is to verify that the SSB based L1-RSRP absolute measurement accuracy is within the specified limits for all bands.

4.7.4.1.1.2 Test applicability

This test applies to all types of NR UE supporting E-UTRA and EN-DC from Release 15 onwards.

4.7.4.1.1.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 4.7.4.0.1.

The normative reference for this requirement is TS 38.133 [6] clause A.4.7.4.1.

4.7.4.1.1.4 Test description

4.7.4.1.1.4.1 Initial conditions

This test shall be tested using any of the test configurations in Table 4.7.4.1.1.4.1-1.

Table 4.7.4.1.1.4.1-1: EN-DC FR1 SSB based L1-RSRP absolute measurement accuracy supported test configurations

Test Case ID	Description
4.7.4.1.1-1	LTE FDD, NR: 15 kHz SSB SCS, 10MHz bandwidth, FDD
4.7.4.1.1-2	LTE FDD, NR: 15 kHz SSB SCS, 10MHz bandwidth, TDD
4.7.4.1.1-3	LTE FDD, NR: 30 kHz SSB SCS, 40MHz bandwidth, TDD
4.7.4.1.1-4	LTE TDD, NR: 15 kHz SSB SCS, 10MHz bandwidth, FDD
4.7.4.1.1-5	LTE TDD, NR: 15 kHz SSB SCS, 10MHz bandwidth, TDD
4.7.4.1.1-6	LTE TDD, NR: 30 kHz SSB SCS, 40MHz bandwidth, TDD
NOTE: The UE is only required to be tested in one of the supported test configurations.	

Configure the test equipment and the DUT according to the parameters in Table 4.7.4.1.1.4.1-2.

Table 4.7.4.1.1.4.1-2: Initial conditions for SSB based L1-RSRP absolute accuracy in FR1

Parameter	Value		Comment
Test environment	NC, TL/VL, TL/VH, TH/VL, TH/VH		As specified in TS 38.508-1 [14] clause 4.1.
Test frequencies	As specified in Annex E, Table E.2-1 and TS 38.508-1 [14] clause 4.3.1.		
Channel bandwidth	As specified by the test configuration selected from Table 4.7.4.1.1.4.1-1.		
Propagation conditions	AWGN		As specified in clause C.2.2.
Connection Diagram	TE Part 2Rx	A.3.1.8.2 with n = 1	As specified in TS 38.508-1 [14] Annex A.
	TE Part 4Rx	A.3.1.8.5 with n = 1	
	DUT Part 2Rx	A.3.2.3.4	
	DUT Part 4Rx	A.3.2.5.2	
Exceptions to connection diagram	N/A		

1. Message contents are defined in clause 4.7.4.1.1.4.3.

2. Cell 1 is the E-UTRA serving cell (PCell) for the EN-DC setup. The power levels and settings for Cell 1 are set according to Annex A.6. Cell 2 is the NR FR1 cell. Cell 2 is the PSCell and the target for SSB-based L1-RSRP measurements. The UE is configured to perform RLM, BFD and L1-RSRP measurement based on the SSBs. The connection setup is done according to the settings in clause C.1.1.

4.7.4.1.1.4.2 Test procedure

Prior to the start of the time duration T1, the UE shall be fully synchronized to PSCell. The UE shall be configured for periodic CSI reporting in PUCCH [format 2] with a reporting periodicity as mentioned in the above table 4.7.4.1.1.4.1-2.

1. Ensure the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity EN-DC, DC bearer MCG and SCG, Connected without release *On* and Test Mode *On*, according to TS 38.508-1 [14] clause 4.5 and general test parameters set according to Table 4.7.4.1.1.4.1-2.
2. Set the parameters according to T1 in Table 4.7.4.1.1.5-1.
3. The UE shall start sending L1-RSRP report including results of both SSB#0 and SSB#1 every 80 slots.
4. The SS shall check the L1-RSRP reported values of SSB#0 or SSB#1 in the periodic L1-RSRP reports. If the value for the strongest SSB is within the limits in Table 4.7.4.1.1.5-2 or Table 4.7.4.1.1.5-3 (depending on the test configuration), the number of passed iterations is increased by one, otherwise the number of failed iterations is increased by one.
5. The SS shall continue checking the L1-RSRP report messages transmitted by the UE until the confidence level according to Table G.2.3-1 in Annex G is achieved.
6. Set the parameters according to each sub-test in Table 4.7.4.1.1.5-1 as appropriate and repeat steps 3-5.

4.7.4.1.1.4.3 Message contents

Message contents are according to TS 38.508-1 [14] clause 7.3 with the following exceptions:

Table 4.7.4.1.1.4.3-1: Common Exception messages EN-DC SSB based L1-RSRP measurement

Default Message Contents	
Common contents of system information blocks exceptions	
Default RRC messages and information elements contents exceptions	Table H.3.6-2 with conditions PERIODIC and SS-RSRP Table H.3.6-3 with conditions SSB and PERIODIC Table H.3.4-1 Table 7.3.1-3 in TS 38.508-1 [14] with condition SMTC.1 Table H.3.5-8

Table 4.7.4.1.1.4.3-2: RadioLinkMonitoringConfig

Derivation Path: TS 38.508-1 [14], Table 4.6.3-133			
Information Element	**Value/remark**	**Comment**	**Condition**
RadioLinkMonitoringConfig ::= SEQUENCE {			
failureDetectionResourcesToAddModList SEQUENCE (SIZE(1..maxNrofFailureDetectionResources)) OF SEQUENCE {	1 entry		
purpose	both	UE is configured to perform RLM and BFD based on the SSBs.	
detectionResource CHOICE {			
ssb-Index	0		
}			
}			
}			

4.7.4.1.1.5 Test requirement

Table 4.7.4.1.1.5-1 defines the primary level settings including test tolerances for all tests.

Each L1-RSRP measurement report for each of the tests in Table 4.7.4.1.1.5-1 shall meet the corresponding absolute accuracy requirements in Table 4.7.4.1.1.5-2 for test configurations 1, 2, 4 and 5, and the corresponding absolute accuracy requirements in Table 4.7.4.1.1.5-3 for test configurations 3 and 6.

Table 4.7.4.1.1.5-1: L1-RSRP test parameters

Parameter	Config	Unit	Test 1	Test 2
SSB GSCN	1~6		freq1	freq1
Duplex mode	1,4		FDD	FDD
	2,5		TDD	TDD
	3,6		TDD	TDD
TDD Configuration	1,4		N/A	N/A
	2,5		TDDConf.1.1	TDDConf.1.1
	3,6		TDDConf.2.1	TDDConf.2.1
$BW_{channel}$	1,4	MHz	10: $N_{RB,c}$ = 52	10: $N_{RB,c}$ = 52
	2,5		10: $N_{RB,c}$ = 52	10: $N_{RB,c}$ = 52
	3,6		40: $N_{RB,c}$ = 106	40: $N_{RB,c}$ = 106
PDSCH Reference measurement channel	1,4		SR.1.1 FDD	SR.1.1 FDD
	2,5		SR.1.1 TDD	SR.1.1 TDD
	3,6		SR.2.1 TDD	SR.2.1 TDD
RMSI CORESET Reference Channel	1,4		CR.1.1 FDD	CR.1.1 FDD
	2,5		CR.1.1 TDD	CR.1.1 TDD
	3,6		CR.2.1 TDD	CR.2.1 TDD
Dedicated CORESET Reference Channel	1,4		CCR.1.1 FDD	CCR.1.1 FDD
	2,5		CCR.1.1 TDD	CCR.1.1 TDD
	3,6		CCR.2.1 TDD	CCR.2.1 TDD
SSB configuration	1,4		SSB.3 FR1	SSB.3 FR1
	2,5		SSB.3 FR1	SSB.3 FR1
	3,6		SSB.4 FR1	SSB.4 FR1
OCNG Patterns	1~6		OP.1	OP.1
TRS configuration	1,4		TRS.1.1 FDD	TRS.1.1 FDD
	2,5		TRS.1.1 TDD	TRS.1.1 TDD
	3,6		TRS.1.2 TDD	TRS.1.2 TDD
Initial BWP Configuration	1~6		DLBWP.0.1 ULBWP.0.1	DLBWP.0.1 ULBWP.0.1
Dedicated BWP configuration	1~6		DLBWP.1.1 ULBWP.1.1	DLBWP.1.1 ULBWP.1.1
SMTC configuration	1~6		SMTC.1	SMTC.1
reportConfigType	1~6		periodic	periodic
reportQuantity	1~6		ssb-Index-RSRP	ssb-Index-RSRP
Number of reported RS	1~6		2	2
L1-RSRP reporting period	1~6		slot80	slot80
EPRE ratio of PSS to SSS EPRE ratio of PBCH DMRS to SSS EPRE ratio of PBCH to PBCH DMRS EPRE ratio of PDCCH DMRS to SSS EPRE ratio of PDCCH to PDCCH DMRS EPRE ratio of PDSCH DMRS to SSS EPRE ratio of PDSCH to PDSCH DMRS EPRE ratio of OCNG DMRS to SSS Note 1 EPRE ratio of OCNG to OCNG DMRS Note 1	1~6	dB	0	0
N_{oc} Note2 Depending on band group	1,2,4,5	dBm/15kHz	-94.65	-117+ Δ_{BG_offset}
	3,6		-96.00	117+ Δ_{BG_offset}
N_{oc} Note2 Depending on band group	1,2,4,5	dBm/SSB SCS	-94.65	-117+ Δ_{BG_offset}
	3,6		-93.00	-114+ Δ_{BG_offset}
$\hat{E}_s / I_{ot}$	1~6	dB	10	-2.2
Depending on band group	1,2,4,5	dBm/SSB SCS	-84.65	-119.2 + Δ_{BG_offset}

Parameter		Config	Unit	Test 1	Test 2
SSB RSRP Note3		3,6		-83.00	-116.2 + Δ_{BG_offset}
Io Note3	Depending on band group	1,2,4,5	dBm/9.36 MHz	-56.28	-87.00 + Δ_{BG_offset}
		3,6	dBm/38.16 MHz	-51.53	-80.90 + Δ_{BG_offset}
$\hat{E}_s / N_{oc}$		1~6	dB	10	-2.2
Propagation condition		1~6		AWGN	AWGN
Antenna configuration		1~6		1x2	1x2

NOTE 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.
NOTE 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for N_{oc} to be fulfilled.
NOTE 3: RSRP and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.
NOTE 4: RSRP minimum requirements are specified assuming independent interference and noise at each receiver antenna port.
NOTE 5: The test configuration excludes support for band n51 and it is not required to run this test on band n51 in this release of the specification.

Table 4.7.4.1.1.5-2: L1-RSRP absolute accuracy requirements for the reported values for test configurations 1, 2, 4 and 5

Normal Conditions	Test 1 All bands	Test 2	
Lowest reported value (Cell 2)	62	Bands NR_FDD_FR1_A, NR_TDD_FR1_A	31
		Bands NR_FDD_FR1_B	31
		Bands NR_TDD_FR1_C	32
		Bands NR_FDD_FR1_D, NR_TDD_FR1_D	32
		Bands NR_FDD_FR1_E, NR_TDD_FR1_E	33
		Bands NR_FDD_FR1_G	34
		Bands NR_FDD_FR1_H	34
Highest reported value (Cell 2)	82	Bands NR_FDD_FR1_A, NR_TDD_FR1_A	44
		Bands NR_FDD_FR1_B	45
		Bands NR_TDD_FR1_C	45
		Bands NR_FDD_FR1_D, NR_TDD_FR1_D	46
		Bands NR_FDD_FR1_E, NR_TDD_FR1_E	46
		Bands NR_FDD_FR1_G	47
		Bands NR_FDD_FR1_H	48
Extreme Conditions	**Test 1 All bands**	**Test 2**	
Lowest reported value (Cell 2)	61	Bands NR_FDD_FR1_A, NR_TDD_FR1_A	30
		Bands NR_FDD_FR1_B	30
		Bands NR_TDD_FR1_C	31
		Bands NR_FDD_FR1_D, NR_TDD_FR1_D	31
		Bands NR_FDD_FR1_E, NR_TDD_FR1_E	32

		Bands NR_FDD_FR1_G	33
		Bands NR_FDD_FR1_H	33
Highest reported value (Cell 2)	83	Bands NR_FDD_FR1_A, NR_TDD_FR1_A	45
		Bands NR_FDD_FR1_B	46
		Bands NR_TDD_FR1_C	46
		Bands NR_FDD_FR1_D, NR_TDD_FR1_D	47
		Bands NR_FDD_FR1_E, NR_TDD_FR1_E	47
		Bands NR_FDD_FR1_G	48
		Bands NR_FDD_FR1_H	49
NOTE: NR operating band groups are defined in clause 3A.4, Table 3A.4.1-2.			

Table 4.7.4.1.1.5-3: L1-RSRP absolute accuracy requirements for the reported values for test configurations 3 and 6

Normal Conditions	**Test 1 All bands**	**Test 2**	
Lowest reported value (Cell 2)	63	Bands NR_FDD_FR1_A, NR_TDD_FR1_A	34
		Bands NR_FDD_FR1_B	34
		Bands NR_TDD_FR1_C	35
		Bands NR_FDD_FR1_D, NR_TDD_FR1_D	35
		Bands NR_FDD_FR1_E, NR_TDD_FR1_E	36
		Bands NR_FDD_FR1_G	37
		Bands NR_FDD_FR1_H	37
Highest reported value (Cell 2)	84	Bands NR_FDD_FR1_A, NR_TDD_FR1_A	47
		Bands NR_FDD_FR1_B	48
		Bands NR_TDD_FR1_C	48
		Bands NR_FDD_FR1_D, NR_TDD_FR1_D	49
		Bands NR_FDD_FR1_E, NR_TDD_FR1_E	49
		Bands NR_FDD_FR1_G	50
		Bands NR_FDD_FR1_H	51
Extreme Conditions	**Test 1 All bands**	**Test 2**	
Lowest reported value (Cell 2)	62	Bands NR_FDD_FR1_A, NR_TDD_FR1_A	33
		Bands NR_FDD_FR1_B	33
		Bands NR_TDD_FR1_C	34
		Bands NR_FDD_FR1_D, NR_TDD_FR1_D	34
		Bands NR_FDD_FR1_E, NR_TDD_FR1_E	35
		Bands NR_FDD_FR1_G	36
		Bands NR_FDD_FR1_H	36
Highest reported value (Cell 2)	85	Bands NR_FDD_FR1_A, NR_TDD_FR1_A	48
		Bands NR_FDD_FR1_B	49
		Bands NR_TDD_FR1_C	49
		Bands NR_FDD_FR1_D, NR_TDD_FR1_D	50
		Bands NR_FDD_FR1_E, NR_TDD_FR1_E	50
		Bands NR_FDD_FR1_G	51
		Bands NR_FDD_FR1_H	52

NOTE: NR operating band groups are defined in clause 3A.4, Table 3A.4.1-2

For the test to pass, the ratio of successful reported values in each test shall be more than 90% with a confidence level of 95%.

4.7.4.1.2 EN-DC FR1 SSB-based L1-RSRP relative measurement accuracy

4.7.4.1.2.1 Test purpose

The purpose of this test is to verify that the SSB based L1-RSRP relative measurement accuracy is within the specified limits for all bands.

4.7.4.1.2.2 Test applicability

This test applies to all types of NR UE supporting E-UTRA and EN-DC from Release 15 onwards.

4.7.4.1.2.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 4.7.4.0.2.

The normative reference for this requirement is TS 38.133 [6] clause A.4.7.4.1.

4.7.4.1.2.4 Test description

4.7.4.1.2.4.1 Initial conditions

This test shall be tested using any of the test configurations in Table 4.7.4.1.2.4.1-1.

Table 4.7.4.1.2.4.1-1: EN-DC FR1 SSB based L1-RSRP relative measurement accuracy supported test configurations

Test Case ID	Description
4.7.4.1.2-1	LTE FDD, NR: 15 kHz SSB SCS, 10MHz bandwidth, FDD
4.7.4.1.2-2	LTE FDD, NR: 15 kHz SSB SCS, 10MHz bandwidth, TDD
4.7.4.1.2-3	LTE FDD, NR: 30 kHz SSB SCS, 40MHz bandwidth, TDD
4.7.4.1.2-4	LTE TDD, NR: 15 kHz SSB SCS, 10MHz bandwidth, FDD
4.7.4.1.2-5	LTE TDD, NR: 15 kHz SSB SCS, 10MHz bandwidth, TDD
4.7.4.1.2-6	LTE TDD, NR: 30 kHz SSB SCS, 40MHz bandwidth, TDD
NOTE: The UE is only required to be tested in one of the supported test configurations	

Configure the test equipment and the DUT according to the parameters in Table 4.7.4.1.2.4.1-2.

Table 4.7.4.1.2.4.1-2: Initial conditions for SSB based L1-RSRP relative accuracy in FR1

Parameter	Value		Comment
Test environment	NC, TL/VL, TL/VH, TH/VL, TH/VH		As specified in TS 38.508-1 [14] clause 4.1.
Test frequencies	As specified in Annex E, Table E.2-1 and TS 38.508-1 [14] clause 4.3.1.		
Channel bandwidth	As specified by the test configuration selected from Table 4.7.4.1.2.4.1-1.		
Propagation conditions	AWGN		As specified in clause C.2.2.
Connection Diagram	TE Part 2Rx	A.3.1.8.2 with n = 1	As specified in TS 38.508-1 [14] Annex A.
	TE Part 4Rx	A.3.1.8.5 with n = 1	
	DUT Part 2Rx	A.3.2.3.4	
	DUT Part 4Rx	A.3.2.5.2	
Exceptions to connection diagram	N/A		

1. Message contents are defined in clause 4.7.4.1.2.4.3.

2. Cell 1 is the E-UTRA serving cell (PCell) for the EN-DC setup. The power levels and settings for Cell 1 are set according to Annex A.6. Cell 2 is the NR FR1 cell. Cell 2 is the PSCell and the target for SSB-based L1-RSRP measurements. The UE is configured to perform RLM, BFD and L1-RSRP measurement based on the SSBs. The connection setup is done according to the settings in clause C.1.1.

4.7.4.1.2.4.2 Test procedure

Prior to the start of the time duration T1, the UE shall be fully synchronized to PSCell. The UE shall be configured for periodic CSI reporting in PUCCH [format 2] with a reporting periodicity as mentioned in the above table 4.7.4.1.2.4.1-2.

1. Ensure the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity EN-DC, DC bearer MCG and SCG, Connected without release *On* and Test Mode *On*, according to TS 38.508-1 [14] clause 4.5 and general test parameters set according to Table 4.7.4.1.2.4.1-2.

2. Set the parameters according to T1 in Table 4.7.4.1.2.5-1.

3. The UE shall start sending L1-RSRP report including results of both SSB#0 and SSB#1 every 80 slots.

4. The SS shall check the L1-RSRP reported values of SSB#0 and SSB#1 in the periodic L1-RSRP reports. The DIFF-RSRP value of SSB#0 or SSB#1 reported by the UE is compared to the expected DIFF-RSRP. If the DIFF-RSRP value is within the limits in Table 4.7.4.1.2.5-2, the number of passed iterations is increased by one, otherwise the number of failed iterations is increased by one.

5. The SS shall continue checking the L1-RSRP report messages transmitted by the UE until the confidence level according to Table G.2.3-1 in Annex G is achieved.

6. Set the parameters according to each sub-test in Table 4.7.4.1.2.5-1 as appropriate and repeat steps 3-5.

4.7.4.1.2.4.3 Message contents

Message contents are same as in Clause 4.7.4.1.1.4.3.

4.7.4.1.2.5 Test requirement

Table 4.7.4.1.2.5-1 defines the primary level settings including test tolerances for all tests.

Each L1-RSRP measurement report for each of the tests in Table 4.7.4.1.2.5-1 shall meet the corresponding relative accuracy requirements in Table 4.7.4.1.2.5-2.

Table 4.7.4.1.2.5-1: Same as Table 4.7.4.1.1.5-1

Table 4.7.4.1.2.5-2: L1-RSRP relative accuracy requirements for the reported values

	Test 1	**Test 2**
	All bands	All bands
Normal Conditions		
Lowest DIFF RSRP reported value	0	0
Highest DIFF RSRP reported value	+3	--3
Extreme Conditions		
Lowest DIFF RSRP reported value	0	0
Highest DIFF RSRP reported value	+4	+4

For the test to pass, the ratio of successful reported values in each test shall be more than 90% with a confidence level of 95%.

4.7.4.2 CSI-RS based L1-RSRP measurements

4.7.4.2.1 EN-DC FR1 CSI-RS-based L1-RSRP absolute measurement accuracy

4.7.4.2.1.1 Test purpose

The purpose of this test is to verify that the CSI-RS based L1-RSRP absolute measurement accuracy is within the specified limits for all bands.

4.7.4.2.1.2 Test applicability

This test applies to all types of NR UE supporting E-UTRA and EN-DC from Release 15 onwards.

4.7.4.2.1.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 4.7.4.0.3.

The normative reference for this requirement is TS 38.133 [6] clause A.4.7.4.2.

4.7.4.2.1.4 Test description

4.7.4.2.1.4.1 Initial conditions

This test shall be tested using any of the test configurations in Table 4.7.4.2.1.4.1-1.

Table 4.7.4.2.1.4.1-1: EN-DC FR1 CSI-RS based L1-RSRP absolute measurement accuracy supported test configurations

Test Case ID	Description
4.7.4.2.1-1	LTE FDD, NR: 15 kHz SSB SCS, 10MHz bandwidth, FDD
4.7.4.2.1-2	LTE FDD, NR: 15 kHz SSB SCS, 10MHz bandwidth, TDD
4.7.4.2.1-3	LTE FDD, NR: 30 kHz SSB SCS, 40MHz bandwidth, TDD
4.7.4.2.1-4	LTE TDD, NR: 15 kHz SSB SCS, 10MHz bandwidth, FDD
4.7.4.2.1-5	LTE TDD, NR: 15 kHz SSB SCS, 10MHz bandwidth, TDD
4.7.4.2.1-6	LTE TDD, NR: 30 kHz SSB SCS, 40MHz bandwidth, TDD
NOTE: The UE is only required to be tested in one of the supported test configurations.	

Configure the test equipment and the DUT according to the parameters in Table 4.7.4.2.1.4.1-2.

Table 4.7.4.2.1.4.1-2: Initial conditions for CSI-RS based L1-RSRP absolute accuracy in FR1

Parameter	Value		Comment
Test environment	NC, TL/VL, TL/VH, TH/VL, TH/VH		As specified in TS 38.508-1 [14] clause 4.1.
Test frequencies	As specified in Annex E, Table E.2-1 and TS 38.508-1 [14] clause 4.3.1.		
Channel bandwidth	As specified by the test configuration selected from Table 4.7.4.2.1.4.1-1.		
Propagation conditions	AWGN		As specified in clause C.2.2.
Connection Diagram	TE Part 2Rx	A.3.1.8.2 with n = 1	As specified in TS 38.508-1 [14] Annex A.
	TE Part 4Rx	A.3.1.8.5 with n = 1	
	DUT Part 2Rx	A.3.2.3.4	
	DUT Part 4Rx	A.3.2.5.2	
Exceptions to connection diagram	N/A		

1. Message contents are defined in clause 4.7.4.2.1.4.3.

2. Cell 1 is the E-UTRA serving cell (PCell) for the EN-DC setup. The power levels and settings for Cell 1 are set according to Annex A.6. Cell 2 is the NR FR1 cell. Cell 2 is the PSCell and the target for CSI-RS-based L1-RSRP measurements. Before the test, UE is configured to perform RLM and BFD measurement based on the SSBs. The connection setup is done according to the settings in clause C.1.1.

4.7.4.2.1.4.2 Test procedure

Prior to the start of the time duration T1, the UE shall be fully synchronized to PSCell. The UE shall be configured for periodic CSI reporting in PUCCH [format 2] with a reporting periodicity as mentioned in the above table 4.7.4.2.1.4.1-2.

1. Ensure the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity EN-DC, DC bearer MCG and SCG, Connected without release *On* and Test Mode *On*, according to TS 38.508-1 [14] clause 4.5 and general test parameters set according to Table 4.7.4.2.1.4.1-2.

2. Set the parameters according to T1 in Table 4.7.4.2.1.5-1.

3. The UE shall start sending L1-RSRP report including results of both CSI-RS#0 and CSI-RS #1 every 80 slots.

4. The SS shall check the L1-RSRP reported values of CSI-RS #0 or CSI-RS #1 in the periodic L1-RSRP reports. If the value for the strongest CSI-RS is within the limits in Table 4.7.4.2.1.5-2 or Table 4.7.4.2.1.5-3 (depending on the test configuration), the number of passed iterations is increased by one, otherwise the number of failed iterations is increased by one.

5. The SS shall continue checking the L1-RSRP report messages transmitted by the UE until the confidence level according to Table G.2.3-1 in Annex G is achieved.

6. Set the parameters according to each sub-test in Table 4.7.4.2.1.5-1 as appropriate and repeat steps 3-5.

4.7.4.2.1.4.3 Message contents

Message contents are according to TS 38.508-1 [14] clause 7.3 with the following exceptions:

Table 4.7.4.2.1.4.3-1: Common Exception messages EN-DC CSI-RS-based L1-RSRP measurement

Default Message Contents	
Common contents of system information blocks exceptions	
Default RRC messages and information elements contents exceptions	Table H.3.6-2 with conditions PERIODIC and CSI-RSRP Table H.3.6-3 with conditions CSI-RS and PERIODIC Table H.3.4-1 Table H.3.5-8 Table 7.3.1-3 in TS 38.508-1 [14] with condition SMTC.1

Table 4.7.4.2.1.4.3-2: RadioLinkMonitoringConfig

Derivation Path: TS 38.508-1 [14], Table 4.6.3-133			
Information Element	**Value/remark**	**Comment**	**Condition**
RadioLinkMonitoringConfig ::= SEQUENCE {			
failureDetectionResourcesToAddModList SEQUENCE (SIZE(1..maxNrofFailureDetectionResources)) OF SEQUENCE {	1 entry		
purpose	both	UE is configured to perform RLM and BFD based on the SSB.	
detectionResource CHOICE {			
ssb-Index	0		
}			
}			
}			

4.7.4.2.1.5 Test requirement

Table 4.7.4.2.1.5-1 defines the primary level settings including test tolerances for all tests.

Each L1-RSRP measurement report for each of the tests in Table 4.7.4.2.1.5-1 shall meet the corresponding absolute accuracy requirements in Table 4.7.4.2.1.5-2 for test configurations 1, 2, 4 and 5, and the corresponding absolute accuracy requirements in Table 4.7.4.2.1.5-3 for test configurations 3 and 6.

Table 4.7.4.2.1.5-1: L1-RSRP test parameters

Parameter	Config	Unit	Test 1	Test 2
SSB GSCN	1~6		freq1	freq1
Duplex mode	1,4		FDD	FDD
	2,5		TDD	TDD
	3,6		TDD	TDD
TDD Configuration	1,4		N/A	N/A
	2,5		TDDConf.1.1	TDDConf.1.1
	3,6		TDDConf.2.1	TDDConf.2.1
$BW_{channel}$	1,4	MHz	10: $N_{RB,c}$ = 52	10: $N_{RB,c}$ = 52
	2,5		10: $N_{RB,c}$ = 52	10: $N_{RB,c}$ = 52
	3,6		40: $N_{RB,c}$ = 106	40: $N_{RB,c}$ = 106
PDSCH Reference measurement channel	1,4		SR.1.1 FDD	SR.1.1 FDD
	2,5		SR.1.1 TDD	SR.1.1 TDD
	3,6		SR.2.1 TDD	SR.2.1 TDD
RMSI CORESET Reference Channel	1,4		CR.1.1 FDD	CR.1.1 FDD
	2,5		CR.1.1 TDD	CR.1.1 TDD
	3,6		CR.2.1 TDD	CR.2.1 TDD
Dedicated CORESET Reference Channel	1,4		CCR.1.1 FDD	CCR.1.1 FDD
	2,5		CCR.1.1 TDD	CCR.1.1 TDD
	3,6		CCR.2.1 TDD	CCR.2.1 TDD
SSB configuration	1,4		SSB.3 FR1	SSB.3 FR1
	2,5		SSB.3 FR1	SSB.3 FR1
	3,6		SSB.4 FR1	SSB.4 FR1
OCNG Patterns	1~6		OP.1	OP.1
TRS configuration	1,4		TRS.1.1 FDD	TRS.1.1 FDD
	2,5		TRS.1.1 TDD	TRS.1.1 TDD
	3,6		TRS.1.2 TDD	TRS.1.2 TDD
Initial BWP Configuration	1~6		DLBWP.0.1 ULBWP.0.1	DLBWP.0.1 ULBWP.0.1
Dedicated BWP configuration	1~6		DLBWP.1.1 ULBWP.1.1	DLBWP.1.1 ULBWP.1.1
SMTC configuration	1~6		SMTC.1	SMTC.1
CSI-RS	1,4		CSI-RS 1.2 FDD	CSI-RS 1.2 FDD
	2,5		CSI-RS 1.2 TDD	CSI-RS 1.2 TDD
	3,6		CSI-RS 2.2 TDD	CSI-RS 2.2 FDD
reportConfigType	1~6		periodic	periodic
reportQuantity	1~6		cri-RSRP	cri-RSRP
Number of reported RS	1~6		2	2
L1-RSRP reporting period	1~6		slot80	slot80
EPRE ratio of PSS to SSS EPRE ratio of PBCH DMRS to SSS EPRE ratio of PBCH to PBCH DMRS EPRE ratio of PDCCH DMRS to SSS EPRE ratio of PDCCH to PDCCH DMRS EPRE ratio of PDSCH DMRS to SSS EPRE ratio of PDSCH to PDSCH DMRS EPRE ratio of OCNG DMRS to SSS[Note 1] EPRE ratio of OCNG to OCNG DMRS [Note 1]	1~6	dB	0	0
	1,2,4,5	dBm/15kHz	-94.65	-117+ Δ_{BG_offset}

Parameter		Config	Unit	Test 1	Test 2
N_{oc} Note2	Depending on band group	3,6		-96.00	117+ Δ_{BG_offset}
N_{oc} Note2		1,2,4,5	dBm/CSI-RS SCS	-94.65	-117+ Δ_{BG_offset}
		3,6		-93.00	-114+ Δ_{BG_offset}
$\hat{E}_s / I_{ot}$		1~6	dB	10	-2.2
CSI-RSRP Note3	Depending on band group	1,2,4,5	dBm/CSI-RS SCS	-84.65	-119.2 + Δ_{BG_offset}
		3,6		-83.00	-116.2 + Δ_{BG_offset}
Io Note3	Depending on band group	1,2,4,5	dBm/9.36 MHz	-56.28	-87.00 + Δ_{BG_offset}
		3,6	dBm/38.16 MHz	-51.53	-80.90 + Δ_{BG_offset}
$\hat{E}_s / N_{oc}$		1~6	dB	10	-2.2
Propagation condition		1~6		AWGN	AWGN
Antenna configuration		1~6		1x2	1x2

NOTE 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.
NOTE 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for N_{oc} to be fulfilled.
NOTE 3: RSRP and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.
NOTE 4: RSRP minimum requirements are specified assuming independent interference and noise at each receiver antenna port.
NOTE 5: The test configuration excludes support for band n51 and it is not required to run this test on band n51 in this release of the specification.

Table 4.7.4.2.1.5-2: Same as Table 4.7.4.1.1.5-2

Table 4.7.4.2.1.5-3: Same as Table 4.7.4.1.1.5-3

For the test to pass, the ratio of successful reported values in each test shall be more than 90% with a confidence level of 95%.

4.7.4.2.2 EN-DC FR1 CSI-RS-based L1-RSRP relative measurement accuracy

4.7.4.2.2.1 Test purpose

The purpose of this test is to verify that the CSI-RS based L1-RSRP relative measurement accuracy is within the specified limits for all bands.

4.7.4.2.2.2 Test applicability

This test applies to all types of NR UE supporting E-UTRA and EN-DC from Release 15 onwards.

4.7.4.2.2.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 4.7.4.0.4.

The normative reference for this requirement is TS 38.133 [6] clause A.4.7.4.2.

4.7.4.2.2.4 Test description

4.7.4.2.2.4.1 Initial conditions

This test shall be tested using any of the test configurations in Table 4.7.4.2.2.4.1-1.

Table 4.7.4.2.2.4.1-1: EN-DC FR1 CSI-RS based L1-RSRP relative measurement accuracy supported test configurations

Test Case ID	Description
4.7.4.2.2-1	LTE FDD, NR: 15 kHz SSB SCS, 10MHz bandwidth, FDD
4.7.4.2.2-2	LTE FDD, NR: 15 kHz SSB SCS, 10MHz bandwidth, TDD
4.7.4.2.2-3	LTE FDD, NR: 30 kHz SSB SCS, 40MHz bandwidth, TDD
4.7.4.2.2-4	LTE TDD, NR: 15 kHz SSB SCS, 10MHz bandwidth, FDD
4.7.4.2.2-5	LTE TDD, NR: 15 kHz SSB SCS, 10MHz bandwidth, TDD
4.7.4.2.2-6	LTE TDD, NR: 30 kHz SSB SCS, 40MHz bandwidth, TDD
NOTE: The UE is only required to be tested in one of the supported test configurations.	

Configure the test equipment and the DUT according to the parameters in Table 4.7.4.2.2.4.1-2.

Table 4.7.4.2.2.4.1-2: Initial conditions for CSI-RS based L1-RSRP relative accuracy in FR1

Parameter	Value		Comment
Test environment	NC, TL/VL, TL/VH, TH/VL, TH/VH		As specified in TS 38.508-1 [14] clause 4.1.
Test frequencies	As specified in Annex E, Table E.2-1 and TS 38.508-1 [14] clause 4.3.1.		
Channel bandwidth	As specified by the test configuration selected from Table 4.7.4.2.2.4.1-1.		
Propagation conditions	AWGN		As specified in clause C.2.2.
Connection Diagram	TE Part 2Rx	A.3.1.8.2 with n = 1	As specified in TS 38.508-1 [14] Annex A.
	TE Part 4Rx	A.3.1.8.5 with n = 1	
	DUT Part 2Rx	A.3.2.3.4	
	DUT Part 4Rx	A.3.2.5.2	
Exceptions to connection diagram	N/A		

1. Message contents are defined in clause 4.7.4.2.2.4.3.
2. Cell 1 is the E-UTRA serving cell (PCell) for the EN-DC setup. The power levels and settings for Cell 1 are set according to Annex A.6. Cell 2 is the NR FR1 cell. Cell 2 is the PSCell and the target for CSI-RS-based L1-RSRP measurements. Before the test, UE is configured to perform RLM and BFD measurement based on the SSBs. The connection setup is done according to the settings in clause C.1.1.

4.7.4.2.2.4.2 Test procedure

Prior to the start of the time duration T1, the UE shall be fully synchronized to PSCell. The UE shall be configured for periodic CSI reporting in PUCCH [format 2] with a reporting periodicity as mentioned in the above table 4.7.4.2.2.4.1-2.

1. Ensure the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity EN-DC, DC bearer MCG and SCG, Connected without release *On* and Test Mode *On*, according to TS 38.508-1 [14] clause 4.5 and general test parameters set according to Table 4.7.4.2.2.4.1-2.
2. Set the parameters according to T1 in Table 4.7.4.2.2.5-1.
3. The UE shall start sending L1-RSRP report including results of both CSI-RS#0 and CSI-RS #1 every 80 slots.
4. The SS shall check the L1-RSRP reported values of CSI-RS #0 and CSI-RS #1 in the periodic L1-RSRP reports. The DIFF-RSRP value of CSI-RS#0 or CSI-RS#1 reported by the UE is compared to the expected DIFF-RSRP.

If the DIFF-RSRP value is within the limits in Table 4.7.4.2.2.5-2, the number of passed iterations is increased by one, otherwise the number of failed iterations is increased by one.

5. The SS shall continue checking the L1-RSRP report messages transmitted by the UE until the confidence level according to Table G.2.3-1 in Annex G is achieved.

6. Set the parameters according to each sub-test in Table 4.7.4.2.2.5-1 as appropriate and repeat steps 3-5.

4.7.4.2.2.4.3 Message contents

Message contents are same as in Clause 4.7.4.2.1.4.3.

4.7.4.2.2.5 Test requirement

Table 4.7.4.2.2.5-1 defines the primary level settings including test tolerances for all tests.

Each L1-RSRP measurement report for each of the tests in Table 4.7.4.2.2.5-1 shall meet the corresponding absolute accuracy requirements in Table 4.7.4.2.2.5-2.

Table 4.7.4.2.2.5-1: Same as Table 4.7.4.2.1.5-1

Table 4.7.4.2.2.5-2: Same as Table 4.7.4.1.2.5-2

For the test to pass, the ratio of successful reported values in each test shall be more than 90% with a confidence level of 95%.

4.7.5 SFTD

4.7.5.0 Minimum conformance requirements

4.7.5.0.1 SFTD Accuracy Requirement

The SFN and frame timing difference (SFTD) is measured between PCell and NR PSCell under EN-DC, or between PCell and NR cell for inter-RAT SFTD. The inter-RAT SFTD measurement can only be configured for E-UTRA - NR band combinations that are supported by the UE.

The accuracy requirements in Table 4.7.5.0.1-3 are applicable under the following conditions:

For PCell SFN and frame timing measurement:

- Cell specific reference signals are transmitted either from one, two or four antenna ports.
- Conditions defined in TS 36.101 [27] clause 7.3 for reference sensitivity are fulfilled.
- No changes to the uplink transmission timing are applied during the measurement period.
- $RSRP|_{dBm}$ according to Annex B.3.5 of TS 36.133 [23] for a corresponding Band.
- Io range defined in Table 4.7.5.0.1-1.

Table 4.7.5.0.1-1: PCell Io range conditions for SFTD measurement accuracy

Parameter	Io Note 1 range		
	E-UTRA operating band groups Note 4, 5	Minimum Io	Maximum Io
		dBm/15kHz Note 2, 3	$dBm/BW_{Channel}$
Conditions	FDD_A, TDD_A	-121	-50
	FDD_C, TDD_C	-120	-50
	FDD_D	-119.5	-50
	FDD_E, TDD_E	-119	-50
	FDD_F	-118.5	-50

	FDD_G	-118	-50
	FDD_H	-117.5	-50
	FDD_N	-114.5	-50

NOTE 1: When in dBm/15kHz, the minimum Io condition is expressed as the average Io per RE over all REs in that symbol. Io may be different in different symbols within a subframe.
NOTE 2: The condition level is increased by Δ>0, when applicable, as described in clause B.4.2 and B.4.3 of TS 36.133 [23].
NOTE 3: The condition level is increased by MSD as defined in clause 7.3B in TS 38.101-3 [4], if applicable depending on E-UTRA - NR band combination.
NOTE 4: E-UTRA operating band groups are as defined in clause 3.5 of TS 36.133 [23].
NOTE 5: Only E-UTRA bands within EN-DC band combinations as specified in clause 5.5B in TS 38.101-3 [4] are applicable.

For NR PSCell, or NR cell SFN and frame timing measurement in FR1:

- Conditions defined in TS 38.101-1 [2] clause 7.3 for reference sensitivity are fulfilled.
- Io range defined in Table 4.7.5.0.1-2.

Table 4.7.5.0.1-2: NR PSCell, or NR cell Io range conditions for SFTD measurement accuracy in FR1

Parameter	Io Note 1 range			
	NR operating band groups Note 4, 5	Minimum Io Note 2, 3		Maximum Io
		dBm/ SCS_{SSB}		dBm/$BW_{Channel}$
		SCS_{SSB} = 15 kHz	SCS_{SSB} = 30 kHz	
Conditions	NR_FDD_FR1_A, NR_TDD_FR1_A	-121	-118	-50
	NR_FDD_FR1_B	-120.5	-117.5	-50
	NR_TDD_FR1_C	-120	-117	-50
	NR_FDD_FR1_D, NR_TDD_FR1_D	-119.5	-116.5	-50
	NR_FDD_FR1_E, NR_TDD_FR1_E	-119	-116	-50
	NR_FDD_FR1_G	-118	-115	-50
	NR_FDD_FR1_H	-117.5	-114.5	-50

NOTE 1: Io is assumed to have constant EPRE across the bandwidth.
NOTE 2: The condition level is increased by $\Delta R_{IB,c}$ as defined in clause 7.3B in TS 38.101-3 [4], depending on E-UTRA - NR band combination.
NOTE 3: The condition level is increased by MSD as defined in clause 7.3B in TS 38.101-3 [4], if applicable depending on E-UTRA - NR band combination.
NOTE 4: NR operating band groups are as defined in clause 3.5 of TS 36.133 [23].
NOTE 5: Only NR bands within EN-DC band combinations as specified in clause 5.5B in TS 38.101-3 [4] are applicable.

Table 4.7.5.0.1-3: SFTD measurement accuracy

Accuracy	Conditions	
	Ês/Iot	Frequency range
Ts Note 1	dB	
40	≥ -3 dB	FR1
40		FR2

NOTE 1: Ts is the basic timing unit defined in TS 36.211 [24].
NOTE 2: The parameter Ês/Iot is the minimum Ês/Iot of the pair of cells to which the requirement applies.

4.7.5.1 EN-DC FR1 SFTD measurement accuracy

4.7.5.1.1 Test purpose

The purpose of this test is to verify that SFTD measurement accuracy is within the specified limits for all bands.

4.7.5.1.2 Test applicability

This test applies to all types of NR UE supporting E-UTRA and EN-DC from Release 15 onwards. Applicability requires support of SFTD measurements between an E-UTRA PCell and an NR PSCell.

4.7.5.1.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 4.7.5.0.1.

The normative reference for this requirement is TS 38.133 [6] clause A.4.7.5.1.

4.7.5.1.4 Test description

4.7.5.1.4.1 Initial conditions

This test shall be tested using any of the test configurations in Table 4.7.5.1.4.1-1.

Table 4.7.5.1.4.1-1: Test configurations

Test Case ID	Description
4.7.5.1-1	LTE FDD, NR: 15 kHz SSB SCS, 10MHz bandwidth, FDD
4.7.5.1-2	LTE FDD, NR: 15 kHz SSB SCS, 10MHz bandwidth, TDD
4.7.5.1-3	LTE FDD, NR: 30 kHz SSB SCS, 40MHz bandwidth, TDD
4.7.5.1-4	LTE TDD, NR: 15 kHz SSB SCS, 10MHz bandwidth, FDD
4.7.5.1-5	LTE TDD, NR: 15 kHz SSB SCS, 10MHz bandwidth, TDD
4.7.5.1-6	LTE TDD, NR: 30 kHz SSB SCS, 40MHz bandwidth, TDD
NOTE: The UE is only required to be tested in one of the supported test configurations.	

Configure the test equipment and the DUT according to the parameters in Table 4.7.5.1.4.1-2.

Table 4.7.5.1.4.1-2: Initial conditions

Parameter	Value		Comment
Test environment	NC, TL/VL, TL/VH, TH/VL, TH/VH		As specified in TS 38.508-1 [14] clause 4.1.
Test frequencies	As specified in Annex E, Table E.2-1 and TS 38.508-1 [14] clause 4.3.1.		
Channel bandwidth	As specified by the test configuration selected from Table 4.7.5.1.4.1-1.		
Propagation conditions	AWGN		As specified in clause C.2.2.
Connection Diagram	TE Part 2Rx	A.3.1.8.2 with n = 1	As specified in TS 38.508-1 [14] Annex A.
	TE Part 4Rx	A.3.1.8.5 with n = 1	
	DUT Part 2Rx	A.3.2.3.4	
	DUT Part 4Rx	A.3.2.5.2	
Exceptions to connection diagram	N/A		

1. Message contents are defined in clause 4.7.5.1.4.3.
2. Cell 1 is the E-UTRA serving cell (PCell) for the EN-DC setup. The power levels and settings for Cell 1 are set according to Annex A.6. Cell 2 is the NR FR1 cell. Cell 2 is the PSCell. The connection setup is done according to the settings in clause C.1.1.
3. The SFTD between PCell and PSCell shall be set to one of the conditions in Table 4.7.5.1.5-2. For negative Frame boundary offset, it can be achieved delaying PSCell in regards to PCell OR advancing PCell in regards to PSCell. For positive Frame boundary offset, it can be achieved delaying PCell in regards to PSCell OR advancing PSCell in regards to PCell.

4.7.5.1.4.2 Test procedure

1. Ensure the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity EN-DC, DC bearer MCG and SCG, Connected without release *On* and Test Mode *On*, according to TS 38.508-1 [14] clause 4.5.
2. Set the parameters according to Table 4.7.5.1.5-1 and Table 4.7.5.1.5-2 as appropriate. (Condition = 3)
3. The SS shall transmit an RRCConnectionReconfiguration message on Cell 1.
4. The UE shall transmit an RRCConnectionReconfigurationComplete message.
5. The UE shall transmit a MeasurementReport containing the MeasResultCellListSFTD-r15 for the PSCell with SFTD measurements.
6. The SS shall check the reported SFN offset and frame boundary offset between the E-UTRA PCell and the NR PSCell. The number of failed iterations is increased by one if
   - The value of *sfn-OffsetResult* is different with the expected SFN offset value, or
   - The value of *frameBoundaryOffsetResult* is outside the range given in Table 4.7.5.1.5-3, or
   - The UE fails to report the measurement value for Cell 2.

   Otherwise the number of successful iterations is increased by one.
7. Switch off and on the UE and ensure the UE is in RRC_CONNECTED with generic procedure parameters Connectivity EN-DC, DC bearer MCG and SCG, Connected without release *On* and Test Mode *On*, according to TS 38.508-1 [14] clause 4.5.
8. Repeat steps 2-7 until the confidence level according to Tables G.2.3-1 in Annex G clause G.2 is achieved.

4.7.5.1.4.3 Message contents

Message contents are according to TS 38.508-1 [14] clause 7.3 with the following exceptions:

Table 4.7.5.1.4.3-1: Common exception messages

Default Message Contents	
Common contents of system information blocks exceptions	
Default RRC messages and information elements contents exceptions	Table H.3.4-4 with Condition INTER_RAT, GAPLESS and SFTD Table H.3.4-7 with Condition Inter-RAT and SFTD
Specific message contents exceptions for Test Configuration 4.7.5.1.-1, 4.7.5.1-2, 4.7.5.1-4 and 4.7.5.1-54	Table H.3.4-6 with Condition SSB.1 FR1 and SMTC.1
Specific message contents exceptions for Test Configuration 4.7.5.1-3 and 4.7.5.1-6	Table H.3.4-6 with Condition S SB.2 FR1 and SMTC.1

Table 4.7.5.1.4.3-2: ReportConfigInterRAT-SFTD

Derivation Path: TS 36.508 [25], Table 4.6.6-8B			
Information Element	**Value/remark**	**Comment**	**Condition**
ReportConfigInterRAT ::= SEQUENCE {			
reportQuantityCellNR-r15 ::= SEQUENCE {			
ss-rsrp	true		
}			
reportSFTD-Meas-r15	pSCell		
}			

4.7.5.1.5 Test requirement

Table 4.7.5.1.5-1 defines the primary level settings including test tolerances.

Table 4.7.5.1.5-1: Test parameters for SFTD accuracy

Parameter	Config	Unit	Test 1
SSB GSCN	1~6		freq1
Duplex mode	1,4		FDD
	2,5		TDD
	3,6		TDD
TDD Configuration	1,4		N/A
	2,5		TDDConf.1.1
	3,6		TDDConf.2.1
$BW_{channel}$	1,4	MHz	10: $N_{RB,c}$ = 52
	2,5		10: $N_{RB,c}$ = 52
	3,6		40: $N_{RB,c}$ = 106
PDSCH Reference measurement channel	1,4		SR.1.1 FDD
	2,5		SR.1.1 TDD
	3,6		SR.2.1 TDD
RMSI CORESET Reference Channel	1,4		CR.1.1 FDD
	2,5		CR.1.1 TDD
	3,6		CR.2.1 TDD
RMC CORESET Reference Channel	1,4		CCR.1.1 FDD
	2,5		CCR.1.1 TDD
	3,6		CCR.2.1 TDD
SSB configuration	1,4		SSB.1 FR1
	2,5		SSB.1 FR1
	3,6		SSB.2 FR1
SMTC configuration	1~6		SMTC.1
DL BWP configuration	1~6		DLBWP.1.1
UL BWP configuration	1~6		ULBWP.1.1
CSI-RS for tracking	1,4		TRS.1.1 FDD
	2,5		TRS.1.1 TDD
	3,6		TRS.1.2 TDD
OCNG Patterns	1~6		OP.1
EPRE ratio of PSS to SSS	1~6	dB	0
EPRE ratio of PBCH DMRS to SSS			
EPRE ratio of PBCH to PBCH DMRS			
EPRE ratio of PDCCH DMRS to SSS			
EPRE ratio of PDCCH to PDCCH DMRS			
EPRE ratio of PDSCH DMRS to SSS			
EPRE ratio of PDSCH to PDSCH DMRS			
EPRE ratio of OCNG DMRS to SSS Note 1			
EPRE ratio of OCNG to OCNG DMRS Note 1			
N_{oc} Note2	1~6	dBm/15kHz	-104
N_{oc} Note2	1,2,4,5	dBm/SSB SCS	-104
	3,6		-101
$\hat{E}_s/I_{ot}$	1~6	dB	-2.7
$\hat{E}_s/N_{oc}$	1~6	dB	-2.7
SS-RSRP Note3	1,2,4,5	dBm/SCS	-106.7
	3,6		-103.7
Io Note3	1,2,4,5	dBm/9.36 MHz	-74.18
	3,6	dBm/38.16 MHz	-68.08
Propagation condition	1~6		AWGN
Antenna configuration	1~6		1x2
NOTE 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.			

Parameter	Config	Unit	Test 1
NOTE 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for N_{oc} to be fulfilled.			
NOTE 3: SS-RSRP and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.			
NOTE 4: SS-RSRP minimum requirements are specified assuming independent interference and noise at each receiver antenna port.			
NOTE 5: The test configuration excludes support for band n51 and it is not required to run this test on band n51 in this release of the specification			

The SFTD reported by the UE consists of two elements, the SFN offset and the frame boundary offset between PCell and PSCell. Table 4.7.5.1.5-2 defines the timing offsets for the SFTD accuracy test. The SFN offset in reported SFTD shall match the values in Table 4.7.5.1.5-2 and the frame boundary offset in reported SFTD shall be within the range given in Table 4.7.5.1.5-3.

Table 4.7.5.1.5-2: Timing offsets for SFTD accuracy test

Condition	SFN offset between PCell and PSCell	Frame boundary offset between PCell and PSCell (Ts)
1	100	-122000
2	300	-60540
3	500	1000
4	700	62540
5	900	124000

Table 4.7.5.1.5-3: EN-DC FR1 SFTD measurement accuracy requirements for the value of frameBoundaryOffsetResult in reported SFTD

Normal and Extreme Conditions	frameBoundaryOffsetResult				
	Condition 1	Condition 2	Condition 3	Condition 4	Condition 5
Lowest reported value	-24408	-12116	192	12500	24792
Highest reported value	-24392	-12100	208	12516	24808

For the test to pass, the ratio of successful reported values in each test shall be more than 90% with a confidence level of 95%.

4.7.6 CLI measurements

4.7.6.0 Minimum conformance requirements

4.7.6.0.1 Minimum conformance requirements for SRS-RSRP accuracy

The SRS-RSRP measurement reported by the UE shall fulfil the accuracy requirements defined in Table 4.7.6.0.1-1 for FR1 and Table 4.7.6.0.1-2 for FR2, provided that the following conditions are met. The accuracy requirements in this clause are derived based on AWGN radio propagation conditions.

- Conditions defined in clause 7.3 of TS 38.101-1 [18] for reference sensitivity are fulfilled.
- Conditions for SRS-RSRP measurements are fulfilled according to Annex B.2.z for a corresponding Band for each relevant SRS resource configured for measurement.
- The time difference between UE's DL reference timing in the serving cell and SRS arrival time is no larger than $T_{error_SRS_RSRP}$, where
  - $T_{error_SRS_RSRP} = T_C \times N_{TA_offset}$ + 4.67us for FR1

- $T_{error_SRS_RSRP} = T_C \times N_{TA_offset}$ + 3.67us for FR2
- N_{TA_offset} is defined in Table 7.1.2-2
- T_C is 0.509ns

- The number of SRS ports in the SRS resource configured for measurement is 1,
- The number of symbols in the SRS resource configured for measurement is 1,
- The number of repetitions in the SRS resource configured for measurement is 1,
- Frequency hopping, sequence group hopping or sequence hopping is disabled in the SRS resource configured for measurement,
- The bandwidth of the SRS resource is 48 PRBs.
- One of the following conditions is met
  - There is no other SRS resource with the same root sequence and on the same symbol and with same comb as the relevant SRS resource.
  - If multiple SRS resources are on the same symbol and with same comb, the distance between cyclic shifts of any two resources is no less than 6 if transmissionComb = n4, and no less than 4 if transmissionComb = n2.

Table 4.7.6.0.1-1: SRS-RSRP absolute accuracy in FR1

Accuracy						Conditions						
Normal condition			Extreme condition			SRS Ês/Iot	Io [Note 1] range					
							NR operating band groups [Note 2]	Minimum Io				Maximum Io
dB						dB		dBm / SCS_{SRS}			dBm/BW Channel	dBm/BW Channel
SCS_{SRS} (kHz)			SCS_{SRS} (kHz)									
15	30	60	15	30	60			SCS_{SRS} = 15 kHz	SCS_{SRS} = 30 kHz	SCS_{SRS} = 60 kHz		
±3	±3.5	±5	±7.5	±8	±9.5	≥1	NR_TDD_FR1_A,	-120	-117	-114	N/A	-70
							NR_TDD_FR1_C	-119	-116	-113	N/A	-70
							NR_TDD_FR1_D	-118.5	-115.5	-112.5	N/A	-70
							NR_TDD_FR1_E	-118	-115	-112	N/A	-70
±6.5	±7	±8.5	±9.5	±10	±11.5	≥1	NR_TDD_FR1_A, NR_TDD_FR1_C, NR_TDD_FR1_D, NR_TDD_FR1_E	N/A	N/A	N/A	-70	-50

NOTE 1: Io is assumed to have constant EPRE across the bandwidth.
NOTE 2: NR operating band groups in FR1 are as defined in clause 3.5.2.

Table 4.7.6.0.1-2: SRS-RSRP absolute accuracy in FR2

Accuracy		Conditions		
Normal condition	Extreme condition	SRS Ês/Iot	Io [Note 1] range	
			Minimum Io	Maximum Io

dB				dB	dBm / SCS_{SRS} Note 2		dBm/$BW_{Channel}$	dBm/$BW_{Channel}$
SCS_{SRS} (kHz)		SCS_{SRS} (kHz)			SCS_{SRS} = 60kHz	SCS_{SRS} = 120kHz		
60	120	60	120					
±6	±8.5	±9	±11.5	≥1	Same value as SRS_RP in Table B.2.7-2, according to UE Power class, operating band and angle of arrival		N/A	-70
±9	±11.5	±11	±13.5	≥1	N/A		-70	-50

NOTE 1: Io specified at the Reference point, and assumed to have constant EPRE across the bandwidth.
NOTE 2: Values based on Refsens and EIS spherical coverage as defined in clauses 7.3.2 and 7.3.4 of TS 38.101-2 [19]. Applicable side condition selected depending on angle of arrival.
NOTE 3: In the test cases, the SSB Ês/Iot and related parameters may need to be adjusted to ensure Ês/Iot at UE baseband is above the value defined in this table.

4.7.6.0.1.1 SRS-RSRP report mapping

The reporting range of SRS-RSRP is defined from -140 dBm to -44 dBm with 1 dB resolution. The mapping of measured quantity is defined in Table 4.7.6.0.1.2-1. The range in the signalling may be larger than the guaranteed accuracy range.

Table 4.7.6.0.1.2-1: SRS-RSRP measurement report mapping

Reported value	Measured quantity value	Unit
SRS-RSRP_0	SRS-RSRP<-140	dBm
SRS-RSRP_1	-140≤ SRS-RSRP<-139	dBm
SRS-RSRP_2	-139≤ SRS-RSRP<-138	dBm
SRS-RSRP_3	-138≤ SRS-RSRP<-137	dBm
SRS-RSRP_4	-137≤ SRS-RSRP<-136	dBm
..	..	…
SRS-RSRP_95	-46≤ SRS-RSRP<-45	dBm
SRS-RSRP_96	-45≤ SRS-RSRP<-44	dBm
SRS-RSRP_97	-44≤ SRS-RSRP	dBm
SRS-RSRP_98	Infinity	
Note: 'Infinity' means that UE cannot detect SRS due to too strong signal to measure.		

The normative reference for this requirement is TS 38.133 [6] clause 10.1.22.1.

4.7.6.0.2 Minimum conformance requirements for CLI-RSSI measurement accuracy with FR1 serving cell

The CLI-RSSI measurement reported by the UE shall fulfil the accuracy requirements defined in Table 4.7.6.0.2-1 for FR1 and Table 4.7.6.0.2-2 for FR2, provided that the following conditions are met.

- Conditions defined in clause 7.3 of TS 38.101-1 [18] for reference sensitivity are fulfilled.

Table 4.7.6.0.2-1: CLI-RSSI absolute accuracy in FR1

Accuracy		Conditions		
Normal condition	Extreme condition	Io Note 1 range		
		NR operating band groups Note 2	Minimum Io	Maximum Io

dB	dB		dBm / SCS_{SRS}			$dBm/BW_{Channel}$	$dBm/BW_{Channel}$
			SCS_{SRS} = 15 kHz	SCS_{SRS} = 30 kHz	SCS_{SRS} = 60 kHz		
±3.5	±6.5	NR_TDD_FR1_A,	-120	-117	-114	N/A	-70
		NR_TDD_FR1_C	-119	-116	-113	N/A	-70
		NR_TDD_FR1_D	-118.5	-115.5	-112.5	N/A	-70
		NR_TDD_FR1_E	-118	-115	-112	N/A	-70
±5.5	±8.5	Note 3	Note 3	Note 3	Note 3	-70	-50
NOTE 1: Io is assumed to have constant EPRE across the bandwidth. NOTE 2: NR operating band groups in FR1 are as defined in clause 3.5.2. NOTE 3: The same bands and the same Io conditions for each band apply for this requirement as for the corresponding highest accuracy requirement.							

Table 4.7.6.0.2-2: CLI-RSSI absolute accuracy in FR2

Accuracy		Conditions		
Normal condition	Extreme condition	Io Note 1 range		
		Minimum Io		Maximum Io
dB	dB	dBm / SCS_{SRS} Note 2	$dBm/BW_{Channel}$	$dBm/BW_{Channel}$
		SCS_{SRS} = 60kHz / SCS_{SRS} = 120kHz		
±5	±8	Same value as SRS_RP in Table B.2.7-2, according to UE Power class, operating band and angle of arrival	N/A	-70
±7	±10	Note 4	-70	-50
NOTE 1: Io specified at the Reference point, and assumed to have constant EPRE across the bandwidth. NOTE 2: Values based on Refsens and EIS spherical coverage as defined in clauses 7.3.2 and 7.3.4 of TS 38.101-2 [19]. Applicable side condition selected depending on angle of arrival. NOTE 3: In the test cases, the SSB Ês/Iot and related parameters may need to be adjusted to ensure Ês/Iot at UE baseband is above the value defined in this table. NOTE 4: The same bands and the same Io conditions for each band apply for this requirement as for the corresponding highest accuracy requirement.				

4.7.6.0.2.1 CLI-RSSI report mapping

The reporting range of CLI-RSSI is defined from -100 dBm to -25 dBm with 1 dB resolution. The mapping of measured quantity is defined in Table 4.7.6.0.2.1-1. The range in the signalling may be larger than the guaranteed accuracy range. UE shall scale the measured CLI-RSSI to report a nominal RSSI equivalent to 6RB measurement with 15kHz SCS.

Table 4.7.6.0.2.1-1: CLI-RSSI measurement report mapping

Reported value	Measured quantity value	Unit
CLI-RSSI_00	CLI-RSSI < -100	dBm
CLI-RSSI_01	-100 ≤ CLI-RSSI < -99	dBm
CLI-RSSI_02	-99 ≤ CLI-RSSI < -98	dBm
…	…	…
CLI-RSSI_74	-27 ≤ CLI-RSSI < -26	dBm
CLI-RSSI_75	-26 ≤ CLI-RSSI < -25	dBm
CLI-RSSI_76	-25 ≤ CLI-RSSI	dBm

The normative reference for this requirement is TS 38.133 [6] clauses 10.1.22.2.

4.7.6.1 EN-DC SRS-RSRP measurement accuracy with FR1 serving cell

Editor's Note: This test case is incomplete in following aspects:

- Message contents are missing.
- TT analysis is missing.

- Test Procedure is FFS.
- Test applicability needs to be updated

4.7.6.1.1 Test purpose

The purpose of this test is to verify that the SRS-RSRP measurement accuracy is within the specified limits with SRS-RSRP measurement requirements in TS 38.133 [6] clause 10.1.22.1.1.

4.7.6.1.2 Test applicability

FFS

4.7.6.1.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 4.7.6.0.1.

The normative reference for this requirement is TS 38.133 [6] clause A.4.7.6.1.

4.7.6.1.4 Test description

4.7.6.1.4.1 Initial conditions

This test shall be tested using any of the test configurations in Table 4.7.6.1.4.1-1. Test environment parameters are given in Table 4.7.6.2.4.1-2.

Table 4.7.6.1.4.1-1: EN-DC FR1 SRS-RSRP accuracy supported test configurations

Config	Description
1	LTE FDD, NR 15 kHz SRS SCS, 10 MHz bandwidth, TDD duplex mode
2	LTE FDD, NR 30kHz SRS SCS, 40 MHz bandwidth, TDD duplex mode
3	LTE TDD, NR 15 kHz SRS SCS, 10 MHz bandwidth, TDD duplex mode
4	LTE TDD, NR 30kHz SRS SCS, 40 MHz bandwidth, TDD duplex mode
Note: The UE is only required to be tested in one of the supported test configurations in each supported band	

Table 4.7.6.1.4.1-2: SRS Configuration parameters for EN-DC SRS-RSRP accuracy

Parameter	Value		Comment
Test environment	NC		As specified in TS 38.508-1 [14] clause 4.1.
Test frequencies	As specified in Annex E, Table E.2-1 and TS 38.508-1 [14] clause 4.3.1 and 4.4.2.		
Channel bandwidth	As specified by the test configuration selected from Table 4.7.6.2.4.1-1.		
Propagation conditions	AWGN		As specified in Annex C.2.2.
Connection Diagram	TE Part	A.3.1.7.1	As specified in TS 38.508-1 [14] Annex A.
	DUT Part	A.3.2.3.4	
Exceptions to connection diagram	For 4Rx capable UEs without any 2 Rx RF bands use A.3.2.5.2 for DUT part and A.3.1.8.4 for TE Part		

1. Message contents are defined in clause 4.7.6.1.4.3.
2. Cell 1 is the E-UTRA serving cell (PCell) for the EN-DC setup. The power levels and settings for Cell 1 are set according to Annex A.6. Cell 2 is NR FR1 cell (PSCell). Cell 2 is the target for SRS-RSRP measurements. Before the test UE is configured to perform SRS-RSRP measurement. During the test, the test system transmits SRS resources for measurement in the DL slots according to the SRS configuration in Table 4.7.6.1.5-3. There is no measurement gap configured in the test. During the test, the test system does not transmit PDCCH/PDSCH/OCNG on SRS symbol to be transmitted and on 1 data symbol before SRS to be transmitted.

4.7.6.1.4.2 Test procedure

FFS

4.7.6.1.4.3 Message contents

Message contents are according to TS 38.508-1 [14] clause 7.3 with the following exceptions:

FFS

4.7.6.1.5 Test requirement

Table 4.7.6.1.5-1 defines the primary level settings including test tolerances for all tests.

Table 4.7.6.1.5-1: NR Cell specific test parameters for EN-DC SRS-RSRP accuracy for PSCell

Parameter		Config	Unit	Test 1	Test 2	Test 3
SSB GSCN		1~4		freq1	freq1	freq1
Duplex mode		1~4		TDD	TDD	TDD
TDD configuration		1,3		TDDConf.1.1	TDDConf.1.1	TDDConf.1.1
		2,4		TDDConf.2.1	TDDConf.2.1	TDDConf.2.1
$BW_{channel}$		1,3	MHz	10: $N_{RB,c}$ = 52	10: $N_{RB,c}$ = 52	10: $N_{RB,c}$ = 52
		2,4		40: $N_{RB,c}$ = 106	40: $N_{RB,c}$ = 106	40: $N_{RB,c}$ = 106
PDSCH Reference measurement channel		1,3		SR.1.1 TDD	SR.1.1 TDD	SR.1.1 TDD
		2,4		SR.2.1 TDD	SR.2.1 TDD	SR.2.1 TDD
RMSI CORESET Reference Channel		1,3		CR.1.1 TDD	CR.1.1 TDD	CR.1.1 TDD
		2,4		CR.2.1 TDD	CR.2.1 TDD	CR.2.1 TDD
Dedicated CORESET Reference Channel		1,3		CCR.1.1 TDD	CCR.1.1 TDD	CCR.1.1 TDD
		2,4		CCR.2.1 TDD	CCR.2.1 TDD	CCR.2.1 TDD
SSB configuration		1,3		SSB.1 FR1	SSB.1 FR1	SSB.1 FR1
		2,4		SSB.2 FR1	SSB.2 FR1	SSB.2 FR1
OCNG Patterns		1~4		OP.1	OP.1	OP.1
TRS configuration		1,3		TRS.1.1 TDD	TRS.1.1 TDD	TRS.1.1 TDD
		2,4		TRS.1.2 TDD	TRS.1.2 TDD	TRS.1.2 TDD
Initial BWP Configuration		1~4		DLBWP.0.1 ULBWP.0.1	DLBWP.0.1 ULBWP.0.1	DLBWP.0.1 ULBWP.0.1
Dedicated BWP configuration		1~4		DLBWP.1.1 ULBWP.1.1	DLBWP.1.1 ULBWP.1.1	DLBWP.1.1 ULBWP.1.1
SMTC configuration		1~4		SMTC.1	SMTC.1	SMTC.1
Time offset between DL from serving cell and SRS from test system		1~4	µs	17.67	17.67	17.67
EPRE ratio of PSS to SSS		1~4	dB	0	0	0
EPRE ratio of PBCH DMRS to SSS						
EPRE ratio of PBCH to PBCH DMRS						
EPRE ratio of PDCCH DMRS to SSS						
EPRE ratio of PDCCH to PDCCH DMRS						
EPRE ratio of PDSCH DMRS to SSS						
EPRE ratio of PDSCH to PDSCH DMRS						
EPRE ratio of OCNG DMRS to SSS Note 1						
EPRE ratio of OCNG to OCNG DMRS Note 1						
N_{oc} Note2	NR_TDD_FR1_A Note3	1,3	dBm/15kHz	-106	-88	-114
	NR_TDD_FR1_C					-113
	NR_TDD_FR1_D					-112.5

	NR_TDD_FR1_E					-112
	NR_TDD_FR1_A Note3	2,4		Not applicable Note4	-91	-114
	NR_TDD_FR1_C					-113
	NR_TDD_FR1_D					-112.5
	NR_TDD_FR1_E					-112
N_{oc} Note2	NR_TDD_FR1_A Note3	1,3	dBm/SRS SCS	-106	-88	-114
	NR_TDD_FR1_C					-113
	NR_TDD_FR1_D					-112.5
	NR_TDD_FR1_E					-112
	NR_TDD_FR1_A Note3	2,4		Not applicable Note4	-88	-111
	NR_TDD_FR1_C					-110
	NR_TDD_FR1_D					-109.5
	NR_TDD_FR1_E					-109
Note 1: OCNG shall be used such that a constant total transmitted power spectral density is achieved for all OFDM symbols.						
Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for N_{oc} to be fulfilled.						
Note 3: The test configuration excludes support for band n51 and it is not required to run this test on band n51 in this release of the specification						
Note 4: Test 1 is not used when testing with 30kHz SSB SCS						

Table 4.7.6.1.5-2: NR Cell specific test parameters for EN-DC FR1 SRS-RSRP accuracy for neighbour cell UE

Parameter		Config	Unit	Test 1	Test 2	Test 3
N_{oc} Note2	NR_TDD_FR1_A NOTE 3	1,3	dBm/15kHz	-106	-88	-114
	NR_TDD_FR1_C					-113
	NR_TDD_FR1_D					-112.5
	NR_TDD_FR1_E					-112
	NR_TDD_FR1_A NOTE 5	2,4		Not applicable Note 6	-91	-114
	NR_TDD_FR1_C					-113
	NR_TDD_FR1_D					-112.5
	NR_TDD_FR1_E					-112
N_{oc} Note2	NR_TDD_FR1_A NOTE 5	1,3	dBm/SRS SCS	-106	-88	-114
	NR_TDD_FR1_C					-113
	NR_TDD_FR1_D					-112.5
	NR_TDD_FR1_E					-112
	NR_TDD_FR1_A NOTE 5	2,4		Not applicable Note 6	-88	-111
	NR_TDD_FR1_C					-110
	NR_TDD_FR1_D					-109.5
	NR_TDD_FR1_E					-109
$\hat{E}_s/I_{ot}$ on SRS		1~4	dB	1	1	1
SRS RSRP Note3	NR_TDD_FR1_A NOTE 5	1,3	dBm/SRS SCS	-105 +TT	-87 +TT	-113+TT
	NR_TDD_FR1_C					-112+TT
	NR_TDD_FR1_D					-111.5+TT
	NR_TDD_FR1_E					-111+TT
	NR_TDD_FR1_A NOTE 5	2,4		Not applicable Note 6	-87+TT	-110+TT
	NR_TDD_FR1_C					-109+TT
	NR_TDD_FR1_D					-108.5+TT
	NR_TDD_FR1_E					-108+TT

Io Note3	NR_TDD_FR1_A NOTE 5	1,3	dBm/9.36 MHz	-74.51	-56.51	-82.51
	NR_TDD_FR1_C					-81.51
	NR_TDD_FR1_D					-81.01
	NR_TDD_FR1_E					-79.51
	NR_TDD_FR1_A NOTE 5	2,4	dBm/38.16 MHz	Not applicable Note 6	-53.42	-76.42
	NR_TDD_FR1_C					-75.42
	NR_TDD_FR1_D					-74.92
	NR_TDD_FR1_E					-74.42
$\hat{E}_s / N_{oc}$ on SRS		1~4	dB	1	1	1
Propagation condition		1~4		AWGN	AWGN	AWGN
Antenna configuration		1~4		1x2	1x2	1x2
SRS configuration		1,3		SRSConf.1	SRSConf.1	SRSConf.1
		2,4		SRSConf.2	SRSConf.2	SRSConf.2

Note 1: The resources for uplink transmission are assigned to the UE prior to the start of the test.
Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for N_{oc} to be fulfilled.
Note 3: RSRP and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.
Note 4: RSRP minimum requirements are specified assuming independent interference and noise at each receiver antenna port.
Note 5: The test configuration excludes support for band n51 and it is not required to run this test on band n51 in this release of the specification
Note 6: Test 1 is not used when testing with 30kHz SSB SCS

Table 4.7.6.1.5-3: SRS configuration for FR1 SRS-RSRP accuracy

	Field	SRSConf.1	SRSConf.2
SRS-ResourceSet	srs-ResourceSetId	0	0
	srs-ResourceIdList	0	0
	resourceType	Periodic	Periodic
	Usage	Codebook	Codebook
SRS-Resource	SRS-ResourceId	0	0
	nrofSRS-Ports	Port1	Port1
	transmissionComb	n2	n2
	combOffset-n2	0	0
	cyclicShift-n2	0	0
	resourceMapping startPosition	0	0
	resourceMapping nrofSymbols	n1	n1
	resourceMapping repetitionFactor	n1	n1
	freqDomainPosition	0	0
	freqDomainShift	0	0
	freqHopping c-SRS	12	12
	freqHopping b-SRS	0	0
	freqHopping b-hop	0	0
	groupOrSequenceHopping	Neither	Neither
	resourceType	Periodic	Periodic
	periodicityAndOffset-p	sl20, 9	sl40, 19
	sequenceId	0	0

For the test to pass, the ratio of successful reported values in each test shall be more than 90% with a confidence level of 95%.

4.7.6.2 EN-DC CLI-RSSI measurement accuracy with FR1 serving cell

Editor's Note: This test case is incomplete in following aspects:

- Message contents are missing.
- TT analysis is missing.
- Test Procedure is FFS.
- Test applicability needs to be updated

4.7.6.2.1 Test purpose

To verify that the UE makes correct reporting of CLI-RSSI measurement accuracy in TS 38.133 [6] clause 10.1.22.2.1.

4.7.6.2.2 Test applicability

FFS.

4.7.6.2.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 4.7.6.0.2.

The normative reference for this requirement is TS 38.133 [6] clause A.4.7.6.2.

4.7.6.2.4 Test description

4.7.6.2.4.1 Initial conditions

This test shall be tested using any of the test configurations in Table 4.7.6.2.4.1-1. Test environment parameters are given in Table 4.7.6.2.4.1-2.

Table 4.7.6.2.4.1-1: Applicable NR configurations for FR1 CLI-RSSI accuracy test

Config	Description
1	LTE FDD, NR 15 kHz SRS SCS, 10 MHz bandwidth, TDD duplex mode
2	LTE FDD, NR 30kHz SRS SCS, 40 MHz bandwidth, TDD duplex mode
3	LTE TDD, NR 15 kHz SRS SCS, 10 MHz bandwidth, TDD duplex mode
4	LTE TDD, NR 30kHz SRS SCS, 40 MHz bandwidth, TDD duplex mode
Note: The UE is only required to be tested in one of the supported test configurations in each supported band	

Table 4.7.6.2.4.1-2: Test Environment parameters for EN-DC SSB based L1-RSRP measurement in DRX

Parameter	Value		Comment
Test environment	NC		As specified in TS 38.508-1 [14] clause 4.1.
Test frequencies	As specified in Annex E, Table E.2-1 and TS 38.508-1 [14] clause 4.3.1 and 4.4.2.		
Channel bandwidth	As specified by the test configuration selected from Table 4.7.6.2.4.1-1.		
Propagation conditions	AWGN		As specified in Annex C.2.2.
Connection Diagram	TE Part	A.3.1.7.1	As specified in TS 38.508-1 [14] Annex A.
	DUT Part	A.3.2.3.4	
Exceptions to connection diagram	For 4Rx capable UEs without any 2 Rx RF bands use A.3.2.5.2 for DUT part and A.3.1.8.4 for TE Part		

1. Message contents are defined in clause 4.7.6.2.4.3.
2. Cell 1 is the E-UTRA serving cell (PCell) for the EN-DC setup. The power levels and settings for Cell 1 are set according to Annex A.6. Cell 2 is NR FR1 cell (PSCell). Cell 2 is the target for CLI-RSSI measurements. Before

the test UE is configured to perform CLI-RSSI measurement. There is no measurement gap configured in the test. During the test, the test system does not transmit PDCCH/PDSCH/OCNG on symbols for CLI-RSSI resource and on 1 data symbol before.

4.7.6.2.4.2 Test procedure

FFS

4.7.6.2.4.3 Message contents

FFS

4.7.6.2.5 Test requirement

Table 4.7.6.2.5-1 defines the primary level settings including test tolerances for all tests.

Table 4.7.6.2.5-1: NR Cell specific test parameters for CLI-RSSI accuracy

Parameter	Config	Unit	Value
SSB GSCN	1~4		freq1
Duplex mode	1~4		TDD
TDD configuration	1,3		TDDConf.1.1
	2,4		TDDConf.2.1
$BW_{channel}$	1,3	MHz	10: $N_{RB,c}$ = 52
	2,4		40: $N_{RB,c}$ = 106
PDSCH Reference measurement channel	1,3		SR.1.1 TDD
	2,4		SR.2.1 TDD
RMSI CORESET Reference Channel	1,3		CR.1.1 TDD
	2,4		CR.2.1 TDD
Dedicated CORESET Reference Channel	1,3		CCR.1.1 TDD
	2,4		CCR.2.1 TDD
SSB configuration	1,3		SSB.1 FR1
	2,4		SSB.2 FR1
OCNG Patterns Note6	1~4		OP.1
TRS configuration	1,3		TRS.1.1 TDD
	2,4		TRS.1.2 TDD
Initial BWP Configuration	1~4		DLBWP.0.1 ULBWP.0.1
Dedicated BWP configuration	1~4		DLBWP.1.1 ULBWP.1.1
SMTC configuration	1~4		SMTC.1
Time offset between DL from serving cell and OCNG from test system	1~4	μs	17.67
EPRE ratio of PSS to SSS	1~4	dB	0
EPRE ratio of PBCH DMRS to SSS			
EPRE ratio of PBCH to PBCH DMRS			
EPRE ratio of PDCCH DMRS to SSS			
EPRE ratio of PDCCH to PDCCH DMRS			
EPRE ratio of PDSCH DMRS to SSS			
EPRE ratio of PDSCH to PDSCH DMRS			
EPRE ratio of OCNG DMRS to SSS Note 1			
EPRE ratio of OCNG to OCNG DMRS Note 1			
N_{oc} on CLI-RSSI measurement resource Note2	1,3	dBm/15kHz	-106

	2,4		-106
N_{oc} on CLI-RSSI measurement resource Note2	1,3	dBm/ BWP SCS	-106
	2,4		-103
$\hat{E}_s/I_{ot}$ on CLI-RSSI measurement resource	1~4	dB	-Infinity
RSRP on CLI-RSSI measurement resource Note3	1~4	dBm/ BWP SCS	-Infinity
Io on CLI-RSSI measurement resource Note3	1,3	dBm/9.36 MHz	-78.05+TT
	2,4	dBm/38.16 MHz	-71.96+TT
Io on CLI-RSSI measurement resource Note3	1,3	dBm/1.08 MHz	-87.43+TT
	2,4		-87.44+TT
$\hat{E}_s/N_{oc}$ on CLI-RSSI measurement resource	1~4	dB	-Infinity
Propagation condition	1~4		AWGN
Antenna configuration	1~4		1x2

Note 1: OCNG shall be used such that a constant total transmitted power spectral density is achieved for all OFDM symbols.
Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for N_{oc} to be fulfilled.
Note 3: RSRP and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.
Note 4: RSRP minimum requirements are specified assuming independent interference and noise at each receiver antenna port.
Note 5: The test configuration excludes support for band n51 and it is not required to run this test on band n51 in this release of the specification
Note 6: OCNG is not transmitted in the CLI-RSSI measurement resources.

Table 4.7.6.2.5-2: CLI-RSSI measurement resource configuration for FR1 CLI-RSSI accuracy

	Field	Config	SRSConf.1
CLI-RSSI measurement resource	rssi-ResourceId	1~4	0
	rssi-SCS	1,3	15kHz
		2,4	30kHz
	startPRB	1~4	0
	nrofPRBs	1,3	52
		2,4	106
	startPosition	1~4	3
	nrofSymbols	1~4	11
	rssi-PeriodicityAndOffset	1,3	sl20, 9
		2,4	sl40, 19

For the test to pass, the ratio of successful reported values in each test shall be more than 90% with a confidence level of 95%.

4.7.7 L1-SINR measurement for beam reporting

4.7.7.0 Minimum conformance requirements

4.7.7.0.1 Minimum conformance requirements for CSI-RS based CMR and no dedicated IMR configured and CSI-RS resource set with repetition off

The UE shall be capable of performing L1-SINR measurements with the CSI-RS configured as CMR and no dedicated resource configured as IMR for L1-SINR computation, and the UE physical layer shall be capable of reporting L1-SINR measured over the measurement period of $T_{L1\text{-}SINR_Measurement_Period_CSI\text{-}RS_CMR_Only}$.

The value of $T_{L1\text{-}SINR_Measurement_Period_CSI\text{-}RS_CMR_Only}$ is defined in Table 4.7.7.0.1-1 for FR1 and in Table 4.7.7.0.1-2 for FR2, where

For the value of M,

- For periodic and semi-persistent CSI-RS resources as CMR, M=1 if higher layer parameter *timeRestrictionForChannelMeasurement* is configured, and M=3 otherwise;
- For aperiodic CSI-RS resources as CMR, M=1.

For the value of N in FR2

- For periodic CSI-RS resources as CMR in a resource set configured with higher layer parameter *repetition* set to OFF, N=1. The requirements apply if *qcl-InfoPeriodicCSI-RS* is configured for all the resources in the resource set and for each resource one RS has QCL-TypeD with
  - SSB for L1-RSRP or L1-SINR measurement, or
  - another CSI-RS in resource set configured with repetition ON.
- For periodic CSI-RS resources as CMR in a resource set configured with higher layer parameter *repetition* set to ON, N=ceil(*maxNumberRxBeam* / $N_{res_per_set}$), where $N_{res_per_set}$ is number of resources in the resource set. The requirements apply provided *qcl-InfoPeriodicCSI-RS* is configured for all resources in the resource set.
- For semi-persistent CSI-RS resources as CMR in a resource set configured with higher layer parameter *repetition* set to OFF, N=1. The requirements apply provided TCI state is provided for all resources in the resource set in the MAC CE activating the resource set and for each resource has QCL-TypeD with
  - SSB for L1-RSRP or L1-SINR measurement, or
  - another CSI-RS in resource set configured with repetition ON.
- For semi-persistent CSI-RS resources as CMR in a resource set configured with higher layer parameter *repetition* set to ON, N=ceil(*maxNumberRxBeam* / $N_{res_per_set}$), where $N_{res_per_set}$ is number of resources in the resource set. The requirements apply provided TCI state is provided for all resources in the resource set in the MAC CE activating the resource set.
- For aperiodic CSI-RS resources as CMR in a resource set configured with higher layer parameter *repetition* set to OFF, N=1. The requirements apply provided *qcl-info* is configured for all resources in the resource set and for each resource has QCL-TypeD with
  - SSB for L1-RSRP or L1-SINR measurement, or
  - another CSI-RS in resource set configured with repetition ON.
- For aperiodic CSI-RS resources as CMR in a resource set configured with higher layer parameter *repetition* set to ON, N=1. UE is not required to meet the accuracy requirements in clause 10.1.28.1 and 10.1.28.3 of TS 38.133 [6] if number of resources in the resource set is smaller than *maxNumberRxBeam*. The requirements apply provided *qcl-info* is configured for all resources in the resource set.

For the value of P in FR1,

- $P=\frac{1}{1-\frac{T_{CSI-RS}}{MRGP}}$, when in the monitored cell there are measurement gaps configured for intra-frequency, inter-frequency or inter-RAT measurements, which are overlapping with some but not all occasions of the CSI-RS; and

- P=1 when in the monitored cell there are no measurement gaps overlapping with any occasion of the CSI-RS.

For the value of P in FR2,

- P=1, when CSI-RS is not overlapped with measurement gap and also not overlapped with SMTC occasion.

- $P=\frac{1}{1-\frac{T_{CSI-RS}}{MRGP}}$, when CSI-RS is partially overlapped with measurement gap and CSI-RS is not overlapped with SMTC occasion ($T_{CSI-RS} < MGRP$)

- $P=\frac{1}{1-\frac{T_{CSI-RS}}{T_{SMTCperiod}}}$, when CSI-RS is not overlapped with measurement gap and CSI-RS is partially overlapped with SMTC occasion ($T_{CSI-RS} < T_{SMTCperiod}$).

- P=3, when CSI-RS is not overlapped with measurement gap and CSI-RS is fully overlapped with SMTC occasion ($T_{CSI-RS} = T_{SMTCperiod}$).

- $P=\frac{1}{1-\frac{T_{CSI-RS}}{MRGP}-\frac{T_{CSI-RS}}{T_{SMTCperiod}}}$, when CSI-RS is partially overlapped with measurement gap and CSI-RS is partially overlapped with SMTC occasion ($T_{CSI-RS} < T_{SMTCperiod}$) and SMTC occasion is not overlapped with measurement gap and

  - $T_{SMTCperiod} \neq MGRP$ or

  - $T_{SMTCperiod} = MGRP$ and $T_{CSI-RS} < 0.5*T_{SMTCperiod}$

- $P=\frac{3}{1-\frac{T_{CSI-RS}}{MRGP}}$, when CSI-RS is partially overlapped with measurement gap and CSI-RS is partially overlapped with SMTC occasion ($T_{CSI-RS} < T_{SMTCperiod}$) and SMTC occasion is not overlapped with measurement gap and $T_{SMTCperiod} = MGRP$ and $T_{CSI-RS} = 0.5*T_{SMTCperiod}$

- $P=\frac{1}{1-\frac{T_{CSI-RS}}{\min(T_{SMTCperiod},MGRP)}}$, when CSI-RS is partially overlapped with measurement gap ($T_{CSI-RS} < MGRP$) and CSI-RS is partially overlapped with SMTC occasion ($T_{CSI-RS} < T_{SMTCperiod}$) and SMTC occasion is partially or fully overlapped with measurement gap.

- $P=\frac{3}{1-\frac{T_{CSI-RS}}{MRGP}}$, when CSI-RS is partially overlapped with measurement gap and CSI-RS is fully overlapped with SMTC occasion ($T_{CSI-RS} = T_{SMTCperiod}$) and SMTC occasion is partially overlapped with measurement gap ($T_{SMTCperiod} < MGRP$)

Where:

$T_{SMTCperiod}$ = the configured SMTC1 period or SMTC2 period if configured.

T_{CSI-RS} = the periodicity of CSI-RS configured for L1-SINR measurement

If the high layer in TS 38.331 [2] signalling of *smtc2* is configured, $T_{SMTCperiod}$ corresponds to the value of higher layer parameter *smtc2*; Otherwise $T_{SMTCperiod}$ corresponds to the value of higher layer parameter *smtc1*.

Note: The overlap between CSI-RS for L1-SINR measurement and SMTC means that CSI-RS for L1-SINR measurement is within the SMTC window duration.

Longer evaluation period would be expected if the combination of CSI-RS, SMTC occasion and measurement gap configurations does not meet pervious conditions.

Table 4.7.7.0.1-1: Measurement period $T_{L1\text{-}SINR_Measurement_Period_CSI\text{-}RS_CMR_Only}$ for FR1

Configuration	$T_{L1\text{-}SINR_Measurement_Period_CSI\text{-}RS_CMR_Only}$ (ms)
non-DRX	$\max(T_{Report}, \text{ceil}(M*P)*T_{CSI-RS})$
DRX cycle ≤ 320ms	$\max(T_{Report}, \text{ceil}(1.5*M*P)*\max(T_{DRX},T_{CSI-RS}))$

DRX cycle > 320ms	ceil(M*P)*T_{DRX}
Note 1:	T_{CSI-RS} is the periodicity of CSI-RS configured for L1-SINR measurement. T_{DRX} is the DRX cycle length. T_{Report} is configured periodicity for reporting.
Note 2:	the requirements are applicable provided that the CSI-RS resource configured for L1-SINR measurement is transmitted with Density = 3.

Table 4.7.7.0.1-2: Measurement period $T_{L1\text{-}SINR_Measurement_Period_CSI\text{-}RS_CMR_Only}$ for FR2

Configuration	$T_{L1\text{-}SINR_Measurement_Period_CSI\text{-}RS_CMR_Only}$ (ms)
non-DRX	max(T_{Report}, ceil(M*P*N)*T_{CSI-RS})
DRX cycle ≤ 320ms	max(T_{Report}, ceil(1.5*M*P*N)*max(T_{DRX},T_{CSI-RS}))
DRX cycle > 320ms	ceil(M*P*N)*T_{DRX}
Note 1:	T_{CSI-RS} is the periodicity of CSI-RS configured for L1-SINR measurement. T_{DRX} is the DRX cycle length. T_{Report} is configured periodicity for reporting.
Note 2:	the requirements are applicable provided that the CSI-RS resource configured for L1-SINR measurement is transmitted with Density = 3.

The accuracy requirements in Table 4.7.7.0.1-3 are valid under the following conditions:

- Conditions defined in clause 7.3 of TS 38.101-1 [18] for reference sensitivity are fulfilled.
- Conditions for L1-SINR measurements are fulfilled according to Annex B.2.8.1 for a corresponding Band for each relevant CSI-RS based CMR.
- The bandwidth of CSI-RS as CMR is 48 PRBs and the density is 3.
- AWGN radio propagation conditions.

The performance with larger bandwidth of CSI-RS as CMR is equal to or better than the accuracy requirements in Table 4.7.7.0.1-3.

Table 4.7.7.0.1-3: L1-SINR absolute accuracy for CSI-RS based CMR only in FR1

Accuracy		Conditions						
Normal condition	Extreme condition	CSI-RS CMR Ês/Iot	Io [Note 1] range					
			NR operating band groups [Note 2]	Minimum Io				Maximum Io
dB	dB	dB		dBm / SCS_{CSI-RS}			dBm/BW Channel	$dBm/BW_{Channel}$
				SCS_{CSI-RS} = 15 kHz	SCS_{CSI-RS} = 30 kHz	SCS_{CSI-RS} = 60 kHz		
±5.5	±6.5	≥-3	NR_FDD_FR1_A, NR_TDD_FR1_A, NR_SDL_FR1_A	-121	-118	-115	N/A	-50
			NR_FDD_FR1_B	-120.5	-117.5	-114.5	N/A	-50
			NR_TDD_FR1_C	-120	-117	-114	N/A	-50
			NR_FDD_FR1_D, NR_TDD_FR1_D	-119.5	-116.5	-113.5	N/A	-50
			NR_FDD_FR1_E, NR_TDD_FR1_E	-119	-116	-113	N/A	-50
			NR_FDD_FR1_F	-118.5	-115.5	-112.5	N/A	-50
			NR_FDD_FR1_G	-118	-115	-112	N/A	-50
			NR_FDD_FR1_H	-117.5	-114.5	-111.5	N/A	-50
NOTE 1: Io is assumed to have constant EPRE across the bandwidth. NOTE 2: NR operating band groups in FR1 are as defined in clause 3.5.2.								

The normative reference for this requirement is TS 38.133 [6] clauses 9.8.4.1 and 10.1.27.1.

4.7.7.0.2 Minimum conformance requirements for SSB based CMR and dedicated IMR

The UE shall be capable of performing L1-SINR measurements with the SSB configured as CMR and dedicated resource configured as IMR for L1-SINR computation, in which the NZP-CSI-RS or CSI-IM resource configured as dedicated IMR shall be 1-to-1 mapped to SSB configured as CMR, with the same periodicity. The UE physical layer shall be capable of reporting L1-SINR measured over the measurement period of $T_{L1\text{-}SINR_Measurement_Period_SSB_CMR_IMR}$.

The requirements in this clause are not applicable if NZP-CSI-RS or CSI-IM resource configured as dedicated IMR is scheduled with different periodicity as SSB configured as CMR.

The value of $T_{L1\text{-}SINR_Measurement_Period_SSB_CMR_IMR}$ is defined in Table 4.7.7.0.2-1 for FR1 and in Table 4.7.7.0.2-2 for FR2, where

For the value of M

- For periodic or semi-persistent NZP CSI-RS or CSI-IM resource as dedicated IMR, M=1 if the higher layer parameters *timeRestrictionForChannelMeasurements* and/or *timeRestrictionForInterferenceMeasurements* are configured, and M=3 otherwise;

For the value of N in FR2

- N = 8.

P is defined as the maximum value between P_{CMR} and P_{IMR}, i.e., $P = \max(P_{CMR}, P_{IMR})$, where

- the value of P_{CMR} shall be derived in the same way as the value of P used for SSB based L1-RSRP measurement in clause 9.5.4.1 of TS 38.133 [6], in which the occasions and period of the SSB for CMR shall be used instead.

- the value of P_{IMR} shall be derived in the same way as the value of P used for CSI-RS based L1-RSRP measurement in clause 9.5.4.2 of TS 38.133 [6], in which the occasions and period of the NZP CSI-RS for NZP-IMR or CSI-IM for ZP-IMR shall be used instead.

Longer evaluation period would be expected if the combination of SSB, SMTC occasion and measurement gap configurations does not meet pervious conditions.

For L1-SINR measurement with SSB as CMR and CSI-RS or CSI-IM as IMR, the requirement shall apply if the CSI-RS is configured as IMR with repetition field as “repetition = OFF” or CSI-IM is configured as IMR.

For L1-SINR measurement with SSB as CMR and CSI-RS/CSI-IM as IMR, no requirement shall apply if SSB occasions for CMR or CSI-RS/CSI-IM occasions for IMR are fully overlapped with the configured measurement gap

Table 4.7.7.0.2-1: Measurement period $T_{L1\text{-}SINR_Measurement_Period_SSB_CMR_IMR}$ for FR1

Configuration	$T_{L1\text{-}SINR_Measurement_Period_SSB_CMR_IMR}$ (ms)
non-DRX	$\max(T_{Report}, \text{ceil}(M*P)*T_{SSB})$
DRX cycle ≤ 320ms	$\max(T_{Report}, \text{ceil}(1.5*M*P)*\max(T_{DRX},T_{SSB}))$
DRX cycle > 320ms	$\text{ceil}(M*P)*T_{DRX}$
Note 1: T_{SSB} = ssb-periodicityServingCell is the periodicity of the SSB-Index configured for L1-SINR channel measurement. T_{DRX} is the DRX cycle length. T_{Report} is configured periodicity for reporting.	
Note 2: The requirements are applicable provided that the CSI-RS resource configured for interference measurement shall be 1-to-1 mapped to SSB configured for channel measurement, with the same periodicity.	

Table 4.7.7.0.2-2: Measurement period $T_{L1\text{-}SINR_Measurement_Period_SSB_CMR_IMR}$ for FR2

Configuration	$T_{L1\text{-}SINR_Measurement_Period_SSB_CMR_IMR}$ (ms)
non-DRX	$\max(T_{Report}, \text{ceil}(M*P*N)*T_{SSB})$
DRX cycle ≤ 320ms	$\max(T_{Report}, \text{ceil}(1.5*M*P*N)*\max(T_{DRX},T_{SSB}))$
DRX cycle > 320ms	$\text{ceil}(1.5*M*P*N)*T_{DRX}$

Note 1:	T_{SSB} = ssb-periodicityServingCell is the periodicity of the SSB-Index configured for L1-SINR measurement. T_{DRX} is the DRX cycle length. T_{Report} is configured periodicity for reporting.
Note 2:	The requirements are applicable provided that the CSI-RS resource configured for interference measurement shall be 1-to-1 mapped to SSB configured for channel measurement, with the same periodicity.

The accuracy requirements in Tables 4.7.7.0.2-3 and 4.7.7.0.2-4 are valid under the following conditions:

- Conditions defined in clause 7.3 of TS 38.101-1 [18] for reference sensitivity are fulfilled.
- Conditions for L1-SINR measurements are fulfilled according to Annex B.2.8.2 for a corresponding Band for each relevant SSB based CMR and IMR.
- The bandwidth of NZP-IMR and ZP-IMR is 48 PRBs and the density is 3.
- AWGN radio propagation conditions.

The performance with larger bandwidth of NZP-IMR and ZP-IMR is equal to or better than the accuracy requirements in Tables 4.7.7.0.2-3 and 4.7.7.0.2-4.

Table 4.7.7.0.2-3: L1-SINR absolute accuracy for SSB based CMR and NZP-IMR in FR1

Accuracy		Conditions					
Normal condition	Extreme condition	SSB-CMR Ês/Iot	NZP-IMR Ês/Iot	Io Note 1 range			
				NR operating band groups Note 2	Minimum Io		Maximum Io
dB	dB	dB	dB		dBm / SCS_{SSB}	dBm/$BW_{Channel}$	dBm/$BW_{Channel}$
					SCS_{SSB} = 15 kHz	SCS_{SSB} = 30 kHz	
±4.0	±5.0	≥0	≥0	NR_FDD_FR1_A, NR_TDD_FR1_A, NR_SDL_FR1_A	-121	-118	N/A	-50
				NR_FDD_FR1_B	-120.5	-117.5	N/A	-50
				NR_TDD_FR1_C	-120	-117	N/A	-50
				NR_FDD_FR1_D, NR_TDD_FR1_D	-119.5	-116.5	N/A	-50
				NR_FDD_FR1_E, NR_TDD_FR1_E	-119	-116	N/A	-50
				NR_FDD_FR1_F	-118.5	-115.5	N/A	-50
				NR_FDD_FR1_G	-118	-115	N/A	-50
				NR_FDD_FR1_H	-117.5	-114.5	N/A	-50
NOTE 1: Io is assumed to have constant EPRE across the bandwidth. NOTE 2: NR operating band groups in FR1 are as defined in clause 3.5.2.								

Table 4.7.7.0.2-4: L1-SINR absolute accuracy for SSB based CMR and ZP-IMR in FR1

Accuracy		Conditions				
Normal condition	Extreme condition	SSB-CMR Ês/Iot	Io Note 1 range			
			NR operating band groups Note 2	Minimum Io		Maximum Io
dB	dB	dB		dBm / SCS_{SSB}	dBm/$BW_{Channel}$	dBm/$BW_{Channel}$
				SCS_{SSB} = 15 kHz	SCS_{SSB} = 30 kHz	
			NR_FDD_FR1_A, NR_TDD_FR1_A, NR_SDL_FR1_A	-121	-118	N/A	-50

±4.5	±5.5	≥-3	NR_FDD_FR1_B	-120.5	-117.5	N/A	-50
			NR_TDD_FR1_C	-120	-117	N/A	-50
			NR_FDD_FR1_D, NR_TDD_FR1_D	-119.5	-116.5	N/A	-50
			NR_FDD_FR1_E, NR_TDD_FR1_E	-119	-116	N/A	-50
			NR_FDD_FR1_F	-118.5	-115.5	N/A	-50
			NR_FDD_FR1_G	-118	-115	N/A	-50
			NR_FDD_FR1_H	-117.5	-114.5	N/A	-50
NOTE 1: Io is assumed to have constant EPRE across the bandwidth. NOTE 2: NR operating band groups in FR1 are as defined in clause 3.5.2.							

The normative reference for this requirement is TS 38.133 [6] clauses 9.8.4.2 and 10.1.27.2.

4.7.7.0.3 Minimum conformance requirements for CSI-RS based CMR and dedicated IMR

The UE shall be capable of performing L1-SINR measurements with the CSI-RS resource configured as CMR and dedicated resource configured as IMR for L1-SINR computation, in which the NZP-CSI-RS or CSI-IM resource configured as dedicated IMR shall be 1-to-1 mapped to CSI-RS resource configured as CMR, with the same periodicity. The UE physical layer shall be capable of reporting L1-SINR measured over the measurement period of $T_{L1\text{-}SINR_Measurement_Period_CSI\text{-}RS_CMR_IMR}$.

The requirements in this clause are not applicable if NZP-CSI-RS or CSI-IM resource configured as dedicated IMR is scheduled with different periodicity as CSI-RS resource configured as CMR.

The value of $T_{L1\text{-}SINR_Measurement_Period_CSI\text{-}RS_CMR_IMR}$ is defined in Table 4.7.7.0.3-1 for FR1 and in Table 4.7.7.0.2-2 for FR2, where

For the value of M,

- M=1 shall be applied if
  - aperiodic NZP-CSI-RS as CMR or dedicated IMR, or
  - aperiodic CSI-IMR as dedicated IMR, or
  - periodic and semi-persistent NZP-CSI-RS as CMR or dedicated IMR and the higher layer parameters *timeRestrictionForChannelMeasurement* and/or *timeRestrictionForInterferenceMeasurements* are configured, or
  - periodic and semi-persistent CSI-IM as dedicated IMR and the higher layer parameters *timeRestrictionForChannelMeasurement* and/or *timeRestrictionForInterferenceMeasurements* are configured;
- M=3 otherwise.

For the value of N in FR2

- For periodic CSI-RS resources as CMR in a resource set configured with higher layer parameter *repetition* set to OFF, N=1. The requirements apply if *qcl-InfoPeriodicCSI-RS* is configured for all the resources in the resource set and for each resource one RS has QCL-TypeD with
  - SSB for L1-RSRP or L1-SINR measurement, or
  - another CSI-RS in resource set configured with repetition ON.
- For periodic CSI-RS resources as CMR in a resource set configured with higher layer parameter *repetition* set to ON, N=ceil(*maxNumberRxBeam* / $N_{res_per_set}$), where $N_{res_per_set}$ is number of resources in the resource set. The requirements apply provided *qcl-InfoPeriodicCSI-RS* is configured for all resources in the resource set.
- For semi-persistent CSI-RS resources as CMR in a resource set configured with higher layer parameter *repetition* set to OFF, N=1. The requirements apply provided TCI state is provided for all resources in the resource set in the MAC CE activating the resource set and for each resource has QCL-TypeD with

- SSB for L1-RSRP or L1-SINR measurement, or
- another CSI-RS in resource set configured with repetition ON.

- For semi-persistent CSI-RS resources as CMR in a resource set configured with higher layer parameter *repetition* set to ON, N=ceil(*maxNumberRxBeam* / $N_{res_per_set}$), where $N_{res_per_set}$ is number of resources in the resource set. The requirements apply provided TCI state is provided for all resources in the resource set in the MAC CE activating the resource set.

- For aperiodic CSI-RS resources as CMR in a resource set configured with higher layer parameter *repetition* set to OFF, N=1. The requirements apply provided *qcl-info* is configured for all resources in the resource set and for each resource has QCL-TypeD with
  - SSB for L1-RSRP or L1-SINR measurement, or
  - another CSI-RS in resource set configured with repetition ON.

- For aperiodic CSI-RS resources as CMR in a resource set configured with higher layer parameter *repetition* set to ON, N=1. UE is not required to meet the accuracy requirements in clause 10.1.28.1 and 10.1.28.3 of TS 38.133 [6] if number of resources in the resource set is smaller than *maxNumberRxBeam*. The requirements apply provided *qcl-info* is configured for all resources in the resource set.

P is defined as the maximum value between P_{CMR} and P_{IMR}, i.e., $P = \max(P_{CMR}, P_{IMR})$, where

- The value of P_{CMR} and P_{IMR} shall be derived in the same way as the value of P used for CSI-RS based L1-RSRP measurement in clause 9.5.4.2 of TS 38.133 [6], in which the occasions and period of the CSI-RS for CMR and NZP CSI-RS for NZP-IMR or CSI-IM for ZP-IMR shall be used instead respectively.

Longer evaluation period would be expected if the combination of CSI-RS, SMTC occasion and measurement gap configurations does not meet pervious conditions.

For L1-SINR measurement with CSI-RS as CMR and CSI-RS as IMR, the requirement shall apply only if CSI-RS resources as CMR and IMR are configured with the same repetition field and the number of CSI-RS resources in the resource sets for CMR and IMR are same.

For L1-SINR measurement with CSI-RS as CMR and CSI-IM as IMR, the requirement shall apply only if the number of CSI-RS resources in the resource set for CMR and the number of CSI-IM resources in the resource set for IMR are same.

For L1-SINR measurement with CSI-RS as CMR and CSI-RS/CSI-IM as IMR, no requirement shall apply if CSI-RS occasions for CMR or CSI-RS/CSI-IM occasions for IMR are fully overlapped with the configured measurement gap.

Table 4.7.7.0.3-1: Measurement period $T_{L1\text{-}SINR_Measurement_Period_CSI\text{-}RS_CMR_IMR}$ for FR1

Configuration	$T_{L1\text{-}SINR_Measurement_Period_CSI\text{-}RS_CMR_IMR}$ (ms)
non-DRX	$\max(T_{Report}, \text{ceil}(M*P)*T_{CSI\text{-}RS})$
DRX cycle ≤ 320ms	$\max(T_{Report}, \text{ceil}(1.5*M*P)*\max(T_{DRX},T_{CSI\text{-}RS}))$
DRX cycle > 320ms	$\text{ceil}(M*P)*T_{DRX}$
Note 1: $T_{CSI\text{-}RS}$ is the periodicity of CSI-RS configured for L1-SINR measurement. T_{DRX} is the DRX cycle length. T_{Report} is configured periodicity for reporting. Note 2: the requirements are applicable provided that the CSI-RS resource configured for L1-SINR measurement is transmitted with Density = 3. Note 3: The requirements are applicable provided that the CSI-RS resource configured for interference measurement shall be 1-to-1 mapped to CSI-RS configured for channel measurement, with the same periodicity.	

Table 4.7.7.0.3-2: Measurement period $T_{L1\text{-}SINR_Measurement_Period_CSI\text{-}RS_CMR_IMR}$ for FR2

Configuration	$T_{L1\text{-}SINR_Measurement_Period_CSI\text{-}RS_CMR_IMR}$ (ms)
non-DRX	$\max(T_{Report}, \text{ceil}(M*P*N)*T_{CSI\text{-}RS})$
DRX cycle ≤ 320ms	$\max(T_{Report}, \text{ceil}(1.5*M*P*N)*\max(T_{DRX},T_{CSI\text{-}RS}))$
DRX cycle > 320ms	$\text{ceil}(M*P*N)*T_{DRX}$

Note 1:	T_{CSI-RS} is the periodicity of CSI-RS configured for L1-SINR measurement. T_{DRX} is the DRX cycle length. T_{Report} is configured periodicity for reporting.
Note 2:	the requirements are applicable provided that the CSI-RS resource configured for L1-SINR measurement is transmitted with Density = 3.
Note 3:	The requirements are applicable provided that the CSI-RS resource configured for interference measurement shall be 1-to-1 mapped to CSI-RS configured for channel measurement, with the same periodicity.

The accuracy requirements in Tables 4.7.7.0.3-3 and 4.7.7.0.3-4 are valid under the following conditions:

- Conditions defined in clause 7.3 of TS 38.101-1 [18] for reference sensitivity are fulfilled.
- Conditions for L1-SINR measurements are fulfilled according to Annex B.2.8.3 for a corresponding Band for each relevant CSI-RS based CMR and IMR.
- The bandwidth of CSI-RS as CMR, NZP-IMR and ZP-IMR is 48 PRBs and the density is 3.
- AWGN radio propagation conditions.

The performance with larger bandwidth of CSI-RS as CMR, NZP-IMR and ZP-IMR is equal to or better than the accuracy requirements in Tables 4.7.7.0.3-3 and 4.7.7.0.3-4.

Table 4.7.7.0.3-3: L1-SINR absolute accuracy for CSI-RS based CMR and NZP-IMR in FR1

Accuracy		Conditions							
Normal condition	Extreme condition	CSI-RS CMR Ês/Iot	NZP-IMR Ês/Iot	Io [Note 1] range					
				NR operating band groups [Note 2]	Minimum Io				Maximum Io
dB	dB	dB	dB		dBm / SCS_{CSI-RS}			dBm/$BW_{Channel}$	dBm/$BW_{Channel}$
					SCS_{CSI-RS} = 15 kHz	SCS_{CSI-RS} = 30 kHz	SCS_{CSI-RS} = 60 kHz		
±4.0	±5.0	≥0	≥0	NR_FDD_FR1_A, NR_TDD_FR1_A, NR_SDL_FR1_A	-121	-118	-115	N/A	-50
				NR_FDD_FR1_B	-120.5	-117.5	-114.5	N/A	-50
				NR_TDD_FR1_C	-120	-117	-114	N/A	-50
				NR_FDD_FR1_D, NR_TDD_FR1_D	-119.5	-116.5	-113.5	N/A	-50
				NR_FDD_FR1_E, NR_TDD_FR1_E	-119	-116	-113	N/A	-50
				NR_FDD_FR1_F	-118.5	-115.5	-112.5	N/A	-50
				NR_FDD_FR1_G	-118	-115	-112	N/A	-50
				NR_FDD_FR1_H	-117.5	-114.5	-111.5	N/A	-50
NOTE 1: Io is assumed to have constant EPRE across the bandwidth. NOTE 2: NR operating band groups in FR1 are as defined in clause 3.5.2.									

Table 4.7.7.0.3-4: L1-SINR absolute accuracy for CSI-RS based CMR and ZP-IMR in FR1

Accuracy		Conditions	
Normal condition	Extreme condition	CSI-RS CMR Ês/Iot	Io [Note 1] range

			NR operating band groups Note 2	Minimum Io				Maximum Io
dB	dB	dB		dBm / SCS_{CSI-RS}			$dBm/BW_{Channel}$	$dBm/BW_{Channel}$
				SCS_{CSI-RS} = 15 kHz	SCS_{CSI-RS} = 30 kHz	SCS_{CSI-RS} = 60 kHz		
±4.5	±5.5	≥-3	NR_FDD_FR1_A, NR_TDD_FR1_A, NR_SDL_FR1_A	-121	-118	-115	N/A	-50
			NR_FDD_FR1_B	-120.5	-117.5	-114.5	N/A	-50
			NR_TDD_FR1_C	-120	-117	-114	N/A	-50
			NR_FDD_FR1_D, NR_TDD_FR1_D	-119.5	-116.5	-113.5	N/A	-50
			NR_FDD_FR1_E, NR_TDD_FR1_E	-119	-116	-113	N/A	-50
			NR_FDD_FR1_F	-118.5	-115.5	-112.5	N/A	-50
			NR_FDD_FR1_G	-118	-115	-112	N/A	-50
			NR_FDD_FR1_H	-117.5	-114.5	-111.5	N/A	-50
NOTE 1: Io is assumed to have constant EPRE across the bandwidth. NOTE 2: NR operating band groups in FR1 are as defined in clause 3.5.2.								

The normative reference for this requirement is TS 38.133 [6] clauses 9.8.4.3 and 10.1.27.3.

4.7.7.1 EN-DC FR1 CSI-RS based CMR and no dedicated IMR configured and CSI-RS resource set with repetition off L1-SINR measurement

4.7.7.1.1 EN-DC FR1 CSI-RS based CMR and no dedicated IMR configured and CSI-RS resource set with repetition off L1-SINR absolute measurement accuracy

4.7.7.1.1.1 Test purpose

The purpose of this test is to verify that the L1-SINR measurement accuracy is within the specified limits.

4.7.7.1.1.2 Test applicability

This test applies to all types of NR UE supporting E-UTRA and EN-DC from Release 16 onwards. Applicability requires support for L1-SINR measurements on the NR PSCell.

4.7.7.1.1.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 4.7.7.0.1.

The normative reference for this requirement is TS 38.133 [6] clause A.4.7.7.1.

4.7.7.1.1.4 Test description

4.7.7.1.1.4.1 Initial conditions

This test shall be tested using any of the test configurations in Table 4.7.7.1.1.4.1-1. Configure the test equipment and the DUT according to the parameters in Table 4.7.7.1.1.4.1-2.

Table 4.7.7.1.1.4.1-1: EN-DC CSI-RS based CMR without dedicated IMR L1-SINR measurement supported test configurations

Config	Description
1	LTE FDD, NR 15 kHz CSI-RS SCS, 10 MHz bandwidth, FDD duplex mode
2	LTE FDD, NR 15 kHz CSI-RS SCS, 10 MHz bandwidth, TDD duplex mode
3	LTE FDD, NR 30kHz CSI-RS SCS, 40 MHz bandwidth, TDD duplex mode
4	LTE TDD, NR 15 kHz CSI-RS SCS, 10 MHz bandwidth, FDD duplex mode
5	LTE TDD, NR 15 kHz CSI-RS SCS, 10 MHz bandwidth, TDD duplex mode

6	LTE TDD, NR 30kHz CSI-RS SCS, 40 MHz bandwidth, TDD duplex mode
Note: The UE is only required to be tested in one of the supported test configurations in each supported band	

Table 4.7.7.1.1.4.1-2: Test Environment parameters for EN-DC CSI-RS based CMR without dedicated IMR L1-SINR measurement

Parameter	Value		Comment
Test environment	NC, TL/VL, TL/VH, TH/VL, TH/VH		As specified in TS 38.508-1 [14] clause 4.1.
Test frequencies	As specified in Annex E, Table E.2-1 and TS 38.508-1 [14] clause 4.3.1.		
Channel bandwidth	As specified by the test configuration selected from Table 4.7.7.1.1.4.1-1.		
Propagation conditions	AWGN		As specified in Annex C.2.2.
Connection Diagram	TE Part 2Rx	A.3.1.8.2 with n = 1	As specified in TS 38.508-1 [14] Annex A.
	TE Part 4Rx	A.3.1.8.5 with n = 1	
	DUT Part 2Rx	A.3.2.3.4	
	DUT Part 4Rx	A.3.2.5.2	
Exceptions to connection diagram	N/A		

1. Message contents are defined in clause 4.7.7.1.1.4.3.
2. Cell 1 is the E-UTRA serving cell (PCell) for the EN-DC setup. The power levels and settings for Cell 1 are set according to Annex A.6. Cell 2 is the NR FR1 cell (PSCell). Cell 2 is the target for CSI-RS-based L1-SINR measurements. Before the test, UE is configured to perform RLM and BFD measurement based on the SSBs. The connection setup is done according to the settings in Annex C.1.1.

4.7.7.1.1.4.2 Test procedure

Prior to the start of the time duration T1, the UE shall be fully synchronized to PSCell. The UE shall be configured for periodic CSI reporting in PUCCH [format 2] with a reporting periodicity as mentioned in the above table 4.7.7.1.1.4.1-2.

1. Ensure the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity EN-DC, DC bearer MCG and SCG, Connected without release *On* and Test Mode *On*, according to TS 38.508-1 [14] clause 4.5 and general test parameters set according to Table 4.7.7.1.1.4.1-2.
2. Set the parameters according to T1 in Table 4.7.7.1.1.5-1.
3. The UE shall start sending L1-SINR report including results of both CSI-RS#0 and CSI-RS #1 every 80 slots.
4. The SS shall check the L1-SINR reported values of CSI-RS #0 and CSI-RS #1 in the periodic L1-SINR reports. If the value for both CSI-RSs is within the limits in Table 4.7.7.1.1.5-2 or Table 4.7.7.1.1.5-3 (depending on the test configuration), the number of passed iterations is increased by one, otherwise the number of failed iterations is increased by one.
5. The SS shall continue checking the L1-SINR report messages transmitted by the UE until the confidence level according to Table G.2.3-1 in Annex G is achieved.
6. Set the parameters according to each sub-test in Table 4.7.7.1.1.5-1 as appropriate and repeat steps 3-5.

4.7.7.1.1.4.3 Message contents

Message contents are according to TS 38.508-1 [14] clause 7.3 with the following exceptions:

Table 4.7.7.1.1.4.3-1: Common Exception messages EN-DC CSI-RS based CMR without dedicated IMR L1-SINR measurement

Default Message Contents	
Common contents of system information blocks exceptions	
Default RRC messages and information elements contents exceptions	Table H.3.6A-1 with conditions PERIODIC and CSI-SINR Table H.3.6A-2 with conditions CSI-RS and PERIODIC Table H.3.6A-3 with condition PERIODIC Table 7.3.1-3 in TS 38.508-1 [14] with condition SMTC.1

Table 4.7.7.1.1.4.3-2: RadioLinkMonitoringConfig

Derivation Path: TS 38.508-1 [14], Table 4.6.3-133			
Information Element	**Value/remark**	**Comment**	**Condition**
RadioLinkMonitoringConfig ::= SEQUENCE {			
failureDetectionResourcesToAddModList SEQUENCE (SIZE(1..maxNrofFailureDetectionResources)) OF SEQUENCE {	1 entry		
purpose	both	UE is configured to perform RLM and BFD based on the SSBs.	
}			
}			

4.7.7.1.1.5 Test requirement

Table 4.7.7.1.1.5-1 defines the primary level settings including test tolerances for all tests.

Each L1-SINR measurement report for each of the tests in Table 4.7.7.1.1.5-1 shall meet the corresponding absolute accuracy requirements in Table 4.7.7.1.1.5-2 for test configurations 1, 2, 4 and 5, and the corresponding absolute accuracy requirements in Table 4.7.7.1.1.5-3 for test configurations 3 and 6.

Table 4.7.7.1.1.5-1: FR1 CSI-RS based L1-SINR test parameters

Parameter	Config	Unit	Test 1	Test 2
SSB GSCN	1~6		freq1	freq1
Duplex mode	1,4		FDD	FDD
	2,5		TDD	TDD
	3,6		TDD	TDD
TDD Configuration	1,4		N/A	N/A
	2,5		TDDConf.1.1	TDDConf.1.1
	3,6		TDDConf.2.1	TDDConf.2.1
$BW_{channel}$	1,4	MHz	10: $N_{RB,c}$ = 52	10: $N_{RB,c}$ = 52
	2,5		10: $N_{RB,c}$ = 52	10: $N_{RB,c}$ = 52
	3,6		40: $N_{RB,c}$ = 106	40: $N_{RB,c}$ = 106
PDSCH Reference measurement channel	1,4		SR.1.1 FDD	SR.1.1 FDD
	2,5		SR.1.1 TDD	SR.1.1 TDD
	3,6		SR.2.1 TDD	SR.2.1 TDD
RMSI CORESET Reference Channel	1,4		CR.1.1 FDD	CR.1.1 FDD
	2,5		CR.1.1 TDD	CR.1.1 TDD
	3,6		CR.2.1 TDD	CR.2.1 TDD
Dedicated CORESET Reference Channel	1,4		CCR.1.1 FDD	CCR.1.1 FDD
	2,5		CCR.1.1 TDD	CCR.1.1 TDD
	3,6		CCR.2.1 TDD	CCR.2.1 TDD
SSB configuration	1,4		SSB.1 FR1	SSB.1 FR1
	2,5		SSB.1 FR1	SSB.1 FR1
	3,6		SSB.2 FR1	SSB.2 FR1

OCNG Patterns		1~6		OP.1	OP.1
TRS configuration		1,4		TRS.1.1 FDD	TRS.1.1 FDD
		2,5		TRS.1.1 TDD	TRS.1.1 TDD
		3,6		TRS.1.2 TDD	TRS.1.2 TDD
Initial BWP Configuration		1~6		DLBWP.0.1 ULBWP.0.1	DLBWP.0.1 ULBWP.0.1
Dedicated BWP configuration		1~6		DLBWP.1.1 ULBWP.1.1	DLBWP.1.1 ULBWP.1.1
SMTC configuration		1~6		SMTC.1	SMTC.1
CSI-RS		1,4		CSI-RS 1.2 FDD	CSI-RS 1.2 FDD
		2,5		CSI-RS 1.2 TDD	CSI-RS 1.2 TDD
		3,6		CSI-RS 2.2 TDD	CSI-RS 2.2 FDD
reportConfigType		1~6		periodic	periodic
reportQuantity-r16		1~6		cri-SINR-r16	cri-SINR-r16
nrofReportedRS		1~6		2	2
L1-RSRP reporting period		1~6		slot80	slot80
EPRE ratio of PSS to SSS		1~6	dB	0	0
EPRE ratio of PBCH DMRS to SSS					
EPRE ratio of PBCH to PBCH DMRS					
EPRE ratio of PDCCH DMRS to SSS					
EPRE ratio of PDCCH to PDCCH DMRS					
EPRE ratio of PDSCH DMRS to SSS					
EPRE ratio of PDSCH to PDSCH DMRS					
EPRE ratio of OCNG DMRS to SSS Note 1					
EPRE ratio of OCNG to OCNG DMRS Note 1					
N_{oc} Note2	Depending on band group	1,2,4,5	dBm/15kHz	-94.65	-117+ Δ_{BG_offset}
		3,6		-96.00	-117+ Δ_{BG_offset}
N_{oc} Note2		1,2,4,5	dBm/SSB SCS	-94.65	-117+ Δ_{BG_offset}
		3,6		-93.00	-114+ Δ_{BG_offset}
$\hat{E}_s/I_{ot}$		1~6	dB	10	-2.2
SSB RSRP Note3	Depending on band group	1,2,4,5	dBm/SSB SCS	-84.65	-119.2 + Δ_{BG_offset}
		3,6		-83.00	-116.2 + Δ_{BG_offset}
Io Note3	Depending on band group	1,2,4,5	dBm/9.36 MHz	-56.28	-87.00 + Δ_{BG_offset}
		3,6	dBm/38.16 MHz	-51.53	-80.90 + Δ_{BG_offset}
$\hat{E}_s/N_{oc}$		1~6	dB	10	-2.2
Propagation condition		1~6		AWGN	AWGN
Antenna configuration		1~6		1x2	1x2

Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.

Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for N_{oc} to be fulfilled.

Note 3: RSRP and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.

Note 4: RSRP minimum requirements are specified assuming independent interference and noise at each receiver antenna port.

Note 5:	The test configuration excludes support for band n51 and it is not required to run this test on band n51 in this release of the specification.

Table 4.7.7.1.1.5-2: L1-SINR absolute accuracy requirements for the reported values for test configurations 1, 2, 4 and 5

Normal Conditions	Test 1 All bands	Test 2	
Lowest reported value (Cell 2)	52	All Bands	28
Highest reported value (Cell 2)	81	All Bands	57
Extreme Conditions	**Test 1 All bands**	**Test 2**	
Lowest reported value (Cell 2)	51	All Bands	27
Highest reported value (Cell 2)	82	All bands	58
NOTE: NR operating band groups are defined in clause 3A.4, Table 3A.4.1-2.			

Table 4.7.7.1.1.5-3: L1-SINR absolute accuracy requirements for the reported values for test configurations 3 and 6

Normal Conditions	Test 1 All bands	Test 2	
Lowest reported value (Cell 2)	52	All Bands	28

Highest reported value (Cell 2)	81	All Bands	57
Extreme Conditions	**Test 1 All bands**	**Test 2**	
Lowest reported value (Cell 2)	51	All Bands	27
Highest reported value (Cell 2)	82	All Bands	58
NOTE: NR operating band groups are defined in clause 3A.4, Table 3A.4.1-2			

For the test to pass, the ratio of successful reported values in each test shall be more than 90% with a confidence level of 95%.

[IS: this new clause creates a duplication!!!!!!]

4.7.7.1.2 EN-DC FR1 CSI-RS based CMR and no dedicated IMR configured and CSI-RS resource set with repetition off L1-SINR relative measurement accuracy

4.7.7.1.2.1 Test purpose

The purpose of this test is to verify that the L1-SINR relative measurement accuracy is within the specified limits.

4.7.7.1.2.2 Test applicability

This test applies to all types of NR UE supporting E-UTRA and EN-DC from Release 16 onwards. Applicability requires support for L1-SINR measurements on the NR PSCell.

4.7.7.1.2.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 4.7.7.0.1.

The normative reference for this requirement is TS 38.133 [6] clause A.4.7.7.1.

4.7.7.1.2.4 Test description

4.7.7.1.2.4.1 Initial conditions

This test shall be tested using any of the test configurations in Table 4.7.7.1.2.4.1-1. Configure the test equipment and the DUT according to the parameters in Table 4.7.7.1.2.4.1-2.

Table 4.7.7.1.2.4.1-1: EN-DC CSI-RS based CMR without dedicated IMR L1-SINR measurement supported test configurations

Config	Description
1	LTE FDD, NR 15 kHz CSI-RS SCS, 10 MHz bandwidth, FDD duplex mode
2	LTE FDD, NR 15 kHz CSI-RS SCS, 10 MHz bandwidth, TDD duplex mode
3	LTE FDD, NR 30kHz CSI-RS SCS, 40 MHz bandwidth, TDD duplex mode
4	LTE TDD, NR 15 kHz CSI-RS SCS, 10 MHz bandwidth, FDD duplex mode
5	LTE TDD, NR 15 kHz CSI-RS SCS, 10 MHz bandwidth, TDD duplex mode
6	LTE TDD, NR 30kHz CSI-RS SCS, 40 MHz bandwidth, TDD duplex mode
Note: The UE is only required to be tested in one of the supported test configurations in each supported band	

Table 4.7.7.1.2.4.1-2: Test Environment parameters for EN-DC CSI-RS based CMR without dedicated IMR L1-SINR measurement

Parameter	Value		Comment
Test environment	NC, TL/VL, TL/VH, TH/VL, TH/VH		As specified in TS 38.508-1 [14] clause 4.1.
Test frequencies	As specified in Annex E, Table E.2-1 and TS 38.508-1 [14] clause 4.3.1.		
Channel bandwidth	As specified by the test configuration selected from Table 4.7.7.1.2.4.1-1.		
Propagation conditions	AWGN		As specified in Annex C.2.2.
Connection Diagram	TE Part 2Rx	A.3.1.8.2 with n = 1	As specified in TS 38.508-1 [14] Annex A.
	TE Part 4Rx	A.3.1.8.5 with n = 1	
	DUT Part 2Rx	A.3.2.3.4	
	DUT Part 4Rx	A.3.2.5.2	
Exceptions to connection diagram	N/A		

1. Message contents are defined in clause 4.7.7.1.2.4.3.

2. Cell 1 is the E-UTRA serving cell (PCell) for the EN-DC setup. The power levels and settings for Cell 1 are set according to Annex A.6. Cell 2 is the NR FR1 cell (PSCell). Cell 2 is the target for CSI-RS-based L1-SINR measurements. Before the test, UE is configured to perform RLM and BFD measurement based on the SSBs. The connection setup is done according to the settings in Annex C.1.1.

4.7.7.1.2.4.2 Test procedure

Prior to the start of the time duration T1, the UE shall be fully synchronized to PSCell. The UE shall be configured for periodic CSI reporting in PUCCH [format 2] with a reporting periodicity as mentioned in the above table 4.7.7.1.4.1-2.

1. Ensure the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity EN-DC, DC bearer MCG and SCG, Connected without release *On* and Test Mode *On*, according to TS 38.508-1 [14] clause 4.5 and general test parameters set according to Table 4.7.7.1.2.4.1-2.

2. Set the parameters according to T1 in Table 4.7.7.2.1.5-1.

3. The UE shall start sending L1-SINR report including results of both CSI-RS#0 and CSI-RS #1 every 80 slots.

4. The SS shall check the L1-SINR reported values of CSI-RS #0 and CSI-RS #1 in the periodic L1-SINR reports. The L1-SINR value for CSI-RS #1 is compared to the L1-SINR value for CSI-RS #0. If the difference is within the limits in Table 4.7.7.1.2.5-2 (depending on the test configuration), the number of passed iterations is increased by one, otherwise the number of failed iterations is increased by one.

5. The SS shall continue checking the L1-SINR report messages transmitted by the UE until the confidence level according to Table G.2.3-1 in Annex G is achieved.

6. Set the parameters according to each sub-test in Table 4.7.4.2.1.5-1 as appropriate and repeat steps 3-5.

4.7.7.1.2.4.3 Message contents

Same message contents as described in section 4.7.7.1.1.4.3

4.7.7.1.2.5 Test requirement

Table 4.7.7.1.2.5-1 defines the primary level settings including test tolerances for all tests.

Each L1-SINR measurement report for each of the tests in Table 4.7.7.1.2.5-1 shall meet the corresponding relative accuracy requirements in Table 4.7.7.1.2.5-2.

Table 4.7.7.1.2.5-1

Same as Table 4.7.7.1.1.5-1

Table 4.7.7.1.2.5-2: L1-SINR relative accuracy requirements for the reported values

	Test 1	Test 2
	All bands	All bands
Normal Conditions		
Lowest reported value (CSI-RS#1)	L1-SINR_x - 9	L1-SINR_x - 9
Highest reported value (CSI-RS#1)	L1-SINR _x + 9	L1-SINR _x + 9
Extreme Conditions		
Lowest reported value (CSI-RS#1)	L1-SINR _x - 10	L1-SINR _x - 10
Highest reported value (CSI-RS#1)	L1-SINR _x + 10	L1-SINR _x + 10
L1-SINR_x is the reported value of Cell 2		

For the test to pass, the ratio of successful reported values in each test shall be more than 90% with a confidence level of 95%.

4.7.7.2 EN-DC FR1 SSB based CMR and dedicated IMR L1-SINR absolute measurement accuracy

4.7.7.2.1 Test purpose

The purpose of this test is to verify that the L1-SINR measurement accuracy is within the specified limits.

4.7.7.2.2 Test applicability

This test applies to all types of NR UE supporting E-UTRA and EN-DC from Release 16 onwards. Applicability requires support for L1-SINR measurements on the NR PSCell.

4.7.7.2.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 4.7.7.0.2.

The normative reference for this requirement is TS 38.133 [6] clause A.4.7.7.2.

4.7.7.2.4 Test description

4.7.7.2.4.1 Initial conditions

This test shall be tested using any of the test configurations in Table 4.7.7.2.4.1-1.

Table 4.7.7.2.4.1-1: Applicable NR configurations for FR1 L1-SINR measurement test with SSB based CMR and CSI-IM based IMR

Config	Description
1	LTE FDD, NR 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode
2	LTE FDD, NR 15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode
3	LTE FDD, NR 30kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode
4	LTE TDD, NR 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode
5	LTE TDD, NR 15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode
6	LTE TDD, NR 30kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode
Note: The UE is only required to be tested in one of the supported test configurations in each supported band	

Configure the test equipment and the DUT according to the parameters in Table 4.7.7.2.4.1-2.

Table 4.7.7.2.4.1-2: Initial conditions

Parameter	Value		Comment
Test environment	NC, TL/VL, TL/VH, TH/VL, TH/VH		As specified in TS 38.508-1 [14] clause 4.1.
Test frequencies	As specified in Annex E, Table E.2-1 and TS 38.508-1 [14] clause 4.3.1.		
Channel bandwidth	As specified by the test configuration selected from Table 4.7.7.2.4.1-1.		
Propagation conditions	AWGN		As specified in Annex C.2.2.
Connection Diagram	TE Part 2Rx	A.3.1.8.2 with n = 1	As specified in TS 38.508-1 [14] Annex A.
	TE Part 4Rx	A.3.1.8.5 with n = 1	
	DUT Part 2Rx	A.3.2.3.4	
	DUT Part 4Rx	A.3.2.5.2	
Exceptions to connection diagram	N/A		

1. Message contents are defined in clause 4.7.7.2.4.3.

2. Cell 1 is the E-UTRA serving cell (PCell) for the EN-DC setup. The power levels and settings for Cell 1 are set according to Annex A.6. Cell 2 is the NR FR1 cell. Cell 2 is the PSCell and the target for SSB-based L1-SINR measurements. Before the test, UE is configured one SSB resource set with two SSB resources and one CSI-IM resource set with two CSI-IM resource. UE is configured to perform RLM and BFD measurement based on the SSB resources 0 and 1. UE is configured to perform L1-SINR measurement based on the SSBs as CMR and the CSI-IM resources as IMR. The connection setup is done according to the settings in Annex C.1.1.

4.7.7.2.4.2 Test procedure

Prior to the start of the time duration T1, the UE shall be fully synchronized to PSCell. The UE shall be configured for periodic CSI reporting in PUCCH [format 2] with a reporting periodicity as mentioned in the above table 4.7.4.1.2.4.1-2.

1. Ensure the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity EN-DC, DC bearer MCG and SCG, Connected without release *On* and Test Mode *On*, according to TS 38.508-1 [14] clause 4.5 and general test parameters set according to Table 4.7.7.2.4.1-2.

2. Set the parameters according to T1 in Table 4.7.7.2.5-1.

3. The UE shall start sending L1-SINR report including results of both SSB#0 and SSB#1 every 80 slots.

4. The SS shall check the L1-SINR reported values of SSB#0+CSI-IM#0 and SSB#1+CSI-IM#1 in the periodic L1-SINR reports. If the value for both SSB#0+CSI-IM#0 and SSB#1+CSI-IM#1 is within the limits in Table 4.7.7.2.5-2 or Table 4.7.7.2.5-3 (depending on the test configuration), the number of passed iterations is increased by one, otherwise the number of failed iterations is increased by one.

5. The SS shall continue checking the L1-SINR report messages transmitted by the UE until the confidence level according to Table G.2.3-1 in Annex G is achieved.

6. Set the parameters according to each sub-test in Table 4.7.7.2.5-1 as appropriate and repeat steps 3-5.

4.7.7.2.4.3 Message contents

Message contents are according to TS 38.508-1 [14] clause 7.3 with the following exceptions:

Table 4.7.7.2.4.3-1: Common Exception messages EN-DC SSB based L1-SINR measurement

Default Message Contents	
Common contents of system information blocks exceptions	
Default RRC messages and information elements contents exceptions	Table H.3.6A-1 with conditions PERIODIC and SS-SINR and CSI-RS_IMR Table H.3.6A-2 with conditions SSB and PERIODIC Table H.3.6A-4 with condition PERIODIC Table 7.3.1-3 in TS 38.508-1 [14] with condition SMTC.1

Table 4.7.7.2.4.3-2: RadioLinkMonitoringConfig

Derivation Path: TS 38.508-1 [14], Table 4.6.3-133			
Information Element	**Value/remark**	**Comment**	**Condition**
RadioLinkMonitoringConfig ::= SEQUENCE {			
failureDetectionResourcesToAddModList SEQUENCE (SIZE(1..maxNrofFailureDetectionResources)) OF SEQUENCE {	1 entry		
purpose	both	UE is configured to perform RLM and BFD based on the SSBs.	
}			
}			

4.7.7.2.5 Test requirement

Table 4.7.7.2.5-1 defines the primary level settings including test tolerances for all tests.

Each L1-SINR measurement report for each of the tests in Table 4.7.7.2.5-1 shall meet the corresponding absolute accuracy requirements in Table 4.7.7.2.5-2 for test configurations 1, 2, 4 and 5, and the corresponding absolute accuracy requirements in Table 4.7.7.2.5-3 for test configurations 3 and 6.

Table 4.7.7.2.5-1: FR1 L1-SINR measurement test with SSB based CMR and CSI-IM based IMR

Parameter	Config	Unit	Test 1	Test 2
SSB GSCN	1~6		freq1	freq1
Duplex mode	1,4		FDD	FDD
	2,5		TDD	TDD
	3,6		TDD	TDD
TDD Configuration	1,4		N/A	N/A
	2,5		TDDConf.1.1	TDDConf.1.1
	3,6		TDDConf.2.1	TDDConf.2.1
$BW_{channel}$	1,4	MHz	10: $N_{RB,c}$ = 52	10: $N_{RB,c}$ = 52

		2,5		10: $N_{RB,c}$ = 52	10: $N_{RB,c}$ = 52
		3,6		40: $N_{RB,c}$ = 106	40: $N_{RB,c}$ = 106
PDSCH Reference measurement channel		1,4		SR.1.1 FDD	SR.1.1 FDD
		2,5		SR.1.1 TDD	SR.1.1 TDD
		3,6		SR.2.1 TDD	SR.2.1 TDD
RMSI CORESET Reference Channel		1,4		CR.1.1 FDD	CR.1.1 FDD
		2,5		CR.1.1 TDD	CR.1.1 TDD
		3,6		CR.2.1 TDD	CR.2.1 TDD
Dedicated CORESET Reference Channel		1,4		CCR.1.1 FDD	CCR.1.1 FDD
		2,5		CCR.1.1 TDD	CCR.1.1 TDD
		3,6		CCR.2.1 TDD	CCR.2.1 TDD
SSB configuration		1,4		SSB.3 FR1	SSB.3 FR1
		2,5		SSB.3 FR1	SSB.3 FR1
		3,6		SSB.4 FR1	SSB.4 FR1
CSI-IM configuration		1,4		CSI-IM 1.1 FDD	CSI-IM 1.1 FDD
		2,5		CSI-IM 1.1 TDD	CSI-IM 1.1 TDD
		3,6		CSI-IM 2.1 TDD	CSI-IM 2.1 TDD
OCNG Patterns		1~6		OP.1	OP.1
TRS configuration		1,4		TRS.1.1 FDD	TRS.1.1 FDD
		2,5		TRS.1.1 TDD	TRS.1.1 TDD
		3,6		TRS.1.2 TDD	TRS.1.2 TDD
Initial BWP Configuration		1~6		DLBWP.0.1 ULBWP.0.1	DLBWP.0.1 ULBWP.0.1
Dedicated BWP configuration		1~6		DLBWP.1.1 ULBWP.1.1	DLBWP.1.1 ULBWP.1.1
SMTC configuration		1~6		SMTC.1	SMTC.1
reportConfigType		1~6		periodic	periodic
reportQuantity-r16		1~6		ssb-Index-SINR-r16	ssb-Index-SINR-r16
Number of reported RS		1~6		2	2
L1-SINR reporting period		1~6		slot80	slot80
EPRE ratio of PSS to SSS		1~6	dB	0	0
EPRE ratio of PBCH DMRS to SSS					
EPRE ratio of PBCH to PBCH DMRS					
EPRE ratio of PDCCH DMRS to SSS					
EPRE ratio of PDCCH to PDCCH DMRS					
EPRE ratio of PDSCH DMRS to SSS					
EPRE ratio of PDSCH to PDSCH DMRS					
EPRE ratio of OCNG DMRS to SSS Note 1					
N_{oc} Note2	Depending on band group	1,2,4,5	dBm/15kHz	-94.65	-117+ Δ_{BG_offset}
		3,6		-96.00	-117+ Δ_{BG_offset}
N_{oc} Note2		1,2,4,5	dBm/SSB SCS	-94.65	-117+ Δ_{BG_offset}
		3,6		-93.00	-114+ Δ_{BG_offset}
$\hat{E}_s / I_{ot}$		1~6	dB	10	-2.2
SSB RSRP Note3	Depending on band group	1,2,4,5	dBm/SSB SCS	-84.65	-119.2 + Δ_{BG_offset}
		3,6		-83.00	-116.2 + Δ_{BG_offset}
Io Note3	Depending on band group	1,2,4,5	dBm/9.36 MHz	-56.28	-87.00 + Δ_{BG_offset}
		3,6	dBm/38.16 MHz	-51.53	-80.90 + Δ_{BG_offset}
EPRE ratio of OCNG to OCNG DMRS Note 1					

$\hat{E}_s / N_{oc}$	1~6	dB	10	-2.2
Propagation condition	1~6		AWGN	AWGN
antenna configuration	1~6		1x2	1x2

Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.

Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for N_{oc} to be fulfilled.

Note 3: RSRP and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.

Note 4: RSRP minimum requirements are specified assuming independent interference and noise at each receiver antenna port.

Note 5: The test configuration excludes support for band n51 and it is not required to run this test on band n51 in this release of the specification.

Table 4.7.7.2.5-2: L1-SINR absolute accuracy requirements for the reported values for test configurations 1, 2, 4 and 5

Normal Conditions	**Test 1 All bands**	**Test 2**	
Lowest reported value (Cell 2)	54	All Bands	30
Highest reported value (Cell 2)	79	All Bands	55
Extreme Conditions	**Test 1 All bands**	**Test 2**	
Lowest reported value (Cell 2)	53	All Bands	29
Highest reported value (Cell 2)	80	All Bands	56

NOTE: NR operating band groups are defined in clause 3A.4, Table 3A.4.1-2.

Table 4.7.7.2.5-3: L1-SINR absolute accuracy requirements for the reported values for test configurations 3 and 6

Normal Conditions	Test 1 All bands	Test 2	
Lowest reported value (Cell 2)	54	All Bands	30
Highest reported value (Cell 2)	79	All Bands	55
Extreme Conditions	**Test 1 All bands**	**Test 2**	
Lowest reported value (Cell 2)	53	All Bands	29
Highest reported value (Cell 2)	80	All Bands	56
NOTE: NR operating band groups are defined in clause 3A.4, Table 3A.4.1-2			

For the test to pass, the ratio of successful reported values in each test shall be more than 90% with a confidence level of 95%.

4.7.7.3 EN-DC FR1 CSI-RS based CMR and dedicated IMR L1-SINR measurement

4.7.7.3.1 EN-DC FR1 CSI-RS based CMR and dedicated IMR L1-SINR absolute measurement accuracy

4.7.7.3.1.1 Test purpose

The purpose of this test is to verify that the L1-SINR measurement accuracy is within the specified limits.

4.7.7.3.1.2 Test applicability

This test applies to all types of NR UE supporting E-UTRA and EN-DC from Release 16 onwards. Applicability requires support of L1-SINR measurements between an E-UTRA PCell and an NR PSCell.

4.7.7.3.1.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 4.7.7.0.3.

The normative reference for this requirement is TS 38.133 [6] clause A.4.7.7.3.

4.7.7.3.1.4 Test description

4.7.7.3.1.4.1 Initial conditions

This test shall be tested using any of the test configurations in Table 4.7.7.3.1.4.1-1.

Table 4.7.7.3.1.4.1-1: Applicable NR configurations for FR1 L1-SINR measurement test with CSI-RS based both CMR based IMR

Config	Description
1	LTE FDD, NR 15 kHz CSI-RS SCS, 10 MHz bandwidth, FDD duplex mode
2	LTE FDD, NR 15 kHz CSI-RS SCS, 10 MHz bandwidth, TDD duplex mode
3	LTE FDD, NR 30kHz CSI-RS SCS, 40 MHz bandwidth, TDD duplex mode
4	LTE TDD, NR 15 kHz CSI-RS SCS, 10 MHz bandwidth, FDD duplex mode
5	LTE TDD, NR 15 kHz CSI-RS SCS, 10 MHz bandwidth, TDD duplex mode
6	LTE TDD, NR 30kHz CSI-RS SCS, 40 MHz bandwidth, TDD duplex mode
Note: The UE is only required to be tested in one of the supported test configurations in each supported band.	

Configure the test equipment and the DUT according to the parameters in Table 4.7.7.3.1.4.1-2.

Table 4.7.7.3.1.4.1-2: Initial conditions

Parameter	Value		Comment
Test environment	NC, TL/VL, TL/VH, TH/VL, TH/VH		As specified in TS 38.508-1 [14] clause 4.1.
Test frequencies	As specified in Annex E, Table E.2-1 and TS 38.508-1 [14] clause 4.3.1.		
Channel bandwidth	As specified by the test configuration selected from Table 4.7.7.3.1.4.1-1.		
Propagation conditions	AWGN		As specified in Annex C.2.2.
Connection Diagram	TE Part 2Rx	A.3.1.8.2 with n = 1	As specified in TS 38.508-1 [14] Annex A.
	TE Part 4Rx	A.3.1.8.5 with n = 1	
	DUT Part 2Rx	A.3.2.3.4	
	DUT Part 4Rx	A.3.2.5.2	
Exceptions to connection diagram	N/A		

1. Message contents are defined in clause 4.7.7.3.1.4.3.
2. Cell 1 is the E-UTRA serving cell (PCell) for the EN-DC setup. The power levels and settings for Cell 1 are set according to Annex A.6. Cell 2 is the NR FR1 cell. Cell 2 is the PSCell and the target for CSI-RS based L1-SINR measurements. Before the test, UE is configured two CSI-RS resource sets with two CSI-RS resources for each set. UE is configured to perform RLM and BFD based on SSB 0 and 1. CSI-RS is not transmitted in the same OFDM symbols as SSB. UE is configured to perform L1-SINR measurement based on the configured CSI-RS as both CMR and IMR. The connection setup is done according to the settings in Annex C.1.1.

4.7.7.3.1.4.2 Test procedure

Prior to the start of the time duration T1, the UE shall be fully synchronized to PSCell. The UE shall be configured for periodic CSI reporting in PUCCH [format 2] with a reporting periodicity as mentioned in the above table 4.7.4.1.2.4.1-2.

1. Ensure the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity EN-DC, DC bearer MCG and SCG, Connected without release *On* and Test Mode *On*, according to TS 38.508-1 [14] clause 4.5 and general test parameters set according to Table 4.7.7.3.1.4.1-2.

2. Set the parameters according to T1 in Table 4.7.7.3.1.5-1.

3. The UE shall start sending L1-SINR report including results of both CSI-RS#0+CSI-IM#0 and CSI-RS#1+CSI-IM#1 every 80 slots.

4. The SS shall check the L1-SINR reported values of CSI-RS#0 and CSI-RS #1 in the periodic L1-SINR reports. If the value for both CSI-RSs is within the limits in Table 4.7.7.3.1.5-2 or Table 4.7.7.3.1.5-3 (depending on the test configuration), the number of passed iterations is increased by one, otherwise the number of failed iterations is increased by one.

5. The SS shall continue checking the L1-SINR report messages transmitted by the UE until the confidence level according to Table G.2.3-1 in Annex G is achieved.

6. Set the parameters according to each sub-test in Table 4.7.7.3.1.5-1 as appropriate and repeat steps 3-5.

4.7.7.3.1.4.3 Message contents

Message contents are according to TS 38.508-1 [14] clause 7.3 with the following exceptions:

Table 4.7.7.3.1.4.3-1: Common Exception messages EN-DC CSI-RS based CMR without dedicated IMR L1-SINR measurement

Default Message Contents	
Common contents of system information blocks exceptions	
Default RRC messages and information elements contents exceptions	Table H.3.6A-1 with conditions PERIODIC and CSI-SINR and CSI-IM_IMR Table H.3.6A-2 with conditions CSI-RS and PERIODIC Table H.3.6A-3 with condition PERIODIC Table 7.3.1-3 in TS 38.508-1 [14] with condition SMTC.1

Table 4.7.7.3.4.3-2: RadioLinkMonitoringConfig

Derivation Path: TS 38.508-1 [14], Table 4.6.3-133			
Information Element	**Value/remark**	**Comment**	**Condition**
RadioLinkMonitoringConfig ::= SEQUENCE {			
failureDetectionResourcesToAddModList SEQUENCE (SIZE(1..maxNrofFailureDetectionResources)) OF SEQUENCE {	1 entry		
purpose	both	UE is configured to perform RLM and BFD based on the SSBs.	
}			
}			

4.7.7.3.1.5 Test requirement

Table 4.7.7.3.5-1 defines the primary level settings not including test tolerances for all tests.

Each L1-RSRP measurement report for each of the tests in Table 4.7.7.3.1.5-1 shall meet the corresponding absolute accuracy requirements in Table 4.7.7.3.1.5-2 for test configurations 1, 2, 4 and 5, and the corresponding absolute accuracy requirements in Table 4.7.7.3.1.5-3 for test configurations 3 and 6.

Table 4.7.7.3.1.5-1: FR1 L1-SINR measurement test with CSI-RS based both CMR and IMR

Parameter	Config	Unit	Test 1	Test 2
SSB GSCN	1~6		freq1	freq1

Duplex mode	1,4		FDD	FDD
	2,5		TDD	TDD
	3,6		TDD	TDD
TDD Configuration	1,4		N/A	N/A
	2,5		TDDConf.1.1	TDDConf.1.1
	3,6		TDDConf.2.1	TDDConf.2.1
$BW_{channel}$	1,4	MHz	10: $N_{RB,c}$ = 52	10: $N_{RB,c}$ = 52
	2,5		10: $N_{RB,c}$ = 52	10: $N_{RB,c}$ = 52
	3,6		40: $N_{RB,c}$ = 106	40: $N_{RB,c}$ = 106
PDSCH Reference measurement channel	1,4		SR.1.1 FDD	SR.1.1 FDD
	2,5		SR.1.1 TDD	SR.1.1 TDD
	3,6		SR.2.1 TDD	SR.2.1 TDD
RMSI CORESET Reference Channel	1,4		CR.1.1 FDD	CR.1.1 FDD
	2,5		CR.1.1 TDD	CR.1.1 TDD
	3,6		CR.2.1 TDD	CR.2.1 TDD
Dedicated CORESET Reference Channel	1,4		CCR.1.1 FDD	CCR.1.1 FDD
	2,5		CCR.1.1 TDD	CCR.1.1 TDD
	3,6		CCR.2.1 TDD	CCR.2.1 TDD
SSB configuration	1,4		SSB.1 FR1	SSB.1 FR1
	2,5		SSB.1 FR1	SSB.1 FR1
	3,6		SSB.2 FR1	SSB.2 FR1
OCNG Patterns	1~6		OP.1	OP.1
TRS configuration	1,4		TRS.1.1 FDD	TRS.1.1 FDD
	2,5		TRS.1.1 TDD	TRS.1.1 TDD
	3,6		TRS.1.2 TDD	TRS.1.2 TDD
Initial BWP Configuration	1~6		DLBWP.0.1 ULBWP.0.1	DLBWP.0.1 ULBWP.0.1
Dedicated BWP configuration	1~6		DLBWP.1.1 ULBWP.1.1	DLBWP.1.1 ULBWP.1.1
SMTC configuration	1~6		SMTC.1	SMTC.1
CSI-RS configuration as CMR	1,4		CSI-RS 1.2 FDD	CSI-RS 1.2 FDD
	2,5		CSI-RS 1.2 TDD	CSI-RS 1.2 TDD
	3,6		CSI-RS 2.2 TDD	CSI-RS 2.2 FDD
CSI-RS configuration as IMR	1,4		CSI-RS 1.3A FDD	CSI-RS 1.3A FDD
	2,5		CSI-RS 1.3A TDD	CSI-RS 1.3A TDD
	3,6		CSI-RS 2.3A TDD	CSI-RS 2.3A TDD
reportConfigType	1~6		periodic	periodic
reportQuantity-r16	1~6		cri-SINR-r16	cri-SINR-r16
nrofReportedRS	1~6		2	2
L1-RSRP reporting period	1~6		slot80	slot80
EPRE ratio of PSS to SSS	1~6	dB	0	0
EPRE ratio of PBCH DMRS to SSS				
EPRE ratio of PBCH to PBCH DMRS				
EPRE ratio of PDCCH DMRS to SSS				
EPRE ratio of PDCCH to PDCCH DMRS				
EPRE ratio of PDSCH DMRS to SSS				
EPRE ratio of PDSCH to PDSCH DMRS				
EPRE ratio of OCNG DMRS to SSS Note 1				
EPRE ratio of OCNG to OCNG DMRS Note 1				
$\hat{E}_s / I_{ot}$	1~6	dB	10	0.8
N_{oc} Note2 Depending on band group	1,2,4,5	dBm/15kHz	-94.65	-117+ Δ_{BG_offset}
	3,6		-96.00	-117+ Δ_{BG_offset}

N_{oc} Note2		1,2,4,5	dBm/SSB SCS	-94.65	-117+ Δ_{BG_offset}
		3,6		-93.00	-114+ Δ_{BG_offset}
$\hat{E}_s/I_{ot}$		1~6	dB	10	0.8
SSB RSRP Note3	Depending on band group	1,2,4,5	dBm/SSB SCS	-84.65	-119.2 + Δ_{BG_offset}
		3,6		-83.00	-116.2 + Δ_{BG_offset}
Io Note3	Depending on band group	1,2,4,5	dBm/9.36 MHz	-56.28	-87.00 + Δ_{BG_offset}
		3,6	dBm/38.16 MHz	-51.53	-80.90 + Δ_{BG_offset}
$\hat{E}_s/N_{oc}$		1~6	dB	10	0.8
Propagation condition		1~6		AWGN	AWGN
Antenna configuration		1~6		1x2	1x2

Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.

Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for N_{oc} to be fulfilled.

Note 3: RSRP and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.

Note 4: RSRP minimum requirements are specified assuming independent interference and noise at each receiver antenna port.

Note 5: The test configuration excludes support for band n51 and it is not required to run this test on band n51 in this release of the specification

Table 4.7.7.3.1.5-2: L1-SINR absolute accuracy requirements for the reported values for test configurations 1, 2, 4 and 5

Normal Conditions	**Test 1 All bands**	**Test 2**	
Lowest reported value (Cell 2)	54	All Bands	30
Highest reported value (Cell 2)	79	All Bands	55
Extreme Conditions	**Test 1 All bands**	**Test 2**	
Lowest reported value (Cell 2)	53	All Bands	29

Highest reported value (Cell 2)	80	All Bands	56
NOTE: NR operating band groups are defined in clause 3A.4, Table 3A.4.1-2.			

Table 4.7.7.3.1.5-3: L1-SINR absolute accuracy requirements for the reported values for test configurations 3 and 6

Normal Conditions	**Test 1 All bands**	**Test 2**	
Lowest reported value (Cell 2)	54	All Bands	30
Highest reported value (Cell 2)	79	All Bands	55
Extreme Conditions	**Test 1 All bands**	**Test 2**	
Lowest reported value (Cell 2)	53	All Bands	29
Highest reported value (Cell 2)	80	All Bands	56
NOTE: NR operating band groups are defined in clause 3A.4, Table 3A.4.1-2			

For the test to pass, the ratio of successful reported values in each test shall be more than 90% with a confidence level of 95%.

4.7.7.3.2 EN-DC FR1 CSI-RS based CMR and dedicated IMR L1-SINR relative measurement accuracy

4.7.7.3.2.1 Test purpose

The purpose of this test is to verify that the L1-SINR relative measurement accuracy is within the specified limits.

4.7.7.3.2.2 Test applicability

This test applies to all types of NR UE supporting E-UTRA and EN-DC from Release 16 onwards. Applicability requires support for L1-SINR measurements on the NR PSCell.

4.7.7.3.2.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 4.7.7.0.3.

The normative reference for this requirement is TS 38.133 [6] clause A.4.7.7.3.

4.7.7.3.2.4 Test description

4.7.7.3.2.4.1 Initial conditions

This test shall be tested using any of the test configurations in Table 4.7.7.3.2.4.1-1. Configure the test equipment and the DUT according to the parameters in Table 4.7.7.3.2.4.1-2.

Table 4.7.7.3.2.4.1-1: EN-DC CSI-RS based CMR with dedicated IMR L1-SINR measurement supported test configurations

Config	Description
1	LTE FDD, NR 15 kHz CSI-RS SCS, 10 MHz bandwidth, FDD duplex mode
2	LTE FDD, NR 15 kHz CSI-RS SCS, 10 MHz bandwidth, TDD duplex mode
3	LTE FDD, NR 30kHz CSI-RS SCS, 40 MHz bandwidth, TDD duplex mode
4	LTE TDD, NR 15 kHz CSI-RS SCS, 10 MHz bandwidth, FDD duplex mode
5	LTE TDD, NR 15 kHz CSI-RS SCS, 10 MHz bandwidth, TDD duplex mode
6	LTE TDD, NR 30kHz CSI-RS SCS, 40 MHz bandwidth, TDD duplex mode
Note: The UE is only required to be tested in one of the supported test configurations in each supported band	

Table 4.7.7.3.2.4.1-2: Test Environment parameters for EN-DC CSI-RS based CMR with dedicated IMR L1-SINR measurement

Parameter	Value		Comment
Test environment	NC, TL/VL, TL/VH, TH/VL, TH/VH		As specified in TS 38.508-1 [14] clause 4.1.
Test frequencies	As specified in Annex E, Table E.2-1 and TS 38.508-1 [14] clause 4.3.1.		
Channel bandwidth	As specified by the test configuration selected from Table 4.7.7.3.2.4.1-1.		
Propagation conditions	AWGN		As specified in Annex C.2.2.
Connection Diagram	TE Part 2Rx	A.3.1.8.2 with n = 1	As specified in TS 38.508-1 [14] Annex A.
	TE Part 4Rx	A.3.1.8.5 with n = 1	
	DUT Part 2Rx	A.3.2.3.4	
	DUT Part 4Rx	A.3.2.5.2	
Exceptions to connection diagram	N/A		

1. Message contents are defined in clause 4.7.7.3.2.4.3.

2. Cell 1 is the E-UTRA serving cell (PCell) for the EN-DC setup. The power levels and settings for Cell 1 are set according to Annex A.6. Cell 2 is the NR FR1 cell (PSCell). Cell 2 is the target for CSI-RS-based L1-SINR measurements. Before the test, UE is configured two CSI-RS resource sets with two CSI-RS resources for each set. UE is configured to perform RLM and BFD based on SSB 0 and 1. CSI-RS is not transmitted in the same OFDM symbols as SSB. UE is configured to perform L1-SINR measurement based on the configured CSI-RS as both CMR and IMR. The connection setup is done according to the settings in Annex C.1.1.

4.7.7.3.2.4.2 Test procedure

Prior to the start of the time duration T1, the UE shall be fully synchronized to PSCell. The UE shall be configured for periodic CSI reporting in PUCCH [format 2] with a reporting periodicity as mentioned in the above table 4.7.7.3.2.4.1-2.

1. Ensure the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity EN-DC, DC bearer MCG and SCG, Connected without release *On* and Test Mode *On*, according to TS 38.508-1 [14] clause 4.5 and general test parameters set according to Table 4.7.7.3.2.4.1-2.

2. Set the parameters according to T1 in Table 4.7.7.3.2.5-1.

3. The UE shall start sending L1-SINR report including results of both CSI-RS#0 and CSI-RS #1 every 80 slots.

4. The SS shall check the L1-SINR reported values of CSI-RS #0 and CSI-RS #1 in the periodic L1-SINR reports. The L1-SINR value for CSI-RS #1 is compared to the L1-SINR value for CSI-RS #0. If the difference is within the limits in Table 4.7.7.3.2.5-2 (depending on the test configuration), the number of passed iterations is increased by one, otherwise the number of failed iterations is increased by one.

5. The SS shall continue checking the L1-SINR report messages transmitted by the UE until the confidence level according to Table G.2.3-1 in Annex G is achieved.

6. Set the parameters according to each sub-test in Table 4.7.7.3.2.5-1 as appropriate and repeat steps 3-5.

4.7.7.3.2.4.3 Message contents

Same message contents as described in section 4.7.7.3.1.4.3

4.7.7.3.2.5 Test requirement

Table 4.7.7.3.2.5-1 defines the primary level settings including test tolerances for all tests.

Each L1-SINR measurement report for each of the tests in Table 4.7.7.3.2.5-1 shall meet the corresponding relative accuracy requirements in Table 4.7.7.3.2.5-2.

Table 4.7.7.3.2.5-1

Same as Table 4.7.7.3.1.5-1

Table 4.7.7.3.2.5-2: L1-SINR relative accuracy requirements for the reported values

	Test 1	**Test 2**
	All bands	All bands
Normal Conditions		
Lowest reported value (CSI-RS#1)	L1-SINR_x - 9	L1-SINR_x - 9
Highest reported value (CSI-RS#1)	L1-SINR _x + 9	L1-SINR _x + 9
Extreme Conditions		
Lowest reported value (CSI-RS#1)	L1-SINR _x - 10	L1-SINR _x - 10
Highest reported value (CSI-RS#1)	L1-SINR _x + 10	L1-SINR _x + 10
L1-SINR_x is the reported value of Cell 2		

For the test to pass, the ratio of successful reported values in each test shall be more than 90% with a confidence level of 95%.

4A NE-DC with all NR cells in FR1

4A.0 General

This clause contains test scenarios for NR and E-UTRA dual connectivity with NR as PCell and E-UTRA and PSCell. This configuration is also known as NE-DC. All NR cells are in Frequency Range 1.

4A.1 Signalling characteristics

4A.1.1 E-UTRAN PSCell addition

4A.1.1.0 Minimum conformance requirements

4A.1.1.0.1 E-UTRA PSCell Addition Delay Requirement

This clause defines requirements for the delay within which the UE shall be able to configure an E-UTRAN PSCell in NR - E-UTRA dual connectivity. The requirements are applicable to an NR - E-UTRA dual connectivity capable UE.

Upon receiving E-UTRAN PSCell addition in subframe *n*, the UE shall be capable to transmit PRACH preamble towards E-UTRAN PSCell no later than in subframe $n + T_{config_EUTRAN\text{-}PSCell}$:

Where:

$T_{config_EUTRAN\text{-}PSCell} = T_{RRC_delay} + T_{activation_time} + 50ms + T_{E\text{-}UTRAN\text{-}PSCell_DU}$

T_{RRC_delay} is the RRC procedure delay as specified in TS 38.331 [13].

$T_{activation_time}$ is the E-UTRAN PSCell activation delay. If the E-UTRAN PSCell is known, then $T_{activation_time}$ is 20ms. If the E-UTRAN PSCell is unknown, then $T_{activation_time}$ is 30ms provided the E-UTRAN PSCell can be successfully detected on the first attempt.

$T_{E\text{-}UTRAN\text{-}PSCell_DU}$ is the delay uncertainty in acquiring the first available PRACH occasion in the E-UTRAN PSCell. $T_{E\text{-}UTRAN\text{-}PSCell_DU}$ is up to 30ms.

E-UTRAN PSCell is known if it has been meeting the following conditions:

- During the last 5 seconds before the reception of the E-UTRAN PSCell configuration command:
  - the UE has sent a valid measurement report for the E-UTRAN PSCell being configured and
  - the E-UTRAN PSCell being configured remains detectable according to the cell identification conditions specified in clause 8.8 of TS 36.133 [23],
- E-UTRAN PSCell being configured also remains detectable during the E-UTRAN PSCell configuration delay $T_{config_EUTRAN\text{-}PSCell}$ according to the cell identification conditions specified in clause 8.8 of TS 36.133 [23].

otherwise it is unknown.

The PCell interruption specified in clause 8.2 of TS 38.133 [6] is allowed only during the RRC reconfiguration procedure [14].

4A.1.1.0.2 E-UTRA PSCell Release Delay Requirement

The requirements in this clause shall apply for a UE which is configured with PCell and E-UTRAN PSCell and may also be configured with one or more SCells and/or E-UTRAN SCells.

Upon receiving E-UTRAN PSCell release in subframe *n*, the UE shall accomplish the release actions specified in TS 38.331 [14] no later than in subframe $n+T_{RRC_delay}$:

Where

T_{RRC_delay} is the RRC procedure delay as specified in TS 38.331 [13].

The PCell interruption specified in clause 8.2 of TS 38.133 [6] is allowed only during the RRC reconfiguration procedure [14].

4A.1.1.1 NE-DC FR1 addition and release delay of known PSCell

Editor's note: This test case is incomplete. The following aspects are either missing or TBD

- Message contents are FFS

4A.1.1.1.1 Test purpose

The purpose of this test is to verify that the LTE PSCell addition/release delay and interruption under NE-DC are within the specified requirements for the case when the PSCell is known by the UE at the time of addition.

4A.1.1.1.2 Test applicability

This test applies to all types of NR UE supporting E-UTRA and NE-DC from Release 15 onwards.

4A.1.1.1.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 4A.1.1.0.

The normative reference for this requirement is TS 38.133 [6] clause A.4A.1.1.

4A.1.1.1.4 Test description

4A.1.1.1.4.1 Initial conditions

This test shall be tested using any of the test configurations in Table 4A.1.1.1.4.1-1.

Table 4A.1.1.1.4.1-1: Test configurations for NE-DC PSCell addition and Release test

Config	Description
1	LTE FDD, NR 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode
2	LTE FDD, NR 15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode
3	LTE FDD, NR 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode
4	LTE TDD, NR 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode
5	LTE TDD, NR 15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode
6	LTE TDD, NR 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode
Note: The UE is only required to be tested in one of the supported test configurations	

Configure the test equipment and the DUT according to the parameters in Table 4A.1.1.1.4.1-2.

Table 4A.1.1.1.4.1-2: Initial conditions

Parameter	Value		Comment
Test environment	NC		As specified in TS 38.508-1 [14] clause 4.1.
Test frequencies	FFS		
Channel bandwidth	As specified by the test configuration selected from Table 4A.1.1.1.4.1-1.		
Propagation conditions	AWGN		As specified in clause C.2.2.
Connection Diagram	TE Part 2Rx	A.3.1.8.2 with n = 1	As specified in TS 38.508-1 [14] Annex A.
	TE Part 4Rx	A.3.1.8.5 with n = 1	
	DUT Part 2Rx	A.3.2.3.4	
	DUT Part 4Rx	A.3.2.5.2	
Exceptions to connection diagram	N/A		

1. Message contents are defined in clause 4A.1.1.1.4.3.

2. Cell 1 is the NR FR1 serving cell (PCell) for the NE-DC setup. Cell 2 is the E-UTRA PSCell. The connection setup is done according to the settings in clause C.1.1.

3 Common test parameters are defined in Table 4A.1.1.1.4.1-3.

Table 4A.1.1.1.4.1-3: General Test Parameters for PSCell Addition and Release

Parameter		Unit	Value	Comment
RF Channel Number			1, 2	Two radio channels are used for this test. One for NR cell and second for E-UTRAN Cell
Initial	Active PCell		Cell1	PCell on RF channel number 1.
	Neighbour cell		Cell2	Neighbour cell on RF channel number 2.
Final Condition	Active PCell		Cell1	PCell on RF channel number 1.
	Neighbour Cell		Cell2	PSCell released on RF channel number 2.
B1	Hysteresis	dB	0	Hysteresis for evaluation of event B1.
	Threshold RSRP (Config 1,2,4,5)	dBm	-97 Note 1	Actual RSRP threshold for event B1.
	Threshold RSRP (Config 3,6)	dBm	-97 Note 2	Actual RSRP threshold for event B1.
	Time to Trigger	S	0	
DRX			OFF	Continuous monitoring of primary cell
Measurement gap pattern Id			0	Gaps are configured before T2 and released before T3.
Cell-individual offset for cells on RF channel number 1		dB	0	Individual offset for cells on primary component carrier.
Cell-individual offset for cells on RF channel number 2		dB	0	Individual offset for cells on carrier frequency of cell2.
T1		s	1	During this time the PCell shall be known and cell2 shall be unknown.
T2		s	1	During this time the UE shall identify neighbour cell (cell2) and report event B1.
T3		s	0.5	During this time the UE adds the PSCell.
T4		s	0.5	During this time the UE sends CSI reports for PSCell.
T5		s	0.5	During this time the UE releases the PSCell.
Note 1: Value includes the TT based on the TT analysis results. Original value -96 dBm. TT: -1dB.				
Note 2: Value includes the TT based on the TT analysis results. Original value -93 dBm. TT: -4dB.				

4A.1.1.1.4.2 Test Procedure

1. Ensure the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity NR, Connected without release On according to TS 38.508-1 [6] clause 4.5.

2. The SS shall set the parameters according to Table 4A.1.1.1.5-1 and 4A.1.1.1.5-2 as appropriate. T1 starts

3. The SS shall transmit an RRCReconfiguration message with event B1 configured.

4. The UE shall transmit an RRCReconfigurationComplete message.

5. When T1 expires, the SS shall set T2 parameters according to Table 4A.1.1.1.5-1 and 4A.1.1.1.5-2 as appropriate. T2 starts.

6. The UE shall transmit a MeasurementReport message triggered by Event B1 for Cell 2 no later than 1.5s from the start of T2.

7. The SS shall transmit an RRCReconfiguration message to release measurement gap.

8. The UE shall transmit an RRCReconfigurationComplete message.

9. The SS then shall transmit RRCReconfiguration message with condition NE-DC according to TS 38.508-1 [6] Table 4.6.1-13 to add E-UTRA cell (PSCell). T3 starts when the UE receives the RRC message.

10. The UE shall transmit an RRCReconfigurationComplete message.

11. The UE shall send a PRACH to PSCell during T3. The UE shall send PRACH no later than 120ms from the start of T3, otherwise increase the number of failed iterations by one, switch off the UE and continue with step 17.

12. T4 starts.

13. During T4 the UE shall send at least one CSI report for PSCell with non-zero CQI index, otherwise increase the number of failed iterations by one, switch off the UE and continue to step 17.

14. The SS shall transmit RRCReconfiguration message with condition NE-DC_PSCell_Rel according to TS 38.508-1 [6] Table 4.6.1-13 to release E-UTRA cell (PSCell) after the UE has send at least one CQI report with non-zero CQI index for PSCell (Cell 2). T5 starts when the UE receives the RRC message.

15. The UE shall transmit an RRCReconfigurationComplete message.

16. The UE shall stop sending CSI reports for PSCell no later than 20ms from the start of T5, if so increase the number of passed iterations by one otherwise increase the number of failed iterations by one and switch off the UE.

17. Set Cell 2 physical cell identity = ((current cell 2 physical cell identity + 1) mod 14 + 2) for the next iteration of the test procedure loop.

18. If the UE is not switched off, the SS shall transmit an RRCRelease message to release the RRC connection then, the SS transmits in Cell 1 a Paging message (including PagingRecord with UE-Identity) for the UE and ensures the UE is in State RRC_CONNECTED with generic parameter Connectivity NR with , Connected without release On. If paging succeeds, go to step 20, otherwise switches off the UE.

19. Switches on the UE and ensures the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity NR with Connected without release On according to TS 38.508-1 [14] clause 4.5.

20. Repeat step 2-19 until a test verdict has been achieved.

4A.1.1.1.4.3 Message Contents

Message contents are according to TS 38.508-1 [14] clause 7.3 with the following exceptions:

Table 4A.1.1.1.4.3-1: Common exception messages

Default Message Contents	
Common contents of system information blocks exceptions	FFS
Default RRC messages and information elements contents exceptions	FFS

4A.1.1.1.5 Test Requirements

Table 4A.1.1.1.5-1 defines the primary level settings including test tolerances for NR Cell 1. Table 4A.1.1.1.5-2 defines primary level settings including test tolerances for E-UTRA Cell 2.Table 4A.1.1.1.5-1: NR Cell Specific Parameters for PSCell Addition and Release

Parameter	Unit	Config	Test
NR RF Channel Number		1,2,3,4,5,6	1
E-UTRA RF Channel Number		1,2,3,4,5,6	2
TDD configuration		1,4	Not Applicable
		2,5	TDDConf.1.1
		3,6	TDDConf.2.1
$BW_{channel}$	MHz	1,4	10: $N_{RB,c}$ = 52
		2,5	10: $N_{RB,c}$ = 52

		3,6	40: $N_{RB,c}$ = 106
Initial BWP Configuration		1,2,3	DLBWP.0.1 ULBWP.0.1
Dedicated BWP Configuration		1,2,3	DLBWP.1.1 ULBWP.1.1
PDSCH Reference measurement channel		1,4	SR.1.1 FDD
		2,5	SR.1.1 TDD
		3,6	SR.2.1 TDD
RMSI CORESET Reference Channel		1,4	CR.1.1 FDD
		2,5	CR.1.1 TDD
		3,6	CR.2.1 TDD
Dedicated CORESET Reference Channel		1,4	CCR.1.1 FDD
		2,5	CCR.1.1 TDD
		3,6	CCR.2.1 TDD
OCNG Patterns		1,2,3,4,5,6	OP.1
SSB configuration		1,2,4,5	SSB.1 FR1
		3,6	SSB.2 FR1
SMTC configuration		1,2,4,5	SMTC.1
		3,6	SMTC.1
TRS Configuration		1,4	TRS.1.1 FDD
		2,5	TRS.1.1 TDD
		3,6	TRS.1.2 TDD
CSI-RS configuration for CSI reporting		1,4	CSI-RS.1.1 FDD
		2,5	CSI-RS.1.1 TDD
		3,6	CSI-RS.2.1 TDD
reportConfigType		1,2,3,4,5,6	periodic
reportQuantity		1,2,3,4,5,6	cri-RI-PMI-CQI
CSI reporting periodicity	slot	1,2,4,5	5
		3,6	10
CSI reporting offset	slot	1,2,4,5	2
		3,6	4
EPRE ratio of PSS to SSS	dB	1,2,3,4,5,6	0
EPRE ratio of PBCH DMRS to SSS			
EPRE ratio of PBCH to PBCH DMRS			
EPRE ratio of PDCCH DMRS to SSS			
EPRE ratio of PDCCH to PDCCH DMRS			
EPRE ratio of PDSCH DMRS to SSS			
EPRE ratio of PDSCH to PDSCH			
EPRE ratio of OCNG DMRS to SSS(Note 1)			
EPRE ratio of OCNG to OCNG DMRS (Note 1)			
N_{oc} Note2	dBm/15 kHz	1,2,3,4,5,6	-88
N_{oc} Note2	dBm/SCS	1,2,4,5	-88
		3,6	-85
$\hat{E}_s/I_{ot}$		1,2,3,4,5,6	0
$\hat{E}_s/N_{oc}$		1,2,3,4,5,6	0
SS-RSRP Note3	dBm/SCS	1,2,4,5	-88
		3,6	-85
Io Note3	dBm/9.36MHz	1,2,4,5	-57
	dBm/38.1MHz	3,6	-51
Propagation condition		1,2,3,4,5,6	AWGN
Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.			

Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for N_{oc} to be fulfilled.
Note 3: SS-RSRP and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.
Note 4: SS-RSRP minimum requirements are specified assuming independent interference and noise at each receiver antenna port.

Table 4A.1.1.1.5-2: E-UTRAN cell specific test parameters for PSCell Addition and Release tests

Parameter	Unit	E-UTRAN Cell				
		T1	T2	T3	T4	T5
Duplex mode		FDD or TDD				
TDD special subframe configuration[Note1]		6				
TDD uplink-downlink configuration[Note1]		1				
$BW_{channel}$		5 MHz: $N_{RB,c}$ = 25 10 MHz: $N_{RB,c}$ = 50 20 MHz: $N_{RB,c}$ = 100				
PDSCH parameters: DL Reference Measurement Channel[Note2]		5 MHz: R.7 FDD 10 MHz: R.3 FDD 20 MHz: R.6 FDD 5 MHz: R.4 TDD 10 MHz: R.0 TDD 20 MHz: R.3 TDD				
PCFICH/PDCCH/PHICH parameters: DL Reference Measurement Channel[Note2]		5 MHz: R.11 FDD 10 MHz: R.6 FDD 20 MHz: R.10 FDD 5 MHz: R.11 TDD 10 MHz: R.6 TDD 20 MHz: R.10 TDD				
OCNG Patterns[Note2]		5 MHz: OP.20 FDD 10 MHz: OP.10 FDD 20 MHz: OP.17 FDD 5 MHz: OP.9 TDD 10 MHz: OP.1 TDD 20 MHz: OP.7 TDD				
PBCH_RA	dB	0				
PBCH_RB	dB					
PSS_RA	dB					
SSS_RA	dB					
PCFICH_RB	dB					
PHICH_RA	dB					
PHICH_RB	dB					
PDCCH_RA	dB					
PDCCH_RB	dB					
PDSCH_RA	dB					
PDSCH_RB	dB					
OCNG_RA[Note3]	dB					
OCNG_RB[Note3]	dB					
N_{oc}[Note4]	dBm/15 kHz	N/A	-104			
$\hat{E}_s/N_{oc}$	dB	-infinite	17			
$\hat{E}_s/I_{ot}$	dB	-infinite	17			
RSRP [Note5]	dBm/15 kHz	-infinite	-87			
SCH_RP [Note5]	dBm/15 kHz	-infinite	-87			
Io [Note5]	dBm/Ch BW	N/A	-59.13+10log($N_{RB,c}$ /50)			
Propagation Condition		AWGN				
Antenna Configuration		1x2				

Note 1:	Special subframe and uplink-downlink configurations are specified in table 4.2-1 in TS 36.211.
Note 2:	DL RMCs and OCNG patterns are specified in clauses A 3.1 and A 3.2 of TS 36.133 respectively.
Note 3:	OCNG shall be used such that all cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.
Note 4:	Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for N_{oc} to be fulfilled.
Note 5:	E_s/I_{ot}, RSRP, SCH_RP and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.

The UE shall transmit the PRACH to PSCell at latest 120 ms[Note1] into T3.

The UE shall send at least one CSI report for PSCell with non-zero CQI index during T4.

The UE shall periodically send CSI reports for PSCell after the UE has sent first CQI report with non-zero CQI index during T4

The UE shall stop sending CSI reports for PSCell in at latest 20ms into T5.

Interruption on PCell during PSCell addition and release shall not exceed the values specified for NE-DC in Clause 8.2.3.2.3 of TS 38.133 [4].

All the above test requirements shall be fulfilled in order for the observed PSCell addition delay and PSCell release delay to be counted as correct. The rate of correct observed PSCell addition delay and PSCell release delay during repeated tests shall be at least 90%.

4A.1.2 Active BWP switch delay

4A.1.2.0 Minimum conformance requirements

FFS

4A.1.2.1 NE-DC FR1 DCI-based and timer-based DL active BWP switch in non-DRX in synchronous NE-DC

Editor's note: This test case is incomplete. The following aspects are either missing or TBD

- TT analysis is missing

- Test procedure is FFS

- Test applicability in TS 38.522 is FFS

- Test requirements contain values in [.]

- Message contents are FFS

4A.1.2.1.1 Test purpose

The purpose of this test is to verify that the active BWP switch delay under NE-DC is within the specified requirements for the case.

4A.1.2.1.2 Test applicability

This test applies to all types of NR UE supporting E-UTRA and NE-DC from Release 15 onwards. This test requires support of DCI and timer based active BWP switching delay type1 or type2 (*bwp-SwitchingDelay)* and BWP adaptation of at least 2BWPs (*bwp-SameNumerology)*.

4A.1.2.1.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 4A.1.2.0.

The normative reference for this requirement is TS 38.133 [6] clause A.4A.1.2.

4A.1.2.1.4 Test description

4A.1.2.1.4.1 Initial conditions

This test shall be tested using any of the test configurations in Table 4A.12.4.1-1.

Table 4A.1.2.1.4.1-1: Test configurations

Config	Description
1	LTE FDD, NR 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode
2	LTE FDD, NR 15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode
3	LTE FDD, NR 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode
4	LTE TDD, NR 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode
5	LTE TDD, NR 15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode
6	LTE TDD, NR 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode
Note: The UE is only required to be tested in one of the supported test configurations	

Configure the test equipment and the DUT according to the parameters in Table 4A.1.2.1.4.1-2.

Table 4A.1.2.1.4.1-2: Initial conditions

Parameter	Value		Comment
Test environment	NC		As specified in TS 38.508-1 [14] clause 4.1.
Test frequencies	FFS		
Channel bandwidth	As specified by the test configuration selected from Table 4A.1.2.1.4.1-1.		
Propagation conditions	AWGN		As specified in clause C.2.2
Connection Diagram	TE Part 2Rx	A.3.1.8.2 with n = 1	As specified in TS 38.508-1 [14] Annex A.
	TE Part 4Rx	A.3.1.8.5 with n = 1	
	DUT Part 2Rx	A.3.2.3.4	
	DUT Part 4Rx	A.3.2.5.2	
Exceptions to connection diagram	N/A		

1. Message contents are defined in clause 4A.1.2.1.4.3.

2. Cell 1 is the NR FR1 serving cell (PCell) for the NE-DC setup. Cell 2 is the E-UTRA PSCell. The power levels and settings for Cell 2 are set according to Annex A.6. The connection setup is done according to the settings in clause C.1.1.

3 Common test parameters are defined in Table 4A.1.2.1.4.1-3.

Table 4A.1.2.1.4.1-3: General test parameters for DL BWP switch in synchronous NE-DC

Parameter	Unit	Value	Comment
NR RF Channel Number		1	One NR radio channel is used for this test
E-UTRA RF Channel Number		2	One E-UTRA radio channel is used for this test
Active PCell		Cell 1	PCell on RF channel number 1.
Active PSCell		Cell 2	PSCell on RF channel number 2.
CP length		Normal	
DRX		OFF	For both PCell and PSCell
bwp-InactivityTimer	ms	[200]	
Cell-individual offset for cells on RF channel number 1	dB	0	Individual offset for cells on PCC.
Cell-individual offset for cells on RF channel number 2	dB	0	Individual offset for cells on PSCC.

Cell2 timing offset to cell1	µs	3	Synchronous NE-DC
T1	s	[0.2]	
T2	s	[0.2]	
T3	s	[0.2]	

4A.1.2.1.4.2 Test Procedure

1. FFS.

4A.1.2.1.4.3 Message Contents

Message contents are according to TS 38.508-1 [14] clause 7.3 with the following exceptions:

Table 4A.1.2.1.4.3-1: Common exception messages

Default Message Contents	
Common contents of system information blocks exceptions	FFS
Default RRC messages and information elements contents exceptions	FFS

4A.1.2.1.5 Test Requirements

Table 4A.1.2.1.5-1 defines the primary level settings including test tolerances for NR Cell 1.

Table 4A.1.2.1.5-1: NR Cell specific test parameters for DL BWP switch in synchronous NE-DC

Parameter		Unit	Cell 1
Frequency Range			FR1
Duplex mode	Config 1,4		FDD
	Config 2,3,5,6		TDD
TDD configuration	Config 1,4		Not Applicable
	Config 2,5		TDDConf.1.1
	Config 3,6		TDDConf.2.1
$BW_{channel}$	Config 1,4		10 MHz: $N_{RB,c}$ = 52
	Config 2,5		10 MHz: $N_{RB,c}$ = 52
	Config 3,6		40 MHz: $N_{RB,c}$ = 106
Active BWP ID			1, 2
Initial DL BWP Configuration	Config 1,4		DLBWP.0.2 Note 4
	Config 2,5		
	Config 3,6		
Active DL BWP-1 Configuration	Config 1,4		DLBWP.1.1 Note 4
	Config 2,5		
	Config 3,6		
Active DL BWP-2 Configuration	Config 1,4		DLBWP.1.3 Note 4
	Config 2,5		
	Config 3,6		
Initial UL BWP Configuration	Config 1,4		ULBWP.0.2 Note 4
	Config 2,5		
	Config 3,6		
Active UL BWP-1 Configuration	Config 1,4		ULBWP.1.1 Note 4
	Config 2,5		
	Config 3,6		
Active UL BWP-2 Configuration	Config 1,4		ULBWP.1.3 Note 4
	Config 2,5		
	Config 3,6		
PDSCH Reference measurement channel	Config 1,4		SR.1.1 FDD
	Config 2,5		SR.1.1 TDD
	Config 3,6		SR.2.1 TDD
RMSI CORESET parameters	Config 1,4		CR.1.1 FDD
	Config 2,5		CR.1.1 TDD
	Config 3,6		CR.2.1 TDD

Dedicated CORESET parameters	Config 1,4		CCR.1.1 FDD
	Config 2,5		CCR.1.1 TDD
	Config 3,6		CCR.2.3 TDD
OCNG Patterns			OP.1
SSB Configuration	Config 1,2,4,5		SSB.1 FR1
	Config 3,6		SSB.2 FR1
SMTC Configuration			SMTC.1
Correlation Matrix and Antenna Configuration			1x2 Low
TRS Configuration	Config 1,4		TRS.1.1 FDD
	Config 2,5		TRS.1.1 TDD
	Config 3,6		TRS.1.2 TDD
EPRE ratio of PSS to SSS		dB	0
EPRE ratio of PBCH DMRS to SSS			
EPRE ratio of PBCH to PBCH DMRS			
EPRE ratio of PDCCH DMRS to SSS			
EPRE ratio of PDCCH to PDCCH DMRS			
EPRE ratio of PDSCH DMRS to SSS			
EPRE ratio of PDSCH to PDSCH			
EPRE ratio of OCNG DMRS to SSS(Note 1)			
EPRE ratio of OCNG to OCNG DMRS (Note 1)			
N_{oc} Note 2	Config 1,2,4,5	dBm/SCS	[-104]
	Config 3,6		[-101]
N_{oc} Note 2		dBm/15kHz	-104
SS-RSRP Note 3	Config 1,2,4,5	dBm/SCS	[-87]
	Config 3,6		[-90]
$\hat{E}_s/I_{ot}$		dB	17
$\hat{E}_s/N_{oc}$		dB	17
Io Note3	Config 1,2,4,5	dBm/9.36MHz	[-59]
	Config 3,6	dBm/38.16MHz	[-61.9]
Propagation Condition			AWGN

Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.
Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for Noc to be fulfilled.
Note 3: SS-RSRP and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.
Note 4: For unpaired spectrum, a DL BWP is linked with an UL BWP. DLBWP.0.2 is linked with ULBWP.0.2; DLBWP.1.1 is linked with ULBWP.1.1; DLBWP.1.3 is linked with ULBWP.1.3 defined in clause 12 of TS 38.213.

During T1, the UE shall start to send the ACK for PCell in the DL slot right after DL slot ($i+T_{BWPswitchDelay}+k1$).

During T3, the UE shall start to send the ACK for PCell in the DL slot right after DL slot ($j+T_{BWPswitchDelay}+k1$).

Where, *k1* is the timing between DL data receiving and acknowledgement as specified in [7].

Depending on UE capability *bwp-SwitchingDelay* [2], UE shall finish BWP switch within the time duration $T_{BWPswitchDelay}$ defined in Table 8.6.2-1.

All of the above test requirements shall be fulfilled in order for the observed PCell active BWP switch delay to be counted as correct.

The rate of correct events observed during repeated tests shall be at least 90%.

During T1, the start time of PSCell interruption during PCell active BWP switch shall not happen outside the BWP switch delay.

During T3, the start time of PSCell interruption of during PCell active BWP switch shall not happen outside the BWP switch delay.

The interruption of PSCell shall not be longer than the interruption duration specified for active BWP switch in TS36.133 Clause 7.36.2.6.

All of the above test requirements shall be fulfilled in order for the observed PSCell active BWP switch interruption to be counted as correct.

The rate of correct events observed during repeated tests shall be at least 90%.

4A.2 Measurement performance requirements

4A.2.1 SFTD accuracy

4A.2.1.0 Minimum conformance requirements

4A.1.1.0.1 NE-DC SFTD accuracy Requirement

The SFN and frame timing difference (SFTD) is measured between PCell and E-UTRAN PSCell under NE-DC.

The accuracy requirements in Table 4A.2.1.1.3-4 are applicable under the following conditions:

For FR1 PCell SFN and frame timing measurement:

- Conditions defined in clause 7.3 of TS 38.101-1 [2] for reference sensitivity are fulfilled.
- Io range defined in Table 4A.2.1.1.3-1.

Table 4A.2.1.1.3-1: PCell Io range conditions in FR1

Parameter	Io [Note 1] range			
	NR operating band groups [Note 4, 5]	Minimum Io [Note 2, 3]		Maximum Io
		dBm/ SCS_{SSB}		dBm/$BW_{Channel}$
		SCS_{SSB} = 15 kHz	SCS_{SSB} = 30 kHz	
Conditions	NR_FDD_FR1_A, NR_TDD_FR1_A	-121	-118	-50
	NR_FDD_FR1_B	-120.5	-117.5	-50
	NR_TDD_FR1_C	-120	-117	-50
	NR_FDD_FR1_D, NR_TDD_FR1_D	-119.5	-116.5	-50
	NR_FDD_FR1_E, NR_TDD_FR1_E	-119	-116	-50
	NR_FDD_FR1_G	-118	-115	-50
	NR_FDD_FR1_H	-117.5	-114.5	-50

NOTE 1: Io is assumed to have constant EPRE across the bandwidth.
NOTE 2: The condition level is increased by $\Delta R_{IB,c}$ as defined in clause 7.3B in TS 38.101-3 [4], depending on E-UTRA – NR band combination.
NOTE 3: The condition level is increased by MSD as defined in clause 7.3B in TS 38.101-3 [4], if applicable depending on E-UTRA – NR band combination.
NOTE 4: NR operating band groups are as defined in clause 3A.4.1.
NOTE 5: Only NR bands within EN-DC band combinations as specified in clause 5.5B in TS 38.101-3 [4] are applicable.

For FR2 PCell SFN and frame timing measurement:

- Conditions defined in clause 7.3 of TS 38.101-2 [2] for reference sensitivity are fulfilled.
- Io range defined in Table 4A.2.1.1.3-2.

Table 4A.2.1.1.3-2: PCell Io range conditions in FR2

Parameter	Io [Note 1] range		
	Minimum Io [Note 2, 3]		Maximum Io
	dBm/ SCS_{SSB}		dBm/$BW_{Channel}$
	SCS_{SSB} = 15 kHz	SCS_{SSB} = 30 kHz	

Conditions	Same value as SSB_RP in Table B.2.4.1-2 of TS 38.133[6], according to UE Power class, operating band and angle of arrival	Same value as SSB_RP in Table B.2.4.1-2 of TS 38.133[6], according to UE Power class, operating band and angle of arrival	-50

NOTE 1: Io is assumed to have constant EPRE across the bandwidth and specified at the Reference point.
NOTE 2: Values based on Refsens and EIS spherical coverage as defined in clauses 7.3.2 and 7.3.4 of TS 38.101-2 [2]. Applicable side condition selected depending on angle of arrival.
NOTE 3: In the test cases, the SSB Ês/Iot and related parameters may need to be adjusted to ensure Ês/Iot at UE baseband is above the value defined in this table.

For E-UTRA PSCell SFN and frame timing measurement:

- Cell specific reference signals are transmitted either from one, two or four antenna ports.
- Conditions defined in TS 36.101 [27] Clause 7.3 for reference sensitivity are fulfilled.
- No changes to the uplink transmission timing are applied during the measurement period.
- $RSRP|_{dBm}$ according to Annex B.3.5 in TS 36.101 [27] for a corresponding Band.
- Io range defined in Table 4A.2.1.1.3-3.

Table 4A.2.1.1.3-3: E-UTRA PSCell Io range conditions

Parameter	**Io Note 1 range**		
	E-UTRA operating band groups Note 3	**Minimum Io**	**Maximum Io**
		dBm/15kHz Note 2	**dBm/BW$_{Channel}$**
Conditions	FDD_A, TDD_A	-121	-50
	FDD_C, TDD_C	-120	-50
	FDD_D	-119.5	-50
	FDD_E, TDD_E	-119	-50
	FDD_F	-118.5	-50
	FDD_G	-118	-50
	FDD_H	-117.5	-50
	FDD_N	-114.5	-50

NOTE 1: When in dBm/15kHz, the minimum Io condition is expressed as the average Io per RE over all REs in that symbol. Io may be different in different symbols within a subframe.
NOTE 2: The condition level is increased by Δ>0, when applicable, as described in clauses B.4.2 and B.4.3 in TS36.133 [23].
NOTE 3: E-UTRA operating band groups are as defined in clause 3.5 in TS 36.133 [23].

Table 4A.2.1.1.3-4: SFTD measurement accuracy

Accuracy	**Conditions**	
	Ês/Iot Note 2	**Frequency range**
Ts Note 1	**dB**	
40*64*Tc	≥-3 dB	FR1
40*64*Tc		FR2

NOTE 1: Tc is the basic timing unit defined in TS 38.211 [7].
NOTE 2: The parameter Ês/Iot is the minimum Ês/Iot of the pair of cells to which the requirement applies.

4A.2.1.1 NE-DC FR1 SFTD accuracy

Editor's note: This test case is incomplete. The following aspects are either missing or TBD

- TT analysis is missing
- Message contents are FFS

4A.2.1.1.1 Test purpose

The purpose of this set of tests is to verify that the SFTD measurement accuracy is within the specified limits.

4A.2.1.1.2 Test applicability

This test applies to all types of NR UE supporting E-UTRA and NE-DC from Release 15 onwards. This test requires support of SFTD measurements between an NR PCell and an E-UTRA PSCell (*sftd-MeasPSCell-NEDC)*.

4A.2.1.1.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 4A.2.1.0.

The normative reference for this requirement is TS 38.133 [6] clause A.4A.2.1.

4A.2.1.1.4 Test description

4A.2.1.1.4.1 Initial conditions

This test shall be tested using any of the test configurations in Table 4A.2.1.1.4.1-1.

Table 4A.2.1.1.4.1-1: Supported test configurations for SFTD accuracy

Configuration	Description
1	NR 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode, LTE FDD
2	NR 15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode, LTE FDD
3	NR 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode, LTE FDD
4	NR 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode, LTE TDD
5	NR 15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode, LTE TDD
6	NR 30kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode, LTE TDD
Note 1: The UE is only required to be tested in one of the supported test configurations	

Configure the test equipment and the DUT according to the parameters in Table 4A.2.1.1.4.1-2.

Table 4A.2.1.1.4.1-2: Initial conditions

Parameter	Value		Comment
Test environment	NC		As specified in TS 38.508-1 [14] clause 4.1.
Test frequencies	FFS		
Channel bandwidth	As specified by the test configuration selected from Table 4A.1.1.1.4.1-1.		
Propagation conditions	AWGN		As specified in clause C.2.2.
Connection Diagram	TE Part 2Rx	A.3.1.8.2 with n = 1	As specified in TS 38.508-1 [14] Annex A.
	TE Part 4Rx	A.3.1.8.5 with n = 1	
	DUT Part 2Rx	A.3.2.3.4	
	DUT Part 4Rx	A.3.2.5.2	
Exceptions to connection diagram	N/A		

1. Message contents are defined in clause 4A.1.1.1.4.3.
2. Cell 1 is the NR FR1 serving cell (PCell) for the NE-DC setup. Cell 2 is the E-UTRA PSCell. The power levels and settings for Cell 2 are set according to Annex A.6. The connection setup is done according to the settings in clause C.1.1.

4A.2.1.1.4.2 Test Procedure

1. Ensure the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity NR, Connected without release On according to TS 38.508-1 [6] clause 4.5.
2. Set the parameters according to Table 4A.2.1.1.5-1 and Table 4A.2.1.1.5-1 as appropriate. (Condition = 3)
3. The SS shall transmit an RRReconfiguration message on Cell 1.
4. The UE shall transmit an RRCReconfigurationComplete message.
5. The UE shall transmit a MeasurementReport containing the MeasResultCellListSFTD-r15 for the PSCell with SFTD measurements.
6. The SS shall check the reported SFN offset and frame boundary offset between the NR PCell and the E-UTRA PSCell. The number of failed iterations is increased by one if
   - The value of *sfn-OffsetResult* is different with the expected SFN offset value, or
   - The value of *frameBoundaryOffsetResult* is outside the range given in Table 4A.2.1.1.5-3, or
   - The UE fails to report the measurement value for Cell 2.

   Otherwise the number of successful iterations is increased by one.
7. Switch off and on the UE and ensure the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity NR, Connected without release On according to TS 38.508-1 [6] clause 4.5.
8. Repeat steps 2-7 until the confidence level according to Tables G.2.3-1 in Annex G clause G.2 is achieved.

4A.2.1.1.4.3 Message Contents

Message contents are according to TS 38.508-1 [14] clause 7.3 with the following exceptions:

Table 4A.2.1.1.4.3-1: Common exception messages

Default Message Contents	
Common contents of system information blocks exceptions	FFS
Default RRC messages and information elements contents exceptions	FFS

4A.2.1.1.5 Test Requirements

Table 4A.2.1.1.5-1 defines the primary level settings including test tolerances for NR Cell 1

Table 4A.2.1.1.5-1: Test parameters for SFTD accuracy (Cell 1)

Parameter	Config	Unit	Test 1
SSB GSCN	1~6		freq1
Duplex mode	1,4		FDD
	2,5		TDD
	3,6		TDD
TDD Configuration	1,4		N/A
	2,5		TDDConf.1.1
	3,6		TDDConf.2.1
$BW_{channel}$	1,4	MHz	10: $N_{RB,c}$ = 52
	2,5		10: $N_{RB,c}$ = 52
	3,6		40: $N_{RB,c}$ = 106
PDSCH Reference measurement channel	1,4		SR.1.1 FDD
	2,5		SR.1.1 TDD
	3,6		SR.2.1 TDD
RMSI CORESET Reference Channel	1,4		CR.1.1 FDD
	2,5		CR.1.1 TDD

		3,6		CR.2.1 TDD
RMC CORESET Reference Channel		1,4		CCR.1.1 FDD
		2,5		CCR.1.1 TDD
		3,6		CCR.2.1 TDD
SSB configuration		1,4		SSB.1 FR1
		2,5		SSB.1 FR1
		3,6		SSB.2 FR1
SMTC configuration		1~6		SMTC.1
DL BWP configuration		1~6		DLBWP.1.1
UL BWP configuration		1~6		ULBWP.1.1
OCNG Patterns		1~6		OP.1
EPRE ratio of PSS to SSS		1~6	dB	0
EPRE ratio of PBCH DMRS to SSS				
EPRE ratio of PBCH to PBCH DMRS				
EPRE ratio of PDCCH DMRS to SSS				
EPRE ratio of PDCCH to PDCCH DMRS				
EPRE ratio of PDSCH DMRS to SSS				
EPRE ratio of PDSCH to PDSCH DMRS				
EPRE ratio of OCNG DMRS to SSS Note 1				
EPRE ratio of OCNG to OCNG DMRS Note 1				
N_{oc} Note2	NR_FDD_FR1_A, NR_TDD_FR1_A NOTE 5	1~6	dBm/15kHz	-104
	NR_FDD_FR1_B			
	NR_TDD_FR1_C			
	NR_FDD_FR1_D, NR_TDD_FR1_D			
	NR_FDD_FR1_E, NR_TDD_FR1_E			
	NR_FDD_FR1_F			
	NR_FDD_FR1_G			
	NR_FDD_FR1_H			
N_{oc} Note2	NR_FDD_FR1_A, NR_TDD_FR1_A NOTE 5	1,2,4,5	dBm/SSB SCS	-104
	NR_FDD_FR1_B			
	NR_TDD_FR1_C			
	NR_FDD_FR1_D, NR_TDD_FR1_D			
	NR_FDD_FR1_E, NR_TDD_FR1_E			
	NR_FDD_FR1_F			
	NR_FDD_FR1_G			
	NR_FDD_FR1_H			
	NR_FDD_FR1_A, NR_TDD_FR1_A NOTE 5	3,6		-101
	NR_FDD_FR1_B			
	NR_TDD_FR1_C			
	NR_FDD_FR1_D, NR_TDD_FR1_D			
	NR_FDD_FR1_E, NR_TDD_FR1_E			
	NR_FDD_FR1_F			
	NR_FDD_FR1_G			
	NR_FDD_FR1_H			
$\hat{E}_s / I_{ot}$		1~6	dB	2.7

$\hat{E}_s / N_{oc}$		1~6	dB	2.7
SS-RSRP Note3	NR_FDD_FR1_A, NR_TDD_FR1_A NOTE 5	1,2,4,5	dBm/SCS	-107
	NR_FDD_FR1_B			
	NR_TDD_FR1_C			
	NR_FDD_FR1_D, NR_TDD_FR1_D			
	NR_FDD_FR1_E, NR_TDD_FR1_E			
	NR_FDD_FR1_F			
	NR_FDD_FR1_G			
	NR_FDD_FR1_H			
	NR_FDD_FR1_A, NR_TDD_FR1_A NOTE 5	3,6		-104
	NR_FDD_FR1_B			
	NR_TDD_FR1_C			
	NR_FDD_FR1_D, NR_TDD_FR1_D			
	NR_FDD_FR1_E, NR_TDD_FR1_E			
	NR_FDD_FR1_F			
	NR_FDD_FR1_G			
	NR_FDD_FR1_H			
Io Note3	NR_FDD_FR1_A, NR_TDD_FR1_A NOTE 5	1,2,4,5	dBm/9.36 MHz	-74.18
	NR_FDD_FR1_B			
	NR_TDD_FR1_C			
	NR_FDD_FR1_D, NR_TDD_FR1_D			
	NR_FDD_FR1_E, NR_TDD_FR1_E			
	NR_FDD_FR1_F			
	NR_FDD_FR1_G			
	NR_FDD_FR1_H			
	NR_FDD_FR1_A, NR_TDD_FR1_A NOTE 5	3,6	dBm/38.16 MHz	-65.08
	NR_FDD_FR1_B			
	NR_TDD_FR1_C			
	NR_FDD_FR1_D, NR_TDD_FR1_D			
	NR_FDD_FR1_E, NR_TDD_FR1_E			
	NR_FDD_FR1_F			
	NR_FDD_FR1_G			
	NR_FDD_FR1_H			
Propagation condition		1~6		AWGN
Antenna configuration		1~6		1x2

Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.

Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for N_{oc} to be fulfilled.

Note 3: SS-RSRP and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.

Note 4:	SS-RSRP minimum requirements are specified assuming independent interference and noise at each receiver antenna port.
Note 5:	The test configuration excludes support for band n51 and it is not required to run this test on band n51 in this release of the specification

Table 4A.2.1.1.5-2: Timing offsets for SFTD accuracy test

Configuration	SFN offset between PCell and PSCell	Frame boundary offset between PCell and PSCell (Ts)
1	100	-122000
2	300	-60540
3	500	1000
4	700	62540
5	900	124000

The SFTD reported by the UE consists of 2 elements, SFN offset and frame boundary offset between PCell and E-UTRAN target cell. The reported SFTD accuracy shall fulfil the requirement in clause 10.1.21.1 of TS 38.133 [4].

5 EN-DC with at least one NR cell in FR2

5.0 General

This clause contains test scenarios for E-UTRA and NR dual connectivity with E-UTRA as PCell and NR as PSCell. At least one NR cell is in Frequency Range 2.

For conformance testing involving FR2 test cases in this specification, the UE under test shall be pre-configured with UL Tx diversity schemes disabled to account for single polarization System Simulator (SS) in the test environment. The UE under test may transmit with dual polarization.

5.1 Void

5.2 Void

5.3 RRC_CONNECTED state mobility

5.3.1 Void

5.3.2 RRC connection mobility control

5.3.2.1 Void

5.3.2.2 Random access

5.3.2.2.1 EN-DC FR2 contention based random access

Editor's note: This test case is incomplete for Test 2, 3 and 7. The following aspects are either missing or not yet determined:

- The settable window for first preamble uplink power and the uplink calibration process are FFS.
- The test requirement for absolute uplink power is FFS.
- The test requirement for relative uplink power is FFS.
- The uncertainty value and test requirement for PRACH timing are in [ ]
- The results of the TT analysis are provisional until the corresponding MU values are agreed

5.3.2.2.1.1 Test purpose

The purpose of this test is to verify that the behaviour of the random access procedure is according to the requirements and that the PRACH power settings and timing are within specified limits.

5.3.2.2.1.2 Test applicability

This test applies to all types of E-UTRA UE release 15 and forward, supporting EN-DC with FR2.

5.3.2.2.1.3 Minimum conformance requirement

The random access procedure is used when establishing the layer 1 communication between the UE and NG-RAN. The random access is as defined in TS 38.213 [8] clause 7.4 and the control of the RACH transmission is as defined in TS 38.321 [12] clause 5.1.

The UE shall have capability to calculate PRACH transmission power according to the PRACH power formula as defined in TS 38.213 [8] clause 7.4 and apply this power level at the first preamble or additional preambles. The absolute power applied to the first preamble shall have an accuracy as defined in TS 38.101-2 [3] Table 6.3.4.2-1. The relative power applied to additional preambles shall have an accuracy as specified in TS 38.101-2 [3] Tables 6.3.4.3-1 and 6.3.4.3-2.

The UE shall indicate a Random Access problem to upper layers if the maximum number of preamble transmission counter has been reached for the random access procedure on PCell or PSCell as specified in TS 38.321 [12] clause 5.1.4.

With the UE selected SSB with SS-RSRP above *rsrp-ThresholdSSB*, UE shall have the capability to select a Random Access Preamble randomly with equal probability from the Random Access Preambles associated with the selected SSB if the association between Random Access Preambles and SS blocks is configured, as specified in clause 5.1.2 in TS 38.321 [12].

With the UE selected SSB with SS-RSRP above *rsrp-ThresholdSSB*, UE shall have the capability to transmit Random Access Preamble on the next available PRACH occasion from the PRACH occasions corresponding to the selected SSB permitted by the restrictions given by the *ra-ssb-OccasionMaskIndex* if configured, if the association between PRACH occasions and SSBs is configured, and PRACH occasion shall be randomly selected with equal probability amongst the selected SSB associated PRACH occasions occurring simultaneously but on different subcarriers, as specified in clause 5.1.2 in TS 38.321 [12].

The UE may stop monitoring for Random Access Response(s) and shall transmit the msg3 if the Random Access Response contains a Random Access Preamble identifier corresponding to the transmitted Random Access Preamble.

The UE shall again perform the Random Access Resource selection procedure defined in clause 5.1.2 in TS 38.321 [12], and transmit with the calculated PRACH transmission power when the backoff time expires if all received Random Access Responses contain Random Access Preamble identifiers that do not match the transmitted Random Access Preamble.

The UE shall again perform the Random Access Resource selection procedure defined in clause 5.1.2 in TS 38.321 [12], and transmit with the calculated PRACH transmission power when the backoff time expires if no Random Access Response is received within the RA Response window defined in clause 5.1.4 in TS 38.321 [12].

The UE shall re-transmit the msg3 upon the reception of an UL grant for msg3 retransmission.

The UE shall send ACK if the Contention Resolution is successful.

The UE shall again perform the Random Access Resource selection procedure defined in clause 5.1.2 in TS 38.321 [12], and transmit with the calculated PRACH transmission power when the backoff time expires unless the received message includes a UE Contention Resolution Identity MAC control element and the UE Contention Resolution Identity included in the MAC control element matches the CCCH SDU transmitted in the uplink message.

The UE shall re-select a preamble and transmit with the calculated PRACH transmission power when the backoff time expires if the Contention Resolution Timer expires.

The normative reference for this requirement is TS 38.133 [6] clause 6.2.2.

5.3.2.2.1.4 Test description

5.3.2.2.1.4.1 Initial conditions

This test can be run in the configurations defined in Table 5.3.2.2.1.4.1-1.

Table 5.3.2.2.1.4.1-1: Supported test configurations

Test Case ID	Test Config Index	Description

5.3.2.2.1-1	1	LTE FDD, NR 120 kHz SSB SCS, 100 MHz bandwidth, TDD
5.3.2.2.1-2	2	LTE TDD, NR 120 kHz SSB SCS, 100 MHz bandwidth, TDD
NOTE: The UE is only required to be tested in one of the supported test configurations.		

Before the test procedure, Downlink and Uplink calibrations are carried out to derive signalled parameter values. This is necessary to ensure that the test case operates within the specified ranges. The detail of the calibration process is implementation dependent, but shall derive the values of Δ_{DL} and Δ_{UL} according to the following principles:

With the UE configured to report SS-RSRP, the Δ_{DL} value is calculated as (RSRP_$_{REP}$ – RSRP_76), where RSRP_$_{REP}$ is the SS-RSRP Reported value according to TS 38.133 [6] Table 10.1.6.1-1 with -80.6dBm/SCS applied at the Reference point. For a Reported value RSRP_x, x is treated as a positive integer value.

With the UE configured to send a first PRACH preamble, Δ_{UL} value is calculated as -ROUND(PPRACH0 -1), where PPRACH0 is the measured first PRACH power with -80.6dBm/SCS applied at the Reference point, and with signalled values *preambleReceivedTargetPower* = -100dBm and *ss-PBCH-BlockPower* = 20dBm.

Configure the test equipment and the DUT according to the parameters in Table 5.3.2.2.1.4.1-2.

Table 5.3.2.2.1.4.1-2: Initial conditions

Parameter	Value		Comment
Test environment	NC		As specified in TS 38.508-1 [14] clause 4.1.
Test frequencies	As specified in Annex E, E.1.1, E.1.3.1 and Table E.3-1 and TS 38.508-1 [14] clause 4.3.1 for E-UTRA and 7.2.3 for NR		
Channel bandwidth	As specified by the test configuration selected from Table 4.3.2.2.1.4.1-1.		
Propagation conditions	AWGN		As specified in clause C.2.2.
Connection Diagram	TE Part	A.3.3.1.1	As specified in TS 38.508-1 [14] Annex A.
	DUT Part	A.3.4.1.1	
Exceptions to connection diagram	N/A		

1. Message contents are defined in clause 5.3.2.2.1.4.3.
2. Cell 1 is the E-UTRA serving cell (PCell) for the EN-DC setup. The E-UTRAN PCell power levels and settings are specified in Table A.6.1.1-1. Cell 2 is the NR FR2 PSCell. The connection setup is done according to the settings in clause C.1.3, with downlink signal levels as per clause C.1.2. General Test parameters are defined in Table 5.3.2.2.1.5-1.
3. Downlink signals for NR cell are initially set up according to clause C.2.1.
4. The UE Rx beam peak direction has been obtained previously using one of the Rx Beam Peak Search procedures as described in Annex I.

5.3.2.2.1.4.2 Test procedure

For this test two cells are used, an E-UTRA serving cell (PCell) and an NR FR2 PSCell. For the NR PSCell, the System Simulator shall not explicitly assign a random access preamble via dedicated signalling in the downlink.

1. Ensure the UE is in state E-UTRA RRC_CONNECTED with generic procedure parameters *Connectivity* E-UTRA/EPC with Test Mode *On* according to TS 38.508-1 [14] clause 4.5.
2. Set the parameters according to Table 5.3.2.2.1.5-1.
3. The test system shall send a RRCReconfiguration message to the UE to add NR PSCell, then the UE shall trigger a random access procedure.
4. Test 1: Correct behaviour when transmitting Random Access Preamble

   4.1. The UE shall send a preamble to the System Simulator. The System Simulator shall check that the Random Access Preamble belongs to one of the Random Access Preambles associated with the SSB with index 0, which has SS-RSRP above the configured rsrp-ThresholdSSB.

5. Test 2: Correct behaviour when receiving Random Access Response

   5.1. Repeat steps 1-3.

   5.2. The UE shall send preambles to the System Simulator. In response to the first 4 preambles, the System Simulator shall transmit a Random Access Response containing Random Access Preamble identifiers that do not match the transmitted Random Access Preamble.

   5.3. As the received Random Access Responses contain Random Access Preamble identifiers that do not match the transmitted Random Access Preamble, the UE shall perform the Random Access Resource selection procedure specified in clause 5.1.2 in TS 38.321 [12], and transmit with the calculated PRACH transmission power when the backoff time expires.

   5.4. The System Simulator shall transmit a Random Access Response containing a Random Access Preamble identifier matching the transmitted Random Access Preamble after 5 preambles have been received by the System Simulator.

   5.5. As the received Random Access Response contains a Random Access Preamble identifier that matches the transmitted Random Access Preamble, the UE shall transmit the msg3.

   5.6. Measure the power and timing of the first preamble and it shall not exceed the values specified in 5.3.2.2.1.5. Measure the relative power and timing applied to additional preambles (last 4 preambles) and it shall not exceed the values specified in 5.3.2.2.1.5.

6. Test 3: Correct behaviour when not receiving Random Access Response

   6.1. Repeat steps 1-3.

   6.2. The UE shall send preambles to the System Simulator. The System Simulator shall not respond to the first 4 preambles.

   6.3. As no Random Access Response was received within the RA Response window, the UE shall perform the Random Access Resource selection procedure specified in clause 5.1.2 in TS 38.321 [12], and transmit with the calculated PRACH transmission power when the backoff time expires.

   6.4. The System Simulator shall transmit a Random Access Response containing a Random Access Preamble identifier matching the transmitted Random Access Preamble after 5 preambles have been received by the System Simulator.

   6.5. As the received Random Access Response contains a Random Access Preamble identifier that matches the transmitted Random Access Preamble, the UE shall transmit the msg3.

   6.6. Measure the power and timing of the first preamble and it shall not exceed the values specified in 5.3.2.2.1.5. Measure the relative power and timing applied to additional preambles (last 4 preambles) and it shall not exceed the values specified in 5.3.2.2.1.5.

7. Test 4: Correct behaviour when receiving an UL grant for msg3 retransmission

   7.1. Repeat steps 1-3.

   7.2. The UE shall send a preamble to the System Simulator. The System Simulator shall transmit a Random Access Response containing a Random Access Preamble identifier matching the transmitted Random Access Preamble.

   7.3. As the received Random Access Response contains a Random Access Preamble identifier that matches the transmitted Random Access Preamble, the UE shall transmit the msg3 including C-RNTI MAC control element.

   7.4. The System Simulator shall send PDCCH addressed to the Temporary C-RNTI after receiving the msg3.

   7.5. The UE shall re-transmit the msg3 including C-RNTI MAC control element.

   7.6. The System Simulator shall check if UE re-transmit the msg3.

8. Test 5: Correct behaviour when receiving a successful UE Contention Resolution

8.1. Repeat steps 1-3.

8.2. The UE shall send a preamble to the System Simulator. The System Simulator shall transmit a Random Access Response containing a Random Access Preamble identifier matching the transmitted Random Access Preamble.

9.3. As the received Random Access Response contains a Random Access Preamble identifier that matches the transmitted Random Access Preamble, the UE shall transmit the msg3 including C-RNTI MAC control element.

9.4. The System Simulator shall send a PDCCH addressed to the C-RNTI.

9.5. The UE shall send PUSCH according to the received PDCCH addressed to the C-RNTI.

10. Test 7: Correct behaviour when contention Resolution timer expires

10.1. Repeat steps 1-3.

10.2. The UE shall send a preamble to the System Simulator. The System Simulator shall transmit a Random Access Response containing a Random Access Preamble identifier matching the transmitted Random Access Preamble.

10.3. As the received Random Access Response contains a Random Access Preamble identifier that matches the transmitted Random Access Preamble, the UE shall transmit the msg3.

10.4. The System Simulator shall not send a response.

10.5. As there was no response, the UE shall perform the Random Access Resource selection procedure specified in clause 5.1.2 in TS 38.321 [12], and transmit with the calculated PRACH transmission power when the Contention Resolution Timer expires and then after the backoff timer expires.

10.6. Measure the power and timing of the first preamble after the Contention Resolution Timer and backoff timer expire and it shall not exceed the values specified in 5.3.2.2.1.5.

5.3.2.2.1.4.3 Message contents

Message contents are according to TS 38.508-1 [14] clause 7.3.1 with the following exceptions:

Table 5.3.2.2.1.4.3-0: Common Exception messages

Default Message Contents	
Common contents of system information blocks exceptions	
Default RRC messages and information elements contents exceptions	
Common exceptions to the contents of TS 38.508-1 [14]	Table 4.6.3-115 with SSB-Index 0 Table 4.6.3-120 with SSB-Index 0

Table 5.3.2.2.1.4.3-1: *FrequencyInfoUL-SIB* for Contention Based Random Access

Derivation Path: TS 38.508-1 [14], table 4.6.3-62			
Information Element	**Value/remark**	**Comment**	**Condition**
FrequencyInfoUL-SIB SEQUENCE {			
p-Max	23	23 dBm	
}			

Table 5.3.2.2.1.4.3-2: RACH-ConfigCommon for Contention Based Random Access

Derivation Path: TS 38.508-1 [14], table 4.6.3-128			
Information Element	**Value/remark**	**Comment**	**Condition**
RACH-ConfigCommon::= SEQUENCE {			
rach-ConfigGeneric	RACH-ConfigGeneric		
totalNumberOfRA-Preambles	48		

ssb-perRACH-OccasionAndCB-PreamblesPerSSB CHOICE {			
oneFourth	n48		FR2
}			
groupBconfigured SEQUENCE {			
numberOfRA-PreamblesGroupA	48		
}			
ra-ContentionResolutionTimer	sf48		
rsrp-ThresholdSSB	RSRP_69 +Δ_{DL}	Δ_{DL} is derived from the downlink calibration process	
prach-RootSequenceIndex CHOICE {			
l139	0		
}			
msg1-SubcarrierSpacing	kHz 120		
}			

Table 5.3.2.2.1.4.3-3: RACH-ConfigGeneric for Contention Based Random Access

Derivation Path: TS 38.508-1 [14], table 4.6.3-130			
Information Element	**Value/remark**	**Comment**	**Condition**
RACH-ConfigGeneric ::= SEQUENCE {			
prach-ConfigurationIndex	190		FR2
msg1-FDM	one		FR2
zeroCorrelationZoneConfig	11		
preambleReceivedTargetPower	-100		
preambleTransMax	n6		
powerRampingStep	dB2		
ra-ResponseWindow	sl10		
}			

Table 5.3.2.2.1.4.3-4: *ServingCellConfigCommonSIB* for Contention Based Random Access

Derivation Path: TS 38.508-1 [14], table 4.6.3-169			
Information Element	**Value/remark**	**Comment**	**Condition**
ServingCellConfigCommonSIB ::= SEQUENCE {			
ssb-PositionsInBurst SEQUENCE {			
inOneGroup	'1100 0000'B		
}			
ss-PBCH-BlockPower	20 +Δ_{UL}	Δ_{UL} is derived from the uplink calibration process	
}			

5.3.2.2.1.5 Test requirement

Table 5.3.2.2.1.5-2 defines the primary level settings for contention based random access test in FR2 for NR Standalone. Tables 5.3.2.2.1.5-3, 5.3.2.2.1.5-4 and 5.3.2.2.1.5-5 define the Absolute power limits, Relative power limits and uplink timing error limits respectively, and all include test tolerances.

Table 5.3.2.2.1.5-1: General test parameters

Parameter		Unit	Test-1	Comments
SSB Configuration	Config 1,2		SSB.1 FR2	As defined in A.3.2
CSI-RS for tracking	Config 1,2		TRS.2.1 TDD	
Duplex Mode for Cell 2	Config 1,2		TDD	
TDD Configuration	Config 1,2		TDDConf.3.1	As defined in A.1.5
$BW_{channel}$	Config 1,2	MHz	100: $N_{RB,c}$ = 24	
OCNG Pattern Note 1			OP.3	As defined in A.2.1
PDSCH Reference Channel Note 2	Config 1,2		SR.3.1 TDD	As defined in A.1.1

RMSI CORESET Reference Channel	Config 1,2		CR.3.1 TDD	As defined in A.1.2
RMC CORESET Reference Channel	Config 1,2		CCR.3.1 TDD	As defined in A.1.3
NR RF Channel Number			1	
EPRE ratio of PSS to SSS		dB	0	
EPRE ratio of PBCH_DMRS to SSS		dB		
EPRE ratio of PBCH to PBCH_DMRS		dB		
EPRE ratio of PDCCH_DMRS to SSS		dB		
EPRE ratio of PDCCH to PDCCH_DMRS		dB		
EPRE ratio of PDSCH_DMRS to SSS		dB		
EPRE ratio of PDSCH to PDSCH_DMRS		dB		
ss-PBCH-BlockPower		dBm/ SCS	+20 +Δ_{UL}	As defined in TS 38.331 [13]. Δ_{UL} is derived from the uplink calibration process Note 3
Configured UE transmitted power ($P_{CMAX,\ f,\ c}$)		dBm	maximum value configurable for certain power class	As defined in clause 6.2.4 of TS 38.101-2 [3]
PRACH Configuration			PRACH.1 FR2	As defined in A.7.2, with exceptions as defined below
rsrp-ThresholdSSB		dBm	RSRP_69 +Δ_{DL}	RSRP_69 corresponds to -88dBm. Δ_{DL} is derived from the downlink calibration process Note 4
preambleReceivedTargetPower		dBm	-100	As defined in TS 38.331 [13]

NOTE 1: OCNG shall be used such that a constant total transmitted power spectral density is achieved for all OFDM symbols. The OCNG pattern is chosen during the test according to the presence of a DL reference measurement channel.
NOTE 2: The DL PDSCH reference measurement channel is used in the test only when a downlink transmission dedicated to the UE under test is required.
NOTE 3: The Δ_{UL} value is calculated as -ROUND(P_{PRACH0} -1), where P_{PRACH0} is the measured first PRACH power with -80.6dBm/SCS applied, *preambleReceivedTargetPower* = -100dBm and *ss-PBCH-BlockPower* = 20dBm. These values are used during the uplink calibration process carried out before the test case is run, with the UE configured to send PRACH.
NOTE 4: The Δ_{DL} value is calculated as ($RSRP_{REP}$ – RSRP_76), where $RSRP_{REP}$ is the SS-RSRP Reported value in Table 10.1.6.1-1 with -80.6dBm/SCS applied. These values are used during the downlink calibration process carried out before the test case is run, with the UE configured to report SS-RSRP. For a Reported value RSRP_x, x is treated as a positive integer value.

Table 5.3.2.2.1.5-2: OTA-related test parameters

Parameter		Unit	Test-1	Comments
AoA setup			Setup 1	As defined in A.9.1
Assumption for UE beams Note 2			Rough	
SSB with index 0	Es Note1	dBm/SCS	-80.6	Power of SSB with index 0 is set to be above configured *rsrp-ThresholdSSB*
	SSB_RP	dBm/SCS	-80.6	
	Es/Iot_{BB}	dB	21.09	
	Io	dBm/95.04 MHz	-56.01	Io in symbols containing SSB index 0
SSB with index 1	Es Note1	dBm/SCS	-95.0	Power of SSB with index 1 is set to be below configured *rsrp-ThresholdSSB*
	SSB_RP	dBm/SCS	-95.0	
	Es/Iot_{BB}	dB	6.69	
	Io	dBm/95.04 MHz	-70.41	Io in symbols containing SSB index 1
Propagation Condition		-	AWGN	

NOTE 1: No artificial noise is applied in this test.
NOTE 2: Information about types of UE beam is given in TS 38.133 [6] clause B.2.1.3, and does not limit UE implementation or test system implementation

Test 1: Correct behaviour when transmitting Random Access Preamble

- The Random Access Preamble shall be one of the Random Access Preambles associated with SSB index 0.

Test 2: Correct behaviour when receiving Random Access Response

- The power of the first preamble shall be 0.6 dBm within the accuracy specified in Table 5.3.2.2.1.5-3.
- The relative power for preamble ramping step shall be 2 dB within the accuracy specified in Table 5.3.2.2.1.5-4.
- The transmit timing of all PRACH transmissions shall be within the accuracy specified in Table 5.3.2.2.1.5-5.

Test 3: Correct behaviour when not receiving Random Access Response

- The power of the first preamble shall be 0.6 dBm within the accuracy specified in Table 5.3.2.2.1.5-3.
- The relative power for preamble ramping step shall be 2 dB within the accuracy specified in Table 5.3.2.2.1.5-4.
- The transmit timing of all PRACH transmissions shall be within the accuracy specified in Table 5.3.2.2.1.5-5.

Test 4: Correct behaviour when receiving an UL grant for msg3 retransmission

- The UE shall re-transmit the msg3 upon the reception of an UL grant for msg3 retransmission.

Test 5: Correct behaviour when receiving a successful UE Contention Resolution

- The UE shall send PUSCH according to the PDCCH addressed to the C-RNTI.

Test 7: Correct behaviour when contention resolution timer expires

- The UE shall re-select a preamble and transmit with the calculated PRACH transmission power when the back off time expires if the contention resolution timer expires.
- The power of the first preamble shall be 0.6 dBm within the accuracy specified in Table 5.3.2.2.1.5-3.
- The transmit timing of the PRACH transmission shall be within the accuracy specified in Table 5.3.2.2.1.5-5.

Table 5.3.2.2.1.5-3 Absolute power tolerance Test requirements

Conditions	Tolerance
Normal	± FFS dB

Table 5.3.2.2.1.5-4 Relative power tolerance Test requirements

Measured power	Power step ΔP (dB)	PRACH (dB)
Measured power of both PRACHs being compared > (P_{max}^{Note1} – 6dB)	2 ≤ ΔP < 3	± (4+FFS).
Measured power of either PRACHs being compared ≤ (P_{max}^{Note1} – 6dB)		± (6+FFS)
NOTE 1: P_{max} is the Min peak EIRP defined in clause 6.2.1 of TS 38.101-2 [3], selected according to power class and operating band.		

Table 5.3.2.2.1.5-5: T_e Timing error Test requirements

Frequency Range	SCS of SSB signals (kHz)	SCS of uplink signals s(KHz)	T_e
2	120	120	224+[48]*T_c
NOTE 1: T_c is the basic timing unit defined in TS 38.211 [7]			

5.3.2.2.2 EN-DC FR2 non-contention based random access

Editor's note: This test case is incomplete for Test 3 and 4. The following aspects are either missing or not yet determined:

- The settable window for first preamble uplink power and the uplink calibration process are FFS.
- The test requirement for absolute uplink power is FFS.
- The test requirement for relative uplink power is FFS.
- The uncertainty value and test requirement for PRACH timing are in [ ]
- The results of the TT analysis are provisional until the corresponding MU values are agreed

5.3.2.2.2.1 Test purpose

The purpose of this test is to verify that the behaviour of the random access procedure is according to the requirements and that the PRACH power settings and timing are within specified limits.

5.3.2.2.2.2 Test applicability

This test applies to all types of E-UTRA UE release 15 and forward, supporting EN-DC with FR2. Additionally Test 2 is applicable to UE that supports CSI-RS based Random Access Preamble which requires UE to support csi-RSRP-AndRSRQ-MeasWithSSB or csi-RSRP-AndRSRQ-MeasWithoutSSB.

5.3.2.2.2.3 Minimum conformance requirement

The random access procedure is used when establishing the layer 1 communication between the UE and NG-RAN. The random access is as defined in TS 38.213 [8] clause 7.4 and the control of the RACH transmission is as defined in TS 38.321 [12] clause 5.1.

The UE shall have capability to calculate PRACH transmission power according to the PRACH power formula as defined in TS 38.213 [8] clause 7.4 and apply this power level at the first preamble or additional preambles. The absolute power applied to the first preamble shall have an accuracy as defined in TS 38.101-2 [3] Table 6.3.4.2-1. The relative power applied to additional preambles shall have an accuracy as specified in TS 38.101-2 [3] Tables 6.3.4.3-1 and 6.3.4.3-2.

The UE shall indicate a Random Access problem to upper layers if the maximum number of preamble transmission counter has been reached for the random access procedure on PCell or PSCell as specified in TS 38.321 [12] clause 5.1.4.

If the contention-free Random Access Resources and the contention-free PRACH occasions associated with SSBs is configured, with the UE selected SSB with SS-RSRP above *rsrp-ThresholdSSB* amongst the associated SSBs, UE shall have the capability to select the Random Access Preamble corresponding to the selected SSB, and to transmit Random Access Preamble on the next available PRACH occasion from the PRACH occasions corresponding to the selected SSB permitted by the restrictions given by the *ra-ssb-OccasionMaskIndex* if configured, and PRACH occasion shall be randomly selected with equal probability amongst the selected SSB associated PRACH occasions occurring simultaneously but on different subcarriers, as specified in clause 5.1.2 in TS 38.321 [12].

If the contention-free Random Access Resources and the contention-free PRACH occasions associated with CSI-RSs is configured, with the UE selected CSI-RS with CSI-RSRP above *cfra-csirs-DedicatedRACH-Threshold* amongst the associated CSI-RSs, UE shall have the capability to select the Random Access Preamble corresponding to the selected CSI-RS, and to transmit Random Access Preamble on the next available PRACH occasion from the PRACH occasions in *ra-OccasionList* corresponding to the selected CSI-RS, and PRACH occasion shall be randomly selected with equal probability amongst the selected CSI-RS associated PRACH occasions occurring simultaneously but on different subcarriers, as specified in clause 5.1.2 in TS 38.321 [12].

The UE may stop monitoring for Random Access Response(s), if the Random Access Response contains a Random Access Preamble identifier corresponding to the transmitted Random Access Preamble, unless the random access procedure is initialized for Other SI request from UE.

The UE shall again perform the Random Access Resource selection procedure defined in clause 5.1.2 in TS 38.321 [12] for the next available PRACH occasion, and transmit the preamble with the calculated PRACH transmission power if

all received Random Access Responses contain Random Access Preamble identifiers that do not match the transmitted Random Access Preamble.

The UE shall again perform the Random Access Resource selection procedure defined in clause 5.1.2 in TS 38.321 [12] for the next available PRACH occasion, and transmit the preamble with the calculated PRACH transmission power, if no Random Access Response is received within the RA Response window configured in *RACH-ConfigCommon* or if no PDCCH addressed to UE's C-RNTI is received within the RA Response window configured in *BeamFailureRecoveryConfig*, as defined in clause 5.1.4 in TS 38.321 [12].

The normative reference for this requirement is TS 38.133 [6] clause 6.2.2.

Non-contention based random access procedure is not initialized for Other SI requested from UE or for beam failure recovery, so the requirements related to those features are omitted.

5.3.2.2.2.4 Test description

5.3.2.2.2.4.1 Initial conditions

This test can be run in the configurations defined in Table 5.3.2.2.2.4.1-1.

Table 5.3.2.2.2.4.1-1: Supported test configurations

Test Case ID	Test Config Index	Description
5.3.2.2.2-1	1	LTE FDD, NR 120 kHz SSB SCS, 100 MHz bandwidth, TDD
5.3.2.2.2-2	2	LTE TDD, NR 120 kHz SSB SCS, 100 MHz bandwidth, TDD
NOTE: The UE is only required to be tested in one of the supported test configurations		

Before the test procedure, Downlink and Uplink calibrations are carried out to derive signalled parameter values. This is necessary to ensure that the test case operates within the specified ranges. The detail of the calibration process is implementation dependent, but shall derive the values of Δ_{DL} and Δ_{UL} according to the following principles:

With the UE configured to report SS-RSRP, the Δ_{DL} value is calculated as (RSRP_$_{REP}$ – RSRP_76), where RSRP_$_{REP}$ is the SS-RSRP Reported value according to TS 38.133 [6] Table 10.1.6.1-1 with -80.6dBm/SCS applied at the Reference point. For a Reported value RSRP_x, x is treated as a positive integer value.

With the UE configured to send a first PRACH preamble, Δ_{UL} value is calculated as -ROUND(PPRACH0 -1), where PPRACH0 is the measured first PRACH power with -80.6dBm/SCS applied at the Reference point, and with signalled values *preambleReceivedTargetPower* = -100dBm and *ss-PBCH-BlockPower* = 20dBm.

Configure the test equipment and the DUT according to the parameters in Table 5.3.2.2.2.4.1-2.

Table 5.3.2.2.2.4.1-2: Initial conditions

Parameter	Value		Comment
Test environment	NC		As specified in TS 38.508-1 [14] clause 4.1.
Test frequencies	As specified in Annex E, E.1.1, E.1.3.1 and Table E.3-1 and TS 38.508-1 [14] clause 4.3.1 for E-UTRA and 7.2.3 for NR		
Channel bandwidth	As specified by the test configuration selected from Table 4.3.2.2.1.4.1-1.		
Propagation conditions	AWGN		As specified in clause C.2.2.
Connection Diagram	TE Part	A.3.3.1.1	As specified in TS 38.508-1 [14] Annex A.
	DUT Part	A.3.4.1.1	
Exceptions to connection diagram	N/A		

1. Message contents are defined in clause 5.3.2.2.2.4.3.
2. Cell 1 is the E-UTRA serving cell (PCell) for the EN-DC setup. The E-UTRAN PCell power levels and settings are specified in Table A.6.1.1-1. Cell 2 is the NR FR2 PSCell. The connection setup is done according to the

settings in clause C.1.3, with downlink signal levels as per clause C.1.2. General Test parameters are defined in Table 5.3.2.2.2.5-1.

3. Downlink signals for NR cell are initially set up according to clause C.2.1.

4. The UE Rx beam peak direction has been obtained previously using one of the Rx Beam Peak Search procedures as described in Annex I.

5.3.2.2.2.4.2 Test procedure

For this test two cells are used, an E-UTRA serving cell (PCell) and an NR FR2 PSCell. For the NR PSCell, the System Simulator shall not explicitly assign a random access preamble via dedicated signalling in the downlink.

1. Ensure the UE is in state E-UTRA RRC_CONNECTED with generic procedure parameters *Connectivity* E-UTRA/EPC with Test Mode *On* according to TS 38.508-1 [14] clause 4.5.

2. Set the parameters according to Table 5.3.2.2.2.5-1.

3. SS sends a RRCReconfiguration to trigger a contention-free random access procedure according to Table 5.3.2.2.2.4.3-2.

4. Test 1: Correct behaviour when transmitting SSB-based Random Access Preamble

   4.1. The UE shall send a preamble to the System Simulator. The System Simulator shall check that the Random Access Preamble has the Preamble Index associated with the SSB with index 0, that it arrives on a PRACH occasion which belongs to the PRACH occasions corresponding to the SSB with index 0, and that the selected PRACH occasion belongs to the PRACH occasions permitted by the restrictions given by the *ra-ssb-OccasionMaskIndex*.

5. Test 2: Correct behaviour when transmitting CSI-RS-based Random Access Preamble

   5.1. Set the parameters according to Table 5.3.2.2.2.5-1 Subtest 2.

   5.2. Repeat steps 1-3

   5.3. The UE shall send a preamble to the System Simulator. The System Simulator shall check that the Random Access Preamble has the Preamble Index associated with the CSI-RS configured, that it arrives on a PRACH occasion which belongs to the PRACH occasions corresponding to the CSI-RS configured, and that the selected PRACH occasion belongs to the PRACH occasions permitted by the restrictions given by the *ra-OccasionList*.

6. Test 3: Correct behaviour when receiving Random Access Response

   6.1. Repeat steps 1-3

   6.2. The UE shall send preambles to the System Simulator. In response to the first 2 preambles, the System Simulator shall transmit a Random Access Response containing Random Access Preamble identifiers that do not match the transmitted Random Access Preamble.

   6.3. As the received Random Access Responses contain Random Access Preamble identifiers that do not match the transmitted Random Access Preamble, the UE shall perform the Random Access Resource selection procedure specified in clause 5.1.2 in TS 38.321 [12], and transmit with the calculated PRACH transmission power.

   6.4. The System Simulator shall transmit a Random Access Response containing a Random Access Preamble identifier matching the transmitted Random Access Preamble after 3 preambles have been received by the System Simulator.

   6.5. As the received Random Access Response contains a Random Access Preamble identifier that matches the transmitted Random Access Preamble, the UE may stop monitoring for Random Access Response(s).

   6.6. Measure the power and timing of the first preamble and it shall not exceed the values specified in 5.3.2.2.2.5. Measure the relative power and timing applied to additional preambles (last 2 preambles) and it shall not exceed the values specified in 5.3.2.2.2.5.

7. Test 4: Correct behaviour when not receiving Random Access Response

7.1. Repeat steps 1-3.

7.2. The UE shall send preambles to the System Simulator. The System Simulator shall not respond to the first 2 preambles.

7.3. As no Random Access Response was received within the RA Response window configured in *RACH-ConfigCommon*, the UE shall perform the Random Access Resource selection procedure specified in clause 5.1.2 in TS 38.321 [12], and transmit with the calculated PRACH transmission power.

7.4. The System Simulator shall transmit a Random Access Response containing a Random Access Preamble identifier matching the transmitted Random Access Preamble after 3 preambles have been received by the System Simulator.

7.5. As the received Random Access Response contains a Random Access Preamble identifier that matches the transmitted Random Access Preamble, the UE may stop monitoring for Random Access Response(s).

7.6. Measure the power and timing of the first preamble and it shall not exceed the values specified in 5.3.2.2.2.5. Measure the relative power and timing applied to additional preambles (last 2 preambles) and it shall not exceed the values specified in 5.3.2.2.2.5.

5.3.2.2.2.4.3 Message contents

Message contents are according to TS 38.508-1 [14] clause 7.3.1 with the following exceptions:

Table 5.3.2.2.2.4.3-0: Common Exception messages

Default Message Contents	
Common contents of system information blocks exceptions	
Default RRC messages and information elements contents exceptions	
Common exceptions to the contents of TS 38.508-1 [14]	Table 4.6.3-115 with SSB-Index 0 Table 4.6.3-120 with SSB-Index 0

Table 5.3.2.2.2.4.3-1: RACH-ConfigCommon for Non-Contention Based Random Access

Derivation Path: TS 38.508-1 [14], table 4.6.3-128			
Information Element	**Value/remark**	**Comment**	**Condition**
RACH-ConfigCommon::= SEQUENCE {			
rach-ConfigGeneric	RACH-ConfigGeneric		
totalNumberOfRA-Preambles	48		
groupBconfigured SEQUENCE {			
numberOfRA-PreamblesGroupA	48		
}			
rsrp-ThresholdSSB	RSRP_69 +Δ_{DL}	Δ_{DL} is derived from the downlink calibration process	Subtest 1
prach-RootSequenceIndex CHOICE {			
l139	0		
}			
msg1-SubcarrierSpacing	kHz 120		
}			

Table 5.3.2.2.2.4.3-2: RACH-ConfigDedicated for Non-Contention Based Random Access

Derivation Path: TS 38.508-1 [14], table 4.6.3-129			
Information Element	**Value/remark**	**Comment**	**Condition**
RACH-ConfigDedicated::= SEQUENCE {			
cfra SEQUENCE {			
occasions SEQUENCE {			
ssb-perRACH-Occasion	oneFourth		
}			

resources CHOICE {			
ssb SEQUENCE {			
ssb-ResourceList SEQUENCE (SIZE(1..maxRA-SSB-Resources)) OF {	1 entry		
ssb[1]	0		
ra-PreambleIndex[1]	50		Subtest 1
}			
ra-ssb-OccasionMaskIndex	1		Subtest 1
}			
csirs SEQUENCE {			
csirs-ResourceList SEQUENCE (SIZE(1..maxRA-CSIRS -Resources)) OF {			
ra-OccasionList	1		Subtest 2
ra-PreambleIndex[1]	50		Subtest 2
}			
rsrp-ThresholdCSI-RS	RSRP_69 +Δ_{DL}	Δ_{DL} is derived from the downlink calibration process	Subtest 2
}			
}			
}			
}			

Table 5.3.2.2.2.4.3-3: RACH-ConfigGeneric for Non-Contention Based Random Access

Derivation Path: TS 38.508-1 [14], table 4.6.3-130			
Information Element	**Value/remark**	**Comment**	**Condition**
RACH-ConfigGeneric ::= SEQUENCE {			
prach-ConfigurationIndex	190		FR2
msg1-FDM	one		FR2
zeroCorrelationZoneConfig	11		
preambleReceivedTargetPower	-100		
preambleTransMax	n6		
powerRampingStep	dB2		
ra-ResponseWindow	sl10		
}			

Table 5.3.2.2.2.4.3-4: *ServingCellConfigCommon* for Non-Contention Based Random Access

Derivation Path: TS 38.508-1 [14], table 4.6.3-168			
Information Element	**Value/remark**	**Comment**	**Condition**
ServingCellConfigCommon ::= SEQUENCE {			
ssb-PositionsInBurst SEQUENCE {			
inOneGroup	'1100 0000'B		
}			
ss-PBCH-BlockPower	20 +Δ_{UL}	Δ_{UL} is derived from the uplink calibration process	
}			

Table 5.3.2.2.2.4.3-5: CellGroupConfig for Non-Contention Based Random Access

Derivation Path: TS 38.508-1 [14], table 4.6.3-19			
Information Element	**Value/remark**	**Comment**	**Condition**
CellGroupConfig ::= SEQUENCE {			
spCellConfig SEQUENCE {			
servCellIndex	ServCellIndex		
reconfigurationWithSync SEQUENCE {			
newUE-Identity	1		
rach-ConfigDedicated CHOICE {			
uplink	RACH-ConfigDedicated		
}			

spCellConfigDedicated SEQUENCE {			
uplinkConfig SEQUENCE {			
initialUplinkBWP SEQUENCE {			
srs-Config	SRS-Config		
}			
firstActiveUplinkBWP-Id	BWP-Id		
}			
}			

5.3.2.2.2.5 Test requirement

Table 5.3.2.2.2.5-2 defines the primary level settings for non-contention based random access test in FR2 for NR Standalone. Tables 5.3.2.2.2.5-3, 5.3.2.2.2.5-4 and 5.3.2.2.2.5-5 define the Absolute power limits, Relative power limits and uplink timing error limits respectively, and all include test tolerances.

Table 5.3.2.2.2.5-1: General test parameters

Parameter		Unit	Test-1	Test-2	Comments
SSB Configuration	Config 1,2		SSB.1 FR2	SSB.1 FR2	As defined in A.3.2
CSI-RS Configuration	Config 1,2		N/A	CSI-RS.3.1 TDD	As defined in A.1.4
Duplex Mode for Cell 2	Config 1,2		TDD	TDD	
TDD Configuration	Config 1,2		TDDConf.3.1	TDDConf.3.1	As defined in A.1.5
$BW_{channel}$	Config 1,2	MHz	100: $N_{RB,c}$ = 24	100: $N_{RB,c}$ = 24	
OCNG Pattern Note 1			OP.3	OP.3	As defined in A.2.1.
PDSCH Reference Channel Note 2	Config 1,2		SR3.1 TDD	SR3.1 TDD	As defined in A.1.1.
RMSI CORESET Reference Channel	Config 1,2		CR.3.1 TDD	CR.3.1 TDD	As defined in A.1.2
RMC CORESET Reference Channel	Config 1,2		CCR.3.1 TDD	CCR.3.1 TDD	As defined in A.1.3
NR RF Channel Number			1	1	
EPRE ratio of PSS to SSS		dB	0	0	
EPRE ratio of PBCH_DMRS to SSS		dB			
EPRE ratio of PBCH to PBCH_DMRS		dB			
EPRE ratio of PDCCH_DMRS to SSS		dB			
EPRE ratio of PDCCH to PDCCH_DMRS		dB			
EPRE ratio of PDSCH_DMRS to SSS		dB			
EPRE ratio of PDSCH to PDSCH_DMRS		dB			
ss-PBCH-BlockPower		dBm/ SCS	+20 +Δ_{UL}	+20 +Δ_{UL}	As defined in TS 38.331 [13]. Δ_{UL} is derived from the uplink calibration process Note 3
Configured UE transmitted power ($P_{CMAX,\ f,\ c}$)		dBm	maximum value configurable for certain power class	maximum value configurable for certain power class	As defined in clause 6.2.4 in TS 38.101-2 [3]
PRACH Configuration			PRACH.2 FR2	PRACH.3 FR2	As defined in A.7.2, with exceptions as defined below.
rsrp-ThresholdSSB		dBm	RSRP_69 +Δ_{DL}	RSRP_69 +Δ_{DL}	RSRP_69 corresponds to -88dBm. Δ_{DL} is derived from the downlink calibration process Note 4
preambleReceivedTargetPower		dBm	-100	-100	As defined in TS 38.331 [13]
NOTE 1: OCNG shall be used such that a constant total transmitted power spectral density is achieved for all OFDM symbols. The OCNG pattern is chosen during the test according to the presence of a DL reference measurement channel.					

NOTE 2: The DL PDSCH reference measurement channel is used in the test only when a downlink transmission dedicated to the UE under test is required.
NOTE 3: The Δ_{UL} value is calculated as -ROUND(P_{PRACH0} -1), where P_{PRACH0} is the measured first PRACH power with -80.6dBm/SCS applied, *preambleReceivedTargetPower* = -100dBm and *ss-PBCH-BlockPower* = 20dBm. These values are used during the uplink calibration process carried out before the test case is run, with the UE configured to send PRACH.
NOTE 4: The Δ_{DL} value is calculated as ($RSRP_{REP}$ – RSRP_76), where $RSRP_{REP}$ is the SS-RSRP Reported value in Table 10.1.6.1-1 with -80.6dBm/SCS applied. These values are used during the downlink calibration process carried out before the test case is run, with the UE configured to report SS-RSRP. For a Reported value RSRP_x, x is treated as a positive integer value.

Table 5.3.2.2.2.5-2: OTA-related test parameters

Parameter		Unit	Test-1	Test-2	Comments
AoA setup			Setup 1	Setup 1	As defined in A.9.1
Assumption for UE beams[Note 2]			Rough	Rough	
SSB with index 0	Es [Note1]	dBm/SCS	-80.6	-80.6	Power of SSB with index 0 is set to be above configured *rsrp-ThresholdSSB*
	SSB_RP	dBm/SCS	-80.6	-80.6	
	Es/Iot_{BB}	dB	21.09	21.09	
	Io	dBm/95.04 MHz	-56.01	-56.01	Io in symbols containing SSB index 0
SSB with index 1	Es [Note1]	dBm/SCS	-95.0	-95.0	Power of SSB with index 1 is set to be below configured *rsrp-ThresholdSSB*
	SSB_RP	dBm/SCS	-95.0	-95.0	
	Es/Iot_{BB}	dB	6.69	6.69	
	Io	dBm/95.04 MHz	-70.41	-70.41	Io in symbols containing SSB index 1
Propagation Condition		-	AWGN	AWGN	

NOTE 1: No artificial noise is applied in this test.
NOTE 2: Information about types of UE beam is given in TS 38.133 [6] clause B.2.1.3, and does not limit UE implementation or test system implementation

Test 1: Correct behaviour when transmitting SSB-based Random Access Preamble

- The Random Access Preamble shall be one of the Random Access Preambles associated with SSB index 0.
- The Random Access Preamble shall arrive on a PRACH occasion which belongs to the PRACH occasions corresponding to the SSB with index 0.
- The selected PRACH occasion shall belong to the PRACH occasions permitted by the restrictions given by the *ra-ssb-OccasionMaskIndex*.

Test 2: Correct behaviour when transmitting CSI-RS-based Random Access Preamble

- The Random Access Preamble shall have the Preamble Index associated with the CSI-RS configured.
- The Random Access Preamble shall arrive on a PRACH occasion which belongs to the PRACH occasions corresponding to the CSI-RS configured.
- The selected PRACH occasion belongs to the PRACH occasions permitted by the restrictions given by the *ra-OccasionList*.

Test 3: Correct behaviour when receiving Random Access Response

- The power of the first preamble shall be 0.6 dBm within the accuracy specified in Table 5.3.2.2.2.5-3.
- The relative power for preamble ramping step shall be 2 dB within the accuracy specified in Table 5.3.2.2.2.5-4.
- The transmit timing of all PRACH transmissions shall be within the accuracy specified in Table 5.3.2.2.2.5-5.

Test 4: Correct behaviour when not receiving Random Access Response

- The power of the first preamble shall be 0.6 dBm within the accuracy specified in Table 5.3.2.2.2.5-3.
- The relative power for preamble ramping step shall be 2 dB within the accuracy specified in Table 5.3.2.2.2.5-4.
- The transmit timing of all PRACH transmissions shall be within the accuracy specified in Table 5.3.2.2.2.5-5.

Table 5.3.2.2.2.5-3 Absolute power tolerance Test requirements

Conditions	Tolerance
Normal	± FFS dB

Table 5.3.2.2.2.5-4 Relative power tolerance Test requirements

Measured power	Power step ΔP (dB)	PRACH (dB)
Measured power of both PRACHs being compared > (P_{max} Note1 – 6dB)	2 ≤ ΔP < 3	± (4+FFS).
Measured power of either PRACHs being compared ≤ (P_{max} Note1 – 6dB)		± (6+FFS)
NOTE 1: P_{max} is the Min peak EIRP defined in clause 6.2.1 of TS 38.101-2 [3], selected according to power class and operating band.		

Table 5.3.2.2.2.5-5: T_e Timing error Test requirements

Frequency Range	SCS of SSB signals (kHz)	SCS of uplink signals s(KHz)	T_e
2	120	120	224+[48]*T_c
NOTE 1: T_c is the basic timing unit defined in TS 38.211 [7]			

5.3.2.2.3 EN-DC FR2 2-step contention based random access

Editor's note: This test case is incomplete. The following aspects are either missing or TBD

- Message contents are not complete.
- TT analysis and test requirements are missing.
- Test procedure is FFS

5.3.2.2.3.1 Test purpose

The purpose of this test is to verify that the behaviour of the random access procedure is according to the requirements and that the MsgA PRACH and MsgA PUSCH power settings and timing are within specified limits.

5.3.2.2.3.2 Test applicability

This test applies to all types of E-UTRA UE release 16 and forward, supporting EN-DC with FR2.

5.3.2.2.3.3 Minimum conformance requirement

Same as in clause 4.3.2.2.3.3

The normative reference for this requirement is TS 38.133 [6] clause 6.2.2 and A.5.3.2.2.3.

5.3.2.2.3.4 Test description

5.3.2.2.3.4.1 Initial conditions

This test can be run in the configurations defined in Table 5.3.2.2.3.4.1-1.

Table 5.3.2.2.3.4.1-1: Supported test configurations

Test Case ID	Test Config Index	Description
5.3.2.2.3-1	1	LTE FDD, NR 120 kHz SSB SCS, 100 MHz bandwidth, TDD
5.3.2.2.3-2	2	LTE TDD, NR 120 kHz SSB SCS, 100 MHz bandwidth, TDD
NOTE: The UE is only required to be tested in one of the supported test configurations		

Before the test procedure, Downlink and Uplink calibrations are carried out to derive signalled parameter values. This is necessary to ensure that the test case operates within the specified ranges. The detail of the calibration process is implementation dependent, but shall derive the values of Δ_{DL} and Δ_{UL} according to the following principles:

With the UE configured to report SS-RSRP, the Δ_{DL} value is calculated as (RSRP_$_{REP}$ – RSRP_76), where RSRP_$_{REP}$ is the SS-RSRP Reported value according to TS 38.133 [6] Table 10.1.6.1-1 with -80.6dBm/SCS applied at the Reference point. For a Reported value RSRP_x, x is treated as a positive integer value.

With the UE configured to send a first PRACH preamble, Δ_{UL} value is calculated as -ROUND(PPRACH0 -1), where PPRACH0 is the measured first PRACH power with -80.6dBm/SCS applied at the Reference point, and with signalled values *preambleReceivedTargetPower* = -100dBm and *ss-PBCH-BlockPower* = 20dBm.

Configure the test equipment and the DUT according to the parameters in Table 5.3.2.2.3.4.1-2.

Table 5.3.2.2.3.4.1-2: Initial conditions

Parameter	Value		Comment
Test environment	NC		As specified in TS 38.508-1 [14] clause 4.1.
Test frequencies	As specified in Annex E, E.1.1, E.1.3.1 and Table E.3-1 and TS 38.508-1 [14] clause 4.3.1 for E-UTRA and 7.2.3 for NR		
Channel bandwidth	As specified by the test configuration selected from Table 4.3.2.2.1.4.1-1.		
Propagation conditions	AWGN		As specified in clause C.2.2.
Connection Diagram	TE Part	A.3.3.1.1	As specified in TS 38.508-1 [14] Annex A.
	DUT Part	A.3.4.1.1	
Exceptions to connection diagram	N/A		

1. Message contents are defined in clause 5.3.2.2.3.4.3.
2. Cell 1 is the E-UTRA serving cell (PCell) for the EN-DC setup. The E-UTRAN PCell power levels and settings are specified in Table A.6.1.1-1. Cell 2 is the NR FR2 PSCell. The connection setup is done according to the settings in clause C.1.3, with downlink signal levels as per clause C.1.2. General Test parameters are defined in Table 5.3.2.2.3.5-1.
3. Downlink signals for NR cell are initially set up according to clause C.2.1.
4. The UE Rx beam peak direction has been obtained previously using one of the Rx Beam Peak Search procedures as described in Annex I.

5.3.2.2.3.4.2 Test procedure

For this test two cells are used, an E-UTRA serving cell (PCell) and an NR FR2 PSCell. For the NR PSCell, the System Simulator shall not explicitly assign a random access preamble via dedicated signalling in the downlink.

1. Ensure the UE is in state E-UTRA RRC_CONNECTED with generic procedure parameters *Connectivity* E-UTRA/EPC with Test Mode *On* according to TS 38.508-1 [14] clause 4.5.

2. Set the parameters according to Table 5.3.2.2.3.5-1.
3. The test system shall send a RRCReconfiguration message to the UE to add NR PSCell, then the UE shall trigger a random access procedure.

   FFS

5.3.2.2.3.4.3 Message contents

Message contents are according to TS 38.508-1 [14] clause 7.3.1 with the following exceptions:

Table 5.3.2.2.3.4.3-0: Common Exception messages

Default Message Contents	
Common contents of system information blocks exceptions	
Default RRC messages and information elements contents exceptions	FFS
Common exceptions to the contents of TS 38.508-1 [14]	FFS

5.3.2.2.3.5 Test requirement

Table 5.3.2.2.3.5-2 defines the primary level settings for contention based random access test in FR2 for NR Standalone. The test requirements are FFS.

Table 5.3.2.2.3.5-1: General test parameters

Parameter		Unit	Test-1	Comments
SSB Configuration	Config 1,2		SSB.1 FR2	As defined in A.3.2
Duplex Mode for Cell 2	Config 1,2		TDD	
TDD Configuration	Config 1,2		TDDConf.3.1	As defined in A.1.5
$BW_{channel}$	Config 1,2	MHz	100: $N_{RB,c}$ = 24	
OCNG Pattern Note 1			OP.3	As defined in A.2.1
PDSCH Reference Channel Note 2	Config 1,2		SR.3.1 TDD	As defined in A.1.1
RMSI CORESET Reference Channel	Config 1,2		CR.3.1 TDD	As defined in A.1.2
RMC CORESET Reference Channel	Config 1,2		CCR.3.1 TDD	As defined in A.1.3
NR RF Channel Number			1	
EPRE ratio of PSS to SSS		dB	0	
EPRE ratio of PBCH_DMRS to SSS		dB		
EPRE ratio of PBCH to PBCH_DMRS		dB		
EPRE ratio of PDCCH_DMRS to SSS		dB		
EPRE ratio of PDCCH to PDCCH_DMRS		dB		
EPRE ratio of PDSCH_DMRS to SSS		dB		
EPRE ratio of PDSCH to PDSCH_DMRS		dB		
ss-PBCH-BlockPower		dBm/ SCS	+20 +Δ_{UL}	As defined in TS 38.331 [13]. Δ_{UL} is derived from the uplink calibration process Note 3
Configured UE transmitted power ($P_{CMAX,\ f,\ c}$)		dBm	maximum value configurable for certain power class	As defined in clause 6.2.4 of TS 38.101-2 [3]
MsgA Configuration			FR2 MsgA configuration 1	As defined in FFS, with exceptions as defined below
msgA-RSRP-ThresholdSSB		dBm	RSRP_69 +ΔDL	RSRP_69 corresponds to -88dBm. Δ_{DL} is derived from the downlink calibration process Note 4
msgA-PreambleReceivedTargetPower		dBm	-100	As defined in TS 38.331 [13]

NOTE 1: OCNG shall be used such that a constant total transmitted power spectral density is achieved for all OFDM symbols. The OCNG pattern is chosen during the test according to the presence of a DL reference measurement channel.
NOTE 2: The DL PDSCH reference measurement channel is used in the test only when a downlink transmission dedicated to the UE under test is required.
NOTE 3: The Δ_{UL} value is calculated as -ROUND(P_{PRACH0} -1), where P_{PRACH0} is the measured first PRACH power with -80.6dBm/SCS applied, *preambleReceivedTargetPower* = -100dBm and *ss-PBCH-BlockPower* = 20dBm. These values are used during the uplink calibration process carried out before the test case is run, with the UE configured to send PRACH.
NOTE 4: The Δ_{DL} value is calculated as ($RSRP_{REP}$ – RSRP_76), where $RSRP_{REP}$ is the SS-RSRP Reported value in Table 10.1.6.1-1 with -80.6dBm/SCS applied. These values are used during the downlink calibration process carried out before the test case is run, with the UE configured to report SS-RSRP. For a Reported value RSRP_x, x is treated as a positive integer value.

Table 5.3.2.2.3.5-2: OTA-related test parameters

Parameter		Unit	Test-1	Comments
AoA setup			Setup 1	As defined in A.9.1
Assumption for UE beams[Note 2]			Rough	
SSB with index 0	Es [Note1]	dBm/SCS	-80.6	Power of SSB with index 0 is set to be above configured *rsrp-ThresholdSSB*
	SSB_RP	dBm/SCS	-80.6	
	Es/Iot_{BB}	dB	21.09	
	Io	dBm/95.04 MHz	-56.01	Io in symbols containing SSB index 0
SSB with index 1	Es [Note1]	dBm/SCS	-95.0	Power of SSB with index 1 is set to be below configured *rsrp-ThresholdSSB*
	SSB_RP	dBm/SCS	-95.0	
	Es/Iot_{BB}	dB	6.69	
	Io	dBm/95.04 MHz	-70.41	Io in symbols containing SSB index 1
Propagation Condition		-	AWGN	

NOTE 1: No artificial noise is applied in this test.
NOTE 2: Information about types of UE beam is given in TS 38.133 [6] clause B.2.1.3, and does not limit UE implementation or test system implementation

5.3.2.2.4 EN-DC FR2 2-step non-contention based random access

Editor's note: This test case is incomplete. The following aspects are either missing or TBD

- Message contents are not complete.

- TT analysis and test requirements are missing.

- Test procedure is FFS

5.3.2.2.4.1 Test purpose

The purpose of this test is to verify that the behaviour of the random access procedure is according to the requirements and that the MsgA PRACH and MsgA PUSCH power settings and timing are within specified limits.

5.3.2.2.4.2 Test applicability

This test applies to all types of E-UTRA UE release 16 and forward, supporting EN-DC with FR2.

5.3.2.2.4.3 Minimum conformance requirement

Same as in clause 4.3.2.2.4.3

The normative reference for this requirement is TS 38.133 [6] clause 6.2.2 and A.5.3.2.2.4.

5.3.2.2.4.4 Test description

5.3.2.2.4.4.1 Initial conditions

This test can be run in the configurations defined in Table 5.3.2.2.4.4.1-1.

Table 5.3.2.2.4.4.1-1: Supported test configurations

Test Case ID	Test Config Index	Description
5.3.2.2.4-1	1	LTE FDD, NR 120 kHz SSB SCS, 100 MHz bandwidth, TDD
5.3.2.2.4-2	2	LTE TDD, NR 120 kHz SSB SCS, 100 MHz bandwidth, TDD
NOTE: The UE is only required to be tested in one of the supported test configurations		

Before the test procedure, Downlink and Uplink calibrations are carried out to derive signalled parameter values. This is necessary to ensure that the test case operates within the specified ranges. The detail of the calibration process is implementation dependent, but shall derive the values of Δ_{DL} and Δ_{UL} according to the following principles:

With the UE configured to report SS-RSRP, the Δ_{DL} value is calculated as (RSRP_$_{REP}$ – RSRP_76), where RSRP_$_{REP}$ is the SS-RSRP Reported value according to TS 38.133 [6] Table 10.1.6.1-1 with -80.6dBm/SCS applied at the Reference point. For a Reported value RSRP_x, x is treated as a positive integer value.

With the UE configured to send a first PRACH preamble, Δ_{UL} value is calculated as -ROUND(PPRACH0 -1), where PPRACH0 is the measured first PRACH power with -80.6dBm/SCS applied at the Reference point, and with signalled values *preambleReceivedTargetPower* = -100dBm and *ss-PBCH-BlockPower* = 20dBm.

Configure the test equipment and the DUT according to the parameters in Table 5.3.2.2.4.4.1-2.

Table 5.3.2.2.4.4.1-2: Initial conditions

Parameter	Value		Comment
Test environment	NC		As specified in TS 38.508-1 [14] clause 4.1.
Test frequencies	As specified in Annex E, E.1.1, E.1.3.1 and Table E.3-1 and TS 38.508-1 [14] clause 4.3.1 for E-UTRA and 7.2.3 for NR.		
Channel bandwidth	As specified by the test configuration selected from Table 4.3.2.2.1.4.1-1.		
Propagation conditions	AWGN		As specified in clause C.2.2.
Connection Diagram	TE Part	A.3.3.1.1	As specified in TS 38.508-1 [14] Annex A.
	DUT Part	A.3.4.1.1	
Exceptions to connection diagram	N/A		

1. Message contents are defined in clause 5.3.2.2.4.4.3.
2. Cell 1 is the E-UTRA serving cell (PCell) for the EN-DC setup. The E-UTRAN PCell power levels and settings are specified in Table A.6.1.1-1. Cell 2 is the NR FR2 PSCell. The connection setup is done according to the settings in clause C.1.3, with downlink signal levels as per clause C.1.2. General Test parameters are defined in Table 5.3.2.2.4.5-1.
3. Downlink signals for NR cell are initially set up according to clause C.2.1.
4. The UE Rx beam peak direction has been obtained previously using one of the Rx Beam Peak Search procedures as described in Annex I.

5.3.2.2.4.4.2 Test procedure

For this test two cells are used, an E-UTRA serving cell (PCell) and an NR FR2 PSCell. For the NR PSCell, the System Simulator shall not explicitly assign a random access preamble via dedicated signalling in the downlink.

1. Ensure the UE is in state E-UTRA RRC_CONNECTED with generic procedure parameters *Connectivity* E-UTRA/EPC with Test Mode *On* according to TS 38.508-1 [14] clause 4.5.

2. Set the parameters according to Table 5.3.2.2.4.5-1.
3. The test system shall send a RRCReconfiguration message to the UE to add NR PSCell, then the UE shall trigger a random access procedure.

   FFS

5.3.2.2.4.4.3 Message contents

Message contents are according to TS 38.508-1 [14] clause 7.3.1 with the following exceptions:

Table 5.3.2.2.4.4.3-0: Common Exception messages

Default Message Contents	
Common contents of system information blocks exceptions	
Default RRC messages and information elements contents exceptions	FFS
Common exceptions to the contents of TS 38.508-1 [14]	FFS

5.3.2.2.4.5 Test requirement

Table 5.3.2.2.4.5-2 defines the primary level settings for non-contention based random access test in FR2 for NR Standalone. The test requirements are FFS.

Table 5.3.2.2.4.5-1: General test parameters

Parameter		Unit	Test-1	Comments
SSB Configuration	Config 1,2		SSB.1 FR2	As defined in A.3.2
Duplex Mode for Cell 2	Config 1,2		TDD	
TDD Configuration	Config 1,2		TDDConf.3.1	As defined in A.1.5
$BW_{channel}$	Config 1,2	MHz	100: $N_{RB,c}$ = 24	
OCNG Pattern Note 1			OP.3	As defined in A.2.1
PDSCH Reference Channel Note 2	Config 1,2		SR.3.1 TDD	As defined in A.1.1
RMSI CORESET Reference Channel	Config 1,2		CR.3.1 TDD	As defined in A.1.2
RMC CORESET Reference Channel	Config 1,2		CCR.3.1 TDD	As defined in A.1.3
NR RF Channel Number			1	
EPRE ratio of PSS to SSS		dB	0	
EPRE ratio of PBCH_DMRS to SSS		dB		
EPRE ratio of PBCH to PBCH_DMRS		dB		
EPRE ratio of PDCCH_DMRS to SSS		dB		
EPRE ratio of PDCCH to PDCCH_DMRS		dB		
EPRE ratio of PDSCH_DMRS to SSS		dB		
EPRE ratio of PDSCH to PDSCH_DMRS		dB		
ss-PBCH-BlockPower		dBm/ SCS	+20 +Δ_{UL}	As defined in TS 38.331 [13]. Δ_{UL} is derived from the uplink calibration process Note 3
Configured UE transmitted power ($P_{CMAX,\ f,\ c}$)		dBm	maximum value configurable for certain power class	As defined in clause 6.2.4 of TS 38.101-2 [3]
MsgA Configuration			FR2 MsgA configuration 2	As defined in FFS, with exceptions as defined below
msgA-RSRP-ThresholdSSB		dBm	RSRP_69 +ΔDL	RSRP_69 corresponds to -88dBm. Δ_{DL} is derived from the downlink calibration process Note 4
msgA-PreambleReceivedTargetPower		dBm	-100	As defined in TS 38.331 [13]

NOTE 1: OCNG shall be used such that a constant total transmitted power spectral density is achieved for all OFDM symbols. The OCNG pattern is chosen during the test according to the presence of a DL reference measurement channel.
NOTE 2: The DL PDSCH reference measurement channel is used in the test only when a downlink transmission dedicated to the UE under test is required.
NOTE 3: The Δ_{UL} value is calculated as -ROUND(P_{PRACH0} -1), where P_{PRACH0} is the measured first PRACH power with -80.6dBm/SCS applied, *preambleReceivedTargetPower* = -100dBm and *ss-PBCH-BlockPower* = 20dBm. These values are used during the uplink calibration process carried out before the test case is run, with the UE configured to send PRACH.
NOTE 4: The Δ_{DL} value is calculated as ($RSRP_{REP}$ – RSRP_76), where $RSRP_{REP}$ is the SS-RSRP Reported value in Table 10.1.6.1-1 with -80.6dBm/SCS applied. These values are used during the downlink calibration process carried out before the test case is run, with the UE configured to report SS-RSRP. For a Reported value RSRP_x, x is treated as a positive integer value.

Table 5.3.2.2.4.5-2: OTA-related test parameters

Parameter		Unit	Test-1	Comments
AoA setup			Setup 1	As defined in A.9.1
Assumption for UE beams Note 2			Rough	
SSB with index 0	Es Note1	dBm/SCS	-80.6	Power of SSB with index 0 is set to be above configured *rsrp-ThresholdSSB*
	SSB_RP	dBm/SCS	-80.6	
	Es/Iot_{BB}	dB	21.09	
	Io	dBm/95.04 MHz	-56.01	Io in symbols containing SSB index 0
SSB with index 1	Es Note1	dBm/SCS	-95.0	Power of SSB with index 1 is set to be below configured *rsrp-ThresholdSSB*
	SSB_RP	dBm/SCS	-95.0	
	Es/Iot_{BB}	dB	6.69	
	Io	dBm/95.04 MHz	-70.41	Io in symbols containing SSB index 1
Propagation Condition		-	AWGN	

NOTE 1: No artificial noise is applied in this test.
NOTE 2: Information about types of UE beam is given in TS 38.133 [6] clause B.2.1.3, and does not limit UE implementation or test system implementation

5.3.2.3 Void

5.4 Timing

5.4.1 UE transmit timing

5.4.1.0 Minimum Conformance Requirements

5.4.1.0.1 Minimum conformance requirements for UE transmit timing accuracy

The UE initial transmission timing error shall be less than or equal to $\pm T_e$ where the timing error limit value T_e is specified in Table 5.4.1.0.1-1. This requirement applies:

- when it is the first transmission in a DRX cycle for PUCCH, PUSCH and SRS or it is the PRACH transmission.

The UE shall meet the Te requirement for an initial transmission provided that at least one SSB is available at the UE during the last 160 ms. The reference point for the UE initial transmit timing control requirement shall be the downlink timing of the reference cell minus $(N_{TA} + N_{TA\ offset}) \times T_c$. The downlink timing is defined as the time when the first detected path (in time) of the corresponding downlink frame is received from the reference cell. N_{TA} for PRACH is defined as 0.

$(N_{TA} + N_{TA\ offset}) \times T_c$ (in T_c units) for other channels is the difference between UE transmission timing and the downlink timing immediately after when the last timing advance in TS 38.133 [6] clause 7.3 was applied. N_{TA} for other channels is not changed until next timing advance is received. The value of $N_{TA\ offset}$ depends on the duplex mode of the cell in which the uplink transmission takes place and the frequency range (FR). $N_{TA\ offset}$ is defined in Table 5.4.1.0.1-2.

Table 5.4.1.0.1-1: T_e Timing Error Limit

Frequency Range	SCS of SSB signals (KHz)	SCS of uplink signals (KHz)	T_e
1	15	15	12*64*T_c
		30	10*64*T_c
		60	10*64*T_c
	30	15	8*64*T_c
		30	8*64*T_c
		60	7*64*T_c
2	120	60	3.5*64*T_c
		120	3.5*64*T_c
	240	60	3*64*T_c
		120	3*64*T_c
NOTE 1: T_c is the basic timing unit defined in TS 38.211 [6]			

Table 5.4.1.0.1-2: The Value of $N_{TA\ offset}$

Frequency range and band of cell used for uplink transmission	$N_{TA\ offset}$ (Unit: T_C)
FR1 FDD band without LTE-NR coexistence case or FR1 TDD band without LTE-NR coexistence case	25600 (Note 1)
FR1 FDD band with LTE-NR coexistence case	0 (Note 1)
FR1 TDD band with LTE-NR coexistence case	39936 (Note 1)
FR2	13792
NOTE: The UE identifies $N_{TA\ offset}$ based on the information n-TimingAdvanceOffset according to [2]. If UE is not provided with the information n-TimingAdvanceOffset, the default value of $N_{TA\ offset}$ is set as 25600 for FR1 band. In case of multiple UL carriers in the same TAG, UE expects that the same value of n-TimingAdvanceOffset is provided for all the UL carriers according to clause 4.2 in [3] and the value 39936 of $N_{TA\ offset}$ can also be provided for a FDD serving cell.NOTE 2: Void	

When it is not the first transmission in a DRX cycle or there is no DRX cycle, and when it is the transmission for PUCCH, PUSCH and SRS transmission, the UE shall be capable of changing the transmission timing according to the received downlink frame of the reference cell except when the timing advance in TS 38.133 [6] clause 7.3 is applied.

When the transmission timing error between the UE and the reference timing exceeds $\pm T_e$, the UE is required to adjust its timing to within $\pm T_e$. The reference timing shall be $(N_{TA} + N_{TA\ offset}) \times T_c$ before the downlink timing of the reference cell. All adjustments made to the UE uplink timing shall follow these rules:

1) The maximum amount of the magnitude of the timing change in one adjustment shall be T_q.

2) The minimum aggregate adjustment rate shall be T_p per second.

3) The maximum aggregate adjustment rate shall be T_q per 200ms.

where the maximum autonomous time adjustment step T_q and the aggregate adjustment rate T_p are specified in Table 5.4.1.0.1-3.

Table 5.4.1.0.1-3: T_q Maximum Autonomous Time Adjustment Step and T_p Minimum Aggregate Adjustment rate

Frequency Range	SCS of uplink signals (KHz)	T_q	T_p
1	15	5.5*64*T_c	5.5*64*T_c

	30	5.5*64*T_c	5.5*64*T_c
	60	5.5*64*T_c	5.5*64*T_c
2	60	2.5*64*T_c	2.5*64*T_c
	120	2.5*64*T_c	2.5*64*T_c
NOTE: T_c is the basic timing unit defined in TS 38.211 [6]			

The normative reference for this requirement is TS.38.133 [6] clause 7.1.2.

5.4.1.1 EN-DC FR2 UE transmit timing accuracy

Editor's Note: This test case has been completed for the following configurations:

- Test frequency f ≤ 40.8 GHz

- UE PC3

- The test is incomplete for UE power classes other than PC3

- The test is incomplete for test frequencies > 40.8 GHz

5.4.1.1.1 Test purpose

The purpose of this test is to verify that the UE can follow frame timing change of the connected gNB and that the UE initial transmit timing accuracy, maximum amount of timing change in one adjustment, minimum and maximum adjustment rate are within the specified limits. This test will verify the requirements in clause 7.1.2

5.4.1.1.2 Test applicability

This test applies to all types of E-UTRA UE release 15 and forward supporting EN-DC FR2.

5.4.1.1.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 5.4.1.0.1.

The normative reference for this requirement is TS.38.133 [6] clause A.5.4.1.1

5.4.1.1.4 Test Description

5.4.1.1.4.1 Initial Conditions

This test can be run in one of the configurations defined in Table 5.4.1.1.4.1-1.

Table 5.4.1.1.4.1-1: Supported test configurations for FR2 PSCell

Configuration	Description
1	LTE FDD, NR TDD, SSB SCS 240 kHz, data SCS 120 kHz, BW 100 MHz
2	LTE TDD, NR TDD, SSB SCS 240 kHz, data SCS 120 kHz, BW 100 MHz
NOTE: The UE is only required to be tested in one of the supported test configurations in FR2 depending on UE capability.	

Configure the test equipment and the DUT according to the parameters in Table 5.4.1.1.4.1-2

Table 5.4.1.1.4.1-2: Initial conditions for EN-DC FR2 transmit timing accuracy

Parameter	Value		Comment
Test environment	NC		As specified in TS 38.508-1 [14] clause 4.1.
Test frequencies	As specified in Annex E.1.1, Table E.3-1 and TS 38.508-1 [14] clause 4.3.1 for E-UTRA and 7.2.3 for NR.		
Channel bandwidth	As specified by the test configuration selected from Table 5.5.1.4.4.1-1		
Propagation conditions	AWGN		As specified in clause C.2.2.
	TE Part	A.3.3.3.1-1	As specified in TS 38.508-1 [14] Annex A.

Connection Diagram	DUT Part	A.3.4.1.1	
Exceptions to connection diagram	N/A		

1. Message contents are defined in clause 5 4.1.1.4.3.
2. There are two cells, Cell 1 is the E-UTRAN PCell, and Cell 2 is the PSCell, in the test. The E-UTRAN PCell setting refers to Table A.6.1.1-1. The power levels and settings for Cell 1 are set according to Annex A.6, Table A.6.1.1-1. Cell 2 is NR FR2 PSCell. The connection setup is done according to the settings in clause C.1.3, and the downlink signal levels as per clause C.1.2.
3. Downlink signals for NR cell are initially set up according to clause C.1.2 and C.1.3.
4. The UE Rx beam peak direction has been obtained previously using one of the Rx Beam Peak Search procedures as described in Annex I.

5.4.1.1.4.2 Test procedure

The test consists of two cells, a single E-UTRA cell (Pcell), and a single NR FR2 cell (PSCell). The downlink timing of the PSCell is changed and the changes in UE transmit timing are observed. The transmit timing is verified by the UE transmitting SRS used as a measurement reference facilitating the SS timing estimation.

The test sequence shall be carried out in RRC_CONNECTED for every test case. Unless otherwise stated, the downlink signal and noise are aligned to arrive in the UE Rx beam peak direction.

Following will be the test sequence for this test

1. Ensure the UE is in state RRC_CONNECTED with generic procedure parameters *Connectivity* EN-DC, DC bearer MCG and SCG, Connected without release *On* and Test Mode *On* according to TS 38.508-1 [6] clause 4.5.
2. Set up E-UTRA PCell according to parameters given in Table A.6.1.1-1 and setup NR PSCell according to parameters given in Table 5.4.1.1.4.1-1.
3. The SS shall transmit an RRCConnectionReconfiguration message configuring the UE with the message content defined in clause 5.4.1.1.4.3.
4. The UE shall transmit RRCConnectionReconfigurationComplete message.
5. Set the UE in the Rx beam peak direction found with a 3D EIS scan as performed in Annex I.1 - I.3. Allow at least BEAM_SELECT_WAIT_TIME (NOTE 1) for the UE Rx beam selection to complete.
6. After connection set up with the cell and during 2 seconds before DL timing adjustment, the test equipment shall monitor all SRS transmissions and verify that, for each received SRS, the timing of the NR cell is within $(N_{TA} + N_{TA_offset}) \times T_c \pm T_e$ of the first detected path of DL SSB.
   a. The N_{TA} offset value (in T_c units) is 13792 for FR2
   b. The T_e values depend on the DL and UL SCS for which the test is being run and are given in Table 5.4.1.1.5-4.
7. The test system shall adjust the timing of the DL path by values given in Table 5.4.1.1.4.2-1

Table 5.4.1.1.4.2-1: Adjustment Value for DL Timing

SCS of SSB signals (KHz)	Adjustment Value	
	Test1	Test2
240	+8*64Tc	+4*64Tc

8. The test system shall verify that the adjustment step size and the adjustment rate shall be according to requirements specified in Table 5.4.1.1.5-5. This will only be done for Test1. The test system samples the UE Transmit Timing once per SRS transmission (as per configured SRS periodicity). To check Rule 1, the SS shall

check that the maximum time adjustment step size T_q between one SRS transmission to next consecutive SRS transmission of a valid UL slot is within Rule 1 as specified in clause 5.4.1.0.1 and Table 5.4.1.0.1-3. To check that the minimum adjustment rate is within Rule 2 as specified in clause 5.4.1.0.1 and Table 5.4.1.0.1-3, the SS shall measure the change in SRS transmission timing over a 1 + offset seconds sliding window (offset in ms to the next consecutive SRS transmission), with step size p (where p is the periodicity of SRS) , as long as the resulting slot is a valid UL slot. To check that the maximum adjustment rate is within Rule 3 as specified in clause 5.4.1.0.1 and Table 5.4.1.0.1-3, the SS shall measure the change in SRS transmission timing over a 200ms – offset sliding window of previous SRS transmission, with step size p (where p is the periodicity of SRS) , as long as the resulting slot is a valid UL slot. The three rules apply until the UE transmit timing offset is within the limits specified in 5.4.1.0.1 and Table 5.4.1.0.1-3 with respect to the first detected path (in time) of the corresponding downlink frame of Cell 1. The test system will wait till evaluation interval of T seconds is met to ensure UE transmit timing is stable at the end of the step, where T=.DL_timing_change[Ts]/5.5Ts and DL_timing_change is specified in Table 5.4.1.1.4.2-1.

9. After the UE transmit timing is within the limits specified in step 7, and during 2 seconds, the test system shall monitor all SRS transmissions and verify that, for each received SRS, the UE transmit timing offset stays within $(N_{TA} + N_{TA_offset}) \times T_c \pm T_e$ of the first detected path of DL SSB. For Test 2 the UE transmit timing offset shall be verified for the first transmission in the DRX cycle immediately after DL timing adjustment.

NOTE: The BEAM_SELECT_WAIT_TIME default value is defined in Annex K.1.1 in TS 38.521-2 [3].

5.4.1.1.4.3 Message contents

Message contents are according to TS 38.508-1 [14] clause 7.3 with the following exceptions:

Table 5.4.1.1.4.3-0: Common Exception messages

Default Message Contents	
Common contents of system information blocks exceptions	
Default RRC messages and information elements contents exceptions	Table H.3.9-1

Table 5.4.1.1.4.3-1: *SRS-Config* : Additional test requirement for UE transmit timing accuracy for EN-DC FR2 UE

Derivation Path: TS 38.331 [6], clause 6.3.2			
Information Element	**Value/remark**	**Comment**	**Condition**
SRS-Config ::= SEQUENCE {			
srs-ResourceSetToAddModList SEQUENCE (SIZE(0..maxNrofSRS-ResourceSets)) OF SEQUENCE {			
SRS-ResourceSet[1] SEQUENCE {		entry 1	
resourceType CHOICE {			
periodic SEQUENCE {			
}			
}			
}			
}			
srs-ResourceToAddModList SEQUENCE (SIZE(1..maxNrofSRS-Resources)) OF SEQUENCE {			
SRS-Resource[1] SEQUENCE {		entry 1	
freqHopping SEQUENCE {			
c-SRS	17		
}			
groupOrSequenceHopping	Neither		
resourceType CHOICE {			
periodic SEQUENCE {			
periodicityAndOffset-p CHOICE {			
sl1	0		Test 1
sl2560	4		Test 2
}			
}			

}			
}			
}			
}			

Table 5.4.1.1.4.3-2: *DRX-Config* : Additional test requirement for UE transmit timing accuracy Test 2 for EN-DC FR2

Derivation Path: TS 38.331 [6], clause 6.3.2			
Information Element	**Value/remark**	**Comment**	**Condition**
DRX-Config ::= CHOICE {			
drx-onDurationTimer CHOICE {			
milliSeconds	ms6		
}			
drx-InactivityTimer	ms1		
drx-HARQ-RTT-TimerDL	56		
drx-HARQ-RTT-TimerUL	56		
drx-RetransmissionTimerDL	sl1		
drx-RetransmissionTimerUL	sl1		
drx-LongCycleStartOffset CHOICE {			
ms320	0		
}			
shortDRX		NOT PRESENT	
}			

5.4.1.1.5 Test Requirements

The UE initial transmission timing error shall be less than or equal to $\pm T_e$ where the timing error limit value T_e is specified in Table 5.4.1.1.5-4.

The UE shall meet the Te requirement for an initial transmission provided that at least one SSB is available at the UE during the last 160 ms. The reference point for the UE initial transmit timing control requirement shall be the downlink timing of the reference cell minus $(N_{\mathrm{TA}} + N_{\mathrm{TA\,offset}}) \times T_{\mathrm{c}}$. The downlink timing is defined as the time when the first detected path (in time) of the corresponding downlink frame is received from the reference cell. N_{TA} for PRACH is defined as 0.

$(N_{\mathrm{TA}} + N_{\mathrm{TA\,offset}}) \times T_{\mathrm{c}}$ (in T_c units) for other channels is the difference between UE transmission timing and the downlink timing immediately after when the last timing advance was applied. N_{TA} for other channels is not changed until next timing advance is received. The value of $N_{\mathrm{TA\,offset}}$ depends on the duplex mode of the cell in which the uplink transmission takes place and the frequency range (FR). $N_{\mathrm{TA\,offset}}$ is defined in Table 5.4.1.1.5-5.

Table 5.4.1.1.5-1: Cell Specific Test Parameters for UL Transmit Timing test

Parameter	Unit	Config	Test1	Test2	Band Group
SSB ARFCN		1,2	Freq1	Freq1	
Duplex Mode		1,2	TDD		
TDD configuration		1,2	TDDConf.3.1		
$BW_{channel}$	MHz	1,2	100: NRB,c = 66		
Initial BWP Configuration		1,2	DLBWP.0.1 ULBWP.0.1		
Dedicated BWP Configuration		1,2	DLBWP.1.1 ULBWP.1.1		
TRS Configuration		1,2	TRS.2.1 TDD		
PDSCH/PDCCH TCI State		1,2	TCI.State.2		
DRx Cycle	ms	1,2	N/A	DRX.8[Note5]	
PDSCH Reference measurement channel		1,2	SR.3.3 TDD		
RMSI CORESET Reference Channel		1,2	CR.3.2 TDD		

Dedicated CORESET Reference Channel		1,2	CCR.3.7 TDD		
OCNG Patterns		1,2	OP.1		
SSB Configuration		1,2	SSB.4 FR2		
SMTC Configuration		1,2	SMTC.1		
PDSCH/PDCCH subcarrier spacing	kHz	1,2	120		
EPRE ratio of PSS to SSS	dB	1,2	0	0	
EPRE ratio of PBCH DMRS to SSS					
EPRE ratio of PBCH to PBCH DMRS					
EPRE ratio of PDCCH DMRS to SSS					
EPRE ratio of PDCCH to PDCCH DMRS					
EPRE ratio of PDSCH DMRS to SSS					
EPRE ratio of PDSCH to PDSCH					
EPRE ratio of OCNG DMRS to SSS(Note 1)					
EPRE ratio of OCNG to OCNG DMRS (Note 1)					
Propagation condition		1,2	AWGN		
SRS Config		1,2	Config1[Note6]	Config2[Note6]	

NOTE 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.
NOTE 2: Void
NOTE 3: Void
NOTE 4: Void
NOTE 5: DRx related parameters are given in Table A.3.3.5-1 or Table A.5-1
NOTE 6: SRS configs are given in Table A. 5.4.1.1.5-2

Table 5.4.1.1.5-2: SRS Configuration for Timing Accuracy Test

	Field	Config1	Config 2	Comments
SRS-ResourceSet	srs-ResourceSetId	0	0	
	srs-ResourceIdList	0	0	
	resourceType	Periodic	Periodic	
	Usage	Codebook	Codebook	
SRS-Resource	SRS-ResourceId	0	0	
	nrofSRS-Ports	Port1	Port1	
	transmissionComb	n2	n2	
	combOffset-n2	0	0	
	cyclicShift-n2	0	0	
	resourceMapping startPosition	0	0	
	resourceMapping nrofSymbols	n1	n1	
	resourceMapping repetitionFactor	n1	n1	
	freqDomainPosition	0	0	
	freqDomainShift	0	0	
	freqHopping c-SRS	17	17	Matches $N_{RB,c}$
	freqHopping b-SRS	0	0	
	freqHopping b-hop	0	0	
	groupOrSequenceHopping	Neither	Neither	
	resourceType	Periodic	Periodic	
	periodicityAndOffset-p	sl1,0	sl2560,4	Offset to align with DRx periodicity
	sequenceId	0	0	Any 10 bit number

Table 5.4.1.1.5-3: OTA related test parameters

Parameter	Unit	Test 1	Test 2
Angle of arrival configuration		Setup 1 defined in A.9.1	
Assumption for UE beams[Note 6]		Fine	
N_{oc}[Note1]	dBm/15kHz[Note4]	-112	
N_{oc}[Note1]	dBm/SCS[Note3]	-100	
$\hat{E}_s/N_{oc}$	dB	4	
SS-RSRP[Note2]	dBm/SCS [Note4]	-96	
$\hat{E}_s/I_{ot}$	dB	4	
Io[Note2]	dBm/95.04 MHz [Note4]	-68.5	

NOTE 1: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for N_{oc} to be fulfilled.
NOTE 2: SSB_RP and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.
NOTE 3: Void
NOTE 4: Equivalent power received by an antenna with 0dBi gain at the centre of the quiet zone
NOTE 5: As observed with 0dBi gain antenna at the centre of the quiet zone
NOTE 6: Information about types of UE beam is given in B.2.1.3, and does not limit UE implementation or test system implementation

Table 5.4.1.1.5-4: T_e Timing Error Limit

Frequency Range	SCS of SSB signals (kHz)	SCS of uplink signals (kHz)	T_e
2	120	60	N/A
		120	N/A
	240	60	N/A
		120	3.75*64*T_c

NOTE 1: T_c is the basic timing unit defined in TS 38.211 [6]

Table 5.4.1.1.5-5: T_q Maximum Autonomous Time Adjustment Step and T_p Minimum Aggregate Adjustment rate

Frequency Range	SCS of uplink signals (KHz)	The Maximum timing change in one adjustment T_q	The Minimum aggregate adjustment rate T_p	The Maximum aggregate adjustment rate T_q
2	120	3.125*64*T_c	-1.225*64*T_c	+3.725*64*T_c

NOTE: T_c is the basic timing unit defined in TS 38.211 [6]

Table 5.4.1.1.5-6: The Value of $N_{\text{TA offset}}$

Frequency range and band of cell used for uplink transmission	$N_{\text{TA offset}}$ (Unit: T_C)
FR2	13792

NOTE 1: The UE identifies $N_{\text{TA offset}}$ based on the information n-TimingAdvanceOffset as specified in TS 38.331 [2]. If UE is not provided with the information n-TimingAdvanceOffset, the default value of $N_{\text{TA offset}}$ is set as 25600 for FR1 band. In case of multiple UL carriers in the same TAG, UE expects that the same value of n-TimingAdvanceOffset is provided for all the UL carriers according to clause 4.2 in TS 38.213 [3] and the value 39936 of $N_{\text{TA offset}}$ can also be provided for a FDD serving cell.
NOTE 2: Void

5.4.2 UE timer accuracy

FFS.

5.4.3 Timing advance

5.4.3.0 Minimum conformance requirements

5.4.3.0.1 Minimum conformance requirements for timing advance adjustment accuracy

The timing advance is initiated from gNB with MAC message that implies and adjustment of the timing advance, as defined in clause 5.2 of TS 38.321 [12].

The UE shall adjust the timing of its transmissions with a relative accuracy better than or equal to the UE Timing Advance adjustment accuracy requirement in Table 5.4.3.0.3-1, to the signalled timing advance value compared to the timing of preceding uplink transmission. The timing advance command step is defined in TS38.213 [8].

Table 5.4.3.0.3-1: UE Timing Advance adjustment accuracy

Sub Carrier Spacing, SCS kHz	15	30	60	120
UE Timing Advance adjustment accuracy	±256 T_c	±256 T_c	±128 T_c	±32 T_c

The normative reference for this requirement is TS.38.133 [6] clause A.5.4.3.

5.4.3.1 EN-DC FR2 timing advance adjustment accuracy

Editor's Note: This test case has been completed for the following configurations:

- Test frequency f ≤ 40.8 GHz
- UE PC3
- The test is incomplete for UE power classes other than PC3
- The test is incomplete for test frequencies > 40.8 GHz

5.4.3.1.1 Test purpose

The purpose of the test is to verify UE timing advance adjustment delay and accuracy requirement defined in clause 7.3 of TS 38.133 [6].

5.4.3.1.2 Test applicability

This test applies to all types of E-UTRA UE release 15 and forward, supporting EN-DC.

5.4.3.1.3 Minimum conformance requirement

The minimum conformance requirements are specified in clause 5.4.3.0.1.

The normative reference for this requirement is TS.38.133 [6] clause A.5.4.3.1.

5.4.3.1.4 Test description

5.4.3.1.4.1 Initial conditions

Initial conditions are a set of test configurations the UE needs to be tested in and the steps for the SS to take with the UE to reach the correct measurement state.

The initial test configurations consist of environmental conditions, test frequencies, test channel bandwidths and sub-carrier spacing based on NR operating bands specified in Table 5.3.5-1 of 38.521-2 [17].

This test shall be tested using any of the test configurations in Table 5.4.3.1.4.1-1.

Table 5.4.3.1.4.1-1: EN-DC FR2 timing advance adjustment accuracy supported test configurations

Config	Description
1	LTE FDD, NR 120 kHz SSB SCS, 100MHz bandwidth, TDD duplex mode
2	LTE TDD, NR 120 kHz SSB SCS, 100MHz bandwidth, TDD duplex mode
NOTE: The UE is only required to be tested in one of the supported test configurations	

Configure the test equipment and the DUT according to the parameters in Table 5.4.3.1.4.1-2

Table 5.4.3.1.4.1-2: Initial conditions for EN-DC FR2 timing advance adjustment accuracy

Parameter	Value		Comment
Test environment	NC		As specified in TS 38.508-1 [14] clause 4.1.
Test frequencies	As specified in Annex E.1.1, E.1.2, and Table E.3-1 and TS 38.508-1 [14] clause 4.3.1 for E-UTRA and clause 7.2.3 for NR.		
Channel bandwidth	As specified by the test configuration selected from Table 5.4.3.1.4.1-1		
Propagation conditions	AWGN		As specified in clause C.2.2.
Connection Diagram	TE Part	A.3.3.3.1-1	As specified in TS 38.508-1 [14] Annex A.
	DUT Part	A.3.4.1.1	
Exceptions to connection diagram	N/A		

Table 5.4.3.1.4.1-3: General test parameters for timing advance

Parameter	Unit	Value	Comment
RF channel number		Cell 1: 1 Cell 2: 2	1 for E-UTRAN PCell 2 for NR PSCell
Initial DL BWP		DLBWP.0.1	As specified in Table A.3.9.2.1-1 of TS 38.133 [6]
Dedicated DL BWP		DLBWP.1.1	As specified in Table A.3.9.2.2-1 of TS 38.133 [6]
Initial UL BWP		ULBWP.0.1	As specified in Table A.3.9.3.1-1 of TS 38.133 [6]
Dedicated UL BWP		ULBWP.1.1	As specified in Table A.3.9.3.2-1 of TS 38.133 [6]
Timing Advance Command (T_A) value during T1		31	$N_{TA_new} = N_{TA_old}$ for the purpose of establishing a reference value from which the timing advance adjustment accuracy can be measured during T2
Timing Advance Command (T_A) value during T2		39	$N_{TA_new} = N_{TA_old} + 1024*T_c$ (based on equation in TS 38.213 [3] clause 4.2)
T1	s	5	
T2	s	5	

1. Cell 1 is the E-UTRA serving cell (PCell) for the EN-DC setup. The power levels and settings for Cell 1 are set according to Annex A.6. Cell 2 is NR FR2 PSCell. The connection setup is done according to the settings in clause C.1.1.

2. Downlink signals for NR cell are initially set up according to clause C.1.2, C.1.3.

3. The UE Rx beam peak direction has been obtained previously using one of the Rx Beam Peak Search procedures as described in Annex I.

5.4.3.1.4.2 Test Procedure

The test consists of two cells, a single E-UTRA cell (PCell), and a single NR cell (PSCell). Cell 1 is the PCell in the primary Timing Advance Group (pTAG) and cell 2 is the PSCell is in the secondary Timing Advance Group (sTAG). The test consists of two successive time periods, with time durations of T1 and T2 respectively. In each time period, timing advance commands for sTAG are sent to the UE and Sounding Reference Signals (SRS), as specified in Table 5.4.3.1.5-1 and Table 5.4.3.1.5-2, are sent from the UE and received by the test equipment. By measuring the reception of the SRS, the transmit timing, and hence the timing advance adjustment accuracy, can be measured for PSCell in sTAG. The UE Time Alignment Timer (timeAlignmentTimer IE), described in Clause 5.2 in TS 38.321, shall be configured so that it does not expire in the duration of the test.

Unless otherwise stated, the downlink signal and noise are aligned to arrive in the UE Rx beam peak direction.

1. Ensure the UE is in state RRC_CONNECTED with generic procedure parameters *Connectivity* EN-DC, DC bearer MCG and SCG, Connected without release *On* and Test Mode *On* according to TS 38.508-1 [14] clause 4.5. Message content are defined in clause 5.4.3.1.2.3.

2. Set the parameters according to values in Tables 5.4.3.1.4.1-3 and Table 5.4.3.1.5-1 as appropriate. Propagation conditions are set according to clause C.2.2.

3. SS shall transmit an RRCConnectionReconfiguration message.

4. The UE shall transmit RRCConnectionReconfigurationComplete message.

5. During time period T1, the test equipment shall send one message with a Timing Advance Command MAC Control Element for sTAG, as specified in Clause 6.1.3.4 in TS 38.321. The Timing Advance Command value shall be set to 31, which according to Clause 4.2 in TS 38.213 results in zero adjustment of the Timing Advance. In this way, a reference value for the timing advance for sTAG used by the UE is established.

6. During time period T2, the test equipment shall send a sequence of messages with Timing Advance Command MAC Control Elements for sTAG, with Timing Advance Command value of 39 as specified in table 5.4.3.1.4.1-3.

7. This value shall result in changes of the timing advance for sTAG used by the UE, and the accuracy of the change shall then be measured, using the SRS sent from the UE.

8. As specified in Clause 7.3.2.1 of TS 38.133 [6], the UE adjusts its uplink timing at slot n+k+1 for a timing advance command received in slot n. This delay shall be taken into account when measuring the timing advance adjustment accuracy, via the SRS sent from the UE.

9. The UE Time Alignment Timer, described in Clause 5.2 in TS 38.321, shall be configured so that it does not expire in the duration of the test.

10. The result from the SRS and adjustment of the timing advance in step 7) is used to measure that the UE adjusts the timing of its transmission with a relative accuracy better than or equal to value specified in Table 5.4.3.0.3-1 to the signalled timing advance value compared to the timing of preceding uplink transmission.

11. If the UE adjust the timing of its transmission within a relative accuracy greater than or equal to value specified in Table 5.4.3.0.3-1 to the signalled timing advance value compared to the timing of preceding uplink transmission then the number of successful tests is increased by one. Otherwise, the number of failure tests is increased by one.

12. The SS shall transmit RRCConnectionReconfiguration message with condition EN-DC_PSCell_Rel according to TS 36.508 [25] Table 4.6.1-8 to release NR cell (PSCell). The UE shall transmit RRCConnectionReconfigurationComplete message.

13. The SS then shall transmit RRCConnectionReconfiguration message with condition MCG_and_SCG according to TS 36.508 [25] Table 4.6.1-8 to add NR cell (PSCell). The UE shall transmit RRCConnectionReconfigurationComplete message.

14. If any of the above Reconfiguration in Step 12 or 13 fails, switch off and on the UE and ensure the UE is in RRC_CONNECTED with generic procedure parameters *Connectivity* EN-DC, DC bearer MCG and SCG, Connected without release *On* according to TS 38.508-1 [14] clause 4.5.

15. Repeat steps 3-14 until the confidence level according to Tables G.2.3-1 in Annex G clause G.2 is achieved.

5.4.3.1.4.3 Message Contents

Message contents are according to TS 38.508-1 [14] clause 7.3, with the following exceptions:

Table 5.4.3.1.4.3-0: Common Exception messages

Default Message Contents	
Common contents of system information blocks exceptions	
Default RRC messages and information elements contents exceptions	Table H.3.9-1

Table 5.4.3.1.4.3-1: srs-Config setup

Derivation Path: TS 38.508-1, Table 4.6.3-182			
Information Element	**Value/remark**	**Comment**	**Condition**
SRS-Config ::= SEQUENCE {			
srs-ResourceSetToAddModList SEQUENCE (SIZE(0..maxNrofSRS-ResourceSets)) OF SEQUENCE {	1 entry		
SRS-ResourceSet[1] SEQUENCE {		entry 1	
resourceType CHOICE {			
periodic SEQUENCE {			
}			
}			
}			
srs-ResourceToAddModList SEQUENCE (SIZE(1..maxNrofSRS-Resources)) OF SEQUENCE {	1 entry		
SRS-Resource[1] SEQUENCE {		entry 1	
freqHopping SEQUENCE {			
c-SRS	16		
}			
groupOrSequenceHopping	Neither		
resourceType CHOICE {			
periodic SEQUENCE {	Periodic		
periodicityAndOffset-p CHOICE {			
sl5	4		
}			
}			
}			
}			
}			
}			

5.4.3.1.5 Test Requirement

The UE shall apply the signalled Timing Advance value for PSCell in sTAG to the transmission timing at the designated activation time i.e. *k+1* slots after the reception of the timing advance command, where *k* = 11.

The Timing Advance adjustment accuracy for PSCell in sTAG shall be within the limits specified in Table 5.4.3.1.5-3.

The rate of correct Timing Advance adjustments observed during repeated tests shall be at least 90% with a confidence level of 95%.

Table 5.4.3.1.5-1, Table 5.4.3.1.5-1a and Table 5.4.3.1.5-2 define the primary level settings.

Table 5.4.3.1.5-1: Cell specific test parameters for timing advance

Parameter	Unit	Test1	
		T1	T2
Duplex mode		TDD	
TDD configuration		TDDConf.3.1	
$BW_{channel}$	MHz	100: $N_{RB,c}$ = 66	

BWP BW	MHz	100: $N_{RB,c} = 66$
DRx Cycle	ms	Not Applicable
PDSCH Reference measurement channel		SR.3.1 TDD
CORESET Reference Channel		CR.3.1 TDD
TRS configuration		TRS.2.1 TDD
PDSCH/PDCCH TCI state		TCI.State.2
OCNG Patterns		OCNG pattern 1
SMTC configuration		SMTC.1 FR2
SSB configuration		SSB.3 FR2
PDSCH/PDCCH subcarrier spacing	kHz	120 kHz
PUCCH/PUSCH subcarrier spacing	kHz	120 kHz
EPRE ratio of PSS to SSS	dB	0
EPRE ratio of PBCH DMRS to SSS		
EPRE ratio of PBCH to PBCH DMRS		
EPRE ratio of PDCCH DMRS to SSS		
EPRE ratio of PDCCH to PDCCH DMRS		
EPRE ratio of PDSCH DMRS to SSS		
EPRE ratio of PDSCH to PDSCH		
EPRE ratio of OCNG DMRS to SSS(Note 1)		
EPRE ratio of OCNG to OCNG DMRS (Note 1)		
Propagation condition	-	AWGN
NOTE 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.		

Table 5.4.3.1.5-1a: OTA specific test parameters for timing advance

Parameter	Unit	Test 1	
		T1	T2
Angle of arrival configuration		Setup 1	
Assumption for UE beams[Note 6]		Fine	
N_{oc} [Note1]	dBm/15kHz[Note4]	-112	
N_{oc} [Note1]	dBm/SCS[Note3]	-103	
$\hat{E}_s / N_{oc}$	dB	4	
SS-RSRP[Note2]	dBm/SCS [Note4]	-99	
$\hat{E}_s / I_{ot}$	dB	4	
Io[Note2]	dBm/95.04 MHz [Note4]	-68.53	
NOTE 1: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for N_{oc} to be fulfilled.			
NOTE 2: SS-RSRP and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.			
NOTE 3: SS-RSRP minimum requirements are specified assuming independent interference and noise at each receiver antenna port.			
NOTE 4: Equivalent power received by an antenna with 0dBi gain at the centre of the quiet zone			
NOTE 5: As observed with 0dBi gain antenna at the centre of the quiet zone			
NOTE 6: Information about types of UE beam is given in B.2.1.3 of TS 38.133 [6], and does not limit UE implementation or test system implementation			

Table 5.4.3.1.5-2: Sounding Reference Symbol Configuration for timing advance

Field	Value	Comment
c-SRS	16	Frequency hopping is disabled
b-SRS	0	
b-hop	0	
freqDomainPosition	0	Frequency domain position of SRS
freqDomainShift	0	
groupOrSequenceHopping	neither	No group or sequence hopping

SRS-PeriodicityAndOffset	sl5=4	Once every 5 slots
pathlossReferenceRS	ssb-Index=0	SSB #0 is used for SRS path loss estimation
usage	Codebook	Codebook based UL transmission
startPosition	0	resourceMapping setting. SRS on last symbol of slot, and 1symbols for SRS without repetition.
nrofSymbols	n1	
repetitionFactor	n1	
combOffset-n2	0	transmissionComb setting
cyclicShift-n2	0	
nrofSRS-Ports	port1	Number of antenna ports used for SRS transmission
NOTE: For further information see clause 6.3.2 in TS 38.331 [13].		

Table 5.4.3.1.5-3: UE Timing Advance adjustment accuracy

UL Sub Carrier Spacing(kHz)	60	120
UE Timing Advance adjustment accuracy	±128 T_c	±72 T_c

For the test to pass, the total number of successful tests shall be more than 90% of the cases with a confidence level of 95%.

5.5 Signaling characteristics

5.5.1 Radio link monitoring

The requirements in this clause apply for radio link monitoring on PSCell in EN-DC operation mode. The UE shall monitor the downlink link quality based on the reference signal in the configured RLM-RS resource(s) in order to detect the downlink radio link quality of the PCell and PSCell as specified in TS 38.213 [8]. The configured RLM-RS resources can be all SSBs, or all CSI-RSs, or a mix of SSBs and CSI-RSs. UE is not required to perform RLM outside the active DL BWP.

On each RLM-RS resource, the UE shall estimate the downlink radio link quality and compare it to the thresholds Q_{out} and Q_{in} for the purpose of monitoring downlink radio link quality of the cell.

5.5.1.0 Minimum conformance requirements

5.5.1.0.1 Minimum conformance requirements for out-of-sync SSB-based RLM

UE shall be able to evaluate whether the downlink radio link quality on the configured RLM-RS resource estimated over the last $T_{Evaluate_out_SSB}$ [ms] period becomes worse than the threshold Q_{out_SSB} within $T_{Evaluate_out_SSB}$ [ms] evaluation period. The requirements in this clause apply for each SSB based RLM-RS resource configured for PSCell, provided that the SSB configured for RLM is transmitted within UE active DL BWP during the entire evaluation period defined in Table 5.5.1.0.1-1.

$T_{Evaluate_out_SSB}$ is defined in Table 5.5.1.0.1-1 for FR2.

Table 5.5.1.0.1-1: Evaluation period $T_{Evaluate_out}$ for FR2

Configuration	$T_{Evaluate_out_SSB}$ (ms)
no DRX	max(200,ceil(10*P*N)*T_{SSB})
DRX cycle≤320	max(200,ceil(15*P*N)*max(T_{DRX},T_{SSB}))
DRX cycle>320	ceil(10*P*N)*T_{DRX}
NOTE: T_{SSB} is the periodicity of SSB configured for RLM. T_{DRX} is the DRX cycle length.	

For FR2,

- P=1/(1 – $T_{SSB}/T_{SMTCperiod}$), when RLM-RS is not overlapped with measurement gap and RLM-RS is partially overlapped with SMTC occasion ($T_{SSB} < T_{SMTCperiod}$).

- P is 3, when RLM-RS is not overlapped with measurement gap and RLM-RS is fully overlapped with SMTC period ($T_{SSB} = T_{SMTCperiod}$).

- P is 1/(1- T_{SSB}/MGRP - $T_{SSB}/T_{SMTCperiod}$), when RLM-RS is partially overlapped with measurement gap and RLM-RS is partially overlapped with SMTC occasion ($T_{SSB} < T_{SMTCperiod}$) and SMTC occasion is not overlapped with measurement gap and

- $T_{SMTCperiod} \neq$ MGRP or

- $T_{SMTCperiod}$ = MGRP and $T_{SSB} < 0.5*T_{SMTCperiod}$

- P is 1/(1- T_{SSB} /MGRP)*3, when RLM-RS is partially overlapped with measurement gap and RLM-RS is partially overlapped with SMTC occasion ($T_{SSB} < T_{SMTCperiod}$) and SMTC occasion is not overlapped with measurement gap and $T_{SMTCperiod}$ = MGRP and $T_{SSB} = 0.5*T_{SMTCperiod}$

- P is 1/{1- T_{SSB} /min ($T_{SMTCperiod}$,MGRP)}, when RLM-RS is partially overlapped with measurement gap and RLM-RS is partially overlapped with SMTC occasion ($T_{SSB} < T_{SMTCperiod}$) and SMTC occasion is partially or fully overlapped with measurement gap

- P is 1/(1- T_{SSB} /MGRP)*3, when RLM-RS is partially overlapped with measurement gap and RLM-RS is fully overlapped with SMTC occasion ($T_{SSB} = T_{SMTCperiod}$) and SMTC occasion is partially overlapped with measurement gap ($T_{SMTCperiod}$ < MGRP)

The normative reference for this requirement is TS 38.133 [6] clauses 8.1.2.

5.5.1.0.2 Minimum conformance requirements for in-sync SSB-based RLM

UE shall be able to evaluate whether the downlink radio link quality on the configured RLM-RS resource estimated over the last $T_{Evaluate_out_SSB}$ [ms] period becomes worse than the threshold Q_{out_SSB} within $T_{Evaluate_out_SSB}$ [ms] evaluation period.

UE shall be able to evaluate whether the downlink radio link quality on the configured RLM-RS resource estimated over the last $T_{Evaluate_in_SSB}$ [ms] period becomes better than the threshold Q_{in_SSB} within $T_{Evaluate_in_SSB}$ [ms] evaluation period.

$T_{Evaluate_out_SSB}$ and $T_{Evaluate_in_SSB}$ are defined in Table 8.1.2.2-1 for FR1.

$T_{Evaluate_out_SSB}$ and $T_{Evaluate_in_SSB}$ are defined in Table 8.1.2.2-2 for FR2 with scaling factor N=8.

For FR2,

- $P = \frac{1}{1-\frac{T_{SSB}}{T_{SMTCperiod}}}$, when RLM-RS is not overlapped with measurement gap and the RLM-RS is partially overlapped with SMTC occasion ($T_{SSB} < T_{SMTCperiod}$).

- P is $P_{sharing\ factor}$, when the RLM-RS is not overlapped with measurement gap and RLM-RS is fully overlapped with SMTC period ($T_{SSB} = T_{SMTCperiod}$).

- $P = \frac{1}{1-\frac{T_{SSB}}{MRGP}-\frac{T_{SSB}}{T_{SMTCperiod}}}$, when the RLM-RS is partially overlapped with measurement gap and the RLM-RS is partially overlapped with SMTC occasion ($T_{SSB} < T_{SMTCperiod}$) and SMTC occasion is not overlapped with measurement gap and

  - $T_{SMTCperiod} \neq$ MGRP or

  - $T_{SMTCperiod}$ = MGRP and $T_{SSB} < 0.5*T_{SMTCperiod}$

- $P = \frac{P_{sharing\ factor}}{1-\frac{T_{SSB}}{MRGP}}$, when the RLM-RS is partially overlapped with measurement gap and the RLM-RS is partially overlapped with SMTC occasion ($T_{SSB} < T_{SMTCperiod}$) and SMTC occasion is not overlapped with measurement gap and $T_{SMTCperiod}$ = MGRP and $T_{SSB} = 0.5*T_{SMTCperiod}$

- $P = \frac{1}{1-\frac{T_{SSB}}{Min(MRGP,T_{SMTCperiod})}}$, when the RLM-RS is partially overlapped with measurement gap and the RLM-RS is partially overlapped with SMTC occasion ($T_{SSB} < T_{SMTCperiod}$) and SMTC occasion is partially or fully overlapped with measurement gap

- $P = \frac{P_{sharing\ factor}}{1-\frac{T_{SSB}}{MRGP}}$, when the RLM-RS is partially overlapped with measurement gap and the RLM-RS is fully overlapped with SMTC occasion ($T_{SSB} = T_{SMTCperiod}$) and SMTC occasion is partially overlapped with measurement gap ($T_{SMTCperiod} < MGRP$)

- $P_{sharing\ factor} = 1$

  - if all of the reference signals configured for RLM outside measurement gap are not fully overlapped by intra-frequency SMTC occasions, or

  - if all of the reference signal configured for RLM outside measurement gap and fully-overlapped by intra-frequency SMTC occasions are not overlapped by with the SSB symbols indicated by SSB-ToMeasure and 1 symbol before each consecutive SSB symbols indicated by SSB-ToMeasure and 1 symbol after each consecutive SSB symbols indicated by SSB-ToMeasure, given that SSB-ToMeasure is configured;

- $P_{sharing\ factor} = 3$, otherwise.

If the high layer in TS 38.331 [2] signalling of *smtc2* is present, $T_{SMTCperiod}$ follows *smtc2*; Otherwise $T_{SMTCperiod}$ follows *smtc1*.

Longer evaluation period would be expected if the combination of RLM-RS, SMTC occasion and measurement gap configurations does not meet previous conditions.

Table 5.5.1.0.2-1: Evaluation period $T_{Evaluate_out_SSB}$ and $T_{Evaluate_in_SSB}$ for FR2

Configuration	$T_{Evaluate_out_SSB}$ (ms)	$T_{Evaluate_in_SSB}$ (ms)
no DRX	Max(200, Ceil(10*P*N)*T_{SSB})	Max(100, Ceil(5*P*N)*T_{SSB})
DRX cycle≤320	Max(200, Ceil(15*P*N)*Max(T_{DRX},T_{SSB}))	Max(100, Ceil(7.5*P*N)*Max(T_{DRX},T_{SSB}))
DRX cycle>320	Ceil(10*P*N)*T_{DRX}	Ceil(5*P*N)*T_{DRX}
NOTE: T_{SSB} is the periodicity of the SSB configured for RLM. T_{DRX} is the DRX cycle length.		

Figure 5.5.1.2.4-1 shows the variation of the downlink SNR in the active cell to emulate out-of-sync and in-sync states

The UE behaviour in each test during time durations T1, T2, T3, T4 and T5 shall be as follows:

During the period from time point A to time point F (D1 second after the start of time duration T5) the UE shall transmit uplink signal at least in all uplink slots configured for CSI transmission according to the configured periodic CSI reporting.

The rate of correct events observed during repeated tests shall be at least 90%.

5.5.1.0.3 Minimum conformance requirements for out-of-sync CSI-RS based RLM

[TS38.133, clause 8.1.3.1]

The requirements apply for each CSI-RS based RLM-RS resource configured for PSCell, provided that the CSI-RS configured for RLM are actually transmitted within UE active DL BWP during the entire evaluation period specified in TS 38.133, clause 8.1.3.2. UE is not expected to perform radio link monitoring measurements on the CSI-RS configured as RLM-RS if the CSI-RS is not in the active TCI state of any CORESET configured in the UE active BWP.

Table 5.5.1.0.3-1: PDCCH transmission parameters for out-of-sync

Attribute	Value for BLER Configuration #0
DCI format	1-0
Number of control OFDM symbols	2
Aggregation level (CCE)	8

Ratio of hypothetical PDCCH RE energy to average CSI-RS RE energy	4dB
Ratio of hypothetical PDCCH DMRS energy to average CSI-RS RE energy	4dB
Bandwidth (MHz)	48
Sub-carrier spacing (kHz)	SCS of the active DL BWP
DMRS precoder granularity	REG bundle size
REG bundle size	6
CP length	Normal
Mapping from REG to CCE	Distributed

[TS38.133, clause 8.1.3.2]

UE shall be able to evaluate whether the downlink radio link quality on the configured RLM-RS resource estimated over the last $T_{Evaluate_out_CSI-RS}$ [ms] period becomes worse than the threshold Q_{out_CSI-RS} within $T_{Evaluate_out_CSI-RS}$ [ms] evaluation period.

- $T_{Evaluate_out_CSI-RS}$ is defined in Table 5.5.1.0.3-2 for FR2 with N=1. The requirements of $T_{Evaluate_out_CSI-RS}$ applies provided that the CSI-RS for RLM is not in a resource set configured with repetition ON. The requirements doesn't apply when the CSI-RS resource in the active TCI state of CORESET is the same CSI-RS resource for RLM and the TCI state information of the CSI-RS resource is not given, wherein the TCI state information means QCL Type-D to SSB for L1-RSRP or CSI-RS with repetition ON.

For FR2,

- P=1, when RLM-RS is not overlapped with measurement gap and also not overlapped with SMTC occasion.
- $P=1/(1 – T_{CSI-RS}/MGRP)$, when RLM-RS is partially overlapped with measurement gap and RLM-RS is not overlapped with SMTC occasion ($T_{CSI-RS} < MGRP$)
- $P=1/(1 – T_{CSI-RS} /T_{SMTCperiod})$, when RLM-RS is not overlapped with measurement gap and RLM-RS is partially overlapped with SMTC occasion ($T_{CSI-RS} < T_{SMTCperiod}$).
- P is 3, when RLM-RS is not overlapped with measurement gap and RLM-RS is fully overlapped with SMTC occasion ($T_{CSI-RS} = T_{SMTCperiod}$).
- $P \text{ is } 1/(1- T_{CSI-RS} /MGRP - T_{CSI-RS} /T_{SMTCperiod})$, when RLM-RS is partially overlapped with measurement gap and RLM-RS is partially overlapped with SMTC occasion ($T_{CSI-RS} < T_{SMTCperiod}$) and SMTC occasion is not overlapped with measurement gap and
  - $T_{SMTCperiod} \neq MGRP$ or
  - $T_{SMTCperiod} = MGRP$ and $T_{CSI-RS} < 0.5*T_{SMTCperiod}$
- $P \text{ is } 1/(1- T_{CSI-RS} /MGRP)* 3$, when RLM-RS is partially overlapped with measurement gap and RLM-RS is partially overlapped with SMTC occasion ($T_{CSI-RS} < T_{SMTCperiod}$) and SMTC occasion is not overlapped with measurement gap and $T_{SMTCperiod} = MGRP$ and $T_{CSI-RS} = 0.5*T_{SMTCperiod}$
- $P \text{ is } 1/\{1- T_{CSI-RS} /\min (T_{SMTCperiod} ,MGRP)\}$, when RLM-RS is partially overlapped with measurement gap and RLM-RS is partially overlapped with SMTC occasion ($T_{CSI-RS} < T_{SMTCperiod}$) and SMTC occasion is partially or fully overlapped with measurement gap
- $P \text{ is } 1/(1- T_{CSI-RS} /MGRP)* 3$, when RLM-RS is partially overlapped with measurement gap and RLM-RS is fully overlapped with SMTC occasion ($T_{CSI-RS} = T_{SMTCperiod}$) and SMTC occasion is partially overlapped with measurement gap ($T_{SMTCperiod} < MGRP$)

If the high layer in TS 38.331 [2] signalling of *smtc2* is present, $T_{SMTCperiod}$ follows *smtc2*; Otherwise $T_{SMTCperiod}$ follows *smtc1*.

NOTE: The overlap between CSI-RS RLM and SMTC means that CSI-RS based RLM is within the SMTC window duration. Longer evaluation period would be expected if the combination of RLM-RS, SMTC occasion and measurement gap configurations does not meet pervious conditions.

The value of M_{out} used in Table 5.5.1.0.3-2 is defined as:

- M_{out} = 20 if the CSI-RS resource configured for RLM is transmitted with higher layer CSI-RS parameter *density* set to 3 and over the bandwidth $\geqslant$ 24 PRBs.

Table 5.5.1.0.3-2: Evaluation period $T_{Evaluate_out_CSI-RS}$ for FR2

Configuration	$T_{Evaluate_out_CSI-RS}$ (ms)
no DRX	$\max(200, \text{ceil}(M_{out}\times P\times N)\times T_{CSI-RS})$
DRX ≤ 320ms	$\max(200, \text{ceil}(1.5\times M_{out}\times P\times N)\times \max(T_{DRX}, T_{CSI-RS}))$
DRX > 320ms	$\text{ceil}(M_{out}\times P\times N) \times T_{DRX}$
NOTE: T_{CSI-RS} is the periodicity of CSI-RS resource configured for RLM. The requirements in this table apply for T_{CSI-RS} equal to 5 ms, 10 ms, 20 ms or 40 ms. T_{DRX} is the DRX cycle length.	

[TS38.133, clause 8.1.3.3]

The UE is required to be capable of measuring CSI-RS for RLM without measurement gaps. The UE is required to perform the CSI-RS measurements with measurement restrictions as described in the following clauses.

For FR2, when the CSI-RS for RLM is in the same OFDM symbol as SSB for RLM/BFD/CBD/L1-RSRP measurement, UE is not required to receive CSI-RS for RLM in the PRBs that overlap with an SSB.

For FR2, when the CSI-RS for RLM is in the same OFDM symbol as SSB for RLM/BFD/L1-RSRP measurement, or in the same symbol as SSB for CBD when beam failure is detected, UE is required to measure one of but not both CSI-RS for RLM and SSB. Longer measurement period for CSI-RS based RLM is expected, and no requirements are defined.

For FR2, when the CSI-RS for RLM is in the same OFDM symbol as another CSI-RS for RLM/BFD/CBD/L1-RSRP measurement,

- In the following cases, UE is required to measure one of but not both CSI-RS for RLM and the other CSI-RS. Longer measurement period for CSI-RS based RLM is expected, and no requirements are defined.
  - The CSI-RS for RLM or the other CSI-RS in a resource set configured with repetition ON, or
  - The other CSI-RS is configured in q1 and beam failure is detected, or
  - The two CSI-RS-es are not QCL-ed w.r.t. QCL-TypeD, or the QCL information is not known to UE,
- Otherwise, UE shall be able to measure the CSI-RS for RLM without any restriction.

[TS38.133, clause 8.1.4 and 8.1.5]

When the UE transitions between DRX and no DRX or when DRX cycle periodicity changes, for each RLM-RS resource, for a duration of time equal to the evaluation period corresponding to the second mode after the transition occurs, the UE shall use an evaluation period that is no less than the minimum of evaluation period corresponding to the first mode and the second mode. Subsequent to this duration, the UE shall use an evaluation period corresponding to the second mode for each RLM-RS resource. This requirement shall be applied to both out-of-sync evaluation and in-sync evaluation of the monitored cell.

When the UE transitions from a first configuration of RLM-RS resources to a second configuration of RLM-RS resources that is different from the first configuration, for each RLM-RS resource present in the second configuration, for a duration of time equal to the evaluation period corresponding to the second configuration after the transition occurs, the UE shall use an evaluation period that is no less than the minimum of evaluation periods corresponding to the first configuration and the second configuration. Subsequent to this duration, the UE shall use an evaluation period corresponding to the second configuration for each RLM-RS resource present in the second configuration. This requirement shall be applied to both out-of-sync evaluation and in-sync evaluation of the monitored cell.

When the UE transitions from a first configuration of active TCI state of the CORESET to a second configuration of active TCI state of the CORESET, for each CSI-RS for RLM present in the second configuration, the UE shall use an evaluation period corresponding to the second configuration from the time of transition. This requirement shall be applied to both out-of-sync evaluation and in-sync evaluation of the monitored cell.

The transmitter power of the UE in the monitored cell shall be turned off within 40ms after expiry of T310 timer as specified in TS 38.331.

[TS38.133, clause 8.1.6]

When the downlink radio link quality on all the configured RLM-RS resources is worse than Q_{out}, Layer 1 of the UE shall send an out-of-sync indication for the cell to the higher layers. A Layer 3 filter shall be applied to the out-of-sync indications as specified in TS 38.331.

The out-of-sync evaluations for the configured RLM-RS resources shall be performed as specified in clause 5 in TS 38.213. Two successive indications from Layer 1 shall be separated by at least $T_{Indication_interval}$.

When DRX is not used $T_{Indication_interval}$ is max(10ms, $T_{RLM-RS,M}$), where $T_{RLM,M}$ is the shortest periodicity of all configured RLM-RS resources for the monitored cell, which corresponds to T_{SSB} specified in clause 8.1.2 if the RLM-RS resource is SSB, or T_{CSI-RS} specified in clause 8.1.3 if the RLM-RS resource is CSI-RS.

In case DRX is used, $T_{Indication_interval}$ is max(10ms, 1.5*DRX_cycle_length, 1.5*$T_{RLM-RS,M}$) if DRX cycle_length is less than or equal to 320ms, and $T_{Indication_interval}$ is DRX_cycle_length if DRX cycle_length is greater than 320ms. Upon start of T310 timer as specified in TS 38.331 [2], the UE shall monitor the configured RLM-RS resources for recovery using the evaluation period and Layer 1 indication interval corresponding to the no DRX mode until the expiry or stop of T310 timer.

References: The conformance requirements covered in the current TC are specified in: TS 38.133 [6], clauses 8.1.3, 8.1.4, 8.1.5 and 8.1.6.

5.5.1.0.4 Minimum conformance requirements for in-sync CSI-RS based RLM

[TS38.133, clause 8.1.3.1]

The requirements apply for each CSI-RS based RLM-RS resource configured for PSCell, provided that the CSI-RS configured for RLM are actually transmitted within UE active DL BWP during the entire evaluation period specified in TS 38.133 clause 8.1.3.2. UE is not expected to perform radio link monitoring measurements on the CSI-RS configured as RLM-RS if the CSI-RS is not in the active TCI state of any CORESET configured in the UE active BWP.

Table 5.5.1.0.4-1: PDCCH transmission parameters for in-sync

Attribute	Value for BLER Configuration #0
DCI payload size	1-0
Number of control OFDM symbols	2
Aggregation level (CCE)	4
Ratio of hypothetical PDCCH RE energy to average CSI-RS RE energy	0dB
Ratio of hypothetical PDCCH DMRS energy to average CSI-RS RE energy	[0]dB
Bandwidth (MHz)	48
Sub-carrier spacing (kHz)	SCS of the active DL BWP
DMRS precoder granularity	REG bundle size
REG bundle size	6
CP length	Normal
Mapping from REG to CCE	Distributed

[TS38.133, clause 8.1.3.2]

UE shall be able to evaluate whether the downlink radio link quality on the configured RLM-RS resource estimated over the last $T_{Evaluate_in_CSI-RS}$ [ms] period becomes better than the threshold Q_{in_CSI-RS} within $T_{Evaluate_in_CSI-RS}$ [ms] evaluation period.

- $T_{Evaluate_in_CSI-RS}$ is defined in Table 5.5.1.0.4-2 for FR2 with N=1. The requirements of $T_{Evaluate_in_CSI-RS}$ applies provided that the CSI-RS for RLM is not in a resource set configured with repetition ON. The requirements doesn't apply when the CSI-RS resource in the active TCI state of CORESET is the same CSI-RS resource for

RLM and the TCI state information of the CSI-RS resource is not given, wherein the TCI state information means QCL Type-D to SSB for L1-RSRP or CSI-RS with repetition ON.

For FR2,

- P=1, when RLM-RS is not overlapped with measurement gap and also not overlapped with SMTC occasion.
- P=1/(1 – T_{CSI-RS}/MGRP) , when RLM-RS is partially overlapped with measurement gap and RLM-RS is not overlapped with SMTC occasion (T_{CSI-RS} < MGRP)
- P=1/(1 – T_{CSI-RS} /$T_{SMTCperiod}$), when RLM-RS is not overlapped with measurement gap and RLM-RS is partially overlapped with SMTC occasion (T_{CSI-RS} < $T_{SMTCperiod}$).
- P is 3, when RLM-RS is not overlapped with measurement gap and RLM-RS is fully overlapped with SMTC occasion (T_{CSI-RS} = $T_{SMTCperiod}$).
- P is 1/(1- T_{CSI-RS} /MGRP - T_{CSI-RS} /$T_{SMTCperiod}$), when RLM-RS is partially overlapped with measurement gap and RLM-RS is partially overlapped with SMTC occasion (T_{CSI-RS} < $T_{SMTCperiod}$) and SMTC occasion is not overlapped with measurement gap and
  - $T_{SMTCperiod}$ ≠ MGRP or
  - $T_{SMTCperiod}$ = MGRP and T_{CSI-RS} < 0.5*$T_{SMTCperiod}$
- P is 1/(1- T_{CSI-RS} /MGRP)* 3, when RLM-RS is partially overlapped with measurement gap and RLM-RS is partially overlapped with SMTC occasion (T_{CSI-RS} < $T_{SMTCperiod}$) and SMTC occasion is not overlapped with measurement gap and $T_{SMTCperiod}$ = MGRP and T_{CSI-RS} = 0.5*$T_{SMTCperiod}$
- P is 1/{1- T_{CSI-RS} /min ($T_{SMTCperiod}$,MGRP)}, when RLM-RS is partially overlapped with measurement gap and RLM-RS is partially overlapped with SMTC occasion (T_{CSI-RS} < $T_{SMTCperiod}$) and SMTC occasion is partially or fully overlapped with measurement gap
- P is 1/(1- T_{CSI-RS} /MGRP)* 3, when RLM-RS is partially overlapped with measurement gap and RLM-RS is fully overlapped with SMTC occasion (T_{CSI-RS} = $T_{SMTCperiod}$) and SMTC occasion is partially overlapped with measurement gap ($T_{SMTCperiod}$ < MGRP)

If the high layer in TS 38.331 [2] signalling of *smtc2* is present, $T_{SMTCperiod}$ follows *smtc2*; Otherwise $T_{SMTCperiod}$ follows *smtc1*.

NOTE: The overlap between CSI-RS RLM and SMTC means that CSI-RS based RLM is within the SMTC window duration. Longer evaluation period would be expected if the combination of RLM-RS, SMTC occasion and measurement gap configurations does not meet pervious conditions.

The values of M_{in} used in Table 5.5.1.0.4-2 are defined as:

- M_{in} = 10, if the CSI-RS resource configured for RLM is transmitted with higher layer CSI-RS parameter *density* set to 3 and over the bandwidth ≥ 24 PRBs.

Table 5.5.1.0.4-2: Evaluation period $T_{Evaluate_in_CSI-RS}$ for FR2

Configuration	$T_{Evaluate_in_CSI-RS}$ (ms)
no DRX	max(100, ceil(M_{in}×P×N) × T_{CSI-RS})
DRX ≤ 320ms	max(100, ceil(1.5×M_{in}×P×N)× max(T_{DRX}, T_{CSI-RS}))
DRX > 320ms	ceil(M_{in}×P×N) × T_{DRX}
NOTE: T_{CSI-RS} is the periodicity of CSI-RS resource configured for RLM. The requirements in this table apply for T_{CSI-RS} equal to 5 ms, 10 ms, 20 ms or 40 ms. T_{DRX} is the DRX cycle length.	

[TS38.133, clause 8.1.3.3]

The UE is required to be capable of measuring CSI-RS for RLM without measurement gaps. The UE is required to perform the CSI-RS measurements with measurement restrictions as described in the following clauses.

For FR2, when the CSI-RS for RLM is in the same OFDM symbol as SSB for RLM/BFD/CBD/L1-RSRP measurement, UE is not required to receive CSI-RS for RLM in the PRBs that overlap with an SSB.

For FR2, when the CSI-RS for RLM is in the same OFDM symbol as SSB for RLM/BFD/L1-RSRP measurement, or in the same symbol as SSB for CBD when beam failure is detected, UE is required to measure one of but not both CSI-RS for RLM and SSB. Longer measurement period for CSI-RS based RLM is expected, and no requirements are defined.

For FR2, when the CSI-RS for RLM is in the same OFDM symbol as another CSI-RS for RLM/BFD/CBD/L1-RSRP measurement,

- In the following cases, UE is required to measure one of but not both CSI-RS for RLM and the other CSI-RS. Longer measurement period for CSI-RS based RLM is expected, and no requirements are defined.
  - The CSI-RS for RLM or the other CSI-RS in a resource set configured with repetition ON, or
  - The other CSI-RS is configured in q1 and beam failure is detected, or
  - The two CSI-RS-es are not QCL-ed w.r.t. QCL-TypeD, or the QCL information is not known to UE,
- Otherwise, UE shall be able to measure the CSI-RS for RLM without any restriction.

[TS38.133, clause 8.1.4 and 8.1.5]

When the UE transitions between DRX and no DRX or when DRX cycle periodicity changes, for each RLM-RS resource, for a duration of time equal to the evaluation period corresponding to the second mode after the transition occurs, the UE shall use an evaluation period that is no less than the minimum of evaluation period corresponding to the first mode and the second mode. Subsequent to this duration, the UE shall use an evaluation period corresponding to the second mode for each RLM-RS resource. This requirement shall be applied to both out-of-sync evaluation and in-sync evaluation of the monitored cell.

When the UE transitions from a first configuration of RLM-RS resources to a second configuration of RLM-RS resources that is different from the first configuration, for each RLM-RS resource present in the second configuration, for a duration of time equal to the evaluation period corresponding to the second configuration after the transition occurs, the UE shall use an evaluation period that is no less than the minimum of evaluation periods corresponding to the first configuration and the second configuration. Subsequent to this duration, the UE shall use an evaluation period corresponding to the second configuration for each RLM-RS resource present in the second configuration. This requirement shall be applied to both out-of-sync evaluation and in-sync evaluation of the monitored cell.

When the UE transitions from a first configuration of active TCI state of the CORESET to a second configuration of active TCI state of the CORESET, for each CSI-RS for RLM present in the second configuration, the UE shall use an evaluation period corresponding to the second configuration from the time of transition. This requirement shall be applied to both out-of-sync evaluation and in-sync evaluation of the monitored cell.

The transmitter power of the UE in the monitored cell shall be turned off within 40ms after expiry of T310 timer as specified in TS 38.331 [2].

[TS38.133, clause 8.1.6]

When the downlink radio link quality on at least one of the configured RLM-RS resources is better than Q_{in}, Layer 1 of the UE shall send an in-sync indication for the cell to the higher layers. A Layer 3 filter shall be applied to the in-sync indications as specified in TS 38.331 [2].

The in-sync evaluations for the configured RLM-RS resources shall be performed as specified in clause 5 in TS 38.213 [3]. Two successive indications from Layer 1 shall be separated by at least $T_{Indication_interval}$.

When DRX is not used $T_{Indication_interval}$ is max(10ms, $T_{RLM\text{-}RS,M}$), where $T_{RLM,M}$ is the shortest periodicity of all configured RLM-RS resources for the monitored cell, which corresponds to T_{SSB} specified in clause 8.1.2 if the RLM-RS resource is SSB, or $T_{CSI\text{-}RS}$ specified in clause 8.1.3 if the RLM-RS resource is CSI-RS.

In case DRX is used, $T_{Indication_interval}$ is max(10ms, 1.5*DRX_cycle_length, 1.5*$T_{RLM\text{-}RS,M}$) if DRX cycle_length is less than or equal to 320ms, and $T_{Indication_interval}$ is DRX_cycle_length if DRX cycle_length is greater than 320ms. Upon start of T310 timer as specified in TS 38.331 [2], the UE shall monitor the configured RLM-RS resources for recovery using the evaluation period and Layer 1 indication interval corresponding to the no DRX mode until the expiry or stop of T310 timer.

References: The conformance requirements covered in the current TC are specified in: TS 38.133 [6], clauses 8.1.3, 8.1.4, 8.1.5 and 8.1.6.

5.5.1.0.5 Minimum conformance requirements for UE scheduling restrictions during radio link monitoring

The following scheduling restriction applies due to radio link monitoring on an FR2 serving PCell and/or PSCell.

- If the RLM-RS is CSI-RS which is type-D QCLed with active TCI state for PDCCH or PDSCH, and the CSI-RS is not in a CSI-RS resource set with repetition ON,
  - There are no scheduling restrictions due to radio link monitoring based on the CSI-RS.
- Otherwise
  - The UE is not expected to transmit PUCCH, PUSCH or SRS or receive PDCCH, PDSCH or CSI-RS for tracking or CSI-RS for CQI on RLM-RS symbols to be measured for radio link monitoring.

When intra-band carrier aggregation in FR2 is performed, the scheduling restrictions on FR2 serving PCell or PSCell applies to all serving cells in the same band on the symbols that fully or partially overlap with restricted symbols.

When inter-band carrier aggregation in FR2 is performed, there are no scheduling restrictions on FR2 serving cell(s) in the bands due to radio link monitoring performed on FR2 serving PCell or PSCell in different bands, provided that UE is capable of independent beam management on this FR2 band pair.

For FR2, if following conditions are met,

- UE has been notified about system information update through paging,
- The gap between UE's reception of PDCCH that UE monitors in the Type2-PDCCH CSS set and that notifies system information update, and the PDCCH that UE monitors in the Type0-PDCCH CSS set, is greater than 2 slots,

For the SSB for RLM and CORESET for RMSI scheduling multiplexing patterns 3, UE is expected to receive the PDCCH that UE monitors in the Type0-PDCCH CSS set, and the corresponding PDSCH, on SSB symbols to be measured for RLM; and

For the SSB for RLM and CORESET for RMSI scheduling multiplexing patterns 2, UE is expected to receive PDSCH that corresponds to the PDCCH that UE monitors in the Type0-PDCCH CSS set, on SSB symbols to be measured for RLM.

5.5.1.1 EN-DC FR2 radio link monitoring out-of-sync test for PSCell configured with SSB-based RLM RS in non-DRX mode

Editor's Note: This test case has been completed for the following configurations:

- Test frequency f ≤ 40.8 GHz
- UE PC3
- Normal conditions

- The test is incomplete for UE power classes other than PC3

- The test is incomplete for test frequencies > 40.8 GHz

- The test is incomplete for extreme conditions

5.5.1.1.1 Test purpose

The purpose of this test is to verify that the UE properly detects the out of sync for the purpose of monitoring downlink radio link quality of the PSCell configured with SSB-based RLM RS in non-DRX mode. This test will partly verify the NR cell radio link monitoring requirements in TS 38.133 [6] clause 8.1.2.

5.5.1.1.2 Test applicability

This test applies to all types of E-UTRA UE release 15 and forward, supporting EN-DC.

5.5.1.1.3 Minimum conformance requirement

The minimum requirements are specified in clause 5.5.1.0.1. DRX configuration is not used for this test.

The normative reference for this requirement is TS 38.133 [6] clause A.5.5.1.1.

5.5.1.1.4 Test description

There are two cells, Cell 1 is the E-UTRAN PCell, and Cell 2 is the PSCell, in the test. The E-UTRAN PCell setting refers to Table A.3.7.2.1-1 as defined in 38.133 [6]. The test consists of three successive time periods, with time duration of T1, T2 and T3 respectively. Figure 5.5.1.1.4-1 shows the variation of the downlink SNR in the active Cell 2 to emulate out-of-sync and in-sync states and Figure 5.5.1.1.4-2 shows the Time multiplexed downlink transmissions from each Angle of Arrival. Prior to the start of the time duration T1, the UE shall be fully synchronized to Cell 1 and Cell 2. The UE shall be configured for periodic CSI reporting with a reporting periodicity of 5 ms. The UE is configured to perform inter-frequency measurements using Gap Pattern ID #0 (40ms).

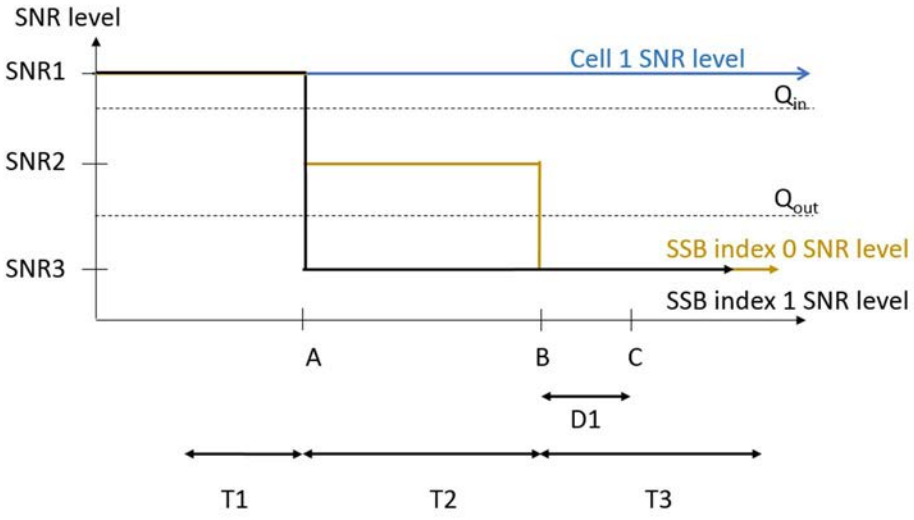


Figure 5.5.1.1.4-1: SNR variation for out-of-sync testing

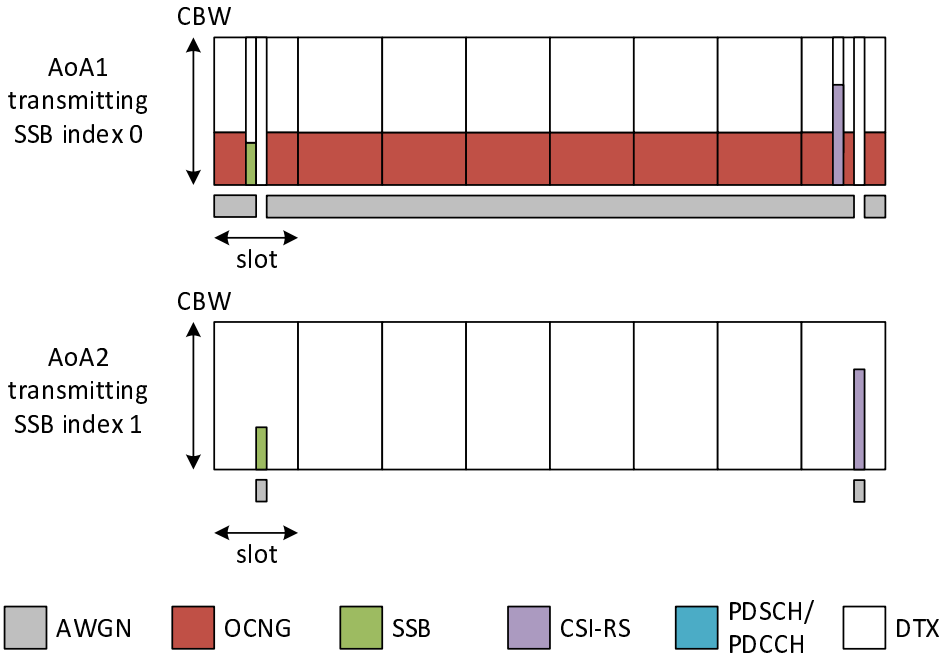


Figure 5.5.1.1.4-2: Time multiplexed downlink transmissions

5.5.1.1.4.1 Initial conditions

Initial conditions are a set of test configurations the UE needs to be tested in and the steps for the SS to take with the UE to reach the correct measurement state.

The initial test configurations consist of environmental conditions, test frequencies, test channel bandwidths and sub-carrier spacing based on NR operating bands specified in Table 5.3.5-1 of 38.521-2 [18].

This test shall be tested using any of the test configurations in Table 5.5.1.1.4.1-1.

Table 5.5.1.1.4.1-1: EN-DC FR2 radio link monitoring out-of-sync test for PSCell configured with SSB-based RLM RS in non-DRX mode supported test configurations

Configuration	Description
5.5.1.1-1	FDD LTE PCell, NR 120 KHz SSB SCS, 100MHz bandwidth, TDD duplex mode
5.5.1.1-2	TDD LTE PCell, NR 120 KHz SSB SCS, 100MHz bandwidth, TDD duplex mode
NOTE: The UE is only required to pass in one of the supported test configurations in FR2	

Configure the test equipment and the DUT according to the parameters in Table 5.5.1.1.4.1-2

Table 5.5.1.1.4.1-2: Initial conditions for EN-DC FR2 radio link monitoring out-of-sync test for PSCell configured with SSB-based RLM RS in non-DRX mode

Parameter	Value		Comment
Test environment	NC		As specified in TS 38.508-1 [14] clause 4.1.
Test frequencies	As specified in Annex E.1.1, Table E.2-1 and TS 38.508-1 [14] clause 4.3.1 for E-UTRA and 7.2.3 for NR.		
Channel bandwidth	As specified by the test configuration selected from Table 5.5.1.1.4.1-1		
Propagation conditions	AWGN		As specified in clause C.2.2.
Connection Diagram	TE Part	A.3.3.1.1	As specified in TS 38.508-1 [14] Annex A.
	DUT Part	A.3.4.1.1	
Exceptions to connection diagram	N/A		

PDCCH transmission parameters are given in Table 5.5.1.1.4.1-4

Table 5.5.1.1.4.1-3: Void

1. Message contents are defined in clause 5.5.1.1.4.3.

2. The power levels and settings for Cell 1 are set according to Annex A.6, Table A.6.1.1-1. Cell 2 is NR FR2 PSCell. The connection setup is done according to the settings in clause C.1.3, and the downlink signal levels as per clause C.1.2

3. The test parameters are given in Table 5.5.1.1.4.1-4 below.

4. Downlink signals for NR cell are initially set up according to Annex C.1.1 and C.1.2 for this test.

Table 5.5.1.1.4.1-4: General test parameters for FR2 out-of-sync testing in non-DRX mode

Parameter			Unit	Value
				Test 1
Active E-UTRA PCell				Cell 1
E-UTRA RF Channel Number				1
Active PSCell				Cell 2
RF Channel Number				2
Duplex mode		Config 1, 2		TDD
$BW_{channel}$		Config 1, 2		100: $N_{RB,c}$ = 66
Data RBs allocated		Config 1, 2		24
DL initial BWP configuration		Config 1, 2		DLBWP.0.1
DL dedicated BWP configuration		Config 1, 2		DLBWP.1.1
UL initial BWP configuration		Config 1, 2		ULBWP.0.1
UL dedicated BWP configuration		Config 1, 2		ULBWP.1.1
TDD Configuration		Config 1, 2		TDDConf.3.1
RMSI CORESET Reference Channel		Config 1, 2		CR.3.1 TDD
Dedicated CORESET Reference Channel		Config 1, 2		CCR.3.4 TDD
SSB Configuration		Config 1, 2		SSB.1 FR2
SMTC Configuration		Config 1, 2		SMTC.1
PDSCH/PDCCH subcarrier spacing		Config 1, 2		120 KHz
PRACH Configuration		Config 1, 2		PRACH.1 FR2
SSB index assigned as RLM RS		Config 1, 2		0,1
OCNG parameters				OP.5
CP length				Normal
Out of sync transmission parameters	DCI format			1-0
	Number of Control OFDM symbols			2
	Aggregation level		CCE	8
	Ratio of hypothetical PDCCH RE energy to average SSS RE energy		dB	4
	Ratio of hypothetical PDCCH DMRS energy to average SSS RE energy		dB	4
	DMRS precoder granularity			REG bundle size
	REG bundle size			6
DRX				*OFF*
Gap pattern ID				*gp0*
Layer 3 filtering				*Enabled*
T310 timer			ms	*0*
T311 timer			ms	1000
N310				1
N311				1
CSI-RS for CSI reporting		Config 1, 2		CSI-RS.3.1 TDD

reportConfigType			periodic
reportQuantity			cri-RI-PMI-CQI
CSI reporting periodicity		slot	40
CSI reporting offset		slot	4
TCI states for PDCCH/PDSCH			TCI.State.2
CSI-RS for tracking	Config 1, 2		TRS.2.1 TDD
T1		s	0.2
T2		s	9.68
T3		s	9.68
D1		s	9.64
Note 1: All configurations are assigned to the UE prior to the start of time period T1. Note 2: UE-specific PDCCH is not transmitted after T1 starts. Note 3: E-UTRAN is in non-DRX mode under test.			

Table 5.5.1.1.4.1-5: Measurement gap configuration for out-of-sync tests in non-DRX mode

Field	Test 1 Value
gapOffset	0
Note 1: E-UTRAN PCell and PSCell are SFN-synchronous and frame boundary aligned. (Ensure that RLM RS is partially overlapped with measurement gap).	

5.5.1.1.4.2 Test Procedure

The test consists of two cells, a single E-UTRA cell (Pcell), and a single NR cell (PSCell). Prior to the start of the time duration T1, the UE shall be fully synchronized to PSCell. The UE shall be configured for periodic CQI reporting in PUCCH [format 2] with a reporting periodicity as mentioned in the above table 5.5.1.1.4.1-4.

1. Ensure the UE is in state RRC_CONNECTED with generic procedure parameters *Connectivity* EN-DC, DC bearer MCG and SCG, Connected without release *On* according to TS 38.508-1 [6] clause 5.5.

1a. The SS shall transmit an *RRCConnectionReconfiguration* message configuring the UE for inter-frequency measurements.

1b. The UE shall transmit *RRCReconfigurationComplete* message.

2. Set the parameters according to T1 in Table 5.5.1.1.4.4-1 for subtest 1 and 2. Propagation conditions are set according to Annex C.2.3. T1 starts.

3. When T1 expires the SS shall change the SNR value to T2 as specified in Table 5.5.1.1.5-1. T2 starts.

4. When T2 expires the SS shall change the SNR value to T3 as specified in Table 5.5.1.1.5-1. T3 starts.

5. If the SS:

a) detects uplink power in each subframe configured for CQI transmission (according to configured CQI periodicity on PUCCH [format 2]) during the period from time point A to time point B

and

b) does not detect any uplink power from time point C (240 ms after the start of T3) until T3 expires,

the number of successful tests is increased by one.

6. Otherwise the number of failed tests is increased by one and proceed to Step 10.

7. When T3 expires the SS shall change the SNR value to T1 as specified in Table 5.5.1.1.4.4-1.

8. If the UE has not re-established the connection in at least 1s, the SS shall ensure PSCell is released.

9. The SS then shall transmit RRCConnectionReconfiguration message with condition MCG_and_SCG according to TS 36.508 [25] Table 4.6.1-8 to add NR cell (PSCell). The UE shall transmit RRCConnectionReconfigurationComplete message.

10. If the Reconfiguration fails, switch off and on the UE and ensure the UE is in RRC_CONNECTED with generic procedure parameters *Connectivity* EN-DC, DC bearer MCG and SCG, Connected without release *On* according to TS 38.508-1 [14] clause 4.5].

11. Repeat steps 2-10 until the confidence level according to Tables G.2.3-1 in Annex G clause G.2 is achieved.

5.5.1.1.4.3 Message Contents

Message contents are according to TS 38.508-1 [14] clause 7.3 with the following exceptions:

Table 5.5.1.1.4.3-0: Common Exception messages

Default Message Contents	
Common contents of system information blocks exceptions	
Default RRC messages and information elements contents exceptions	Table H.3.1-1 Table H.3.1-2 with Condition INTER-FREQ, L3 FILTERING NEEDED Table H.3.1-3 with Condition INTER-FREQ MO (where ssbFrequency is set to the ARFCN value of carrier center of Adjacent range) Table H.3.1-4 with A3-offset = 0 Table H.3.4-1 Table H.3.4-1a Table H.3.4-4 with condition gapUE Table H.3.4-5 with condition BFD Table H.3.5-4 Table H.3.1-8 with Condition SSB RLM

Table 5.5.1.1.4.3-1: Void

Table 5.5.1.1.4.3-2: RLF-TimersAndConstants

Derivation Path: TS 38.508-1 [14], Table 4.6.3-150			
Information Element	**Value/remark**	**Comment**	**Condition**
UE-TimersAndConstants ::= SEQUENCE {			
t310	ms0		
n310	n1		
t311	ms1000		
n311	n1		
}			

Table 5.5.1.1.4.3-3: Void

5.5.1.1.5 Test Requirement

Table 5.5.1.1.5-1 defines the cell specific primary level settings.

The UE behavior in each test during time durations T1, T2 and T3 shall be as follows:

During the period from time point A to time point B the UE shall transmit uplink signal at least in all uplink slots configured for CSI transmission according to the configured periodic CSI reporting.

The UE shall stop transmitting uplink signal no later than time point C (D1 second after the start of the time duration T3).

The rate of correct events observed during repeated tests shall be at least 90%.

Table 5.5.1.1.5-1: OTA related cell specific test parameters for FR2 (Cell 2) for out-of-sync radio link monitoring tests in non-DRX mode

Parameter		Unit	Test 1					
			T1	T2	T3	T1	T2	T3
AoA setup			Setup 3 defined in A.9.3					
			AoA1			AoA2		
Assumption for UE beams[Note 5]			Rough			Rough		
EPRE ratio of PDCCH DMRS to SSS		dB	4			Not sent		
EPRE ratio of PDCCH to PDCCH DMRS		dB	0					
EPRE ratio of PBCH DMRS to SSS		dB						
EPRE ratio of PBCH to PBCH DMRS		dB						
EPRE ratio of PSS to SSS		dB						
EPRE ratio of PDSCH DMRS to SSS		dB						
EPRE ratio of PDSCH to PDSCH DMRS		dB						
EPRE ratio of OCNG DMRS to SSS		dB						
EPRE ratio of OCNG to OCNG DMRS		dB						
ssb-Index 0 SNR	Config 1, 2	dB	4.1 Note 6	-3.9 Note 6	-15			
ssb-Index 1 SNR	Config 1, 2		Not sent			4.1 Note 6	-15	-15
N_{oc}	Config 1, 2	dBm/ 15kHz	-94.8			-94.8		
Time multiplexing of the downlink transmissions from each AoA			Defined in Figure 5.5.1.1.4-2					
Propagation condition			TDL-A 30ns 75Hz			TDL-A 30ns 75Hz		

Note 1: OCNG shall be used such that a constant total transmitted power spectral density is achieved for all OFDM symbols.
Note 2: The signal contains PDCCH for UEs other than the device under test as part of OCNG.
Note 3: SNR levels correspond to the signal to noise ratio over the SSS REs.
Note 4: The SNR values are specified for testing a UE which supports 2RX on at least one band. For testing of a UE which supports 4RX on all bands, the SNR during T3 is 38.133 [6] A.3.6.
Note 5: Information about types of UE beam is given in 38.133 [6] B.2.1.3, and does not limit UE implementation or test system implementation
Note 6: This value allows up to 1dB degradation from applied SNR to UE baseband

5.5.1.2 EN-DC FR2 radio link monitoring in-sync test for PSCell configured with SSB-based RLM RS in non-DRX mode

Editor's Note: This test case has been completed for the following configurations:

- Test frequency f ≤ 40.8 GHz
- UE PC3
- Normal conditions

- The test is incomplete for UE power classes other than PC3
- The test is incomplete for test frequencies > 40.8 GHz
- The test is incomplete for extreme conditions

5.5.1.2.1 Test Purpose

The purpose of this test is to verify that the UE properly detects the out of sync and in sync for the purpose of monitoring downlink radio link quality of the PSCell. This test will partly verify the FR2 PSCell radio link monitoring requirements in clause 8.1 of TS 38.133 [3].

5.5.1.2.2 Test Applicability

This test applies to all types of E-UTRA UEs Release 15 and forward supporting EN-DC FR2.

5.5.1.2.3 Minimum Conformance Requirements

The minimum requirements are specified in clause 5.5.1.0.2. DRX configuration is not used for this test.

The normative reference for this requirement is TS 38.133 [6] clause A.5.5.1.2.

5.5.1.2.4 Test Description

There are two cells, Cell 1 is the E-UTRAN PCell, and Cell 2 is the PSCell, in the test. The E-UTRAN PCell setting refers to Table A.3.7.2.1-2. The test consists of five successive time periods, with time duration of T1, T2, T3, T4 and T5 respectively. Figure 5.5.1.2.4-1 shows the variation of the downlink SNR in the active cell to emulate out-of-sync and in-sync states and Figure 5.5.1.2.4-2 shows the Time multiplexed downlink transmissions from each Angle of Arrival. Prior to the start of the time duration T1, the UE shall be fully synchronized to Cell 1 and Cell 2. The UE shall be configured for periodic CSI reporting with a reporting periodicity of 5ms.

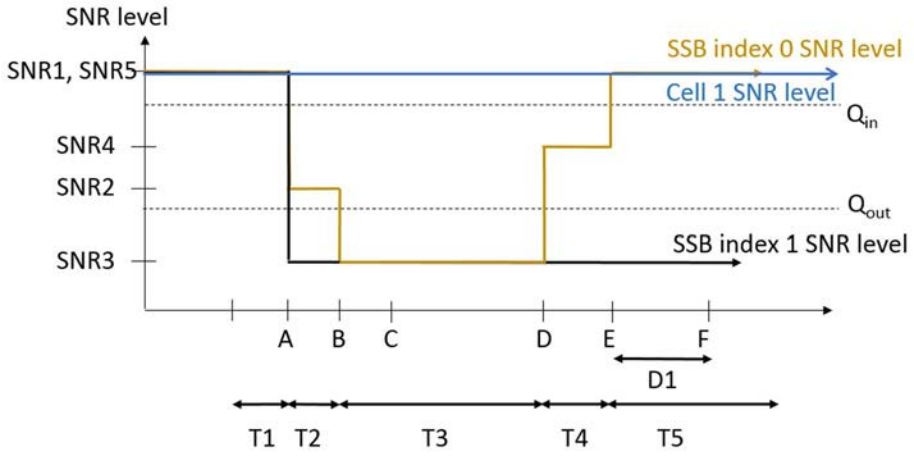


Figure 5.5.1.2.4-1: SNR variation for in-sync testing

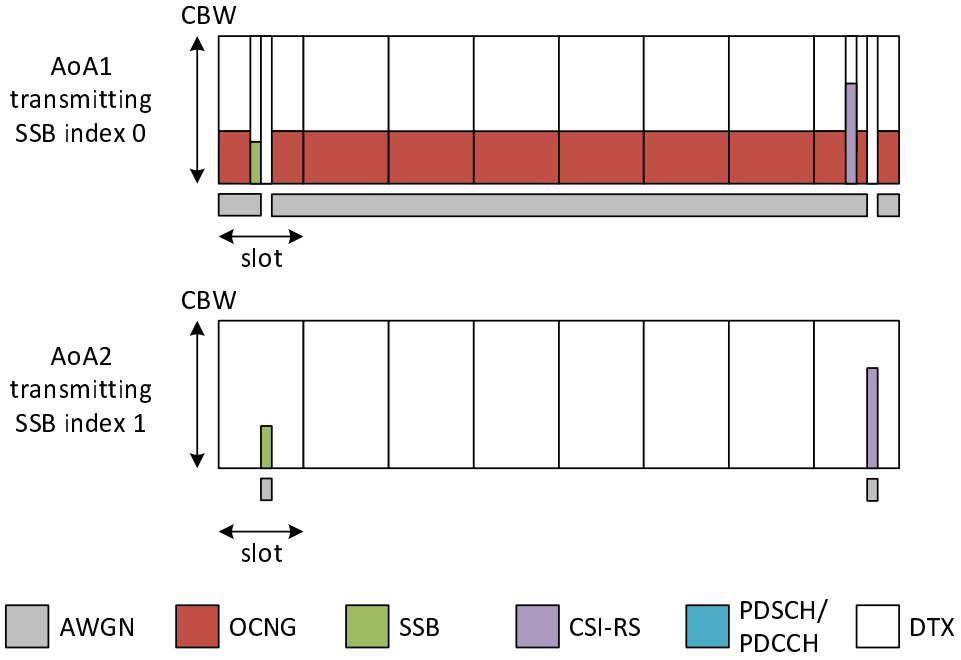


Figure 5.5.1.2.4-2: Time multiplexed downlink transmissions

5.5.1.2.4.1 Initial conditions

Initial conditions are a set of test configurations the UE needs to be tested in and the steps for the SS to take with the UE to reach the correct measurement state.

The initial test configurations consist of environmental conditions, test frequencies, test channel bandwidths and sub-carrier spacing based on NR operating bands specified in Table [5.3.5-1] and Table 5.3.5-1 of 38.521-2 [18].

This test shall be tested using any of the test configurations in Table 5.5.1.2.4.1-1.

Table 5.5.1.2.4.1-1: Supported test configurations for FR2 PSCell

Configuration	Description
5.5.1.2-1	FDD LTE PCell, NR 120 KHz SSB SCS, 100MHz bandwidth, TDD duplex mode
5.5.1.2-2	TDD LTE PCell, NR 120 KHz SSB SCS, 100MHz bandwidth, TDD duplex mode
NOTE: The UE is only required to pass in one of the supported test configurations in FR2	

Configure the test equipment and the DUT according to the parameters in Table 5.5.1.2.4.1-2.

Table 5.5.1.2.4.1-2: Initial conditions for EN-DC FR2 radio link monitoring in-sync test for PSCell configured with SSB-based RLM RS in non-DRX mode

Parameter	Value		Comment
Test environment	NC		As specified in TS 38.508-1 [14] clause 4.1.
Test frequencies	As specified in Annex E.1.1, Table E.2-1 and TS 38.508-1 [14] clause 4.3.1 for E-UTRA and 7.2.3 for NR.		
Channel bandwidth	As specified by the test configuration selected from Table 5.5.1.3.4.1-1		
Propagation conditions	AWGN		As specified in clause C.2.2.
Connection Diagram	TE Part	A.3.3.1.1	As specified in TS 38.508-1 [14] Annex A.
	DUT Part	A.3.4.1.1	
Exceptions to connection diagram	N/A		

PDCCH transmission parameters are given in Table 5.5.1.2.4.1-4.

Table 5.5.1.2.4.1-3: Void

1. Message contents are defined in clause 5.5.1.2.4.3.

2. The power levels and settings for Cell 1 are set according to Annex A.6, Table A.6.1.1-1. Cell 2 is NR FR2 PSCell. The connection setup is done according to the settings in clause C.1.3, and the downlink signal levels as per clause C.1.2

3. The general test parameters are given in Table 5.5.1.2.5-4 below.

4. Downlink signals for NR cell are initially set up according to clause C.1.

Table 5.5.1.2.4.1-4: General test parameters for FR2 in-sync testing in non-DRX mode

Parameter		Unit	Value
			Test 1
Active E-UTRA PCell			Cell 1
E-UTRA RF Channel Number			1
Active PSCell			Cell 2
RF Channel Number			2
Duplex mode	Config 1, 2		TDD
$BW_{channel}$	Config 1, 2		100: $N_{RB,c}$ = 66

Parameter			Unit	Value
				Test 1
DL initial BWP configuration		Config 1, 2		DLBWP.0.1
DL dedicated BWP configuration		Config 1, 2		DLBWP.1.1
UL initial BWP configuration		Config 1, 2		ULBWP.0.1
UL dedicated BWP configuration		Config 1, 2		ULBWP.1.1
TDD Configuration		Config 1, 2		TDDConf.3.1
CORESET Reference Channel		Config 1, 2		CR.3.1 TDD
Dedicated CORESET Reference Channel		Config 1, 2		CCR.3.1 TDD
SSB Configuration		Config 1, 2		SSB.1 FR2
SMTC Configuration		Config 1, 2		SMTC.3
PDSCH/PDCCH subcarrier spacing		Config 1, 2		120 KHz
PRACH Configuration		Config 1, 2		PRACH.1 FR2
SSB index assigned as RLM RS		Config 1, 2		0,1
OCNG parameters				OP.2
CP length				Normal
In sync transmission parameters	DCI format			1-0
	Number of Control OFDM symbols			2
	Aggregation level		CCE	4
	Ratio of hypothetical PDCCH RE energy to average SSS RE energy		dB	0
	Ratio of hypothetical PDCCH DMRS energy to average SSS RE energy		dB	0
	DMRS precoder granularity			REG bundle size
	REG bundle size			6
Out of sync transmission parameters	DCI format			1-0
	Number of Control OFDM symbols			2
	Aggregation level		CCE	8
	Ratio of hypothetical PDCCH RE energy to average SSS RE energy		dB	4
	Ratio of hypothetical PDCCH DMRS energy to average SSS RE energy		dB	4
	DMRS precoder granularity			REG bundle size
	REG bundle size			6
DRX				*OFF*
Gap pattern ID				N.A.
Layer 3 filtering				*Enabled*
T310 timer			ms	4000
T311 timer			ms	1000
N310				1
N311				1
CSI-RS for CSI reporting		Config 1, 2		CSI-RS.3.1 TDD
TCI states for PDCCH/PDSCH				TCI.State.2
CSI-RS for tracking		Config 1, 2		TRS.2.1 TDD
reportConfigType				periodic
reportQuantity				cri-RI-PMI-CQI
CSI reporting periodicity			slot	40
CSI reporting offset			slot	4
T1			s	0.2
T2			s	0.2
T3			s	1.88
T4			s	0.2
T5			s	3.84
D1			s	3.8
NOTE 1: All configurations are assigned to the UE prior to the start of time period T1. NOTE 2: UE-specific PDCCH is not transmitted after T1 starts. NOTE 3: E-UTRAN is in non-DRX mode under test.				

5.5.1.2.4.2 Test procedure

The test consists of two cells, a single E-UTRA cell (Pcell), and a single NR cell (PSCell). Prior to the start of the time duration T1, the UE shall be fully synchronized to PSCell. The UE shall be configured for periodic CQI reporting in PUCCH [format 2] with a reporting periodicity as mentioned in the above table 5.5.1.2.4.1-4.

1. Ensure the UE is in state RRC_CONNECTED with generic procedure parameters *Connectivity* EN-DC, DC bearer MCG and SCG, Connected without release *On* according to TS 38.508-1 [6] clause 4.5.

2. Set the parameters according to T1 in Table 5.5.1.2.5-1. Propagation conditions are set according to Annex C.2.3. T1 starts.

3. When T1 expires, the SS shall change the SNR value to T2 as specified in Table 5.5.1.2.5-1. T2 starts.

4. When T2 expires, the SS shall change the SNR value to T3 as specified in Table 5.5.1.2.5-1. T3 starts.

5. When T3 expires, the SS shall change the SNR value to T3 as specified in Table 5.5.1.2.5-1. T4 starts.

6. When T4 expires, the SS shall change the SNR value to T3 as specified in Table 5.5.1.2.5-1. T5 starts.

7. If the SS detects uplink power in each subframe according the configured CQI reporting mode (PUCCH 2-0) during the period from time point A to time point F (1120 ms after the start of time duration T5) the number of successful tests is increased by one.

   Otherwise the number of failed tests is increased by one.

8. Repeat steps 2-7 for all subtests until the confidence level according to Tables G.2.3-1 in Annex G clause G.2 is achieved.

5.5.1.2.4.3 Message Contents

Message contents are according to TS 38.508-1 [14] clause 7.3 with the following exceptions.

Table 5.5.1.2.4.3-1: Common Exception messages

Default Message Contents	
Common contents of system information blocks exceptions	
Default RRC messages and information elements contents exceptions	Table H.3.4-1 Table H.3.5-4 Table H.3.1-8 with Condition SSB RLM

Table 5.5.1.2.4.3-2: Void

Table 5.5.1.2.4.3-3: *RLF-TimersAndConstant*

Derivation Path: TS 38.508-1 [14], Table 4.6.3-150			
Information Element	**Value/remark**	**Comment**	**Condition**
RLF-TimersAndConstants ::= SEQUENCE {			
t310	ms4000		
n310	n1		
n311	n1		
t311-v1530	ms1000		
}			

Table 5.5.1.2.4.3-4: Void

5.5.1.2.5 Test Requirements

The UE behaviour in each test during time durations T1, T2, T3, T4 and T5 shall be as follows:

During the period from time point A to time point F (D1 second after the start of time duration T5) the UE shall transmit uplink signal at least in all uplink slots configured for CSI transmission according to the configured periodic CSI reporting.

The rate of correct events observed during repeated tests shall be at least 90% with a 95% confidence interval.

5.5.1.2.5-1: OTA related cell specific test parameters for FR2 (Cell 2) for in-sync radio link monitoring tests in non-DRX mode

Parameter		Unit	Test 1									
			T1	T2	T3	T4	T5	T1	T2	T3	T4	T5
AoA setup			Setup 3 defined in A.9.3									
			AoA1					AoA2				
Assumption for UE beams[Note 5]			Rough					Rough				
EPRE ratio of PDCCH DMRS to SSS		dB	0					Not sent				
EPRE ratio of PDCCH to PDCCH DMRS		dB	0									
EPRE ratio of PBCH DMRS to SSS		dB										
EPRE ratio of PBCH to PBCH DMRS		dB										
EPRE ratio of PSS to SSS		dB										
EPRE ratio of PDSCH DMRS to SSS		dB										
EPRE ratio of PDSCH to PDSCH DMRS		dB										
EPRE ratio of OCNG DMRS to SSS		dB										
EPRE ratio of OCNG to OCNG DMRS		dB										
ssb-Index 0 SNR	Config 1, 2	dB	4.1 Note 6	-3.9[Note 6]	-15	-4.5	4.1 Note 6					
ssb-Index 1 SNR	Config 1, 2		Not sent					4.1 Note 6	-15	-15	-15	-15
N_{oc}	Config 1, 2	dBm/ 15kHz	-94.8					-94.8				
Time multiplexing of the downlink transmissions from each AoA			Defined in Figure 5.5.1.2.4-2									
Propagation condition			TDL-A 30ns 75Hz					TDL-A 30ns 75Hz				

Note 1: OCNG shall be used such that a constant total transmitted power spectral density is achieved for all OFDM symbols.
Note 2: The signal contains PDCCH for UEs other than the device under test as part of OCNG.
Note 3: SNR levels correspond to the signal to noise ratio over the SSS REs.
Note 4: The SNR values are specified for testing a UE which supports 2RX on at least one band. For testing of a UE which supports 4RX on all bands, the SNR during T3 is 38.133 [6] A.3.6.
Note 5: Information about types of UE beam is given in B.2.1.3, and does not limit UE implementation or test system implementation
Note 6: This value allows up to 1dB degradation from applied SNR to UE baseband

5.5.1.3 EN-DC FR2 radio link monitoring out-of-sync test for PSCell configured with SSB-based RLM RS in DRX mode

Editor's Note: This test case has been completed for the following configurations:

- Test frequency f ≤ 40.8 GHz

- UE PC3

- Normal conditions

- The test is incomplete for UE power classes other than PC3

- The test is incomplete for test frequencies > 40.8 GHz

- The test is incomplete for extreme conditions

5.5.1.3.1 Test purpose

The purpose of this test is to verify that the UE properly detects the out of sync for the purpose of monitoring downlink radio link quality of the PSCell configured with SSB-based RLM RS when DRX is used. This test will partly verify the NR cell radio link monitoring requirements in TS 38.133 [6] clause 8.1.2.

5.5.1.3.2 Test applicability

This test applies to all types of E-UTRA UE release 15 and forward, supporting EN-DC.

5.5.1.3.3 Minimum conformance requirement

The minimum requirements are specified in clause 5.5.1.0.1. DRX configuration is used for this test.

The normative reference for this requirement is TS 38.133 [6] clause A.5.5.1.3.

5.5.1.3.4 Test description

There are two cells, Cell 1 is the E-UTRAN PCell, and Cell 2 is the PSCell, in the test. The E-UTRAN PCell setting refers to Table A.3.7.2.1-2 as defined in 38.133 [6]. The test consists of three successive time periods, with time duration of T1, T2 and T3 respectively. Figure 5.5.1.3.4-1 shows the variation of the downlink SNR in the active Cell 2 to emulate out-of-sync and in-sync states. Prior to the start of the time duration T1, the UE shall be fully synchronized to Cell 1 and Cell 2. The UE shall be configured for periodic CSI reporting with a reporting periodicity of 5 ms.

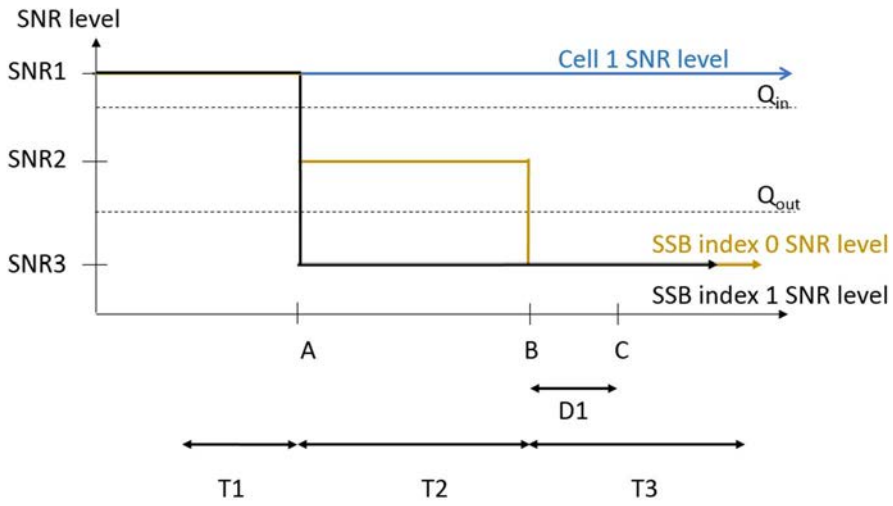


Figure 5.5.1.3.4-1: SNR variation for out-of-sync testing

5.5.1.3.4.1 Initial conditions

Initial conditions are a set of test configurations the UE needs to be tested in and the steps for the SS to take with the UE to reach the correct measurement state.

The initial test configurations consist of environmental conditions, test frequencies, test channel bandwidths and sub-carrier spacing based on NR operating bands specified in Table 5.3.5-1 of 38.521-2 [18].

This test shall be tested using any of the test configurations in Table 5.5.1.3.4.1-1.

Table 5.5.1.3.4.1-1: EN-DC FR2 radio link monitoring out-of-sync test for PSCell configured with SSB-based RLM RS in non-DRX mode supported test configurations

Configuration	Description
5.5.1.3-1	FDD LTE PCell, NR 120 KHz SSB SCS, 100MHz bandwidth, TDD duplex mode
5.5.1.3-2	TDD LTE PCell, NR 120 KHz SSB SCS, 100MHz bandwidth, TDD duplex mode
NOTE: The UE is only required to pass in one of the supported test configurations in FR2	

Configure the test equipment and the DUT according to the parameters in Table 5.5.1.3.4.1-2

Table 5.5.1.3.4.1-2: Initial conditions for EN-DC FR2 radio link monitoring out-of-sync test for PSCell configured with SSB-based RLM RS in non-DRX mode

Parameter	Value		Comment
Test environment	NC		As specified in TS 38.508-1 [14] clause 4.1.
Test frequencies	As specified in Annex E.1.1, Table E.3-1 and TS 38.508-1 [14] clause 4.3.1 for E-UTRA and 7.2.3 for NR.		
Channel bandwidth	As specified by the test configuration selected from Table 5.5.1.3.4.1-1		
Propagation conditions	AWGN		As specified in clause C.2.2.
Connection Diagram	TE Part	A.3.3.1.1	As specified in TS 38.508-1 [14] Annex A.
	DUT Part	A.3.4.1.1	
Exceptions to connection diagram	N/A		

PDCCH transmission parameters are given in Table 5.5.1.3.4.1-4

Table 5.5.1.3.4.1-3: Void

1. Message contents are defined in clause 5.5.1.3.4.3.
2. The power levels and settings for Cell 1 are set according to Annex A.6, Table A.6.1.1-1. Cell 2 is NR FR2 PSCell. The connection setup is done according to the settings in clause C.1.3, and the downlink signal levels as per clause C.1.2
3. The test parameters are given in Table 5.5.1.3.4.1-4 below.
4. Downlink signals for NR cell are initially set up according to Annex C.1.1 and C.1.2 for this test.

Table 5.5.1.3.4.1-4: General test parameters for FR2 out-of-sync testing in DRX mode

Parameter		Unit	Value
			Test 1
Active E-UTRA PCell			Cell 1
E-UTRA RF Channel Number			1
Active PSCell			Cell 2
RF Channel Number			2
Duplex mode	Config 1, 2		TDD
$BW_{channel}$	Config 1, 2		100: $N_{RB,c}$ = 66
Data RBs allocated	Config 1, 2		66
DL initial BWP configuration	Config 1, 2		DLBWP.0.1
DL dedicated BWP configuration	Config 1, 2		DLBWP.1.1
UL initial BWP configuration	Config 1, 2		ULBWP.0.1
UL dedicated BWP configuration	Config 1, 2		ULBWP.1.1
TDD Configuration	Config 1, 2		TDDConf.3.1
RMSI CORESET Reference Channel	Config 1, 2		CR.3.1 TDD

Dedicated CORESET Reference Channel		Config 1, 2		CCR.3.4 TDD
SSB Configuration		Config 1, 2		SSB.1 FR2
SMTC Configuration		Config 1, 2		SMTC.1
PDSCH/PDCCH subcarrier spacing		Config 1, 2		120 KHz
PRACH Configuration		Config 1, 2		PRACH.1 FR2
SSB index assigned as RLM RS		Config 1, 2		0,1
OCNG parameters				OP.1
CP length				Normal
Out of sync transmission parameters	DCI format			1-0
	Number of Control OFDM symbols			2
	Aggregation level		CCE	8
	Ratio of hypothetical PDCCH RE energy to average SSS RE energy		dB	4
	Ratio of hypothetical PDCCH DMRS energy to average SSS RE energy		dB	4
	DMRS precoder granularity			REG bundle size
	REG bundle size			6
DRX Configuration				DRX.3
Gap pattern ID				N.A.
Layer 3 filtering				*Enabled*
T310 timer			ms	*0*
T311 timer			ms	1000
N310				1
N311				1
CSI-RS for CSI reporting		Config 1, 2		CSI-RS.3.1 TDD
reportConfigType				periodic
reportQuantity				cri-RI-PMI-CQI
CSI reporting periodicity			slot	40
CSI reporting offset			slot	4
TCI states for PDCCH/PDSCH				TCI.State.2
CSI-RS for tracking		Config 1, 2		TRS.2.1 TDD
T1			s	0.2
T2			s	14.48
T3			s	14.48
D1			s	14.44
Note 1: All configurations are assigned to the UE prior to the start of time period T1. Note 2: UE-specific PDCCH is not transmitted after T1 starts. Note 3: E-UTRAN is in non-DRX mode under test.				

5.5.1.3.4.2 Test Procedure

The test consists of two cells, a single E-UTRA cell (Pcell), and a single NR cell (PSCell). Prior to the start of the time duration T1, the UE shall be fully synchronized to PSCell. The UE shall be configured for periodic CQI reporting in PUCCH [format 2] with a reporting periodicity as mentioned in the above table 5.5.1.3.4.1-4.

1. Ensure the UE is in state RRC_CONNECTED with generic procedure parameters *Connectivity* EN-DC, DC bearer MCG and SCG, Connected without release *On* according to TS 38.508-1 [6] clause 5.5.

2. Set the parameters according to T1 in Table 5.5.1.3.5-1. Propagation conditions are set according to Annex C.2.3. T1 starts.

3. When T1 expires the SS shall change the SNR value to T2 as specified in Table 5.5.1.3.5-1. T2 starts.

4. When T2 expires the SS shall change the SNR value to T3 as specified in Table 5.5.1.3.5-1. T3 starts.

5. If the SS:

   a) detects uplink power in the On-Duration part of every DRX cycle in each subframe configured for CQI transmission (according to configured CQI periodicity on PUCCH [format 2]) during the period from time point A to time point B

and

b) does not detect any uplink power from time point C (D1 after the start of T3) until T3 expires,

the number of successful tests is increased by one.

6. Otherwise the number of failed tests is increased by one and proceed to Step 10.

7. When T3 expires the SS shall change the SNR value to T1 as specified in Table 5.5.1.3.4.4-1.

8. If the UE has not re-established the connection in at least 1s, the SS shall ensure PSCell is released.

9. The SS then shall transmit RRCConnectionReconfiguration message with condition MCG_and_SCG according to TS 36.508 [25] Table 4.6.1-8 to add NR cell (PSCell). The UE shall transmit RRCConnectionReconfigurationComplete message.

10. If the Reconfiguration fails, switch off and on the UE and ensure the UE is in RRC_CONNECTED with generic procedure parameters *Connectivity* EN-DC, DC bearer MCG and SCG, Connected without release *On* according to TS 38.508-1 [14] clause 4.5].

11. Repeat steps 2-10 until the confidence level according to Tables G.2.3-1 in Annex G clause G.2 is achieved.

5.5.1.3.4.3 Message Contents

Message contents are according to TS 38.508-1 [14] clause 4.6 and 7.3.1 with condition “Short_DCI” and with the following exceptions:

Table 5.5.1.3.4.3-1: Common Exception messages

Default Message Contents	
Common contents of system information blocks exceptions	
Default RRC messages and information elements contents exceptions	Table H.3.4-1 Table H.3.1-8 with Condition SSB RLM Table H.3.7-1 with condition DRX.3

Table 5.5.1.3.4.3-2: Void

Table 5.5.1.3.4.3-3: RLF-TimersAndConstants

Derivation Path: TS 38.508-1 [14], Table 4.6.3-150			
Information Element	**Value/remark**	**Comment**	**Condition**
UE-TimersAndConstants ::= SEQUENCE {			
t310	ms0		
n310	n1		
t311	ms1000		
n311	n1		
}			

Table 5.5.1.3.4.3-4: Void

Table 5.5.1.3.4.3-5: CSI-ReportConfig

Derivation Path: Table H.3.5-4			
Information Element	**Value/remark**	**Comment**	**Condition**
CSI-ReportConfig ::= SEQUENCE {			
reportConfigType CHOICE {			
periodic SEQUENCE {			
reportSlotConfig ::= CHOICE {			

slots40	4		
}			
pucch-CSI-ResourceList SEQUENCE (SIZE (1..maxNrofBWPs)) OF{			
PUCCH_CSI_Resource[0] SEQUENCE {			
uplinkBandwidthPartId	BWP-Id		
pucch_Resource	9		
}			
}			
}			
}			
}			

5.5.1.3.5 Test Requirement

Table 5.5.1.3.5-1 defines the cell specific primary level settings.

The UE behavior in each test during time durations T1, T2 and T3 shall be as follows:

During the period from time point A to time point B the UE shall transmit uplink signal at least in all uplink slots configured for CSI transmission according to the configured periodic CSI reporting.

The UE shall stop transmitting uplink signal no later than time point C (D1 second after the start of the time duration T3).

The rate of correct events observed during repeated tests shall be at least 90%.

Table 5.5.1.3.5-1: OTA related cell specific test parameters for FR2 (Cell 2) for out-of-sync radio link monitoring tests in DRX mode

Parameter		Unit	Test 1		
			T1	T2	T3
AoA setup			Setup 1 defined in A.9.1		
Assumption for UE beams[Note 5]			Rough		
EPRE ratio of PDCCH DMRS to SSS		dB	4		
EPRE ratio of PDCCH to PDCCH DMRS		dB	0		
EPRE ratio of PBCH DMRS to SSS		dB	0		
EPRE ratio of PBCH to PBCH DMRS		dB			
EPRE ratio of PSS to SSS		dB			
EPRE ratio of PDSCH DMRS to SSS		dB			
EPRE ratio of PDSCH to PDSCH DMRS		dB			
EPRE ratio of OCNG DMRS to SSS		dB			
EPRE ratio of OCNG to OCNG DMRS		dB			
ssb-Index 0 SNR	Config 1, 2	dB	3.3[Note 6]	-4.7[Note 6]	-15.4
ssb-Index 1 SNR	Config 1, 2		3.3[Note 6]	-15.4	-15.4
N_{oc}	Config 1, 2	dBm/15K Hz	-104.7dBm		
Propagation condition			TDL-A 30ns 75Hz		

Note 1: OCNG shall be used such that the resources in Cell 2 are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.
Note 2: The signal contains PDCCH for UEs other than the device under test as part of OCNG.
Note 3: SNR levels correspond to the signal to noise ratio over the SSS REs.
Note 4: The SNR values are specified for testing a UE which supports 2RX on at least one band. For testing of a UE which supports 4RX on all bands, the SNR during T3 is TS 38.133 [6] A.3.6.
Note 5: Information about types of UE beam is given in TS 38.133 [6] B.2.1.3, and does not limit UE implementation or test system implementation
Note 6: This value allows up to 1dB degradation from applied SNR to UE baseband

5.5.1.4 EN-DC FR2 radio link monitoring in-sync test for PSCell configured with SSB-based RLM RS in DRX mode

Editor's Note: This test case has been completed for the following configurations:

- Test frequency f ≤ 40.8 GHz

- UE PC3

- Normal conditions

- The test is incomplete for UE power classes other than PC3

- The test is incomplete for test frequencies > 40.8 GHz

- The test is incomplete for extreme conditions

5.5.1.4.1 Test Purpose

The purpose of this test is to verify that the UE properly detects the out of sync and in sync for the purpose of monitoring downlink radio link quality of the PSCell with DRX configured. This test will partly verify the FR2 PSCell radio link monitoring requirements in clause 8.1.

5.5.1.4.2 Test Applicability

This test applies to all types of E-UTRA UEs Release 15 and forward supporting EN-DC

5.5.1.4.3 Minimum Conformance Requirements

The minimum requirements are specified in clause 5.5.1.0.2. DRX configuration is used for this test.

The normative reference for this requirement is TS 38.133 [6] clause A.5.5.1.2.

5.5.1.4.4 Test Description

5.5.1.4.4 Test Description

There are two cells, Cell 1 is the E-UTRAN PCell, and Cell 2 is the PSCell, in the test. The E-UTRAN PCell setting refers to Table A.3.7.2.1-2. The test consists of five successive time periods, with time duration of T1, T2, T3, T4 and T5 respectively. Figure A.5.5.1.4.1-1 shows the variation of the downlink SNR in the active cell to emulate out-of-sync and in-sync states. Prior to the start of the time duration T1, the UE shall be fully synchronized to Cell 1 and Cell 2. The UE shall be configured for periodic CSI reporting with a reporting periodicity of 5 ms. In the test, DRX configuration is enabled and DRX inactivity timer has already been expired, i.e. UE tries to decode PDCCH and to send periodic CSI during the period when On-duration timer is running. Time alignment timers shall be set to “infinity” so that UL timing alignment is maintained during the test.

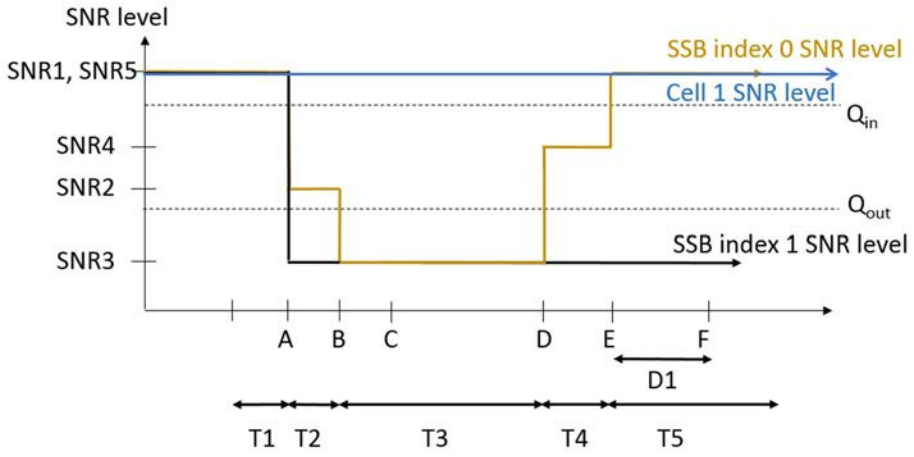


Figure 5.5.1.4.4-1: SNR variation for in-sync testing

5.5.1.4.4.1 Initial conditions

Initial conditions are a set of test configurations the UE needs to be tested in and the steps for the SS to take with the UE to reach the correct measurement state.

The initial test configurations consist of environmental conditions, test frequencies, test channel bandwidths and sub-carrier spacing based on NR operating bands specified in Table [5.3.5-1] and Table 5.3.5-1 of 38.521-2 [18].

This test shall be tested using any of the test configurations in Table 5.5.1.4.4.1-1.

Table 5.5.1.4.4.1-1: Supported test configurations for FR2 PSCell

Configuration	Description
5.5.1.4-1	FDD LTE PCell, NR 120 KHz SSB SCS, 100MHz bandwidth, TDD duplex mode
5.5.1.4-2	TDD LTE PCell, NR 120 KHz SSB SCS, 100MHz bandwidth, TDD duplex mode
NOTE: The UE is only required to pass in one of the supported test configurations in FR2	

Configure the test equipment and the DUT according to the parameters in Table 5.5.1.4.4.1-2.

Table 5.5.1.4.4.1-2: Initial conditions for EN-DC FR2 radio link monitoring in-sync test for PSCell configured with SSB-based RLM RS in non-DRX mode

Parameter	Value		Comment
Test environment	NC		As specified in TS 38.508-1 [14] clause 4.1.
Test frequencies	As specified in Annex E.1.1, Table E.3-1 and TS 38.508-1 [14] clause 4.3.1 for E-UTRA and 7.2.3 for NR.		
Channel bandwidth	As specified by the test configuration selected from Table 5.5.1.3.4.1-1		
Propagation conditions	AWGN		As specified in clause C.2.2.
Connection Diagram	TE Part	A.3.3.1.1	As specified in TS 38.508-1 [14] Annex A.
	DUT Part	A.3.4.1.1	
Exceptions to connection diagram	N/A		

PDCCH transmission parameters are given in Table 5.5.1.4.4.1-4.

Table 5.5.1.4.4.1-3: Void

1. Message contents are defined in clause 5.5.1.4.4.3.
2. The power levels and settings for Cell 1 are set according to Annex A.6, Table A.6.1.1-1. Cell 2 is NR FR2 PSCell. The connection setup is done according to the settings in clause C.1.3, and the downlink signal levels as per clause C.1.2
3. The general test parameters are given in Table 5.5.1.4.5-4 below.
4. Downlink signals for NR cell are initially set up according to clause C.1.

Table 5.5.1.4.4.1-4: General test parameters for FR2 in-sync testing in DRX mode

Parameter		Unit	Value
			Test 1
Active E-UTRA PCell			Cell 1
E-UTRA RF Channel Number			1
Active PSCell			Cell 2
RF Channel Number			2
Duplex mode	Config 1, 2		TDD
$BW_{channel}$	Config 1, 2		100: $N_{RB,c}$ = 66
DL initial BWP configuration	Config 1, 2		DLBWP.0.1
DL dedicated BWP configuration	Config 1, 2		DLBWP.1.1

Parameter			Unit	Value
				Test 1
UL initial BWP configuration		Config 1, 2		ULBWP.0.1
UL dedicated BWP configuration		Config 1, 2		ULBWP.1.1
TDD Configuration		Config 1, 2		TDDConf.3.1
RMSI CORESET Reference Channel		Config 1, 2		CR.3.1 TDD
Dedicated CORESET Reference Channel		Config 1, 2		CCR.3.1 TDD
SSB Configuration		Config 1, 2		SSB.1 FR2
SMTC Configuration		Config 1, 2		SMTC.3
PDSCH/PDCCH subcarrier spacing		Config 1, 2		120 KHz
PRACH Configuration		Config 1, 2		PRACH.1 FR2
SSB index assigned as RLM RS		Config 1, 2		0,1
OCNG parameters				OP.1
CP length				Normal
In sync transmission parameters	DCI format			1-0
	Number of Control OFDM symbols			2
	Aggregation level		CCE	4
	Ratio of hypothetical PDCCH RE energy to average SSS RE energy		dB	0
	Ratio of hypothetical PDCCH DMRS energy to average SSS RE energy		dB	0
	DMRS precoder granularity			REG bundle size
	REG bundle size			6
Out of sync transmission parameters	DCI format			1-0
	Number of Control OFDM symbols			2
	Aggregation level		CCE	8
	Ratio of hypothetical PDCCH RE energy to average SSS RE energy		dB	4
	Ratio of hypothetical PDCCH DMRS energy to average SSS RE energy		dB	4
	DMRS precoder granularity			REG bundle size
	REG bundle size			6
DRX Configuration				DRX.11
Gap pattern ID				N.A.
Layer 3 filtering				*Enabled*
T310 timer			ms	4000
T311 timer			ms	1000
N310				1
N311				1
CSI-RS for CSI reporting		Config 1, 2		CSI-RS.3.1 TDD
reportConfigType				periodic
reportQuantity				cri-RI-PMI-CQI
CSI reporting periodicity			slot	40
CSI reporting offset			slot	4
TCI states for PDCCH/PDSCH				TCI.State.2
CSI-RS for tracking		Config 1, 2		TRS.2.1 TDD
T1			s	0.2
T2			s	0.2
T3			s	2.8
T4			s	0.2
T5			s	3.88
D1			s	3.84
NOTE 1: All configurations are assigned to the UE prior to the start of time period T1. NOTE 2: UE-specific PDCCH is not transmitted after T1 starts. NOTE 3: E-UTRAN is in non-DRX mode under test.				

5.5.1.4.4.2 Test procedure

The test consists of two cells, a single E-UTRA cell (Pcell), and a single NR cell (PSCell). Prior to the start of the time duration T1, the UE shall be fully synchronized to PSCell. The UE shall be configured for periodic CQI reporting in PUCCH [format 2] with a reporting periodicity as mentioned in the above table 5.5.1.4.4.1-4.

1. Ensure the UE is in state RRC_CONNECTED with generic procedure parameters *Connectivity* EN-DC, DC bearer MCG and SCG, Connected without release *On* according to TS 38.508-1 [6] clause 4.5.

2. Set the parameters according to T1 in Table 5.5.1.4.4-1. Propagation conditions are set according to Annex C.2.3. T1 starts.

3. When T1 expires, the SS shall change the SNR value to T2 as specified in Table 5.5.1.4.5-1. T2 starts.

4. When T2 expires, the SS shall change the SNR value to T3 as specified in Table 5.5.1.4.5-1. T3 starts.

5. When T3 expires, the SS shall change the SNR value to T4 as specified in Table 5.5.1.4.5-1. T4 starts.

6. When T4 expires, the SS shall change the SNR value to T5 as specified in Table 5.5.1.4.5-1. T5 starts.

7. If the SS detects uplink power in the On-duration part of every DRX cycle in the subframe according the configured CQI reporting mode (PUCCH 2-0) during the period from time point A to time point F (D1after the start of time duration T5) the number of successful tests is increased by one.

   Otherwise the number of failed tests is increased by one.

8. Repeat steps 2-7 for all subtests until the confidence level according to Tables G.2.3-1 in Annex G clause G.2 is achieved.

5.5.1.4.4.3 Message Contents

Message contents are according to TS 38.508-1 [14] clause 4.6 and 7.3.1 with condition “Short_DCI” and with the following exceptions.

Table 5.5.1.4.4.3-1: Common Exception messages

Default Message Contents	
Common contents of system information blocks exceptions	
Default RRC messages and information elements contents exceptions	Table H.3.4-1 Table H.3.1-8 with Condition SSB RLM Table H.3.7-1 with condition DRX.11

Table 5.5.1.4.4.3-2: Void

Table 5.5.1.4.4.3-3: *RLF-TimersAndConstant*

Derivation Path: TS 38.508-1 [14], Table 4.6.3-150			
Information Element	**Value/remark**	**Comment**	**Condition**
RLF-TimersAndConstants ::= SEQUENCE {			
t310	ms4000		
n310	n1		
n311	n1		
t311	ms1000		
}			

Table 5.5.1.4.4.3-4: Void

Table 5.5.1.4.4.3-5: CSI-ReportConfig

Derivation Path: Table H.3.5-4			
Information Element	**Value/remark**	**Comment**	**Condition**
CSI-ReportConfig ::= SEQUENCE {			
reportConfigType CHOICE {			
periodic SEQUENCE {			
reportSlotConfig ::= CHOICE {			
slots40	4		
}			
pucch-CSI-ResourceList SEQUENCE (SIZE (1..maxNrofBWPs)) OF{			
PUCCH_CSI_Resource[0] SEQUENCE {			
uplinkBandwidthPartId	BWP-Id		
pucch_Resource	9		
}			
}			
}			
}			
}			

5.5.1.4.5 Test Requirements

The UE behaviour in each test during time durations T1, T2, T3, T4 and T5 shall be as follows:

During the period from time point A to time point F (D1 second after the start of time duration T5) the UE shall transmit uplink signal at least in all uplink slots configured for CSI transmission according to the configured periodic CSI reporting.

The rate of correct events observed during repeated tests shall be at least 90% with a 95% confidence interval.

Table 5.5.1.4.5-1: OTA related cell specific test parameters for FR2 (Cell 2) for in-sync radio link monitoring tests in DRX mode

Parameter		**Unit**	**Test 1**				
			T1	**T2**	**T3**	**T4**	**T5**
AoA setup			Setup 1 defined in A.9.1				
Assumption for UE beams[Note 5]			Rough				
EPRE ratio of PDCCH DMRS to SSS		dB	0				
EPRE ratio of PDCCH to PDCCH DMRS		dB	0				
EPRE ratio of PBCH DMRS to SSS		dB	0				
EPRE ratio of PBCH to PBCH DMRS		dB					
EPRE ratio of PSS to SSS		dB					
EPRE ratio of PDSCH DMRS to SSS		dB					
EPRE ratio of PDSCH to PDSCH DMRS		dB					
EPRE ratio of OCNG DMRS to SSS		dB					
EPRE ratio of OCNG to OCNG DMRS		dB					
ssb-Index 0 SNR	Config 1, 2	dB	3.3 Note 6	-4.7 Note 6	-15.4	-4.9	3.3 Note 6
ssb-Index 1 SNR	Config 1, 2		3.3 Note 6	-15.4	-15.4	-15.4	-15.4
N_{oc}	Config 1, 2	dBm/15 KHz	-104.7dBm				
Propagation condition			TDL-A 30ns 75Hz				

NOTE 1:	OCNG shall be used such that the resources in Cell 2 are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.
NOTE 2:	The signal contains PDCCH for UEs other than the device under test as part of OCNG.3
NOTE 3:	SNR levels correspond to the signal to noise ratio over the SSS REs.
NOTE 4:	The SNR values are specified for testing a UE which supports 2RX on at least one band. For testing of a UE which supports 4RX on all bands, the SNR during T3 is TS 38.133 [6] A.3.6.
Note 5:	Information about types of UE beam is given in 38.133 [6] B.2.1.3, and does not limit UE implementation or test system implementation
Note 6:	This value allows up to 1dB degradation from applied SNR to UE baseband

5.5.1.5 EN-DC FR2 radio link monitoring out-of-sync test for PSCell configured with CSI-RS-based RLM RS in non-DRX mode

Editor's note: This test case is incomplete. The following aspects are either missing or TBD

- TT analysis is made at Test frequency f ≤ 40.8 GHz

- Connection diagram is TBD

- Test Procedure and message contents will need further editing and review

5.5.1.5.1 Test purpose

The purpose of this test is to verify that the UE properly detects the out of sync for the purpose of monitoring downlink CSI-RS based radio link quality of the PSCell when no DRX is used. This test will partly verify the FR2 TDD PSCell CSI-RS Out-of-sync radio link monitoring requirements in TS 38.133 clause 8.1.

5.5.1.5.2 Test applicability

This test applies to all types of E-UTRA UE release 15 and forward supporting EN-DC and CSI-RS based RLM.

5.5.1.5.3 Minimum conformance requirements

The minimum requirements are specified in clause 5.5.1.0.3. DRX configuration is not used for this test.

The normative reference for this requirement is TS 38.133 [6] clause A.5.5.1.5.

5.5.1.5.4 Test description

There are two cells configured in this test, the E-UTRA PCell and NR PSCell. This test consists of three successive time periods, with time duration of T1, T2 and T3 respectively. Figure 5.5.1.5.4-1 shows the three different time durations and the corresponding variation of the downlink SNR in the active cell to emulate out-of-sync states.

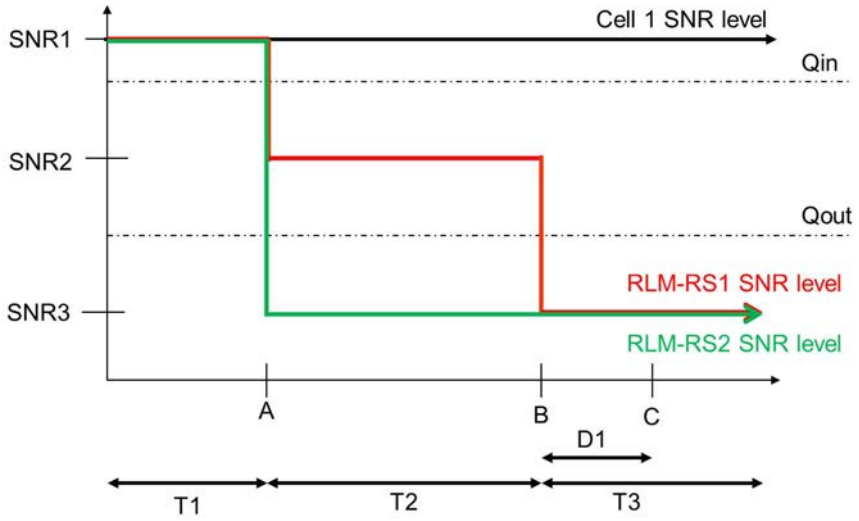


Figure 5.5.1.5.4-1: SNR variation for out-of-sync testing

5.5.1.5.4.1 Initial conditions

Test 5.5.1.5 can be run in one of the configurations defined in Table 5.5.1.5.4.1-1.

Table 5.5.1.5.4.1-1: Supported test configurations for FR2 PSCell

Configuration	Description
5.5.1.5-1	LTE FDD, NR 120 kHz SSB SCS, 100 MHz bandwidth, TDD duplex mode
5.5.1.5-2	LTE TDD, NR 120 kHz SSB SCS, 100 MHz bandwidth, TDD duplex mode
NOTE: The UE is only required to pass in one of the supported test configurations in FR2	

Configure the test equipment and the DUT according to the parameters in Table 5.5.1.5.4.1-2

Table 5.5.1.5.4.1-2: Initial conditions for CSI-RS In-sync radio link monitoring in non-DRX mode

Parameter	Value		Comment
Test environment	NC		As specified in TS 38.508-1 [14] clause 4.1.
Test frequencies	As specified in Annex E, table E.-1 and TS 38.508-1 [14] clause 4.3.1 for E-UTRA and 7.2.3 for NR.		
Channel bandwidth	As specified by the test configuration selected from Table 4.5.1.6.4.1-1.		
Propagation conditions	AWGN		As specified in clause C.2.2.
Connection Diagram	TE Part	TBD	As specified in TS 38.508-1 [14] Annex A.
	DUT Part	TBD	
Exceptions to connection diagram	N/A		

1. The test parameters are given in Table 5.5.1.5.4.1-3 below.

2. Message contents are defined in clause 5.5.1.5.4.3.

3. There are two cells in the test, where Cell 1 is the E-UTRAN PCell on the E-UTRA carrier, and Cell 2 is the NR PSCell on the NR carrier. Cell 1 is the cell used for connection setup with the power level set according to TS 38.133 [6] Table A.6.1.1-1 for this test. Cell 2 is configured according to clause C.1.1 and C.1.2.

Table 5.5.1.5.4.1-3: General test parameters for FR2 PSCell for CSI-RS out-of-sync testing in non-DRX mode

Parameter		Unit	Value
			Test 1
Active E-UTRA PCell			Cell 1
E-UTRA RF Channel Number			1
Active PSCell			Cell 2
RF Channel Number			2
Duplex Mode			TDD
$BW_{channel}$		Config 1, 2	100: $N_{RB,c}$ = 66
Data RBs allocated		Config 1, 2	24
$BW_{occupied}$		Config 1, 2	24
TDD Configuration	Config 1		TDDConf.3.1
	Config 2		TDDConf.3.1
DL initial BWP configuration	Config 1, 2		DLBWP.0.1
DL dedicated BWP configuration	Config 1, 2		DLBWP.1.4
UL initial BWP configuration	Config 1, 2		ULBWP.0.1
UL dedicated BWP configuration	Config 1, 2		ULBWP.1.4
RMSI CORESET Reference Channel	Config 1		CR.3.1 TDD
	Config 2		CR.3.1 TDD
Dedicated CORESET Reference Channel	Config 1		CCR.3.4 TDD CCR.3.6 TDD
	Config 2		CCR.3.4 TDD CCR.3.6 TDD
SSB Configuration	Config 1		SSB.1 FR2
	Config 2		SSB.1 FR2
SMTC Configuration	Config 1		SMTC.1
	Config 2		SMTC.1
PDSCH/PDCCH subcarrier spacing	Config 1		120 KHz
	Config 2		120 KHz
CSI-RS for RLM	Config 1, 2		Resource #4 in TRS.2.1 TDD Resource #4 in TRS.2.2 TDD
reportConfigType			periodic
reportQuantity			cri-RI-PMI-CQI
CSI reporting periodicity		slot	40
CSI reporting offset		slot	4
TRS configuration			TRS.2.1 TDD TRS.2.2 TDD
TCI configuration for PDCCH#1/PDSCH			TCI.State.2
TCI configuration for PDCCH#2			TCI.State.3
OCNG parameters			OP.5
CP length			Normal
Out of sync transmission parameters	DCI format		1-0
	Number of Control OFDM symbols		2
	Aggregation level	CCE	8
	Ratio of hypothetical PDCCH RE energy to average CSI-RS RE energy	dB	4
	Ratio of hypothetical PDCCH DMRS energy to average CSI-RS RE energy	dB	4
	DMRS precoder granularity		REG bundle size
	REG bundle size		6
DRX			*OFF*
Gap pattern ID			*gp0*
Layer 3 filtering			*Enabled*
T310 timer		ms	*0*
T311 timer		ms	1000
N310			1
N311			1

Parameter		Unit	Value
			Test 1
CSI-RS for CSI reporting	Config 1		CSI-RS.3.1 TDD
	Config 2		CSI-RS.3.1 TDD
T1		s	0.2
T2		s	0.35
T3		s	0.35
D1		s	0.31
NOTE 1: UE-specific PDCCH is not transmitted after T1 starts. NOTE 2: E-UTRAN is in non-DRX mode under test.			

Table 5.5.1.5.4.1-4: Measurement gap configuration for FR2 CSI-RS out-of-sync radio link monitoring in non-DRX mode

Field	Test 1
	Value
gapOffset	0
NOTE 1: E-UTRAN PCell and PSCell are SFN-synchronous and frame boundary aligned. (Ensure that RLM RS is partially overlapped with measurement gap)	

5.5.1.5.4.2 Test procedure

Prior to the start of the time duration T1, the UE shall be fully synchronized to Cell 1 and Cell 2. The UE shall be configured for periodic CSI reporting with a reporting periodicity defined in CSI-RS configuration. In the test, DRX configuration is not enabled. The UE is configured to perform inter-frequency measurements using GP ID #0 (40ms).

1. Ensure the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity EN-DC, DC bearer *MCG* and *SCG*, Connected without release *On* according to TS 38.508-1 [14] clause 4.5.4.
2. Set the parameters of Cell 2 according to T1 in Table 5.5.1.5.5-1. Propagation conditions are set according to clause C.2.3. T1 starts.
3. When T1 expires the SS shall change the SNR value to T2 as specified in Table 5.5.1.5.5-1. T2 starts.
4. When T2 expires the SS shall change the SNR value to T3 as specified in Table 5.5.1.5.5-1. T3 starts.
5. If the SS:

   a) detects uplink power on NR carrier in each slot configured for CQI transmission (according CQI reporting on PUCCH) during the period from time point A to time point B

   and

   b) does not detect any uplink power on NR carrier from time point C (D1 after the start of T3) until T3 expires,

   the number of successful tests is increased by one.

   Otherwise the number of failed tests is increased by one.
6. When T3 expires the SS shall change the SNR value to T1 as specified in Table 5.5.1.5.5-1.
7. If the UE has not re-established the connection in at least 1s, the SS shall ensure PSCell is released.
8. The SS then shall transmit *RRCConnectionReconfiguration* message with condition MCG and_SCG according to TS 36.508 [25] Table 4.6.1-8 to add NR cell (PSCell). The UE shall transmit *RRCConnectionReconfigurationComplete* message.
9. If the Reconfiguration fails, switch off and on the UE and ensure the UE is in RRC_CONNECTED with generic procedure parameters *Connectivity* EN-DC, DC bearer MCG and SCG, Connected without release *On* according to TS 38.508-1 [14] clause 4.5].
10. Repeat steps 2-10 until the confidence level according to Tables G.2.3-1 in Annex G clause G.2 is achieved.

5.5.1.5.4.3 Message contents

Message contents are according to TS 38.508-1 [14] clause 4.6 with the following exceptions:

Table 5.5.1.5.4.3-1: Common Exception messages

Default Message Contents	
Common contents of system information blocks exceptions	
Default RRC messages and information elements contents exceptions	Table H.3.1-2 with Condition INTER-FREQ, L3 FILTERING NEEDED; Table H.3.1-3 with Condition INTER-FREQ MO, SSB.1 FR2, SMTC.1 and RLM Table H.3.1-4 with a3-offset = -6dB; Table H.3.1-8 with Condition CSI RLM Table H.3.1-9

Table 5.5.1.5.4.3-2: MeasConfig for E-UTRAN PCell

Derivation Path: TS 36.508 [25], Table 4.6.6-1 with condition RF			
Information Element	**Value/remark**	**Comment**	**Condition**
MeasConfig-DEFAULT ::= SEQUENCE {			
reportConfigToAddModList	Not present		
measIdToAddModList	Not present		
measGapConfig	MeasGapConfig-GP1	TS 36.508, table 4.6.6-1A	
}			

5.5.1.5.5 Test requirement

Tables 5.5.1.5.4.1-2 and 5.5.1.5.5-1 define the primary level settings including test tolerances for Radio Link Monitoring Out-of-sync Test for FR2 PSCell configured with CSI-RS-based RLM in non-DRX mode.

Table 5.5.1.5.5-1: Cell specific test parameters for FR2 for CSI-RS out-of-sync radio link monitoring in non-DRX mode

Parameter		Unit	Test 1					
			T1	T2	T3	T1	T2	T3
AoA setup			Setup 3 defined in A.9.3					
			AoA1			AoA2		
Assumption for UE beams[Note 10]			Rough			Rough		
EPRE ratio of PDCCH DMRS to SSS		dB	4			Not sent		
EPRE ratio of PDCCH to PDCCH DMRS		dB	0					
EPRE ratio of PBCH DMRS to SSS		dB						
EPRE ratio of PBCH to PBCH DMRS		dB						
EPRE ratio of PSS to SSS		dB						
EPRE ratio of PDSCH DMRS to SSS		dB						
EPRE ratio of PDSCH to PDSCH DMRS		dB						
EPRE ratio of OCNG DMRS to SSS		dB						
EPRE ratio of OCNG to OCNG DMRS		dB						
SNR on RLM-RS1	Config 1, 2	dB	4.1[Note 11]	3.9[Note 11]	-15			
SNR on RLM-RS2	Config 1, 2		Not sent			4.1[Note 11]	-14	-15
N_{oc}	Config 1, 2	dBm/ 15kHz	-94.8			-94.8		
Propagation condition			TDL-A 30ns 75Hz			TDL-A 30ns 75Hz		

Note 1:	OCNG shall be used such that the resources in Cell 2 are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.
Note 2:	The uplink resources for CSI reporting are assigned to the UE prior to the start of time period T1.
Note 3:	NZP CSI-RS resource set configuration for CSI reporting are assigned to the UE prior to the start of time period T1.
Note 4:	Measurement gap configuration is assigned to the UE prior to the start of time period T1.
Note 5:	The timers and layer 3 filtering related parameters are configured prior to the start of time period T1.
Note 6:	The signal contains PDCCH for UEs other than the device under test as part of OCNG.
Note 7:	SNR levels correspond to the signal to noise ratio over the SSS REs.
Note 8:	The SNR in time periods T1, T2 and T3 is denoted as SNR1, SNR2 and SNR3 respectively in figure 5.5.1.5.4-1.
Note 9:	The SNR values are specified for testing a UE which supports 2RX on at least one band. For testing of a UE which supports 4RX on all bands, the SNR during T3 is TS 38.133 [6] A.3.6.
Note 10:	Information about types of UE beam is given in TS 38.133 [6] B.2.1.3, and does not limit UE implementation or test system implementation
Note 11:	This value allows up to 1dB degradation from applied SNR to UE baseband

The UE behaviour in each test during time durations T1, T2 and T3 shall be as follows:

During the period from time point A to time point B the UE shall transmit uplink signal in Cell 2 (PSCell) at least in all uplink slots configured for CSI transmission according the configured periodic CSI reporting for Cell 2.

The UE shall stop transmitting uplink signal in Cell 2 (PSCell) no later than time point C (D1 after the start of time duration T3) on the PSCell.

The rate of correct events observed during repeated tests shall be at least 90% with a confidence level of 95%.

5.5.1.6 EN-DC FR2 radio link monitoring in-sync test for PSCell configured with CSI-RS-based RLM RS in non-DRX mode

Editor's note: This test case is incomplete. The following aspects are either missing or TBD

- TT analysis is made at Test frequency f ≤ 40.8 GHz- Connection diagram is TBD.

- Test Procedure and message contents will need further editing and review

5.5.1.6.1 Test purpose

The purpose of this test is to verify that the UE properly detects the in-sync for the purpose of monitoring downlink CSI-RS based radio link quality of the PSCell when no DRX is used. This test will partly verify the FR2 TDD PSCell CSI-RS in-sync radio link monitoring requirements in TS 38.133 clause 8.1.

5.5.1.6.2 Test applicability

This test applies to all types of E-UTRA UE release 15 and forward supporting EN-DC and CSI-RS based RLM.

5.5.1.6.3 Minimum conformance requirements

The minimum requirements are specified in clause 4.5.1.0.4. DRX configuration is not used for this test.

The normative reference for this requirement is TS 38.133 [6] clause A.5.5.1.6.

5.5.1.6.4 Test description

There are two cells configured in this test, the E-UTRA PCell and NR PSCell. This test consists of five successive time periods, with time duration of T1, T2, T3, T4 and T5 respectively. Figure 5.5.1.6.4-1 shows the five different time durations and the corresponding variation of the downlink SNR in the active cell to emulate in-sync states.

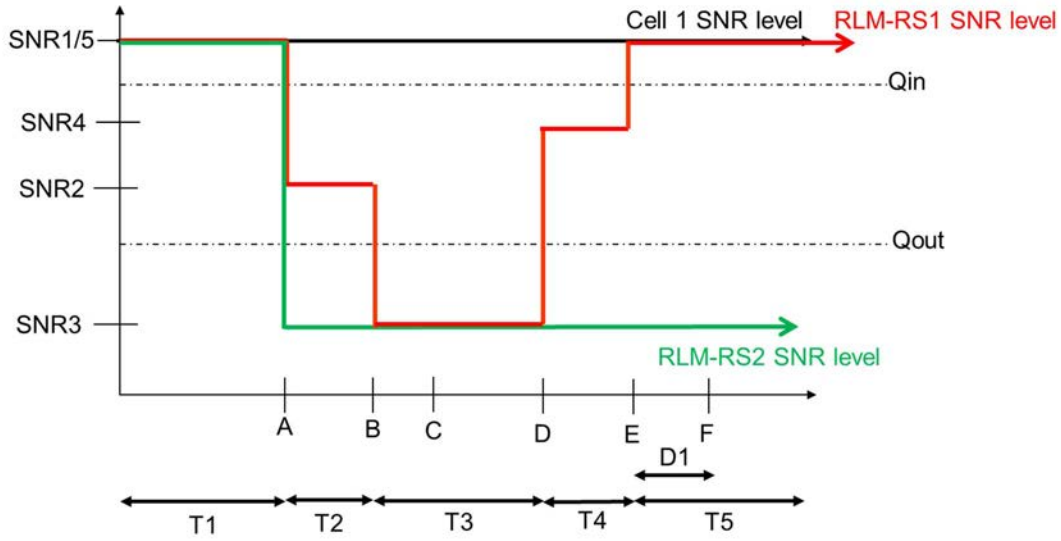


Figure 5.5.1.6.4-1: SNR variation for in-sync testing

5.5.1.6.4.1 Initial conditions

Test 5.5.1.6 can be run in one of the configurations defined in Table 5.5.1.6.4.1-1.

Table 5.5.1.6.4.1-1: Supported test configurations for FR2 PSCell

Configuration	Description
5.5.1.6-1	LTE FDD, NR 120 kHz SSB SCS, 100 MHz bandwidth, TDD duplex mode
5.5.1.6-2	LTE TDD, NR 120 kHz SSB SCS, 100 MHz bandwidth, TDD duplex mode
NOTE: The UE is only required to pass in one of the supported test configurations in FR2	

Configure the test equipment and the DUT according to the parameters in Table 5.5.1.6.4.1-2

Table 5.5.1.6.4.1-2: Initial conditions for CSI-RS in-sync radio link monitoring in non-DRX mode

Parameter	Value		Comment
Test environment	NC		As specified in TS 38.508-1 [14] clause 4.1.
Test frequencies	As specified in Annex E, table E.2-1 and TS 38.508-1 [14] clause 4.3.1 for E-UTRA and 7.2.3 for NR.		
Channel bandwidth	As specified by the test configuration selected from Table 4.5.1.6.4.1-1.		
Propagation conditions	AWGN		As specified in clause C.2.2.
Connection Diagram	TE Part	TBD	As specified in TS 38.508-1 [14] Annex A.
	DUT Part	TBD	
Exceptions to connection diagram	N/A		

1. The test parameters are given in Table 5.5.1.6.4.1-3 below.

2. Message contents are defined in clause 5.5.1.6.4.3.

3. There are two cells in the test, where Cell 1 is the E-UTRAN PCell on the E-UTRA carrier, and Cell 2 is the NR PSCell on the NR carrier. Cell 1 is the cell used for connection setup with the power level set according to TS 38.133 [6] Table A.6.1.1-1 for this test. Cell 2 is configured according to clause C.1.1 and C.1.2.

Table 5.5.1.6.4.1-3: General test parameters for FR2 PSCell for CSI-RS in-sync testing in non-DRX mode

Parameter		Unit	Value
			Test 1
Active E-UTRA PCell			Cell 1
E-UTRA RF Channel Number			1
Active PSCell			Cell 2
RF Channel Number			2
Duplex Mode			TDD
$BW_{channel}$	Config 1, 2		100: $N_{RB,c}$ = 66
Data RBs allocated	Config 1, 2		24
$BW_{occupied}$	Config 1, 2		24
TDD Configuration	Config 1		TDDConf.3.1
	Config 2		TDDConf.3.1
DL initial BWP configuration	Config 1, 2		DLBWP.0.1
DL dedicated BWP configuration	Config 1, 2		DLBWP.1.4
UL initial BWP configuration	Config 1, 2		ULBWP.0.1
UL dedicated BWP configuration	Config 1, 2		ULBWP.1.4
RMSI CORESET Reference Channel	Config 1		CR.3.1 TDD
	Config 2		CR.3.1 TDD
Dedicated CORESET Reference Channel	Config 1		CCR.3.1 TDD CCR.3.3 TDD
	Config 2		CCR.3.1 TDD CCR.3.3 TDD
SSB Configuration	Config 1		SSB.1 FR2
	Config 2		SSB.1 FR2
SMTC Configuration	Config 1		SMTC.1
	Config 2		SMTC.1
PDSCH/PDCCH subcarrier spacing	Config 1		120 KHz
	Config 2		120 KHz
CSI-RS for RLM	Config 1, 2		Resource #4 in TRS.2.1 TDD Resource #4 in TRS.2.2 TDD
OCNG parameters			OP.5
TRS configuration			TRS.2.1 TDD TRS.2.2 TDD
TCI configuration for PDCCH#1/PDSCH			TCI.State.2
TCI configuration for PDCCH#2			TCI.State.3
CP length			Normal
Out of sync transmission parameters	DCI format		1-0
	Number of Control OFDM symbols		2
	Aggregation level	CCE	8
	Ratio of hypothetical PDCCH RE energy to average CSI-RS RE energy	dB	4
	Ratio of hypothetical PDCCH DMRS energy to average CSI-RS RE energy	dB	4
	DMRS precoder granularity		REG bundle size
	REG bundle size		6
In sync transmission parameters	DCI format		1-0
	Number of Control OFDM symbols		2
	Aggregation level	CCE	4
	Ratio of hypothetical PDCCH RE energy to	dB	0

Parameter		Unit	Value
			Test 1
	average CSI-RS RE energy		
	Ratio of hypothetical PDCCH DMRS energy to average CSI-RS RE energy	dB	0
	DMRS precoder granularity		REG bundle size
	REG bundle size		6
DRX			*OFF*
Gap pattern ID			N.A.
Layer 3 filtering			*Enabled*
T310 timer		ms	1000
T311 timer		ms	1000
N310			1
N311			1
CSI-RS for CSI reporting	Config 1		CSI-RS.3.1 TDD
	Config 2		CSI-RS.3.1 TDD
T1		s	0.2
reportConfigType			periodic
reportQuantity			cri-RI-PMI-CQI
CSI reporting periodicity		slot	40
CSI reporting offset		slot	4
T2		s	0.2
T3		s	0.24
T4		s	0.2
T5		s	0.88
D1		s	0.84
NOTE 1: UE-specific PDCCH is not transmitted after T1 starts. NOTE 2: E-UTRAN is in non-DRX mode under test.			

5.5.1.6.4.2 Test procedure

Prior to the start of the time duration T1, the UE shall be fully synchronized to Cell 1 and Cell 2. The UE shall be configured for periodic CSI reporting with a reporting periodicity defined in CSI-RS configuration. In the test, DRX configuration is not enabled.

1. Ensure the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity EN-DC, DC bearer *MCG* and *SCG*, Connected without release *On* according to TS 38.508-1 [14] clause 4.5.4.

2. Set the parameters of Cell 2 according to T1 in Table 5.5.1.6.5-1. Propagation conditions are set according to clause C.2.3. T1 starts.

3. When T1 expires the SS shall change the SNR value to T2 as specified in Table 5.5.1.6.5-1. T2 starts.

4. When T2 expires the SS shall change the SNR value to T3 as specified in Table 5.5.1.6.5-1. T3 starts.

5. When T3 expires the SS shall change the SNR value to T4 as specified in Table 5.5.1.6.5-1. T4 starts.

6. When T4 expires the SS shall change the SNR value to T5 as specified in Table 5.5.1.6.5-1. T5 starts.

7. If the SS detects uplink power on NR carrier in each slot configured for CQI transmission (according CQI reporting on PUCCH) during the period from time point A to time point F (T6 ms after the start of time duration T5) the number of successful tests is increased by one.

   Otherwise the number of failed tests is increased by one.

8. If the UE has not re-established the connection in at least 1s, the SS shall ensure PSCell is released.

9. The SS then shall transmit *RRCConnectionReconfiguration* message with condition MCG_and_SCG according to TS 36.508 [25] Table 4.6.1-8 to add NR cell (PSCell). The UE shall transmit *RRCConnectionReconfigurationComplete* message.

10. If the Reconfiguration fails, switch off and on the UE and ensure the UE is in RRC_CONNECTED with generic procedure parameters Connectivity EN-DC, DC bearer MCG and SCG, Connected without release On according to TS 38.508-1 [14] clause 4.5].

11. Repeat steps 2-10 until the confidence level according to Tables G.2.3-1 in Annex G clause G.2 is achieved.

5.5.1.6.4.3 Message contents

Message contents are according to TS 38.508-1 [14] clause 4.6 with the following exceptions:

Table 5.5.1.6.4.3-1: Common Exception messages

Default Message Contents	
Common contents of system information blocks exceptions	
Default RRC messages and information elements contents exceptions	Table H.3.1-2 with Condition INTRA-FREQ, L3 FILTERING NEEDED; Table H.3.1-3 with Condition INTRA-FREQ MO, SSB.1 FR2, SMTC.1 and RLM Table H.3.1-8 with Condition CSI RLM Table H.3.1-9

5.5.1.6.5 Test requirement

Tables 5.5.1.6.4.1-2 and 5.5.1.6.5-1 define the primary level settings including test tolerances for Radio Link Monitoring in-sync Test for FR2 PSCell configured with CSI-RS-based RLM in non-DRX mode.

Table 5.5.1.6.5-1: Cell specific test parameters for FR2 for CSI-RS is-sync radio link monitoring in non-DRX mode

Parameter		Unit	Test 1									
			T1	T2	T3	T4	T5	T1	T2	T3	T4	T5
AoA setup			Setup 3 defined in A.9.3									
			AoA1					AoA2				
Assumption for UE beams[Note 10]			Rough					Rough				
EPRE ratio of PDCCH DMRS to SSS		dB	0					Not sent				
EPRE ratio of PDCCH to PDCCH DMRS		dB	0									
EPRE ratio of PBCH DMRS to SSS		dB										
EPRE ratio of PBCH to PBCH DMRS		dB										
EPRE ratio of PSS to SSS		dB										
EPRE ratio of PDSCH DMRS to SSS		dB										
EPRE ratio of PDSCH to PDSCH DMRS		dB										
EPRE ratio of OCNG DMRS to SSS		dB										
EPRE ratio of OCNG to OCNG DMRS		dB										
SNR on RLM-RS1	Config 1, 2	dB	4.1[Note 11]	3.9[Note 11]	-15	-4.5	4.1[Note 11]					
SNR on RLM-RS2	Config 1, 2		Not sent					4.1[Note 11]	-14	-15	-15	-14
N_{oc}	Config 1, 2	dBm/ 15KHz	-94.8					-94.8				
Propagation condition			TDL-A 30ns 75Hz					TDL-A 30ns 75Hz				

Note 1:	OCNG shall be used such that the resources in Cell 2 are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.
Note 2:	The uplink resources for CSI reporting are assigned to the UE prior to the start of time period T1.
Note 3:	NZP CSI-RS resource set configuration for CSI reporting are assigned to the UE prior to the start of time period T1.
Note 4:	Measurement gap configuration is assigned to the UE prior to the start of time period T1.
Note 5:	The timers and layer 3 filtering related parameters are configured prior to the start of time period T1.
Note 6:	The signal contains PDCCH for UEs other than the device under test as part of OCNG.
Note 7:	SNR levels correspond to the signal to noise ratio over the SSS REs.
Note 8:	The SNR in time periods T1, T2, T3, T4 and T5 is denoted as SNR1, SNR2, SNR3, SNR4 and SNR5 respectively in figure 5.5.1.6.4-1.
Note 9:	The SNR values are specified for testing a UE which supports 2RX on at least one band. For testing of a UE which supports 4RX on all bands, the SNR during T3 is TS 38.133 [6] A.3.6.
Note 10:	Information about types of UE beam is given in TS 38.133 [6] B.2.1.3, and does not limit UE implementation or test system implementation
Note 11:	This value allows up to 1dB degradation from applied SNR to UE baseband

The UE behaviour in each test during time durations T1, T2, T3, T4 and T5 shall be as follows:

During the period from time point A to time point F (T6 after the start of time duration T5) the UE shall transmit uplink signal at least in all slots configured for CSI transmission according to the configured periodic CSI reporting on the PSCell.

The rate of correct events observed during repeated tests shall be at least 90% with a confidence level of 95%.

5.5.1.7 EN-DC FR2 radio link monitoring out-of-sync test for PSCell configured with CSI-RS-based RLM RS in DRX mode

Editor's note: This test case has been completed for the following configurations:

- Test frequency f ≤ 40.8 GHz
- UE PC3
- Normal conditions

- The test is incomplete for UE power classes other than PC3
- The test is incomplete for test frequencies > 40.8 GHz

5.5.1.7.1 Test purpose

The purpose of this test is to verify that the UE properly detects the out of sync for the purpose of monitoring downlink CSI-RS based radio link quality of the PSCell when DRX is used. This test will partly verify the FR2 TDD PSCell CSI-RS Out-of-sync radio link monitoring requirements in TS 38.133 clause 8.1.

5.5.1.7.2 Test applicability

This test applies to all types of E-UTRA UE release 15 and forward supporting EN-DC, CSI-RS based RLM and long DRX cycle.

5.5.1.7.3 Minimum conformance requirements

The minimum requirements are specified in clause 5.5.1.0.3. DRX configuration is used for this test.

The normative reference for this requirement is TS 38.133 [6] clause A.5.5.1.7.

5.5.1.7.4 Test description

There are two cells configured in this test, the E-UTRA PCell and NR PSCell. This test consists of three successive time periods, with time duration of T1, T2 and T3 respectively. Figure 5.5.1.7.4-1 shows the three different time durations and the corresponding variation of the downlink SNR in the active cell to emulate out-of-sync states.

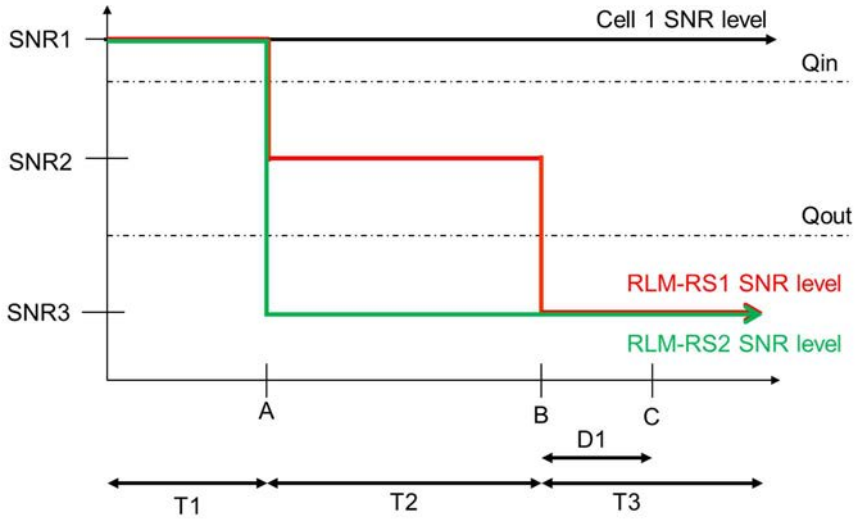


Figure 5.5.1.7.4-1: SNR variation for out-of-sync testing

5.5.1.7.4.1 Initial conditions

Test 5.5.1.7 can be run in one of the configurations defined in Table 5.5.1.7.4.1-1.

Table 5.5.1.7.4.1-1: Supported test configurations for FR2 PSCell

Configuration	Description
5.5.1.7-1	LTE FDD, NR 120 kHz SSB SCS, 100 MHz bandwidth, TDD duplex mode
5.5.1.7-2	LTE TDD, NR 120 kHz SSB SCS, 100 MHz bandwidth, TDD duplex mode
NOTE: The UE is only required to pass in one of the supported test configurations in FR2	

Configure the test equipment and the DUT according to the parameters in Table 5.5.1.7.4.1-2

Table 5.5.1.7.4.1-2: Initial conditions for CSI-RS out-of-sync radio link monitoring in DRX mode

Parameter	Value		Comment
Test environment	NC		As specified in TS 38.508-1 [14] clause 4.1.
Test frequencies	As specified in Annex E, table E.3-1 and TS 38.508-1 [14] clause 4.3.1 for E-UTRA and 7.2.3 for NR.		
Channel bandwidth	As specified by the test configuration selected from Table 5.5.1.7.4.1-1.		
Propagation conditions	AWGN		As specified in clause C.2.2.
Connection Diagram	TE Part	A.3.3.1.1	As specified in TS 38.508-1 [14] Annex A.
	DUT Part	A.3.4.1.1	
Exceptions to connection diagram	N/A		

1. The test parameters are given in Table 5.5.1.7.4.1-3 below.

2. Message contents are defined in clause 5.5.1.7.4.3.

3. There are two cells in the test, where Cell 1 is the E-UTRAN PCell on the E-UTRA carrier, and Cell 2 is the NR PSCell on the NR carrier. Cell 1 is the cell used for connection setup with the power level set according to Table A.6.1.1-1 for this test. Cell 2 is configured according to clause C.1.1 and C.1.2.

Table 5.5.1.7.4.1-3: General test parameters for FR2 PSCell for CSI-RS out-of-sync testing in DRX mode

Parameter		Unit	Value
			Test 1
Active E-UTRA PCell			Cell 1
E-UTRA RF Channel Number			1
Active PSCell			Cell 2
RF Channel Number			2
Duplex Mode			TDD
TDD Configuration	Config 1		TDDConf.3.1
	Config 2		TDDConf.3.1
DL initial BWP configuration	Config 1, 2		DLBWP.0.1
DL dedicated BWP configuration	Config 1, 2		DLBWP.1.1
UL initial BWP configuration	Config 1, 2		ULBWP.0.1
UL dedicated BWP configuration	Config 1, 2		ULBWP.1.1
RMSI CORESET Reference Channel	Config 1		CR. 3.1 TDD
	Config 2		CR. 3.1 TDD
Dedicated CORESET Reference Channel	Config 1		CCR. 3.4 TDD CCR.3.6 TDD
	Config 2		CCR. 3.4 TDD CCR.3.6 TDD
SSB Configuration	Config 1		SSB.1 FR2
	Config 2		SSB.1 FR2
SMTC Configuration	Config 1		SMTC.1
	Config 2		SMTC.1
PDSCH/PDCCH subcarrier spacing	Config 1		120 KHz
	Config 2		120 KHz
CSI-RS for RLM	Config 1, 2		Resource #4 in TRS.2.1 TDD Resource #4 in TRS.2.2 TDD
SSB index for BFD-RS	Config 1, 2		0, 1
TRS configuration			TRS.2.1 TDD TRS.2.2 TDD
TCI configuration for PDCCH#1/PDSCH			TCI.State.2
TCI configuration for PDCCH#2			TCI.State.3
OCNG parameters			OP.1
CP length			Normal
Out of sync transmission parameters	DCI format		1-0
	Number of Control OFDM symbols		2
	Aggregation level	CCE	8
	Ratio of hypothetical PDCCH RE energy to average CSI-RS RE energy	dB	4
	Ratio of hypothetical PDCCH DMRS energy to average CSI-RS RE energy	dB	4
	DMRS precoder granularity		REG bundle size
	REG bundle size		6
DRX			DRX.3
Gap pattern ID			N.A.

Parameter		Unit	Value
			Test 1
Layer 3 filtering			*Enabled*
T310 timer		ms	*0*
T311 timer		ms	1000
N310			1
N311			1
CSI-RS for CSI reporting	Config 1		CSI-RS.3.1 TDD
	Config 2		CSI-RS.3.1 TDD
reportConfigType			periodic
reportQuantity			cri-RI-PMI-CQI
CSI reporting periodicity		slot	40
CSI reporting offset		slot	4
T1		s	0.2
T2		s	1.28
T3		s	1.28
D1		s	1.24
NOTE 1: UE-specific PDCCH is not transmitted after T1 starts. NOTE 2: E-UTRAN is in non-DRX mode under test.			

5.5.1.7.4.2 Test procedure

Prior to the start of the time duration T1, the UE shall be fully synchronized to Cell 1 and Cell 2. The UE shall be configured for periodic CSI reporting with a reporting periodicity defined in CSI-RS configuration. In the test, DRX configuration is enabled in PSCell and DRX inactivity timer has already been expired, i.e. UE tries to decode PDCCH and to send periodic CQI during the period when On-duration timer is running. Time alignment timers shall be set to "infinity" so that UL timing alignment is maintained during the test.

1. Ensure the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity EN-DC, DC bearer *MCG* and *SCG*, Connected without release *On* according to TS 38.508-1 [14] clause 4.5.4.
2. Set the parameters of Cell 2 according to T1 in Table 5.5.1.7.5-1. Propagation conditions are set according to clause C.2.3. T1 starts.
3. When T1 expires the SS shall change the SNR value to T2 as specified in Table 5.5.1.7.5-1. T2 starts.
4. When T2 expires the SS shall change the SNR value to T3 as specified in Table 5.5.1.7.5-1. T3 starts.
5. If the SS:

   a) detects uplink power on NR carrier in the On-duration part of every DRX cycle in the slots configured for CQI transmission (according CQI reporting on PUCCH) during the period from time point A to time point B

   and

   b) does not detect any uplink power on NR carrier from time point C (D1 after the start of T3) until T3 expires,

   the number of successful tests is increased by one.

   Otherwise the number of failed tests is increased by one.
6. When T3 expires the SS shall change the SNR value to T1 as specified in Table 5.5.1.7.5-1.
7. If the UE has not re-established the connection in at least 1s, the UE is switched off and then on. Ensure the UE is in RRC_CONNECTED with generic procedure parameters Connectivity EN-DC, DC bearer *MCG* and *SCG*, Connected without release *On* according to TS 38.508-1 [14] clause 4.5.
8. Repeat steps 2-7 for all subtests until the confidence level according to Tables G.2.3-1 in Annex G clause G.2 is achieved.

5.5.1.7.4.3 Message contents

Message contents are according to TS 38.508-1 [14] clause 4.6 and 7.3.1 with condition "Short_DCI" and with the following exceptions:

Table 5.5.1.7.4.3-1: Common Exception messages

Default Message Contents	
Common contents of system information blocks exceptions	
Default RRC messages and information elements contents exceptions	Table H.3.1-9 Table H.3.7-1 with condition DRX.3

Table 5.5.1.7.4.3-2: CSI-ReportConfig

Derivation Path: Table H.3.5-4			
Information Element	**Value/remark**	**Comment**	**Condition**
CSI-ReportConfig ::= SEQUENCE {			
reportConfigType CHOICE {			
periodic SEQUENCE {			
reportSlotConfig ::= CHOICE {			
slots40	4		
}			
pucch-CSI-ResourceList SEQUENCE (SIZE (1..maxNrofBWPs)) OF{			
PUCCH_CSI_Resource[0] SEQUENCE {			
uplinkBandwidthPartId	BWP-Id		
pucch_Resource	9		
}			
}			
}			
}			
}			

Table 5.5.1.7.4.3-3: *RadioLinkMonitoringConfig*

Derivation Path: TS 38.508-1 [14], Table 4.6.3-133			
Information Element	**Value/remark**	**Comment**	**Condition**
RadioLinkMonitoringConfig ::= SEQUENCE {			
failureDetectionResourcesToAddModList SEQUENCE (SIZE(1..maxNrofFailureDetectionResources)) OF {	4 entries		
RadioLinkMonitoringRS[1] SEQUENCE {			
radioLinkMonitoringRS-Id	0		
purpose	beamFailure		
detectionResource CHOICE {			
ssb-Index	0	Index of SSB #0	
}			
}			
RadioLinkMonitoringRS[2] SEQUENCE {			
radioLinkMonitoringRS-Id	1		
purpose	beamFailure		
detectionResource CHOICE {			
ssb-Index	1	Index of SSB #1	
}			
}			
RadioLinkMonitoringRS[3] SEQUENCE {			
radioLinkMonitoringRS-Id	2		
purpose	rlf		
detectionResource CHOICE {			
csi-RS-Index	NZP-CSI-RS-ResourceId for TRS(4)	TS 38.508-1[14], table 7.3.1-7C	
}			
}			
RadioLinkMonitoringRS[4] SEQUENCE {			
radioLinkMonitoringRS-Id	3		
purpose	rlf		
detectionResource CHOICE {			

csi-RS-Index	NZP-CSI-RS-ResourceId for TRS(4) with condition SECOND_SET	TS 38.508-1[14], table 7.3.1-7C	
}			
}			
}			
}			

5.5.1.7.5 Test requirement

Tables 5.5.1.7.4.1-2 and 5.5.1.7.5-1 define the primary level settings including test tolerances for Radio Link Monitoring Out-of-sync Test for FR2 PSCell configured with CSI-RS-based RLM in DRX mode.

Table 5.5.1.7.5-1: Cell specific test parameters for FR2 for CSI-RS out-of-sync radio link monitoring in DRX mode

Parameter		Unit	Test 1		
			T1	T2	T3
AoA setup			Setup 1 defined in A.9.3		
Assumption for UE beams[Note 10]			Rough		
EPRE ratio of PDCCH DMRS to SSS		dB	4		
EPRE ratio of PDCCH to PDCCH DMRS		dB	0		
EPRE ratio of PBCH DMRS to SSS		dB			
EPRE ratio of PBCH to PBCH DMRS		dB			
EPRE ratio of PSS to SSS		dB			
EPRE ratio of PDSCH DMRS to SSS		dB			
EPRE ratio of PDSCH to PDSCH DMRS		dB			
EPRE ratio of OCNG DMRS to SSS		dB			
EPRE ratio of OCNG to OCNG DMRS		dB			
SNR on RLM-RS1	Config 1, 2	dB	3.3[Note]	-4.7[Note]	-15.4
SNR on RLM-RS2	Config 1, 2		3.3[Note]	-14.4	-15.4
N_{oc}	Config 1	dBm/15KHz	-104.7		
	Config 2		-104.7		
Propagation condition			TDL-A 30ns 75Hz		

Note 1: OCNG shall be used such that the resources in Cell 2 are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.
Note 2: The uplink resources for CSI reporting are assigned to the UE prior to the start of time period T1.
Note 3: NZP CSI-RS resource set configuration for CSI reporting are assigned to the UE prior to the start of time period T1.
Note 4: Measurement gap configuration is assigned to the UE prior to the start of time period T1.
Note 5: The timers and layer 3 filtering related parameters are configured prior to the start of time period T1.
Note 6: The signal contains PDCCH for UEs other than the device under test as part of OCNG.
Note 7: SNR levels correspond to the signal to noise ratio over the SSS REs.
Note 8: The SNR in time periods T1, T2 and T3 is denoted as SNR1, SNR2 and SNR3 respectively in figure 5.5.1.7.4-1.
Note 9: The SNR values are specified for testing a UE which supports 2RX on at least one band. For testing of a UE which supports 4RX on all bands, the SNR during T3 is TS 38.133 [6] A.3.6.
Note 10: Information about types of UE beam is given in TS 38.133 [6] B.2.1.3, and does not limit UE implementation or test system implementation
Note 11: This value allows up to 1dB degradation from applied SNR to UE baseband

The UE behaviour in each test during time durations T1, T2 and T3 shall be as follows:

During the period from time point A to time point B the UE shall transmit uplink signal at least once every DRX cycle, in the On-duration part of the cycle in the slots configured for CSI transmission according the configured periodic CSI reporting for Cell 2.

The UE shall stop transmitting uplink signal in Cell 2 (PSCell) no later than time point C (D1 after the start of time duration T3) on the PSCell.

The rate of correct events observed during repeated tests shall be at least 90% with a confidence level of 95%.

5.5.1.8 EN-DC FR2 radio link monitoring in-sync test for PSCell configured with CSI-RS-based RLM RS in DRX mode

Editor's note: This test case has been completed for the following configurations:

- Test frequency f ≤ 40.8 GHz
- UE PC3
- Normal conditions

- The test is incomplete for UE power classes other than PC3
- The test is incomplete for test frequencies > 40.8 GHz

5.5.1.8.1 Test purpose

The purpose of this test is to verify that the UE properly detects the in sync for the purpose of monitoring downlink CSI-RS based radio link quality of the PSCell when DRX is used. This test will partly verify the FR2 PSCell CSI-RS in-sync radio link monitoring requirements in TS 38.133 clause 8.1.

5.5.1.8.2 Test applicability

This test applies to all types of E-UTRA UE release 15 and forward supporting EN-DC, CSI-RS based RLM and long DRX cycle.

5.5.1.8.3 Minimum conformance requirements

The minimum requirements are specified in clause 5.5.1.0.4. DRX configuration is used for this test.

The normative reference for this requirement is TS 38.133 [6] clause A.5.5.1.8.

5.5.1.8.4 Test description

There are two cells configured in this test, the E-UTRA PCell and NR PSCell. This test consists of five successive time periods, with time duration of T1, T2, T3, T4 and T5 respectively. Figure 5.5.1.8.4-1 shows the five different time durations and the corresponding variation of the downlink SNR in the active cell to emulate in-sync states.

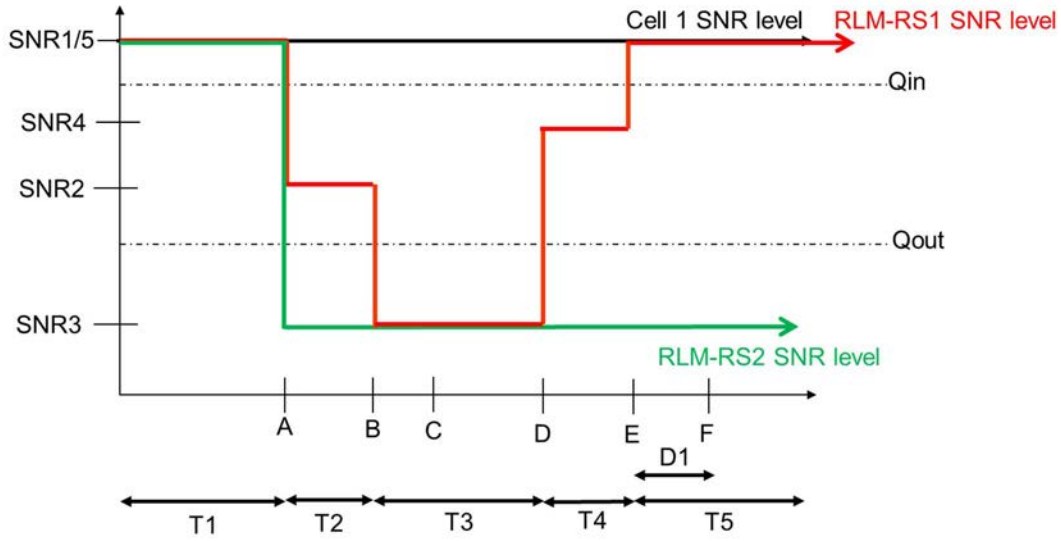


Figure 5.5.1.8.4-1: SNR variation for In-sync testing

5.5.1.8.4.1 Initial conditions

Test 5.5.1.8 can be run in one of the configurations defined in Table 5.5.1.8.4.1-1.

Table 5.5.1.8.4.1-1: Supported test configurations for FR2 PSCell

Configuration	Description
5.5.1.8-1	LTE FDD, NR 120 kHz SSB SCS, 100 MHz bandwidth, TDD duplex mode
5.5.1.8-2	LTE TDD, NR 120 kHz SSB SCS, 100 MHz bandwidth, TDD duplex mode
NOTE: The UE is only required to pass in one of the supported test configurations in FR2	

Configure the test equipment and the DUT according to the parameters in Table 5.5.1.8.4.1-2

Table 5.5.1.8.4.1-2: Initial conditions for CSI-RS In-sync radio link monitoring in DRX mode

Parameter	Value		Comment
Test environment	NC		As specified in TS 38.508-1 [14] clause 4.1.
Test frequencies	As specified in Annex E, table E.3-1 and TS 38.508-1 [14] clause 4.3.1 for E-UTRA and 7.2.3 for NR.		
Channel bandwidth	As specified by the test configuration selected from Table 5.5.1.8.4.1-1.		
Propagation conditions	AWGN		As specified in clause C.2.2.
Connection Diagram	TE Part	A.3.3.1.1	As specified in TS 38.508-1 [14] Annex A.
	DUT Part	A.3.4.1.1	
Exceptions to connection diagram	N/A		

1. The test parameters are given in Table 5.5.1.8.4.1-2 below.

2. Message contents are defined in clause 5.5.1.8.4.3.

3. There are two cells in the test, where Cell 1 is the E-UTRAN PCell on the E-UTRA carrier, and Cell 2 is the NR PSCell on the NR carrier. Cell 1 is the cell used for connection setup with the power level set according to Table A.6.1.1-1 for this test. Cell 2 is configured according to clause C.1.1 and C.1.2.

Table 5.5.1.8.4.1-3: General test parameters for FR2 PSCell for CSI-RS In-sync testing in DRX mode

Parameter		Unit	Value
			Test 1
Active E-UTRA PCell			Cell 1
E-UTRA RF Channel Number			1
Active PSCell			Cell 2
RF Channel Number			2
Duplex Mode			TDD
TDD Configuration	Config 1		TDDConf.3.1
	Config 2		TDDConf.3.1
DL initial BWP configuration	Config 1, 2		DLBWP.0.1
DL dedicated BWP configuration	Config 1, 2		DLBWP.1.1
UL initial BWP configuration	Config 1, 2		ULBWP.0.1
UL dedicated BWP configuration	Config 1, 2		ULBWP.1.1
RMSI CORESET Reference Channel	Config 1		CR.3.1 TDD
	Config 2		CR.3.1 TDD
Dedicated CORESET Reference Channel	Config 1		CCR.3.1 TDD CCR.3.3 TDD
	Config 2		CCR.3.1 TDD CCR.3.3 TDD
SSB Configuration	Config 1		SSB.1 FR2
	Config 2		SSB.1 FR2
SMTC Configuration	Config 1		SMTC.1
	Config 2		SMTC.1
PDSCH/PDCCH subcarrier spacing	Config 1		120 KHz
	Config 2		120 KHz
CSI-RS for RLM	Config 1, 2		Resource #4 in TRS.2.1 TDD Resource #4 in TRS.2.2 TDD
SSB index for BFD-RS	Config 1, 2		0, 1
TRS configuration			TRS.2.1 TDD TRS.2.2 TDD
TCI configuration for PDCCH#1/PDSCH			TCI.State.2
TCI configuration for PDCCH#2			TCI.State.3
OCNG parameters			OP.1
CP length			Normal
Out of sync transmission parameters	DCI format		1-0
	Number of Control OFDM symbols		2
	Aggregation level	CCE	8
	Ratio of hypothetical PDCCH RE energy to average CSI-RS RE energy	dB	4
	Ratio of hypothetical PDCCH DMRS energy to average CSI-RS RE energy	dB	4
	DMRS precoder granularity		REG bundle size
	REG bundle size		6
In sync transmission parameters	DCI format		1-0
	Number of Control OFDM symbols		2
	Aggregation level	CCE	4
	Ratio of hypothetical	dB	0

Parameter		Unit	Value
			Test 1
	PDCCH RE energy to average CSI-RS RE energy		
	Ratio of hypothetical PDCCH DMRS energy to average CSI-RS RE energy	dB	0
	DMRS precoder granularity		REG bundle size
	REG bundle size		6
DRX			DRX.3
Gap pattern ID			*gp0*
Layer 3 filtering			*Enabled*
T310 timer		ms	2000
T311 timer		ms	1000
N310			1
N311			1
CSI-RS for CSI reporting	Config 1		CSI-RS.3.1 TDD
	Config 2		CSI-RS.3.1 TDD
reportConfigType			periodic
reportQuantity			cri-RI-PMI-CQI
CSI reporting periodicity		slot	40
CSI reporting offset		slot	4
T1		s	0.2
T2		s	0.2
T3		s	1.64
T4		s	0.2
T5		s	1.88
D1		s	1.84
NOTE 1: UE-specific PDCCH is not transmitted after T1 starts. NOTE 2: E-UTRAN is in non-DRX mode under test.			

Table 5.5.1.8.4.1-4: Measurement gap configuration for FR2 CSI-RS In-sync radio link monitoring in DRX mode

Field	Test 1
	Value
gapOffset	0
NOTE 1: E-UTRAN PCell and PSCell are SFN-synchronous and frame boundary aligned. (Ensure that RLM RS is partially overlapped with measurement gap)	

5.5.1.8.4.2 Test procedure

Prior to the start of the time duration T1, the UE shall be fully synchronized to Cell 1 and Cell 2. The UE shall be configured for periodic CSI reporting with a reporting periodicity defined in CSI-RS configuration. In the test, DRX configuration is enabled in PSCell and DRX inactivity timer has already been expired, i.e. UE tries to decode PDCCH and to send periodic CSI during the period when On-duration timer is running. Time alignment timers shall be set to "infinity" so that UL timing alignment is maintained during the test. The UE is configured to perform inter-frequency measurements using GP ID #0 (40ms).

1. Ensure the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity EN-DC, DC bearer *MCG* and *SCG*, Connected without release *On* according to TS 38.508-1 [14] clause 4.5.4.

2. The SS shall transmit an *RRCConnectionReconfiguration* message configuring the UE for inter-frequency measurements.

3. The UE shall transmit *RRCReconfigurationComplete* message.
4. Set the parameters of Cell 2 according to T1 in Table 5.5.1.8.5-1. Propagation conditions are set according to clause C.2.3. T1 starts.
5. When T1 expires the SS shall change the SNR value to T2 as specified in Table 5.5.1.8.5-1. T2 starts.
6. When T2 expires the SS shall change the SNR value to T3 as specified in Table 5.5.1.8.5-1. T3 starts.
7. When T3 expires the SS shall change the SNR value to T4 as specified in Table 5.5.1.8.5-1. T4 starts.
8. When T4 expires the SS shall change the SNR value to T5 as specified in Table 5.5.1.8.5-1. T5 starts.
9. If the SS detects uplink power on NR carrier in the On-duration part of every DRX cycle in the configured slots for CQI transmission (according CQI reporting on PUCCH) during the period from time point A to time point F (D1 after the start of time duration T5) the number of successful tests is increased by one.

   Otherwise the number of failed tests is increased by one.
10. If the UE has not re-established the connection in at least 1s, the SS shall ensure PSCell is released.
11. The SS then shall transmit *RRCConnectionReconfiguration* message with condition *MCG_and_SCG* according to TS 36.508 [25] Table 4.6.1-8 to add NR cell (PSCell). The UE shall transmit *RRCConnectionReconfigurationComplete* message.
12. If the Reconfiguration fails, switch off and on the UE and ensure the UE is in RRC_CONNECTED with generic procedure parameters Connectivity *EN-DC*, DC bearer *MCG and SCG*, Connected without release *On* according to TS 38.508-1 [14] clause 4.5].
13. Repeat steps 2-12 until the confidence level according to Tables G.2.3-1 in Annex G clause G.2 is achieved.

5.5.1.8.4.3 Message contents

Message contents are according to TS 38.508-1 [14] clause 4.6 and 7.3.1 with condition “Short_DCI” and with the following exceptions:

Table 5.5.1.8.4.3-1: Common Exception messages

Default Message Contents	
Common contents of system information blocks exceptions	
Default RRC messages and information elements contents exceptions	Table H.3.1-2 with Condition INTER-FREQ, L3 FILTERING NEEDED; Table H.3.1-3 with Condition INTER-FREQ MO, (where ssbFrequency is set to the ARFCN value of carrier center of High range),and RLM Table H.3.1-4 with a3-offset = 0dB; Table H.3.7-1 with condition DRX.3 and Gap

Table 5.5.1.8.4.3-2: MeasConfig for E-UTRAN PCell

Derivation Path: TS 36.508, Table 4.6.6-1 with condition RF			
Information Element	**Value/remark**	**Comment**	**Condition**
MeasConfig-DEFAULT ::= SEQUENCE {			
reportConfigToAddModList	Not present		
measIdToAddModList	Not present		
measGapConfig	MeasGapConfig-GP1	TS 36.508, table 4.6.6-1A	
}			

Table 5.5.1.8.4.3-3: RLF-TimersAndConstant

Derivation Path: TS 38.508-1 [14], Table 4.6.3-150

Information Element	Value/remark	Comment	Condition
RLF-TimersAndConstants ::= SEQUENCE {			
t310	ms2000		
}			

Table 5.5.1.8.4.3-4: CSI-ReportConfig

Derivation Path: Table H.3.5-4			
Information Element	**Value/remark**	**Comment**	**Condition**
CSI-ReportConfig ::= SEQUENCE {			
reportConfigType CHOICE {			
periodic SEQUENCE {			
reportSlotConfig ::= CHOICE {			
slots40	4		
}			
pucch-CSI-ResourceList SEQUENCE (SIZE (1..maxNrofBWPs)) OF{			
PUCCH_CSI_Resource[0] SEQUENCE {			
uplinkBandwidthPartId	BWP-Id		
pucch_Resource	9		
}			
}			
}			
}			
}			

Table 5.5.1.8.4.3-5: *RadioLinkMonitoringConfig*

Derivation Path: TS 38.508-1 [14], Table 4.6.3-133			
Information Element	**Value/remark**	**Comment**	**Condition**
RadioLinkMonitoringConfig ::= SEQUENCE {			
failureDetectionResourcesToAddModList SEQUENCE (SIZE(1..maxNrofFailureDetectionResources)) OF {	4 entries		
RadioLinkMonitoringRS[1] SEQUENCE {			
radioLinkMonitoringRS-Id	0		
purpose	beamFailure		
detectionResource CHOICE {			
ssb-Index	0	Index of SSB #0	
}			
}			
RadioLinkMonitoringRS[2] SEQUENCE {			
radioLinkMonitoringRS-Id	1		
purpose	beamFailure		
detectionResource CHOICE {			
ssb-Index	1	Index of SSB #1	
}			
}			
RadioLinkMonitoringRS[3] SEQUENCE {			
radioLinkMonitoringRS-Id	2		
purpose	rlf		
detectionResource CHOICE {			
csi-RS-Index	NZP-CSI-RS-ResourceId for TRS(4)	TS 38.508-1[14], table 7.3.1-7C	
}			
}			
RadioLinkMonitoringRS[4] SEQUENCE {			
radioLinkMonitoringRS-Id	3		
purpose	rlf		
detectionResource CHOICE {			
csi-RS-Index	NZP-CSI-RS-ResourceId for TRS(4) with condition SECOND_SET	TS 38.508-1[14], table 7.3.1-7C	

}			
}			
}			
}			

5.5.1.8.5 Test requirement

Tables 5.5.1.8.4.1-2 and 5.5.1.8.5-1 define the primary level settings including test tolerances for Radio Link Monitoring In-sync Test for FR2 PSCell configured with CSI-RS-based RLM in DRX mode.

Table 5.5.1.8.5-1: Cell specific test parameters for FR2 for CSI-RS In-sync radio link monitoring in DRX mode

Parameter		Unit	Test 1				
			T1	T2	T3	T4	T5
AoA setup			Setup 1 defined in A.9.3				
Assumption for UE beams[Note 10]			Rough				
EPRE ratio of PDCCH DMRS to SSS		dB	0				
EPRE ratio of PDCCH to PDCCH DMRS		dB	0				
EPRE ratio of PBCH DMRS to SSS		dB					
EPRE ratio of PBCH to PBCH DMRS		dB					
EPRE ratio of PSS to SSS		dB					
EPRE ratio of PDSCH DMRS to SSS		dB					
EPRE ratio of PDSCH to PDSCH DMRS		dB					
EPRE ratio of OCNG DMRS to SSS		dB					
EPRE ratio of OCNG to OCNG DMRS		dB					
SNR on RLM-RS1	Config 1, 2	dB	3.3[Note]	-4.7[Note 11]	-15.4	-4. 9	3.3[Note 11]
SNR on RLM-RS2	Config 1, 2	dB	3.3[Note]	-14.4	-15.4	-15.4	-14.4
N_{oc}	Config 1, 2	dBm/15KHz	-104.7				
Propagation condition			TDL-A 30ns 75Hz				

Note 1: OCNG shall be used such that the resources in Cell 2 are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.
Note 2: The uplink resources for CSI reporting are assigned to the UE prior to the start of time period T1.
Note 3: NZP CSI-RS resource set configuration for CSI reporting are assigned to the UE prior to the start of time period T1.
Note 4: Measurement gap configuration is assigned to the UE prior to the start of time period T1.
Note 5: The timers and layer 3 filtering related parameters are configured prior to the start of time period T1.
Note 6: The signal contains PDCCH for UEs other than the device under test as part of OCNG.
Note 7: SNR levels correspond to the signal to noise ratio over the SSS REs.
Note 8: The SNR in time periods T1, T2, T3, T4 and T5 is denoted as SNR1, SNR2, SNR3, SNR4 and SNR5 respectively in figure 5.5.1.8.4-1.
Note 9: The SNR values are specified for testing a UE which supports 2RX on at least one band. For testing of a UE which supports 4RX on all bands, the SNR during T3 is TS 38.133 [6] A.3.6.
Note 10: Information about types of UE beam is given in TS 38.133 [6] B.2.1.3, and does not limit UE implementation or test system implementation
Note 11: This value allows up to 1dB degradation from applied SNR to UE baseband

The UE behaviour in each test during time durations T1, T2, T3, T4 and T5 shall be as follows:

During the period from time point A to time point F (D1 after the start of time duration T5) the UE shall transmit uplink signal at least once every DRX cycle, in the ON-duration part of the cycle in the slots configured for CSI transmission according to the configured periodic CSI reporting on the PSCell.

The rate of correct events observed during repeated tests shall be at least 90% with a confidence level of 95%.

5.5.1.9 EN-DC FR2 radio link monitoring UE scheduling restrictions

Editor's note: This test case is incomplete. The following aspects are either missing or not yet determined:

-The test tolerances and test system uncertainties applicable to this test are undefined.

-Message content is TBD

5.5.1.9.1 Test purpose

The purpose of this test is to verify that the NR UE correctly follows the RLM scheduling restrictions requirements defined in TS 38.133 [6] clause 8.1.7, and to verify that the UE correctly receive the PDCCH scheduled on the symbols right before the RLM SSB symbols without overlap so that it sends ACK/NACK correctly.

5.5.1.9.2 Test applicability

This test applies to all types of NR UE from Release 15 onwards.

This test is only applicable to UE which supports *pdcch-MonitoringAnyOccasions* or *pdcch-MonitoringAnyOccasionsWithSpanGap*.

5.5.1.9.3 Minimum conformance requirement

The minimum conformance requirements are specified in clause 5.5.1.0.5.

The normative reference for this requirement is TS 38.133 [6] clause A.5.5.1.9.

5.5.1.9.4 Test description

Two cells are deployed in the test, which are E-UTRAN PCell (Cell 1) and NR FR2 PSCell (Cell 2). The test parameters for NR PSCell are given in table 5.5.1.9.4.1-1, table 5.5.1.9.4.1-3 and table 5.5.1.9.5-1 below and the parameters and applicability for the E-UTRAN cell are defined in A.6.1.2. The test consists of one time period with time duration of T1. Figure 5.5.1.9.4-1 shows the Time multiplexed downlink transmissions from each Angle of Arrival. The UE is required during time period T1 to transmit ACK/NACK correctly upon scheduling of PDSCH.

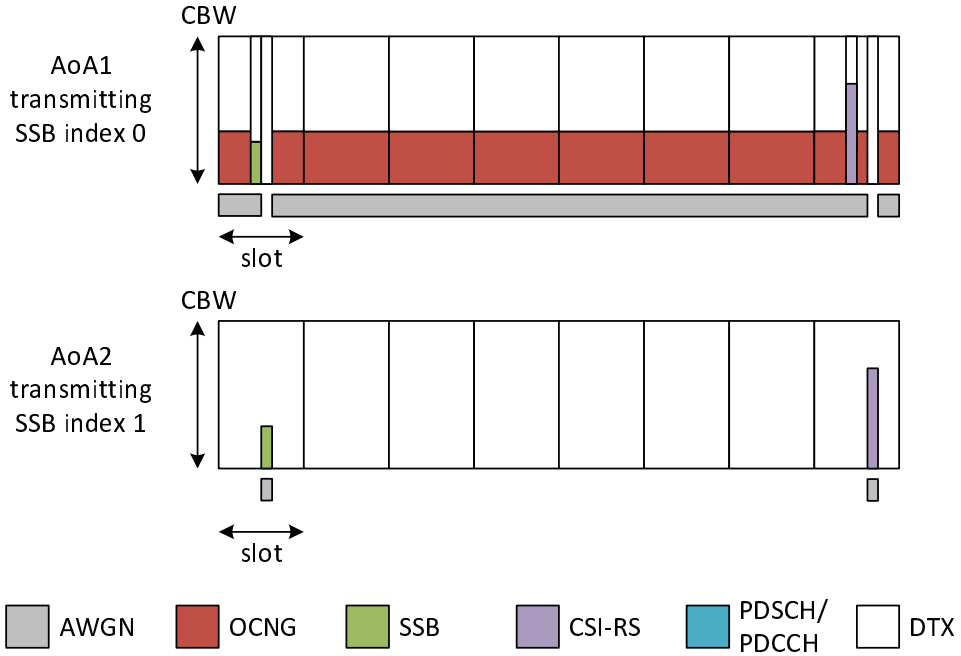


Figure 5.5.1.9.4-1: Time multiplexed downlink transmissions

5.5.1.9.4.1 Initial conditions

This test shall be tested using any of the test configurations in Table 5.5.1.9.4.1-1.

Table 5.5.1.9.4.1-1: Supported test configurations for EN-DC FR2 radio link monitoring UE scheduling restrictions

Configuration	Description
5.5.1.9-1	FDD LTE, 120 kHz SSB SCS, 120 kHz RMC SCS, 100 MHz bandwidth, TDD duplex mode
5.5.1.9-2	TDD LTE, 120 kHz SSB SCS, 120 kHz RMC SCS, 100 MHz bandwidth, TDD duplex mode
NOTE: The UE is only required to be tested in one of the supported test configurations.	

Configure the test equipment and the DUT according to the parameters in Table 5.5.1.9.4.1-2

Table 5.5.1.9.4.1-2: Initial conditions for EN-DC FR2 radio link monitoring UE scheduling restrictions

Parameter	Value		Comment
Test environment	NC		As specified in TS 38.508-1 [14] clause 4.1.
Test frequencies	As specified in Annex E.1.2, Table E.4-1 and TS 38.508-1 [14] clause 4.3.1 for E-UTRA and 7.2.3 for NR.		
Channel bandwidth	As specified by the test configuration selected from Table 5.5.1.9.4.1-1		
Propagation conditions	AWGN		As specified in clause C.2.2.
Connection Diagram	TE Part	TBD	As specified in TS 38.508-1 [14] Annex A.
	DUT Part	TBD	
Exceptions to connection diagram	N/A		

1. The test parameters for PSCell are given in Table 5.5.1.9.4.1-3
2. Message contents are defined in clause 5.5.1.9.4.3.
3. The power levels and settings for Cell 1 are set according to Annex A.6, Table A.6.1.1-1. Cell 2 is NR FR2 PSCell. The connection setup is done according to the settings in clause C.1.3, and the downlink signal levels as per clause C.1.2

Table 5.5.1.9.4.1-3: General test parameters for EN-DC FR2 radio link monitoring UE scheduling restrictions

Parameter	Unit	Test configuration	Value	Comment
RF Channel Number		1, 2	1 and 2	1 for NR PSCell and 2 for LTE PCell
SSB configuration		1, 2	SSB.1 FR2	
SMTC configuration		1, 2	SMTC pattern 1	
DRX cycle length	s	1, 2	OFF	
T1	s	1, 2	5	During T1 the UE is required to correctly transmit ACK/NACK

5.5.1.9.4.2 Test Procedure

During the test PDCCHs indicating new transmissions shall be sent continuously on PSCell (Cell 2) to ensure that the UE would have ACK/NACK sending.

1. Set the parameters according to T1 in Table 5.5.1.9.4.4-1. Propagation conditions are set according to clause C.2.2. T1 starts.

2. If the SS receives ACK/NACK from Cell 2 on each UL transmission occasion scheduled by PDCCH which are not overlapped with SSBs configured for radio link monitoring during T1, the number of successful tests is increased by one. otherwise the number of failed tests is increased by one.

3. The UE is switched off and then on. Ensure the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity *NR*, Connected without release *On* according to TS 38.508-1 [10] clause 4.5.

4. Repeat steps 1-3 until the confidence level according to Tables G.2.3-1 in Annex G clause G.2 is achieved.

5.5.1.9.4.3 Message Contents

Message contents are according to TS 38.508-1 [14] clause 7.3 with the following exceptions:

Table 5.5.1.9.4.3-1: Common Exception messages for EN-DC FR2 radio link monitoring UE scheduling restrictions

Default Message Contents	
Common contents of system information blocks exceptions	TBD
Default RRC messages and information elements contents exceptions	TBD

5.5.1.9.5 Test Requirement

Table 5.5.1.9.4.1-3 and 5.5.1.9.5-1 define the primary level settings including test tolerances for EN-DC FR2 radio link monitoring UE scheduling restrictions.

Table 5.5.1.9.5-1: Cell specific test parameters for EN-DC FR2 radio link monitoring UE scheduling restrictions

Parameter	Unit	Test configuration	Cell 2	
AoA setup		1, 2	Setup 3 defined in A.9.3	
			AoA1	**AoA2**
Assumption for UE beams[Note 1]			Rough	Rough
TDD configuration		1, 2	TDDConf.3.1	
$BW_{channel}$	MHz	1, 2	100: $N_{RB,c}$ = 66	
Data RBs allocated		1, 2	24	
PDSCH Reference measurement channel		1, 2	SR.3.2 TDD	Not sent
RMSI CORESET RMC configuration		1, 2	CR.3.1 TDD	Not sent
Dedicated CORESET RMC configuration		1, 2	CCR.3.2 TDD	Not sent
TRS configuration		1, 2	TRS.2.1 TDD	TRS.2.2 TDD
PDCCH/PDSCH TCI state		1, 2	TCI.State.2	Not sent
OCNG Pattern		1, 2	OP.5	Not sent
Initial DL BWP configuration		1, 2	DLBWP.0.1	
Initial UL BWP configuration		1, 2	ULBWP.0.1	
RLM-RS		1, 2	SSB with index 0	SSB with index 1
N_{oc}	dBm/15kHz	1, 2	-92.1	-92.1
N_{oc} [Note2]	dBm/SCS	1, 2	-83.1	-83.1

$\hat{E}_s/N_{oc}$	dB	1, 2	2	2
$\hat{E}_s/I_{ot}$ BB Note 4	dB	1, 2	1	1
SSB_RP Note3	dBm/SCS	1, 2	-81.1	-81.1
Io	dBm/95.04 MHz	1, 2	-54.35	-54.35
Time multiplexing of the downlink transmissions from each AoA		1, 2	Defined in Figure 5.5.1.9.4-1	
Propagation Condition		1, 2	AWGN	AWGN
Note 1: Information about types of UE beam is given in B.2.1.3, and does not limit UE implementation or test system implementation Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for Noc to be fulfilled. Note 3: Es/Iot, SSB_RP and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves. Note 4: Calculation of Es/Iot_{BB} includes the effect of UE internal noise up to the value assumed for the associated Refsens requirement in clause 7.3.2 of TS 38.101-2 [3], and an allowance of 1dB for UE multi-band relaxation factor ΔMB_S from TS 38.101-2 [3] Table 6.2.1.3-4.				

The UE behaviour during time duration T1 follows the requirements defined in TS 38.133 [6] clause 8.1.7.3:

The UE is not expected to transmit PUCCH, PUSCH or SRS or receive PDCCH, PDSCH or CSI-RS for tracking or CSI-RS for CQI on RLM-RS symbols to be measured for radio link monitoring.

For the test to pass, the total number of successful tests shall be more than 90% of the cases with a confidence level of 95%.

5.5.2 Interruption

5.5.2.0 Minimum conformance requirements

5.5.2.0.1 Minimum conformance requirements for interruptions at transitions between active and non-active during DRX

[TS38.133, clause 8.2.1.2.1]

Interruption on PSCell and the activated SCell if configured due to E-UTRA PCell transitions between active and non-active during DRX when PSCell or SCell is in non-DRX are allowed with up to 1% probability of missed ACK/NACK when the configured E-UTRA PCell DRX cycle is less than 640 ms, and 0.625% probability of missed ACK/NACK is allowed when the configured E-UTRA PCell DRX cycle is 640 ms or longer. Each interruption shall not exceed X slot as defined in table 5.5.2.0.1-1.

Each interruption shall not exceed X slot as defined in table 5.5.2.0.1-1.

Table 5.5.2.0.1-1: Interruption length X at transition between active and non-active during DRX

μ	NR Slot length (ms)	Interruption length X	
		Sync	Async
0	1	1	2
1	0.5	1	2
2	0.25	3	
3	0.125	5	

When both E-UTRA PCell and PSCell are in DRX, no interruption is allowed.

The normative reference for this requirement is TS 38.133 [6] clause 8.2.1.2.1.

5.5.2.0.2 Minimum conformance requirements for interruptions during measurements on deactivated NR SCC

[TS38.133, clause 8.2.1.2.5.1]

Interruption on PSCell and other active NR SCell(s) during measurement on the deactivated NR SCC shall meet requirements in clause 8.2.2.2.3, where the term PCell in clause 8.2.2.2.3 shall be deemed to be replaced with PSCell.

[TS38.133, clause 8.2.2.2.3]

Interruptions on PCell due to measurements when an SCell is deactivated are allowed with up to 0.5% probability of missed ACK/NACK when the configured *measCycleSCell* [2] is 640 ms or longer. The UE is only allowed to cause interruptions immediately before and immediately after an SMTC. Each interruption shall not exceed requirement in Table 5.5.2.0.2-1 if the PCell is not in the same band as the deactivated SCell. Each interruption shall not exceed requirement in Table 5.5.2.0.2-2 if the PCell is in the same band as the deactivated SCell.

Interruptions on active SCell due to measurements when an SCell is deactivated are allowed with up to 0.5% probability of missed ACK/NACK when the configured *measCycleSCell* [2] is 640 ms or longer. The UE is only allowed to cause interruptions immediately before and immediately after an SMTC. Each interruption shall not exceed requirement in Table 5.5.2.0.2-1 if the active SCell is not in the same band as the deactivated SCell. Each interruption shall not exceed requirement in Table 5.5.2.0.2-2 if the active SCell is in the same band as the deactivated SCell.

[TS38.133, clause 8.2.2.2.2]

Table 5.5.2.0.2-1: Interruption duration for SCell activation/deactivation for inter-band CA

μ	NR Slot length (ms)	Interruption length
0	1	1
1	0.5	1
2	0.25	2
3	0.125	4

Table 5.5.2.0.2-2: Interruption duration for SCell activation/deactivation for intra-band CA

μ	NR Slot length (ms)	Interruption length
0	1	1 + $T_{SMTC_duration}$
1	0.5	1 + $T_{SMTC_duration}$
2	0.25	2 + $T_{SMTC_duration}$
3	0.125	4 + $T_{SMTC_duration}$
NOTE: $T_{SMTC_duration}$ is - the longest SMTC duration among all above activated serving cells and the SCell being activated when one SCell is activated; - the longest SMTC duration among all activated serving cells in the same band when one SCell is deactivated.		

The normative reference for this requirement is TS 38.133 [6] clause 8.2.1.2.5.1.

5.5.2.0.3 Minimum conformance requirements for interruptions during measurements on deactivated E-UTRAN SCC

[TS38.133 clause 8.2.1.2.5.2]

When one E-UTRA SCell in MCG is deactivated, the UE is allowed due to measurements on the E-UTRA SCC with the deactivated E-UTRA SCell:

- an interruption on PSCell or any activated SCell with up to 0.5% probability of missed ACK/NACK when any of the configured *measCycleSCell* [2] for the deactivated E-UTRA SCells is 640 ms or longer.

- an interruption on PSCell or any activated SCell with up to 0.5% probability of missed ACK/NACK regardless of the configured *measCycleSCell* [2] for the deactivated E-UTRA SCells if indicated by the network using IE *allowInterruptions* [2].

Each interruption shall not exceed

- X3 slot, if the PSCell or activated SCell is not in the same band as the E-UTRA deactivated SCC being measured, or

- Y3 slot + SMTC duration, if the PSCell or activated SCell is in the same band as the E-UTRA deactivated SCC being measured, provided the cell specific reference signals from the PSCell or activated SCell and the E-UTRA deactivated SCC being measured are available in the same slot.

Table 5.5.2.0.3-1: Interruption length X3 and Y3 at measurements on deactivated E-UTRA SCC

μ	NR Slot length (ms)	Interruption length X3 slot	Interruption length Y3 slot
0	1	1	1
1	0.5	1	1
2	0.25	2	2
3	0.125	4	4

The normative reference for this requirement is TS 38.133 [6] clause 8.2.1.2.5.1.

5.5.2.0.4 Minimum conformance requirements for interruptions at NR SRS carrier based switching

SRS transmission can be configured on a carrier not configured for PUCCH/PUSCH transmission. When a UE needs to transmit periodic, semi-persistent or aperiodic SRS on a carrier of a serving cell not configured for PUCCH/PUSCH transmission, the UE can perform carrier based switching to one or more carriers not configured for PUCCH/PUSCH transmission from a carrier with PUCCH/PUSCH transmission or from a carrier not configured for PUCCH/PUSCH transmission prior to transmitting SRS, provided that:

- switching is from a configured carrier to an active UL BWP of another activated carrier;

- the carrier of SCells not configured for PUCCH/PUSCH transmission to which SRS carrier based switching is performed is indicated by DCI SRS request field for aperiodic SRS transmission, or indicated by MAC-CE for semi-persistent SRS transmission, or configured via RRC for periodic SRS transmission;

- the serving cell, from which SRS carrier based switching is performed and whose UL transmission may therefore be interrupted, is indicated by srs-SwitchFromServCellIndex and srs-SwitchFromCarrier in TS38.331 [2];

- the SRS switching is not colliding with any other transmission with higher priority defined in TS 38.214 [26].

- the SRS switching is not colliding with any SSB/CSI-RS based L3 measurements and the measurements for RLM/BFD in SCG.

- for UE, which does not support simultaneous reception and transmission for inter-band TDD CA specified in TS 38.331 [2], and is compliant to the requirements for inter-band CA with uplink in one NR band and without simultaneous Rx/Tx specified in TS 38.101 [5], the SRS transmission are not simultaneously scheduled with DL SSB/CSI-RS for L3 or L1 measurements transmission on other carriers.

The UE shall not perform SRS carrier based switching if the above conditions cannot be met.

When SRS carrier based switching is performed between carriers, the UE is allowed interruptions on any active serving cell in SCG if UE is not capable of Per-FR gap, or on active serving cell(s) in SCG in FR1 if UE is capable of Per-FR gap, during the switching to the carrier of a serving cell in FR1 not configured for PUCCH/PUSCH transmission,

- with up to X1 slot as specified in Table 5.5.2.0.4-1.

When SRS carrier based switching is performed between carriers, the UE is allowed interruptions on any active serving cell in SCG if UE is not capable of Per-FR gap, or on active serving cell(s) in SCG in FR2 if UE is capable of Per-FR gap, during the switching to the carrier of a serving cell in FR2 not configured for PUCCH/PUSCH transmission,

- with up to X2 slot as specified in Table 5.5.2.0.4-2.

When SRS carrier based switching is performed between carriers, the UE is allowed interruptions on any active serving cell in SCG if UE is not capable of Per-FR gap, or on active serving cell(s) in SCG in FR1 if UE is capable of Per-FR gap, during the switching from the carrier of a serving cell in FR1 not configured for PUCCH/PUSCH transmission,

- with up to X1 slot as specified in Table 5.5.2.0.4-1.

When SRS carrier based switching is performed between carriers, the UE is allowed interruptions on any active serving cell in SCG if UE is not capable of Per-FR gap, or on active serving cell(s) in SCG in FR2 if UE is capable of Per-FR gap, during the switching from the carrier of a serving cell in FR2 not configured for PUCCH/PUSCH transmission,

- with up to X2 slot as specified in Table 5.5.2.0.4-2.

Table 5.5.2.0.4-1: Interruption length X1 (slot)

μ	NR Slot length (ms) of victim cell	SRS carrier switching time (us)[Note 1]	Interruption length X1 (slots)	
			Sub carrier spacing for agressor cell (kHz)	
			15	30
0	1	≤ 200	2	2
		300, 500	2	2
		900	3	3
1	0.5	≤ 200	3	2
		300, 500	3	3
		900	4	4
2	0.25	≤ 200	4	3
		300, 500	5	4
		900	7	6
3	0.125	≤ 200	7	5
		300, 500	9	7
		900	12	10
Note1: NR SRS carrier switching time is UE capability indicated by higher layer parameter *SRS-SwitchingTimeNR*.				

Table 5.5.2.0.4-2: Interruption length X2 (slot)

μ	NR Slot length (ms) of victim cell	SRS carrier switching time (us) [Note1]	Interruption length X2 (slots)	
			Sub carrier spacing for agressor cell (kHz)	
			60	120
0	1	$\leq$ 200	2	2
1	0.5	$\leq$ 200	2	2
2	0.25	$\leq$ 200	3	3
3	0.125	$\leq$ 200	4	4
Note1: NR SRS carrier switching time is UE capability indicated by higher layer parameter *SRS-SwitchingTimeNR*.				

For intra-band SRS carrier switching in FR1 or FR2, interruptions in Table 5.5.2.0.4-1 and in Table 5.5.2.0.4-2 based on SRS carrier switching time $\leq$ 200us shall apply. For inter-band SRS carrier switching in FR1, interruptions in Table 5.5.2.0.4-1 and in Table 5.5.2.0.4-2 shall apply.

The normative reference for this requirement is TS 38.133 [6] clause 8.2.1.2.12.

5.5.2.0.5 Minimum conformance requirements for interruptions at E-UTRA SRS carrier based switching

A PUSCH-less carrier of E-UTRA SCell is a TDD carrier without PUCCH/PUSCH configured. When a UE needs to transmit periodic or aperiodic SRS [23] and/or non-contention based PRACH on a PUSCH-less carrier of E-UTRA SCell, the UE can perform carrier based switching to one or more PUSCH-less carrier of E-UTRA SCells from a E-UTRA carrier with PUSCH or from another PUSCH-less E-UTRA carrier of SCell prior to transmitting SRS and/or PRACH, provided that:

- switching is from a configured E-UTRA carrier to another activated TDD E-UTRA carrier;
- the PUSCH-less carrier of E-UTRA SCells to which SRS carrier based switching is performed is indicated by DCI SRS request field for aperiodic SRS transmission or configured via RRC [15] for periodic SRS transmission;
- the E-UTRA serving cell, from which SRS carrier based switching is performed and whose UL transmission may therefore be interrupted, is indicated by srs-SwitchFromServCellIndex [15];
- the SRS switching is not colliding with any other transmission with higher priority defined in TS36.213 [26];
- the SRS switching is not colliding with PDCCH in subframe 0 and 5 as specified in TS36.213 [26];
- for UE, which does not support simultaneous reception and transmission for inter-band TDD CA specified in TS 36.331 [2], and is compliant to the requirements for inter-band CA with uplink in one E-UTRA band and without simultaneous Rx/Tx specified in TS 36.101 [25], the SRS or RACH transmission are not simultaneously scheduled with DL subframe #0 or DL subframe #5 on other E-UTRA carriers.

The UE shall not perform SRS carrier based switching if the above conditions cannot be met.

When SRS carrier based switching is performed between E-UTRA carriers, the UE is allowed interruptions on any active serving cell in SCG if UE is not capable of Per-FR gap, or on active serving cell(s) in SCG in FR1 if UE is capable of Per-FR gap, during the switching to the PUSCH-less carrier of a serving cell,

- with up to X3 slot as specified in Table 5.5.2.0.5-1.

When SRS carrier based switching is performed between E-UTRA carriers, the UE is allowed interruptions on any active serving cell in SCG if UE is not capable of Per-FR gap, or on active serving cell(s) in SCG in FR1 if UE is capable of Per-FR gap, during the switching from the PUSCH-less carrier of a serving cell,

- with up to X3 slot as specified in Table 5.5.2.0.5-1

Table 5.5.2.0.5-1: Interruption length X3 (slot)

μ	NR Slot length (ms)	Interruption length X3 (slots)
0	1	2
1	0.5	3
2	0.25	5
3	0.125	9

The normative reference for this requirement is TS 38.133 [6] clause 8.2.1.2.13.

5.5.2.1 EN-DC FR2 interruptions at transitions between active and non-active during DRX in synchronous EN-DC

Editor's Note: This test case has been completed for the following configurations:

- Test frequency f ≤ 40.8 GHz

- UE PC3

- The test is incomplete for UE power classes other than PC3

- The test is incomplete for test frequencies > 40.8 GHz

5.5.2.1.1 Test purpose

The purpose of this test is:

- To verify that when LTE PCell is in DRX and NR PSCell is in non-DRX, NR PSCell interruptions due to transitions from active to non-active and from non-active to active during LTE PCell DRX the UE missed ACK/NACK does not exceed the limits.

- To verify the missed ACK/NACK rate for NR PSCell in EN-DC.

5.5.2.1.2 Test applicability

This test applies to all types of E-UTRA UE release 15 and forward supporting EN-DC and long DRX cycle.

5.5.2.1.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 5.5.2.0.1.

The normative reference for this requirement is TS 38.133 [6] clause A.5.5.2.1.

5.5.2.1.4 Test description

5.5.2.1.4.1 Initial conditions

This test shall be tested using any of the test configurations in Table 5.5.2.1.4.1-1.

Table 5.5.2.1.4.1-1: Supported test configurations for EN-DC FR2 interruptions at transitions between active and non-active during DRX in synchronous EN-DC

Configuration	Description
5.5.2.1-1	LTE FDD, NR 120 kHz SSB SCS, 100MHz bandwidth, TDD duplex mode
5.5.2.1-2	LTE TDD, NR 120 kHz SSB SCS, 100MHz bandwidth, TDD duplex mode

Configure the test equipment and the DUT according to the parameters in Table 5.5.2.1.4.1-2.

Table 5.5.2.1.4.1-2: Initial conditions for EN-DC FR2 interruptions at transitions between active and non-active during DRX in synchronous EN-DC

Parameter	Value		Comment
Test environment	NC		As specified in TS 38.508-1 [14] clause 4.1.
Test frequencies	As specified in Annex E, table E.3-1 and TS 38.508-1 [14] clause 4.3.1 for E-UTRA and 7.2.3 for NR.		
Channel bandwidth	As specified by the test configuration selected from Table 5.5.2.1.4.1-1.		
Propagation conditions	AWGN		As specified in clause C.2.1.
Connection Diagram	TE Part	A.3.3.3.1-1	As specified in TS 38.508-1 [14] Annex A.
	DUT Part	A.3.4.1.1	
Exceptions to connection diagram	N/A		

1. The general test parameter settings are set up according to Table 5.5.2.1.4.1-3.
2. Message contents are defined in clause 5.5.2.1.4.3.
3. There are one E-UTRAN carrier and one NR carrier and two cells in the test. Cell 1 is PCell on the E-UTRAN carrier, Cell 2 is PSCell on the NR carrier, Cell 1 is the cell used for connection setup with the power levels set according to Table A.6.1.1-1 for this test. Cell 2 is configured according to clause C.1.1 and C.1.2.

Table 5.5.2.1.4.1-3: General test parameters for EN-DC FR2 interruptions at transitions between active and non-active during DRX in synchronous EN-DC

Parameter	Unit	Value	Comment
RF Channel Number		1, 2	One is E-UTRAN RF channel and the other is NR RF channel
Active PCell		Cell1	PCell on E-UTRAN RF channel number 1.
Configured PSCell		Cell2	PSCell on NR RF channel number 2.
CP length		Normal	Applicable to cell1 and cell 2
DRX		DRX.4	DRX related parameters are defined in TS 38.133 Table A.3.3.4-1

Measurement gap pattern Id		OFF	
T1	s	6.25	

5.5.2.1.4.2 Test procedure

The test consists of two cells: Cell1 and Cell2. Cell1 is LTE PCell and Cell2 is NR PSCell. The test consists of one time period, with duration of T1. During T1, NR PSCell is continuously scheduled in DL while LTE PCell is not scheduled and has DRX configured. Prior to the start of the time duration T1, the UE shall be fully synchronized to Cell1 and Cell2. Cell1 shall be configured as LTE PCell and Cell2 shall be configured as NR PSCell. Prior to start of T1 the DRX inactivity timer for the LTE PCell has already expired. During T1 the UE shall be continuously scheduled on NR PSCell while not scheduled on LTE PCell.

1. Ensure the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity *EN-DC*, DC bearer *MCG_and_SCG*, Connected without release *On* according to TS 38.508-1 [14] clause 4.5.

2. Configure MCG according to TS 36.521-3 [26] clause C.0, C.1 and SCG according to clause C.1.1 and C.1.2 for all downlink physical channels.

3. The SS shall transmit an *RRCConnectionReconfiguration* message to configure PCell (Cell1) and PSCell (Cell2) on the MCG and SCG as per TS 36.508 [7] clause 4.6 with the message content exceptions defined in clause 5.5.2.1.4.3.

4. The UE shall transmit *RRCConnectionReconfigurationComplete* message.

5. The SS would ensure continuous transmission on PSCell, while not scheduling on PCell at least for 200 ms to ensure inactivity timer is expired on the UE for LTE PCell.

6. Set the parameters according to T1 in Table 5.5.2.1.5-1. Propagation conditions are set according to clause C.2.1. T1 starts.

7. SS schedules on PSCell continuously and UE shall start sending ACK/NACK reports. The SS shall monitor ACK/NACK/DTX on PSCell.

8. If more than 99% of uplink transmissions are received by SS then count a success for the event “ACK/NACK”. Otherwise count a fail for the event “ACK/NACK”.

9. If no two consecutive missing PUCCH transmissions are observed by the SS, then count a success for the event “DTX”. Otherwise count a fail for the event “DTX”.

10. After the RRC connection release, the SS:

    - transmits in Cell 1 a Paging message (including PagingRecord with UE-Identity) for the UE and ensures the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity *EN-DC*, DC bearer *MCG_and_SCG*, Connected without release *On* according to TS 38.508-1 [14] clause 4.5. (if the paging fails, switches off and on the UE and ensures the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity *EN-DC*, DC bearer *MCG_and_SCG*, Connected without release *On* according to TS 38.508-1 [14] clause 4.5),

    or

    - switches off and on the UE and ensures the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity *EN-DC*, DC bearer *MCG_and_SCG*, Connected without release *On* according to TS 38.508-1 [14] clause 4.5.

11. Repeat step 3-10 until a test verdict has been achieved

Each of the events "ACK/NACK" and "DTX" is evaluated independently for the statistic, resulting in an event verdict: pass or fail. Each event is evaluated only until the confidence level according to Table G.2.3-1 in Annex G.2 is achieved. Different events may require different times for a verdict. If all events pass, the test passes. If one event fails, the test fails.

5.5.2.1.4.3 Message contents

Message contents are according to TS 38.508-1 [14] clause 7.3 with the following exceptions:

Table 5.5.2.1.4.3-1: Common Exception messages

Default Message Contents	
Common contents of system information blocks exceptions	
Default RRC messages and information elements contents exceptions	Table H.3.7-2 with Condition DRX.4

5.5.2.1.5 Test requirement

Table 5.5.2.1.4.1-1, 5.5.2.1.5-1 and 5.5.2.1.5-2 define the NR cell specific primary level settings including test tolerances for EN-DC FR2 interruptions at transitions between active and non-active during DRX in synchronous EN-DC test.

Table 5.5.2.1.5-1: NR cell specific test parameters for EN-DC FR2 interruptions at transitions between active and non-active during DRX in synchronous EN-DC

Parameter		Unit	Cell 2
Frequency Range			FR2
Duplex mode	Config 1,2		TDD
TDD configuration	Config 1,2		TDDConf.3.1
$BW_{channel}$	Config 1,2	MHz	100: $N_{RB,c}$ = 66
Data RBs allocated	Config 1,2		66
Initial DL BWP Configuration	Config 1,2		DLBWP.0.1
Downlink dedicated BWP Configuration	Config 1,2		DLBWP.1.1
Uplink initial BWP configuration	Config 1,2		ULBWP.0.1
Uplink dedicated BWP configuration	Config 1,2		ULBWP.1.1
TRS configuration	Config 1,2		TRS.2.1 TDD
TCI state	Config 1,2		TCI.State.0
PDSCH Reference measurement channel	Config 1,2		SR.3.1 TDD
RMSI CORESET parameters	Config 1,2		CR.3.1 TDD
PDCCH CORESET parameters	Config 1,2		CCR.3.1 TDD
OCNG Patterns			OP.1
SSB Configuration			SSB.3 FR2
SMTC Configuration	Config 1,2		SMTC.1
EPRE ratio of PSS to SSS		dB	0
EPRE ratio of PBCH DMRS to SSS			
EPRE ratio of PBCH to PBCH DMRS			
EPRE ratio of PDCCH DMRS to SSS			
EPRE ratio of PDCCH to PDCCH DMRS			
EPRE ratio of PDSCH DMRS to SSS			
EPRE ratio of PDSCH to PDSCH			
EPRE ratio of OCNG DMRS to SSS(Note 1)			
EPRE ratio of OCNG to OCNG DMRS (Note 1)			
$\hat{E}_s/N_{oc}$		dB	17
Propagation Condition			AWGN
Time offset to cell1 Note 2		μs	3

NOTE 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.
NOTE 2: Receive time difference of signals received between subframe timing boundary of E-UTRA PCell and slot timing boundary of PSCell including time alignment error between the two cells

Table 5.5.2.1.5-2: NR cell specific OTA related test parameters for EN-DC FR2 interruptions at transitions between active and non-active during DRX in synchronous EN-DC

Parameter	Unit	Cell2
Angle of arrival configuration		Setup 1 according to clause A.9.1
Assumption for UE beams Note 6		Fine

N_{oc} Note1	dBm/15kHz Note4	-112
N_{oc} Note1	dBm/SCS Note3	-102.97
$\hat{E}_s / N_{oc}$	dB	17
SSB_RP Note2	dBm/SCS Note4	-85.97
$\hat{E}_s / I_{ot}$	dB	17
Io Note2	dBm/95.04 MHz Note4	-56.90
NOTE 1: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for N_{oc} to be fulfilled.		
NOTE 2: SSB_RP and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.		
NOTE 3: SS-RSRP minimum requirements are specified assuming independent interference and noise at each receiver antenna port.		
NOTE 4: Equivalent power received by an antenna with 0dBi gain at the centre of the quiet zone		
NOTE 5: As observed with 0dBi gain antenna at the centre of the quiet zone		
NOTE 6: Information about types of UE beam is given in B.2.1.3 of TS 38.133[6], and does not limit UE implementation or test system implementation		

The UE shall be continuously scheduled in NR PSCell during the entire length of T1. UE shall not be scheduled in LTE PCell during T1. During the time duration T1 the UE shall transmit at least 99% of ACK/NACK on NR PSCell.

Interruption on NR PSCell shall not exceed 0.625ms (5 slots) as defined in clause TS 38.133 clause 8.2.1.

The rate of correct events observed during repeated tests shall be at least 90%.

5.5.2.2 EN-DC FR2 interruptions at transitions between active and non-active during DRX in asynchronous EN-DC

Editor's Note: This test case has been completed for the following configurations:

- Test frequency f ≤ 40.8 GHz

- UE PC3

- The test is incomplete for UE power classes other than PC3

- The test is incomplete for test frequencies > 40.8 GHz

5.5.2.2.1 Test purpose

The purpose of this test is:

- To verify that when LTE PCell is in DRX and NR PSCell is in non-DRX, NR PSCell interruptions due to transitions from active to non-active and from non-active to active during LTE PCell DRX the UE missed ACK/NACK does not exceed the limits.

- To verify the missed ACK/NACK rate for NR PSCell in EN-DC.

5.5.2.2.2 Test applicability

This test applies to all types of E-UTRA UE release 15 and forward supporting EN-DC and long DRX cycle.

5.5.2.2.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 5.5.2.0.1.

The normative reference for this requirement is TS 38.133 [6] clause A.5.5.2.2.

5.5.2.2.4 Test description

5.5.2.2.4.1 Initial conditions

This test shall be run in one of the configurations defined in Table 5.5.2.2.4.1-1.

Table 5.5.2.2.4.1-1: Supported test configurations for EN-DC FR2 interruptions at transitions between active and non-active during DRX in asynchronous EN-DC

Configuration	Description
5.5.2.2-1	LTE FDD, NR 120 kHz SSB SCS, 100MHz bandwidth, TDD duplex mode
5.5.2.2-2	LTE TDD, NR 120 kHz SSB SCS, 100MHz bandwidth, TDD duplex mode

Configure the test equipment and the DUT according to the parameters in Table 5.5.2.2.4.1-2.

Table 5.5.2.2.4.1-2: Initial conditions for EN-DC FR2 interruptions at transitions between active and non-active during DRX in asynchronous EN-DC

Parameter	Value		Comment
Test environment	NC		As specified in TS 38.508-1 [14] clause 4.1.
Test frequencies	As specified in Annex E, Table E.3-1 and TS 38.508-1 [14] clause 4.3.1 for E-UTRA and 7.2.3 for NR.		
Channel bandwidth	As specified by the test configuration selected from Table 5.5.2.2.4.1-1.		
Propagation conditions	AWGN		As specified in clause C.2.1.
Connection Diagram	TE Part	A.3.3.3.1-1	As specified in TS 38.508-1 [14] Annex A.
	DUT Part	A.3.4.1.1	
Exceptions to connection diagram	N/A		

1. The general test parameter settings are set up according to Table 5.5.2.2.4.1-3.
2. Message contents are defined in clause 5.5.2.2.4.3.
3. There are one E-UTRAN carrier and one NR carrier and two cells in the test. Cell 1 is PCell on the E-UTRAN carrier, Cell 2 is PSCell on the NR carrier, Cell 1 is the cell used for connection setup with the power levels set according to Table A.6.1.1-1 for this test. Cell 2 is configured according to clause C.1.1 and C.1.2.

Table 5.5.2.2.4.1-3: General test parameters for EN-DC FR2 interruptions at transitions between active and non-active during DRX in asynchronous EN-DC

Parameter	Unit	Value	Comment
RF Channel Number		1, 2	One is E-UTRAN RF channel and the other is NR RF channel
Active PCell		Cell1	PCell on E-UTRAN RF channel number 1.
Configured PSCell		Cell2	PSCell on NR RF channel number 2.
CP length		Normal	Applicable to cell1 and cell 2
DRX		DRX.4	DRX related parameters are defined in TS 38.133 Table A.3.3.4-1
Measurement gap pattern Id		OFF	
T1	s	6.25	

5.5.2.2.4.2 Test procedure

The test consists of two cells: Cell1 and Cell2. Cell1 is LTE PCell and Cell2 is NR PSCell. The test consists of one time period, with duration of T1. During T1, NR PSCell is continuously scheduled in DL while LTE PCell is not scheduled and has DRX configured. Prior to the start of the time duration T1, the UE shall be fully synchronized to Cell1 and Cell2. Cell1 shall be configured as LTE PCell and Cell2 shall be configured as NR PSCell. Prior to start of T1 the DRX inactivity timer for the LTE PCell has already expired. During T1 the UE shall be continuously scheduled on NR PSCell while not scheduled on LTE PCell.

1. Ensure the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity *EN-DC*, DC bearer *MCG_and_SCG*, Connected without release *On* according to TS 38.508-1 [14] clause 4.5.

2. Configure MCG according to TS 36.521-3 [26] clause C.0, C.1 and SCG according to clause C.1.1 and C.1.2 for all downlink physical channels.

3. The SS shall transmit an *RRCConnectionReconfiguration* message to configure PCell (Cell1) and PSCell (Cell2) on the MCG and SCG as per TS 36.508 [7] clause 4.6 with the message content exceptions defined in clause 5.5.2.2.4.3.

4. The UE shall transmit *RRCConnectionReconfigurationComplete* message.

5. The SS would ensure continuous transmission on PSCell, while not scheduling on PCell at least for 200 ms to ensure inactivity timer is expired on the UE for LTE PCell.

6. Set the parameters according to T1 in Table 5.5.2.2.5-1. Propagation conditions are set according to clause C.2.1. T1 starts.

7. SS schedules on PSCell continuously and UE shall start sending ACK/NACK reports. The SS shall monitor ACK/NACK/DTX on PSCell.

8. If more than 99% of uplink transmissions are received by SS then count a success for the event “ACK/NACK”. Otherwise count a fail for the event “ACK/NACK”.

9. If no two consecutive missing PUCCH transmissions are observed by the SS, then count a success for the event “DTX”. Otherwise count a fail for the event “DTX”.

10. After the RRC connection release, the SS:

    - transmits in Cell 1 a Paging message (including PagingRecord with UE-Identity) for the UE and ensures the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity *EN-DC*, DC bearer *MCG_and_SCG*, Connected without release *On* according to TS 38.508-1 [14] clause 4.5. (if the paging fails, switches off and on the UE and ensures the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity *EN-DC*, DC bearer *MCG_and_SCG*, Connected without release *On* according to TS 38.508-1 [14] clause 4.5),

    or

    - switches off and on the UE and ensures the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity *EN-DC*, DC bearer *MCG_and_SCG*, Connected without release *On* according to TS 38.508-1 [14] clause 4.5.

11. Repeat step 3-10 until a test verdict has been achieved

Each of the events "ACK/NACK" and "DTX" is evaluated independently for the statistic, resulting in an event verdict: pass or fail. Each event is evaluated only until the confidence level according to Table G.2.3-1 in Annex G.2 is achieved. Different events may require different times for a verdict. If all events pass, the test passes. If one event fails, the test fails.

5.5.2.2.4.3 Message contents

Message contents are according to TS 38.508-1 [14] clause 7.3 with the following exceptions:

Table 5.5.2.2.4.3-1: Common Exception messages

Default Message Contents	
Common contents of system information blocks exceptions	
Default RRC messages and information elements contents exceptions	Table H.3.7-2 with Condition DRX.4

5.5.2.2.5 Test requirement

Table 5.5.2.2.4.1-1, 5.5.2.2.5-1 and 5.5.2.2.5-2 define the NR cell specific primary level settings including test tolerances for EN-DC FR2 interruptions at transitions between active and non-active during DRX in asynchronous EN-DC test.

Table 5.5.2.2.5-1: NR cell specific test parameters for EN-DC FR2 interruptions at transitions between active and non-active during DRX in asynchronous EN-DC

Parameter		Unit	Cell 2
Frequency Range			FR2
Duplex mode	Config 1,2		TDD
TDD configuration	Config 1,2		TDDConf.3.1
$BW_{channel}$	Config 1,2	MHz	100: $N_{RB,c}$ = 66
Data RBs allocated	Config 1,2		66
Initial DL BWP Configuration	Config 1,2		DLBWP.0.1
Dedicated DL BWP Configuration	Config 1,2		DLBWP.1.1
Initial UL BWP configuration	Config 1,2		ULBWP.0.1
Dedicated UL BWP configuration	Config 1,2		ULBWP.1.1
TRS configuration	Config 1,2		TRS.2.1 TDD
TCI state	Config 1,2		TCI.State.0
PDSCH Reference measurement channel	Config 1,2		SR.3.1 TDD
RMSI CORESET parameters	Config 1,2		CR.3.1 TDD
PDCCH CORESET parameters	Config 1,2		CCR.3.1 TDD
OCNG Patterns			OP.1
SSB Configuration			SSB.3 FR2
SMTC Configuration	Config 1,2		SMTC.1
EPRE ratio of PSS to SSS		dB	0
EPRE ratio of PBCH DMRS to SSS			
EPRE ratio of PBCH to PBCH DMRS			
EPRE ratio of PDCCH DMRS to SSS			
EPRE ratio of PDCCH to PDCCH DMRS			
EPRE ratio of PDSCH DMRS to SSS			
EPRE ratio of PDSCH to PDSCH			
EPRE ratio of OCNG DMRS to SSS(Note 1)			
EPRE ratio of OCNG to OCNG DMRS (Note 1)			
$\hat{E}_s/N_{oc}$		dB	17
Propagation Condition			AWGN
Time offset to cell1 Note 2		µs	62.5

NOTE 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.
NOTE 2: Receive time difference of signals received between subframe timing boundary of E-UTRA PCell and slot timing boundary of PSCell including time alignment error between the two cells

Table 5.5.2.2.5-2: NR cell specific OTA related test parameters for EN-DC FR2 interruptions at transitions between active and non-active during DRX in asynchronous EN-DC

Parameter	Unit	Cell2
Angle of arrival configuration		Setup 1 according to clause A.9.1
Assumption for UE beams Note 6		Fine
N_{oc} Note1	dBm/15kHz Note4	-112
N_{oc} Note1	dBm/SCS Note3	-102.97
$\hat{E}_s/N_{oc}$	dB	17
SSB_RP Note2	dBm/SCS Note4	-85.97

$\hat{E}_s/I_{ot}$	dB	17
Io Note2	dBm/95.04 MHz Note4	-56.90
NOTE 1: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for N_{oc} to be fulfilled.		
NOTE 2: SSB_RP and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.		
NOTE 3: SS-RSRP minimum requirements are specified assuming independent interference and noise at each receiver antenna port.		
NOTE 4: Equivalent power received by an antenna with 0dBi gain at the centre of the quiet zone		
NOTE 5: As observed with 0dBi gain antenna at the centre of the quiet zone		
NOTE 6: Information about types of UE beam is given in B.2.1.3 of TS 38.133[6], and does not limit UE implementation or test system implementation		

The UE shall be continuously scheduled in NR PSCell during the entire length of T1. UE shall not be scheduled in LTE PCell during T1. During the time duration T1 the UE shall transmit at least 99% of ACK/NACK on NR PSCell.

Interruption on NR PSCell shall not exceed 0.625ms (5 slots) as defined in TS 38.133 clause 8.2.1.

The rate of correct events observed during repeated tests shall be at least 90%.

5.5.2.3 EN-DC FR2 interruptions during measurements on deactivated NR SCC in synchronous EN-DC

Editor's Note: This test case has been completed for the following configurations:

- Test frequency f ≤ 40.8 GHz

- UE PC3

- The test is incomplete for UE power classes other than PC3

- The test is incomplete for test frequencies > 40.8 GHz

5.5.2.3.1 Test purpose

The purpose of this test is:

- To verify NR PSCell interruptions during the measurement on the deactivated NR SCC, the UE missed ACK/NACK does not exceed the limits.

- To verify the missed ACK/NACK rate for NR PSCell in EN-DC.

5.5.2.3.2 Test applicability

This test applies to all types of E-UTRA UE release 15 and forward supporting EN-DC. and 2 DL CA

5.5.2.3.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 5.5.2.0.2.

The normative reference for this requirement is TS 38.133 [6] clause A.5.5.2.3.

5.5.2.3.4 Test description

5.5.2.3.4.1 Initial conditions

This test shall be run in one of the configurations defined in Table 5.5.2.3.4.1-1.

Table 5.5.2.3.4.1-1: Supported test configurations for EN-DC FR2 interruptions during measurements on deactivated NR SCC in synchronous EN-DC

Configuration	Description
5.5.2.3-1	LTE FDD, NR 120 kHz SSB SCS, 100MHz bandwidth, TDD duplex mode
5.5.2.3-2	LTE TDD, NR 120 kHz SSB SCS, 100MHz bandwidth, TDD duplex mode
NOTE 1: The UE is only required to be tested in one of the supported test configurations	

Configure the test equipment and the DUT according to the parameters in Table 5.5.2.3.4.1-2.

Table 5.5.2.3.4.1-2: Initial conditions for EN-DC FR2 interruptions during measurements on deactivated NR SCC in synchronous EN-DC

Parameter	Value		Comment
Test environment	NC		As specified in TS 38.508-1 [14] clause 4.1.
Test frequencies	As specified in Annex E, table E.3-1 and TS 38.508-1 [14] clause 4.3.1 for E-UTRA and 7.2.3 for NR.		
Channel bandwidth	As specified by the test configuration selected from Table 5.5.2.3.4.1-1.		
Propagation conditions	AWGN		As specified in clause C.2.1.
Connection Diagram	TE Part	A.3.3.3.1	As specified in TS 38.508-1 [14] Annex A.
	DUT Part	A.3.4.1.1	
Exceptions to connection diagram	N/A		

1. The general test parameter settings are set up according to Table 5.5.2.3.4.1-3.
2. Message contents are defined in clause 5.5.2.3.4.3.
3. There are three cells (one E-UTRAN carrier and two NR carriers) specified in the test. Cell 1 is the PCell on E-UTRAN carrier, Cell 2 is the PSCell on one NR carrier and Cell 3 is the SCell on the other NR carrier. Cell 1 is the cell used for connection setup with the power level set according to Table A.6.1.1-1. Cell 2 and Cell 3 shall be configured according to clause C.1.1 and C.1.2.

Table 5.5.2.3.4.1-3: General test parameters for EN-DC FR2 interruptions during measurements on deactivated NR SCC in synchronous EN-DC

Parameter	Unit	Value	Comment
RF Channel Number		1, 2, 3	One is E-UTRAN RF channel and the other two are NR RF channel
Active PCell		Cell1	PCell on E-UTRAN RF channel number 1.
Configured PSCell		Cell2	PSCell on NR RF channel number 2.
Configured deactivated SCell		Cell3	Deactivated SCell on NR RF channel number 3.
CP length		Normal	Applicable to cell1, cell 2 and cell3
DRX		OFF	
Measurement gap pattern Id		OFF	
SCell measurement cycle (measCycleSCell)	ms	640	
T1	s	10	

5.5.2.3.4.2 Test procedure

The test consists of three cells: Cell1, Cell2 and Cell3. Cell1 is E-UTRAN PCell, Cell2 is NR PSCell and Cell3 is deactivated NR SCell. The test consists of one time period, with duration of T1. Prior to the start of the time duration T1, the UE shall be connected and fully synchronized to Cell1, Cell2 and Cell3. The point in time at which the RRC message including *measCycleSCell* for the deactivated NR SCell is received by the UE, defines the start of time period T1. During T1 the UE shall be continuously scheduled on E-UTRAN PCell DL and NR PSCell DL.

Unless otherwise stated, the downlink signal and noise are aligned to arrive in the UE Rx beam peak direction.

1. Ensure the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity *EN-DC*, DC bearer *MCG_and_SCG*, Connected without release *On* according to TS 38.508-1 [14] clause 4.5. Message contents are defined in clause 5.5.2.3.4.3.
2. Configure MCG according to TS 36.521-3 [26] clause C.0, C.1 and SCG according to clause C.1.1 and C.1.2 for all downlink physical channels. Set the parameters according to values in Table 5.5.2.3.4.1-3 as appropriate.
3. The SS shall transmit an *RRCReconfiguration* message including *measCycleSCell* for the deactivated NR SCell.
4. The UE shall transmit *RRCReconfigurationComplete* message.
5. Set the parameters according to T1 in Table 5.5.2.3.5-1 and Table 5.5.2.3.5-2. Propagation conditions are set according to clause C.2.2.
6. SS schedules on PSCell continuously and UE shall start sending ACK/NACK reports. T1 starts. During T1, the SS shall monitor ACK/NACK/DTX on PSCell.
7. If more than 99.5% of uplink transmissions are received by SS then count a success for the event “ACK/NACK”. Otherwise count a fail for the event “ACK/NACK”.
8. If no longer than X consecutive DTXs are observed by the SS, then count a success for the event “DTX”. Otherwise count a fail for the event “DTX”, where,

   - X = 6 if the NR PSCell is not in the same band as the deactivated SCell, otherwise X = 16.

9. After T1 expires, the SS shall transmit an RRC connection release. Afterwards, the SS shall:

   9a. transmit in Cell 1 a Paging message (including PagingRecord with UE-Identity) for the UE and go back to step 1 to prepare for the next iteration. If the paging fails, proceed as per step 9b

   or

   9b. switch off and on the UE and go back to step 1 to prepare for the next iteration.

10. Repeat steps 1-9 until a test verdict has been achieved.

Each of the events "ACK/NACK" and "DTX" is evaluated independently for the statistic, resulting in an event verdict: pass or fail. Each event is evaluated only until the confidence level according to Table G.2.3-1 in Annex G.2 is achieved. Different events may require different times for a verdict.

If all events pass, the test passes. If one event fails, the test fails.

5.5.2.3.4.3 Message contents

Message contents are according to TS 38.508-1 [14] clause 4.6 with the following exceptions:

Table 5.5.2.3.4.3-1: Common Exception messages

Default Message Contents	
Common contents of system information blocks exceptions	
Specific message contents exceptions for Test Configuration 5.5.2.3-1 and 5.5.2.3-2	Table 7.3.1-3a in TS 38.508-1 [14] with condition SSB.1 FR2

Default RRC messages and information elements contents exceptions	Table H.3.1-1; Table H.3.1-2 with Condition Deactivated SCell; Table H.3.1-3 with Condition Deactivated SCell, SSB.1 FR2 and SMTC.1; Table H.3.1-4 with A3-offset = -6dB; Table H.3.1-7 with Condition Deactivated SCell;

5.5.2.3.5 Test requirement

Table 5.5.2.3.5-1 and Table 5.5.2.3.5-2 define the primary level settings including test tolerances for FR2 interruptions during measurements on deactivated NR SCC in synchronous EN-DC test configurations.

Table 5.5.2.3.5-1: NR cell specific test parameters for EN-DC FR2 interruptions during measurements on deactivated NR SCC in synchronous EN-DC

Parameter		Unit	Cell 2	Cell 3
Frequency Range			FR2	FR2
Duplex mode	Config 1,2		TDD	TDD
TDD configuration	Config 1,2		TDDConf.3.1	TDDConf.3.1
$BW_{channel}$	Config 1,2	MHz	100: $N_{RB,c}$ = 66	100: $N_{RB,c}$ = 66
Data RBs allocated	Config 1,2		66	66
Downlink initial BWP Configuration	Config 1,2		DLBWP.0.1	DLBWP.0.1
Downlink dedicated BWP Configuration	Config 1,2		DLBWP.1.1	DLBWP.1.1
Uplink initial BWP configuration	Config 1,2		ULBWP.0.1	ULBWP.0.1
Uplink dedicated BWP configuration	Config 1,2		ULBWP.1.1	ULBWP.1.1
PDSCH Reference measurement channel	Config 1,2		SR.3.1 TDD	-
RMSI CORESET Reference Channel	Config 1,2		CR.3.1 TDD	CR.3.1 TDD
PDCCH CORESET parameters	Config 1,2		CCR 3.1 TDD	CCR 3.1 TDD
OCNG Patterns			OP.1	OP.1
SSB Configuration	Config 1,2		SSB.1 FR2	SSB.1 FR2
SMTC Configuration	Config 1,2		SMTC.1	SMTC.1
TRS configuration	Config 1,2		TRS.2.1 TDD	TRS.2.1 TDD
TCI state	Config 1,2		TCI.State.0	TCI.State.0
EPRE ratio of PSS to SSS		dB	0	0
EPRE ratio of PBCH DMRS to SSS				
EPRE ratio of PBCH to PBCH DMRS				
EPRE ratio of PDCCH DMRS to SSS				
EPRE ratio of PDCCH to PDCCH DMRS				
EPRE ratio of PDSCH DMRS to SSS				
EPRE ratio of PDSCH to PDSCH				
EPRE ratio of OCNG DMRS to SSS(Note 1)				
EPRE ratio of OCNG to OCNG DMRS (Note 1)				
Propagation Condition			AWGN	AWGN
Time offset to cell1 Note 2		µs	3	3+ Time offset to cell2
Time offset to cell2 Note 3		µs	-	3

Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.
Note 2: Receive time difference of signals received between subframe timing boundary of E-UTRA PCell and slot timing boundary of PSCell including time alignment error between the two cells
Note 3: Receive time difference of signals received between slot timing boundary from two NR Cells including time alignment error between the two cells

Table 5.5.2.3.5-2: NR cell specific OTA related test parameters for EN-DC FR2 interruptions during measurements on deactivated NR SCC in synchronous EN-DC

Parameter	Unit	Cell 2	Cell 3

Angle of arrival configuration			Setup 1 defined in clause A.9	
Assumption for UE beams[Note 6]			Fine	Rough
N_{oc} Note1	NR_TDD_FR2_A	dBm/15kHz	-111.7	-104.7
	NR_TDD_FR2_B			
	NR_TDD_FR2_F			
	NR_TDD_FR2_G			
	NR_TDD_FR2_T			
	NR_TDD_FR2_Y			
N_{oc} Note1	NR_TDD_FR2_A	dBm/SCS[Note3]	-102.7	-95.7
	NR_TDD_FR2_B			
	NR_TDD_FR2_F			
	NR_TDD_FR2_G			
	NR_TDD_FR2_T			
	NR_TDD_FR2_Y			
SSB_RP[Note2]	NR_TDD_FR2_A	dBm/SCS [Note4]	-90.7	-90.7
	NR_TDD_FR2_B			
	NR_TDD_FR2_F			
	NR_TDD_FR2_G			
	NR_TDD_FR2_T			
	NR_TDD_FR2_Y			
$\hat{E}_s/I_{ot}$	NR_TDD_FR2_A	dB	12	5
	NR_TDD_FR2_B			
	NR_TDD_FR2_F			
	NR_TDD_FR2_G			
	NR_TDD_FR2_T			
	NR_TDD_FR2_Y			
$\hat{E}_s/N_{oc}$	NR_TDD_FR2_A	dB	12	5
	NR_TDD_FR2_B			
	NR_TDD_FR2_F			
	NR_TDD_FR2_G			
	NR_TDD_FR2_T			
	NR_TDD_FR2_Y			
Io[Note2]	NR_TDD_FR2_A	dBm/95.04 MHz Note4	-61.45	-60.52
	NR_TDD_FR2_B			
	NR_TDD_FR2_F			
	NR_TDD_FR2_G			
	NR_TDD_FR2_T			
	NR_TDD_FR2_Y			

Note 1: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for N_{oc} to be fulfilled.

Note 2: SSB_RP and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.

Note 3: SS-RSRP minimum requirements are specified assuming independent interference and noise at each receiver antenna port.

Note 4: Equivalent power received by an antenna with 0dBi gain at the centre of the quiet zone

Note 5: As observed with 0dBi gain antenna at the centre of the quiet zone

Note 6: Information about types of UE beam is given in 38.133 [6] clause B.2.1.3, and does not limit UE implementation or test system implementation

The UE shall be continuously scheduled in LTE PCell and NR PSCell during the entire length of T1. During the time duration T1 the UE shall transmit at least 99.5% of ACK/NACK on NR PSCell.

If the NR PSCell is not in the same band as the deactivated SCell, the UE is only allowed to cause interruptions immediately before and immediately after an SMTC. Each interruption on NR PSCell shall not exceed the value defined in Table 5.5.2.3.5-3.

If the NR PSCell is in the same band as the deactivated SCell, the UE is only allowed to cause an interruption on NR PSCell no earlier than 4 slots before an SMTC and no later than 4 slots after the SMTC. The interruption on NR PSCell shall not exceed the value defined in Table 5.5.2.3.5-4.

Table 5.5.2.3.5-3: Interruption duration if the NR PSCell is not in the same band as the deactivated SCell

μ	NR Slot length (ms)	Interruption length (slot)
3	0.125	4

Table 5.5.2.3.5-4: Interruption duration if the NR PSCell is in the same band as the deactivated SCell

μ	NR Slot length (ms)	Interruption length (slot)
3	0.125	8 + SMTC duration

The rate of correct events observed during repeated tests shall be at least 90%.

5.5.2.4 EN-DC FR2 interruptions during measurements on deactivated NR SCC in asynchronous EN-DC

Editor's Note: This test case has been completed for the following configurations:

- Test frequency f ≤ 40.8 GHz

- UE PC3

- The test is incomplete for UE power classes other than PC3

- The test is incomplete for test frequencies > 40.8 GHz

5.5.2.4.1 Test purpose

The purpose of this test is:

- To verify NR PSCell interruptions during the measurement on the deactivated NR SCC, the UE missed ACK/NACK does not exceed the limits.

- To verify the missed ACK/NACK rate for NR PSCell in EN-DC.

5.5.2.4.2 Test applicability

This test applies to all types of E-UTRA UE release 15 and forward supporting EN-DC and 2 DL CA.

5.5.2.4.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 5.5.2.0.2.

The normative reference for this requirement is TS 38.133 [6] clause A.5.5.2.4.

5.5.2.4.4 Test description

5.5.2.4.4.1 Initial conditions

This test shall be tested using any of the test configurations in Table 5.5.2.4.4.1-1.

Table 5.5.2.4.4.1-1: Supported test configurations for EN-DC FR2 interruptions during measurements on deactivated NR SCC in asynchronous EN-DC

Configuration	Description
5.5.2.4-1	LTE FDD, NR 120 kHz SSB SCS, 100MHz bandwidth, TDD duplex mode
5.5.2.4-2	LTE TDD, NR 120 kHz SSB SCS, 100MHz bandwidth, TDD duplex mode
NOTE 1: The UE is only required to be tested in one of the supported test configurations	

Configure the test equipment and the DUT according to the parameters in Table 5.5.2.4.4.1-2.

Table 5.5.2.4.4.1-2: Initial conditions for EN-DC FR2 interruptions during measurements on deactivated NR SCC in asynchronous EN-DC

Parameter	Value		Comment
Test environment	NC		As specified in TS 38.508-1 [14] clause 4.1.
Test frequencies	As specified in Annex E, table E.3-1 and TS 38.508-1 [14] clause 4.3.1 for E-UTRA and 7.2.3 for NR.		
Channel bandwidth	As specified by the test configuration selected from Table 5.5.2.4.4.1-1.		
Propagation conditions	AWGN		As specified in clause C.2.1.
Connection Diagram	TE Part	A.3.3.3.1	As specified in TS 38.508-1 [14] Annex A.
	DUT Part	A.3.4.1.1	
Exceptions to connection diagram	N/A		

1. The general test parameter settings are set up according to Table 5.5.2.4.4.1-3.
2. Message contents are defined in clause 5.5.2.4.4.3.
3. There are three cells (one E-UTRAN carrier and two NR carriers) specified in the test. Cell 1 is the PCell on E-UTRAN carrier, Cell 2 is the PSCell on one NR carrier and Cell 3 is the SCell on the other NR carrier. Cell 1 is the cell used for connection setup with the power level set according to Table A.6.1.1-1. Cell 2 and Cell 3 shall be configured according to clause C.1.1 and C.1.2.

Table 5.5.2.4.4.1-3: General test parameters for EN-DC FR2 interruptions during measurements on deactivated NR SCC in asynchronous EN-DC

Parameter	Unit	Value	Comment
RF Channel Number		1, 2, 3	One is E-UTRAN RF channel and the other two are NR RF channel
Active PCell		Cell1	PCell on E-UTRAN RF channel number 1.
Configured PSCell		Cell2	PSCell on NR RF channel number 2.
Configured deactivated SCell		Cell3	Deactivated SCell on NR RF channel number 3.
CP length		Normal	Applicable to cell1, cell 2 and cell3
AoA number		1	Applicable to cell2 and cell3
DRX		OFF	
Measurement gap pattern Id		OFF	
SCell measurement cycle (measCycleSCell)	ms	640	
T1	s	10	

5.5.2.4.4.2 Test procedure

The test consists of three cells: Cell1, Cell2 and Cell3. Cell1 is E-UTRAN PCell, Cell2 is NR PSCell and Cell3 is deactivated NR SCell. The test consists of one time period, with duration of T1. Prior to the start of the time duration T1, the UE shall be connected and fully synchronized to Cell1, Cell2 and Cell3. The point in time at which the RRC message including *measCycleSCell* for the deactivated NR SCell is received by the UE, defines the start of time period T1. During T1 the UE shall be continuously scheduled on E-UTRAN PCell DL and NR PSCell DL.

1. Ensure the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity *EN-DC*, DC bearer *MCG_and_SCG*, Connected without release *On* according to TS 38.508-1 [14] clause 4.5. Message contents are defined in clause 5.5.2.4.4.3.
2. Configure MCG according to TS 36.521-3 [26] clause C.0, C.1 and SCG according to clause C.1.1 and C.1.2 for all downlink physical channels. Set the parameters according to values in Table 5.5.2.3.4.1-3 as appropriate.
3. The SS shall transmit an *RRCReconfiguration* message including *measCycleSCell* for the deactivated NR SCell.
4. The UE shall transmit *RRCReconfigurationComplete* message.

5. Set the parameters according to T1 in Table 5.5.2.4.5-1 and Table 5.5.2.4.5-2. Propagation conditions are set according to clause C.2.2.

6. SS schedules on PSCell continuously and UE shall start sending ACK/NACK reports. T1 starts. During T1, the SS shall monitor ACK/NACK/DTX on PSCell.

7. If more than 99.5% of uplink transmissions are received by SS then count a success for the event "ACK/NACK". Otherwise count a fail for the event "ACK/NACK".

8. If no longer than X consecutive DTX is observed by the SS, then count a success for the event "DTX". Otherwise count a fail for the event "DTX", where,

   - X = 6 if the NR PSCell is not in the same band as the deactivated SCell, otherwise X = 16.

9. After T1 expires, the SS shall transmit an RRC connection release. Afterwards, the SS shall:

   9a. transmit in Cell 1 a Paging message (including PagingRecord with UE-Identity) for the UE and go back to step 1 to prepare for the next iteration. If the paging fails, proceed as per step 9b

   or

   9b. switch off and on the UE and go back to step 1 to prepare for the next iteration.

10. Repeat steps 1-9 until a test verdict has been achieved.

Each of the events "ACK/NACK" and "DTX" is evaluated independently for the statistic, resulting in an event verdict: pass or fail. Each event is evaluated only until the confidence level according to Table G.2.3-1 in Annex G.2 is achieved. Different events may require different times for a verdict.

If all events pass, the test passes. If one event fails, the test fails.

5.5.2.4.4.3 Message contents

Message contents are according to TS 38.508-1 [14] clause 4.6 with the following exceptions:

Table 5.5.2.4.4.3-1: Common Exception messages

Default Message Contents	
Common contents of system information blocks exceptions	
Specific message contents exceptions for Test Configuration 5.5.2.4-1 and 5.5.2.4-2	Table 7.3.1-3a in TS 38.508-1 [14] with condition SSB.1 FR2
Default RRC messages and information elements contents exceptions	Table H.3.1-1; Table H.3.1-2 with Condition Deactivated SCell; Table H.3.1-3 with Condition Deactivated SCell, SSB.1 FR2 and SMTC.1; Table H.3.1-4 with A3-offset = -6dB; Table H.3.1-7 with Condition Deactivated SCell;

5.5.2.4.5 Test requirement

Table 5.5.2.4.5-1 and Table 5.5.2.4.5-2 define the primary level settings including test tolerances for FR2 interruptions during measurements on deactivated NR SCC in asynchronous EN-DC test configurations.

Table 5.5.2.4.5-1: NR cell specific test parameters for EN-DC FR2 interruptions during measurements on deactivated NR SCC in asynchronous EN-DC

Parameter		Unit	Cell 2	Cell 3
Frequency Range			FR2	FR2
Duplex mode	Config 1,2		TDD	TDD
TDD configuration	Config 1,2		TDDConf.3.1	TDDConf.3.1
$BW_{channel}$	Config 1,2	MHz	100: $N_{RB,c}$ = 66	100: $N_{RB,c}$ = 66
Data RBs allocated	Config 1,2		66	66
Downlink initial BWP Configuration	Config 1,2		DLBWP.0.1	

Downlink dedicated BWP Configuration	Config 1,2		DLBWP.1.1	
Uplink initial BWP configuration	Config 1,2		ULBWP.0.1	
Uplink dedicated BWP configuration	Config 1,2		ULBWP.1.1	
PDSCH Reference measurement channel	Config 1,2		SR.3.1 TDD	-
RMSI CORESET Reference Channel	Config 1,2		CR.3.1 TDD	CR.3.1 TDD
PDCCH CORESET parameters	Config 1,2		CCR.3.1 TDD	CCR.3.1 TDD
OCNG Patterns			OP.1	OP.1
SSB Configuration			SSB.1 FR2	SSB.1 FR2
SMTC Configuration	Config 1,2		SMTC.1 FR2	SMTC.1 FR2
TRS configuration	Config 1,2		TRS.2.1 TDD	TRS.2.1 TDD
TCI state	Config 1,2		TCI.State.0	TCI.State.0
EPRE ratio of PSS to SSS		dB	0	0
EPRE ratio of PBCH DMRS to SSS				
EPRE ratio of PBCH to PBCH DMRS				
EPRE ratio of PDCCH DMRS to SSS				
EPRE ratio of PDCCH to PDCCH DMRS				
EPRE ratio of PDSCH DMRS to SSS				
EPRE ratio of PDSCH to PDSCH				
EPRE ratio of OCNG DMRS to SSS(Note 1)				
EPRE ratio of OCNG to OCNG DMRS (Note 1)				
Propagation Condition			AWGN	AWGN
Time offset to cell1 Note 2		µs	62.5	62.5+ Time offset to cell2
Time offset to cell2 Note 3		µs	-	3
Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols. Note 2: Receive time difference of signals received between subframe timing boundary of E-UTRA PCell and slot timing boundary of PSCell including time alignment error between the two cells Note 3: Receive time difference of signals received between slot timing boundary from two NR Cells including time alignment error between the two cells				

Table 5.5.2.4.5-2: NR cell specific OTA related test parameters for EN-DC FR2 interruptions during measurements on deactivated NR SCC in asynchronous EN-DC

Parameter		Unit	Cell 2	Cell 3
Angle of arrival configuration			Setup 1 defined in clause A.9	
Assumption for UE beams Note 6			Fine	Rough
N_{oc} Note1	NR_TDD_FR2_A	dBm/15kHz	-111.7	-104.7
	NR_TDD_FR2_B			
	NR_TDD_FR2_F			
	NR_TDD_FR2_G			
	NR_TDD_FR2_T			
	NR_TDD_FR2_Y			
N_{oc} Note1	NR_TDD_FR2_A	dBm/SCS Note3	-102.7	-95.7
	NR_TDD_FR2_B			
	NR_TDD_FR2_F			
	NR_TDD_FR2_G			
	NR_TDD_FR2_T			
	NR_TDD_FR2_Y			
SSB_RP Note2	NR_TDD_FR2_A	dBm/SCS Note4	-90.7	-90.7
	NR_TDD_FR2_B			
	NR_TDD_FR2_F			
	NR_TDD_FR2_G			
	NR_TDD_FR2_T			
	NR_TDD_FR2_Y			
$\hat{E}_s / I_{ot}$		dB	12	5

$\hat{E}_s/N_{oc}$		dB	12	5
Io[Note2]	NR_TDD_FR2_A	dBm/95.04 MHz Note4	-61.45	-60.52
	NR_TDD_FR2_B			
	NR_TDD_FR2_F			
	NR_TDD_FR2_G			
	NR_TDD_FR2_T			
	NR_TDD_FR2_Y			

Note 1: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for N_{oc} to be fulfilled.
Note 2: SSB_RP and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.
Note 3: SS-RSRP minimum requirements are specified assuming independent interference and noise at each receiver antenna port.
Note 4: Equivalent power received by an antenna with 0dBi gain at the centre of the quiet zone
Note 5: As observed with 0dBi gain antenna at the centre of the quiet zone
Note 6: Information about types of UE beam is given in 38.133 [6] clause B.2.1.3, and does not limit UE implementation or test system implementation

The UE shall be continuously scheduled in LTE PCell and NR PSCell during the entire length of T1. During the time duration T1 the UE shall transmit at least 99.5% of ACK/NACK on NR PSCell.

If the NR PSCell is not in the same band as the deactivated SCell, the UE is only allowed to cause interruptions on NR PSCell on NR PSCell immediately before and immediately after an SMTC. Each interruption on NR PSCell shall not exceed the value defined in Table 5.5.2.4.5-3.

If the NR PSCell is in the same band as the deactivated SCell, the UE is only allowed to cause an interruption on NR PSCell no earlier than 4 slots before an SMTC and no later than 4 slots after the SMTC. The interruption on NR PSCell shall not exceed the value defined in Table 5.5.2.4.2-4.

Table 5.5.2.4.5-3: Interruption duration if the NR PSCell is not in the same band as the deactivated SCell

μ	NR Slot length (ms)	Interruption length (slot)
3	0.125	4

Table 5.5.2.4.2-4: Interruption duration if the NR PSCell is in the same band as the deactivated SCell

μ	NR Slot length (ms)	Interruption length (slot)
3	0.125	8 + SMTC duration

The rate of correct events observed during repeated tests shall be at least 90%.

5.5.2.5 EN-DC FR2 interruptions during measurements on deactivated E-UTRAN SCC in synchronous EN-DC

Editor's note:

- Connection diagram is TBD.

- Test tolerance is missing.

- Test procedure may be further modified.

5.5.2.5.1 Test purpose

The purpose of this test is:

- To verify NR PSCell interruptions during the measurement on the deactivated E-UTRAN SCC, the UE missed ACK/NACK does not exceed the limits.

- To verify the missed ACK/NACK rate for NR PSCell in EN-DC.

5.5.2.5.2 Test applicability

This test applies to all types of E-UTRA UE release 15 and forward supporting EN-DC.

5.5.2.5.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 5.5.2.0.3.

The normative reference for this requirement is TS 38.133 [6] clause A.5.5.2.5.

5.5.2.5.4 Test description

5.5.2.5.4.1 Initial conditions

This test shall be run in one of the configurations defined in Table 5.5.2.5.4.1-1.

Table 5.5.2.5.4.1-1: Supported test configurations for EN-DC FR2 interruptions during measurements on deactivated E-UTRAN SCC in synchronous EN-DC

Configuration	Description
5.5.2.5-1	LTE FDD, NR 120 kHz SSB SCS, 100MHz bandwidth, TDD duplex mode
5.5.2.5-2	LTE TDD, NR 120 kHz SSB SCS, 100MHz bandwidth, TDD duplex mode

Configure the test equipment and the DUT according to the parameters in Table 5.5.2.5.4.1-2.

Table 5.5.2.5.4.1-2: Initial conditions for EN-DC FR2 interruptions during measurements on deactivated E-UTRAN SCC in synchronous EN-DC

Parameter	Value		Comment
Test environment	NC		As specified in TS 38.508-1 [14] clause 4.1.
Test frequencies	As specified in Annex E, table E.3-1 and TS 38.508-1 [14] clause 4.3.1 for E-UTRA and 7.2.3 for NR.		
Channel bandwidth	As specified by the test configuration selected from Table 5.5.2.5.4.1-1.		
Propagation conditions	AWGN		As specified in clause C.2.1.
Connection Diagram	TE Part	A.3.TBD	As specified in TS 38.508-1 [14] Annex A.
	DUT Part	A.3.TBD	
Exceptions to connection diagram	N/A		

1. The general test parameter settings are set up according to Table 5.5.2.5.4.1-3.

2. Message contents are defined in clause 5.5.2.5.4.3.

3. There are two E-UTRAN carriers and one NR carrier and three cells specified in the test. Cell1 and Cell3 is E-UTRAN PCell and E-UTRAN deactivated SCell, Cell2 is NR FR2 PSCell. Cell 1 is the cell used for connection setup with the power level set according to Table A.6.1.1-1. Cell 2 and Cell 3 shall be configured according to clause C.1.1 and C.1.2.

Table 5.5.2.5.4.1-3: General test parameters for EN-DC FR2 interruptions during measurements on deactivated E-UTRAN SCC in synchronous EN-DC

Parameter	Unit	Value	Comment
RF Channel Number		1, 2	One is E-UTRAN RF channel and the other two are NR RF channel
Active PCell		Cell1	PCell on E-UTRAN RF channel number 1.

Configured PSCell		Cell2	PSCell on NR RF channel number 2.
Configured deactivated SCell		Cell3	Deactivated SCell on NR RF channel number 2.
CP length		Normal	Applicable to cell1, cell 2 and cell3
DRX		OFF	
Measurement gap pattern Id		OFF	
SCell measurement cycle (measCycleSCell)	ms	640	
T1	s	10	

5.5.2.5.4.2 Test procedure

The test consists of three cells: Cell1, Cell2 and Cell3. Cell1 and Cell3 is E-UTRAN PCell and E-UTRAN deactivated SCell, Cell2 is NR FR2 PSCell. The test consists of one time period, with duration of T1. Prior to the start of the time duration T1, the UE shall be fully synchronized to Cell1, Cell2 and Cell3. Cell1 shall be configured as E-UTRAN PCell, Cell2 shall be configured as NR PSCell and Cell3 shall be configured as E-UTRAN deactivated SCell. The point in time at which the RRC message including *measCycleSCell* or *allowInterruptions* for the E-UTRAN SCell is received by the UE, defines the start of time period T1. During T1 the UE shall be continuously scheduled on E-UTRAN PCell and NR PSCell.

1. Ensure the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity *EN-DC*, DC bearer *MCG_and_SCG*, Connected without release *On* according to TS 38.508-1 [14] clause 4.5.
2. Configure MCG according to TS 36.521-3 [26] clause C.0, C.1 and SCG according to clause C.1.1 and C.1.2 for all downlink physical channels.
3. The SS shall transmit an *RRCConnectionReconfiguration* message including *measCycleSCell* or *allowInterruptions* for the deactivated E-UTRAN SCell to perform measurements on the deactivated SCC.
4. The UE shall transmit *RRCConnectionReconfigurationComplete* message.
5. Set the parameters according to T1 in Table 5.5.2.5.5-1. Propagation conditions are set according to clause C.2.1. T1 starts.
6. SS schedules on PSCell continuously and UE shall start sending ACK/NACK reports. The SS shall monitor ACK/NACK/DTX on PSCell.
7. If more than 99.5% of uplink transmissions are received by SS then count a success for the event “ACK/NACK”. Otherwise count a fail for the event “ACK/NACK”.
8. If no longer than 8 consecutive DTX is observed by the SS, then count a success for the event “DTX”. Otherwise count a fail for the event “DTX”.
9. After the RRC connection release, the SS:

   - transmits in Cell 1 a Paging message (including PagingRecord with UE-Identity) for the UE and ensures the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity *EN-DC*, DC bearer *MCG_and_SCG*, Connected without release *On* according to TS 38.508-1 [14] clause 4.5. (if the paging fails, switches off and on the UE and ensures the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity *EN-DC*, DC bearer *MCG_and_SCG*, Connected without release *On* according to TS 38.508-1 [14] clause 4.5),

   or

   - switches off and on the UE and ensures the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity *EN-DC*, DC bearer *MCG_and_SCG*, Connected without release *On* according to TS 38.508-1 [14] clause 4.5.

10. Repeat step 3-9 until a test verdict has been achieved.

Each of the events "ACK/NACK" and "DTX" is evaluated independently for the statistic, resulting in an event verdict: pass or fail. Each event is evaluated only until the confidence level according to Table G.2.3-1 in Annex G.2 is achieved. Different events may require different times for a verdict.

If all events pass, the test passes. If one event fails, the test fails.

5.5.2.5.4.3 Message contents

Message contents are according to TS 38.508-1 [14] clause 4.6 with the following exceptions:

Table 5.5.2.5.4.3-1: Common Exception messages

Default Message Contents	
Common contents of system information blocks exceptions	
Default RRC messages and information elements contents exceptions	

Table 5.5.2.5.4.3-2: MeasObjectEUTRA for E-UTRAN deactivated SCell

Derivation Path: 36.508 Table 4.6.6-2			
Information Element	**Value/remark**	**Comment**	**Condition**
MeasObjectEUTRA ::= SEQUENCE {			
carrierFreq	Downlink EARFCN for E-UTRAN SCell		
measCycleSCell-r10	sf640		
}			

5.5.2.5.5 Test requirement

Table 5.5.2.5.5-1 and Table 5.5.2.5.5-2 defines the primary level settings including test tolerances for E-UTRAN – NR FR2 interruptions during measurements on deactivated E-UTRAN SCC in synchronous EN-DC test configurations.

Table 5.5.2.5.5-1: NR cell specific test parameters for EN-DC FR2 interruptions during measurements on deactivated E-UTRAN SCC in synchronous EN-DC

Parameter		Unit	Cell 2
Frequency Range			FR2
Duplex mode	Config 1,2		TDD
TDD configuration	Config 1,2		TBD
$BW_{channel}$	Config 1,2	MHz	100: $N_{RB,c}$ = 66
Initial BWP Configuration	Config 1,2		TBD
PDSCH Reference measurement channel	Config 1,2		SR.3.1 TDD
RMSI CORESET parameters	Config 1,2		CR.3.1 TDD
PDCCH CORESET parameters	Config 1,2		TBD
OCNG Patterns			OP.1
SMTC Configuration	Config 1,2		SMTC.1 FR2
EPRE ratio of PSS to SSS		dB	0
EPRE ratio of PBCH DMRS to SSS			
EPRE ratio of PBCH to PBCH DMRS			
EPRE ratio of PDCCH DMRS to SSS			
EPRE ratio of PDCCH to PDCCH DMRS			
EPRE ratio of PDSCH DMRS to SSS			
EPRE ratio of PDSCH to PDSCH			
EPRE ratio of OCNG DMRS to SSS(Note 1)			
EPRE ratio of OCNG to OCNG DMRS (Note 1)			
$\hat{E}_s/N_{oc}$		dB	TBD+TT
Propagation Condition			AWGN
Time offset to cell1 Note 2		µs	3
NOTE 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols. NOTE 2: Receive time difference of signals received between subframe timing boundary of E-UTRA PCell and slot timing boundary of PSCell including time alignment error between the two cells			

Table 5.5.2.5.5-2: NR cell specific OTA related test parameters for EN-DC FR2 interruptions during measurements on deactivated E-UTRAN SCC in synchronous EN-DC

Parameter		Unit	Cell 2
UE orientation around TBD axis and TBD axis			TBD
Relative difference in angle of arrival of cell 2 relative to cell 1		degrees	TBD
N_{oc} Note1	NR_TDD_FR2_A	dBm/15kHz Note4	TBD+TT
	NR_TDD_FR2_B		
	NR_TDD_FR2_C		
	NR_TDD_FR2_D		
	NR_TDD_FR2_E		
	NR_TDD_FR2_F		
	NR_TDD_FR2_G		
N_{oc} Note1	NR_TDD_FR2_A	dBm/SCS Note3	TBD+TT
	NR_TDD_FR2_B		
	NR_TDD_FR2_C		
	NR_TDD_FR2_D		
	NR_TDD_FR2_E		
	NR_TDD_FR2_F		
	NR_TDD_FR2_G		
SS-RSRP Note2	NR_TDD_FR2_A	dBm/SCS Note4	TBD+TT
	NR_TDD_FR2_B		
	NR_TDD_FR2_C		
	NR_TDD_FR2_D		
	NR_TDD_FR2_E		
	NR_TDD_FR2_F		
	NR_TDD_FR2_G		
$\hat{E}_s / I_{ot}$		dB	TBD+TT
Io Note2	NR_TDD_FR2_A	dBm/95.04 MHz Note4	TBD+TT

NOTE 1: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modeled as AWGN of appropriate power for N_{oc} to be fulfilled.
NOTE 2: SS-RSRP and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.
NOTE 3: SS-RSRP minimum requirements are specified assuming independent interference and noise at each receiver antenna port.
NOTE 4: Equivalent power received by an antenna with 0dBi gain at the centre of the quiet zone
NOTE 5: As observed with 0dBi gain antenna at the centre of the quiet zone

The UE shall be continuously scheduled in LTE PCell and NR PSCell during the entire length of T1. During the time duration T1 the UE shall transmit at least 99.5% of ACK/NACK on NR PSCell. The UE is only allowed to cause interruptions immediately before and immediately after an SMTC. Each interruption on NR PSCell shall not exceed the value defined in Table 5.5.2.5.5-3.

Table 5.5.2.5.5-3: Interruption duration if the NR PSCell is not in the same band as the deactivated SCell

μ	NR Slot length (ms)	Interruption length (slot)
3	0.125	5

Table 5.5.2.5.5-4: Void

The rate of correct events observed during repeated tests shall be at least 90%.

5.5.2.6 EN-DC FR2 interruptions during measurements on deactivated E-UTRAN SCC in asynchronous EN-DC

Editor's note:

- Connection diagram is TBD.

- Test tolerance is missing.

- Test procedure may be further modified.

5.5.2.6.1 Test purpose

The purpose of this test is:

- To verify NR PSCell interruptions during the measurement on the deactivated E-UTRAN SCC, the UE missed ACK/NACK does not exceed the limits.

-To verify the missed ACK/NACK rate for NR PSCell in EN-DC.

5.5.2.6.2 Test applicability

This test applies to all types of E-UTRA UE release 15 and forward supporting EN-DC.

5.5.2.6.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 5.5.2.0.3.

The normative reference for this requirement is TS 38.133 [6] clause A.5.5.2.6.

5.5.2.6.4 Test description

5.5.2.6.4.1 Initial conditions

Test 5.5.2.6 can be run in one of the configurations defined in Table 5.5.2.6.4.1-1.

Table 5.5.2.6.4.1-1: Supported test configurations for EN-DC FR2 interruptions during measurements on deactivated E-UTRAN SCC in asynchronous EN-DC

Configuration	Description
5.5.2.6-1	LTE FDD, NR 120 kHz SSB SCS, 100MHz bandwidth, TDD duplex mode
5.5.2.6-2	LTE TDD, NR 120 kHz SSB SCS, 100MHz bandwidth, TDD duplex mode

Configure the test equipment and the DUT according to the parameters in Table 5.5.2.6.4.1-2.

Table 5.5.2.6.4.1-2: Initial conditions for EN-DC FR2 interruptions during measurements on deactivated E-UTRAN SCC in asynchronous EN-DC

Parameter	Value		Comment
Test environment	NC		As specified in TS 38.508-1 [14] clause 4.1.
Test frequencies	As specified in Annex E, table E.3-1 and TS 38.508-1 [14] clause 4.3.1 for E-UTRA and 7.2.3 for NR.		
Channel bandwidth	As specified by the test configuration selected from Table 5.5.2.6.4.1-1.		
Propagation conditions	AWGN		As specified in clause C.2.1.
Connection Diagram	TE Part	A.3.TBD	As specified in TS 38.508-1 [14] Annex A.
	DUT Part	A.3.TBD	
Exceptions to connection diagram	N/A		

2. The general test parameter settings are set up according to Table 5.5.2.6.4.1-3.

4. Message contents are defined in clause 5.5.2.6.4.3.

5. There are two E-UTRAN carriers and one NR carrier and three cells specified in the test. Cell1 and Cell3 is E-UTRAN PCell and E-UTRAN deactivated SCell, Cell2 is NR FR2 PSCell. Cell 1 is the cell used for connection setup with the power level set according to Table A.6.1.1-1. Cell 2 and Cell 3 shall be configured according to clause C.1.1 and C.1.2.

Table 5.5.2.6.4.1-3: General test parameters for EN-DC FR2 interruptions during measurements on deactivated E-UTRAN SCC in asynchronous EN-DC

Parameter	Unit	Value	Comment
RF Channel Number		1, 2	One is E-UTRAN RF channel and the other two are NR RF channel
Active PCell		Cell1	PCell on E-UTRAN RF channel number 1.
Configured PSCell		Cell2	PSCell on NR RF channel number 2.
Configured deactivated SCell		Cell3	Deactivated SCell on NR RF channel number 2.
CP length		Normal	Applicable to cell1, cell 2 and cell3
DRX		OFF	
Measurement gap pattern Id		OFF	
SCell measurement cycle (measCycleSCell)	ms	640	
T1	s	10	

5.5.2.6.4.2 Test procedure

The test consists of three cells: Cell1, Cell2 and Cell3. Cell1 and Cell3 is E-UTRAN PCell and E-UTRAN deactivated SCell, Cell2 is NR FR2 PSCell. The test consists of one time period, with duration of T1. Prior to the start of the time duration T1, the UE shall be fully synchronized to Cell1, Cell2 and Cell3. Cell1 shall be configured as E-UTRAN PCell, Cell2 shall be configured as NR PSCell and Cell3 shall be configured as E-UTRAN deactivated SCell. The point in time at which the RRC message including *measCycleSCell* or *allowInterruptions* for the E-UTRAN SCell is received by the UE, defines the start of time period T1. During T1 the UE shall be continuously scheduled on E-UTRAN PCell and NR PSCell.

1. Ensure the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity *EN-DC*, DC bearer *MCG_and_SCG*, Connected without release *On* according to TS 38.508-1 [14] clause 4.5.

2. Configure MCG according to TS 36.521-3 [26] clause C.0, C.1 and SCG according to clause C.1.1 and C.1.2 for all downlink physical channels.

3. The SS shall transmit an *RRCConnectionReconfiguration* message including *measCycleSCell* or *allowInterruptions* for the deactivated E-UTRAN SCell to perform measurements on the deactivated SCC.

4. The UE shall transmit *RRCConnectionReconfigurationComplete* message.

5. Set the parameters according to T1 in Table 5.5.2.6.5-1. Propagation conditions are set according to clause C.2.1. T1 starts.

6. SS schedules on PSCell continuously and UE shall start sending ACK/NACK reports. The SS shall monitor ACK/NACK/DTX on PSCell.

7. If more than 99.5% of uplink transmissions are received by SS then count a success for the event “ACK/NACK”. Otherwise count a fail for the event “ACK/NACK”.

8. If no longer than 8 consecutive DTX is observed by the SS, then count a success for the event “DTX”. Otherwise count a fail for the event “DTX”.

9. After the RRC connection release, the SS:

   - transmits in Cell 1 a Paging message (including PagingRecord with UE-Identity) for the UE and ensures the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity *EN-DC*, DC bearer *MCG_and_SCG*, Connected without release *On* according to TS 38.508-1 [14] clause 4.5. (if the paging fails, switches off and on the UE and ensures the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity *EN-DC*, DC bearer *MCG_and_SCG*, Connected without release *On* according to TS 38.508-1 [14] clause 4.5),

   or

   - switches off and on the UE and ensures the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity *EN-DC*, DC bearer *MCG_and_SCG*, Connected without release *On* according to TS 38.508-1 [14] clause 4.5.

10. Repeat step 3-9 until a test verdict has been achieved.

Each of the events "ACK/NACK" and "DTX" is evaluated independently for the statistic, resulting in an event verdict: pass or fail. Each event is evaluated only until the confidence level according to Table G.2.3-1 in Annex G.2 is achieved. Different events may require different times for a verdict.

If all events pass, the test passes. If one event fails, the test fails.

5.5.2.6.4.3 Message contents

Message contents are according to TS 38.508-1 [14] clause 4.6 with the following exceptions:

Table 5.5.2.6.4.3-1: Common Exception messages

Default Message Contents	
Common contents of system information blocks exceptions	
Default RRC messages and information elements contents exceptions	

Table 5.5.2.6.4.3-2: MeasObjectEUTRA for EUTRAN deactivated SCell

Derivation Path: 36.508 Table 4.6.6-2			
Information Element	**Value/remark**	**Comment**	**Condition**
MeasObjectEUTRA ::= SEQUENCE {			
carrierFreq	Downlink EARFCN for E-UTRAN SCell		
measCycleSCell-r10	sf640		
}			

5.5.2.6.5 Test requirement

Table 5.5.2.6.5-1 and Table 5.5.2.6.5-2 defines the primary level settings including test tolerances for E-UTRAN – NR FR2 interruptions during measurements on deactivated E-UTRAN SCC in asynchronous EN-DC test configurations.

Table 5.5.2.6.5-1: NR cell specific test parameters for EN-DC FR2 interruptions during measurements on deactivated E-UTRAN SCC in asynchronous EN-DC

Parameter		Unit	Cell 2
Frequency Range			FR2
Duplex mode	Config 1,2		TDD
TDD configuration	Config 1,2		TBD
$BW_{channel}$	Config 1,2	MHz	100: $N_{RB,c}$ = 66
Initial BWP Configuration	Config 1,2		TBD
PDSCH Reference measurement channel	Config 1,2		SR.3.1 TDD
RMSI CORESET parameters	Config 1,2		CR.3.1 TDD
PDCCH CORESET parameters	Config 1,2		TBD
OCNG Patterns			OP.1
SMTC Configuration	Config 1,2		SMTC.1 FR2
EPRE ratio of PSS to SSS		dB	0
EPRE ratio of PBCH DMRS to SSS			
EPRE ratio of PBCH to PBCH DMRS			
EPRE ratio of PDCCH DMRS to SSS			
EPRE ratio of PDCCH to PDCCH DMRS			
EPRE ratio of PDSCH DMRS to SSS			
EPRE ratio of PDSCH to PDSCH			
EPRE ratio of OCNG DMRS to SSS(Note 1)			
EPRE ratio of OCNG to OCNG DMRS (Note 1)			
$\hat{E}_s/N_{oc}$		dB	TBD
Propagation Condition			AWGN

Time offset to cell1 Note 2	μs	62.5
NOTE 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols. NOTE 2: Receive time difference of signals received between subframe timing boundary of E-UTRA PCell and slot timing boundary of PSCell including time alignment error between the two cells		

Table 5.5.2.6.5-2: NR cell specific OTA related test parameters for EN-DC FR2 interruptions during measurements on deactivated E-UTRAN SCC in asynchronous EN-DC

Parameter		Unit	Cell 2
UE orientation around TBD axis and TBD axis			TBD
Relative difference in angle of arrival of cell 2 relative to cell 1		degrees	TBD
N_{oc} Note1	NR_TDD_FR2_A	dBm/15kHz Note4	TBD
	NR_TDD_FR2_B		
	NR_TDD_FR2_C		
	NR_TDD_FR2_D		
	NR_TDD_FR2_E		
	NR_TDD_FR2_F		
	NR_TDD_FR2_G		
N_{oc} Note1	NR_TDD_FR2_A	dBm/SCS Note3	TBD
	NR_TDD_FR2_B		
	NR_TDD_FR2_C		
	NR_TDD_FR2_D		
	NR_TDD_FR2_E		
	NR_TDD_FR2_F		
	NR_TDD_FR2_G		
SS-RSRP Note2	NR_TDD_FR2_A	dBm/SCS Note4	TBD
	NR_TDD_FR2_B		
	NR_TDD_FR2_C		
	NR_TDD_FR2_D		
	NR_TDD_FR2_E		
	NR_TDD_FR2_F		
	NR_TDD_FR2_G		
$\hat{E}_s / I_{ot}$		dB	TBD
Io Note2	NR_TDD_FR2_A	dBm/95.04 MHz Note4	TBD
NOTE 1: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modeled as AWGN of appropriate power for N_{oc} to be fulfilled. NOTE 2: SS-RSRP and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves. NOTE 3: SS-RSRP minimum requirements are specified assuming independent interference and noise at each receiver antenna port. NOTE 4: Equivalent power received by an antenna with 0dBi gain at the center of the quiet zone NOTE 5: As observed with 0dBi gain antenna at the center of the quiet zone			

The UE shall be continuously scheduled in LTE PCell and NR PSCell during the entire length of T1. During the time duration T1 the UE shall transmit at least 99.5% of ACK/NACK on NR PSCell. The UE is only allowed to cause interruptions immediately before and immediately after an SMTC. Each interruption on NR PSCell shall not exceed the value defined in Table 5.5.2.6.5-3.

Table 5.5.2.6.5-3: Interruption duration if the NR PSCell is not in the same band as the deactivated SCell

μ	NR Slot length (ms)	Interruption length
3	0.125	5

Table 5.5.2.6.5-4: Void

The rate of correct events observed during repeated tests shall be at least 90%.

5.5.2.7 EN-DC FR2 interruptions at E-UTRA SRS carrier based switching

Editor's Note: This test case is incomplete in following aspects:

- Message contents are missing.
- TT analysis is missing.
- Test Procedure is FFS.
- Test applicability needs to be updated
- Cell mapping is missing in Annex E
- Antenna connection diagram is FFS
- E-UTRA - FR2 OTA testability is still FFS.

5.5.2.7.1 Test purpose

The purpose of this test is to verify E-UTRAN PCell and NR PSCell interruptions during carrier-based switching to one PUSCH-less SCCs from a CC with PUSCH, when a UE needs to transmit aperiodic SRS.

5.5.2.7.2 Test applicability

This test applies to all types of E-UTRA UE release 16 and forward supporting EN-DC and 2 DL CA in E-UTRA.

5.5.2.7.3 Minimum conformance requirements

The minimum conformance requirements are defined in clause 5.5.2.0.5.

The normative reference for this requirement is TS 38.133 [6] clause A.5.5.2.7.

5.5.2.7.4 Test description

5.5.2.7.4.1 Initial conditions

This test shall be tested using any of the test configurations in Table 5.5.2.7.4.1-1.

Table 5.5.2.7.4.1-1: Supported test configurations for EN-DC FR1 interruptions at E-UTRA SRS carrier based switching

Configuration	Description
5.5.2.7-1	LTE FDD(cell1), LTE TDD (cell3), NR 120 kHz SSB SCS, 100 MHz bandwidth, TDD duplex mode
5.5.2.7-2	LTE TDD(cell1), LTE TDD (cell3), NR 120 kHz SSB SCS, 100 MHz bandwidth, TDD duplex mode
NOTE.1: The UE is only required to be tested in one of the supported test configurations.	

Configure the test equipment and the DUT according to the parameters in Table 5.5.2.7.4.1-2.

Table 5.5.2.7.4.1-2: Initial conditions for EN-DC FR1 interruptions at SRS carrier based switching in asynchronous EN-DC

Parameter	Value		Comment
Test environment	NC		As specified in TS 38.508-1 [14] clause 4.1.
Test frequencies	As specified in Annex E, table E.3-1 and TS 38.508-1 [14] clause 4.3.1 for E-UTRA and 7.2.3 for NR.		
Channel bandwidth	As specified by the test configuration selected from Table 5.5.2.7.4.1-1.		
Propagation conditions	AWGN		As specified in clause C.2.1.
Connection Diagram	TE Part	TBD	As specified in TS 38.508-1 [14] Annex A.
	DUT Part	TBD	

Exceptions to connection diagram	N/A	

1. The general test parameter settings are set up according to Table 5.5.2.7.4.1-3.
2. Message contents are defined in clause 5.5.2.7.4.3.
3. There are two E-UTRA carriers and one NR carrier, and three cells specified in the test. Each cell is on a different carrier. Cell1 Is E-UTRAN PCell, Cell2 is NR FR1 PSCell and Cell 3 is E-UTRA activated Scell. Cell 1 is the cell used for connection setup with the power level set according to Table A.6.1.1-1. Cell 2 shall be configured according to clauses C.1.1 and C.1.2.

Table 5.5.2.7.4.1-3: General test parameters for EN-DC FR2 interruptions at E-UTRA SRS carrier based switching

Parameter	Unit	Value	Comment
RF Channel Number		1, 2, 3	One is NR RF channel and the other two are E-UTRAN RF channels
Active PCell		Cell1	PCell on E-UTRAN RF channel number 1.
Active PSCell		Cell2	PSCell on NR RF channel number 2.
Activated SCell		Cell3	SCell on E-UTRAN RF channel number 3.
CP length		Normal	Applicable to Cell1, Cell2 and Cell3
DRX		OFF	
Measurement gap pattern Id		OFF	
T1	s	0.2	
T2	s	0.2	UE shall perform SRS switching during T2

Table 5.5.2.7.4.1-4: Sounding Reference Symbol Configuration for E-UTRAN – NR FR2 interruptions at E-UTRA SRS carrier based switching

Field	Value	Comment
srsBandwidthConfiguration	bw5	
srsSubframeConfiguration	Sc8	Once every 5 subframes
ackNackSrsSimultaneousTransmission	FALSE	
srsMaxUpPTS	N/A	Not applicable for E-UTRAN FDD
srsBandwidth	0	No hopping
srsHoppingBandwidth	hbw0	
frequencyDomainPosition	0	
Duration	TRUE	Indefinite duration
Srs-ConfigurationIndex	47	SRS periodicity of 40ms.
transmissionComb	0	
cyclicShift	cs0	No cyclic shift
SRS-AntennaPort	an1	Number of antenna ports used for SRS transmission
Note: For further information see clause 6.3.2 in TS 36.331.		

5.5.2.7.4.2 Test procedure

TBD

5.5.2.7.4.3 Message contents

TBD

5.5.2.7.5 Test requirement

Tables 5.5.2.7.5-1 and 5.5.2.7.5-2 define the primary level settings including test tolerances for EN-DC FR2 interruptions at E-UTRA SRS carrier based switching in asynchronous EN-DC.

Table 5.5.2.7.5-1: NR cell specific test parameters for E-UTRAN – NR FR2 interruptions at E-UTRA SRS carrier based switching

Parameter		Unit	Cell 2
Frequency Range			**FR2**
Duplex mode	Config 1,2		TDD
TDD configuration	Config 1,2		[TDDConf.3.2]
$BW_{channel}$	Config 1,2	MHz	100: $N_{RB,c}$ = 66
Downlink initial BWP Configuration	Config 1,2		DLBWP.0.1
Downlink dedicated BWP Configuration	Config 1,2		DLBWP.1.1
Uplink initial BWP configuration	Config 1,2		ULBWP.0.1
Uplink dedicated BWP configuration	Config 1,2		ULBWP.1.1
TRS configuration	Config 1,2		TRS.2.1 TDD
TCI state	Config 1,2		TCI.State.0
PDSCH Reference measurement channel	Config 1,2		SR.3.1 TDD
RMSI CORESET Reference Channel	Config 1,2		CR.3.1 TDD
RMC CORESET Reference Channel	Config 1,2		CCR.3.1 TDD
OCNG Patterns			OP.1
SSB Configuration			SSB.1 FR2
SMTC Configuration	Config 1,2		SMTC.1
EPRE ratio of PSS to SSS		dB	0
EPRE ratio of PBCH DMRS to SSS			
EPRE ratio of PBCH to PBCH DMRS			
EPRE ratio of PDCCH DMRS to SSS			
EPRE ratio of PDCCH to PDCCH DMRS			
EPRE ratio of PDSCH DMRS to SSS			
EPRE ratio of PDSCH to PDSCH			
EPRE ratio of OCNG DMRS to SSS(Note 1)			
EPRE ratio of OCNG to OCNG DMRS (Note 1)			
$\hat{E}_s/N_{oc}$		dB	17
Propagation Condition			AWGN
Time offset to cell1 Note 2		ms	3

Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.

Note 2: Receive time difference of signals received between subframe timing boundary of E-UTRA PCell and slot timing boundary of PSCell including time alignment error between the two cells

Table 5.5.2.7.5-2: NR cell specific OTA related test parameters for E-UTRAN – NR FR2 interruptions at E-UTRA SRS carrier based switching

Parameter	Unit	Cell2
Angle of arrival configuration		Setup 1 according to clause A.3.15.1
Assumption for UE beams Note 6		Fine
N_{oc} Note1	dBm/15kHz Note4	-112
N_{oc} Note1	dBm/SCS Note3	-102.97
$\hat{E}_s/N_{oc}$	dB	17

SS-RSRP Note2	dBm/SCS Note4	-85.97
$\hat{E}_s/I_{ot}$	dB	17
Io Note2	dBm/95.04 MHz Note4	-56.90

Note 1: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for N_{oc} to be fulfilled.
Note 2: SS-RSRP and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.
Note 3: SS-RSRP minimum requirements are specified assuming independent interference and noise at each receiver antenna port.
Note 4: Equivalent power received by an antenna with 0dBi gain at the centre of the quiet zone
Note 5: As observed with 0dBi gain antenna at the centre of the quiet zone
Note 6: Information about types of UE beam is given in B.2.1.3, and does not limit UE implementation or test system implementation

The UE shall be continuously scheduled in NR FR2 PSCell throughout the test. During T2 two interruption time periods are allowed on Cell2 and Cell1, each interruption due to SRS carrier based switching on Cell2 shall not exceed X defined in Table A.5.5.2.7.2-1.

Table 5.5.2.7.5-3: Interruption length X (slot) E-UTRAN – NR at E-UTRA SRS carrier based switching

μ	NR Slot length (ms)	Interruption length X (slots)
2	0.25	5
3	0.125	9

The rate of correct events observed during repeated tests shall be at least 90% with the confidence level of 95%.

5.5.2.8 EN-DC FR2 interruptions at NR SRS carrier based switching

Editor's Note: This test case is incomplete in following aspects:

- Message contents are missing.
- TT analysis is missing.
- Test Procedure is FFS.
- Test applicability needs to be updated
- Cell mapping is missing in Annex E
- Antenna connection diagram is FFS

5.5.2.8.1 Test purpose

The purpose of this test is to verify E-UTRAN PCell and NR PSCell interruptions during carrier-based switching to one carrier not configured for PUCCH/PUSCH transmission from a CC with PUCCH/PUSCH transmission, when a UE needs to transmit aperiodic SRS.

5.5.2.8.2 Test applicability

This test applies to all types of E-UTRA UE release 16 and forward supporting EN-DC and 2 DL CA in NR.

5.5.2.8.3 Minimum conformance requirements

The minimum conformance requirements are defined in clause 5.5.2.0.5.

The normative reference for this requirement is TS 38.133 [6] clause A.5.5.2.8.

5.5.2.8.4 Test description

5.5.2.8.4.1 Initial conditions

This test shall be tested using any of the test configurations in Table 5.5.2.8.4.1-1.

Table 5.5.2.8.4.1-1: Supported test configurations for EN-DC FR2 interruptions at NR SRS carrier based switching

Configuration	Description
5.5.2.8-1	LTE FDD, NR 120 kHz SSB SCS, 100 MHz bandwidth, TDD duplex mode
5.5.2.8-2	LTE TDD, NR 120 kHz SSB SCS, 100 MHz bandwidth, TDD duplex mode
NOTE.1: The UE is only required to be tested in one of the supported test configurations.	

Configure the test equipment and the DUT according to the parameters in Table 5.5.2.8.4.1-2.

Table 5.5.2.8.4.1-2: Initial conditions for EN-DC FR1 interruptions at SRS carrier based switching in asynchronous EN-DC

Parameter	Value		Comment
Test environment	NC		As specified in TS 38.508-1 [14] clause 4.1.
Test frequencies	As specified in Annex E, table E.3-1 and TS 38.508-1 [14] clause 4.3.1 for E-UTRA and 7.2.3 for NR.		
Channel bandwidth	As specified by the test configuration selected from Table 5.5.2.8.4.1-1.		
Propagation conditions	AWGN		As specified in clause C.2.1.
Connection Diagram	TE Part	TBD	As specified in TS 38.508-1 [14] Annex A.
	DUT Part	TBD	
Exceptions to connection diagram	N/A		

1. The general test parameter settings are set up according to Table 5.5.2.8.4.1-3.
2. Message contents are defined in clause 5.5.2.8.4.3.
3. There are two NR carriers and one E-UTRA carrier, and three cells specified in the test. Each cell is on a different carrier. Cell1 is E-UTRAN PCell, Cell2 is NR FR2 PSCell and Cell 3 is NR activated Scell. Cell 1 is the cell used for connection setup with the power level set according to Table A.6.1.1-1. Cell 2 and Cell 3 shall be configured according to clauses C.1.1 and C.1.2.

Table 5.5.2.8.4.1-3: General test parameters for EN-DC FR2 interruptions at NR SRS carrier based switching

Parameter	Unit	Value	Comment
RF Channel Number		1, 2, 3	One is E-UTRAN RF channel and the other is NR RF channel
Active PCell		Cell1	PCell on E-UTRAN RF channel number 1.
Configured PSCell		Cell2	PSCell on NR RF channel number 2.
Configured SCell		Cell3	SCell on NR RF channel number 3.
CP length		Normal	Applicable to cell1 and cell 2
DRX		OFF	
Measurement gap pattern Id		OFF	
T1	s	5	
T2	s	0.1	

5.5.2.8.4.2 Test procedure

TBD

5.5.2.8.4.3 Message contents

TBD

5.5.2.8.5 Test requirement

Tables 5.5.2.8.5-1 and 5.5.2.8.5-2 define the primary level settings including test tolerances for EN-DC FR2 interruptions at E-UTRA SRS carrier based switching in asynchronous EN-DC.

Table 5.5.2.8.5-1: NR cell specific test parameters for E-UTRAN – NR FR2 interruptions at NR SRS carrier based switching

Parameter		Unit	Cell 2	Cell 3
Frequency Range			FR2	
Duplex mode	Config 1,2		TDD	
TDD configuration	Config 1,2		[TDDConf.3.2]	
$BW_{channel}$	Config 1,2	MHz	100: $N_{RB,c}$ = 66	
Downlink initial BWP Configuration	Config 1,2		DLBWP.0.1	
Downlink dedicated BWP Configuration	Config 1,2		DLBWP.1.1	
Uplink initial BWP configuration	Config 1,2		ULBWP.0.1	
Uplink dedicated BWP configuration	Config 1,2		ULBWP.1.1	
TRS configuration	Config 1,2		TRS.2.1 TDD	
SRS configuration	Config 1,2		SRS.3 TDD	
TCI state	Config 1,2		TCI.State.0	
PDSCH Reference measurement channel	Config 1,2		SR.3.1 TDD	
RMSI CORESET Reference Channel	Config 1,2		CR.3.1 TDD	
RMC CORESET Reference Channel	Config 1,2		CCR.3.1 TDD	
OCNG Patterns			OP.1	
SSB Configuration			SSB.1 FR2	
SMTC Configuration	Config 1,2		SMTC.1	
EPRE ratio of PSS to SSS		dB	0	
EPRE ratio of PBCH DMRS to SSS				
EPRE ratio of PBCH to PBCH DMRS				
EPRE ratio of PDCCH DMRS to SSS				
EPRE ratio of PDCCH to PDCCH DMRS				
EPRE ratio of PDSCH DMRS to SSS				
EPRE ratio of PDSCH to PDSCH				
EPRE ratio of OCNG DMRS to SSS(Note 1)				
EPRE ratio of OCNG to OCNG DMRS (Note 1)				
$\hat{E}_s/N_{oc}$		dB	17	
Propagation Condition			AWGN	
Time offset to cell1 Note 2		µs	33	

Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.

Note 2: Receive time difference of signals received between subframe timing boundary of E-UTRA PCell and slot timing boundary of PSCell including time alignment error between the two cells

Table 5.5.2.8.5-2: NR cell specific OTA related test parameters for E-UTRAN – NR FR2 interruptions at NR SRS carrier based switching

Parameter	Unit	Test 1	
		Cell 2	Cell 3
Angle of arrival configuration		Setup 1 according to clause A.3.15.1	
Assumption for UE beams Note 6		Fine	

N_{oc} Note1	dBm/15kHz Note4	-112
N_{oc} Note1	dBm/SCS Note3	-103
$\hat{E}_s / N_{oc}$	dB	4
SS-RSRP Note2	dBm/SCS Note4	-99
$\hat{E}_s / I_{ot}$	dB	4
Io Note2	dBm/95.04 MHz Note4	-68.5
Note 1: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for N_{oc} to be fulfilled.		
Note 2: SS-RSRP and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.		
Note 3: SS-RSRP minimum requirements are specified assuming independent interference and noise at each receiver antenna port.		
Note 4: Equivalent power received by an antenna with 0dBi gain at the centre of the quiet zone		
Note 5: As observed with 0dBi gain antenna at the centre of the quiet zone		
Note 6: Information about types of UE beam is given in B.2.1.3, and does not limit UE implementation or test system implementation		

In T2 UE shall transmit SRS on Cell3 as requested. During T2 interruption on Cell2 due to SRS carrier based switching from Cell2 to Cell3 shall not exceed the requirements defined in TS38.133 clause 8.2.1.2.12.

The rate of correct events observed during repeated tests shall be at least 90% with the confidence level of 95%.

5.5.3 SCell activation and deactivation delay

5.5.3.1 EN-DC FR2 SCell activation and deactivation intra-band in non-DRX

Editor's Note: This test case has been completed for the following configurations: (?)

- *Test frequency f ≤ 40.8 GHz*
- *UE PC3*
- *The test is incomplete for UE power classes other than PC3*
- *The test is incomplete for test frequencies > 40.8 GHz*

5.5.3.1.1 Test purpose

This test is to verify that the SCell activation and deactivation times are within the requirements, when the SCell in FR2 intra-band is known by the UE at the time of activation.

5.5.3.1.2 Test applicability

This test applies to all types of NR UE supporting E-UTRA and EN-DC from Release 15 onwards and supporting 2DL CA.

5.5.3.1.3 Minimum conformance requirements

Same minimum conformance requirements as described in clause 4.5.3.1.3.

The normative reference for this requirement is TS 38.133 [6] clause 8.3 and A.5.5.3.1.

5.5.3.1.4 Test description

5.5.3.1.4.1 Initial conditions

This test shall be tested using any of the test configurations in Table 5.5.3.1.4.1-1.

Table 5.5.3.1.4.1-1: Supported test configurations for FR2 SCell activation case with FR2 PSCell

Test Case ID	Description
5.5.3.1-1	FDD LTE PCell, Cell 2&3 120 kHz SSB SCS, 100MHz bandwidth, TDD duplex mode
5.5.3.1-2	TDD LTE PCell, Cell 2&3 120 kHz SSB SCS, 100MHz bandwidth, TDD duplex mode
NOTE: The UE is only required to pass in one of the supported test configurations.	

Configure the test equipment and the DUT according to the parameters in Table 5.5.3.1.4.1-2 and Table 5.5.3.1.4.1-3.

Table 5.5.3.1.4.1-2: Initial conditions for known FR2 SCell activation case with FR2 PSCell

Parameter	Value		Comment
Test environment	NC		As specified in TS 38.508-1 [14] clause 4.1.
Test frequencies	As specified in Annex E, Table E.1-1 and TS 38.508-1 [14] clause 4.3.1 for E-UTRA and 7.2.3 for NR.		
Channel bandwidth	As specified by the test configuration selected from Table 4.7.1.1.2-1.		
Propagation conditions	AWGN		As specified in clause C.2.2.
Connection Diagram	TE Part	A.3.3.1.1	As specified in TS 38.508-1 [14] Annex A.
	DUT Part	A.3.4.1.1	
Exceptions to connection diagram	N/A		

Table 5.5.3.1.4.1-3: General test parameters for FR2 SCell activation case with FR2 PSCell

Parameter	Unit	Value	Comment
RF Channel Number		1,2,3	One E-UTRAN radio channel (1) and two NR radio channel (2,3) are used for this test
Active PCell		Cell 1	Primary cell on E-UTRAN RF channel number 1. As specified in clause A.3.7.2.2 of TS38.133 [6]
Active PSCell		Cell 2	Primary secondary cell on NR RF channel number 2.
Configured deactivated SCell		Cell 3	Configured deactivated secondary cell on NR RF channel number 3
CP length		Normal	
DRX		OFF	Continuous monitoring of primary cell
Cell-individual offset for cells on E-UTRA RF channel number	dB	0	Individual offset for cells on primary component carrier.
Cell-individual offset for cells on NR channel number	dB	0	Individual offset for cells on secondary component carrier.
SCell measurement cycle (measCycleSCell)	ms	160	
Cell3 timing offset to cell2	µs	0	
Time alignment error between cell3 and cell2	µs	≤ Time alignment error as specified in TS 38.104 [28] clause 6.5.3.1.	The value of time alignment error depends upon the type of carrier aggregation.
T1	s	7	During this time the PSCell shall be known and the SCell configured and detected.
T2	s	1	During this time the UE shall activate the SCell.
T3	s	1	During this time the UE shall deactivate the SCell.

T_{HARQ}	ms	k_1*NR slot length	k1 is a number of slots and is indicated by the PDSCH-to-HARQ-timing-indicator field in the DCI format, if present, or provided by dl-DataToUL-ACK, the value of k should be the minimum value defined in TS 38.213 [8]
$T_{CSI_Reporting}$	ms	15	the delay (in ms) including uncertainty in acquiring the first available downlink CSI reference resource, UE processing time for CSI reporting (clause 5.2.2.5 in TS 38.214) and uncertainty in acquiring the first available CSI reporting resources as specified in 38.331 [13].
k	ms	$k_1 + 3 \cdot N_{slot}^{subframe,\ \mu} + 1$	As specified in clause 4.3 of TS38.213 [8]

1. Message contents are defined in clause 5.5.3.1.4.3.
2. Cell 1 is the E-UTRA serving cell (PCell) for the EN-DC setup. The power levels and settings for Cell 1 are set according to Annex A.6. Cell 2 and Cell 3 are NR FR2 cells in the same frequency. Cell 2 is the PSCell and Cell 3 is the deactivated SCell.
3. Downlink signals for NR cell are initially set up according to clause C.2.1.
4. The UE Rx beam peak direction has been obtained previously using one of the Rx Beam Peak Search procedures as described in Annex I.

5.5.3.1.4.2 Test procedure

Same as in 4.5.3.1.4.2 with the following exception:

2. Set the parameters according to T1 in Tables 5.5.3.1.5-1 and A.6.1.2-1. Propagation conditions are set according to Annex C clauses C.2.2.
3. T1 starts. Immediately after, the SS shall configure SCell (Cell 3) on the SCC as per TS 38.508-1 [14] clause 7.5.2, with the message content exceptions defined in clause 5.5.3.1.4.3. NR RRCReconfiguration message is contained in RRCConnectionReconfiguration and NR RRCReconfigurationComplete message is contained in RRCConnectionReconfigurationComplete.

5.5.3.1.4.3 Message contents

Same message contents as described in section 4.5.3.1.4.3 with following exception:

5.5.3.1.5 Test requirement

Table 5.5.3.1.5-1 will replace the values of corresponding parameters in Table 4.5.3.1.5-1 and Table 5.5.3.1.5-2 defines OTA related test parameters.

Table 5.5.3.1.5-1: Cell specific test parameters for FR2 SCell activation case with FR2 PSCell

Parameter[Note 5]	Unit	Cell 2			Cell 3		
		T1	T2	T3	T1	T2	T3
SSB ARFCN		freq1			freq2		
Duplex mode		TDD			TDD		
TDD configuration		TDDConf.3.1			TDDConf.3.1		
$BW_{channel}$	MHz	100: $N_{RB,c}$ = 66			100: $N_{RB,c}$ = 66		
PDSCH Reference measurement channel		SR.3.1 TDD			SR.3.1 TDD		
RMSI CORESET Reference Channel		CR.3.1 TDD			CR.3.1 TDD		
RMC CORESET Reference Channel		CCR.3.1 TDD			CCR.3.1 TDD		
DL initial BWP configuration		DLBWP.0.1					
DL dedicated BWP configuration		DLBWP.1.1					
UL initial BWP configuration		ULBWP.0.1					
UL dedicated BWP configuration		ULBWP.1.1					
OCNG Patterns		OP.1					
SMTC configuration		SMTC.1					

SSB configuration		SSB.1 FR2	
TCI state		TCI.State.0	
TRS configuration		TRS.2.1 TDD	
CSI-RS configuration for CSI reporting		CSI-RS.3.1 TDD	
reportConfigType		periodic	N/A
reportQuantity		cri-RI-PMI-CQI	N/A
CSI reporting periodicity	slot	40	N/A
CSI reporting offset	slot	4	N/A
PDSCH/PDCCH subcarrier spacing	kHz	120	
TRS configuration		TRS.2.1 TDD	
EPRE ratio of PSS to SSS	dB	0	
EPRE ratio of PBCH_DMRS to SSS			
EPRE ratio of PBCH to PBCH_DMRS			
EPRE ratio of PDCCH_DMRS to SSS			
EPRE ratio of PDCCH to PDCCH_DMRS			
EPRE ratio of PDSCH_DMRS to SSS			
EPRE ratio of PDSCH to PDSCH_DMRS			
EPRE ratio of OCNG DMRS to SSS note 1			
EPRE ratio of OCNG to OCNG DMRS note 1			
Propagation conditions		AWGN	

NOTE 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.
NOTE 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for N_{oc} to be fulfilled.
NOTE 3: SS-RSRP and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.
NOTE 4: SS-RSRP minimum requirements are specified assuming independent interference and noise at each receiver antenna port.
NOTE 5: All parameters apply for configuration 1 and 2.

Table 5.5.3.1.5-2: OTA related test parameters for FR2 SCell activation case with FR2 PSCell

Parameter Note 6	Unit	Cell 2			Cell 3		
		T1	T2	T3	T1	T2	T3
Angle of arrival configuration		Setup 1 according to A.9.1					
Assumption for UE beams Note 7		Rough			Rough		
N_{oc} Note1	dBm/15kHz Note4	-104.7			-104.7		
N_{oc} Note1	dBm/SCS Note3	-95.7			-95.7		
$\hat{E}_s / N_{oc}$	dB	7			7		
SS-RSRP Note2	dBm/SCS Note4	-88.7			-88.7		
$\hat{E}_s / I_{ot}$	dB	7			7		
Io Note2	dBm/95.04 MHz Note4	-58.92			-58.92		

NOTE 1: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for N_{oc} to be fulfilled.
NOTE 2: Es/Iot, SSB_RP and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.
NOTE 3: Void
NOTE 4: Equivalent power received by an antenna with 0dBi gain at the centre of the quiet zone
NOTE 5: Void
NOTE 6: All parameters apply for configuration 1 and 2
NOTE 7: Information about types of UE beam is given in TS 38.133 [6] clause B.2.1.3, and does not limit UE implementation or test system implementation

The test requirements defined in clause 4.5.3.1.5 shall apply to this test case, with the following exceptions:

- Placement of interruptions is only verified in NR PSCell.

5.5.3.2 to 5.5.3.6

5.5.3.7 Direct SCell activation at SCell addition of known SCell in FR2

Editor's note: This test case is incomplete. The following aspects are missing

- Test Tolerances and measurement uncertainty are missing

- CSI-RS config is missing

5.5.3.7.1 Test Purpose

The purpose of this test is to verify that the direct SCell activation time is within the requirements, when the SCell in FR2 is known by the UE at the time of activation.

5.5.3.7.2 Test applicability

This test applies to all types of NR UE supporting E-UTRA and EN-DC from Release 15 onwards and supporting 2DL CA.

5.5.3.7.3 Minimum conformance requirements

The minimum conformance requirements are defined in clause 4.5.3.0.1.

The normative reference for this requirement is TS 38.133 [6] clause 8.3 and A.5.5.3.7.

5.5.3.7.4 Test description

5.5.3.7.4.1 Initial Conditions

This test shall be tested using any of the test configurations in Table 5.5.3.7.4.1-1.

Table 5.5.3.7.4.1-1: Supported test configurations for FR2 SCell activation case with FR2 PSCell

Test Case ID	Description
5.5.3.7-1	FDD LTE PCell, Cell 2&3 120 kHz SSB SCS, 100MHz bandwidth, TDD duplex mode
5.5.3.7-2	TDD LTE PCell, Cell 2&3 120 kHz SSB SCS, 100MHz bandwidth, TDD duplex mode
NOTE: The UE is only required to pass in one of the supported test configurations.	

Configure the test equipment and the DUT according to the parameters in Table 5.5.3.7.4.1-2 and Table 5.5.3.7.4.1-3.

Table 5.5.3.7.4.1-2: Initial conditions for known FR2 SCell activation case with FR2 PSCell

Parameter	Value		Comment
Test environment	NC		As specified in TS 38.508-1 [14] clause 4.1.
Test frequencies	As specified in Annex E, Table E.1-1 and TS 38.508-1 [14] clause 4.3.1 for E-UTRA and 7.2.3 for NR.		
Channel bandwidth	As specified by the test configuration selected from Table 4.7.1.1.2-1.		
Propagation conditions	AWGN		As specified in clause C.2.2.
Connection Diagram	TE Part	A.3.3.1.1	As specified in TS 38.508-1 [14] Annex A.
	DUT Part	A.3.4.1.1	
Exceptions to connection diagram	N/A		

Table 5.5.3.7.4.1-3: General test parameters for FR2 SCell activation case with FR2 PSCell

Parameter	Unit	Value	Comment

RF Channel Number		1, 2, 3	Two radio channels are used for this test. One for E-UTRA cell and two for NR Cell
Active PCell		Cell1	PCell on RF channel number 1. As specified in clause A.3.7.2.2
Active PSCell		Cell2	PSCell on RF channel number 2.
SCell		Cell3	secondary cell on RF channel number 3
DRX		OFF	Continuous monitoring of PCell/PSCell
PRACH configuration on cell2		FR2 configuration 2	Captured in A.3.8.3.2
PSCell CQI/PMI periodicity and offset configuration index		slot5	CQI reporting for PSCell every uplink slot
Cell-individual offset for cells on RF channel number 1	dB	0	Individual offset for cells on carrier frequency of cell1.
Cell-individual offset for cells on RF channel number 2	dB	0	Individual offset for cells on carrier frequency of cell2.
Cell-individual offset for cells on RF channel number 3	dB	0	Individual offset for cells on carrier frequency of cell3.
T1	s	7	During this time the PCell/PSCell shall be known and cell3 is detected, and UE shall report a valid CQI for PCell/PSCell.
T2	s	N_{direct}	During this time the UE shall be configured with directly activated SCell1.
T3	s	1	During this time the UE shall report a valid CQI for PCell/PSCell and SCell.

1. Message contents are defined in clause 5.5.3.7.4.3.

2. Cell 1 is the E-UTRA serving cell (PCell) for the EN-DC setup. The power levels and settings for Cell 1 are set according to Annex A.6. Cell 2 and Cell 3 are NR FR2 cells in the same frequency. Cell 2 is the PSCell and Cell 3 is the SCell.

5.5.3.7.4.2 Test procedure

Same as in 4.5.3.5.4.2 with the following exception:

2. Set the parameters according to T1 in Tables 5.5.3.7.5-1 and A.6.1.2-1. Propagation conditions are set according to Annex C clauses C.2.2.

3. T1 starts. Immediately after, the SS shall configure SCell (Cell 3) on the SCC as per TS 38.508-1 [14] clause 7.5.2, with the message content exceptions defined in clause 5.5.3.7.4.3. NR RRCReconfiguration message is contained in RRCConnectionReconfiguration and NR RRCReconfigurationComplete message is contained in RRCConnectionReconfigurationComplete.

5.5.3.7.4.3 Message contents

Message contents are according to TS 38.508-1 [14] clause 7.3 with the exception as described in section 4.5.3.5.4.3.

5.5.3.7.5 Test requirement

Table 5.5.3.7.5-1 defines the cell specific test parameters and Table 5.5.3.7.5-2 defines OTA related test parameters.

Table 5.5.3.7.5-1: Cell specific test parameters for FR2 SCell activation case with FR2 PSCell

ParameterNote 5	Unit	Cell 2			Cell 3		
		T1	T2	T3	T1	T2	T3
SSB ARFCN		freq1			freq2		
Duplex mode		TDD			TDD		
TDD configuration		TDDConf.3.1			TDDConf.3.1		
$BW_{channel}$	MHz	100: $N_{RB,c}$ = 66			100: $N_{RB,c}$ = 66		
PDSCH Reference measurement channel		SR.3.1 TDD			SR.3.1 TDD		
RMSI CORESET Reference Channel		CR.3.1 TDD			CR.3.1 TDD		
RMC CORESET Reference Channel		CCR.3.1 TDD			CCR.3.1 TDD		

DL initial BWP configuration		DLBWP.0.1
DL dedicated BWP configuration		DLBWP.1.1
UL initial BWP configuration		ULBWP.0.1
UL dedicated BWP configuration		ULBWP.1.1
OCNG Patterns		OP.1
SMTC configuration		SMTC.1
SSB configuration		SSB.1 FR2
TCI state		TCI.State.0
TRS configuration		TRS.2.1 TDD
EPRE ratio of PSS to SSS	dB	0
EPRE ratio of PBCH_DMRS to SSS		
EPRE ratio of PBCH to PBCH_DMRS		
EPRE ratio of PDCCH_DMRS to SSS		
EPRE ratio of PDCCH to PDCCH_DMRS		
EPRE ratio of PDSCH_DMRS to SSS		
EPRE ratio of PDSCH to PDSCH_DMRS		
EPRE ratio of OCNG DMRS to SSS Note 1		
EPRE ratio of OCNG to OCNG DMRS Note 1		
Propagation conditions		AWGN

Note 1: OCNG shall be used such that both cells are fully allocated, and a constant total transmitted power spectral density is achieved for all OFDM symbols.
Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for N_{oc} to be fulfilled.
Note 3: SS-RSRP and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.
Note 4: SS-RSRP minimum requirements are specified assuming independent interference and noise at each receiver antenna port.
Note 5: All parameters apply for configuration 1 and 2.

Table 5.5.3.7.5-2: OTA related test parameters for FR2 SCell activation case with FR2 PSCell

ParameterNote 6	Unit	Cell 2			Cell 3		
		T1	T2	T3	T1	T2	T3
Angle of arrival configuration		Setup 1 according to A.3.15.1					
Assumption for UE beams Note 7		Rough			Rough		
N_{oc} Note1	dBm/15kHz Note4	-104.7			-104.7		
N_{oc} Note1	dBm/SCS Note 3	-95.7			-95.7		
$\hat{E}_s / N_{oc}$	dB	7			7		
SS-RSRP Note2	dBm/SCS Note4	-88.7			-88.7		
$\hat{E}_s / I_{ot}$	dB	7			7		
Io Note2	dBm/95.04 MHz Note4	-58.92			-58.92		

Note 1: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for N_{oc} to be fulfilled.
Note 2: SS-RSRP and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.
Note 3: SS-RSRP minimum requirements are specified assuming independent interference and noise at each receiver antenna port.
Note 4: Equivalent power received by an antenna with 0dBi gain at the centre of the quiet zone
Note 5: As observed with 0dBi gain antenna at the centre of the quiet zone
Note 6: All parameters apply for configuration 1 and 2
Note 7: Information about types of UE beam is given in B.2.1.3, and does not limit UE implementation or test system implementation

The UE shall accomplish the activation of the SCell no later than subframe m+N_{direct} as defined in TS 38.133[6], clause 8.3.4. Time period T3 starts at (m+ N_{direct}), at which point UE shall be reporting a valid CQI for both PSCell and SCell.

During T3 the UE shall send CSI reports for SCell with non-zero CQI index and continue to send CSI reports for SCell 1 with non-zero CQI index until the end of T3. All of the above test requirements shall be fulfilled in order for the observed SCell1 direct activation delay to be counted as correct. The rate of correct observed SCell1 direct activation delay during repeated tests shall be at least 90%.

NOTE: In this test case the placement of interruptions is only verified in NR PSCell.

5.5.4 UE UL carrier RRC reconfiguration delay

5.5.5 Link recovery procedures

5.5.5.0 Minimum conformance requirements

5.5.5.0.1 Minimum conformance requirements for SSB-based BFD and link recovery procedures

[TS38.133, clause 8.5.2.1]

The requirements in this clause apply for each SSB resource in the set $\overline{q}_0$ configured for a serving cell, provided that the SSB configured for beam failure detection is actually transmitted within the UE active DL BWP during the entire evaluation period specified in TS 38.133 [6] clause 8.5.2.2. The requirements in this clause could not be applicable if UE is required to perform beam failure detection on more than 1 serving cell per band.

Table 5.5.5.0.1-1: PDCCH transmission parameters for beam failure instance

Attribute	Value for BLER
DCI format	1-0
Number of control OFDM symbols	2
Aggregation level (CCE)	8
Ratio of hypothetical PDCCH RE energy to average SSS RE energy	0dB
Ratio of hypothetical PDCCH DMRS energy to average SSS RE energy	0dB
Bandwidth (PRBs)	24
Sub-carrier spacing (kHz)	Same as the SCS of RMSI CORESET
DMRS precoder granularity	REG bundle size
REG bundle size	6
CP length	Normal
Mapping from REG to CCE	Distributed

[TS38.133, clause 8.5.2.2]

UE shall be able to evaluate whether the downlink radio link quality on the configured SSB resource in set $\overline{q}_0$ estimated over the last $T_{Evaluate_BFD_SSB}$ ms period becomes worse than the threshold $Q_{out_LR_SSB}$ within $T_{Evaluate_BFD_SSB}$ ms period.

The value of $T_{Evaluate_BFD_SSB}$ is defined in Table 5.5.5.0.1-2 for FR2 with scaling factor N=8.

For FR2,

- P=1/(1-T_{SSB}/$T_{SMTCperiod}$), when BFD-RS is not overlapped with measurement gap and the BFD-RS resource is partially overlapped with SMTC occasion (T_{SSB} < $T_{SMTCperiod}$).

- P = $P_{sharing\ factor}$, when the BFD-RS resource is not overlapped with measurement gap and the BFD-RS resource is fully overlapped with SMTC period ($T_{SSB} = T_{SMTCperiod}$).

- P=1/(1-T_{SSB}/MGRP-T_{SSB}/$T_{SMTCperiod}$), when the BFD-RS resource is partially overlapped with measurement gap and the BFD-RS resource is partially overlapped with SMTC occasion ($T_{SSB} < T_{SMTCperiod}$) and SMTC occasion is not overlapped with measurement gap and

  - $T_{SMTCperiod} \neq$ MGRP or

  - $T_{SMTCperiod}$ = MGRP and $T_{SSB} < 0.5*T_{SMTCperiod}$

- P= $P_{sharing\ factor}$ /(1-T_{SSB}/MGRP), when the BFD-RS resource is partially overlapped with measurement gap and the BFD-RS resource is partially overlapped with SMTC occasion ($T_{SSB} < T_{SMTCperiod}$) and SMTC occasion is not overlapped with measurement gap and $T_{SMTCperiod}$ = MGRP and $T_{SSB} = 0.5*T_{SMTCperiod}$

- P=1/(1-T_{SSB}/ $T_{SMTCperiod}$), when the BFD-RS resource is partially overlapped with measurement gap (T_{SSB} <MGRP) and the BFD-RS resource is partially overlapped with SMTC occasion ($T_{SSB} < T_{SMTCperiod}$) and SMTC occasion is partially or fully overlapped with measurement gap.

- P= $P_{sharing\ factor}$ /(1-T_{SSB}/MGRP), when the BFD-RS resource is partially overlapped with measurement gap and the BFD-RS resource is fully overlapped with SMTC occasion ($T_{SSB} = T_{SMTCperiod}$) and SMTC occasion is partially overlapped with measurement gap ($T_{SMTCperiod}$ < MGRP)

- $P_{sharing\ factor}$ = 1, if the BFD-RS resource outside measurement gap is

  - not overlapped with the SSB symbols indicated by *SSB-ToMeasure* and 1 data symbol before each consecutive SSB symbols indicated by *SSB-ToMeasure* and 1 data symbol after each consecutive SSB symbols indicated by *SSB-ToMeasure*, given that *SSB-ToMeasure* is configured, where the *SSB-ToMeasure* is the union set of *SSB-ToMeasure* from all the configured measurement objects merged on the same serving carrier, and;- not overlapped with the RSSI symbols indicated by *ss-RSSI-Measurement* and 1 data symbol before each RSSI symbol indicated by *ss-RSSI-Measurement* and 1 data symbol after each RSSI symbol indicated by *ss-RSSI-Measurement*, given that *ss-RSSI-Measurement* is configured.

- $P_{sharing\ factor}$ = 3, otherwise.

where,

If the high layer in TS 38.331 [2] signaling of *smtc2* is configured, $T_{SMTCperiod}$ corresponds to the value of higher layer parameter *smtc2*; Otherwise $T_{SMTCperiod}$ corresponds to the value of higher layer parameter *smtc1*. $T_{SMTCperiod}$ is the shortest SMTC period among all CCs in the same FR2 band, given the SMTC offset of all CCs in FR2 provided the same offset.

Longer evaluation period would be expected if the combination of BFD resource, SMTC occasion and measurement gap configurations does not meet pervious conditions.

For either an FR1 or FR2 serving cell, longer evaluation period would be expected during the period $T_{identify_CGI}$ when the UE is requested to decode an NR CGI.

For either an FR1 or FR2 serving cell, longer BFD evaluation period would be expected during the period $T_{identify_CGI,E-UTRAN}$ when the UE is requested to decode an LTE CGI.

Table 5.5.5.0.1-2: Evaluation period $T_{Evaluate_BFD_SSB}$ for FR2

Configuration	$T_{Evaluate_BFD_SSB}$ (ms)
no DRX	Max([50], Cceil(5*P*N)*T_{SSB})
DRX cycle ≤ 320ms	Mmax([50], Cceil(7.5*P*N)*Mmax(T_{DRX},T_{SSB}))
DRX cycle > 320ms	Cceil(5*P*N)*T_{DRX}
NOTE: T_{SSB} is the periodicity of SSB in the set $\bar{q}_0$. T_{DRX} is the DRX cycle length.	

[TS38.133, clause 8.5. 2.3]

The UE is required to be capable of measuring SSB for BFD without measurement gaps. The UE is required to perform the SSB measurements with measurement restrictions as described in the following clauses.

For FR2, when the SSB for BFD measurement on one CC is in the same OFDM symbol as CSI-RS for RLM, BFD, CBD or L1-RSRP measurement on the same CC or different CCs in the same band, UE is required to measure one of but not both SSB for BFD measurement and CSI-RS. Longer measurement period for SSB based BFD measurement is expected, and no requirements are defined.

[TS38.133, clause 8.5.4]

When the radio link quality on all the RS resources in set $\overline{Q}_0$ is worse than Q_{out_LR}, Layer 1 of the UE shall send a beam failure instance indication to the higher layers.

The beam failure instance evaluation for the RS resources in set $\overline{Q}_0$ shall be performed as specified in clause 6 in TS 38.213. Two successive indications from Layer 1 shall be separated by at least $T_{Indication_interval_BFD}$.

When DRX is not used, $T_{Indication_interval_BFD}$ is max(2ms, $T_{SSB\text{-}RS,M}$)) or max(2ms, $T_{CSI\text{-}RS,M}$), where $T_{SSB\text{-}RS,M}$ and $T_{CSI\text{-}RS,M}$ is the shortest periodicity of all RS resources in set $\overline{Q}_0$ for the accessed cell, corresponding to either the shortest periodicity of the SSB in the set $\overline{Q}_0$ or CSI-RS resource in the set $\overline{Q}_0$.

When DRX is used, for SSB based link quality measurement,

- $T_{Indication_interval_BFD}$ = Max(1.5 × DRX_cycle_length, 1.5 × $T_{SSB\text{-}RS,M}$), if DRX_cycle_length ≤ 320ms,
- $T_{Indication_interval_BFD}$ = DRX_cycle_length, if DRX_cycle_length > 320ms.

[TS38.133, clause 8.5.5.1]

The requirements in this clause apply for each SSB resource in the set $\overline{q}_1$ configured for a serving cell, provided that the SSBs configured for candidate beam detection are actually transmitted within UE active DL BWP during the entire evaluation period specified in TS 38.133 [6] clause 8.5.5.2. The requirements in this clause could not be applicable if UE is required to perform candidate beam detection on more than 1 serving cell per band or on more than one band among a set of bands that it can receive with a common beam.

[TS38.133, clause 8.5.5.2]

Upon request the UE shall be able to evaluate whether the L1-RSRP measured on the configured SSB resource in set $\overline{q}_1$ estimated over the last $T_{Evaluate_CBD_SSB}$ ms period becomes better than the threshold Q_{in_LR} provided SSB_RP and SSB Ês/Iot are according to Annex Table B.2.4.1 for a corresponding band.

The UE shall monitor the configured SSB resources using the evaluation period in table 5.5.5.0.1-3 corresponding to the non-DRX mode, if the configured DRX cycle ≤ 320ms.

The value of $T_{Evaluate_CBD_SSB}$ is defined in Table 5.5.5.0.1-3 for FR2 with scaling factor N=8.

Where,

For FR2,

- $P=1/(1-T_{SSB}/T_{SMTCperiod})$, when candidate beam detection RS is not overlapped with measurement gap and candidate beam detection RS is partially overlapped with SMTC occasion ($T_{SSB} < T_{SMTCperiod}$).
- P is $P_{sharing\ factor}$, when candidate beam detection RS is not overlapped with measurement gap and candidate beam detection RS is fully overlapped with SMTC period ($T_{SSB} = T_{SMTCperiod}$).
- $P=1/(1-T_{SSB}/MGRP-T_{SSB}/T_{SMTCperiod})$, when candidate beam detection RS is partially overlapped with measurement gap and candidate beam detection RS is partially overlapped with SMTC occasion ($T_{SSB} < T_{SMTCperiod}$) and SMTC occasion is not overlapped with measurement gap and
  - $T_{SMTCperiod} \neq$ MGRP or
  - $T_{SMTCperiod}$ = MGRP and $T_{SSB} < 0.5*T_{SMTCperiod}$

- $P = P_{sharing\ factor} / (1-T_{SSB}/MGRP)$, when candidate beam detection RS is partially overlapped with measurement gap and candidate beam detection RS is partially overlapped with SMTC occasion ($T_{SSB} < T_{SMTCperiod}$) and SMTC occasion is not overlapped with measurement gap and $T_{SMTCperiod} = MGRP$ and $T_{SSB} = 0.5*T_{SMTCperiod}$

- $P=1/(1-T_{SSB}/ T_{SMTCperiod})$, when candidate beam detection RS is partially overlapped with measurement gap and candidate beam detection RS is partially overlapped with SMTC occasion ($T_{SSB} < T_{SMTCperiod}$) and SMTC occasion is partially or fully overlapped with measurement gap

- $P = P_{sharing\ factor} / (1-T_{SSB}/MGRP)$, when candidate beam detection RS is partially overlapped with measurement gap and candidate beam detection RS is fully overlapped with SMTC occasion ($T_{SSB} = T_{SMTCperiod}$) and SMTC occasion is partially overlapped with measurement gap ($T_{SMTCperiod} < MGRP$)

- $P_{sharing\ factor} = 1$, if the candidate beam detection RS outside measurement gap is

  - not overlapped with the SSB symbols indicated by *SSB-ToMeasure* and 1 data symbol before each consecutive SSB symbols indicated by *SSB-ToMeasure* and 1 data symbol after each consecutive SSB symbols indicated by *SSB-ToMeasure*, given that *SSB-ToMeasure* is configured, where the *SSB-ToMeasure* is the union set of *SSB-ToMeasure* from all the configured measurement objects merged on the same serving carrier, and;

- not overlapped with the RSSI symbols indicated by *ss-RSSI-Measurement* and 1 data symbol before each RSSI symbol indicated by *ss-RSSI-Measurement* and 1 data symbol after each RSSI symbol indicated by *ss-RSSI-Measurement*, given that *ss-RSSI-Measurement* is configured - $P_{sharing\ factor} = 3$, otherwise.

where,

If the high layer in TS 38.331 [2] signaling of *smtc2* is present, $T_{SMTCperiod}$ follows *smtc2*; Otherwise $T_{SMTCperiod}$ follows *smtc1*. $T_{SMTCperiod}$ is the shortest SMTC period among all CCs in the same FR2 band, provided the SMTC offset of all CCs in FR2 have the same offset.

Longer evaluation period would be expected if the combination of the CBD-RS resource, SMTC occasion and measurement gap configurations does not meet pervious conditions.

For either an FR1 or FR2 serving cell, longer evaluation period would be expected during the period $T_{identify_CGI}$ when the UE is requested to decode an NR CGI.

For either an FR1 or FR2 serving cell, longer CBD evaluation period would be expected during the period $T_{identify_CGI,E-UTRAN}$ when the UE is requested to decode an LTE CGI.

The values of P_{CBD} used in Table 5.5.5.0.1-3 are defined as

For each SSB resource in the set $\overline{q}_1$ configured for PCell or PSCell in EN-DC or NE-DC or SA; or PCell in NR-DC

- $P_{CBD} = 1$.

For each SSB resource in the set $\overline{q}_1$ configured for PSCell in NR-DC

- $P_{CBD} = 2$ if UE is configured for candidate beam detection on SCell, 1 otherwise.

For each SSB resource in the set $\overline{q}_1$ configured for a SCell

- $P_{CBD} = Z$ in EN-DC or NE-DC or SA.

- $P_{CBD} = 2* Z$ in NR-DC.

Where Z is the number of band(s) on which UE is performing beam failure detection only for SCell Table 5.5.5.0.1-3: Evaluation period $T_{Evaluate_CBD_SSB}$ for FR2

Configuration	$T_{Evaluate_CBD_SSB}$ (ms)
non-DRX, DRX cycle ≤ 320ms	$Max(25, Ceil(3 \times P \times N \times P_{CBD}) \times T_{SSB})$
DRX cycle > 320ms	$Ceil(3 \times P \times N \times P_{CBD}) \times T_{DRX}$
NOTE: T_{SSB} is the periodicity of SSB in the set $\overline{q}_1$. T_{DRX} is the DRX cycle length.	

[TS38.133, clause 8.5.5.3]

For FR2, when the SSB for CBD measurement on one CC is in the same OFDM symbol as CSI-RS for RLM, BFD, CBD or L1-RSRP measurement on the same CC or different CCs in the same band, UE is required to measure one of but not both SSB for CBD measurement and CSI-RS. Longer measurement period for SSB based CBD measurement is expected, and no requirements are defined.

References: The conformance requirements covered in the current TC are specified in: TS 38.133 [6], clauses 8.5.2.1, 8.5.2.2, 8.5.2.3, 8.5.4, 8.5.5.1, 8.5.5.2 and 8.5.5.3.

5.5.5.0.2 Minimum conformance requirements for CSI-RS-based BFD and link recovery procedures

[TS38.133, clause 8.5.3.1]

The requirements in this clause apply for each CSI-RS resource in the set $\bar{q}_0$ of resource configurations for a serving cell, provided that the CSI-RS resource(s) in set $\bar{q}_0$ for beam failure detection are actually transmitted within the UE active DL BWP during the entire evaluation period specified in TS 38.133 clause 8.5.3.2. UE is not expected to perform beam failure detection measurements on the CSI-RS configured as BFD-RS if the CSI-RS is not QCL-ed, with QCL-TypeD when applicable, with the RS in the active TCI state of any CORESET configured in the UE active BWP. The requirements in this clause could not be applicable if UE is required to perform beam failure detection on more than 1 serving cell per band or on more than one band among a set of bands that it can receive with a common beam.

Table 5.5.5.0.2-1: PDCCH transmission parameters for beam failure instance

Attribute	Value for BLER
DCI format	1-0
Number of control OFDM symbols	2
Aggregation level (CCE)	8
Ratio of hypothetical PDCCH RE energy to average CSI-RS RE energy	0dB
Ratio of hypothetical PDCCH DMRS energy to average CSI-RS RE energy	0dB
Bandwidth (PRBs)	48
Sub-carrier spacing (kHz)	SCS of the active DL BWP
DMRS precoder granularity	REG bundle size
REG bundle size	6
CP length	Normal
Mapping from REG to CCE	Distributed

[TS38.133, clause 8.5.3.2]

UE shall be able to evaluate whether the downlink radio link quality on the CSI-RS resource in set $\bar{q}_0$ estimated over the last $T_{Evaluate_BFD_CSI-RS}$ ms period becomes worse than the threshold $Q_{out_LR_CSI-RS}$ within $T_{Evaluate_BFD_CSI-RS}$ ms period.

The value of $T_{Evaluate_BFD_CSI-RS}$ is defined in Table 5.5.5.0.2-2 for FR2 with N=1. The requirements of $T_{Evaluate_BFD_CSI-RS}$ apply provided that the CSI-RS for BFD is not in a resource set configured with repetition ON. The requirements shall not apply when the CSI-RS resource in the active TCI state of CORESET is the same CSI-RS resource for BFD and the TCI state information of the CSI-RS resource is not given, wherein the TCI state information means QCL Type-D to SSB for L1-RSRP or CSI-RS with repetition ON.

For FR2,

- P=1, when the BFD-RS resource is not overlapped with measurement gap and also not overlapped with SMTC occasion.

- $P=1/(1 - T_{CSI-RS}/MGRP)$, when the BFD-RS resource is partially overlapped with measurement gap and the BFD-RS resource is not overlapped with SMTC occasion ($T_{CSI-RS} < MGRP$)

- $P=1/(1 - T_{CSI-RS} /T_{SMTCperiod})$, when the BFD-RS resource is not overlapped with measurement gap and the BFD-RS resource is partially overlapped with SMTC occasion ($T_{CSI-RS} < T_{SMTCperiod}$).

- P is $P_{sharing\ factor}$, when the BFD-RS resource is not overlapped with measurement gap and the BFD-RS resource is fully overlapped with SMTC occasion ($T_{CSI-RS} = T_{SMTCperiod}$).

- P is $1/(1- T_{CSI-RS} /MGRP - T_{CSI-RS} /T_{SMTCperiod})$, when the BFD-RS resource is partially overlapped with measurement gap and the BFD-RS resource is partially overlapped with SMTC occasion ($T_{CSI-RS} < T_{SMTCperiod}$) and SMTC occasion is not overlapped with measurement gap and

  - $T_{SMTCperiod} \neq MGRP$ or

  - $T_{SMTCperiod} = MGRP$ and $T_{CSI-RS} < 0.5*T_{SMTCperiod}$

- P is $1/(1- T_{CSI-RS} /MGRP)* P_{sharing\ factor}$, when the BFD-RS resource is partially overlapped with measurement gap and the BFD-RS resource is partially overlapped with SMTC occasion ($T_{CSI-RS} < T_{SMTCperiod}$) and SMTC occasion is not overlapped with measurement gap and $T_{SMTCperiod} = MGRP$ and $T_{CSI-RS} = 0.5*T_{SMTCperiod}$

- P is $1/\{1- T_{CSI-RS} / T_{SMTCperiod} \}$, when the BFD-RS resource is partially overlapped with measurement gap ($T_{CSI-RS} < MGRP$) and the BFD-RS resource is partially overlapped with SMTC occasion ($T_{CSI-RS} < T_{SMTCperiod}$) and SMTC occasion is partially or fully overlapped with measurement gap.

- P is $1/(1- T_{CSI-RS} /MGRP)* P_{sharing\ factor}$, when the BFD-RS resource is partially overlapped with measurement gap and the BFD-RS resource is fully overlapped with SMTC occasion ($T_{CSI-RS} = T_{SMTCperiod}$) and SMTC occasion is partially overlapped with measurement gap ($T_{SMTCperiod} < MGRP$)

- $P_{sharing\ factor} = 1$, if the BFD-RS resource outside measurement gap is

  - not overlapped with the SSB symbols indicated by *SSB-ToMeasure* and 1 data symbol before each consecutive SSB symbols indicated by *SSB-ToMeasure* and 1 data symbol after each consecutive SSB symbols indicated by *SSB-ToMeasure*, given that *SSB-ToMeasure* is configured, where the *SSB-ToMeasure* is the union set of *SSB-ToMeasure* from all the configured measurement objects merged on the same serving carrier, and;

  - not overlapped with the RSSI symbols indicated by *ss-RSSI-Measurement* and 1 data symbol before each RSSI symbol indicated by *ss-RSSI-Measurement* and 1 data symbol after each RSSI symbol indicated by *ss-RSSI-Measurement*, given that *ss-RSSI-Measurement* is configured,

- $P_{sharing\ factor}$ is 3, otherwise.

where,

If the high layer in TS 38.331 [2] signalling of *smtc2* is configured, $T_{SMTCperiod}$ corresponds to the value of higher layer parameter *smtc2*; Otherwise $T_{SMTCperiod}$ corresponds to the value of higher layer parameter *smtc1*. $T_{SMTCperiod}$ is the shortest SMTC period among all CCs in the same FR2 band, provided the SMTC offset of all CCs in FR2 have the same offset.

NOTE: The overlap between CSI-RS for BFD and SMTC means that CSI-RS for BFD is within the SMTC window duration.

Longer evaluation period would be expected if the combination of BFD-RS, SMTC occasion and measurement gap configurations does not meet pervious conditions.

For either an FR1 or FR2 serving cell, longer evaluation period would be expected during the period $T_{identify_CGI}$ when the UE is requested to decode an NR CGI.

For either an FR1 or FR2 serving cell, longer BFD evaluation period would be expected during the period $T_{identify_CGI,E-UTRAN}$ when the UE is requested to decode an LTE CGI.

The values of M_{BFD} used in Table 5.5.5.0.2-2 are defined as

- M_{BFD} = 10, if the CSI-RS resource(s) in set $\bar{q}_0$ used for BFD is transmitted with Density = 3 and over the bandwidth $\geqslant$ 24 PRBs.

The values of P_{BFD} used in Table 5.5.5.0.2-2 are defined as

For each CSI-RS resource in the set $\bar{q}_0$ configured for PCell or PSCell in EN-DC or NE-DC or SA; or PCell in NR-DC

- P_{BFD} = 1.

For each CSI-RS resource in the set $\bar{q}_0$ configured for PSCell in NR-DC

P_{BFD} = 2 if UE is configured for beam failure detection on SCell, 1 otherwise.

For each CSI-RS resource in the set $\bar{q}_0$ configured for a SCell

- P_{BFD} = Z in EN-DC or NE-DC or SA.
- P_{BFD} = 2* Z in NR-DC.

  Where Z is the number of band(s) on which UE is performing beam failure detection only for SCell

Table 5.5.5.0.2-2: Evaluation period $T_{Evaluate_BFD_CSI\text{-}RS}$ for FR2

Configuration	$T_{Evaluate_BFD_CSI\text{-}RS}$ (ms)
no DRX	$Max(50, Ceil(M_{BFD} \times P \times N \times P_{BFD}) \times T_{CSI\text{-}RS})$
DRX cycle ≤ 320ms	$Max(50, Ceil(1.5 \times M_{BFD} \times P \times N \times P_{BFD}) \times Max(T_{DRX}, T_{CSI\text{-}RS}))$
DRX cycle > 320ms	$Ceil(M_{BFD} \times P \times N \times P_{BFD}) \times T_{DRX}$
NOTE: $T_{CSI\text{-}RS}$ is the periodicity of CSI-RS resource in the set $\bar{q}_0$. T_{DRX} is the DRX cycle length.	

[TS38.133, clause 8.5.3.3]

The UE is required to be capable of measuring CSI-RS for BFD without measurement gaps. The UE is required to perform the CSI-RS measurements with measurement restrictions as described in the following clauses.

For FR2, when the CSI-RS for BFD measurement is in the same OFDM symbol as SSB for RLM/BFD/CBD/L1-RSRP measurement, UE is not required to receive CSI-RS for BFD measurement in the PRBs that overlap with an SSB.

For FR2, when the CSI-RS for BFD measurement on one CC is in the same OFDM symbol as SSB for RLM, BFD or L1-RSRP measurement on the same CC or different CCs in the same band, or in the same symbol as SSB for CBD measurement on the same CC or different CCs in the same band when beam failure is detected, UE is required to measure one of but not both CSI-RS for BFD measurement and SSB. Longer measurement period for CSI-RS based BFD measurement is expected, and no requirements are defined.

For FR2, when the CSI-RS for BFD measurement on one CC is in the same OFDM symbol as another CSI-RS for RLM, BFD, CBD or L1-RSRP measurement on the same CC or different CCs in the same band,

- In the following cases, UE is required to measure one of but not both CSI-RS for BFD measurement and the other CSI-RS. Longer measurement period for CSI-RS based BFD measurement is expected, and no requirements are defined.
  - The CSI-RS for BFD measurement or the other CSI-RS in a resource set configured with repetition ON, or
  - The other CSI-RS is configured in set $\bar{q}_1$ and beam failure is detected, or
  - The two CSI-RS-es are not QCL-ed w.r.t. QCL-TypeD, or the QCL information is not known to UE,
- Otherwise, UE shall be able to measure the CSI-RS for BFD measurement without any restriction.

[TS38.133, clause 8.5.4]

When the radio link quality on all the RS resources in set $\overline{q}_0$ is worse than Q_{out_LR}, Layer 1 of the UE shall send a beam failure instance indication to the higher layers.

The beam failure instance evaluation for the RS resources in set $\overline{q}_0$ shall be performed as specified in clause 6 in TS 38.213. Two successive indications from Layer 1 shall be separated by at least $T_{Indication_interval_BFD}$.

When DRX is not used, $T_{Indication_interval_BFD}$ is max(2ms, $T_{SSB\text{-}RS,M}$)) or max(2ms, $T_{CSI\text{-}RS,M}$), where $T_{SSB\text{-}RS,M}$ and $T_{CSI\text{-}RS,M}$ is the shortest periodicity of all RS resources in set $\overline{q}_0$ for the accessed cell, corresponding to either the shortest periodicity of the SSB in the set $\overline{q}_0$ or CSI-RS resource in the set $\overline{q}_0$.

When DRX is used, for CSI-RS based link quality measurement,

- $T_{Indication_interval_BFD}$ = Max(1.5 × DRX_cycle_length, 1.5 × $T_{CSI\text{-}RS,M}$), if DRX_cycle_length ≤ 320ms,
- $T_{Indication_interval_BFD}$ = DRX_cycle_length, if DRX_cycle_length > 320ms.

[TS38.133, clause 8.5.6.1]

The requirements in this clause apply for each CSI-RS resource in the set $\overline{q}_1$ configured for a serving cell, provided that the CSI-RS resources configured for candidate beam detection are actually transmitted within UE active DL BWP during the entire evaluation period specified in TS 38.133 clause 8.5.6.2. The requirements in this clause could not be applicable if UE is required to perform candidate beam detection on more than 1 serving cell per band or on more than one band among a set of bands that it can receive with a common beam.

[TS38.133, clause 8.5.6.2]

Upon request the UE shall be able to evaluate whether the L1-RSRP measured on the configured CSI-RS resource in set $\overline{q}_1$ estimated over the last $T_{Evaluate_CBD_CSI\text{-}RS}$ [ms] period becomes better than the threshold Q_{in_LR} within $T_{Evaluate_CBD_CSI\text{-}RS}$ [ms] period provided CSI-RS Ês/Iot is according to TS 38.133 Annex Table B.2.4.2 for a corresponding band.

The UE shall monitor the configured CSI-RS resources using the evaluation period in Table 5.5.5.0.2-3 corresponding to the non-DRX mode, if the configured DRX cycle ≤ 320ms.

The value of $T_{Evaluate_CBD_CSI\text{-}RS}$ is defined in Table 5.5.5.0.2-3 for FR2 with scaling factor N=8.

For FR2,

- P=1, when candidate beam detection RS is not overlapped with measurement gap and also not overlapped with SMTC occasion.
- P=1/(1 – $T_{CSI\text{-}RS}$/MGRP) , when candidate beam detection RS is partially overlapped with measurement gap and candidate beam detection RS is not overlapped with SMTC occasion ($T_{CSI\text{-}RS}$ < MGRP)
- P=1/(1 – $T_{CSI\text{-}RS}$ /$T_{SMTCperiod}$), when candidate beam detection RS is not overlapped with measurement gap and candidate beam detection RS is partially overlapped with SMTC occasion ($T_{CSI\text{-}RS}$ < $T_{SMTCperiod}$).
- P =$P_{sharing\ factor}$, when candidate beam detection RS is not overlapped with measurement gap and candidate beam detection RS is fully overlapped with SMTC occasion ($T_{CSI\text{-}RS}$ = $T_{SMTCperiod}$).
- P is 1/(1- $T_{CSI\text{-}RS}$ /MGRP - $T_{CSI\text{-}RS}$ /$T_{SMTCperiod}$), when candidate beam detection RS is partially overlapped with measurement gap and candidate beam detection RS is partially overlapped with SMTC occasion ($T_{CSI\text{-}RS}$ < $T_{SMTCperiod}$) and SMTC occasion is not overlapped with measurement gap and
  - $T_{SMTCperiod}$ ≠ MGRP or
  - $T_{SMTCperiod}$ = MGRP and $T_{CSI\text{-}RS}$ < 0.5*$T_{SMTCperiod}$
- P is 1/(1- $T_{CSI\text{-}RS}$ /MGRP)* $P_{sharing\ factor}$, when candidate beam detection RS is partially overlapped with measurement gap and candidate beam detection RS is partially overlapped with SMTC occasion ($T_{CSI\text{-}RS}$ < $T_{SMTCperiod}$) and SMTC occasion is not overlapped with measurement gap and $T_{SMTCperiod}$ = MGRP and $T_{CSI\text{-}RS}$ = 0.5*$T_{SMTCperiod}$

- P is 1/{1- T_{CSI-RS} / $T_{SMTCperiod}$ }, when candidate beam detection RS is partially overlapped with measurement gap and candidate beam detection RS is partially overlapped with SMTC occasion (T_{CSI-RS} < $T_{SMTCperiod}$) and SMTC occasion is partially or fully overlapped with measurement gap

- P is 1/(1- T_{CSI-RS} /MGRP)* 3, when candidate beam detection RS is partially overlapped with measurement gap and candidate beam detection RS is fully overlapped with SMTC occasion (T_{CSI-RS} = $T_{SMTCperiod}$) and SMTC occasion is partially overlapped with measurement gap ($T_{SMTCperiod}$ < MGRP)- $P_{sharing\ factor}$ = 1, if the candidate beam detection RS outside measurement gap is

  - not overlapped with the SSB symbols indicated by *SSB-ToMeasure* and 1 data symbol before each consecutive SSB symbols indicated by *SSB-ToMeasure* and 1 data symbol after each consecutive SSB symbols indicated by *SSB-ToMeasure*, given that *SSB-ToMeasure* is configured, where the *SSB-ToMeasure* is the union set of *SSB-ToMeasure* from all the configured measurement objects merged on the same serving carrier, and;

  - not overlapped with the RSSI symbols indicated by *ss-RSSI-Measurement* and 1 data symbol before each RSSI symbol indicated by *ss-RSSI-Measurement* and 1 data symbol after each RSSI symbol indicated by *ss-RSSI-Measurement*, given that *ss-RSSI-Measurement* is configured.

- $P_{sharing\ factor}$ = 3, otherwise.

where,

If the high layer in TS 38.331 [2] signalling of *smtc2* is present, $T_{SMTCperiod}$ follows *smtc2*; Otherwise $T_{SMTCperiod}$ follows *smtc1*. $T_{SMTCperiod}$ is the shortest SMTC period among all CCs in the same FR2 band, provided the SMTC offset of all CCs in FR2 have the same offset.

Note: The overlap between CSI-RS for CBD and SMTC means that CSI-RS for CBD is within the SMTC window duration.

Longer evaluation period would be expected if the combination of the CBD-RS resource, SMTC occasion and measurement gap configurations does not meet pervious conditions.

Longer evaluation period would be expected if the CSI-RS is on the same OFDM symbols with RLM, BFD, BM-RS, or other CBD-RS, according to the measurement restrictions defined in TS 38.133 clause 8.5.6.3.

For either an FR1 or FR2 serving cell, longer evaluation period would be expected during the period $T_{identify_CGI}$ when the UE is requested to decode an NR CGI.

For either an FR1 or FR2 serving cell, longer CBD evaluation period would be expected during the period $T_{identify_CGI,E-UTRAN}$ when the UE is requested to decode an LTE CGI.

The values of M_{CBD} used in Table 8.5.6.2-1 and Table 8.5.6.2-2 are defined as

- M_{CBD} = 3, if the CSI-RS resource configured in the set $\bar{q}_1$ is transmitted with Density = 3 and over the bandwidth $\geqslant$ 24 PRBs.

The values of P_{CBD} used in Table 8.5.6.2-1 and Table 8.5.6.2-2 are defined as

For each CSI-RS resource in the set $\bar{q}_1$ configured for PCell or PSCell in EN-DC or NE-DC or SA; or PCell in NR-DC

- P_{CBD} = 1.

For each CSI-RS resource in the set $\bar{q}_1$ configured for PSCell in NR-DC

- P_{CBD} = 2 if UE configured for candidate beam detection on SCell, 1 otherwise.

For each CSI-RS resource in the set $\bar{q}_1$ configured for a SCell

- P_{CBD} = Z in EN-DC or NE-DC or SA.

- P_{CBD} = 2* Z in NR-DC.

  Where Z is the number of band(s) on which UE is performing beam failure detection only for SCell

Table 5.5.5.0.2-3: Evaluation period $T_{Evaluate_CBD_CSI\text{-}RS}$ for FR2

Configuration	$T_{Evaluate_CBD_CSI\text{-}RS}$ (ms)
non-DRX, DRX cycle ≤ 320ms	$Max(25, Ceil(M_{CBD} \times P \times N \times P_{CBD}) \times T_{CSI\text{-}RS})$
DRX cycle > 320ms	$Ceil(M_{CBD} \times P \times N \times P_{CBD}) \times T_{DRX}$
NOTE: $T_{CSI\text{-}RS}$ is the periodicity of CSI-RS resource in the set $\overline{q}_1$. T_{DRX} is the DRX cycle length.	

[TS38.133, clause 8.5.6.3]

For FR2, when the CSI-RS for CBD measurement is in the same OFDM symbol as SSB for RLM/BFD/CBD/L1-RSRP measurement, UE is not required to receive CSI-RS for CBD measurement in the PRBs that overlap with an SSB.

For FR2, when the CSI-RS for CBD measurement on one CC is in the same OFDM symbol as SSB for RLM, BFD, CBD or L1-RSRP measurement on the same CC or different CCs in the same band, UE is required to measure one of but not both CSI-RS for CBD measurement and SSB. Longer evaluation period for CSI-RS based CBD measurement is expected, and no requirements are defined.

For FR2, when the CSI-RS for CBD measurement on one CC is in the same OFDM symbol as another CSI-RS for RLM, BFD, CBD or L1-RSRP measurement on the same CC or different CCs in the same band, UE is required to measure one of but not both CSI-RS for CBD measurement and the other CSI-RS. Longer evaluation period for CSI-RS based CBD measurement is expected, and no requirements are defined.

References: The conformance requirements covered in the current TC are specified in: TS 38.133 [6], clauses 8.5.3.1, 8.5.3.2, 8.5.3.3, 8.5.4, 8.5.6.1, 8.5.6.2 and 8.5.6.3.

5.5.5.0.3 Scheduling availability of UE during beam failure detection and candidate beam detection

[TS38.133, clause 8.5.7.3]

The following scheduling restriction applies due to beam failure detection.

- For the case where no RSs are provided for BFD, or when CSI-RS is configured for BFD is explicitly configured and is type-D QCLed with active TCI state for PDCCH or PDSCH, and the CSI-RS is not in a CSI-RS resource set with repetition ON
  - There are no scheduling restrictions due to beam failure detection performed based on the CSI-RS.
- Otherwise
  - The UE is not expected to transmit PUCCH, PUSCH or SRS or receive PDCCH, PDSCH or CSI-RS for tracking or CSI-RS for CQI on BFD-RS resource symbols to be measured for beam failure detection.

For FR2, if following conditions are met,

- UE has been notified about system information update through paging,
- The gap between UE's reception of PDCCH that UE monitors in the Type2-PDCCH CSS set and that notifies system information update, and the PDCCH that UE monitors in the Type0-PDCCH CSS set, is greater than 2 slots,

For the SSB and CORESET for RMSI scheduling multiplexing patterns 3, UE is expected to receive the PDCCH that UE monitors in the Type0-PDCCH CSS set, and the corresponding PDSCH, on SSB symbols to be measured for BFD measurement; and

For the SSB and CORESET for RMSI scheduling multiplexing patterns 2, UE is expected to receive PDSCH that corresponds to the PDCCH that UE monitors in the Type0-PDCCH CSS set, on SSB symbols to be measured for BFD measurement.

[TS38.133, clause 8.5.8.3]

The following scheduling restriction applies due to candidate beam detection

- The UE is not expected to transmit PUCCH, PUSCH or SRS or receive PDCCH, PDSCH, CSI-RS for tracking or CSI-RS for CQI on reference symbols to be measured for candidate beam detection.

For FR2, if following conditions are met,

- UE has been notified about system information update through paging,
- The gap between UE's reception of PDCCH that UE monitors in the Type2-PDCCH CSS set and that notifies system information update, and the PDCCH that UE monitors in the Type0-PDCCH CSS set, is greater than 2 slots,

For the SSB and CORESET for RMSI scheduling multiplexing patterns 3, UE is expected to receive the PDCCH that UE monitors in the Type0-PDCCH CSS set, and the corresponding PDSCH, on SSB symbols to be measured for CBD measurement; and

For the SSB and CORESET for RMSI scheduling multiplexing patterns 2, UE is expected to receive PDSCH that corresponds to the PDCCH that UE monitors in the Type0-PDCCH CSS set, on SSB symbols to be measured for CBD measurement.

References: The conformance requirements covered in the current TC are specified in: TS 38.133 [6], clauses 8.5.7.4, 8.5.8.3.

5.5.5.0.4 Requirements for Beam Failure Recovery in SCell

[TS 38.133, clause 8.5.9.1]

For the UE provided with a configuration of PUCCH transmission with a link recovery request (LRR) as described in clause 9.2.4 in TS 38.213 [3], if beam recovery procedure is triggered for any of SCells, the UE shall transmit SR for UL resource, followed by MAC CE providing one index for at least one corresponding SCell with radio link quality is worse than $Q_{out,LR}$, and the index q_{new} for a periodic CSI-RS configuration or for a SSB provided by higher layer, as described in clause 5.17 of TS38.321 [7], if any, for a corresponding SCell.

For the UE not provided with a configuration of PUCCH transmission with a link recovery request (LRR) as described in clause 9.2.4 in TS 38.213 [3], if beam recovery procedure is triggered for any of SCells, the UE shall transmit preamble for UL-SCH resource application, followed by MAC CE providing one index for at least one corresponding SCell with radio link quality is worse than $Q_{out,LR}$, and the index q_{new} for a periodic CSI-RS configuration or for a SSB provided by higher layer, as described in clause 5.17 of TS38.321 [7], if any, for a corresponding SCell.

[TS 38.133, clause 8.5.9.2]

Provided that UE is configured by *schedulingRequestIDForBFR* a configuration for LRR in a PUCCH transmission, after BFR is triggered on any of SCells as described in clause 5.17 of TS38.321 [7], UE shall be capable of transmit PUCCH with a LRR within a period of T, where

- $T = T_1 \times Ceil((T_2+D)/T_1)$ in which T_1, T_2 and D are defined as
  - T_1 is equal to the periodicity of PUCCH configured with *schedulingRequestIDForBFR*.
  - $T_2 = T_{Evaluate_CBD}$ is the evaluation period specified in TS 38.133 clause 8.5.5 or 8.5.6 for SSB or CSI-RS based candidate beam detection, that is $T_{Evaluate_CBD_SSB}$ or $T_{Evaluate_CBD_CSI-RS}$, depending on the applicable reference signal configured for candidate beam detection.
  - D = 2ms is the UE Processing time.

References: The conformance requirements covered in the current TC are specified in: TS 38.133 [6], clauses 8.5.9.1, 8.5.9.2.

5.5.5.1 EN-DC FR2 SSB-based beam failure detection and link recovery in non-DRX

Editor's Note: This test case is complete for the following configurations:

- Test frequency f ≤ 40.8 GHz
- UE PC3

This test case is incomplete for Test frequency f > 40.8 GHz

This test case is incomplete for UE power class other than PC3.

5.5.5.1.1 Test purpose

The purpose of this test is to verify that the UE properly detects SSB-based beam failure in the set q_0 configured for a serving PSCell and that the UE performs correct SSB-based link recovery based on beam candidate set q_1. The purpose is to test he downlink monitoring for beam failure detection within the UEs active DL BWP of the PSCell, during the evaluation period, and link recovery, when no DRX is used. This test will partly verify the SSB based beam failure detection and link recovery for an FR2 serving cell requirements in TS 38.133 [6] clause 8.5.

5.5.5.1.2 Test applicability

This test applies to all types of NR UE supporting E-UTRA and EN-DC from release 15 onwards.

5.5.5.1.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 5.5.5.0.1.

The normative reference for this requirement is TS 38.133 [6] clause A.5.5.5.1.

5.5.5.1.4 Test description

There are two cell configured in this test: E-UTRAN PCell and NR PSCell. This test consists of five successive time periods, with time duration of T1, T2, T3, T4 and T5 respectively. Figure 5.5.5.1.4-1 shows the five different time durations and the corresponding variation of the downlink SNR of the PCell and the SNR of the SSB in set q_0 in the active PSCell to emulate SSB based beam failure. Figure 5.5.5.1.4-1 additionally shows the variation of the downlink L1-RSRP of the SSB in set q_1 of the candidate beam used for link recovery.

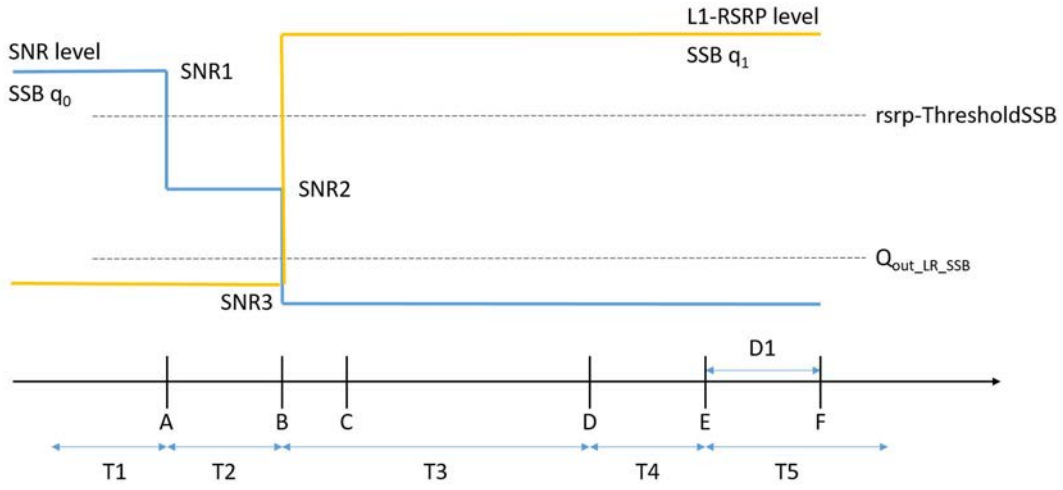


Figure 5.5.5.1.4-1: SNR and L1-RSRP for EN-DC FR2 SSB-based beam failure detection and link recovery in non-DRX

5.5.5.1.4.1 Initial conditions

This test shall be tested using any of the test configurations in Table 5.5.5.1.4.1-1.

Table 5.5.5.1.4.1-1: Supported test configurations for EN-DC FR2 SSB-based beam failure detection and link recovery in non-DRX

Configuration	Description
5.5.5.1-1	LTE FDD, NR TDD duplex mode, 120 kHz SSB SCS, 100 MHz bandwidth
5.5.5.1-2	LTE TDD, NR TDD duplex mode, 120 kHz SSB SCS, 100 MHz bandwidth

5.5.5.1-3	LTE FDD, NR TDD duplex mode, 240 kHz SSB SCS, 100 MHz bandwidth
5.5.5.1-4	LTE TDD, NR TDD duplex mode, 240 kHz SSB SCS, 100 MHz bandwidth
NOTE: The UE is only required to pass in one of the supported test configurations in FR2	

Configure the test equipment and the DUT according to the parameters in Table 5.5.5.1.4.1-2.

Table 5.5.5.1.4.1-2: Initial conditions for EN-DC FR2 SSB-based beam failure detection and link recovery in non-DRX

Parameter	Value		Comment
Test environment	NC		As specified in TS 38.508-1 [14] clause 4.1.
Test frequencies	As specified in Annex E, table E.3-1 and TS 38.508-1 [14] clause 4.3.1 for E-UTRA and 7.2.3 for NR.		
Channel bandwidth	As specified by the test configuration selected from Table 5.5.5.1.4.1-1.		
Propagation conditions	AWGN		As specified in clause C.2.2.
Connection Diagram	TE Part	A.3.3.1.1	As specified in TS 38.508-1 [14] Annex A.
	DUT Part	A.3.4.1.1	
Exceptions to connection diagram	N/A		

1. The general test parameter settings are set up according to Table 5.5.5.1.4.1-3.
2. Message contents are defined in clause 5.5.5.1.4.3.
3. There are one E-UTRAN cell and one NR cell specified in the test. E-UTRAN Cell 1 is the cell used for connection setup with the power level set according to clause C.1.1 and C.1.2 for this test.

Table 5.5.5.1.4.1-3: General test parameters for EN-DC FR2 SSB-based beam failure detection and link recovery in non-DRX

Parameter	Test Config.	Unit	Value	Comment
			Test 1	
Active E-UTRA PCell	1-4		Cell 1	
E-UTRA RF Channel Number	1-4		1	
Active PCell	1-4		Cell 2	
RF Channel Number	1-4		2	
Duplex mode	1-4		TDD	
TDD Configuration	1-4		TDDConf.3.1	Table A.1.5-3
$BW_{channel}$	1-4	MHz	100: $N_{RB,c}$ = 66	
Data RBs allocated	1-4		66	
PDSCH/PDCCH subcarrier spacing	1-4	kHz	120	
DL initial BWP configuration	1-4		DLBWP.0.1	Table A.8.1-1
DL dedicated BWP configuration	1-4		DLBWP.1.1	Table A.8.1-2
UL initial BWP configuration	1-4		ULBWP.0.1	Table A.8.2-1
UL dedicated BWP configuration	1-4		ULBWP.1.1	Table A.8.2-2
PDSCH Reference Channel	1-2		SR.3.2 TDD	Table A.1.1.2-3
	3-4		SR.3.3 TDD	
RMSI CORESET Reference Channel	1-2		CR.3.1 TDD	Table A.1.2.2-3
	3-4		CR.3.2 TDD	
Dedicated CORESET Reference Channel	1-2		CCR.3.1 TDD	Table A.1.3.2-3
	3-4		CCR.3.7 TDD	
OCNG parameters	1-4		OP.1	Table A.2.1-1
CP length	1-4		Normal	
PDSCH/PDCCH TCI state	1-4		TCI.State.0	Table A.10.2-1
CSI-RS for tracking	1-4		TRS.2.1 TDD	Table A.1.4A.2.1-1
SSB Configuration	1-2		SSB.1 FR2	Table A.3.2-1
	3-4		SSB.2 FR2	
SMTC Configuration	1-4		SMTC.3	Table A.4-1
PRACH Configuration	1-4		PRACH.2 FR2	Table A.7.2-1
DRX configuration	1-4		OFF	
SSB index assigned as BFD RS (q_0)	1-4		0	

SSB index assigned as CBD RS (q_1)		1-4		1	
SSB index assigned as RLM RS		1-4		0,1	
Beam failure detection transmission parameters	DCI format	1-4		1-0	
	Number of Control OFDM symbols	1-4		2	
	Aggregation level	1-4	CCE	8	
	Ratio of hypothetical PDCCH RE energy to average SSS RE energy	1-4	dB	0	
	Ratio of hypothetical PDCCH DMRS energy to average SSS RE energy	1-4	dB	0	
	DMRS precoder granularity	1-4		REG bundle size	
	REG bundle size	1-4		6	
Gap pattern ID		1-4		gp0	
gapOffset		1-4	ms	0	
rlmInSyncOutOfSyncThreshold		1-4		absent	Value 0 is applied. (38.133 [6] Table 8.1.1-1).
rsrp-ThresholdSSB		1-2	dBm/SCS	-109 Note 3	Threshold used for $Q_{in_LR_SSB}$
		3-4		-106 Note 3	
powerControlOffsetSS		1-4		db0	Used for deriving rsrp-ThresholdCSI-RS
beamFailureInstanceMaxCount		1-4		n1	see TS 38.321 [12], clause 5.17
beamFailureDetectionTimer		1-4		pbfd4	see TS 38.321 [12], clause 5.17
CSI-RS configuration for CSI reporting		1-4		CSI-RS.3.1 TDD	Table A.1.4.2-3
reportConfigType		1-4		periodic	
reportQuantity		1-4		cri-RI-PMI-CQI	
CSI reporting periodicity		1-4	slot	40	
CSI reporting offset		1-4	slot	4	
T310		1-4	ms	1000	
N310		1-4		2	
T1		1-4	s	1	The UE shall be fully synchronized to cell 1 during T1
T2		1-4	s	2.61	
T3		1-4	s	1.64	
T4		1-4	s	0	
T5		1-4	s	1.01	
D1		1-4	s	0.97	
Note 1: All configurations are assigned to the UE prior to the start of time period T1. Note 2: UE-specific PDCCH is not transmitted after T1 starts. Note 3: Including test tolerance given in Annex F.1.3.2.					

5.5.5.1.4.2 Test procedure

Prior to the start of the time duration T1, the UE shall be fully synchronized to E-UTRA Cell 1 and NR Cell 2. The UE shall be configured for periodic CSI reporting with a reporting periodicity of 5 ms. In the test, DRX configuration is not enabled. The UE is configured to perform inter-frequency measurements using GP ID #0 (40ms).

1. Ensure the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity *EN-DC*, DC bearer *MCG* and *SCG*, Connected without release *On* according to TS 38.508-1 [14] clause 4.5.4.

2. Set the parameters of NR Cell 1 according to T1 in Table 5.5.5.1.5-1. Propagation conditions are set according to clause C.2.3. T1 starts.

3. When T1 expires the SS shall change the SNR value to T2 as specified in Table 5.5.5.1.5-1. T2 starts.

4. When T2 expires the SS shall change the SNR value to T3 as specified in Table 5.5.5.1.5-1. T3 starts.

5. When T3 expires the SS shall change the SNR value to T4 as specified in Table 5.5.5.1.5-1. T4 starts.
6. When T4 expires the SS shall change the SNR value to T5 as specified in Table 5.5.5.1.5-1. T5 starts.
7. If the SS:

   a) detects uplink power on NR carrier in each slot configured for CQI transmission (according CQI reporting on PUCCH) during the period from time point A to time point B; and

   b) does not detect preamble on a beam associated with candidate beam set q_1 before time point B; and

   c) detects preamble on a beam associated with candidate beam set q_1 before time point F (D1 after the start of T5),

   the number of successful tests is increased by one.Otherwise the number of failed tests is increased by one.
8. When T5 expires the SS shall change the SNR value to T1 as specified in Table 5.5.5.1.5-1.
9. Wait 1s for the UE to re-establish the connection or continue directly to step 10. If the UE re-establishes the connection within 1s continue to step 11. Otherwise continue to step 10.
10. Switch the UE on and off. Ensure the UE is in RRC_CONNECTED with generic procedure parameters Connectivity *EN-DC*, DC bearer *MCG* and *SCG*, Connected without release *On* according to TS 38.508-1 [14] clause 4.5.4.
11. Repeat steps 2-10 for all subtests until the confidence level according to Tables G.2.3-1 in Annex G clause G.2 is achieved.

5.5.5.1.4.3 Message contents

Message contents are according to TS 38.508-1 [14] clause 7.3 with the following exceptions:

Table 5.5.5.1.4.3-1: Common Exception messages for EN-DC FR2 SSB-based beam failure detection and link recovery in non-DRX

Default Message Contents	
Common contents of system information blocks exceptions	
Default RRC messages and information elements contents exceptions	Table H.3.1-1 Table H.3.1-2 with condition INTER-FREQ Table H.3.1-3 with condition INTER-FREQ MO (where ssbFrequency is set to the ARFCN value of carrier centre of High range) Table H.3.1-4 with A3-offset = 0 Table H.3.1-8 with condition SSB BFD Table H.3.1-10 with condition SSB Table H.3.1-10A Table H.3.4-4 with Condition gapUE Table H.3.4-5 with Condition BFD

Table 5.5.5.1.4.3-2: PDCCH *Search Space* for BFR

Derivation Path: TS 38.508-1 [14], Table 4.6.3-162			
Information Element	**Value/remark**	**Comment**	**Condition**
SearchSpace ::= SEQUENCE {			
searchSpaceId	3	BFR	
controlResourceSetId	2	BFR	
monitoringSlotPeriodicityAndOffset CHOICE {			
sl1	NULL		
}			
monitoringSymbolsWithinSlot	10000000000000	Symbols 0 and 1	
nrofCandidates SEQUENCE {			
aggregationLevel1	n0		
aggregationLevel2	n0		
aggregationLevel4	n0		
aggregationLevel8	n1	AL8	

Derivation Path: TS 38.508-1 [14], Table 4.6.3-162			
Information Element	**Value/remark**	**Comment**	**Condition**
aggregationLevel16	n0		
}			
searchSpaceType CHOICE {			
ue-Specific SEQUENCE {			USS
dci-Formats	formats0-0-And-1-0	DCI Format 1_0	
}			
}			
}			

Table 5.5.5.1.4.3-3: *RLF-TimersAndConstants*

Derivation Path: TS 38.508-1 [14], Table 4.6.3-150			
Information Element	**Value/remark**	**Comment**	**Condition**
RLF-TimersAndConstants ::= SEQUENCE {			
n310	n2		
}			

Table 5.5.5.1.4.3-4: *PDCCH-Config*

Derivation Path: TS 38.501-1 [14],Table 4.6.3-95			
Information Element	**Value/remark**	**Comment**	**Condition**
PDCCH-Config ::= SEQUENCE {			
controlResourceSetToAddModList SEQUENCE(SIZE (1..3)) OF ControlResourceSet {	2 entries		
ControlResourceSet[2]	ControlResourceSet	entry 2, BFR	
}			
controlResourceSetToReleaseList	Not present		
searchSpacesToAddModList SEQUENCE(SIZE (1..10)) OF SearchSpace {	2 entries		
SearchSpace[2]	SearchSpace	entry 2, BFR	
}			
searchSpacesToReleaseList	Not present		
downlinkPreemption	Not present		
tpc-PUSCH	Not present		
tpc-PUCCH	Not present		
tpc-SRS	Not present		
}			

Table 5.5.5.1.4.3-5: ControlResourceSet for BFR

Derivation Path: TS 38.501-1 [14],Table 7.3.1-15			
Information Element	**Value/remark**	**Comment**	**Condition**
ControlResourceSet ::= SEQUENCE {			
controlResourceSetId	2		
duration	2		
	1		Test Configuration 3 & 4
cce-REG-MappingType CHOICE {			
interleaved ::= SEQUENCE {			
reg-BundleSize	n6		
interleaverSize	n2		
shiftIndex	0		
}			
tci-StatesPDCCH-ToAddList	Not present		
}			

5.5.5.1.5 Test requirement

Tables 5.5.5.1.4.1-3 and 5.5.5.1.5-1 define the primary level settings including test tolerances for EN-DC FR2 SSB-based beam failure detection and link recovery in non-DRX.

Table 5.5.5.1.5-1: NR Cell specific test parameters for EN-DC FR2 SSB-based beam failure detection and link recovery in non-DRX

Parameter		Unit	Test 1				
			T1	T2	T3	T4	T5
AoA setup			Setup 1 defined in A.9				
Assumption for UE beams Note 10			Rough				
EPRE ratio of PDCCH DMRS to SSS		dB	0				
EPRE ratio of PDCCH to PDCCH DMRS		dB					
EPRE ratio of PBCH DMRS to SSS		dB					
EPRE ratio of PBCH to PBCH DMRS		dB					
EPRE ratio of PSS to SSS		dB					
EPRE ratio of PDSCH DMRS to SSS		dB					
EPRE ratio of PDSCH to PDSCH DMRS		dB					
EPRE ratio of OCNG DMRS to SSS		dB					
EPRE ratio of OCNG to OCNG DMRS		dB					
SNR_SSB of set q_0	Config 1-4	dB	13.7 Note 11,12	5.7 Note 11,12	-12	-12	-12
SNR_SSB of set q_1	Config 1-4	dB	0.2	0.2	20 Note 12	20 Note 12	20 Note 12
SSB_RP of set q_1	Config 1-2	dBm/ SCS	-104.5	-104.5	-84.7	-84.7	-84.7
	Config 3-4		-101.5	-101.5	-101.5	-81.7	-81.7
N_{oc}	Config 1-4	dBm/120 KHz	-104.7				
Propagation condition			TDL-A 30ns 75Hz				

NOTE 1: OCNG shall be used such that the resources in Cell 1 are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.
NOTE 2: The uplink resources for CSI reporting are assigned to the UE prior to the start of time period T1.
NOTE 3: NZP CSI-RS resource set configuration for CSI reporting are assigned to the UE prior to the start of time period T1.
NOTE 4: Measurement gap configuration is assigned to the UE prior to the start of time period T1.
NOTE 5: The timers and layer 3 filtering related parameters are configured prior to the start of time period T1.
NOTE 6: The signal contains PDCCH for UEs other than the device under test as part of OCNG.
NOTE 7: SNR levels correspond to the signal to noise ratio over the SSS REs.
NOTE 8: The SNR in time periods T1, T2, T3, T4 and T5 is denoted as SNR1, SNR2 and SNR3 respectively in figure 5.5.5.1.4-1.
NOTE 9: The SNR values are specified for testing a UE which supports 2RX on at least one band. For testing of a UE which supports 4RX on all bands, the SNR during T3 is modified as specified in clause D.4.
NOTE 10: Information about types of UE beam is given in TS 38.133 clause B.2.1.3, and does not limit UE implementation or test system implementation
Note 11: This value allows up to 1dB degradation from applied SNR to UE baseband
Note 12: Including test tolerance given in Annex F.1.3.2

Table 5.5.5.1.5-2: Void

The UE behaviour during time durations T1, T2, T3, T4 and T5 shall be as follows:

During the time duration T1 and T2, the UE shall transmit uplink signal at least in all subframes configured for CSI transmission on Cell 1.

During the period from time point A to time point B the UE shall transmit uplink signal in Cell 1 in all uplink slots configured for CSI transmission according to the configured periodic CSI reporting for Cell 1.

During T3 the shall detect beam failure and initiate link recovery. During T4 and T5 the UE measures and evaluate beam candidate from beam candidate set q_1.

No later than time point F occurring no later than D1 = 960+10 ms after the start of T5, the UE shall transmit preamble on a beam associated with the candidate beam set q_1. The UE shall not transmit preamble on a beam associated with the candidate beam set q_1 earlier than time point B.

Test is concluded once the test equipment has received the initial preamble transmission from the UE. The rate of correct events observed during repeated tests shall be at least 90%.

5.5.5.2 EN-DC FR2 SSB-based beam failure detection and link recovery in DRX

Editor's Note: This test case is complete for the following configurations:

- Test frequency f ≤ 40.8 GHz
- UE PC3

This test case is incomplete for Test frequency f > 40.8 GHz

This test case is incomplete for UE power class other than PC3.

5.5.5.2.1 Test purpose

The purpose of this test is to verify that the UE properly detects SSB-based beam failure in the set q_0 configured for a serving PSCell and that the UE performs correct SSB-based link recovery based on beam candidate set q_1. The purpose is to test the downlink monitoring for beam failure detection within the UEs active DL BWP of the PSCell, during the evaluation period, and link recovery, when DRX is used. This test will partly verify the SSB based beam failure detection and link recovery for an FR2 serving cell requirements in TS 38.133 [6] clause 8.5.

5.5.5.2.2 Test applicability

This test applies to all types of NR UE supporting E-UTRA and EN-DC from release 15 onwards and supporting long DRX cycle.

5.5.5.2.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 5.5.5.0.1.

The normative reference for this requirement is TS 38.133 [6] clause A.5.5.5.2.

5.5.5.2.4 Test description

There is one E-UTRAN PCell and one NR PSCell configured in this test. This test consists of five successive time periods, with time duration of T1, T2, T3, T4 and T5 respectively. Figure 5.5.5.2.4-1 shows the variation of the downlink SNR of the PCell and the SNR of the SSB in set q_0 in the active PSCell to emulate SSB based beam failure. Figure 5.5.5.2.4-1 additionally shows the variation of the downlink L1-RSRP of the SSB in set q_1 of the candidate beam used for link recovery

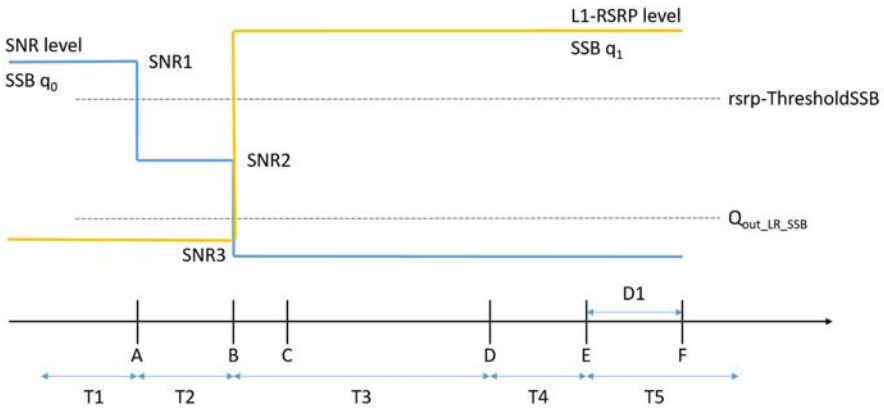


Figure 5.5.5.2.4-1: SNR and L1-RSRP variation for EN-DC FR2 SSB-based beam failure detection and link recovery in DRX

5.5.5.2.4.1 Initial conditions

This test shall be tested using any of the test configurations in Table 5.5.5.2.4.1-1.

Table 5.5.5.2.4.1-1: Supported test configurations for EN-DC FR2 SSB-based beam failure detection and link recovery in DRX

Configuration	Description
5.5.5.2-1	LTE FDD, NR TDD duplex mode, 120 kHz SSB SCS, 100 MHz bandwidth
5.5.5.2-2	LTE TDD, NR TDD duplex mode, 120 kHz SSB SCS, 100 MHz bandwidth
5.5.5.2-3	LTE FDD, NR TDD duplex mode, 240 kHz SSB SCS, 100 MHz bandwidth
5.5.5.2-4	LTE TDD, NR TDD duplex mode, 240 kHz SSB SCS, 100 MHz bandwidth
NOTE: The UE is only required to pass in one of the supported test configurations in FR2	

Configure the test equipment and the DUT according to the parameters in Table 5.5.5.2.4.1-2.

Table 5.5.5.2.4.1-2: Initial conditions for EN-DC FR2 SSB-based beam failure detection and link recovery in DRX

Parameter	Value		Comment
Test environment	NC		As specified in TS 38.508-1 [14] clause 4.1.
Test frequencies	As specified in Annex E, table E.3-1 and TS 38.508-1 [14] clause 4.3.1 for E-UTRA and 7.2.3 for NR.		
Channel bandwidth	As specified by the test configuration selected from Table 6.5.5.3.4.1-1.		
Propagation conditions	AWGN		As specified in clause C.2.2.
Connection Diagram	TE Part	A.3.3.1.1	As specified in TS 38.508-1 [14] Annex A.
	DUT Part	A.3.4.1.1	
Exceptions to connection diagram	N/A		

1. The general test parameter settings are set up according to Table 5.5.5.2.4.1-3. The DRX configuration for is according to Table 5.5.5.2.4.1-3. Time alignment timers shall be set to “infinity” so that UL timing alignment is maintained during the test.

2. Message contents are defined in clause 5.5.5.2.4.3.

3. There is one E-UTRAN cell and one NR cell specified in the test. E-UTRAN Cell 1 is the cell used for connection setup with the power level set according to clause C.1.1 and C.1.2 for this test.

Table 5.5.5.2.4.1-3: General test parameters for EN-DC FR2 SSB-based beam failure detection and link recovery in DRX

Parameter	Test Config.	Unit	Value	Comment
			Test 1	
Active E-UTRA PCell	1-4		Cell 1	
E-UTRA RF Channel Number	1-4		1	
Active PCell	1-4		Cell 2	
RF Channel Number	1-4		2	
Duplex mode	1-4		TDD	Table A.1.5-3
TDD Configuration	1-4		TDDConf.3.1	
$BW_{channel}$	1-4	MHz	100: $N_{RB,c}$ = 66	
Data RBs allocated	1-4		66	
PDSCH/PDCCH subcarrier spacing	1-4	kHz	120	
DL initial BWP configuration	1-4		DLBWP.0.1	Table A.8.1-1
DL dedicated BWP configuration	1-4		DLBWP.1.1	Table A.8.1-2
UL initial BWP configuration	1-4		ULBWP.0.1	Table A.8.2-1
UL dedicated BWP configuration	1-4		ULBWP.1.1	Table A.8.2-2
PDSCH Reference Channel	1-2		SR.3.2 TDD	Table A.1.1.2-3
	3-4		SR.3.3 TDD	
RMSI CORESET Reference Channel	1-2		CR.3.1 TDD	Table A.1.2.2-3

		3-4		CR.3.2 TDD	
Dedicated CORESET Reference Channel		1-2		CCR.3.1 TDD	Table A.1.3.2-3
		3-4		CCR.3.7 TDD	
OCNG parameters		1-4		OP.1	Table A.2.1-1
CP length		1-4		Normal	
PDSCH/PDCCH TCI state		1-4		TCI.State.0	Table A.10.2-1
CSI-RS for tracking		1-4		TRS.2.1 TDD	Table A.1.4A.2.1-1
SSB Configuration		1-2		SSB.1 FR2	Table A.3.2-1
		3-4		SSB.2 FR2	
SMTC Configuration		1-4		SMTC.3	Table A.4-1
PRACH Configuration		1-4		PRACH.2 FR2	Table A.7.2-1
DRX configuration		1-4		DRX.3	Table A.5-1
SSB index assigned as BFD RS (q_0)		1-4		0	
SSB index assigned as CBD RS (q_1)		1-4		1	
SSB index assigned as RLM RS		1-4		0,1	
Beam failure detection transmission parameters	DCI format	1-4		1-0	
	Number of Control OFDM symbols	1-4		2	
	Aggregation level	1-4	CCE	8	
	Ratio of hypothetical PDCCH RE energy to average SSS RE energy	1-4	dB	0	
	Ratio of hypothetical PDCCH DMRS energy to average SSS RE energy	1-4	dB	0	
	DMRS precoder granularity	1-4		REG bundle size	
	REG bundle size	1-4		6	
Gap pattern ID		1-4		N/A	
rlmInSyncOutOfSyncThreshold		1-4		absent	Value 0 is applied. (TS 38.133 [6] Table 8.1.1-1).
rsrp-ThresholdSSB		1-2	dBm/SCS	-109 Note 2	Threshold used for $Q_{in_LR_SSB}$
		3-4		-106 Note 2	
powerControlOffsetSS		1-4		db0	Used for deriving rsrp-ThresholdCSI-RS
beamFailureInstanceMaxCount		1-4		n1	see TS 38.321 [12], clause 5.17
beamFailureDetectionTimer		1-4		pbfd4	see TS 38.321 [12], clause 5.17
CSI-RS configuration for CSI reporting		1-4		CSI-RS.3.1 TDD	Table A.1.4.2-3
reportConfigType		1-4		periodic	
reportQuantity		1-4		cri-RI-PMI-CQI	
CSI reporting periodicity		1-4	slot	40	
CSI reporting offset		1-4	slot	4	
T310		1-4	ms	1000	
N310		1-4		2	
T1		1-4	s	1	The UE shall be fully synchronized to cell 1 during T1
T2		1-4	s	3.37	
T3		1-4	s	2.8	
T4		1-4	s	0	
T5		1-4	s	0.61	
D1		1-4	s	0.57	
Note 1: UE-specific PDCCH is not transmitted after T1 starts. Note 2: Including test tolerance given in Annex F.1.3.2					

5.5.5.2.4.2 Test procedure

Prior to the start of the time duration T1, the UE shall be fully synchronized to cell 1 and cell 2. The UE shall be configured for periodic CSI reporting with a reporting periodicity of 5 ms. In the test, DRX configuration is enabled in PSCell and DRX inactivity timer has already been expired, i.e. UE tries to decode PDCCH and to send periodic CQI during the period when On-duration timer is running. Time alignment timers shall be set to "infinity" so that UL timing alignment is maintained during the test.

1. Ensure the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity *EN-DC*, DC bearer *MCG* and *SCG*, Connected without release *On* according to TS 38.508-1 [14] clause 4.5.4
2. Set the parameters of NR Cell 1 according to T1 in Table 5.5.5.2.5-1. Propagation conditions are set according to clause C.2.3. T1 starts.
3. When T1 expires the SS shall change the SNR value to T2 as specified in Table 5.5.5.2.5-1. T2 starts.
4. When T2 expires the SS shall change the SNR value to T3 as specified in Table 5.5.5.2.5-1. T3 starts.
5. When T3 expires the SS shall change the SNR value to T4 as specified in Table 5.5.5.2.5-1. T4 starts.
6. When T4 expires the SS shall change the SNR value to T5 as specified in Table 5.5.5.2.5-1. T5 starts.
7. If the SS:

   a) detects uplink power on NR carrier in each slot configured for CQI transmission (according CQI reporting on PUCCH) during the period from time point A to time point B; and

   b) does not detect preamble on a beam associated with the candidate beam set q_1 before time point B; and

   c) detects preamble on a beam associated with the candidate beam set q_1 before time point F (D1 after the start of T5),

   the number of successful tests is increased by one. Otherwise the number of failed tests is increased by one.
8. When T5 expires the SS shall change the SNR value to T1 as specified in Table 5.5.5.2.5-1.
9. Wait 1s for the UE to re-establish the connection or continue directly to step 10. If the UE re-establishes the connection within 1s continue to step 11. Otherwise continue to step 10.
10. Switch the UE on and off. Ensure the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity *EN-DC*, DC bearer *MCG* and *SCG*, Connected without release *On* according to TS 38.508-1 [14] clause 4.5.4.
11. Repeat steps 2-10 for all subtests until the confidence level according to Tables G.2.3-1 in Annex G clause G.2 is achieved.

5.5.5.2.4.3 Message contents

Message contents are according to TS 38.508-1 [14] clause 7.3 with the following exceptions:

Table 5.5.5.2.4.3-1: Common Exception messages for EN-DC FR2 SSB-based beam failure detection and link recovery in DRX

Default Message Contents	
Common contents of system information blocks exceptions	
Default RRC messages and information elements contents exceptions	Table H.3.1-8 with condition SSB BFD Table H.3.1-10 with condition SSB Table H.3.1-10A Table H.3.7-1 with condition DRX.3

Table 5.5.5.2.4.3-2: PDCCH *Search Space* for BFR

Derivation Path: TS 38.508-1 [14], Table 4.6.3-162

Information Element	Value/remark	Comment	Condition
SearchSpace ::= SEQUENCE {			
searchSpaceId	3	BFR	
controlResourceSetId	2	BFR	
monitoringSlotPeriodicityAndOffset CHOICE {			
sl1	NULL		
}			
monitoringSymbolsWithinSlot	10000000000000	Symbols 0 and 1	
nrofCandidates SEQUENCE {			
aggregationLevel1	n0		
aggregationLevel2	n0		
aggregationLevel4	n0		
aggregationLevel8	n1	AL8	
aggregationLevel16	n0		
}			
searchSpaceType CHOICE {			
ue-Specific SEQUENCE {			USS
dci-Formats	formats0-0-And-1-0	DCI Format 1_0	
}			
}			
}			

Table 5.5.5.2.4.3-3: *RLF-TimersAndConstants*

Derivation Path: TS 38.508-1 [14], Table 4.6.3-150			
Information Element	**Value/remark**	**Comment**	**Condition**
RLF-TimersAndConstants ::= SEQUENCE {			
n310	n2		
}			

Table 5.5.5.2.4.3-4: *PDCCH-Config*

Derivation Path: TS 38.501-1 [14],Table 4.6.3-95			
Information Element	**Value/remark**	**Comment**	**Condition**
PDCCH-Config ::= SEQUENCE {			
controlResourceSetToAddModList SEQUENCE(SIZE (1..3)) OF ControlResourceSet {	2 entries		
ControlResourceSet[2]	ControlResourceSet	entry 2, BFR	
}			
controlResourceSetToReleaseList	Not present		
searchSpacesToAddModList SEQUENCE(SIZE (1..10)) OF SearchSpace {	2 entries		
SearchSpace[2]	SearchSpace	entry 2, BFR	
}			
searchSpacesToReleaseList	Not present		
downlinkPreemption	Not present		
tpc-PUSCH	Not present		
tpc-PUCCH	Not present		
tpc-SRS	Not present		
}			

Table 5.5.5.2.4.3-5: ControlResourceSet for BFR

Derivation Path: TS 38.501-1 [14],Table 7.3.1-15			
Information Element	**Value/remark**	**Comment**	**Condition**
ControlResourceSet ::= SEQUENCE {			
controlResourceSetId	2		
duration	2		
	1		Test Configuration 3 & 4

cce-REG-MappingType CHOICE {			
interleaved ::= SEQUENCE {			
reg-BundleSize	n6		
interleaverSize	n2		
shiftIndex	0		
}			
tci-StatesPDCCH-ToAddList	Not present		
}			

5.5.5.2.5 Test requirement

Tables 5.5.5.2.4.1-3 and 5.5.5.2.5-1 define the primary level settings including test tolerances for EN-DC FR2 SSB-based beam failure detection and link recovery in DRX.

Table 5.5.5.2.5-1: NR Cell specific test parameters for EN-DC FR2 SSB-based beam failure detection and link recovery in DRX

Parameter		Unit	Test 1				
			T1	T2	T3	T4	T5
AoA setup			Setup 1 defined in A.9				
Assumption for UE beams Note 10			Rough				
EPRE ratio of PDCCH DMRS to SSS		dB	0				
EPRE ratio of PDCCH to PDCCH DMRS		dB					
EPRE ratio of PBCH DMRS to SSS		dB					
EPRE ratio of PBCH to PBCH DMRS		dB					
EPRE ratio of PSS to SSS		dB					
EPRE ratio of PDSCH DMRS to SSS		dB					
EPRE ratio of PDSCH to PDSCH DMRS		dB					
EPRE ratio of OCNG DMRS to SSS		dB					
EPRE ratio of OCNG to OCNG DMRS		dB					
SNR_SSB of set q_0	Config 1-4	dB	13.7 Note 11,12	5.7 Note 11,12	-12	-12	-12
SNR_SSB of set q_1	Config 1-4	dB	0.2	0.2	20 Note 12	20 Note 12	20 Note 12
SSB_RP of set q_1	Config 1-2	dBm/ SCS kHz	-104.5	-104.5	-84.7	-84.7	-84.7
	Config 3-4		-101.5	-101.5	-81.7	-81.7	-81.7
N_{oc}	Config 1-4	dBm/120 KHz	-104.7				
Propagation condition			TDL-A 30ns 75Hz				

NOTE 1: OCNG shall be used such that the resources in Cell 1 are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.
NOTE 2: The uplink resources for CSI reporting are assigned to the UE prior to the start of time period T1.
NOTE 3: NZP CSI-RS resource set configuration for CSI reporting are assigned to the UE prior to the start of time period T1.
NOTE 4: Measurement gap configuration is assigned to the UE prior to the start of time period T1.
NOTE 5: The timers and layer 3 filtering related parameters are configured prior to the start of time period T1.
NOTE 6: The signal contains PDCCH for UEs other than the device under test as part of OCNG.
NOTE 7: SNR levels correspond to the signal to noise ratio over the SSS REs.
NOTE 8: The SNR in time periods T1, T2, T3, T4 and T5 is denoted as SNR1, SNR2 and SNR3 respectively in figure 5.5.5.2.4-1.
NOTE 9: The SNR values are specified for testing a UE which supports 2RX on at least one band. For testing of a UE which supports 4RX on all bands, the SNR during T3 is modified as specified in clause D.4.
NOTE 10: Information about types of UE beam is given in TS 38.133 clause B.2.1.3, and does not limit UE implementation or test system implementation
Note 11: This value allows up to 1dB degradation from applied SNR to UE baseband
Note 12: Including test tolerance given in Annex F.1.3.2

The UE behaviour during time durations T1, T2, T3, T4 and T5 shall be as follows:

During the time duration T1 and T2, the UE shall transmit uplink signal at least in all subframes configured for CSI transmission on Cell 1.

During the period from time point A to time point B the UE shall transmit uplink signal in Cell 1 in all uplink slots configured for CSI transmission according to the configured periodic CSI reporting for Cell 1.

During T3 the UE shall detect beam failure and initiate link recovery. During T4 and T5 the UE measures and evaluate beam candidate from beam candidate set q_1.

No later than time point F occurring no later than D1 = 560+10 ms after the start of T5, the UE shall transmit preamble on a beam associated with the candidate beam set q_1. The UE shall not transmit preamble on a beam associated with the candidate beam set q_1 earlier than time point B.

Test is concluded once the test equipment has received the initial preamble transmission from the UE. The rate of correct events observed during repeated tests shall be at least 90%.

5.5.5.3 EN-DC FR2 CSI-RS-based beam failure detection and link recovery in non-DRX

Editor's Note: This test case is complete for the following configurations:

- Test frequency f ≤ 40.8 GHz
- UE PC3

This test case is incomplete for Test frequency f > 40.8 GHz

This test case is incomplete for UE power class other than PC3.

5.5.5.3.1 Test purpose

The purpose of this test is to verify that the UE properly detects CSI-RS-based beam failure in the set q_0 configured for a serving cell and that the UE performs correct CSI-RS-based link recovery based on beam candidate set q_1. The purpose is to test the downlink monitoring for beam failure detection within the UEs active DL BWP, during the evaluation period, and link recovery, when no DRX is used. This test will partly verify the CSI-RS based beam failure detection and link recovery for an FR2 serving cell requirements in TS 38.133 [6] clause 8.5.

5.5.5.3.2 Test applicability

This test applies to all types of NR UE supporting E-UTRA and EN-DC from release 15 and forward supporting CSI-RS-based RLM and link recovery.

5.5.5.3.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 5.5.5.0.2.

The normative reference for this requirement is TS 38.133 [6] clause A.5.5.5.3.

5.5.5.3.4 Test description

There are two cell configured in this test: E-UTRAN PCell and NR PSCell. This test consists of five successive time periods, with time duration of T1, T2, T3, T4 and T5 respectively. Figure 5.5.5.3.4-1 shows the five different time durations and the corresponding variation of the downlink SNR in the active cell to emulate CSI-RS based beam failure. Figure 5.5.5.3.4-1 additionally shows the variation of the downlink L1-RSRP of the CSI-RS in set q_1 of the candidate beam used for link recovery.

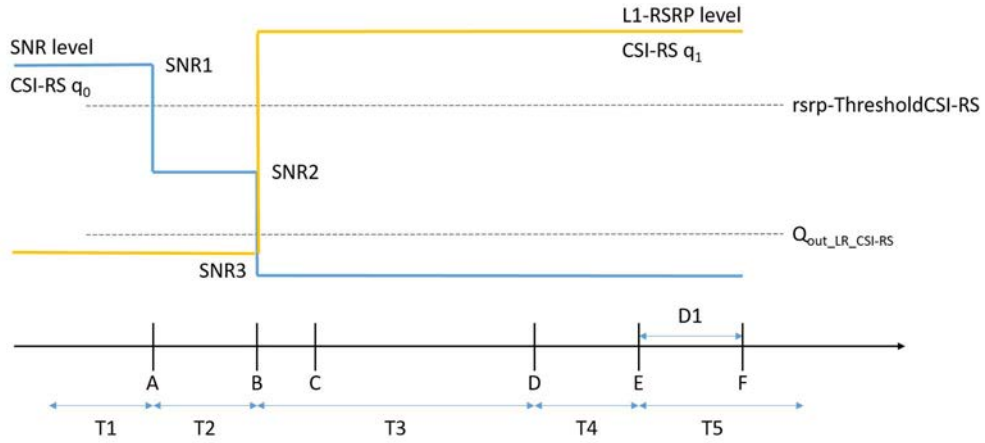


Figure 5.5.5.3.4-1: SNR and L1-RSRP variation for EN-DC FR2 CSI-RS-based beam failure detection and link recovery in non-DRX

5.5.5.3.4.1 Initial conditions

This test shall be tested using any of the test configurations in Table 5.5.5.3.4.1-1.

Table 5.5.5.3.4.1-1: Supported test configurations for EN-DC FR2 CSI-RS-based beam failure detection and link recovery in non-DRX

Configuration	Description
5.5.5.3-1	LTE FDD, NR TDD duplex mode, 120 kHz SSB SCS, 100 MHz bandwidth
5.5.5.3-2	LTE TDD, NR TDD duplex mode, 120 kHz SSB SCS, 100 MHz bandwidth

Configure the test equipment and the DUT according to the parameters in Table 5.5.5.3.4.1-2.

Table 5.5.5.3.4.1-2: Initial conditions for EN-DC FR2 CSI-RS-based beam failure detection and link recovery in non-DRX

Parameter	Value		Comment
Test environment	NC		As specified in TS 38.508-1 [14] clause 4.1.
Test frequencies	As specified in Annex E, table E.3-1 and TS 38.508-1 [14] clause 4.3.1 for E-UTRA and 7.2.3 for NR.		
Channel bandwidth	As specified by the test configuration selected from Table 5.5.5.3.4.1-1.		
Propagation conditions	AWGN		As specified in clause C.2.2.
Connection Diagram	TE Part	A.3.3.1.1	As specified in TS 38.508-1 [14] Annex A.
	DUT Part	A.3.4.1.1	
Exceptions to connection diagram	N/A		

1. The general test parameter settings are set up according to Table 5.5.5.3.4.1-3. The NZP-CSI-RS configuration is according to Table 5.5.5.3.4.1-3.

2. Message contents are defined in clause 5.5.5.3.4.3.

3. There are one E-UTRAN cell and one NR cell specified in the test. E-UTRAN Cell 1 is the cell used for connection setup with the power level set according to clause C.1.1 and C.1.2 for this test.

Table 5.5.5.3.4.1-3: General test parameters for EN-DC FR2 CSI-RS-based beam failure detection and link recovery in non-DRX

Parameter	Test Config.	Unit	Value	Comment
			Test 1	

Active E-UTRA PCell		1-2		Cell 1	
E-UTRA RF Channel Number		1-2		1	
Active PCell		1-2		Cell 2	
RF Channel Number		1-2		2	
Duplex mode		1-2		TDD	
TDD Configuration		1-2		TDDConf.3.1	Table A.1.5-3
$BW_{channel}$		1-2	MHz	100: $N_{RB,c}$ = 66	
Data RBs allocated		1-2		66	
PDSCH/PDCCH subcarrier spacing		1-2	kHz	120	
DL initial BWP configuration		1-2		DLBWP.0.1	Table A.8.1-1
DL dedicated BWP configuration		1-2		DLBWP.1.1	Table A.8.1-2
UL initial BWP configuration		1-2		ULBWP.0.1	Table A.8.2-1
UL dedicated BWP configuration		1-2		ULBWP.1.1	Table A.8.2-2
PDSCH Reference Channel		1-2		SR.3.2 TDD	Table A.1.1.2-3
RMSI CORESET Reference Channel		1-2		CR.3.1 TDD	Table A.1.2.2-3
Dedicated CORESET Reference Channel		1-2		CCR.3.1 TDD	Table A.1.3.2-3
OCNG parameters		1-2		OP.1	Table A.2.1-1
CP length		1-2		Normal	
PDSCH/PDCCH TCI state		1-2		TCI.State.0	Table A.10.2-1
CSI-RS for tracking		1-2		TRS.2.1 TDD	Table A.1.4A.2.1-1
SSB Configuration		1-2		SSB.1 FR2	Table A.3.2-1
SMTC Configuration		1-2		SMTC.3	Table A.4-1
PRACH Configuration		1-2		PRACH.4 FR2	Table A.7.2-1
DRX configuration		1-2		OFF	
CSI-RS configuration for BFD/CBD/RLM		1-2		CSI-RS.3.2 TDD	Table A.1.4.2-3
CSI-RS index assigned as BFD RS (q_0)		1-2		0	
CSI-RS index assigned as CBD RS (q_1)		1-2		1	
CSI-RS index assigned as RLM RS		1-2		0,1	
Beam failure detection transmission parameters	DCI format	1-2		1-0	
	Number of Control OFDM symbols	1-2		2	
	Aggregation level	1-2	CCE	8	
	Ratio of hypothetical PDCCH RE energy to average SSS RE energy	1-2	dB	0	
	Ratio of hypothetical PDCCH DMRS energy to average SSS RE energy	1-2	dB	0	
	DMRS precoder granularity	1-2		REG bundle size	
	REG bundle size	1-2		6	
Gap pattern ID		1-2		N/A	
rlmInSyncOutOfSyncThreshold		1-2		absent	Value 0 is applied. (TS 38.133 [6] Table 8.1.1-1).
rsrp-ThresholdSSB		1-2	dBm/SCS	-109 Note 2	Threshold used for $Q_{in_LR_SSB}$
powerControlOffsetSS		1-2		db0	Used for deriving rsrp-ThresholdCSI-RS
beamFailureInstanceMaxCount		1-2		n1	see TS 38.321 [12], clause 5.17
beamFailureDetectionTimer		1-2		pbfd4	see TS 38.321 [12], clause 5.17
CSI-RS configuration for CSI reporting		1-2		CSI-RS.3.1 TDD	Table A.1.4.2-3
reportConfigType		1-2		periodic	
reportQuantity		1-2		cri-RI-PMI-CQI	
CSI reporting periodicity		1-2	slot	40	
CSI reporting offset		1-2	slot	4	
T310		1-2	ms	1000	
N310		1-2		2	
T1		1-2	s	1	The UE shall be fully synchronized to cell 1 during T1
T2		1-2	s	1.17	

T3	1-2	s	0.9	
T4	1-2	s	0	
T5	1-2	s	0.31	
D1	1-2	s	0.27	
Note 1: UE-specific PDCCH is not transmitted after T1 starts. Note 2: Including test tolerance given in Annex F.1.3.2.				

5.5.5.3.4.2 Test procedure

Prior to the start of the time duration T1, the UE shall be fully synchronized to NR Cell 1. The UE shall be configured for periodic CSI reporting with a reporting periodicity of 5 ms. In the test, DRX configuration is not enabled.

1. Ensure the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity *EN-DC*, DC bearer *MCG* and *SCG*, Connected without release *On* according to TS 38.508-1 [14] clause 4.5.4.

2. Set the parameters of NR Cell 1 according to T1 in Table 5.5.5.3.5-1. Propagation conditions are set according to clause C.2.3. T1 starts.

3. When T1 expires the SS shall change the SNR value to T2 as specified in Table 5.5.5.3.5-1. T2 starts.

4. When T2 expires the SS shall change the SNR value to T3 as specified in Table 5.5.5.3.5-1. T3 starts.

5. When T3 expires the SS shall change the SNR value to T4 as specified in Table 5.5.5.3.5-1. T4 starts.

6. When T4 expires the SS shall change the SNR value to T5 as specified in Table 5.5.5.3.5-1. T5 starts.

7. If the SS:

   a) detects uplink power on NR carrier in each slot configured for CQI transmission (according CQI reporting on PUCCH) during the period from time point A to time point B;

   and

   b) does not detect preamble on a beam associated with the candidate beam set q_1 before time point B; and

   c) detects preamble on a beam associated with the candidate beam set q_1 before time point F (D1 after the start of T5),

   the number of successful tests is increased by one. Otherwise the number of failed tests is increased by one.

8. When T5 expires the SS shall change the SNR value to T1 as specified in Table 5.5.5.3.5-1.

9. Wait 1s for the UE to re-establish the connection or continue directly to step 10. If the UE re-establishes the connection within 1s continue to step 11. Otherwise continue to step 10.

10. Switch the UE on and off. Ensure the UE is in RRC_CONNECTED with generic procedure parameters Connectivity *EN-DC*, DC bearer *MCG* and *SCG*, Connected without release *On* according to TS 38.508-1 [14] clause 4.5.4.

11. Repeat steps 2-10 for all subtests until the confidence level according to Tables G.2.3-1 in Annex G clause G.2 is achieved.

5.5.5.3.4.3 Message contents

Message contents are according to TS 38.508-1 [14] clause 7.3 with the following exceptions:

Table 5.5.5.3.4.3-1: Common Exception messages for EN-DC FR2 CSI-RS-based beam failure detection and link recovery in non-DRX

Default Message Contents	
Common contents of system information blocks exceptions	

Default RRC messages and information elements contents exceptions	Table H.3.1-8 with condition CSI-RS BFD Table H.3.1-10 with condition CSI-RS Table H.3.1-10A

Table 5.5.5.3.4.3-2: PDCCH *Search Space* for BFR

Derivation Path: TS 38.508-1 [14], Table 4.6.3-162			
Information Element	**Value/remark**	**Comment**	**Condition**
SearchSpace ::= SEQUENCE {			
searchSpaceId	3	BFR	
controlResourceSetId	2	BFR	
monitoringSlotPeriodicityAndOffset CHOICE {			
sl1	NULL		
}			
monitoringSymbolsWithinSlot	10000000000000	Symbols 0 and 1	
nrofCandidates SEQUENCE {			
aggregationLevel1	n0		
aggregationLevel2	n0		
aggregationLevel4	n0		
aggregationLevel8	n1	AL8	
aggregationLevel16	n0		
}			
searchSpaceType CHOICE {			
ue-Specific SEQUENCE {			USS
dci-Formats	formats0-0-And-1-0	DCI Format 1_0	
}			
}			
}			

Table 5.5.5.3.4.3-3: *RLF-TimersAndConstants*

Derivation Path: TS 38.508-1 [14], Table 4.6.3-150			
Information Element	**Value/remark**	**Comment**	**Condition**
RLF-TimersAndConstants ::= SEQUENCE {			
n310	n2		
}			

Table 5.5.5.3.4.3-4: *NZP-CSI-RS-Resource*

Derivation Path: TS 38.508-1 [14], Table 4.6.3-85			
Information Element	**Value/remark**	**Comment**	**Condition**
NZP-CSI-RS-Resource ::= SEQUENCE {			
powerControlOffsetSS	db0		
}			

Table 5.5.5.3.4.3-5: *PDCCH-Config*

Derivation Path: TS 38.501-1 [14],Table 4.6.3-95			
Information Element	**Value/remark**	**Comment**	**Condition**
PDCCH-Config ::= SEQUENCE {			
controlResourceSetToAddModList SEQUENCE(SIZE (1..3)) OF ControlResourceSet {	2 entries		
ControlResourceSet[2]	ControlResourceSet	entry 2, BFR	
}			
controlResourceSetToReleaseList	Not present		
searchSpacesToAddModList SEQUENCE(SIZE (1..10)) OF SearchSpace {	2 entries		
SearchSpace[2]	SearchSpace	entry 2, BFR	
}			
searchSpacesToReleaseList	Not present		
downlinkPreemption	Not present		

tpc-PUSCH	Not present		
tpc-PUCCH	Not present		
tpc-SRS	Not present		
}			

Table 5.5.5.3.4.3-6: ControlResourceSet for BFR

Derivation Path: TS 38.501-1 [14],Table 7.3.1-15			
Information Element	**Value/remark**	**Comment**	**Condition**
ControlResourceSet ::= SEQUENCE {			
controlResourceSetId	2		
duration	2		
cce-REG-MappingType CHOICE {			
interleaved ::= SEQUENCE {			
reg-BundleSize	n6		
interleaverSize	n2		
shiftIndex	0		
}			
tci-StatesPDCCH-ToAddList	Not present		
}			

5.5.5.3.5 Test requirement

Tables 5.5.5.3.4.1-3 and 5.5.5.3.5-1 define the primary level settings including test tolerances for EN-DC FR2 CSI-RS-based beam failure detection and link recovery in non-DRX.

Table 5.5.5.3.5-1: NR Cell specific test parameters for EN-DC FR2 CSI-RS-based beam failure detection and link recovery in non-DRX

Parameter		**Unit**	**Test 1**				
			T1	**T2**	**T3**	**T4**	**T5**
AoA setup			Setup 1 defined in A.9				
Assumption for UE beams Note 10			Rough				
EPRE ratio of PDCCH DMRS to SSS		dB	0				
EPRE ratio of PDCCH to PDCCH DMRS		dB					
EPRE ratio of PBCH DMRS to SSS		dB					
EPRE ratio of PBCH to PBCH DMRS		dB					
EPRE ratio of PSS to SSS		dB					
EPRE ratio of PDSCH DMRS to SSS		dB					
EPRE ratio of PDSCH to PDSCH DMRS		dB					
EPRE ratio of OCNG DMRS to SSS		dB					
EPRE ratio of OCNG to OCNG DMRS		dB					
SNR_CSI-RS of set q_0	Config 1-2	dB	13.7 Note 11,12	5.7 Note 11,12	-12	-12	-12
SNR_CSI-RS of set q_1	Config 1-2	dB	0.2	0.2	20 Note 12	20 Note 12	20 Note 12
CSI-RS_RP of set q_1	Config 1-2	dBm/SCS	-104.5	-104.5	-84.7	-84.7	-84.7
N_{oc}	Config 1-2	dBm/120 KHz	TBD				
Propagation condition			TDL-A 30ns 75Hz				

NOTE 1:	OCNG shall be used such that the resources in Cell 1 are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.
NOTE 2:	The uplink resources for CSI reporting are assigned to the UE prior to the start of time period T1.
NOTE 3:	NZP CSI-RS resource set configuration for CSI reporting are assigned to the UE prior to the start of time period T1.
NOTE 4:	Void
NOTE 5:	The timers and layer 3 filtering related parameters are configured prior to the start of time period T1.
NOTE 6:	The signal contains PDCCH for UEs other than the device under test as part of OCNG.
NOTE 7:	SNR levels correspond to the signal to noise ratio over the REs carrying CSI-RS.
NOTE 8:	The SNR in time periods T1, T2, T3, T4 and T5 is denoted as SNR1, SNR2 and SNR3 respectively in figure 5.5.5.3.4-1.
NOTE 9:	The SNR values are specified for testing a UE which supports 2RX on at least one band. For testing of a UE which supports 4RX on all bands, the SNR during T3 is modified as specified in clause D.4.
NOTE 10:	Information about types of UE beam is given in TS 38.133 clause B.2.1.3, and does not limit UE implementation or test system implementation
Note 11:	This value allows up to 1dB degradation from applied SNR to UE baseband
Note 12:	Including test tolerance given in Annex F.1.3.2

The UE behaviour during time durations T1, T2, T3, T4 and T5 shall be as follows:

During the time duration T1 and T2, the UE shall transmit uplink signal at least in all subframes configured for CSI transmission on Cell 1.

During the period from time point A to time point B the UE shall transmit uplink signal in Cell 1 in all uplink slots configured for CSI transmission according to the configured periodic CSI reporting for Cell 1.

During T3 the shall detect beam failure and initiate link recovery. During T4 and T5 the UE measures and evaluate beam candidate from beam candidate set q_1.

No later than time point F occurring no later than D1 = 260+10 ms after the start of T5, the UE shall transmit preamble on a beam associated with the candidate beam set q_1. The UE shall not transmit preamble on a beam associated with the candidate beam set q_1 earlier than time point B

Test is concluded once the test equipment has received the initial preamble transmission from the UE. The rate of correct events observed during repeated tests shall be at least 90%.

5.5.5.4 EN-DC FR2 CSI-RS-based beam failure detection and link recovery in DRX

Editor's Note: This test case is complete for the following configurations:

- Test frequency f ≤ 40.8 GHz
- UE PC3

This test case is incomplete for Test frequency f > 40.8 GHz

This test case is incomplete for UE power class other than PC3.

5.5.5.4.1 Test purpose

The purpose of this test is to verify that the UE properly detects CSI-RS-based beam failure in the set q_0 configured for a serving cell and that the UE performs correct CSI-RS-based link recovery based on beam candidate set q_1. The purpose is to test the downlink monitoring for beam failure detection within the UEs active DL BWP, during the evaluation period, and link recovery, when DRX is used. This test will partly verify the CSI-RS based beam failure detection and link recovery for an FR2 serving cell requirements in TS 38.133 [6] clause 8.5.

5.5.5.4.2 Test applicability

This test applies to all types of NR UE supporting E-UTRA and EN-DC from release 15 and forward supporting CSI-RS-based RLM and long DRX cycle and link recovery.

5.5.5.4.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 5.5.5.0.2.

The normative reference for this requirement is TS 38.133 [6] clause A.5.5.5.4.

5.5.5.4.4 Test description

There is one E-UTRAN PCell and one NR PSCell configured in this test. This test consists of five successive time periods, with time duration of T1, T2, T3, T4 and T5 respectively. Figure 5.5.5.4.4-1 shows the five different time durations and the corresponding variation of the downlink SNR in the active cell to emulate CSI-RS based beam failure. Figure 5.5.5.4.1-1 additionally shows the variation of the downlink L1-RSRP of the CSI-RS in set q_1 of the candidate beam used for link recovery.

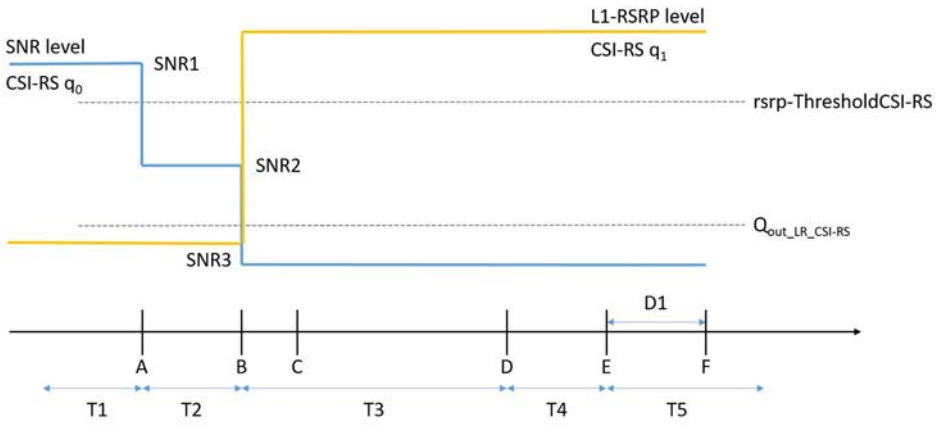


Figure 5.5.5.4.4-1: SNR and L1-RSRP variation for EN-DC FR2 CSI-RS-based beam failure detection and link recovery in DRX

5.5.5.4.4.1 Initial conditions

This test shall be tested using any of the test configurations in Table 5.5.5.4.4.1-1.

Table 5.5.5.4.4.1-1: Supported test configurations for EN-DC FR2 CSI-RS-based beam failure detection and link recovery in DRX

Configuration	Description
5.5.5.4-1	LTE FDD, NR TDD duplex mode, 120 kHz SSB SCS, 100MHz bandwidth
5.5.5.4-2	LTE TDD, NR TDD duplex mode, 120 kHz SSB SCS, 100 MHz bandwidth

Configure the test equipment and the DUT according to the parameters in Table 5.5.5.4.4.1-2.

Table 5.5.5.4.4.1-2: Initial conditions for EN-DC FR2 CSI-RS-based beam failure detection and link recovery in DRX

Parameter	Value		Comment
Test environment	NC		As specified in TS 38.508-1 [14] clause 4.1.
Test frequencies	As specified in Annex E, table E.3-1 and TS 38.508-1 [14] clause 4.3.1 for E-UTRA and 7.2.3 for NR.		
Channel bandwidth	As specified by the test configuration selected from Table 6.5.5.3.4.1-1.		
Propagation conditions	AWGN		As specified in clause C.2.2.
Connection Diagram	TE Part	A.3.3.1.1	As specified in TS 38.508-1 [14] Annex A.
	DUT Part	A.3.4.1.1	
Exceptions to connection diagram	N/A		

1. The general test parameter settings are set up according to Table 5.5.5.4.4.1-3. The NZP-CSI-RS configuration is according to Table 5.5.5.4.4.1-3. The DRX configuration for is according to Table 5.5.5.4.4.1-3. Time alignment timers shall be set to "infinity" so that UL timing alignment is maintained during the test.

2. Message contents are defined in clause 5.5.5.4.4.3.

3. There is one E-UTRAN cell and one NR cell specified in the test. E-UTRAN Cell 1 is the cell used for connection setup with the power level set according to clause C.1.1 and C.1.2 for this test.

Table 5.5.5.4.4.1-3: General test parameters for EN-DC FR2 CSI-RS-based beam failure detection and link recovery in DRX

Parameter		Test Config.	Unit	Value	Comment
				Test 1	
Active E-UTRA PCell		1-2		Cell 1	
E-UTRA RF Channel Number		1-2		1	
Active PCell		1-2		Cell 2	
RF Channel Number		1-2		2	
Duplex mode		1-2		TDD	
TDD Configuration		1-2		TDDConf.3.1	Table A.1.5-3
$BW_{channel}$		1-2	MHz	100: $N_{RB,c}$ = 66	
Data RBs allocated		1-2		66	
PDSCH/PDCCH subcarrier spacing		1-2	kHz	120	
DL initial BWP configuration		1-2		DLBWP.0.1	Table A.8.1-1
DL dedicated BWP configuration		1-2		DLBWP.1.1	Table A.8.1-2
UL initial BWP configuration		1-2		ULBWP.0.1	Table A.8.2-1
UL dedicated BWP configuration		1-2		ULBWP.1.1	Table A.8.2-2
PDSCH Reference Channel		1-2		SR.3.2 TDD	Table A.1.1.2-3
RMSI CORESET Reference Channel		1-2		CR.3.1 TDD	Table A.1.2.2-3
Dedicated CORESET Reference Channel		1-2		CCR.3.1 TDD	Table A.1.3.2-3
OCNG parameters		1-2		OP.1	Table A.2.1-1
CP length		1-2		Normal	
PDSCH/PDCCH TCI state		1-2		TCI.State.0	Table A.10.2-1
CSI-RS for tracking		1-2		TRS.2.1 TDD	Table A.1.4A.2.1-1
SSB Configuration		1-2		SSB.1 FR2	Table A.3.2-1
SMTC Configuration		1-2		SMTC.3	Table A.4-1
PRACH Configuration		1-2		PRACH.4 FR2	Table A.7.2-1
DRX configuration		1-2		DRX.3	Table A.5-1
CSI-RS configuration for BFD/CBD/RLM		1-2		CSI-RS.3.2 TDD	Table A.1.4.2-3
CSI-RS index assigned as BFD RS (q_0)		1-2		0	
CSI-RS index assigned as CBD RS (q_1)		1-2		1	
CSI-RS index assigned as RLM RS		1-2		0,1	
Beam failure detection transmission parameters	DCI format	1-2		1-0	
	Number of Control OFDM symbols	1-2		2	
	Aggregation level	1-2	CCE	8	
	Ratio of hypothetical PDCCH RE energy to average SSS RE energy	1-2	dB	0	
	Ratio of hypothetical PDCCH DMRS energy to average SSS RE energy	1-2	dB	0	
	DMRS precoder granularity	1-2		REG bundle size	
	REG bundle size	1-2		6	
Gap pattern ID		1-2		N/A	
rlmInSyncOutOfSyncThreshold		1-2		absent	Value 0 is applied. (TS 38.133 [6] Table 8.1.1-1).
rsrp-ThresholdSSB		1-2	dBm/SCS	-109 Note 2	Threshold used for $Q_{in_LR_SSB}$
powerControlOffsetSS		1-2		db0	Used for deriving rsrp-ThresholdCSI-RS

beamFailureInstanceMaxCount	1-2		n1	see TS 38.321 [12], clause 5.17
beamFailureDetectionTimer	1-2		pbfd4	see TS 38.321 [12], clause 5.17
CSI-RS configuration for CSI reporting	1-2		CSI-RS.3.1 TDD	Table A.1.4.2-3
reportConfigType	1-2		periodic	
reportQuantity	1-2		cri-RI-PMI-CQI	
CSI reporting periodicity	1-2	slot	40	
CSI reporting offset	1-2	slot	4	
T310	1-2	ms	1000	
N310	1-2		2	
T1	1-2	s	1	The UE shall be fully synchronized to cell 1 during T1
T2	1-2	s	5.43	
T3	1-2	s	5.16	
T4	1-2	s	0	
T5	1-2	s	0.31	
D1	1-2	s	0.27	
Note 1: UE-specific PDCCH is not transmitted after T1 starts. Note 2: Including test tolerance given in Annex F.1.3.2.				

Table 5.5.5.4.4.1-4: Void

5.5.5.4.4.2 Test procedure

Prior to the start of the time duration T1, the UE shall be fully synchronized to NR Cell 1. The UE shall be configured for periodic CSI reporting with a reporting periodicity of 5 ms. In the test, DRX configuration is enabled.

1. Ensure the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity *EN-DC*, DC bearer *MCG* and *SCG*, Connected without release *On* according to TS 38.508-1 [14] clause 4.5.4

2. Set the parameters of NR Cell 1 according to T1 in Table 5.5.5.4.5-1. Propagation conditions are set according to clause C.2.3. T1 starts.

3. When T1 expires the SS shall change the SNR value to T2 as specified in Table 5.5.5.4.5-1. T2 starts.

4. When T2 expires the SS shall change the SNR value to T3 as specified in Table 5.5.5.4.5-1. T3 starts.

5. When T3 expires the SS shall change the SNR value to T4 as specified in Table 5.5.5.4.5-1. T4 starts.

6. When T4 expires the SS shall change the SNR value to T5 as specified in Table 5.5.5.4.5-1. T5 starts.

7. If the SS:

   a) detects uplink power on NR carrier in each slot configured for CQI transmission (according CQI reporting on PUCCH) during the period from time point A to time point B; and

   b) does not detect preamble on a beam associated with the candidate beam set q_1 before time point B; and

   c) detects preamble on a beam associated with the candidate beam set q_1 before time point F (D1 after the start of T5),

   the number of successful tests is increased by one. Otherwise the number of failed tests is increased by one.

8. When T5 expires the SS shall change the SNR value to T1 as specified in Table 5.5.5.4.5-1.

9. Wait 1s for the UE to re-establish the connection or continue directly to step 10. If the UE re-establishes the connection within 1s continue to step 11. Otherwise continue to step 10.

10. Switch the UE on and off. Ensure the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity *EN-DC*, DC bearer *MCG* and *SCG*, Connected without release *On* according to TS 38.508-1 [14] clause 4.5.4.

11. Repeat steps 2-10 for all subtests until the confidence level according to Tables G.2.3-1 in Annex G clause G.2 is achieved.

5.5.5.4.4.3 Message contents

Message contents are according to TS 38.508-1 [14] clause 7.3 with the following exceptions:

Table 5.5.5.4.4.3-1: Common Exception messages for EN-DC FR2 CSI-RS-based beam failure detection and link recovery in DRX

Default Message Contents	
Common contents of system information blocks exceptions	
Default RRC messages and information elements contents exceptions	Table H.3.1-8 with condition CSI-RS BFD Table H.3.1-10 with condition CSI-RS Table H.3.1-10A Table H.3.7-1 with condition DRX.3

Table 5.5.5.4.4.3-2: PDCCH *Search Space* for BFR

Derivation Path: TS 38.508-1 [14], Table 4.6.3-162			
Information Element	**Value/remark**	**Comment**	**Condition**
SearchSpace ::= SEQUENCE {			
searchSpaceId	3	BFR	
controlResourceSetId	2	BFR	
monitoringSlotPeriodicityAndOffset CHOICE {			
sl1	NULL		
}			
monitoringSymbolsWithinSlot	10000000000000	Symbols 0 and 1	
nrofCandidates SEQUENCE {			
aggregationLevel1	n0		
aggregationLevel2	n0		
aggregationLevel4	n0		
aggregationLevel8	n1	AL8	
aggregationLevel16	n0		
}			
searchSpaceType CHOICE {			
ue-Specific SEQUENCE {			USS
dci-Formats	formats0-0-And-1-0	DCI Format 1_0	
}			
}			
}			

Table 5.5.5.4.4.3-3: *RLF-TimersAndConstants*

Derivation Path: TS 38.508-1 [14], Table 4.6.3-150			
Information Element	**Value/remark**	**Comment**	**Condition**
RLF-TimersAndConstants ::= SEQUENCE {			
n310	n2		
}			

Table 5.5.5.4.4.3-4: *PDCCH-Config*

Derivation Path: TS 38.501-1 [14],Table 4.6.3-95			
Information Element	**Value/remark**	**Comment**	**Condition**
PDCCH-Config ::= SEQUENCE {			
controlResourceSetToAddModList SEQUENCE(SIZE (1..3)) OF ControlResourceSet {	2 entries		
ControlResourceSet[2]	ControlResourceSet	entry 2, BFR	
}			
controlResourceSetToReleaseList	Not present		

searchSpacesToAddModList SEQUENCE(SIZE (1..10)) OF SearchSpace {	2 entries		
SearchSpace[2]	SearchSpace	entry 2, BFR	
}			
searchSpacesToReleaseList	Not present		
downlinkPreemption	Not present		
tpc-PUSCH	Not present		
tpc-PUCCH	Not present		
tpc-SRS	Not present		
}			

Table 5.5.5.4.4.3-5: ControlResourceSet for BFR

Derivation Path: TS 38.501-1 [14],Table 7.3.1-15			
Information Element	**Value/remark**	**Comment**	**Condition**
ControlResourceSet ::= SEQUENCE {			
controlResourceSetId	2		
duration	2		
cce-REG-MappingType CHOICE {			
interleaved ::= SEQUENCE {			
reg-BundleSize	n6		
interleaverSize	n2		
shiftIndex	0		
}			
tci-StatesPDCCH-ToAddList	Not present		
}			

5.5.5.4.5 Test requirement

Tables 5.5.5.4.4.1-3 and 5.5.5.4.5-1 define the primary level settings including test tolerances for EN-DC FR2 CSI-RS-based beam failure detection and link recovery in DRX.

Table 5.5.5.4.5-1: NR Cell specific test parameters for EN-DC FR2 CSI-RS-based beam failure detection and link recovery in DRX

Parameter		Unit	Test 1				
			T1	T2	T3	T4	T5
AoA setup			Setup 1 defined in A.9				
Assumption for UE beams Note 10			Rough				
EPRE ratio of PDCCH DMRS to SSS		dB	0				
EPRE ratio of PDCCH to PDCCH DMRS		dB					
EPRE ratio of PBCH DMRS to SSS		dB					
EPRE ratio of PBCH to PBCH DMRS		dB					
EPRE ratio of PSS to SSS		dB					
EPRE ratio of PDSCH DMRS to SSS		dB					
EPRE ratio of PDSCH to PDSCH DMRS		dB					
EPRE ratio of OCNG DMRS to SSS		dB					
EPRE ratio of OCNG to OCNG DMRS		dB					
SNR_CSI-RS of set q_0	Config 1-2	dB	13.7 Note 11,12	5.7 Note 11,12	-12	-12	-12
SNR_CSI-RS of set q_1	Config 1-2	dB	0.2	0.2	20 Note 12	20 Note 12	20 Note 12
CSI-RS_RP of set q_1	Config 1-2	dBm/SCS	-104.5	-104.5	-84.7	-84.7	-84.7
N_{oc}	Config 1-2	dBm/120 KHz	-104.7				
Propagation condition			TDL-A 30ns 75Hz				

NOTE 1:	OCNG shall be used such that the resources in Cell 1 are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.
NOTE 2:	The uplink resources for CSI reporting are assigned to the UE prior to the start of time period T1.
NOTE 3:	NZP CSI-RS resource set configuration for CSI reporting are assigned to the UE prior to the start of time period T1.
NOTE 4:	Void
NOTE 5:	The timers and layer 3 filtering related parameters are configured prior to the start of time period T1.
NOTE 6:	The signal contains PDCCH for UEs other than the device under test as part of OCNG.
NOTE 7:	SNR levels correspond to the signal to noise ratio over the SSS REs.
NOTE 8:	The SNR in time periods T1, T2, T3, T4 and T5 is denoted as SNR1, SNR2 and SNR3 respectively in figure 5.5.5.4.4-1.
NOTE 9:	The SNR values are specified for testing a UE which supports 2RX on at least one band. For testing of a UE which supports 4RX on all bands, the SNR during T3 is modified as specified in clause D.4.
NOTE 10:	Information about types of UE beam is given in TS 38.133 clause B.2.1.3, and does not limit UE implementation or test system implementation
Note 11:	This value allows up to 1dB degradation from applied SNR to UE baseband
Note 12:	Including test tolerance given in Annex F.1.3.2.

The UE behaviour during time durations T1, T2, T3, T4 and T5 shall be as follows:

During the time duration T1 and T2, the UE shall transmit uplink signal at least in all subframes configured for CSI transmission on Cell 1.

During the period from time point A to time point B the UE shall transmit uplink signal in Cell 1 in all uplink slots configured for CSI transmission according to the configured periodic CSI reporting for Cell 1.

During T3 the UE shall detect beam failure and initiate link recovery. During T4 and T5 the UE measures and evaluate beam candidate from beam candidate set q_1.

No later than time point F occurring no later than D1 = 260+10 ms after the start of T5, the UE shall transmit preamble on a beam associated with the candidate beam set q_1. The UE shall not transmit preamble on a beam associated with the candidate beam set q_1 earlier than time point B.

Test is concluded once the test equipment has received the initial preamble transmission from the UE. The rate of correct events observed during repeated tests shall be at least 90%.

5.5.5.5 EN-DC FR2 scheduling available restriction during SSB-based beam failure detection and link recovery in non-DRX

Editor's Note: This test case is complete for the following configurations:

- Test frequency f ≤ 40.8 GHz
- UE PC3

This test case is incomplete for Test frequency f > 40.8 GHz

This test case is incomplete for UE power class other than PC3.

5.5.5.5.1 Test purpose

The purpose of this test is to test scheduling availability restrictions when the UE is performing beam failure detection or when the UE is performing L1-RSRP measurement for candidate beam detection, when no DRX is used, and to verify the scheduling availability restriction requirements for SSB based beam failure detection and link recovery for an FR2 serving cell in TS 38.133 [6] clause 8.5.7 and 8.5.8.

5.5.5.5.2 Test applicability

This test applies to all types of NR UE supporting E-UTRA and EN-DC from release 15 onwards.

5.5.5.5.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 5.5.5.0.3.

The normative reference for this requirement is TS 38.133 [6] clause A.5.5.5.5.

5.5.5.5.4 Test description

There are two cell configured in this test. Cell 1 is the E-UTRAN PCell and Cell 2 is the PSCell. This test consists of five successive time periods, with time duration of T1, T2, T3, T4 and T5 respectively. Figure 5.5.5.5.4-1 shows the variation of the downlink SNR of the PCell and the SNR of the SSB in set q_0 in the active PSCell to emulate SSB based beam failure. Figure 5.5.5.5.4-1 additionally shows the variation of the downlink L1-RSRP of the SSB in set q_1 of the candidate beam used for link recovery.

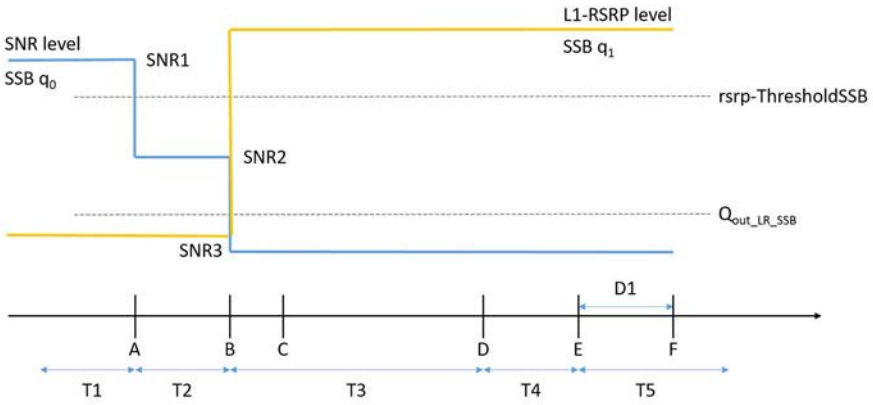


Figure 5.5.5.5.4-1: SNR and L1-RSRP variation for EN-DC FR2 scheduling available restriction during SSB-based beam failure detection and link recovery in non-DRX

5.5.5.5.4.1 Initial conditions

This test shall be tested using any of the test configurations in Table 5.5.5.5.4.1-1.

Table 5.5.5.5.4.1-1: Supported test configurations for EN-DC FR2 scheduling available restriction during SSB-based beam failure detection and link recovery in non-DRX

Configuration	Description
5.5.5.5-1	LTE FDD, NR 120 kHz SSB SCS, 100MHz bandwidth, TDD duplex mode
5.5.5.5-2	LTE TDD, NR 120 kHz SSB SCS, 100MHz bandwidth, TDD duplex mode
5.5.5.5-3	LTE FDD, NR 240 kHz SSB SCS, 100MHz bandwidth, TDD duplex mode
5.5.5.5-4	LTE TDD, NR 240 kHz SSB SCS, 100MHz bandwidth, TDD duplex mode
NOTE: The UE is only required to be tested in one of the supported test configurations	

Configure the test equipment and the DUT according to the parameters in Table 5.5.5.5.4.1-2.

Table 5.5.5.5.4.1-2: Initial conditions for EN-DC FR2 scheduling available restriction during SSB-based beam failure detection and link recovery in non-DRX

Parameter	Value		Comment
Test environment	NC		As specified in TS 38.508-1 [14] clause 4.1.
Test frequencies	As specified in Annex E, table E.5-1 and TS 38.508-1 [14] clause 4.3.1 for E-UTRA and 7.2.3 for NR.		
Channel bandwidth	As specified by the test configuration selected from Table 5.5.5.5.4.1-1.		
Propagation conditions	AWGN		As specified in clause C.2.2.
Connection Diagram	TE Part	A.3.3.1.1	As specified in TS 38.508-1 [14] Annex A.
	DUT Part	A.3.4.1.1	
Exceptions to connection diagram	N/A		

1. The general test parameter settings are set up according to Table 5.5.5.5.4.1-3.
2. Message contents are defined in clause 5.5.5.5.4.3.
3. There are one E-UTRAN cell and one NR cell specified in the test. E-UTRAN Cell 1 is the cell used for connection setup with the power level set according to clause C.1.1 and C.1.2 for this test.

Table 5.5.5.5.4.1-3: General test parameters for EN-DC FR2 scheduling available restriction during SSB-based beam failure detection and link recovery in non-DRX

Parameter		Test Config.	Unit	Value	Comment
				Test 1	
Active E-UTRA PCell		1-4		Cell 1	
E-UTRA RF Channel Number		1-4		1	
Active PCell		1-4		Cell 2	
RF Channel Number		1-4		2	
Duplex mode		1-4		TDD	
TDD Configuration		1-4		TDDConf.3.1	Table A.1.5-3
$BW_{channel}$		1-4	MHz	100: $N_{RB,c}$ = 66	
Data RBs allocated		1-4		66	
PDSCH/PDCCH subcarrier spacing		1-4	kHz	120	
DL initial BWP configuration		1-4		DLBWP.0.1	Table A.8.1-1
DL dedicated BWP configuration		1-4		DLBWP.1.1	Table A.8.1-2
UL initial BWP configuration		1-4		ULBWP.0.1	Table A.8.2-1
UL dedicated BWP configuration		1-4		ULBWP.1.1	Table A.8.2-2
PDSCH Reference Channel		1-2		SR.3.2 TDD	Table A.1.1.2-3
		3-4		SR.3.3 TDD	
RMSI CORESET Reference Channel		1-2		CR.3.1 TDD	Table A.1.2.2-3
		3-4		CR.3.2 TDD	
Dedicated CORESET Reference Channel		1-2		CCR.3.1 TDD	Table A.1.3.2-3
		3-4		CCR.3.7 TDD	
OCNG parameters		1-4		OP.1	Table A.2.1-1
CP length		1-4		Normal	
PDSCH/PDCCH TCI state		1-4		TCI.State.0	Table A.10.2-1
CSI-RS for tracking		1-4		TRS.2.1 TDD	Table A.1.4A.2.1-1
SSB Configuration		1-2		SSB.1 FR2	Table A.3.2-1
		3-4		SSB.2 FR2	
SMTC Configuration		1-4		SMTC.1	Table A.4-1
PRACH Configuration		1-4		PRACH.2 FR2	Table A.7.2-1
DRX configuration		1-4		OFF	
SSB index assigned as BFD RS (q_0)		1-4		0	
SSB index assigned as CBD RS (q_1)		1-4		1	
Beam failure detection transmission parameters	DCI format	1-4		1-0	
	Number of Control OFDM symbols	1-4		2	
	Aggregation level	1-4	CCE	8	
	Ratio of hypothetical PDCCH RE energy to average SSS RE energy	1-4	dB	0	
	Ratio of hypothetical PDCCH DMRS energy to average SSS RE energy	1-4	dB	0	
	DMRS precoder granularity	1-4		REG bundle size	
	REG bundle size	1-4		6	
Gap pattern ID		1-4		N/A	No measurement gap is configured
rlmInSyncOutOfSyncThreshold		1-4		absent	Value 0 is applied. (TS 38.133 [6] Table 8.1.1-1).
rsrp-ThresholdSSB		1-2	dBm/SCS	-109 Note 3	Threshold used for $Q_{in_LR_SSB}$
		3-4		-106 Note 3	

powerControlOffsetSS	1-4		db0	Used for deriving rsrp-ThresholdCSI-RS
beamFailureInstanceMaxCount	1-4		n1	see TS 38.321 [12], clause 5.17
beamFailureDetectionTimer	1-4		pbfd4	see TS 38.321 [12], clause 5.17
CSI-RS configuration for CSI reporting	1-4		CSI-RS.3.1 TDD	Table A.1.4.2-3
reportConfigType	1-4		periodic	
reportQuantity	1-4		cri-RI-PMI-CQI	
CSI reporting periodicity	1-4	slot	40	
CSI reporting offset	1-4	slot	4	
T310	1-4	ms	1000	
N310	1-4		2	
T1	1-4	s	1	The UE shall be fully synchronized to cell 1 during T1
T2	1-4	s	2.6	
T3	1-4	s	1.64	
T4	1-4	s	0	
T5	1-4	s	1.01	
D1	1-4	s	0.97	
Note 1: All configurations are assigned to the UE prior to the start of time period T1. Note 2: UE-specific PDCCH is not transmitted after T1 starts. Note 3: Including test tolerance given in Annex F.1.3.2				

5.5.5.5.4.2 Test procedure

Prior to the start of the time duration T1, the UE shall be fully synchronized to Cell 1 and Cell 2. The UE shall be configured for periodic CSI reporting with a reporting periodicity defined in CSI-RS configuration. This test will focus on the scheduling availability during beam failure detection and candidate beam detection. In the test, DRX configuration is not enabled. During the test the UE is scheduled to transmit continuously in UL.

1. Ensure the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity *EN-DC*, DC bearer *MCG* and *SCG*, Connected without release *On* and Test Mode *On* according to TS 38.508-1 [14] clause 4.5.4.

2. Set the parameters of NR Cell 1 according to T1 in Table 5.5.5.5.5-1. Propagation conditions are set according to clause C.2.3. T1 starts.

3. When T1 expires the SS shall change the SNR value to T2 as specified in Table 5.5.5.5.5-1. T2 starts.

4. When T2 expires the SS shall change the SNR value to T3 as specified in Table 5.5.5.5.5-1. T3 starts.

5. When T3 expires the SS shall change the SNR value to T4 as specified in Table 5.5.5.5.5-1. T4 starts.

6. When T4 expires the SS shall change the SNR value to T5 as specified in Table 5.5.5.5.5-1. T5 starts.

7. If the SS:

   a) detects uplink power on NR carrier in each slot configured for CQI transmission (according CQI reporting on PUCCH) which are not overlapped with SSBs configured for beam failure detection during the period from time point B to time point D; and

   b) detects uplink power on NR carrier in each slot configured for CQI transmission (according CQI reporting on PUCCH) during the period from time point D until T5 expires,

   the number of successful tests is increased by one.

   Otherwise the number of failed tests is increased by one.

8. When T5 expires the SS shall change the SNR value to T1 as specified in Table 5.5.5.5.5-1.

9. Wait 1s for the UE to re-establish the connection or continue directly to step 10. If the UE re-establishes the connection within 1s continue to step 11. Otherwise continue to step 10.

10. Switch the UE on and off. Ensure the UE is in RRC_CONNECTED with generic procedure parameters Connectivity *EN-DC*, DC bearer *MCG* and *SCG*, Connected without release *On* and Test Mode *On* according to TS 38.508-1 [14] clause 4.5.4.

11. Repeat steps 2-10 for all subtests until the confidence level according to Tables G.2.3-1 in Annex G clause G.2 is achieved.

5.5.5.5.4.3 Message contents

Message contents are according to TS 38.508-1 [14] clause 7.3 with the following exceptions:

Table 5.5.5.5.4.3-1: Common Exception messages for EN-DC FR2 scheduling available restriction during SSB-based beam failure detection and link recovery in non-DRX

Default Message Contents	
Common contents of system information blocks exceptions	
Default RRC messages and information elements contents exceptions	Table H.3.1-8 with condition SSB BFD Table H.3.1-10 with condition SSB Table H.3.1-10A

5.5.5.5.5 Test requirement

Tables 5.5.5.5.4.1-3 and 5.5.5.5.5-1 define the primary level settings including test tolerances for EN-DC FR2 scheduling available restriction during SSB-based beam failure detection and link recovery in non-DRX.

Table 5.5.5.5.5-1: NR Cell specific test parameters for EN-DC FR2 scheduling available restriction during SSB-based beam failure detection and link recovery in non-DRX

Parameter		Unit	Test 1				
			T1	T2	T3	T4	T5
AoA setup			Setup 1 defined in A. 9.1				
Assumption for UE beams[Note 10]			Rough				
EPRE ratio of PDCCH DMRS to SSS		dB	0				
EPRE ratio of PDCCH to PDCCH DMRS		dB					
EPRE ratio of PBCH DMRS to SSS		dB					
EPRE ratio of PBCH to PBCH DMRS		dB					
EPRE ratio of PSS to SSS		dB					
EPRE ratio of PDSCH DMRS to SSS		dB					
EPRE ratio of PDSCH to PDSCH DMRS		dB					
EPRE ratio of OCNG DMRS to SSS		dB					
EPRE ratio of OCNG to OCNG DMRS		dB					
SNR_SSB of set q_0	Config 1-4	dB	13.7 [Note 11,12]	5.7 [Note 11,12]	-12	-12	-12
SNR_SSB of set q_1	Config 1-4	dB	0.2	0.2	20 [Note 12]	20 [Note 12]	20 [Note 12]
SSB_RP of set q_1	Config 1-2	dBm/ SCS	-104.5	-104.5	-84.7	-84.7	-84.7
	Config 3-4		-101.5	-101.5	-81.7	-81.7	-81.7
N_{oc}	Config 1-4	dBm/120K Hz	-104.7				
Propagation condition			TDL-A 30ns 75Hz				

NOTE 1:	OCNG shall be used such that the resources in Cell 1 are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.
NOTE 2:	The uplink resources for CSI reporting are assigned to the UE prior to the start of time period T1.
NOTE 3:	NZP CSI-RS resource set configuration for CSI reporting are assigned to the UE prior to the start of time period T1.
NOTE 4:	Void
NOTE 5:	The timers and layer 3 filtering related parameters are configured prior to the start of time period T1.
NOTE 6:	The signal contains PDCCH for UEs other than the device under test as part of OCNG.
NOTE 7:	SNR levels correspond to the signal to noise ratio over the SSS REs.
NOTE 8:	The SNR in time periods T1, T2, T3, T4 and T5 is denoted as SNR1, SNR2 and SNR3 respectively in figure 5.5.5.5.4-1.
NOTE 9:	The SNR values are specified for testing a UE which supports 2RX on at least one band. For testing of a UE which supports 4RX on all bands, the SNR during T3 is modified as specified in clause D.4.
NOTE 10:	Information about types of UE beam is given in TS 38.133 clause B.2.1.3, and does not limit UE implementation or test system implementation
Note 11:	This value allows up to 1dB degradation from applied SNR to UE baseband
Note 12:	Including test tolerance given in Annex F.1.3.2.

The UE behaviour during time duration T3 follows the requirements defined in TS 38.133 [6] clause 8.5.7.3:

The UE is not expected to transmit PUCCH/PUSCH/SRS or receive PDCCH/PDSCH/CSI-RS for tracking/CSI-RS for CQI on BFD-RS symbols to be measured for beam failure detection.

The UE behaviour during time durations T4 and T5 follows the requirements defined in TS 38.133 [6] clause 8.5.8.3:

The UE is not expected to transmit PUCCH/PUSCH or receive PDCCH/PDSCH on reference symbols to be measured for candidate beam detection.

5.5.5.6 EN-DC FR2 CSI-RS-based BFD and LR for SCell in non-DRX

Editor's Note:

- This test case is incomplete for Test frequency f > 40.8 GHz
- This test case is incomplete for UE power class other than PC3.

5.5.5.6.1 Test purpose

The purpose of this test is to verify that the UE properly detects CSI-RS-based beam failure in the set q_0 configured for an active SCell and that the UE performs correct CSI-RS-based link recovery based on beam candidate set q_1. The purpose is to test the downlink monitoring for beam failure detection within the UEs active DL BWP of the SCell with *schedulingRequestID-BFR-SCell-r16* configuration, during the evaluation period, and link recovery, when no DRX is used. This test will partly verify the CSI-RS based beam failure detection and link recovery for an FR2 SCell requirements in TS 38.133 [6] clause 8.5.

5.5.5.6.2 Test applicability

This test applies to all types of NR UE supporting E-UTRA and EN-DC from release 16 onwards supporting SCell BFR.

5.5.5.6.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 5.5.5.0.2 and 5.5.5.0.4.

The normative reference for this requirement is TS 38.133 [6] clause A.5.5.5.6.

5.5.5.6.4 Test description

There are three cells configured in this test. Cell 1 is the E-UTRAN PCell, Cell 2 is the PSCell and Cell 3 is the SCell. This test consists of five successive time periods, with time duration of T1, T2, T3, T4 and T5 respectively. Figure 5.5.5.6.4-1 shows the variation of the downlink SNR of the active SCell and the SNR of the CSI-RS in set q_0 in the

active SCell to emulate CSI-RS based beam failure. Figure 5.5.5.6.4-1 additionally shows the variation of the downlink L1-RSRP of the CSI-RS in set q_1 of the candidate beam used for link recovery.

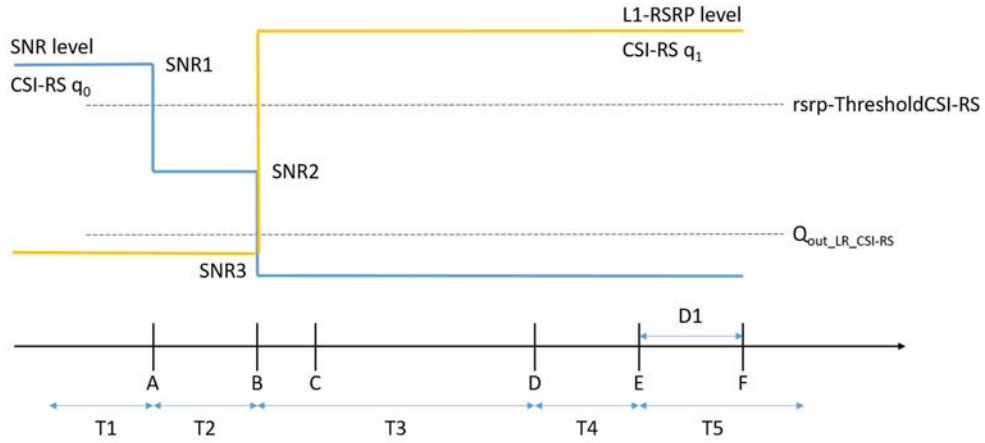


Figure 5.5.5.6.4-1: SNR and L1-RSRP variation for CSI-RS based beam failure detection and link recovery testing for SCell in non-DRX mode

5.5.5.6.4.1 Initial conditions

This test shall be tested using any of the test configurations in Table 5.5.5.6.4.1-1.

Table 5.5.5.6.4.1-1: Supported test configurations for EN-DC FR2 SCell beam failure detection and link recovery testing in non-DRX

Configuration	Description
5.5.5.6-1	LTE FDD, TDD duplex mode, 120 kHz SSB SCS, 100 MHz bandwidth
5.5.5.6-2	LTE TDD, TDD duplex mode, 120 kHz SSB SCS, 100 MHz bandwidth
Note: The UE is only required to be tested in one of the supported test configurations	

Configure the test equipment and the DUT according to the parameters in Table 5.5.5.6.4.1-2.

Table 5.5.5.6.4.1-2: Initial conditions for EN-DC FR2 SCell beam failure detection and link recovery testing in non-DRX

Parameter	Value		Comment
Test environment	NC		As specified in TS 38.508-1 [14] clause 4.1.
Test frequencies	As specified in Annex E, table E.5-1 and TS 38.508-1 [14] clause 4.3.1 for E-UTRA and 7.2.3 for NR.		
Channel bandwidth	As specified by the test configuration selected from Table 5.5.5.6.4.1-1.		
Propagation conditions	AWGN		As specified in Annex C.2.2.
Connection Diagram	TE Part	A.3.3.3.1	As specified in TS 38.508-1 [14] Annex A.
	DUT Part	A.3.4.1.1	
Exceptions to connection diagram	N/A		

1. The general test parameter settings are set up according to Table 5.5.5.6.4.1-3.
2. Message contents are defined in clause 5.5.5.6.4.3.
3. There are one E-UTRAN cell and two NR cells specified in the test. E-UTRAN Cell 1 is the cell used for connection setup with the power level set according to Annex C.1.1 and C.1.2 for this test.

Table 5.5.5.6.4.1-3: General test parameters for FR2 SCell for beam failure detection and link recovery testing in non-DRX mode

Parameter		Test Config.	Unit	Value	Comment
				Test 1	
Active E-UTRA PCell		1-2		Cell 1	
E-UTRA RF Channel Number		1-2		1	
Active PCell		1-2		Cell 2	
RF Channel Number for PSCell		1-2		2	
Active SCell		1-2		Cell 3	
RF Channel Number for SCell		1-2		3	
Duplex mode		1-2		TDD	
TDD Configuration		1-2		TDDConf.3.1	
$BW_{channel}$		1-2	MHz	100: $N_{RB,c}$ = 66	
Data RBs allocated		1-2		66	
PDSCH/PDCCH subcarrier spacing		1-2	kHz	120	
DL initial BWP configuration		1-2		DLBWP.0.1	
DL dedicated BWP configuration		1-2		DLBWP.1.1	
UL initial BWP configuration		1-2		ULBWP.0.1	
UL dedicated BWP configuration		1-2		ULBWP.1.1	
PDSCH Reference Channel		1-2		SR.3.2 TDD	
RMSI CORESET Reference Channel		1-2		CR.3.1 TDD	A.1.2.2
Dedicated CORESET Reference Channel		1-2		CCR.3.1 TDD	
OCNG parameters		1-2		OP.1	A.2.1
CP length		1-2		Normal	
PDSCH/PDCCH TCI state		1-2		TCI.State.0	
CSI-RS for tracking		1-2		TRS.2.1 TDD	
SSB Configuration		1-2		SSB.3 FR2	A.3
SMTC Configuration		1-2		SMTC.3	A.4
PRACH Configuration		1-2		FR2 PRACH configuration 4	Table A.7.2-1
DRX configuration		1-2		OFF	
CSI-RS configuration for BFD/CBD in activated SCell		1-2		CSI-RS.3.2 TDD	A.1.4.2
CSI-RS index assigned as BFD RS (q_0) in activated SCell		1-2		0	
CSI-RS index assigned as CBD RS (q_1) in activated SCell		1-2		1	
CSI-RS configuration for RLM in PSCell		1-2		CSI-RS.3.2 TDD	A.1.4.2
Beam failure detection transmission parameters	DCI format	1-2		1-0	
	Number of Control OFDM symbols	1-2		2	
	Aggregation level	1-2	CCE	8	
	Ratio of hypothetical PDCCH RE energy to average SSS RE energy	1-2	dB	0	
	Ratio of hypothetical PDCCH DMRS energy to average SSS RE energy	1-2	dB	0	
	DMRS precoder granularity	1-2		REG bundle size	
	REG bundle size	1-2		6	
Gap pattern ID		1-2		N/A	
schedulingRequestID-BFR-SCell-r16		1-2		Configured	
Periodicity of PUCCH for SR configuration for BFR on SCell		1-2	slot	40	5ms
Offset of PUCCH for SR configuration for BFR on SCell		1-2	slot	4	
PUCCH parameters for SR configuration for BFR on SCell		1-2		Table 8.3.3.1.2-1 in [28]	
rlmInSyncOutOfSyncThreshold		1-2		absent	Value 0 is applied. (Table 8.1.1-1 in TS 38.133 [6]).

rsrp-ThresholdSSB	1-2	dBm/SCS	-109 Note 2	Threshold used for $Q_{in_LR_SSB}$
powerControlOffsetSS	1-2		db0	Used for deriving rsrp-ThresholdCSI-RS
beamFailureInstanceMaxCount	1-2		n1	see TS 38.321 [7], clause 5.17
beamFailureDetectionTimer	1-2		pbfd4	see TS 38.321 [7], clause 5.17
CSI-RS configuration for CSI reporting	1-2		CSI-RS.3.1 TDD	A.1.4.2
reportConfigType	1-2		periodic	
reportQuantity	1-2		cri-RI-PMI-CQI	
CSI reporting periodicity	1-2	slot	40	
CSI reporting offset	1-2	slot	4	
T310	1-2	ms	1000	
N310	1-2		2	
T1	1-2	s	1	The UE shall be fully synchronized to cell 1 during T1
T2	1-2	s	1.17	
T3	1-2	s	0.9	
T4	1-2	s	0	
T5	1-2	s	0.31	
D1	1-2	s	0.27	
Note 1: UE-specific PDCCH is not transmitted after T1 starts. Note 2: Including test toelerance given in Annex F.1.3.2				

5.5.5.6.4.2 Test procedure

Prior to the start of the time duration T1, the UE shall be fully synchronized to Cell 1, Cell 2 and Cell 3. The UE shall be configured for periodic CSI reporting with a reporting periodicity defined in CSI-RS configuration. In the test, DRX configuration is not enabled. During the test the UE is scheduled to transmit continuously in UL.

1. Ensure the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity *EN-DC*, DC bearer *MCG* and *SCG*, Connected without release *On* and Test Mode *On* according to TS 38.508-1 [14] clause 4.5.4.

2. The SS shall configure SCell (Cell 3) on the SCC as per TS 38.508-1 [14] clause 7.5.2, with the message content exceptions defined in clause 5.5.5.6.4.3. NR RRCReconfiguration message is contained in RRCConnectionReconfiguration and NR RRCReconfigurationComplete message is contained in RRCConnectionReconfigurationComplete.

3. The SS activates SCC by sending the activation MAC-CE (Refer TS 38.321 [12], clauses 5.9, 6.1.3.10).

4. Set the parameters of NR Cell 2 and Cell 3 according to T1 in Table 5.5.5.6.5-1. Propagation conditions are set according to Annex C.2.3. T1 starts.

5. When T1 expires the SS shall change the SNR value to T2 as specified in Table 5.5.5.6.5-1. T2 starts.

6. When T2 expires the SS shall change the SNR value to T3 as specified in Table 5.5.5.6.5-1. T3 starts.

7. When T3 expires the SS shall change the SNR value to T4 as specified in Table 5.5.5.6.5-1. T4 starts.

8. When T4 expires the SS shall change the SNR value to T5 as specified in Table 5.5.5.6.5-1. T5 starts.

9. If the SS:

   a) detects uplink power on NR in each slot configured for CSI transmission (according CSI reporting on PUCCH) during the period from time point A to time point B; and

   b) does not detect PUCCH with LRR before time point B, and

   c) detects PUCCH with LRR, followed by BFR MAC CE containing a beam associated with the candidate beam set q_1 before time point F (D1 after the start of T5),

the number of successful tests is increased by one.

Otherwise the number of failed tests is increased by one.

10. When T5 expires the SS shall change the SNR value to T1 as specified in Table 5.5.5.6.5-1.

11. If the iteration fails, the SS shall first attempt to release and add the FR2 SCell. If that also fails, then the UE is switched OFF/ON to proceed with the next iteration, and ensure the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity *EN-DC*, DC bearer *MCG* and *SCG*, Connected without release *On* and Test Mode *On* according to TS 38.508-1 [14] clause 4.5.4.

12. Repeat steps 2-11 for all subtests until the confidence level according to Tables G.2.3-1 in Annex G clause G.2 is achieved.

5.5.5.6.4.3 Message contents

Message contents are according to TS 38.508-1 [14] clause 7.3 with the following exceptions:

Table 5.5.5.6.4.3-1: Common Exception messages for EN-DC FR2 SCell for beam failure detection and link recovery testing in non-DRX mode

Default Message Contents	
Common contents of system information blocks exceptions	
Default RRC messages and information elements contents exceptions	Table H.3.1-8 with Condition CSI-RS BFD Table H.3.1-12 on Cell 3 Table H.3.1-13 on Cell 3

Table 5.5.5.6.4.3-2: MAC-CellGroupConfig

Derivation Path: TS 38.508-1 [14], Table 4.6.3-68			
Information Element	**Value/remark**	**Comment**	**Condition**
MAC-CellGroupConfig ::= SEQUENCE {			
schedulingRequestID-BFR-SCell-r16	SchedulingRequestId		
}			

Table 5.5.5.6.4.3-3: *SchedulingRequestResourceConfig*

Derivation Path: TS 38.508-1 [14], Table 4.6.3-157			
Information Element	**Value/remark**	**Comment**	**Condition**
SchedulingRequestResourceConfig ::= SEQUENCE {			
periodicityAndOffset CHOICE {			
sl40	4		
}			
}			

5.5.5.6.5 Test requirement

Tables 5.5.5.6.4.1-3 and 5.5.5.6.5-1 define the primary level settings including test tolerances for EN-DC FR2 SCell for beam failure detection and link recovery testing in non-DRX.

Table 5.5.5.6.5-1: NR Cell specific test parameters for EN-DC FR2 SCell for beam failure detection and link recovery testing in non-DRX mode

Parameter	Unit	Cell2	Cell3 Test 1				
		T1 to T5	T1	T2	T3	T4	T5
AoA setup		Setup 1 defined in A.9.1	Setup 1 defined in A.9.1				
Assumption for UE beams[Note 10]		Rough	Rough				

EPRE ratio of PDCCH DMRS to SSS		dB	0	0				
EPRE ratio of PDCCH to PDCCH DMRS		dB						
EPRE ratio of PBCH DMRS to SSS		dB						
EPRE ratio of PBCH to PBCH DMRS		dB						
EPRE ratio of PSS to SSS		dB						
EPRE ratio of PDSCH DMRS to SSS		dB						
EPRE ratio of PDSCH to PDSCH DMRS		dB						
EPRE ratio of OCNG DMRS to SSS		dB						
EPRE ratio of OCNG to OCNG DMRS		dB						
SNR_CSI-RS of set q_0	Config 1	dB	5	13.7	5.7	-12	-12	-12
SNR_CSI-RS of set q_1	Config 1	dB	0.2	0.2	0.2	20	20	20
CSI-RS_RP of set q_1	Config 1	dBm/SCS kHz	-104.5	-104.5	-104.5	-84.7	-84.7	-84.7
N_{oc}	Config 1	dBm/120kHz	-104.7	-104.7				
Propagation condition			TDL-A 30ns 75Hz	TDL-A 30ns 75Hz				

Note 1: OCNG shall be used such that the resources in Cell 1 are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.
Note 2: The uplink resources for CSI reporting are assigned to the UE prior to the start of time period T1.
Note 3: NZP CSI-RS resource set configuration for CSI reporting are assigned to the UE prior to the start of time period T1.
Note 4: Void
Note 5: The timers and layer 3 filtering related parameters are configured prior to the start of time period T1.
Note 6: The signal contains PDCCH for UEs other than the device under test as part of OCNG.
Note 7: SNR levels correspond to the signal to noise ratio over the REs carrying CSI-RS.
Note 8: The SNR in time periods T1, T2, T3, T4 and T5 is denoted as SNR1, SNR2 and SNR3 respectively in figure 5.5.5.6.4-1.
Note 9: The SNR values are specified for testing a UE which supports 2RX on at least one band. For testing of a UE which supports 4RX on all bands, the SNR during T3 is modified as specified in clause D.4.
Note 10: Information about types of UE beam is given in B.2.1.3 in TS 38.133 [6], and does not limit UE implementation or test system implementation

The UE behaviour during time durations T1, T2, T3, T4 and T5 shall be as follows:

During the time duration T1 and T2, the UE shall transmit uplink signal at least in all subframes configured for CSI transmission on Cell 2.

During the period from time point A to time point B the UE shall transmit uplink signal in Cell 2 in all uplink slots configured for CSI transmission according to the configured periodic CSI reporting for Cell 2.

During T3 the UE shall detect beam failure and initial link recovery. During T4 and T5 the UE measures and evaluates beam candidate from beam candidate set q_1.

No later than time point F occurring no later than D1 = 260+10 ms after the start of T5, the UE shall transmit PUCCH with LRR, followed by BFR MAC CE containing a beam associated with the candidate beam set q_1. The UE shall not transmit PUCCH with an LRR with the candidate beam set q_1 earlier than time point B.

Test is concluded once the test equipment has received the initial preamble transmission from the UE. The rate of correct events observed during repeated tests shall be at least 90%.

5.5.5.7 EN-DC FR2 SCell CSI-RS-based beam failure detection and link recovery in DRX

Editor's Note: This test case is incomplete for Test frequency f > 40.8 GHz

- This test case is incomplete for UE power class other than PC3.

5.5.5.7.1 Test purpose

The purpose of this test is to verify that the UE properly detects CSI-RS-based beam failure in the set q_0 configured for an active SCell and that the UE performs correct CSI-RS-based link recovery based on beam candidate set q_1. The purpose is to test the downlink monitoring for beam failure detection within the UEs active DL BWP of the SCell with *schedulingRequestID-BFR-SCell-r16* configuration, during the evaluation period, and link recovery, when DRX is used. This test will partly verify the CSI-RS based beam failure detection and link recovery for an FR2 SCell requirements in TS 38.133 [6] clause 8.5.

5.5.5.7.2 Test applicability

This test applies to all types of NR UE supporting E-UTRA and EN-DC from release 16 onwards supporting SCell BFR.

5.5.5.7.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 5.5.5.0.2 and 5.5.5.0.4.

The normative reference for this requirement is TS 38.133 [6] clause A.5.5.5.7.

5.5.5.7.4 Test description

There are three cells configured in this test. Cell 1 is the E-UTRAN PCell, Cell 2 is the PSCell and Cell 3 is the SCell. This test consists of five successive time periods, with time duration of T1, T2, T3, T4 and T5 respectively. Figure 5.5.5.7.4-1 shows the variation of the downlink SNR of the active SCell and the SNR of the CSI-RS in set q_0 in the active SCell to emulate CSI-RS based beam failure. Figure 5.5.5.7.4-1 additionally shows the variation of the downlink L1-RSRP of the CSI-RS in set q_1 of the candidate beam used for link recovery.

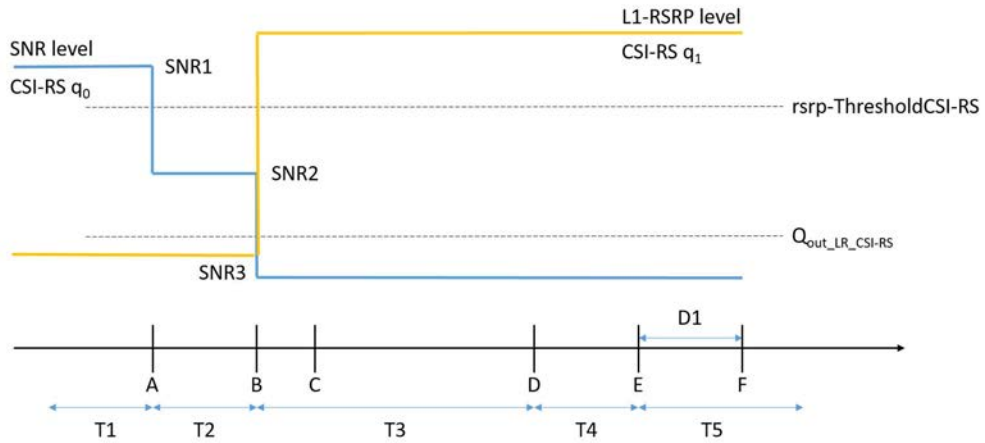


Figure 5.5.5.7.4-1: SNR and L1-RSRP variation for CSI-RS based beam failure detection and link recovery testing for SCell in DRX mode

5.5.5.7.4.1 Initial conditions

This test shall be tested using any of the test configurations in Table 5.5.5.7.4.1-1.

Table 5.5.5.7.4.1-1: Supported test configurations for EN-DC FR2 SCell beam failure detection and link recovery testing in DRX

Configuration	Description
5.5.5.7-1	LTE FDD, TDD duplex mode, 120 kHz SSB SCS, 100 MHz bandwidth
5.5.5.7-2	LTE TDD, TDD duplex mode, 120 kHz SSB SCS, 100 MHz bandwidth
Note: The UE is only required to be tested in one of the supported test configurations	

Configure the test equipment and the DUT according to the parameters in Table 5.5.5.7.4.1-2.

Table 5.5.5.7.4.1-2: Initial conditions for EN-DC FR2 SCell beam failure detection and link recovery testing in DRX

Parameter	Value		Comment
Test environment	NC		As specified in TS 38.508-1 [14] clause 4.1.
Test frequencies	As specified in Annex E, table E.5-1 and TS 38.508-1 [14] clause 4.3.1 for E-UTRA and 7.2.3 for NR.		
Channel bandwidth	As specified by the test configuration selected from Table 5.5.5.7.4.1-1.		
Propagation conditions	AWGN		As specified in Annex C.2.2.
Connection Diagram	TE Part	A.3.3.3.1	As specified in TS 38.508-1 [14] Annex A.
	DUT Part	A.3.4.1.1	
Exceptions to connection diagram	N/A		

1. The general test parameter settings are set up according to Table 5.5.5.7.4.1-3.
2. Message contents are defined in clause 5.5.5.7.4.3.
3. There are one E-UTRAN cell and two NR cells specified in the test. E-UTRAN Cell 1 is the cell used for connection setup with the power level set according to Annex C.1.1 and C.1.2 for this test.

Table 5.5.5.7.4.1-3: General test parameters for FR2 SCell for beam failure detection and link recovery testing in DRX mode

Parameter	Test Config.	Unit	Value	Comment
			Test 1	
Active E-UTRA PCell	1-2		Cell 1	
E-UTRA RF Channel Number	1-2		1	
Active PCell	1-2		Cell 2	
RF Channel Number for PSCell	1-2		2	
Active SCell	1-2		Cell 3	
RF Channel Number for SCell	1-2		3	
Duplex mode	1-2		TDD	
TDD Configuration	1-2		TDDConf.3.1	
$BW_{channel}$	1-2	MHz	100: $N_{RB,c}$ = 66	
Data RBs allocated	1-2		66	
PDSCH/PDCCH subcarrier spacing	1-2	kHz	120	
DL initial BWP configuration	1-2		DLBWP.0.1	
DL dedicated BWP configuration	1-2		DLBWP.1.1	
UL initial BWP configuration	1-2		ULBWP.0.1	
UL dedicated BWP configuration	1-2		ULBWP.1.1	
PDSCH Reference Channel	1-2		SR.3.2 TDD	
RMSI CORESET Reference Channel	1-2		CR.3.1 TDD	A.1.2.2
Dedicated CORESET Reference Channel	1-2		CCR.3.1 TDD	
OCNG parameters	1-2		OP.1	A.2.1
CP length	1-2		Normal	
PDSCH/PDCCH TCI state	1-2		TCI.State.0	
CSI-RS for tracking	1-2		TRS.2.1 TDD	
SSB Configuration	1-2		SSB.3 FR2	A.3

SMTC Configuration		1-2		SMTC.3	A.4
PRACH Configuration		1-2		FR2 PRACH configuration 4	Table A.7.2-1
DRX configuration		1-2		DRX.3	A.5
CSI-RS configuration for BFD/CBD in activated SCell		1-2		CSI-RS.3.2 TDD	A.1.4.2
CSI-RS index assigned as BFD RS (q_0) in activated SCell		1-2		0	
CSI-RS index assigned as CBD RS (q_1) in activated SCell		1-2		1	
CSI-RS configuration for RLM in PSCell		1-2		CSI-RS.3.2 TDD	A.1.4.2
Beam failure detection transmission parameters	DCI format	1-2		1-0	
	Number of Control OFDM symbols	1-2		2	
	Aggregation level	1-2	CCE	8	
	Ratio of hypothetical PDCCH RE energy to average SSS RE energy	1-2	dB	0	
	Ratio of hypothetical PDCCH DMRS energy to average SSS RE energy	1-2	dB	0	
	DMRS precoder granularity	1-2		REG bundle size	
	REG bundle size	1-2		6	
Gap pattern ID		1-2		N/A	
schedulingRequestID-BFR-SCell-r16		1-2		Configured	
Periodicity of PUCCH for SR configuration for BFR on SCell		1-2	slot	40	5ms
Offset of PUCCH for SR configuration for BFR on SCell		1-2	slot	4	
PUCCH parameters for SR configuration for BFR on SCell		1-2		Table 8.3.3.1.2-1 in [28]	
rlmInSyncOutOfSyncThreshold		1-2		absent	Value 0 is applied. (Table 8.1.1-1 in TS 38.133 [6]).
rsrp-ThresholdSSB		1-2	dBm/SCS	-109 Note 2	Threshold used for $Q_{in_LR_SSB}$
powerControlOffsetSS		1-2		db0	Used for deriving rsrp-ThresholdCSI-RS
beamFailureInstanceMaxCount		1-2		n1	see TS 38.321 [12], clause 5.17
beamFailureDetectionTimer		1-2		pbfd4	see TS 38.321 [12], clause 5.17
CSI-RS configuration for CSI reporting		1-2		CSI-RS.3.1 TDD	A.1.4.2
reportConfigType		1-2		periodic	
reportQuantity		1-2		cri-RI-PMI-CQI	
CSI reporting periodicity		1-2	slot	40	
CSI reporting offset		1-2	slot	4	
T310		1-2	ms	1000	
N310		1-2		2	
T1		1-2	s	1	The UE shall be fully synchronized to cell 1 during T1
T2		1-2	s	5.43	
T3		1-2	s	5.16	
T4		1-2	s	0	
T5		1-2	s	0.31	
D1		1-2	s	0.27	
Note 1: UE-specific PDCCH is not transmitted after T1 starts. Note 2: Including test toelerance given in Annex F.1.3.2					

5.5.5.7.4.2 Test procedure

Prior to the start of the time duration T1, the UE shall be fully synchronized to Cell 1, Cell 2 and Cell 3. The UE shall be configured for periodic CSI reporting with a reporting periodicity defined in CSI-RS configuration. In the test, DRX configuration is enabled in PCell and DRX inactivity timer has already been expired, i.e. UE tries to decode PDCCH and to send periodic CQI during the period when On-duration timer is running. Time alignment timers shall be set to "infinity" so that UL timing alignment is maintained during the test. During the test the UE is scheduled to transmit continuously in UL.

1. Ensure the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity *EN-DC*, DC bearer *MCG* and *SCG*, Connected without release *On* and Test Mode *On* according to TS 38.508-1 [14] clause 4.5.4.
2. The SS shall configure SCell (Cell 3) on the SCC as per TS 38.508-1 [14] clause 7.5.2, with the message content exceptions defined in clause 5.5.5.7.4.3. NR RRCReconfiguration message is contained in RRCConnectionReconfiguration and NR RRCReconfigurationComplete message is contained in RRCConnectionReconfigurationComplete.
3. The SS activates SCC by sending the activation MAC-CE (Refer TS 38.321 [12], clauses 5.9, 6.1.3.10).
4. Set the parameters of NR Cell 2 and Cell 3 according to T1 in Table 5.5.5.7.5-1. Propagation conditions are set according to Annex C.2.3. T1 starts.
5. When T1 expires the SS shall change the SNR value to T2 as specified in Table 5.5.5.7.5-1. T2 starts.
6. When T2 expires the SS shall change the SNR value to T3 as specified in Table 5.5.5.7.5-1. T3 starts.
7. When T3 expires the SS shall change the SNR value to T4 as specified in Table 5.5.5.7.5-1. T4 starts.
8. When T4 expires the SS shall change the SNR value to T5 as specified in Table 5.5.5.7.5-1. T5 starts.
9. If the SS:

   a) detects uplink power on NR carrier in each slot configured for CSI transmission (according CSI reporting on PUCCH) during the period from time point A to time point B; and

   b) does not detect PUCCH with LRR before time point B, and

   c) detects PUCCH with LRR, followed by BFR MAC CE containing a beam associated with the candidate beam set q_1 before time point F (D1 after the start of T5),

   the number of successful tests is increased by one.

   Otherwise the number of failed tests is increased by one.
10. When T5 expires the SS shall change the SNR value to T1 as specified in Table 5.5.5.7.5-1.
11. If the iteration fails, the SS shall first attempt to release and add the FR2 SCell. If that also fails, then the UE is switched OFF/ON to proceed with the next iteration, and ensure the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity *EN-DC*, DC bearer *MCG* and *SCG*, Connected without release *On* and Test Mode *On* according to TS 38.508-1 [14] clause 4.5.4.
12. Repeat steps 2-11 for all subtests until the confidence level according to Tables G.2.3-1 in Annex G clause G.2 is achieved.

5.5.5.7.4.3 Message contents

Message contents are according to TS 38.508-1 [14] clause 7.3 with the following exceptions:

Table 5.5.5.7.4.3-1: Common Exception messages for EN-DC FR2 SCell for beam failure detection and link recovery testing in DRX mode

Default Message Contents	
Common contents of system information blocks exceptions	

Default RRC messages and information elements contents exceptions	Table H.3.1-8 with Condition CSI-RS BFD Table H.3.1-12 on Cell 3 Table H.3.1-13 on Cell 3 Table H.3.7-1 with condition DRX.3

Table 5.5.5.7.4.3-2: MAC-CellGroupConfig

Derivation Path: TS 38.508-1 [14], Table 4.6.3-68			
Information Element	**Value/remark**	**Comment**	**Condition**
MAC-CellGroupConfig ::= SEQUENCE {			
schedulingRequestID-BFR-SCell-r16	SchedulingRequestId		
}			

Table 5.5.5.7.4.3-3: *SchedulingRequestResourceConfig*

Derivation Path: TS 38.508-1 [14], Table 4.6.3-157			
Information Element	**Value/remark**	**Comment**	**Condition**
SchedulingRequestResourceConfig ::= SEQUENCE {			
periodicityAndOffset CHOICE {			
sl40	4		
}			
}			

5.5.5.7.5 Test requirement

Tables 5.5.5.7.4.1-3 and 5.5.5.7.5-1 define the primary level settings including test tolerances for EN-DC FR2 SCell for beam failure detection and link recovery testing in DRX.

Table 5.5.5.7.5-1: NR Cell specific test parameters for EN-DC FR2 SCell for beam failure detection and link recovery testing in DRX mode

Parameter		Unit	Cell2	Cell3 Test 1				
			T1 to T5	T1	T2	T3	T4	T5
AoA setup			Setup 1 defined in A.9.1	Setup 1 defined in A.9.1				
Assumption for UE beams[Note 10]			Rough	Rough				
EPRE ratio of PDCCH DMRS to SSS		dB	0	0				
EPRE ratio of PDCCH to PDCCH DMRS		dB						
EPRE ratio of PBCH DMRS to SSS		dB						
EPRE ratio of PBCH to PBCH DMRS		dB						
EPRE ratio of PSS to SSS		dB						
EPRE ratio of PDSCH DMRS to SSS		dB						
EPRE ratio of PDSCH to PDSCH DMRS		dB						
EPRE ratio of OCNG DMRS to SSS		dB						
EPRE ratio of OCNG to OCNG DMRS		dB						
SNR_CSI-RS of set q_0	Config 1	dB	5	13.7	5.7	-12	-12	-12
SNR_CSI-RS of set q_1	Config 1	dB	0.2	0.2	0.2	20	20	20
CSI-RS_RP of set q_1	Config 1	dBm/SCS kHz	-104.5	-104.5	-104.5	-84.7	-84.7	-84.7

N_{oc}	Config 1	dBm/120kHz	-104.7	-104.7
Propagation condition			TDL-A 30ns 75Hz	TDL-A 30ns 75Hz

Note 1: OCNG shall be used such that the resources in Cell 1 are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.
Note 2: The uplink resources for CSI reporting are assigned to the UE prior to the start of time period T1.
Note 3: NZP CSI-RS resource set configuration for CSI reporting are assigned to the UE prior to the start of time period T1.
Note 4: Void
Note 5: The timers and layer 3 filtering related parameters are configured prior to the start of time period T1.
Note 6: The signal contains PDCCH for UEs other than the device under test as part of OCNG.
Note 7: SNR levels correspond to the signal to noise ratio over the REs carrying CSI-RS.
Note 8: The SNR in time periods T1, T2, T3, T4 and T5 is denoted as SNR1, SNR2 and SNR3 respectively in figure 5.5.5.7.4-1.
Note 9: The SNR values are specified for testing a UE which supports 2RX on at least one band. For testing of a UE which supports 4RX on all bands, the SNR during T3 is modified as specified in clause D.4.
Note 10: Information about types of UE beam is given in B.2.1.3 in TS 38.133 [6], and does not limit UE implementation or test system implementation

The UE behaviour during time durations T1, T2, T3, T4 and T5 shall be as follows:

During the time duration T1 and T2, the UE shall transmit uplink signal at least in all subframes configured for CSI transmission on Cell 2.

During the period from time point A to time point B the UE shall transmit uplink signal in Cell 2 in all uplink slots configured for CSI transmission according to the configured periodic CSI reporting for Cell 2.

During T3 the UE shall detect beam failure and initial link recovery. During T4 and T5 the UE measures and evaluates beam candidate from beam candidate set q_1.

No later than time point F occurring no later than D1 = 260+10 ms after the start of T5, the UE shall transmit PUCCH with LRR, followed by BFR MAC CE containing a beam associated with the candidate beam set q_1. The UE shall not transmit PUCCH with an LRR with the candidate beam set q_1 earlier than time point B.

Test is concluded once the test equipment has received the initial preamble transmission from the UE. The rate of correct events observed during repeated tests shall be at least 90%.

5.5.5.8 EN-DC FR2 PSCell TRP specific Beam Failure Detection and Link Recovery in DRX mode

Editor's Note: This test case is incomplete in following aspects:

- This test case is incomplete for Test frequency f > 40.8 GHz
- This test case is incomplete for UE power class other than PC3.
- TT analysis has not been provided.
- TS 38.522 applicability spec update is pending

5.5.5.8.1 Test purpose

The purpose of this test is to verify that the UE properly detects the TRP specific CSI-RS-based beam failure in the set (q0,0), (q0,1) configured for a serving PSCell and a cell with PCID different from the serving cell, and that the UE performs correct CSI-RS-based link recovery based on beam candidate set (q1,0) and (q1,1). The purpose is to test the downlink monitoring for beam failure detection within the UEs active DL BWP of the PSCell with *schedulingRequestID-BFR-r17* configured, during the evaluation period, and link recovery, when DRX is used. This test will partly verify the CSI-RS based beam failure detection and link recovery for an FR2 serving cell requirements in TS 38.133 [6] clause 8.5.

5.5.5.8.2 Test applicability

This test applies to all types of NR UE supporting E-UTRA and EN-DC from release 17 onwards supporting PSCell BFR.

5.5.5.8.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 5.5.5.0.2 and 5.5.5.0.4.

The normative reference for this requirement is TS 38.133 [6] clause A.5.5.5.8.

5.5.5.8.4 Test description

There are three cells, cell 1 is the E-UTRAN PCell, cell 2 is the PSCell and cell 3 is the cell with different PCID in the test. The test consists of five successive time periods, with time duration of T1, T2, T3, T4 and T5 respectively. Figure 5.5.5.8.4-1 shows the variation of the downlink SNR of the PSCell and the SNR of the CSI-RS in set q_0 in the active PSCell to emulate CSI-RS based beam failure. Figure 5.5.5.8.4-1 additionally shows the variation of the downlink L1-RSRP of the CSI-RS in set q_1 of the candidate beam used for link recovery.

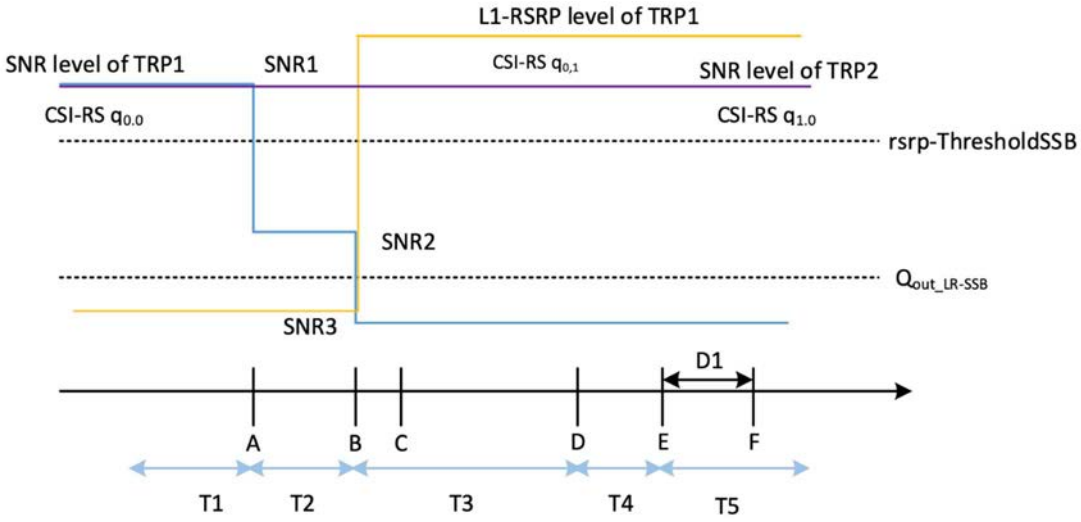


Figure 5.5.5.8.4-1: SNR and L1-RSRP variation for CSI-RS-based beam failure detection and link recovery testing in DRX mode

5.5.5.8.4.1 Initial conditions

This test shall be tested using any of the test configurations in Table 5.5.5.8.4.1-1.

Table 5.5.5.8.4.1-1: Supported test configurations for FR2 PSCell

Configuration	Description
1	LTE FDD, NR 120 kHz SCS, 100 MHz bandwidth, TDD duplex mode
2	LTE TDD, NR 120 kHz SCS, 100 MHz bandwidth, TDD duplex mode

Configure the test equipment and the DUT according to the parameters in Table 5.5.5.8.4.1-2.

Table 5.5.5.8.4.1-2: Initial conditions for EN-DC FR2 PSCell beam failure detection and link recovery testing in DRX

Parameter	Value	Comment
Test environment	NC	As specified in TS 38.508-1 [14] clause 4.1.
Test frequencies	As specified in Annex E, table E.5-1 and TS 38.508-1 [14] clause 4.3.1 for E-UTRA and 7.2.3 for NR.	

Channel bandwidth	As specified by the test configuration selected from Table 5.5.5.8.4.1-1.		
Propagation conditions	AWGN		As specified in Annex C.2.2.
Connection Diagram	TE Part	A.3.3.3.1	As specified in TS 38.508-1 [14] Annex A.
	DUT Part	A.3.4.1.1	
Exceptions to connection diagram	N/A		

1. The general test parameter settings are set up according to Table 5.5.5.8.4.1-3.
2. Message contents are defined in clause 5.5.5.8.4.3.
3. There are one E-UTRAN cell and one NR cell specified in the test. E-UTRAN Cell 1 is the cell used for connection setup with the power level set according to Annex C.1.1 and C.1.2 for this test.

Table A.5.5.5.8.4.1-3: General test parameters for FR2 PSCell for CSI-RS-based beam failure detection and link recovery testing in DRX mode

Parameter	Test Config.	Unit	Value	Comment
			Test 1	
Active E-UTRA PCell	1-2		Cell 1	
E-UTRA RF Channel Number	1-2		1	
Active PSCell	1-2		Cell 2	
RF Channel Number	1-2		2	
Duplex mode	1-2		TDD	
TDD Configuration	1-2		TDDConf.3.1	
$BW_{channel}$	1-2		100: $N_{RB,c}$ = 66	
Data RBs allocated	1-2		66	
PDSCH/PDCCH subcarrier spacing	1-2	kHz	120	
DL initial BWP configuration	1-2		DLBWP.0.1	
DL dedicated BWP configuration	1-2		DLBWP.1.1	
UL initial BWP configuration	1-2		ULBWP.0.1	
UL dedicated BWP configuration	1-2		ULBWP.1.1	
PDSCH Reference Channel	1-2		SR.3.2 TDD	
RMSI CORESET Reference Channel	1-2		CR.3.1 TDD	A.1.2.2
Dedicated CORESET Reference Channel	1-2		CCR.3.1 TDD	
OCNG parameters	1-2		OP.1	A.2.1
CP length	1-2		Normal	
PDSCH/PDCCH TCI state	1-2		TCI.State.0	
CSI-RS for tracking	1-2		TRS.2.1 TDD	
SSB Configuration	1-2		SSB.1 FR2	A.3
SMTC Configuration	1-2		SMTC.3	A.4
PRACH Configuration	1-2		FR2 PRACH configuration 4	Table A.7.2-1
DRX configuration	1-2		DRX.3	A.5
CSI-RS configuration for TRP0	1-2		CSI-RS.3.2 TDD	A.1.4.2
CSI-RS configuration for TRP1			CSI-RS.3.6 TDD	A.1.4.2
CSI-RS index assigned as BFD RS ($q_{0,0}$)	1-2		CSI-RS#0	
CSI-RS index assigned as CBD RS ($q_{1,0}$)	1-2		CSI-RS#1	
CSI-RS index assigned as BFD RS ($q_{0,1}$)	1-2		CSI-RS#2	
CSI-RS index assigned as CBD RS ($q_{1,1}$)	1-2		CSI-RS#3	
CSI-RS index assigned as RLM RS	1-2		0,1,2,3	A.1.4.2

Beam failure detection transmission parameters	DCI format	1-2		1-0	
	Number of Control OFDM symbols	1-2		2	
	Aggregation level	1-2	CCE	8	
	Ratio of hypothetical PDCCH RE energy to average SSS RE energy	1-2	dB	0	
	Ratio of hypothetical PDCCH DMRS energy to average SSS RE energy	1-2	dB	0	
	DMRS precoder granularity	1-2		REG bundle size	
	REG bundle size	1-2		6	
Gap pattern ID		1-2		N/A	
schedulingRequestID-BFR- r17		1-2		Configured	
Periodicity of PUCCH for SR configuration for BFR on PSCell		1-2	slot	40	5ms
rlmInSyncOutOfSyncThreshold		1-2		absent	Value 0 is applied. (Table 8.1.1-1 in TS 38.133 [6]).
rsrp-ThresholdSSB		1-2	dBm/SCS	-95	Threshold used for $Q_{in_LR_SSB}$
powerControlOffsetSS		1-2		db0	Used for deriving rsrp-ThresholdCSI-RS
beamFailureInstanceMaxCount		1-2		n1	see TS 38.321 [12], clause 5.17
beamFailureDetectionTimer		1-2		pbfd4	see TS 38.321 [12], clause 5.17
CSI-RS configuration for CSI reporting		1-2		CSI-RS.3.1 TDD	A.1.4.2
reportConfigType		1-2		periodic	
reportQuantity		1-2		cri-RI-PMI-CQI	
CSI reporting periodicity		1-2	slot	40	
CSI reporting offset		1-2	slot	4	
T310		1-2	ms	1000	
N310		1-2		2	
T1		1-2	s	1	The UE shall be fully synchronized to cell 1 during T1
T2		1-2	s	10.81	
T3		1-2	s	10.28	
T4		1-2	s	0	
T5		1-2	s	0.57	
D1		1-2	s	0.53	
Note 1: UE-specific PDCCH is not transmitted after T1 starts.					

5.5.5.8.4.2 Test procedure

Prior to the start of the time duration T1, the UE shall be fully synchronized to cell 1 and cell 2. The UE shall be configured for periodic CSI reporting with a reporting periodicity of 5 ms. In the test, DRX configuration is enabled in PCell and DRX inactivity timer has already been expired, i.e. UE tries to decode PDCCH and to send periodic CQI during the period when On-duration timer is running. Time alignment timers shall be set to "infinity" so that UL timing alignment is maintained during the test.

1. Ensure the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity *EN-DC*, DC bearer *MCG* and *SCG*, Connected without release *On* and Test Mode *On* according to TS 38.508-1 [14] clause 4.5.4.
2. NR RRCReconfiguration message is contained in RRCConnectionReconfiguration and NR RRCReconfigurationComplete message is contained in RRCConnectionReconfigurationComplete.
3. Set the parameters of NR Cell 2 according to T1 in Table 5.5.5.8.5-1. Propagation conditions are set according to Annex C.2.3. T1 starts.
4. When T1 expires the SS shall change the SNR1 and SNR2 values to T2 as specified in Table 5.5.5.8.5-1. T2 starts.
5. When T2 expires the SS shall change the SNR1 and SNR2 values to T3 as specified in Table 5.5.5.8.5-1. T3 starts.
6. When T3 expires the SS shall change the SNR1 and SNR2 values to T4 as specified in Table 5.5.5.8.5-1. T4 starts.
7. When T4 expires the SS shall change the SNR1 and SNR2 values to T5 as specified in Table 5.5.5.8.5-1. T5 starts.
8. If the SS:

   a) detects uplink power on NR carrier in each slot configured for CSI transmission (according CSI reporting on PUCCH) during the period from time point A to time point B; and

   b) does not detect PUCCH with LRR before time point B, and

   c) detects PUCCH with LRR, followed by BFR MAC CE containing a beam associated with the candidate beam set q_{10} and q_{11} before time point F (D1 after the start of T5),

   the number of successful tests is increased by one.

   Otherwise the number of failed tests is increased by one.
9. When T5 expires the SS shall change the SNR value to T1 as specified in Table 5.5.5.8.5-1.
10. If the iteration fails, the SS shall first attempt to release and add the FR2 PSCell. If that also fails, then the UE is switched OFF/ON to proceed with the next iteration, and ensure the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity *EN-DC*, DC bearer *MCG* and *SCG*, Connected without release *On* and Test Mode *On* according to TS 38.508-1 [14] clause 4.5.4.
11. Repeat steps 2-10 for all subtests until the confidence level according to Tables G.2.3-1 in Annex G clause G.2 is achieved.

5.5.5.8.4.3 Message contents

Message contents are according to TS 38.508-1 [14] clause 7.3 with the following exceptions:

Table 5.5.5.8.4.3-1: Common Exception messages for EN-DC FR2 PSCell for beam failure detection and link recovery testing in DRX mode

Default Message Contents	
Common contents of system information blocks exceptions	

Default RRC messages and information elements contents exceptions	Table H.3.1-8A with Condition CSI-RS BFD Table H.3.1-12A on Cell 2 Table H.3.1-13 on Cell 2 with condition SpCell Table H.3.7-1 with condition DRX.3

Table 5.5.5.8.4.3-2: *MAC-CellGroupConfig for R17 BFR*

Derivation Path: TS 38.508-1, Table 4.6.3-68			
Information Element	Value/remark	Comment	Condition
MAC-CellGroupConfig ::= SEQUENCE {			
schedulingRequestID-BFR-r17	Not present		
schedulingRequestID-BFR2-r17	Not present		
schedulingRequestConfig-v1700	SchedulingRequest-Config		
}			

Table 5.5.5.8.4.3-3: *SchedulingRequestResourceConfig*

Derivation Path: TS 38.508-1 [14], Table 4.6.3-157			
Information Element	**Value/remark**	**Comment**	**Condition**
SchedulingRequestResourceConfig ::= SEQUENCE {			
periodicityAndOffset CHOICE {			
sl40	4		
}			
}			

5.5.5.8.5 Test requirement

Tables 5.5.5.8.4.1-3 and 5.5.5.8.5-1 define the primary level settings including test tolerances for EN-DC FR2 PSCell for beam failure detection and link recovery testing in DRX.

Parameter		**Unit**	**Test 1**				
			T1	**T2**	**T3**	**T4**	**T5**
AoA setup			Setup 1 defined in A.9.1				
Assumption for UE beams[Note 10]			Rough				
EPRE ratio of PDCCH DMRS to SSS		dB	0				
EPRE ratio of PDCCH to PDCCH DMRS		dB					
EPRE ratio of PBCH DMRS to SSS		dB					
EPRE ratio of PBCH to PBCH DMRS		dB					
EPRE ratio of PSS to SSS		dB					
EPRE ratio of PDSCH DMRS to SSS		dB					
EPRE ratio of PDSCH to PDSCH DMRS		dB					
EPRE ratio of OCNG DMRS to SSS		dB					
EPRE ratio of OCNG to OCNG DMRS		dB					
SNR_CSI-RS of set $q_{0,0}$	Config 1-2	dB	5+TT	-3+TT	-12+TT	-12+TT	-12+TT
SNR_CSI-RS of set $q_{1,0}$	Config 1-2	dB	5+TT	5+TT	5+TT	5+TT	5+TT
SNR_CSI-RS of set $q_{0,1}$	Config 1-2	dB	0.2+TT	0.2+TT	20.2+TT	20.2+TT	20.2+TT
SNR_CSI-RS of set $q_{1,1}$	Config 1-2	dB	0.2+TT	0.2+TT	20.2+TT	20.2+TT	20.2+TT
CSI-RS_RP of set $q_{1,0}$	Config 1-2	dBm/SCS	-104.5+TT	-104.5+TT	-84.5+TT	-84.5+TT	-84.5+TT
CSI-RS_RP of set $q_{1,1}$	Config 1-2	dBm/SCS	-104.5+TT	-104.5+TT	-84.5+TT	-84.5+TT	-84.5+TT

N_{oc}	Config 1-2	dBm/12 0 KHz	-104.7+TT
Propagation condition			TDL-A 30ns 75Hz

Note 1: OCNG shall be used such that the resources in Cell 1 are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.
Note 2: The uplink resources for CSI reporting are assigned to the UE prior to the start of time period T1.
Note 3: NZP CSI-RS resource set configuration for CSI reporting are assigned to the UE prior to the start of time period T1.
Note 4: Void
Note 5: The timers and layer 3 filtering related parameters are configured prior to the start of time period T1.
Note 6: The signal contains PDCCH for UEs other than the device under test as part of OCNG.
Note 7: SNR levels correspond to the signal to noise ratio over the SSS REs.
Note 8: The SNR in time periods T1, T2, T3, T4 and T5 is denoted as SNR1, SNR2 and SNR3 respectively in figure 5.5.5.8.4-1.
Note 9: The SNR values are specified for testing a UE which supports 2RX on at least one band. For testing of a UE which supports 4RX on all bands, the SNR during T3 is modified as specified in clause A.3.6.
Note 10: Information about types of UE beam is given in B.2.1.3, and does not limit UE implementation or test system implementation
Note 11: This value allows up to 1dB degradation from applied SNR to UE baseband

The UE behaviour during time durations T1, T2, T3, T4 and T5 shall be as follows:

During the time duration T1 and T2, the UE shall transmit uplink signal at least in all subframes configured for CSI transmission on Cell 1.

During the period from time point A to time point B the UE shall transmit uplink signal in Cell 1 in all uplink slots configured for CSI transmission according to the configured periodic CSI reporting for Cell 1.

During T3 the UE shall detect beam failure and initiate link recovery. During T4 and T5 the UE measures and evaluate beam candidate from beam candidate set q_1.

No later than time point F occurring no later than D1 = 260+10 ms after the start of T5, the UE shall transmit PUCCH with LRR, followed by BFR MAC CE containing a beam associated with the candidate beam set $q_{1,0}$. The UE shall not transmit PUCCH with an LRR with the candidate beam set $q_{1,0}$ earlier than time point B.

Test is concluded once the test equipment has received the initial preamble transmission from the UE. The rate of correct events observed during repeated tests shall be at least 90%.

5.5.6 Active BWP switch delay

5.5.6.1 DCI-based and time-based active BWP switch

5.5.6.1.0 Minimum conformance requirements

FFS

5.5.6.1.1 EN-DC FR2 DCI-based DL active BWP switch in non-DRX in synchronous EN-DC

Editor's note: This test case is incomplete. The following aspects are either missing or TBD

- Test tolerance analysis is missing

- Message contents are TBD

- Cell mapping is TBD

- Test procedure is TBD

- Test applicability needs to be added to TS 38.522

5.5.6.1.1.1 Test purpose

FFS

5.5.6.1.1.2 Test applicability

FFS

5.5.6.1.1.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 5.5.6.1.0.1.

The normative reference for this requirement is TS 38.133 [6] clause A.5.5.6.1.1.

5.5.6.1.1.4 Test description

5.5.6.1.1.4.1 Initial conditions

FFS

5.5.6.1.1.4.2 Test procedure

FFS

5.5.6.1.1.4.3 Message contents

FFS

5.5.6.1.1.5 Test requirements

FFS

5.5.6.1.2 EN-DC FR2 DCI-based DL active BWP switch with SCell in non-DRX in synchronous EN-DC

Editor's note: This test case is incomplete. The following aspects are either missing or TBD

- Test tolerance analysis is missing

- Message contents are TBD

- Cell mapping is TBD

- Test procedure is TBD

- Test applicability needs to be added to TS 38.522

5.5.6.1.2.1 Test purpose

FFS

5.5.6.1.2.2 Test applicability

FFS

5.5.6.1.2.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 5.5.6.1.0.2.

The normative reference for this requirement is TS 38.133 [6] clause A.5.5.6.1.2.

5.5.6.1.2.4 Test description

5.5.6.1.2.4.1 Initial conditions

FFS

5.5.6.1.2.4.2 Test procedure

FFS

5.5.6.1.2.4.3 Message contents

FFS

5.5.6.1.2.5 Test requirements

FFS

5.5.6.2 RRC-based active BWP switch

The requirements in this clause apply for a UE configured with more than one BWP on PSCell or any activated SCell in SCG in EN-DC. UE shall complete the switch of active DL and/or UL BWP within the delay defined in this clause.

5.5.6.2.0 Minimum conformance requirements

The requirements in this clause only apply to the case that the BWP switch is performed on a single CC with one or more than one BWP configuration(s) configured, with

- Active BWP switch or parameter change of its active BWPs for SpCell
- Parameter change of its active BWPs except parameter *firstActiveDownlinkBWP-Id* and *firstActiveUplinkBWP-Id* for SCell

For RRC-based BWP switch, after the UE receives BWP switching request, UE shall be able to receive PDSCH/PDCCH (for DL active BWP switch) or transmit PUSCH (for UL active BWP switch) on the new BWP on the serving cell on which BWP switch occurs on the first DL or UL slot right after the beginning of DL slot n + $\frac{T_{RRCprocessingDelay}+T_{BWPswitchDelayRRC}}{NR\ Slot\ length}$, where

DL slot n is the last slot overlapping with the PDSCH containing the RRC command, and

$NR\ Slot\ length$ is determined by the smaller SCS between the SCS before BWP switch and the SCS after BWP switch if the BWP switch involves changing of SCS.

$T_{RRCprocessing\ Delay}$ is the length of the RRC procedure delay in millisecond as defined in clause 11.2 in TS 36.331 [29] if the corresponding RRC message is embedded in E-UTRA RRC message, otherwise it is the length of the RRC procedure delay in ms as defined in clause 12 in TS 38.331 [2], and

$T_{BWPswitchDelayRRC} = 6ms$ is the time used by the UE to perform BWP switch.

The UE is not required to transmit UL signals or receive DL signals during the time defined by $T_{RRCprocessingDelay} + T_{BWPswitchDelayRRC}$ on the cell where RRC-based BWP switch occurs. When $T_{HARQ} > T_{RRCprocessingDelay}$ a longer switching delay is allowed. Where T_{HARQ} is the time between DL data transmission and acknowledgement as specified in TS 38.213 [8].

5.5.6.2.1 EN-DC FR2 RRC-based DL active BWP switch in non-DRX in synchronous EN-DC

Editor's Note: This test case has been completed for the following configurations:

- Test frequency f ≤ 40.8 GHz
- UE PC3
- The test is incomplete for UE power classes other than PC3

- The test is incomplete for test frequencies > 40.8 GHz

5.5.6.2.1.1 Test purpose

The purpose of this test is to verify the DL BWP switch delay requirement for RRC-based BWP switch defined in clause 5.5.6.2.0.1. Supported test configurations are shown in Table 5.5.6.2.1.4.1-1.

5.5.6.2.1.2 Test applicability

This test applies to all types of E-UTRA UE release 15 and forward, supporting EN-DC and BWP adaptation of at least 2 BWPs.

5.5.6.2.1.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 5.5.6.2.0.1.

The normative reference for this requirement is TS 38.133 [6] clause A.5.5.6.2.1.

5.5.6.2.1.4 Test description

5.5.6.2.1.4.1 Initial conditions

Initial conditions are a set of test configurations the UE needs to be tested in and the steps for the SS to take with the UE to reach the correct measurement state.

The initial test configurations consist of environmental conditions, test frequencies, test channel bandwidths and sub-carrier spacing based on NR operating bands specified in Table 5.3.5-1 of 38.521-2 [18].

This test shall be tested using any of the test configurations in Table 5.5.6.2.1.4.1-1.

Table 5.5.6.2.1.4.1-1: DL BWP switch supported test configurations

Config	Description
1	LTE FDD, NR 120 kHz SSB SCS, 100 MHz bandwidth, TDD duplex mode
2	LTE TDD, NR 120 kHz SSB SCS, 100 MHz bandwidth, TDD duplex mode
NOTE 1: The UE is only required to be tested in one of the supported test configurations	

Configure the test equipment and the DUT according to the parameters in Table 5.5.6.2.1.4.1-2

Table 5.5.6.2.1.4.1-2: Initial conditions for EN-DC FR2 RRC-based DL active BWP switch in non-DRX in synchronous EN-DC

Parameter	Value		Comment
Test environment	NC		As specified in TS 38.508-1 [14] clause 4.1.
Test frequencies	As specified in Annex E.1.1, Table E.2-1 and TS 38.508-1 [14] clause 4.3.1 for E-UTRA and 7.2.3 for NR.		
Channel bandwidth	As specified by the test configuration selected from Table 5.5.1.1.4.1-1		
Propagation conditions	AWGN		As specified in clause C.2.2.
Connection Diagram	TE Part	A.3.3.1.1	As specified in TS 38.508-1 [14] Annex A.
	DUT Part	A.3.4.1.1	
Exceptions to connection diagram	N/A		

1. Message contents are defined in clause 5.5.6.2.1.4.3.

2. The power levels and settings for Cell 1 are set according to Annex A.6, Table A.6.1.1-1. Cell 2 is NR FR2 PSCell. The connection setup is done according to the settings in Annex C.1.1, and the downlink signal levels as per Annex C.1.2.

3. The test parameters are given in Table 5.5.6.2.1.4.1-3 below.

Table 5.5.6.2.1.4.1-3: General test parameters for DL BWP switch in synchronous EN-DC

Parameter	Unit	Value	Comment
E-UTRA RF Channel Number		1	One E-UTRA radio channel is used for this test
NR RF Channel Number		2	One NR radio channel is used for this test
Active PCell		Cell 1	PCell on RF channel number 1.
Active PSCell		Cell 2	PSCell on RF channel number 2.
CP length		Normal	
DRX		OFF	
Cell-individual offset for cells on RF channel number 1	dB	0	Individual offset for cells on PCC.
Cell-individual offset for cells on RF channel number 2	dB	0	Individual offset for cells on PSCC.
Cell2 timing offset to cell1	μs	3	Synchronous EN-DC
T1	s	0.2	

5.5.6.2.1.4.2 Test procedure

The test consists of two cells, a single E-UTRA cell (PCell), and a single NR cell (PSCell). Prior to the start of the test, the UE shall be fully synchronized to PSCell. The UE shall be configured for parameters as mentioned in the Table 5.5.6.2.1.4.1-3.

1. Ensure the UE is in state RRC_CONNECTED with generic procedure parameters *Connectivity* EN-DC, DC bearer MCG and SCG, Connected without release *On* according to TS 38.508-1 [6] clause 5.5.

2. PDCCHs indicating new transmissions shall be sent continuously on PCell (Cell 1) to ensure that the UE will have ACK/NACK sending.

3. The SS shall send an *RRCConnectionReconfiguration* message releasing the dedicated configuration of the *initialDownlinkBWP* and the *initialUplinkBWP*. This message also configures another UE-specific bandwidth part, BWP-1, and indicates BWP-1 as the active DL BWP using *firstActiveDownlinkBWP-Id*, according to the initial condition of Active BWP-1 in Table 5.5.6.2.1.5-1 and Table 5.5.6.2.1.4.3-2.

4. The UE shall transmit an *RRCConnectionReconfigurationComplete* message.

5. Before the test starts UE is connected to Cell 1 (PCell) on radio channel 1 (PCC) and to Cell 2 (PSCell) on radio channel 2 (PSCC).

6. Before the test starts UE has bandwidth part BWP-1 in its RRC-configuration for Cell 2 (PSCell).

7. Before the test starts UE is indicated in *firstActiveDownlinkBWP-Id* that the active DL BWP is BWP-1 in PSCell.

8. Ensure all cells have constant signal levels throughout the test.

9. The test consists of 1 time period, with duration of T1.

10. Time period T1 starts when a *RRCConnectionReconfiguration* with updated bandwidth part configuration for active BWP-1, sent from the test equipment to the UE, is received at the UE side in PSCell's slot # denoted *i*. The UE shall reconfigure its bandwidth part with the updated bandwidth part corresponding to the final condition of active BWP-1, according to Table 5.5.6.2.1.5-1 and Table 5.5.6.2.1.4.3-2.

11. The UE shall be continuously scheduled on PSCell's BWP-1 starting the first DL slot that occurs right after the beginning of DL slot i+208. If the UE starts to report valid ACK/NACK for PSCell from the first UL slot that occurs after the beginning of DL slot $i+208+k_1$ then the number of successful tests is increased by one. Otherwise, the number of failure tests is increased by one.

12. After the SS receives the ACK/NACK in step 11, or when T1 expires, the SS shall transmit *RRCConnectionReconfiguration* message with condition EN-DC_PSCell_Rel according to TS 36.508 [25] Table 4.6.1-8 to release NR cell (PSCell). The UE shall transmit *RRCConnectionReconfigurationComplete* message.

13. The SS shall transmit *RRCConnectionReconfiguration* message with condition MCG_and_SCG according to TS 36.508 [25] Table 4.6.1-8 to add NR cell (PSCell). The UE shall transmit

RRCConnectionReconfigurationComplete message. If either of the reconfiguration in step 3, step 10, step 12 or step 13 fails, switch off and on the UE and go to step 1.

14. Repeat steps 2-13 until the confidence level according to Tables G.2.3-1 in Annex G clause G.2 is achieved.

5.5.6.2.1.4.3 Message contents

Message contents are according to TS 38.508-1 [14] clause 7.3 with the following exceptions:

Table 5.5.6.2.1.4.3-1: Common Exception messages

Default Message Contents	
Common contents of system information blocks exceptions	

Table 5.5.6.2.1.4.3-2: *RRCReconfiguration* (Step 3 and Step 10)

Derivation Path: TS 38.508-1 [14], Table 4.6.1-13 with condition NR			
Information Element	**Value/remark**	**Comment**	**Condition**
RRCReconfiguration ::= SEQUENCE {			
criticalExtensions CHOICE {			
rrcReconfiguration SEQUENCE {			
radioBearerConfig	Not present		
nonCriticalExtension SEQUENCE {			
masterCellGroup	CellGroupConfig	Table 5.5.6.2.1.4.3-3	
dedicatedNAS-MessageList	Not present		
}			
}			
}			
}			

Table 5.5.6.2.1.4.3-3: *CellGroupConfig* (configured in Table 5.5.6.2.1.4.3-2)

Derivation Path: TS 38.508-1 [14], Table 4.6.3-19			
Information Element	**Value/remark**	**Comment**	**Condition**
CellGroupConfig ::= SEQUENCE {			
spCellConfig SEQUENCE {			
spCellConfigDedicated	ServingCellConfig	Table 5.5.6.2.1.4.3-4	
}			
}			

Table 5.5.6.2.1.4.3-4: *ServingCellConfig* (configured in Table 5.5.6.2.1.4.3-3)

Derivation Path: TS 38.508-1 [14], Table 4.6.3-167			
Information Element	**Value/remark**	**Comment**	**Condition**
ServingCellConfig ::= SEQUENCE {			
initialDownlinkBWP SEQUENCE {			
pdcch-Config CHOICE {			
release	NULL		
}			
pdsch-Config CHOICE {			
release	NULL		
}			
radioLinkMonitoringConfig CHOICE {			
release	NULL		
}			
downlinkBWP-ToAddModList SEQUENCE (SIZE (1..maxNrofBWPs)) OF BWP-Downlink {	1 entry		
BWP-Downlink[1] SEQUENCE {	BWP-Downlink	entry 1	

		Table 5.5.6.2.1.4.3-5	
}			
firstActiveDownlinkBWP-Id	1	BWP-1	
defaultDownlinkBWP-Id	1	BWP-1	
uplinkConfig SEQUENCE {			
initialUplinkBWP SEQUENCE {			
pucch-Config CHOICE {			
release	NULL		
}			
pusch-Config CHOICE {			
release	NULL		
}			
srs-Config CHOICE {			
release	NULL		
}			
uplinkBWP-ToAddModList SEQUENCE (SIZE (1..maxNrofBWPs)) OF BWP-Uplink {	1 entry		
BWP-Uplink[1]	BWP-Uplink	entry 1 Table 5.5.6.2.1.4.3-6	
}			
firstActiveUplinkBWP-Id	1	BWP-1	
}			
}			

Table 5.5.6.2.1.4.3-5: *BWP-Downlink* (configured in Table 5.5.6.2.1.4.3-4)

Derivation Path: TS 38.508-1 [14], Table 4.6.3-9			
Information Element	**Value/remark**	**Comment**	**Condition**
BWP-Downlink ::= SEQUENCE {			
bwp-Id	1		
bwp-Common SEQUENCE {			
genericParameters	RIV defined in TS 38.214 [9] that corresponds to DLBWP.1.3		Step 3
	RIV defined in TS 38.214 [9] that corresponds to DLBWP.1.1		Step 10
}			
}			

Table 5.5.6.2.1.4.3-6: *BWP-Uplink* (configured in Table 5.5.6.2.1.4.3-4)

Derivation Path: TS 38.508-1 [14], Table 4.6.3-13			
Information Element	**Value/remark**	**Comment**	**Condition**
BWP-Uplink ::= SEQUENCE {			
bwp-Id	1		
bwp-Common SEQUENCE {			
genericParameters	RIV defined in TS 38.214 [9] that corresponds to ULBWP.1.3		Step 3
	RIV defined in TS 38.214 [9] that corresponds to ULBWP.1.1		Step 10
}			
}			

5.5.6.2.1.5 Test requirements

During T1, the UE shall be ready for the reception of uplink grant for PSCell from the first DL slot that occurs right after the beginning of DL slot $i + \frac{T_{RRCprocessingDelay} + T_{BWPswitchDelayRRC}}{\text{NR Slot length}}$ and starts to report valid ACK/NACK for the PSCell from the first UL slot that occurs after the beginning of DL slot $i + \frac{T_{RRCprocessingDelay} + T_{BWPswitchDelayRRC}}{\text{NR Slot length}} + k_1$, where,

$T_{RRCprocessingDelay}$ = 20 ms, is the RRC procedure delay in ms as defined in clause 11.2 in TS 36.331 [29];

$T_{BWPSwitchDelayRRC}$ = 6 ms, is the time used by the UE to perform BWP switch;

NR slot length = 0.125 ms for SCS = 120 kHz.

k_1 is the timing between DL data receiving and acknowledgement as specified in [12].

Which gives $\frac{T_{RRCprocessingDelay} + T_{BWPswitchDelayRRC}}{\text{NR Slot length}} = 208$ slots.

All of the above test requirements shall be fulfilled in order for the observed PSCell active BWP switch delay to be counted as correct.

The rate of correct events observed during repeated tests shall be at least 90%.

Table 5.5.6.2.1.5-1: NR Cell specific test parameters for DL BWP switch in synchronous EN-DC

Parameter		Unit	Cell 2
Frequency Range			FR2
Duplex mode			TDD
TDD configuration			TDDConf.3.1
$BW_{channel}$			100 MHz: $N_{RB,c}$ = 66
Active BWP ID			1
Initial DL BWP Configuration			DLBWP.0.2
Initial UL BWP Configuration			ULBWP.0.2
Initial Condition	Active DL BWP-1 Configuration		DLBWP.1.3
	Active UL BWP-1 Configuration		ULBWP.1.3
Final Condition	Active DL BWP-1 Configuration		DLBWP.1.1
	Active UL BWP-1 Configuration		ULBWP.1.1
PDSCH Reference measurement channel			SR.3.1 TDD
RMSI CORESET parameters			CR.3.1 TDD
Dedicated CORESET parameters			CCR.3.1 TDD
OCNG Patterns			OP.1
SSB Configuration			SSB.1 FR2
SMTC Configuration			SMTC.1
TCI State			TCI.State.0
TRS Configuration			TRS.2.1 TDD
Antenna Configuration			1x2
Propagation Condition			AWGN
EPRE ratio of PSS to SSS		dB	0
EPRE ratio of PBCH DMRS to SSS			
EPRE ratio of PBCH to PBCH DMRS			
EPRE ratio of PDCCH DMRS to SSS			
EPRE ratio of PDCCH to PDCCH DMRS			
EPRE ratio of PDSCH DMRS to SSS			
EPRE ratio of PDSCH to PDSCH			
EPRE ratio of OCNG DMRS to SSS(Note 1)			
EPRE ratio of OCNG to OCNG DMRS (Note 1)			

Note 1:	OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.
Note 2:	Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for N_{oc} to be fulfilled.
Note 3:	SS-RSRP and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.
Note 4:	For unpaired spectrum, a DL BWP is linked with an UL BWP. DLBWP.0.2 is linked with ULBWP.0.2; DLBWP.1.1 is linked with ULBWP.1.1; DLBWP.1.3 is linked with ULBWP.1.3 defined in clause 12 of TS 38.213 [8].

Table 5.5.6.2.1.5-2: OTA related test parameters for BWP switching test case

Parameter		Unit	Cell 2
Angle of arrival configuration			According to table A. 9
N_{oc} Note1	NR_TDD_FR2_A	dBm/15kHz	-112
	NR_TDD_FR2_B		
	NR_TDD_FR2_F		
	NR_TDD_FR2_G		
	NR_TDD_FR2_T		
	NR_TDD_FR2_Y		
N_{oc} Note1	NR_TDD_FR2_A	dBm/SCS	-103
	NR_TDD_FR2_B		
	NR_TDD_FR2_F		
	NR_TDD_FR2_G		
	NR_TDD_FR2_T		
	NR_TDD_FR2_Y		
SS-RSRP Note2	NR_TDD_FR2_A	dBm/SCS Note3	-85
	NR_TDD_FR2_B		
	NR_TDD_FR2_F		
	NR_TDD_FR2_G		
	NR_TDD_FR2_T		
	NR_TDD_FR2_Y		
$\hat{E}_s/I_{ot}$		dB	18
Io Note2	NR_TDD_FR2_A	dBm/95.04 MHz Note4	-56
	NR_TDD_FR2_B		
	NR_TDD_FR2_F		
	NR_TDD_FR2_G		
	NR_TDD_FR2_T		
	NR_TDD_FR2_Y		
NOTE 1:	Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for N_{oc} to be fulfilled.		
NOTE 2:	SS-RSRP and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.		
NOTE 3:	SS-RSRP minimum requirements are specified assuming independent interference and noise at each receiver antenna port.		
NOTE 4:	Equivalent power received by an antenna with 0dBi gain at the centre of the quiet zone		

5.5.7 Void

5.5.8 Active TCI state switch delay

5.5.8.0 Minimum conformance requirements

5.5.8.0.1 Minimum conformance requirements for MAC-CE based active TCI state switch

[TS38.133, clause 8.10.2]

The TCI state is known if the following conditions are met:

- During the period from the last transmission of the RS resource used for the L1-RSRP measurement reporting for the target TCI state to the completion of active TCI state switch, where the RS resource for L1-RSRP measurement is the RS in target TCI state or QCLed to the target TCI state
  - TCI state switch command is received within 1280 ms upon the last transmission of the RS resource for beam reporting or measurement
  - The UE has sent at least 1 L1-RSRP report for the target TCI state before the TCI state switch command
  - The TCI state remain detectable during the TCI state switching period
  - The SSB associated with the TCI state remain detectable during the TCI switching period
    - SNR of the TCI state ≥ -3dB

Otherwise, the TCI state is unknown.

[TS38.133, clause 8.10.3]

If the target TCI state is known, upon receiving PDSCH carrying MAC-CE activation command in slot n, UE shall be able to receive PDCCH with target TCI state of the serving cell on which TCI state switch occurs no later than at slot n+ T_{HARQ} +(3ms +TO_k*($T_{first-SSB}$ + $T_{SSB-proc}$)) / *NR slot length*. The UE shall be able to receive PDCCH with the old TCI state until slot n+ T_{HARQ} +(3ms +TO_k*($T_{first-SSB}$)) / *NR slot length*.

Where,

T_{HARQ} is the timing between DL data transmission and acknowledgement as specified in TS 38.321 [7];

$T_{first-SSB}$ is time to first SSB transmission after MAC CE command is decoded by the UE;

$T_{SSB-proc}$ = 2ms;

TO_k = 1 if target TCI state is not in the active TCI state list for PDSCH, 0 otherwise.

If the target TCI state is unknown, upon receiving PDSCH carrying MAC-CE activation command in slot n, UE shall be able to receive PDCCH with target TCI state of the serving cell on which TCI state switch occurs no later than at slot n+ T_{HARQ} +(3 ms + $T_{L1-RSRP}$ +TO_{uk}*($T_{first-SSB}$+ $T_{SSB-proc}$)) / *NR slot length*. The UE shall be able to receive PDCCH with the old TCI state until slot n+ T_{HARQ} +(3 ms+ $T_{L1-RSRP}$ +TO_{uk}*($T_{first-SSB}$)) / *NR slot length*.

Where

$T_{L1-RSRP}$ is the time for L1-RSRP measurement for Rx beam refinement, defined as

- $T_{L1-RSRP_Measurement_Period_SSB}$ for SSB as specified in clause 9.5.4.1,
  - with the assumption of M=1
  - with T_{Report} = 0
- $T_{L1-RSRP_Measurement_Period_CSI-RS}$ for CSI-RS as specified in clause 9.5.4.2
  - with the assumption of M=1 for periodic CSI-RS
  - for aperiodic CSI-RS if number of resources in resource set at least equal to *MaxNumberRxBeam*
  - with T_{Report} = 0
- $T_{L1-RSRP_Measurement_Period_SSB}$ = 0 for SSB in FR2 and $T_{L1-RSRP_Measurement_Period_CSI-RS}$ = 0 for CSI-RS in FR2, provided that the TCI state switching involves QCL-TypeA, QCL-TypeB or QCL-TypeC only.

TO_{uk} = 1 for CSI-RS based L1-RSRP measurement, and 0 for SSB based L1-RSRP measurement when TCI state switching involves QCL-TypeD

TO_{uk} = 1 when TCI state switching involves other QCL types

$T_{first-SSB}$ is time to first SSB transmission after L1-RSRP measurement when TCI state switching involves QCL-TypeD;

$T_{first-SSB}$ is time to first SSB transmission after MAC CE command is decoded by the UE for other QCL types;

The SSB shall be the QCL-TypeA or QCL-TypeC to target TCI state

During MAC-CE based TCI state switch the UE is allowed an interruption due to one shot timing adjustment on the serving or any activated serving cells as defined in clause 8.2.

5.5.8.0.2 Minimum conformance requirements for RRC based active TCI state switch

[TS38.133, clause 8.10.2]

The TCI state is known if the following conditions are met:

- During the period from the last transmission of the RS resource used for the L1-RSRP measurement reporting for the target TCI state to the completion of active TCI state switch, where the RS resource for L1-RSRP measurement is the RS in target TCI state or QCLed to the target TCI state
  - TCI state switch command is received within 1280 ms upon the last transmission of the RS resource for beam reporting or measurement
  - The UE has sent at least 1 L1-RSRP report for the target TCI state before the TCI state switch command
  - The TCI state remain detectable during the TCI state switching period
  - The SSB associated with the TCI state remain detectable during the TCI switching period
    - SNR of the TCI state ≥ -3dB

Otherwise, the TCI state is unknown.

[TS38.133, clause 8.10.5]

If the target TCI state is known, UE shall be able to receive PDCCH with target TCI state of the serving cell on which TCI state switch occurs no later than at slot n+ $T_{RRC_processing}$ +TO_k*($T_{first-SSB}$ + $T_{SSB-proc}$) / *NR slot length*. The UE is not required to receive PDCCH/PDSCH or transmit PUCCH/PUSCH until the end of switching period.

Where

- Slot n is the last slot overlapping with the PDSCH carrying RRC activation command.
- $T_{RRC_processing}$ is the RRC processing delay defined in Clause 11.2 of TS 36.331 [16] if the corresponding RRC message is embedded in E-UTRA RRC message, otherwise it is the RRC processing delay defined in Clause 12 of TS 38.331 [2].
- $T_{first-SSB}$ is time to first SSB transmission after RRC processing by the UE; The SSB shall be the QCL-TypeA or QCL-TypeC to target TCI state
- $T_{SSB-proc}$ and TO_k are defined in clause 8.10.3.

If the target TCI state is unknown, UE shall be able to receive PDCCH with target TCI state of the serving cell on which TCI state switch occurs no later than at slot n+ $T_{RRC_processing}$ +$T_{L1-RSRP}$ +TO_{uk}*($T_{first-SSB}$ + $T_{SSB-proc}$) / *NR slot length*. The UE is not required to receive PDCCH/PDSCH or transmit PUCCH/PUSCH until the end of switching period.

Where

- Slot n is the last slot overlapping with the PDSCH carrying RRC activation command.
- $T_{RRC_processing}$ is the RRC processing delay defined in Clause 11.2 of TS 36.331 [16] if the corresponding RRC message is embedded in E-UTRA RRC message, otherwise it is the RRC processing delay defined in Clause 12 of TS 38.331 [2].

- $T_{first-SSB}$ is time to first SSB transmission after L1-RSRP measurement when TCI state switching involves QCL-TypeD;
- $T_{first-SSB}$ is time to first SSB transmission after RRC processing time at the UE for other QCL types;
  - The SSB shall be the QCL-TypeA or QCL-TypeC to target TCI state
- $T_{L1-RSRP}$, TO_{uk} and $T_{SSB-proc}$ are defined in 38.133 clause 8.10.3.

The requirements for RRC based TCI state switch delay apply when only 1 TCI state is configured in RRC TCI state list. When $T_{HARQ} > T_{RRC_processing}$ a longer switching delay is allowed. Where T_{HARQ} is the time between DL data transmission and acknowledgement as specified in TS 38.213 [8].

5.5.8.1 EN-DC FR2 MAC-CE based active TCI state switch

Editor's note: This test case is incomplete. The following aspects are either missing or TBD

- Message contents are not complete.

- Connection diagram is TBD.

- TT analysis is missing.

- RAN4 dependency: Test parameters have brackets and TBDs.

5.5.8.1.1 Test purpose

The purpose of this test is to verify the active TCI state switch delay requirement defined in TS 38.133 [6] clause 8.10.3.

5.5.8.1.2 Test applicability

This test applies to all types of NR UE release 15 onwards.

5.5.8.1.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 5.5.8.0.1.

The normative reference for this requirement is TS 38.133 [6] clause A.5.5.8.1.

5.5.8.1.4 Test description

There are two cell configured in this test: E-UTRAN PCell (Cell 1) and NR PSCell (Cell 2). This test consists of two successive time periods, with time duration of T1 and T2 respectively.

5.5.8.1.4.1 Initial conditions

This test shall be tested using any of the test configurations in Table 5.5.8.1.4.1-1.

Table 5.5.8.1.4.1-1: Supported test configurations for EN-DC FR2 MAC-CE based active TCI state switch

Config	Description
5.5.8.1-1	LTE FDD, NR 120 kHz SSB SCS, 100 MHz bandwidth, TDD duplex mode
5.5.8.1-2	LTE TDD, NR 120 kHz SSB SCS, 100 MHz bandwidth, TDD duplex mode
NOTE 1: The UE is only required to be tested in one of the supported test configurations	

Configure the test equipment and the DUT according to the parameters in Table 5.5.8.1.4.1-2.

Table 5.5.8.1.4.1-2: Initial conditions for EN-DC FR2 MAC-CE based active TCI state switch

Parameter	Value	Comment
Test environment	NC	As specified in TS 38.508-1 [14] clause 4.1.

Test frequencies	As specified in Annex E, table E.5-1 and TS 38.508-1 [14] clause 4.3.1 for E-UTRA and 7.2.3 for NR.		
Channel bandwidth	As specified by the test configuration selected from Table 5.5.8.1.4.1-1.		
Propagation conditions	AWGN		As specified in clause C.2.2.
Connection Diagram	TE Part	A.3.TBD	As specified in TS 38.508-1 [14] Annex A.
	DUT Part	A.3.TBD	
Exceptions to connection diagram	N/A		

1. The general test parameter settings are set up according to Table 5.5.8.1.4.1-3.
2. Message contents are defined in clause 5.5.8.1.4.3.
3. There are one E-UTRAN cell and one NR cell specified in the test. E-UTRAN Cell 1 is the cell used for connection setup with the power level set according to clause C.1.1 and C.1.2 for this test.

Table 5.5.8.1.4.1-3: General test parameters for EN-DC FR2 MAC-CE based active TCI state switch

Parameter	Unit	Value	Comment
E-UTRA RF Channel Number		1	One E-UTRA radio channel is used for this test
NR RF Channel Number		2	One NR radio channel is used for this test
Active PCell		Cell 1	PCell on RF channel number 1.
Active PSCell		Cell 2	PSCell on RF channel number 2.
CP length		Normal	
DRX		OFF	For both PCell and PSCell
Cell-individual offset for cells on RF channel number 1	dB	0	Individual offset for cells on PCC.
Cell-individual offset for cells on RF channel number 2	dB	0	Individual offset for cells on PSCC.
Cell2 timing offset to cell1	µs	3	Synchronous EN-DC
T1	s	[0.2]	
T2	s	[0.2]	

5.5.8.1.4.2 Test procedure

During the test PDCCHs indicating new transmissions shall be sent continuously on PSCell (Cell 2) to ensure that the UE would have ACK/NACK sending.

Prior to the start of the time duration T1, the UE shall be fully synchronized to E-UTRA PCell and PSCell. The UE shall be configured with 2 different TCI states for PSCell: PDCCH TCI-state 0 (QCL'd to SSB0) and TCI-state 1 (QCL'd to SSB1), in Cell 2 before starting the test. TCI state-0 is indicated as the active PDCCH TCI-state

1. Ensure the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity *EN-DC*, DC bearer *MCG* and *SCG*, Connected without release *On* according to TS 38.508-1 [14] clause 4.5.4.
2. Set the parameters of NR Cell 1 according to T1 in Table 5.5.8.1.5-1. Propagation conditions are set according to clause C.2.3. T1 starts. During T1 only SSB to which PDCCH TCI-state 0 is QCL'd is transmitted.
3. When T1 expires the SS shall change the SNR value to T2 as specified in Table 5.5.8.1.5-1. T2 starts. At the beginning of T2, the SSB corresponding to TCI state 1 starts transmitting.
4. The SS transmits an *RRCReconfiguration* message to configure periodic L1-RSRP reporting.
5. The UE transmits an *RRCReconfigurationComplete* message.
6. The SS sends a MAC-CE to indicate switch to TCI-state 1 in slot n which is within 1280ms of UE providing L1-RSRP report with results for both SSB0 and SSB1.
7. If the SS:

a) Receives ACK/NACK on each UL transmission occasion scheduled on TCI-state 0 until slot $n+T_{HARQ}+24+8\times T_{first\text{-}SSB}$, and

b) Receives ACK/NACK on each UL transmission occasion scheduled on TCI-state 1 after slot $n+T_{HARQ}+40+8\times T_{first\text{-}SSB}$

the number of successful tests is increased by one, otherwise the number of failed tests is increased by one.

8. When T2 expires the SS shall sends a MAC-CE to indicate switch to TCI-state 0.
9. Wait 1s for the UE to switch TCI-state 0. If the SS receives ACK/NACK on each UL transmission occasion scheduled on TCI-state 0 continue to step 11. Otherwise continue to step 10.
10. Switch the UE on and off. Ensure the UE is in RRC_CONNECTED with generic procedure parameters Connectivity *EN-DC*, DC bearer *MCG* and *SCG*, Connected without release *On* according to TS 38.508-1 [14] clause 4.5.4.
11. Repeat steps 2-10 for all subtests until the confidence level according to Tables G.2.3-1 in Annex G clause G.2 is achieved.

5.5.8.1.4.3 Message contents

Message contents are according to TS 38.508-1 [14] clause 7.3 with the following exceptions:

Table 5.5.8.1.4.3-1: Common Exception messages for EN-DC FR2 MAC-CE based active TCI state switch

Default Message Contents	
Common contents of system information blocks exceptions	
Default RRC messages and information elements contents exceptions	FFS

5.5.8.1.5 Test requirement

Tables 5.5.8.1.4.1-3, 5.5.8.1.5-1 and 5.5.8.1.5-2 define the primary level settings including test tolerances for EN-DC FR2 MAC-CE based active TCI state switch.

Table 5.5.8.1.5-1: NR Cell specific test parameters for EN-DC FR2 MAC-CE based active TCI state switch

Parameter	Unit	Cell 2
Frequency Range		FR2
Duplex mode		TDD
TDD configuration		TDDConf.3.1
$BW_{channel}$		100 MHz: $N_{RB,c}$ = 66
Initial DL BWP Configuration		DLBWP.0.2
Dedicated DL BWP Configuration		DLBWP.1.1
Initial UL BWP Configuration		ULBWP.0.2
Dedicated UL BWP Configuration		ULBWP.1.1
PDSCH Reference measurement channel		SR.3.1 TDD
RMSI CORESET parameters		CR.3.1 TDD
Dedicated CORESET parameters		CCR.3.1 TDD
OCNG Patterns		OP.1
SSB Configuration		SSB.1 FR2
SMTC Configuration		SMTC.1
TCI State 0		TC. State.0
TCI State 1		TCI.State.1
TRS Configuration		TRS.2.1 TDD
Correlation Matrix and Antenna Configuration		1x2 Low
EPRE ratio of PSS to SSS	dB	0
EPRE ratio of PBCH DMRS to SSS		
EPRE ratio of PBCH to PBCH DMRS		

EPRE ratio of PDCCH DMRS to SSS		
EPRE ratio of PDCCH to PDCCH DMRS		
EPRE ratio of PDSCH DMRS to SSS		
EPRE ratio of PDSCH to PDSCH		
EPRE ratio of OCNG DMRS to SSS(Note 1)		
EPRE ratio of OCNG to OCNG DMRS (Note 1)		
Propagation Condition		AWGN
NOTE 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.		

Table 5.5.8.1.5-2: OTA related test parameter for EN-DC FR2 MAC-CE based active TCI state switch

Parameter	Unit	Cell 2			
		SSB0		SSB1	
		T1	T2	T1	T2
Angle of arrival configuration		Setup 3			
N_{oc} Note 1	dBm/15 kHz	[-92.1]			
N_{oc} Note 1	dBm/SCS	[-83.1]			
$\hat{E}_s/N_{oc}$	dB	1	1	-Infinity	1
SS-RSRP Note 2	dBm/120 kHz Note3	-82.1	-82.1	-Infinity	-82.1
Io Note2,Note6	dBm/95.04 MHz Note4	-54.94	-54.94	-54.94	-54.94
NOTE 1: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for N_{oc} to be fulfilled. NOTE 2: SS-RSRP and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves. NOTE 3: SS-RSRP minimum requirements are specified assuming independent interference and noise at each receiver antenna port. NOTE 4: Equivalent power received by an antenna with 0 dBi gain at the centre of the quiet zone NOTE 5: As observed with 0dBi gain antenna at the center of the quiet zone.					

During T2, UE shall send L1-RSRP report with results for both SSB0 and SSB1.

After receiving MAC-CE command in slot n, UE shall be able to continue to receive on TCI state 0 until $n+T_{HARQ}+(3ms+T_{first\text{-}SSB})$ / NR slot length, where

- T_{HARQ} (in ms) is the timing between DL data transmission and acknowledgement as specified in TS 38.213 [8];
- $T_{first\text{-}SSB}$ is time to first SSB transmission after MAC CE command is decoded by the UE;
- NR slot length = 0.125ms for 120kHz SSB SCS;

So UE shall be able to continue to receive PDCCH on TCI state 0 until $n+T_{HARQ}+24+8\times T_{first\text{-}SSB}$

After receiving MAC-CE command in slot n, UE shall be able to receive PDCCH with TCI state 1 no later than at slot $n+T_{HARQ}+(3ms+T_{first\text{-}SSB} + T_{SSB\text{-}proc})$ / NR slot length., where

- T_{HARQ} (in ms) is the timing between DL data transmission and acknowledgement as specified in TS 38.213 [8];
- $T_{first\text{-}SSB}$ is time to first SSB transmission after MAC CE command is decoded by the UE;
- $T_{SSB\text{-}proc}$ = 2 ms;
- NR slot length = 0.125ms for 120kHz SSB SCS;

So UE shall be able to continue to receive PDCCH on TCI state 1 no later than $n+T_{HARQ}+40+8\times T_{first\text{-}SSB}$

5.5.8.2 EN-DC FR2 RRC based active TCI state switch

Editor's note: This test case is incomplete. The following aspects are either missing or TBD

- Message contents are not complete.

- Connection diagram is TBD.

- TT analysis is missing.

- RAN4 dependency: Test parameters have brackets and TBDs.

5.5.8.2.1 Test purpose

The purpose of this test is to verify the active TCI state switch delay requirement defined in TS 38.133 [6] clause 8.10.3.

5.5.8.2.2 Test applicability

This test applies to all types of NR UE release 15 onwards.

5.5.8.2.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 5.5.8.0.2.

The normative reference for this requirement is TS 38.133 [6] clause A.5.5.8.2.

5.5.8.2.4 Test description

There are two cell configured in this test: E-UTRAN PCell (Cell 1) and NR PSCell (Cell 2). This test consists of two successive time periods, with time duration of T1 and T2 respectively.

5.5.8.2.4.1 Initial conditions

This test shall be tested using any of the test configurations in Table 5.5.8.2.4.1-1.

Table 5.5.8.2.4.1-1: Supported test configurations for EN-DC FR2 RRC based active TCI state switch

Config	Description
5.5.8.2-1	LTE FDD, NR 120 kHz SSB SCS, 100 MHz bandwidth, TDD duplex mode
5.5.8.2-2	LTE TDD, NR 120 kHz SSB SCS, 100 MHz bandwidth, TDD duplex mode
NOTE 1: The UE is only required to be tested in one of the supported test configurations	

Configure the test equipment and the DUT according to the parameters in Table 5.5.8.2.4.1-2.

Table 5.5.8.2.4.1-2: Initial conditions for EN-DC FR2 RRC based active TCI state switch

Parameter	Value		Comment
Test environment	NC		As specified in TS 38.508-1 [14] clause 4.1.
Test frequencies	As specified in Annex E, table E.5-1 and TS 38.508-1 [14] clause 4.3.1 for E-UTRA and 7.2.3 for NR.		
Channel bandwidth	As specified by the test configuration selected from Table 5.5.8.2.4.1-1.		
Propagation conditions	AWGN		As specified in clause C.2.2.
Connection Diagram	TE Part	A.3.TBD	As specified in TS 38.508-1 [14] Annex A.
	DUT Part	A.3.TBD	
Exceptions to connection diagram	N/A		

1. The general test parameter settings are set up according to Table 5.5.8.2.4.1-3.

2. Message contents are defined in clause 5.5.8.2.4.3.

3. There are one E-UTRAN cell and one NR cell specified in the test. E-UTRAN Cell 1 is the cell used for connection setup with the power level set according to clause C.1.1 and C.1.2 for this test.

Table 5.5.8.2.4.1-3: General test parameters for EN-DC FR2 RRC based active TCI state switch

Parameter	Unit	Value	Comment
E-UTRA RF Channel Number		1	One E-UTRA radio channel is used for this test
NR RF Channel Number		2	One NR radio channel is used for this test
Active PCell		Cell 1	PCell on RF channel number 1.
Active PSCell		Cell 2	PSCell on RF channel number 2.
CP length		Normal	
DRX		OFF	For both PCell and PSCell
Cell-individual offset for cells on RF channel number 1	dB	0	Individual offset for cells on PCC.
Cell-individual offset for cells on RF channel number 2	dB	0	Individual offset for cells on PSCC.
Cell2 timing offset to cell1	μs	3	Synchronous EN-DC
T1	s	[0.2]	
T2	s	[0.2]	

5.5.8.2.4.2 Test procedure

During the test PDCCHs indicating new transmissions shall be sent continuously on PSCell (Cell 2) to ensure that the UE would have ACK/NACK sending.

Prior to the start of the time duration T1, the UE shall be fully synchronized to E-UTRA PCell and PSCell. The UE shall be configured with 2 different TCI states for PSCell: PDCCH TCI-state 0 (QCL'd to SSB0) and TCI-state 1 (QCL'd to SSB1), in Cell 2 before starting the test. TCI state-0 is indicated as the active PDCCH TCI-state

1. Ensure the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity *EN-DC*, DC bearer *MCG* and *SCG*, Connected without release *On* according to TS 38.508-1 [14] clause 4.5.4.
2. Set the parameters of NR Cell 1 according to T1 in Table 5.5.8.2.5-1. Propagation conditions are set according to clause C.2.3. T1 starts. During T1 only SSB to which PDCCH TCI-state 0 is QCL'd is transmitted.
3. When T1 expires the SS shall change the SNR value to T2 as specified in Table 5.5.8.2.5-1. T2 starts. At the beginning of T2, the SSB corresponding to TCI state 1 starts transmitting.
4. The SS transmits an *RRCReconfiguration* message to configure periodic L1-RSRP reporting.
5. The UE transmits an *RRCReconfigurationComplete* message.
6. The SS sends an *RRCReconfiguration* message to indicate switch to TCI-state 1 in slot n which is within 1280ms of UE providing L1-RSRP report with results for both SSB0 and SSB1.
7. The UE transmits an *RRCReconfigurationComplete* message.
8. If the SS receives ACK/NACK on each UL transmission occasion scheduled on TCI-state 1 after slot $n+176+8\times T_{first\text{-}SSB}$ the number of successful tests is increased by one, otherwise the number of failed tests is increased by one.
9. When T2 expires the SS sends an *RRCReconfiguration* message to indicate switch to TCI-state 0.
10. The UE transmits an *RRCReconfigurationComplete* message.
11. Wait 1s for the UE to switch TCI-state 0. If the SS receives ACK/NACK on each UL transmission occasion scheduled on TCI-state 0 continue to step 13. Otherwise continue to step 12.
12. Switch the UE on and off. Ensure the UE is in RRC_CONNECTED with generic procedure parameters Connectivity *EN-DC*, DC bearer *MCG* and *SCG*, Connected without release *On* according to TS 38.508-1 [14] clause 4.5.4.
13. Repeat steps 2-10 for all subtests until the confidence level according to Tables G.2.3-1 in Annex G clause G.2 is achieved.

5.5.8.2.4.3 Message contents

Message contents are according to TS 38.508-1 [14] clause 7.3 with the following exceptions:

Table 5.5.8.2.4.3-1: Common Exception messages for EN-DC FR2 RRC based active TCI state switch

Default Message Contents	
Common contents of system information blocks exceptions	
Default RRC messages and information elements contents exceptions	FFS

5.5.8.2.5 Test requirement

Tables 5.5.8.2.4.1-3, 5.5.8.2.5-1 and 5.5.8.2.5-2 define the primary level settings including test tolerances for EN-DC FR2 RRC based active TCI state switch.

Table 5.5.8.2.5-1: NR Cell specific test parameters for EN-DC FR2 RRC based active TCI state switch

Parameter	Unit	Cell 2
Frequency Range		FR2
Duplex mode		TDD
TDD configuration		TDDConf.3.1
$BW_{channel}$		100 MHz: $N_{RB,c}$ = 66
Initial DL BWP Configuration		DLBWP.0.2
Dedicated DL BWP Configuration		DLBWP.1.1
Initial UL BWP Configuration		ULBWP.0.2
Dedicated UL BWP Configuration		ULBWP.1.1
PDSCH Reference measurement channel		SR.3.1 TDD
RMSI CORESET parameters		CR.3.1 TDD
Dedicated CORESET parameters		CCR.3.1 TDD
OCNG Patterns		OP.1
SSB Configuration		SSB.1 FR2
SMTC Configuration		SMTC.1
TCI State 0		TCI.State.0
TCI State 1		TCI.State.1
TRS Configuration		TRS.2.1 TDD
Correlation Matrix and Antenna Configuration		1x2 Low
EPRE ratio of PSS to SSS	dB	0
EPRE ratio of PBCH DMRS to SSS		
EPRE ratio of PBCH to PBCH DMRS		
EPRE ratio of PDCCH DMRS to SSS		
EPRE ratio of PDCCH to PDCCH DMRS		
EPRE ratio of PDSCH DMRS to SSS		
EPRE ratio of PDSCH to PDSCH		
EPRE ratio of OCNG DMRS to SSS(Note 1)		
EPRE ratio of OCNG to OCNG DMRS (Note 1)		
Propagation Condition		AWGN
NOTE: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.		

Table 5.5.8.2.5-2: OTA related test parameter for EN-DC FR2 RRC based active TCI state switch

Parameter	Unit	Cell 2			
		SSB0		SSB1	
		T1	T2	T1	T2
Angle of arrival configuration		Setup 3			
N_{oc} Note 1	dBm/15 kHz	[-92.1]			
N_{oc} Note 1	dBm/SCS	[-83.1]			
$\hat{E}_s/N_{oc}$	dB	1	1	-Infinity	1
SS-RSRP Note 2	dBm/120 kHz Note3	-82.1	-82.1	-Infinity	-82.1
Io Note2,Note6	dBm/95.04 MHz Note4	-54.94	-54.94	-54.94	-54.94

NOTE 1:	Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for N_{oc} to be fulfilled.
NOTE 2:	SS-RSRP and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.
NOTE 3:	SS-RSRP minimum requirements are specified assuming independent interference and noise at each receiver antenna port.
NOTE 4:	Equivalent power received by an antenna with 0 dBi gain at the centre of the quiet zone
NOTE 5:	As observed with 0dBi gain antenna at the center of the quiet zone.

During T2, UE shall send L1-RSRP report with results for both SSB0 and SSB1.

After receiving RRC command in slot n, UE shall be able to receive PDCCH with TCI state 1 no later than at slot n+ ($T_{RRC_processing}$ + $T_{first\text{-}SSB}$ + $T_{SSB\text{-}proc}$) / NR slot length, where

- $T_{RRC_processing}$ =20 ms is the RRC processing delay as specified in TS 38.331 [13];
- $T_{first\text{-}SSB}$ is time to first SSB transmission after RRC processing by the UE; The SSB shall be the QCL-TypeA or QCL-TypeC to TCI state 1;
- $T_{SSB\text{-}proc}$ = 2 ms;
- NR slot length = 0.125ms for 120kHz SSB SCS;

So UE shall be able to continue to receive PDCCH on TCI state 1 no later than slot n+176+8$\times T_{first\text{-}SSB}$.

5.6 Measurement procedures

5.6.1 Intra-frequency measurements

5.6.1.0 Minimum conformance requirements

5.6.1.0.1 Minimum conformance requirements for event-triggered measurement without gap

[TS38.133, clause 9.2.2]

The requirements in Section 9.2 apply, provided:

- The cell being identified or measured is detectable.

An intra-frequency cell shall be considered detectable when for each relevant SSB:

- SS-RSRP related side conditions given in Sections 10.1.2 and 10.1.3 for FR1 and FR2, respectively, for a corresponding Band,
- SS-RSRQ related side conditions given in Sections 10.1.7 and 10.1.8 for FR1 and FR2, respectively, for a corresponding Band,
- SS-SINR related side conditions given in Sections 10.1.12 and 10.1.13 for FR1 and FR2, respectively, for a corresponding Band,
- SSB_RP and SSB Ês/Iot according to Annex B.2.2 for a corresponding Band.

[TS38.133, clause 9.2.4.3]

Reported RSRP, RSRQ, and RS-SINR measurements contained in periodically triggered measurement reports shall meet the requirements in clauses 10.1.2.1, 10.1.3.1, 10.1.7.1, 10.1.8.1, 10.1.12.1 and 10.1.13.1, respectively.

The UE shall not send any event triggered measurement reports as long as no reporting criteria are fulfilled.

The measurement reporting delay is defined as the time between an event that will trigger a measurement report and the point when the UE starts to transmit the measurement report over the air interface. This requirement assumes that the measurement report is not delayed by other RRC signalling on the DCCH. This measurement reporting delay excludes a delay uncertainty resulted when inserting the measurement report to the TTI of the uplink DCCH. The delay uncertainty is: 2 x TTI_{DCCH}. This measurement reporting delay excludes a delay which caused by no UL resources for UE to send the measurement report.

The event triggered measurement reporting delay, measured without L3 filtering shall be less than $T_{identify\ intra\ with\ index}$ or $T_{identify\ intra\ without\ index}$ defined in clause 9.2.5.1 or clause 9.2.6.2. When L3 filtering is used an additional delay can be expected.

A cell is detectable only if at least one SSBs measured from the Cell being configured remains detectable during the time period $T_{identify_intra_without_index}$ or $T_{identify_intra_with_index}$ defined in clause 9.2.5.1 or clause 9.2.6.2. If a cell which has been detectable at least for the time period $T_{identify\ intra\ without\ index}$ or $T_{identify\ intra\ with\ index}$ defined in clause 9.2.5.1 or clause 9.2.6.2 becomes undetectable for a period and then the cell becomes detectable again and triggers an event, the event triggered measurement reporting delay shall be less than $T_{SSB_measurement_period_intra}$ provided the timing to that cell has not changed more than ± 3200 Tc while the measurement gap has not been available and the L3 filter has not been used. When L3 filtering is used, an additional delay can be expected.

[TS38.133-f60, clause 9.2.5.1]

The UE shall be able to identify a new detectable intra frequency cell within $T_{identify_intra_without_index}$ if UE is not indicated to report SSB based RRM measurement result with the associated SSB index(*reportQuantityRsIndexes* or *maxNrofRSIndexesToReport* is not configured), or the UE is indicated that the neighbour cell is synchronous with the serving cell (*deriveSSB-IndexFromCell* is enabled). Otherwise UE shall be able to identify a new detectable intra frequency cell within $T_{identify_intra_with_index}$. The UE shall be able to identify a new detectable intra frequency SS block of an already detected cell within $T_{identify_intra_without_index.}$ It is assumed that *deriveSSB-IndexFromCell* is always enabled for FR1 TDD and FR2.

$$T_{identify_intra_without_index} = (T_{PSS/SSS_sync_intra} + T_{SSB_measurement_period_intra})\ ms$$

Where:

T_{PSS/SSS_sync_intra}: it is the time period used in PSS/SSS detection given in table 5.6.1.0.1-1

$T_{SSB_measurement_period_intra}$: equal to a measurement period of SSB based measurement given in table 5.6.1.0.1-2

$CSSF_{intra}$: it is a carrier specific scaling factor and is determined

- -according to $CSSF_{outside_gap,i}$ in clause 9.1.5.1 for measurement conducted outside measurement gaps, i.e. when intra frequency SMTC is fully non overlapping or partially overlapping with measurement gaps, or according to $CSSF_{within_gap,i}$ in clause 9.1.5.2 for measurement conducted within measurement gaps, i.e. when intra frequency SMTC is fully overlapping with measurement gaps.
  - -if the high layer in TS 38.331 [2] signalling of *smtc2* is configured, the assumed periodicity of intra frequency SMTC occasions corresponds to the value of higher layer parameter *smtc2*; Otherwise the assumed periodicity of intra frequency SMTC occasions corresponds to the value of higher layer parameter *smtc1*.

$M_{pss/sss_sync_w/o_gaps}$: For a UE supporting FR2 power class 1, M_{pss/sss_sync}=40. For a UE supporting power class 2, $M_{pss/sss_sync_w/o_gaps}$ =24. For a UE supporting FR2 power class 3, $M_{pss/sss_sync_w/o_gaps}$ =24. For a UE supporting FR2 power class 4, $M_{pss/sss_sync_w/o_gaps}$ =24

$M_{meas_period_w/o_gaps}$: For a UE supporting power class 1, $M_{meas_period_w/o_gaps}$ =40. For a UE supporting FR2 power class 2, $M_{meas_period_w/o_gaps}$ =24. For a UE supporting power class 3, $M_{meas_period_w/o_gaps}$ =24. For a UE supporting power class 4, $M_{meas_period_w/o_gaps}$ =24.

When intra frequency SMTC is fully non overlapping with measurement gaps or intra frequency SMTC is fully overlapping with MGs, Kp=1

When intra frequency SMTC is partially overlapping with measurement gaps, Kp = 1/(1- (SMTC period /MGRP)), where SMTC period < MGRP

If the higher layer signalling in TS38.331 [2] signalling of *smtc2* is present and smtc1 is fully overlapping with measurement gaps and smtc2 is partially overlapping with measurement gaps, requirements are not specified for $T_{identify_intra_without_index}$ or $T_{identify_intra_with_index}$

For FR2, if *SSB-ToMeasure* is configured, when all of the reference signals configured for RLM, BFD, CBD or L1-RSRP for beam reporting outside measurement gap is fully non-overlapping with the SSB symbols indicated by *SSB-ToMeasure* and 1 symbol before each consecutive SSB symbols indicated by *SSB-ToMeasure* and 1 symbol after each consecutive SSB symbols indicated by *SSB-ToMeasure*, $K_{layer1_measurement}$= 1, otherwise $K_{layer1_measurement}$=1.5. If *SSB-ToMeasure* is not configured, when any of the reference signals configured for RLM, BFD, CBD or L1-RSRP for beam reporting outside measurement gap is fully overlapping with intra-frequency SMTC, $K_{layer1_measurement}$= 1.5, otherwise $K_{layer1_measurement}$=1.

If SCG DRX is in use, intra frequency cell identification requirements specified in Table 5.6.1.0.1-1 shall depend on the SCG DRX cycle. Otherwise, the requirements for when DRX is not in use shall apply.

Table 5.6.1.0.1-1: Time period for PSS/SSS detection, (Frequency range FR2)

DRX cycle	T_{PSS/SSS_sync_intra}
No DRX	max(600ms, ceil($M_{pss/sss_sync_w/o_gaps}$ x K_p x $K_{layer1_measurement}$) x SMTC period)[Note 1] x $CSSF_{intra}$
DRX cycle≤ 320ms	max(600ms, ceil(1.5 x $M_{pss/sss_sync_w/o_gaps}$ x K_p x $K_{layer1_measurement}$) x max(SMTC period,DRX cycle)) x $CSSF_{intra}$
DRX cycle>320ms	ceil($M_{pss/sss_sync_w/o_gaps}$ x K_p x $K_{layer1_measurement}$) x DRX cycle x $CSSF_{intra}$
NOTE: If different SMTC periodicities are configured for different cells, the SMTC period in the requirement is the one used by the cell being identified	

[TS38.133, clause 9.2.5.2]

The measurement period for intra frequency measurements without gaps is as shown in table 5.6.1.0.1-2. If the higher layer signalling in TS38.331 [2] signalling of *smtc2* is present and smtc1 is fully overlapping with measurement and smtc2 is partially overlapping with measurement gaps, requirements are not specified for $T_{SSB_measurement_period_intra}$

If SCG DRX is in use, intra frequency measurement period requirements specified in Table 5.6.1.0.1-2 shall depend on the SCG DRX cycle. Otherwise, the requirements for when DRX is not in use shall apply.

Table 5.6.1.0.1-2: Measurement period for intrafrequency measurements without gaps(Frequency FR2)

DRX cycle	$T_{SSB_measurement_period_intra}$
No DRX	max(400ms, ceil($M_{meas_period_w/o_gaps}$ x K_p x $K_{layer1_measurement}$) x SMTC period)[Note 1] x $CSSF_{intra}$
DRX cycle≤ 320ms	max(400ms, ceil(1.5x $M_{meas_period_w/o_gaps}$ x K_p x $K_{layer1_measurement}$) x max(SMTC period,DRX cycle)) x $CSSF_{intra}$
DRX cycle>320ms	ceil($M_{meas_period_w/o_gaps}$ xK_p x $K_{layer1_measurement}$) x DRX cycle x $CSSF_{intra}$
NOTE: If different SMTC periodicities are configured for different cells, the SMTC period in the requirement is the one used by the cell being identified	

The normative reference for this requirement is TS 38.133 [6] clause 9.2.2, 9.2.4.3, 9.2.5.1, 9.2.5.2.

5.6.1.0.2 Minimum conformance requirements for event-triggered measurement with gap

[TS38.133, clause 9.2.2]

The requirements in Section 9.2 apply, provided:

- The cell being identified or measured is detectable.

An intra-frequency cell shall be considered detectable when for each relevant SSB:

- SS-RSRP related side conditions given in Sections 10.1.2 and 10.1.3 for FR1 and FR2, respectively, for a corresponding Band,
- SS-RSRQ related side conditions given in Sections 10.1.7 and 10.1.8 for FR1 and FR2, respectively, for a corresponding Band,
- SS-SINR related side conditions given in Sections 10.1.12 and 10.1.13 for FR1 and FR2, respectively, for a corresponding Band,
- SSB_RP and SSB Ês/Iot according to Annex B.2.2 for a corresponding Band.

[TS38.133, clause 9.2.4.3]

Reported RSRP, RSRQ, and RS-SINR measurements contained in periodically triggered measurement reports shall meet the requirements in clauses 10.1.2.1, 10.1.3.1, 10.1.7.1, 10.1.8.1, 10.1.12.1 and 10.1.13.1, respectively.

The UE shall not send any event triggered measurement reports as long as no reporting criteria are fulfilled.

The measurement reporting delay is defined as the time between an event that will trigger a measurement report and the point when the UE starts to transmit the measurement report over the air interface. This requirement assumes that the measurement report is not delayed by other RRC signalling on the DCCH. This measurement reporting delay excludes a delay uncertainty resulted when inserting the measurement report to the TTI of the uplink DCCH. The delay uncertainty is: 2 x TTI_{DCCH}. This measurement reporting delay excludes a delay which caused by no UL resources for UE to send the measurement report.

The event triggered measurement reporting delay, measured without L3 filtering shall be less than $T_{identify\ intra\ with\ index}$ or $T_{identify\ intra\ without\ index}$ defined in clause 9.2.5.1 or clause 9.2.6.2. When L3 filtering is used an additional delay can be expected.

A cell is detectable only if at least one SSBs measured from the Cell being configured remains detectable during the time period $T_{identify_intra_without_index}$ or $T_{identify_intra_with_index}$ defined in clause 9.2.5.1 or clause 9.2.6.2. If a cell which has been detectable at least for the time period $T_{identify\ intra\ without\ index}$ or $T_{identify\ intra\ with\ index}$ defined in clause 9.2.5.1 or clause 9.2.6.2 becomes undetectable for a period and then the cell becomes detectable again and triggers an event, the event triggered measurement reporting delay shall be less than $T_{SSB_measurement_period_intra}$ provided the timing to that cell has not changed more than ± 3200 Tc while the measurement gap has not been available and the L3 filter has not been used. When L3 filtering is used, an additional delay can be expected.

[TS38.133, clause 9.2.6.2]

The UE shall be able to identify a new detectable intra frequency cell within $T_{identify_intra_without_index}$ if UE is not indicated to report SSB based RRM measurement result with the associated SSB index (*reportQuantityRsIndexes* or *maxNrofRSIndexesToReport* is not configured), or the UE has been indicated that the neighbour cell is synchronous with the serving cell (*deriveSSB-IndexFromCell* is enabled). Otherwise UE shall be able to identify a new detectable intra frequency cell within $T_{identify_intra_with_index.}$ The UE shall be able to identify a new detectable intra frequency SS block of an already detected cell within $T_{identify_intra_without_index.}$ It is assumed that *deriveSSB-IndexFromCell* is always enabled for FR1 TDD and FR2.

$$T_{identify_intra_without_index} = (T_{PSS/SSS_sync_intra} + T_{SSB_measurement_period_intra})\ ms$$

Where:

T_{PSS/SSS_sync_intra}: it is the time period used in PSS/SSS detection given in table 5.6.1.0.2-1

$T_{SSB_measurement_period_intra}$: equal to a measurement period of SSB based measurement given in table 5.6.1.0.2-2

$CSSF_{intra}$: it is a carrier specific scaling factor and is determined according to $CSSF_{within_gap,i}$ in clause 9.1.5.2 for measurement conducted within measurement gaps.

$M_{pss/sss_sync_with_gaps}$: For a UE supporting FR2 power class 1, $M_{pss/sss_sync\ with_gaps}$=40. For a UE supporting FR2 power class 2, $M_{pss/sss_sync\ with_gaps}$ =24. For a UE supporting FR2 power class 3, $M_{pss/sss_sync\ with_gaps}$ =24. For a UE supporting power class 4, $M_{pss/sss_sync\ with_gaps}$ =24

$M_{meas_period_with_gaps}$: For a UE supporting power class 1, $M_{meas_period_with_gaps}$ =40. For a UE supporting power class 2, $M_{meas_period_with_gaps}$ =24. For a UE supporting power class 3, $M_{meas_period_with_gaps}$ =24. For a UE supporting power class 4, $M_{meas_period\ with_gaps}$ =24.

If the higher layer signalling in TS 38.331 [2] signalling of *smtc2* is present and smtc1 is fully overlapping with measurement gaps and smtc2 is partially overlapping with measurement gaps, requirements are not specified for $T_{identify_intra_without_index}$ or $T_{identify_intra_with_index}$.

If SCG DRX is in use, intrafrequency cell identification requirements specified in Table 5.6.1.0.2-1 shall depend on the SCG DRX cycle. Otherwise, the requirements for when DRX is not in use shall apply.

Table 5.6.1.0.2-1: Time period for PSS/SSS detection (Frequency range FR2)

DRX cycle	T_{PSS/SSS_sync_intra}
No DRX	max(600ms, $M_{pss/sss_sync_with_gaps}$ x max(MGRP, SMTC period)) x $CSSF_{intra}$
DRX cycle≤ 320ms	max(600ms, ceil(1.5x $M_{pss/sss_sync_with_gaps}$) x max(MGRP, SMTC period, DRX cycle)) x $CSSF_{intra}$
DRX cycle>320ms	$M_{pss/sss_sync_with_gaps}$ x max(MGRP, DRX cycle) x $CSSF_{intra}$

[TS38.133, clause 9.2.6.3]

The measurement period for FR2 intra frequency measurements with gaps is as shown in table 5.6.1.0.2-2.

If SCG DRX is in use, intrafrequency measurement period requirements specified in Table 5.6.1.0.2-2 shall depend on the SCG DRX cycle. Otherwise, the requirements for when DRX is not in use shall apply.

Table 5.6.1.0.2-2: Measurement period for intrafrequency measurements with gaps(Frequency Range FR2)

DRX cycle	$T_{SSB_measurement_period_intra}$
No DRX	max(400ms, $M_{meas_period\ with_gaps}$ x max(MGRP, SMTC period)) x $CSSF_{intra}$
DRX cycle≤ 320ms	max(400ms, ceil(1.5 x $M_{meas_period\ with_gaps}$) x max(MGRP, SMTC period, DRX cycle)) Note 1 x $CSSF_{intra}$
DRX cycle>320ms	$M_{meas_period\ with_gaps}$ x max(MGRP, DRX cycle) x $CSSF_{intra}$

The normative reference for this requirement is TS 38.133 [6] clause 9.2.2, 9.2.4.3, 9.2.6.2, 9.2.6.3.

5.6.1.1 EN-DC FR2 event-triggered reporting without gap in non-DRX

Editor's Note: This test case has been completed for the following configurations:

-Test frequency f ≤ 40.8 GHz

-UE PC3

This test case is incomplete for UE power classes other than PC3

This test case is incomplete for test frequencies > 40.8 GHz

5.6.1.1.1 Test purpose

To verify the UE's ability to make a correct reporting of an event within intra-frequency cell search without gap under non-DRX. This test will partly verify the TDD intra-frequency cell search requirements in TS 38.133 [6] clause 9.2.5.1 and 9.2.5.2

5.6.1.1.2 Test applicability

This test applies to all types of E-UTRA UE release 15 forward, supporting EN-DC.

5.6.1.1.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 5.6.1.0.1.

The normative reference for this requirement is TS 38.133 [6] clause A.5.6.1.1.

5.6.1.1.4 Test description

5.6.1.1.4.1 Initial conditions

This test shall be tested using any of the test configurations in Table 5.6.1.1.4.1-1.

Table 5.6.1.1.4.1-1: Supported test configurations for EN-DC FR2 event-triggered reporting without gap under non-DRX

Configuration	Description
5.6.1.1-1	LTE FDD, 120 kHz SSB SCS, 100MHz bandwidth, TDD duplex mode
5.6.1.1-2	LTE TDD, 120 kHz SSB SCS, 100MHz bandwidth, TDD duplex mode
5.6.1.1-3	LTE FDD, 240 kHz SSB SCS, 100MHz bandwidth, TDD duplex mode
5.6.1.1-4	LTE TDD, 240 kHz SSB SCS, 100MHz bandwidth, TDD duplex mode
NOTE: The UE is only required to be tested in one of the supported test configurations.	

Configure the test requirement and the DUT according to the parameters in Table 5.6.1.1.4.1-2.

Table 5.6.1.1.4.1-2: Initial conditions for EN-DC FR2 event-triggered reporting without gap under non-DRX

Parameter	Value		Comment
Test environment	NC		As specified in TS 38.508-1 [14] clause 4.1.
Test frequencies	As specified in Annex E, Table E.3-1 and TS 38.508-1 [14] clause 4.3.1 for E-UTRA, 7.2.3 for NR FR2.		
Channel bandwidth	As specified by the test configuration selected from Table 5.6.1.1.4.1-1.		
Propagation conditions	AWGN		As specified in clause C.2.2
Connection Diagram	TE Part	A.3.3.1.1	As specified in TS 38.508-1 [14] Annex A.
	DUT Part	A.3.4.1.1	
Exceptions to connection diagram	TBD		

1. The test parameters for PSCell and neighbour cell are given in Table 5.6.1.1.4.1-3 below.

2. Message contents are defined in clause 5.6.1.1.4.3.

3. There are three cells in the test, E-UTRAN PCell (Cell 1), FR2 PSCell (Cell 2) and a FR2 neighbour cell (Cell 3) on the same frequency as the PSCell. The power levels and settings for Cell 1 are set according to Annex A.6. Cell 2 is the PSCell and Cell 3 is the target cell. The power levels and settings for Cell 2 and Cell 3 are set according to clause C.1.1 and C.1.2.

Table 5.6.1.1.4.1-3: General test parameters for EN-DC FR2 intra-frequency event triggered reporting tests without gap under non-DRX

Parameter	Unit	Config	Value	Comment
Active cell		1~4	E-UTRAN PCell (Cell 1) PSCell (Cell 2)	
Neighbour cell		1~4	Cell 3	Cell to be identified.
RF Channel Number		1~4	1: Cell 1 2: Cell 2 and Cell 3	One TDD carrier frequency is used for the NR cells and one TDD or FDD carrier frequency is used for E-UTRAN cell.
SMTC configuration		1~4	SMTC.1	
A3-Offset	dB	1~4	-11	
CP length		1~4	Normal	
Hysteresis	dB	1~4	0	
Time To Trigger	s	1~4	0	
Filter coefficient		1~4	0	L3 filtering is not used

Parameter	Unit	Config	Value	Comment
DRX		1~4	OFF	
Time offset between Cell 1 and Cell 2		1~4	3 µs	Synchronous EN-DC
Time offset between Cell 2 and Cell 3		1~4	3 µs	Synchronous cells
T1	s	1~4	5	
T2	s	1~4	5	

5.6.1.1.4.2 Test procedure

There are three cells in the test, E-UTRAN PCell (Cell 1), FR2 PSCell (Cell 2) and a FR2 neighbour cell (Cell 3) on the same frequency as the PSCell.

In the measurement control information a measurement object is configured for the frequency of the PSCell, and it is indicated to the UE that event-triggered reporting with Event A3 is used.

The test consists of two successive time periods, with time duration of T1, and T2 respectively. During time duration T1, the UE shall not have any timing information of cell 3.

1. Ensure the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity EN-DC, DC bearer MCG and SCG, Connected without release *On* according to TS 38.508-1 [14] clause 4.5.

2. Set the parameters according to T1 in Table 5.6.1.1.5-1.

3. SS shall transmit an *RRCConnectionReconfiguration* message with event A3 configured.

4. The UE shall transmit *RRCConnectionReconfigurationComplete* message.

5. When T1 expires, the SS shall switch the power setting from T1 to T2 as specified in Table 5.6.1.1.5-1. T2 starts.

6. UE shall transmit a *MeasurementReport* message triggered by Event A3 embedded in E-UTRA RRC message *ULInformationTransferMRDC*. If the overall delays measured from the beginning of time period T2 is less than 1442 ms, then the number of successful tests is increased by one. If the UE fails to report the event within the overall delays measured requirement then the number of failure tests is increased by one.

7. After the SS receive the *MeasurementReport* message in step 6 or when T2 expires, the SS shall transmit RRCConnectionReconfiguration message with condition EN-DC_PSCell_Rel according to TS 36.508 [25] Table 4.6.1-8 to release NR cell (PSCell). The UE shall transmit RRCConnectionReconfigurationComplete message.

8. Set Cell 3 physical cell identity = ((current cell 3 physical cell identity + 1) mod 1008) for next iteration of the test procedure loop.

9. The SS shall transmit RRCConnectionReconfiguration message with condition MCG_and_SCG according to TS 36.508 [25] Table 4.6.1-8 to add NR cell (PSCell). The UE shall transmit RRCConnectionReconfigurationComplete message. If either of the reconfiguration in step 7 or step 9 fails, SS switches off and on the UE and ensures the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity EN-DC, DC bearer MCG and SCG, Connected without release *On* according to TS 38.508-1 [14] clause 4.5.

10. Repeat step 2-9 until the confidence level according to Tables G.2.3-1 in Annex G clause G.2 is achieved.

5.6.1.1.4.3 Message contents

Message contents are according to TS 38.508-1 [14] clause 7.3 with the following exceptions:

Table 5.6.1.1.4.3-1: Common Exception messages EN-DC FR2 intra frequency event triggered reporting tests without gap under non-DRX

Default Message Contents	
Common contents of system information blocks exceptions	

Default RRC messages and information elements contents exceptions	Table H.3.1-1 Table H.3.1-2 Table H.3.1-4 with A3-offset = -11dB Table H.3.1-7 with Condition INTRA-FREQ Table H.3.1-8 with Condition SSB RLM Table H.3.4-1 Table H.3.4-2

Table 5.6.1.1.4.3-2: MeasObjectNR (Step 3, test procedure)

Derivation Path: Table H.3.1-3 with condition INTRA-FREQ MO, Synchronous cells and NOT SS-SINR and (SSB.7 FR2 OR SSB.8 FR2)			
Information Element	**Value/remark**	**Comment**	**Condition**
MeasObjectNR::= SEQUENCE {			
ssbSubcarrierSpacing	SubcarrierSpacing specified in 38.508-1 [14] Table 7.3.1-3a with condition SSB.3 FR2		5.6.1.1-1, 5.6.1.1-2
	SubcarrierSpacing specified in 38.508-1 [14] Table 7.3.1-3a with condition SSB.4 FR2		5.6.1.1-3, 5.6.1.1-4
smtc1	SSB-MTC specified in 38.508-1 [14] Table 7.3.1-3 with condition SMTC.1		
cellsToAddModList SEQUENCE (SIZE (1..maxNrofCellMeas)) OF CellsToAddMod {	1 entry		
CellsToAddMod[1] SEQUENCE {		entry 1	
physCellId	PhysCellId of Cell 3		
cellIndividualOffset SEQUENCE {			
rsrpOffsetSSB	dB16		
rsrqOffsetSSB	Not present		
sinrOffsetSSB	Not present		
rsrpOffsetCSI-RS	Not present		
rsrqOffsetCSI-RS	Not present		
sinrOffsetCSI-RS	Not present		
}			
}			
}			
}			

5.6.1.1.5 Test requirement

Tables 5.6.1.1.4.1-3, 5.6.1.1.5-1 and 5.6.1.1.5-2 define the primary level settings including test tolerances for EN-DC FR2 event triggered reporting test without gap under non-DRX.

Table 5.6.1.1.5-1: NR Cell specific test parameters for intra-frequency event triggered reporting for EN-DC with TDD PSCell in FR2 without gap under non-DRX

Parameter	Unit	Config	Cell 2		Cell 3	
			T1	T2	T1	T2
TDD configuration		1~4	TDDConf.3.1		TDDConf.3.1	
$BW_{channel}$	MHz	1~4	100: $N_{RB,c}$ = 66		100: $N_{RB,c}$ = 66	
Data RBs allocated		1,2	24		24	
		3,4	48		48	
Initial BWP configuration		1~4	DLBWP.0.1 ULBWP.0.1		DLBWP.0.1 ULBWP.0.1	
Active DL BWP configuration		1~4	DLBWP.1.1		DLBWP.1.1	
Active UL BWP configuration		1~4	ULBWP.1.1		ULBWP.1.1	

RLM-RS		1~4	SSB	SSB
PDSCH RMC configuration		1,2	SR.3.2 TDD	N/A
		3,4	SR.3.3 TDD	
RMSI CORESET RMC configuration		1,2	CR.3.1 TDD	CR.3.1 TDD
		3,4	CR.3.2 TDD	CR.3.2 TDD
Dedicated CORESET RMC configuration		1,2	CCR.3.1 TDD	CCR.3.1 TDD
		3,4	CCR.3.7 TDD	CCR.3.7 TDD
PDSCH/PDCCH subcarrier spacing	kHz	1~4	120	120
OCNG Patterns		1~4	OP.5	N/A
TRS configuration		1~4	TRS.2.1 TDD	N/A
PDSCH/PDCCH TCI state		1~4	TCI.State.2	N/A
cellIndividualOffset	dB	1~4	N/A	16
SSB configuration		1, 2	SSB.3 FR2	SSB.7 FR2
		3, 4	SSB.4 FR2	SSB.8 FR2
Propagation Condition		1~4	AWGN	

Table 5.6.1.1.5-2: NR OTA Cell specific test parameters for intra-frequency event triggered reporting for EN-DC with TDD PSCell in FR2 without gap under non-DRX

Parameter	Unit	Config	Cell 2		Cell 3	
			T1	T2	T1	T2
AoA setup		1~4	Setup 3 defined in A.9.3			
			AoA1		AoA2	
Assumption for UE beams[Note 4]		1~4	Rough		Rough	
E_S	dBm/SCS	1, 2	-89		-89	
		3, 4	-86		-86	
$\hat{E}_s/I_{ot}$ BB [Note 5]	dB	1~4	-0.12	-0.12	-Infinity	-0.12
SSB_RP	dBm/SCS	1, 2	-89	-89	-Infinity	-89
		3, 4	-86	-86	-Infinity	-86
Io	dBm/95.04MHz	1,2	-64.41	-64.41	-Infinity	-64.41
		3,4	-61.41	-61.41	-Infinity	-61.41
Time multiplexing of the downlink transmissions from each AoA	1~4	Defined in Figure 5.6.1.1.5-1	Time multiplexing of the downlink transmissions from each AoA		1~4	

NOTE 1: The resources for uplink transmission are assigned to the UE prior to the start of time period T2.
NOTE 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for N_{oc} to be fulfilled.
NOTE 3: SS-RSRP levels have been derived from other parameters for information purposes. They are not settable parameters themselves.
Note 4: Information about types of UE beam is given in B.2.1.3, and does not limit UE implementation or test system implementation.
Note 5: Calculation of Es/Iot_{BB} includes the effect of UE internal noise up to the value assumed for the associated Refsens requirement in clause 7.3.2 of TS 38.101-2 [19], and an allowance of 1dB for UE multi-band relaxation factor ΔMB_P from TS 38.101-2 [19] Table 6.2.1.3-4.

In the test, the UE shall send one Event A3 triggered measurement report, with a measurement reporting delay less than 1440 ms from the beginning of time period T2.

The UE is not required to read the neighbour cell SSB index in this test.

The UE shall not send event triggered measurement reports, as long as the reporting criteria are not fulfilled.

The rate of correct events observed during repeated tests shall be at least 90%.

NOTE: The actual overall delays measured in the test may be up to $2xTTI_{DCCH}$ higher than the measurement reporting delays above because of TTI insertion uncertainty of the measurement report in DCCH.

The overall delays measured shall be less than a total of 1442 ms in this test case (note: this gives a total measurement reporting delay plus 2 ms for TTI insertion uncertainty).

For the test to pass, the total number of successful tests shall be more than 90% of the cases with a confidence level of 95%.

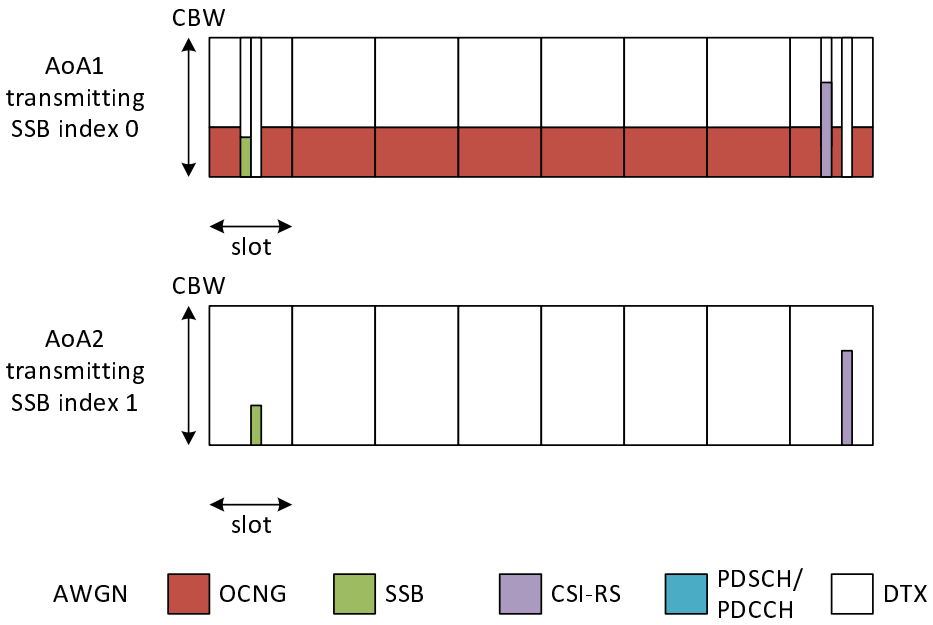


Figure 5.6.1.1.5-1: Time multiplexed downlink transmissions (Config 1,2 example)

5.6.1.2 EN-DC FR2 event-triggered reporting without gap in DRX

Editor's Note: This test case has been completed for the following configurations:

- Test frequency f ≤ 40.8 GHz

- UE PC3

- The test is incomplete for UE power classes other than PC3

- The test is incomplete for test frequencies > 40.8 GHz

- The test is incomplete for test frequencies > 40.8 GHz5.6.1.2.1 Test purpose

To verify the UE's ability to make a correct reporting of an event within intra-frequency cell search without gap in DRX. This test will partly verify the TDD intra-frequency cell search requirements in TS 38.133 [6] clause 9.2.5.1 and 9.2.5.2

5.6.1.2.2 Test applicability

This test applies to all types of E-UTRA UE release 15 forward, supporting EN-DC and long DRX cycle.

5.6.1.2.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 5.6.1.0.1.

The normative reference for this requirement is TS 38.133 [6] clause A.5.6.1.2.

5.6.1.2.4 Test description

5.6.1.2.4.1 Initial conditions

This test shall be tested using any of the test configurations in Table 5.6.1.2.4.1-1.

Table 5.6.1.2.4.1-1: Supported test configurations for EN-DC FR2 event-triggered reporting without gap in DRX

Configuration	Description
5.6.1.2-1	LTE FDD, 120 kHz SSB SCS, 100MHz bandwidth, TDD duplex mode
5.6.1.2-2	LTE TDD, 120 kHz SSB SCS, 100MHz bandwidth, TDD duplex mode
5.6.1.2-3	LTE FDD, 240 kHz SSB SCS, 100MHz bandwidth, TDD duplex mode
5.6.1.2-4	LTE TDD, 240 kHz SSB SCS, 100MHz bandwidth, TDD duplex mode
NOTE: The UE is only required to be tested in one of the supported test configurations.	

Configure the test requirement and the DUT according to the parameters in Table 5.6.1.2.4.1-2.

Table 5.6.1.2.4.1-2: Initial conditions for EN-DC FR2 event-triggered reporting without gap in DRX

Parameter	Value		Comment
Test environment	NC		As specified in TS 38.508-1 [14] clause 4.1.
Test frequencies	As specified in Annex E, Table E.3-1 and TS 38.508-1 [14] clause 4.3.1 for E-UTRA, 7.2.3 for NR FR2.		
Channel bandwidth	As specified by the test configuration selected from Table 5.6.1.2.4.1-1.		
Propagation conditions	AWGN		As specified in clause C.2.2
Connection Diagram	TE Part	A.3.3.3.1-1	As specified in TS 38.508-1 [14] Annex A.
	DUT Part	A.3.4.3	
Exceptions to connection diagram	TBD		

1. The test parameters for PSCell and neighbour cell are given in Table 5.6.1.2.4.1-3 below.

2. Message contents are defined in clause 5.6.1.2.4.3.

3. There are three cells in the test, E-UTRAN PCell (Cell 1), FR2 PSCell (Cell 2) and a FR2 neighbour cell (Cell 3) on the same frequency as the PSCell. The power levels and settings for Cell 1 are set according to Annex A.6. Cell 2 is the PSCell and Cell 3 is the target cell. The power levels and settings for Cell 2 and Cell 3 are set according to clause C.1.1 and C.1.2.

Table 5.6.1.2.4.1-3: General test parameters for EN-DC FR2 intra-frequency event triggered reporting tests without gap in DRX

Parameter	Unit	Config	Value		Comment
			Test 1	Test 2	
Active cell		1~4	E-UTRAN PCell (Cell 1) PSCell (Cell 2)		
Neighbour cell		1~4	Cell 3		Cell to be identified.
RF Channel Number		1~4	1: Cell 1 2: Cell 2 and Cell 3		One TDD carrier frequency is used for the NR cells and one TDD or FDD carrier frequency is used for E-UTRAN cell.
SMTC configuration		1~4	SMTC.1		
A3-Offset	dB	1~4	-7 (Note1)		
CP length		1~4	Normal		
Hysteresis	dB	1~4	0		
Time To Trigger	s	1~4	0		
Filter coefficient		1~4	0		L3 filtering is not used
DRX		1~4	DRX.1	DRX. 7	DRX related parameters are defined in Table 5.6.1.2.5-2
Time offset between Cell 1 and Cell 2		1~4	3 μs		Synchronous EN-DC

Parameter	Unit	Config	Value		Comment
			Test 1	Test 2	
Time offset between Cell 2 and Cell 3		1~4	3 μs		Synchronous cells
T1	s	1~4	5		
T2	s	1~4	10	52	
NOTE: Test tolerance of -1dB applied					

5.6.1.2.4.2 Test procedure

There are three cells in the test, E-UTRAN PCell (Cell 1), FR2 PSCell (Cell 2) and a FR2 neighbour cell (Cell 3) on the same frequency as the PSCell.

In the measurement control information a measurement object is configured for the frequency of the PSCell, and it is indicated to the UE that event-triggered reporting with Event A3 is used.

The test consists of two successive time periods, with time duration of T1, and T2 respectively. During time duration T1, the UE shall not have any timing information of cell 3.

1. Ensure the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity DC, DC bearer MCG and SCG, Connected without release *On* according to TS 38.508-1 [14] clause 4.5.

2. Set the parameters according to T1 in Table 5.6.1.2.5-1.

3. SS shall transmit an *RRCConnectionReconfiguration* message with event A3 configured.

4. The UE shall transmit *RRCConnectionReconfigurationComplete* message.

5. When T1 expires, the SS shall switch the power setting from T1 to T2 as specified in Table 5.6.1.2.5-1. T2 starts.

6. UE shall transmit a *MeasurementReport* message triggered by Event A3 embedded in E-UTRA RRC message *ULInformationTransferMRDC*. If the overall delays measured from the beginning of time period T2 is less than 4322 ms for Test 1 and 30722 ms for Test 2, then the number of successful tests is increased by one. If the UE fails to report the event within the overall delays measured requirement then the number of failure tests is increased by one.

7. After the SS receive the *MeasurementReport* message in step 6 or when T2 expires, the SS shall transmit RRCConnectionReconfiguration message with condition EN-DC_PSCell_Rel according to TS 36.508 [25] Table 4.6.1-8 to release NR cell (PSCell). The UE shall transmit RRCConnectionReconfigurationComplete message.

8. Set Cell 3 physical cell identity = ((current cell 3 physical cell identity + 1) mod 1008) for next iteration of the test procedure loop.

9. The SS then shall transmit *RRCConnectionReconfiguration* message with condition MCG_and_SCG according to TS 36.508 [25] Table 4.6.1-8 to add NR cell (PSCell). The UE shall transmit *RRCConnectionReconfigurationComplete* message.

10. If any the reconfiguration fails, switch off and on the UE and ensure the UE is in RRC_CONNECTED with generic procedure parameters Connectivity EN-DC, DC bearer MCG and SCG, Connected without release On according to TS 38.508-1 [14] clause 4.5].

11. Repeat step 2-10 until the confidence level according to Tables G.2.3-1 in Annex G clause G.2 is achieved.

12. Repeat step 1-11 for each sub-test in Table 5.6.1.2.4.1-3 as appropriate.

5.6.1.2.4.3 Message contents

Message contents are according to TS 38.508-1 [14] clause 7.3 with the following exceptions:

Table 5.6.1.2.4.3-1: Common Exception messages EN-DC FR2 intra frequency event triggered reporting tests without gap in DRX

Default Message Contents

Common contents of system information blocks exceptions	
Default RRC messages and information elements contents exceptions	Table H.3.1-1 Table H.3.1-2 Table H.3.1-3 with Condition INTRA-FREQ MO, Synchronous cells and NOT SS-SINR Table H.3.1-4 with A3-offset = -7dB Table H.3.1-7 with Condition INTRA-FREQ Table H.3.1-8 with Condition SSB RLM Table H.3.4-1 Table H.3.4-2 Table H.3.7-1 with Condition DRX.1 for Test 1 Table H.3.7-1 with Condition DRX. 7 for Test 2 Table 7.3.1-3 in TS 38.508-1 [14] with condition SMTC.1
Specific message contents exceptions for Test Configuration 5.6.1.2-1 and 5.6.1.2-2	Table 7.3.1-3a in TS 38.508-1 [14] with condition SSB.3 FR2
Specific message contents exceptions for Test Configuration 5.6.1.2-3 and 5.6.1.2-4	Table 7.3.1-3a in TS 38.508-1 [14] with condition SSB.4 FR2

5.6.1.2.5 Test requirement

Tables 5.6.1.2.4.1-3, 5.6.1.2.5-1 and 5.6.1.2.5-2 define the primary level settings including test tolerances for EN-DC FR2 event triggered reporting test without gap in DRX.

Table 5.6.1.2.5-1: NR Cell specific test parameters for intra-frequency event triggered reporting for EN-DC with TDD PSCell in FR2 without gap in DRX

Parameter	Unit	Config	Cell 2		Cell 3	
			T1	T2	T1	T2
TDD configuration		1~4	TDDConf.3.1		TDDConf.3.1	
$BW_{channel}$	MHz	1~4	100: $N_{RB,c}$ = 66		100: $N_{RB,c}$ = 66	
Data RBs allocated		1~4	66		66	
Initial BWP configuration		1~4	DLBWP.0.1 ULBWP.0.1		DLBWP.0.1 ULBWP.0.1	
Active DL BWP configuration		1~4	DLBWP.1.1		DLBWP.1.1	
Active UL BWP configuration		1~4	ULBWP.1.1		ULBWP.1.1	
RLM-RS		1~4	SSB		SSB	
PDSCH RMC configuration		1,2	SR.3.2 TDD		N/A	
		3,4	SR.3.3 TDD			
RMSI CORESET RMC configuration		1,2	CR.3.1 TDD		N/A	
		3,4	CR.3.2 TDD		N/A	
Dedicated CORESET RMC configuration		1,2	CCR.3.1 TDD		N/A	
		3,4	CCR.3.7 TDD		N/A	
PDSCH/PDCCH subcarrier spacing	kHz	1~4	120		120	
OCNG Patterns		1~4	OP.1		OP.1	
PDSCH/PDCCH TCI state		1~4	TCI.State.2		N/A	
CSI-RS for tracking		1~4	TRS.2.1 TDD		N/A	
SSB configuration		1, 2	SSB.3 FR2		SSB.3 FR2	
		3, 4	SSB.4 FR2		SSB.4 FR2	
Propagation Condition		1~4	AWGN		AWGN	

Table 5.6.1.2.5-2: NR OTA Cell specific test parameters for intra-frequency event triggered reporting for EN-DC with TDD PSCell in FR2 without gap in DRX

Parameter	Unit	Config	Cell 2	Cell 3

			T1	T2	T1	T2
AoA setup		1~4	Setup 1 defined in A.9.1			
$\hat{E}_s/I_{ot}$ BB Note 5	dB	1~4	3.77	-1.52	-Infinity	-1.52
N_{oc} Note 2	dBm/15 KHz	1~4	-101.5			
N_{oc} Note 2	dBm/SCS	1, 2	-92.5			
		3, 4	-89.5			
SSB_RP	dBm/SCS	1, 2	-88.47	-88.47	-Infinity	-88.47
		3, 4	-85.46	-85.46	-Infinity	-85.46
$\hat{E}_s/N_{oc}$	dB	1~4	4	4	-Infinity	4
Io	dBm/95.04MHz	1~4	-58.03	-55.68	See Cell 2 columns	

NOTE 1: The resources for uplink transmission are assigned to the UE prior to the start of time period T2.
NOTE 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for N_{oc} to be fulfilled.
NOTE 3: Es/Iot, SSB_RP and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.
NOTE 4: Information about types of UE beam is given in B.2.1.3, and does not limit UE implementation or test system implementation.
NOTE 5: Calculation of Es/Iot_{BB} includes the effect of UE internal noise up to the value assumed for the associated Refsens requirement in clause 7.3.2 of TS 38.101-2 [19], and an allowance of 1dB for UE multi-band relaxation factor ΔMB_P from TS 38.101-2 [19] Table 6.2.1.3-4.

In test 1, the UE shall send one Event A3 triggered measurement report, with a measurement reporting delay less than 4.32s from the beginning of time period T2.

In test 2, the UE shall send one Event A3 triggered measurement report, with a measurement reporting delay less than 30.72s from the beginning of time period T2.

The UE is not required to read the neighbour cell SSB index in this test.

The UE shall not send event triggered measurement reports, as long as the reporting criteria are not fulfilled.

The rate of correct events observed during repeated tests shall be at least 90%.

NOTE: The actual overall delays measured in the test may be up to $2xTTI_{DCCH}$ higher than the measurement reporting delays above because of TTI insertion uncertainty of the measurement report in DCCH.

The overall delays measured shall be less than a total of 4322 ms for Test 1 and 30722 ms for Test 2 in this test case (note: this gives a total measurement reporting delay plus 2 ms for TTI insertion uncertainty).

For the test to pass, the total number of successful tests shall be more than 90% of the cases with a confidence level of 95%.

5.6.1.3 EN-DC FR2 event-triggered reporting with gap in non-DRX

Editor's Note: This test case has been completed for the following configurations:

- Test frequency f ≤ 40.8 GHz
- UE PC3

This test case is incomplete for UE power classes other than PC3

This test case is incomplete for test frequencies > 40.8 GHz

5.6.1.3.1 Test purpose

To verify the UE's ability to make a correct reporting of an event within intra-frequency cell search with gap in non-DRX. This test will partly verify the TDD intra-frequency cell search requirements in TS 38.133 [6] clause 9.2.5.1 and 9.2.5.2

5.6.1.3.2 Test applicability

This test applies to all types of E-UTRA UE release 15 forward, supporting EN-DC. This test applies to UE that support CSI-RS based RLM and BWP operation without bandwidth restriction.

5.6.1.3.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 5.6.1.0.2.

The normative reference for this requirement is TS 38.133 [6] clause A.5.6.1.3.

5.6.1.3.4 Test description

5.6.1.3.4.1 Initial conditions

This test shall be tested using any of the test configurations in Table 5.6.1.3.4.1-1.

Table 5.6.1.3.4.1-1: Supported test configurations for EN-DC FR2 event-triggered reporting with gap in non-DRX

Configuration	Description
5.6.1.3-1	LTE FDD, 120 kHz SSB SCS, 100MHz bandwidth, TDD duplex mode
5.6.1.3-2	LTE TDD, 120 kHz SSB SCS, 100MHz bandwidth, TDD duplex mode
5.6.1.3-3	LTE FDD, 240 kHz SSB SCS, 100MHz bandwidth, TDD duplex mode
5.6.1.3-4	LTE TDD, 240 kHz SSB SCS, 100MHz bandwidth, TDD duplex mode
NOTE: The UE is only required to be tested in one of the supported test configurations.	

Configure the test requirement and the DUT according to the parameters in Table 5.6.1.3.4.1-2.

Table 5.6.1.3.4.1-2: Initial conditions for EN-DC FR2 event-triggered reporting with gap in non-DRX

Parameter	Value		Comment
Test environment	NC		As specified in TS 38.508-1 [14] clause 4.1.
Test frequencies	As specified in Annex E, Table E.3-1 and TS 38.508-1 [14] clause 4.3.1 for E-UTRA, 7.2.3 for NR FR2.		
Channel bandwidth	As specified by the test configuration selected from Table 5.6.1.3.4.1-1.		
Propagation conditions	AWGN		As specified in clause C.2.2
Connection Diagram	TE Part	A.3.3.1.1	As specified in TS 38.508-1 [14] Annex A.
	DUT Part	A.3.4.1.1	
Exceptions to connection diagram	TBD		

1. The test parameters for PSCell and neighbour cell are given in Table 5.6.1.3.4.1-3 below.

2. Message contents are defined in clause 5.6.1.3.4.3.

3. There are three cells in the test, E-UTRAN PCell (Cell 1), FR2 PSCell (Cell 2) and a FR2 neighbour cell (Cell 3) on the same frequency as the PSCell. The power levels and settings for Cell 1 are set according to Annex A.6. Cell 2 is the PSCell and Cell 3 is the target cell. The power levels and settings for Cell 2 and Cell 3 are set according to clause C.1.1 and C.1.2.

Table 5.6.1.3.4.1-3: General test parameters for intra-frequency event triggered reporting for EN-DC with TDD PSCell in FR2 with per-UE gaps without DRX

Parameter	Unit	Config	Value	Comment

Active cell		1~4	E-UTRAN PCell (Cell 1) PSCell (Cell 2)	
Neighbour cell		1~4	Cell 3	Cell to be identified.
RF Channel Number		1~4	1: Cell 1 2: Cell 2 and Cell 3	One TDD carrier frequency is used for the NR cells and one TDD or FDD carrier frequency is used for E-UTRAN cell.
Gap type		1~4	Per-UE gaps	
Measurement gap repetition periodicity	ms	1~4	40	
Measurement gap length	ms	1~4	6	
Measurement gap offset	ms	1~4	39	
SMTC configuration		1~4	SMTC.1	
CSI-RS parameters		1~4	CSI-RS.3.2 TDD **resource #0**	
A3-Offset	dB	1~4	-11	
CP length		1~4	Normal	
Hysteresis	dB	1~4	0	
Time To Trigger	s	1~4	0	
Filter coefficient		1~4	0	L3 filtering is not used
DRX		1~4	OFF	
Time offset between Cell 1 and Cell 2		1~4	3 μs	Synchronous EN-DC
Time offset between Cell 2 and Cell 3		1~4	3 μs	Synchronous cells
T1	s	1~4	5	
T2	s	1~4	5	

5.6.1.3.4.2 Test procedure

There are three cells in the test, E-UTRAN PCell (Cell 1), FR2 PSCell (Cell 2) and a FR2 neighbour cell (Cell 3) on the same frequency as the PSCell.

There are two BWPs configured in Cell 2, BWP1 which contains the cell defining SSB, and BWP2 which does not contain any SSB of Cell 2. During the whole test, BWP2 is always scheduled as the active BWP for the UE.

In the measurement control information a measurement object is configured for the frequency of the PSCell, and it is indicated to the UE that event-triggered reporting with Event A3 is used.

The test consists of two successive time periods, with time duration of T1, and T2 respectively. During time duration T1, the UE shall not have any timing information of cell 3.

1. Ensure the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity EN-DC, DC bearer MCG and SCG, Connected without release *On* according to TS 38.508-1 [14] clause 4.5.

2. Set the parameters according to T1 in Table 5.6.1.3.5-1.

3. SS shall transmit an *RRCConnectionReconfiguration* message with event A3 configured.

4. The UE shall transmit *RRCConnectionReconfigurationComplete* message.

5. When T1 expires, the SS shall switch the power setting from T1 to T2 as specified in Table 5.6.1.3.5-1. T2 starts.

6. UE shall transmit a *MeasurementReport* message triggered by Event A3 embedded in E-UTRA RRC message *ULInformationTransferMRDC*. If the overall delays measured from the beginning of time period T2 is less than 1922 ms, then the number of successful tests is increased by one. If the UE fails to report the event within the overall delays measured requirement then the number of failure tests is increased by one.

7. After the SS receive the *MeasurementReport* message in step 6 or when T2 expires, the SS shall transmit RRCConnectionReconfiguration message with condition EN-DC_PSCell_Rel according to TS 36.508 [25] Table 4.6.1-8 to release NR cell (PSCell). The UE shall transmit RRCConnectionReconfigurationComplete message.

8. Set Cell 3 physical cell identity = ((current cell 3 physical cell identity + 1) mod 1008) for next iteration of the test procedure loop.

9. The SS shall transmit RRCConnectionReconfiguration message with condition MCG_and_SCG according to TS 36.508 [25] Table 4.6.1-8 to add NR cell (PSCell). The UE shall transmit RRCConnectionReconfigurationComplete message. If either of the reconfiguration in step 7 or step 9 fails, SS switches off and on the UE and ensures the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity EN-DC, DC bearer MCG and SCG, Connected without release *On* according to TS 38.508-1 [14] clause 4.5.

10. Repeat step 2-9 until the confidence level according to Tables G.2.3-1 in Annex G clause G.2 is achieved.

5.6.1.3.4.3 Message contents

Message contents are according to TS 38.508-1 [14] clause 7.3 with the following exceptions:

Table 5.6.1.3.4.3-1: Common Exception messages EN-DC FR2 intra frequency event triggered reporting tests with gap in non-DRX

Default Message Contents	
Common contents of system information blocks exceptions	
Default RRC messages and information elements contents exceptions	Table H.3.1-1 Table H.3.1-2 with Condition INTRA-FREQ and GAP NEEDED Table H.3.1-4 with A3-offset =-11dB Table H.3.1-7 with Condition INTRA-FREQ Table H.3.1-8 with Condition CSI-RS RLM Table H.3.4-1 Table H.3.4-2 Table H.3.4-4 with Condition gapUE Table H.3.4-5 with Condition Pattern #0

Table 5.6.1.3.4.3-2: MeasObjectNR (Step 3, test procedure)

Derivation Path: Table H.3.1-3 with condition INTRA-FREQ MO, Synchronous cells and NOT SS-SINR and (SSB.7 FR2 OR SSB.8 FR2)			
Information Element	**Value/remark**	**Comment**	**Condition**
MeasObjectNR::= SEQUENCE {			
ssbSubcarrierSpacing	SubcarrierSpacing specified in 38.508-1 [14] Table 7.3.1-3a with condition SSB.3 FR2		5.6.1.3-1, 5.6.1.3-2
	SubcarrierSpacing specified in 38.508-1 [14] Table 7.3.1-3a with condition SSB.4 FR2		5.6.1.3-3, 5.6.1.3-4
smtc1	SSB-MTC specified in 38.508-1 [14] Table 7.3.1-3 with condition SMTC.1		
cellsToAddModList SEQUENCE (SIZE (1..maxNrofCellMeas)) OF CellsToAddMod {	1 entry		
CellsToAddMod[1] SEQUENCE {		entry 1	
physCellId	PhysCellId of Cell 3		
cellIndividualOffset SEQUENCE {			
rsrpOffsetSSB	dB16		
rsrqOffsetSSB	Not present		
sinrOffsetSSB	Not present		
rsrpOffsetCSI-RS	Not present		
rsrqOffsetCSI-RS	Not present		
sinrOffsetCSI-RS	Not present		
}			
}			
}			

}			

5.6.1.3.5 Test requirement

Tables 5.6.1.3.4.1-3, 5.6.1.3.5-1 and 5.6.1.3.5-2 define the primary level settings including test tolerances for EN-DC FR2 event triggered reporting test with gap under non-DRX.

Table 5.6.1.3.5-1: NR Cell specific test parameters for intra-frequency event triggered reporting for EN-DC with TDD PSCell in FR2 with per-UE gaps without DRX

Parameter	Unit	Config	Cell 2		Cell 3	
			T1	T2	T1	T2
TDD configuration		1~4	TDDConf.3.1		TDDConf.3.1	
$BW_{channel}$	MHz	1~4	100: $N_{RB,c}$ = 66		100: $N_{RB,c}$ = 66	
Data RBs allocated		1,2	24		24	
		3,4	48		48	
Initial BWP configuration		1~4	DLBWP.0.1 ULBWP.0.1		DLBWP.0.1 ULBWP.0.1	
Active DL BWP configuration		1~4	DLBWP.1.2		DLBWP.1.1	
Active UL BWP configuration		1~4	ULBWP.1.2		ULBWP.1.1	
RLM-RS		1~4	CSI-RS		SSB	
PDSCH RMC configuration		1,2	SR.3.2 TDD		N/A	
		3,4	SR.3.3 TDD			
RMSI CORESET RMC configuration		1,2	CR.3.1 TDD		CR.3.1 TDD	
		3,4	CR.3.2 TDD		CR.3.2 TDD	
Dedicated CORESET RMC configuration		1,2	CCR.3.1 TDD		CCR.3.1 TDD	
		3,4	CCR.3.7 TDD		CCR.3.7 TDD	
TRS configuration		1~4	TRS.2.1 TDD		N/A	
PDSCH/PDCCH TCI state		1~4	TCI.State.2		N/A	
PDSCH/PDCCH subcarrier spacing	kHz	1~4	120		120	
OCNG Patterns		1~4	OP.5		N/A	
cellIndividualOffset	dB	1~4	N/A		16	
SSB		1, 2	SSB.3 FR2		SSB.7 FR2	
		3, 4	SSB.4 FR2		SSB.8 FR2	
Propagation Condition		1~4	AWGN			

Table 5.6.1.3.5-2: NR OTA Cell specific test parameters for intra-frequency event triggered reporting for EN-DC with TDD PSCell in FR2 with per-UE gaps without DRX

Parameter	Unit	Config	Cell 2		Cell 3	
			T1	T2	T1	T2
AoA setup		1~4	Setup 3 defined in A.3.9.3			
			AoA1		AoA2	
Assumption for UE beams[Note 4]		1~4	Rough		Rough	
E_s	dBm/SCS	1,2	-89		-89	
		3,4	-86		-86	
$\hat{E}_s / I_{ot}$ BB [Note 5]	dB	1~4	-0.12	-0.12	-Infinity	-0.12
SSB_RP	dBm/SCS	1, 2	-89	-89	-Infinity	-89
		3, 4	-86	-86	-Infinity	-86
Io	dBm/95.04MHz	1,2	-64.41	-64.41	-Infinity	-64.41
		3,4	-61.41	-61.41	-Infinity	-61.41

Time multiplexing of the downlink transmissions from each AoA	1~4	Defined in Figure 5.6.1.3.5-1	Time multiplexing of the downlink transmissions from each AoA	Time multiplexing of the downlink transmissions from each AoA

NOTE 1: The resources for uplink transmission are assigned to the UE prior to the start of time period T2.

NOTE 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for N_{oc} to be fulfilled.

NOTE 3: SS-RSRP levels have been derived from other parameters for information purposes. They are not settable parameters themselves.

Note 4: Information about types of UE beam is given in B.2.1.3, and does not limit UE implementation or test system implementation.

Note 5: Calculation of Es/Iot_{BB} includes the effect of UE internal noise up to the value assumed for the associated Refsens requirement in clause 7.3.2 of TS 38.101-2 [19], and an allowance of 1dB for UE multi-band relaxation factor ΔMB_P from TS 38.101-2 [19] Table 6.2.1.3-4.

In the test, the UE shall send one Event A3 triggered measurement report, with a measurement reporting delay less than 1.92s from the beginning of time period T2

The UE is not required to read the neighbour cell SSB index in this test.

The UE shall not send event triggered measurement reports, as long as the reporting criteria are not fulfilled.

The rate of correct events observed during repeated tests shall be at least 90%.

NOTE: The actual overall delays measured in the test may be up to $2xTTI_{DCCH}$ higher than the measurement reporting delays above because of TTI insertion uncertainty of the measurement report in DCCH.

The overall delays measured shall be less than a total of 1922 ms in this test case (note: this gives a total measurement reporting delay plus 2 ms for TTI insertion uncertainty).

For the test to pass, the total number of successful tests shall be more than 90% of the cases with a confidence level of 95%.

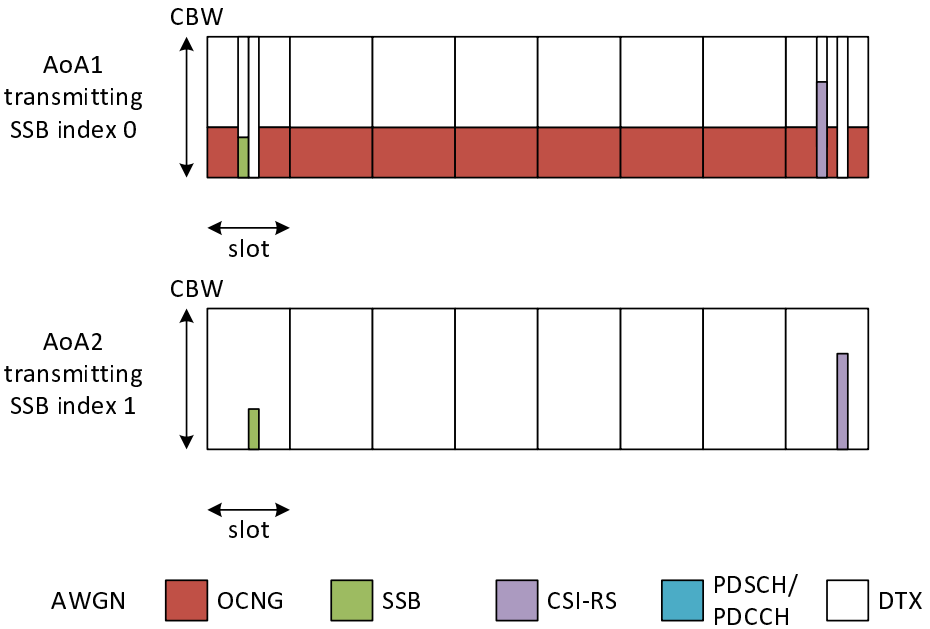


Figure 5.6.1.3.5-1: Time multiplexed downlink transmissions (Config 1,2 example)

5.6.1.4 EN-DC FR2 event-triggered reporting with gap in DRX

Editor's Note: This test case has been completed for the following configurations:

- Test frequency f ≤ 40.8 GHz

- UE PC3

- The test is incomplete for UE power classes other than PC3

- The test is incomplete for test frequencies > 40.8 GHz

5.6.1.4.1 Test purpose

To verify the UE's ability to make a correct reporting of an event within intra-frequency cell search with gap in DRX. This test will partly verify the TDD intra-frequency cell search requirements in TS 38.133 [6] clause 9.2.5.1 and 9.2.5.2

5.6.1.4.2 Test applicability

This test applies to all types of E-UTRA UE release 15 forward, supporting EN-DC, This test applies to UE that support CSI-RS based RLM, BWP operation without bandwidth restriction and long DRX cycle.

5.6.1.4.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 5.6.1.0.2.

The normative reference for this requirement is TS 38.133 [6] clause A.5.6.1.4.

5.6.1.4.4 Test description

5.6.1.4.4.1 Initial conditions

This test shall be tested using any of the test configurations in Table 5.6.1.4.4.1-1.

Table 5.6.1.4.4.1-1: Supported test configurations for EN-DC FR2 event-triggered reporting with gap in DRX

Configuration	Description
5.6.1.4-1	LTE FDD, 120 kHz SSB SCS, 100MHz bandwidth, TDD duplex mode
5.6.1.4-2	LTE TDD, 120 kHz SSB SCS, 100MHz bandwidth, TDD duplex mode
5.6.1.4-3	LTE FDD, 240 kHz SSB SCS, 100MHz bandwidth, TDD duplex mode
5.6.1.4-4	LTE TDD, 240 kHz SSB SCS, 100MHz bandwidth, TDD duplex mode
NOTE: The UE is only required to be tested in one of the supported test configurations.	

Configure the test requirement and the DUT according to the parameters in Table 5.6.1.4.4.1-2.

Table 5.6.1.4.4.1-2: Initial conditions for EN-DC FR2 event-triggered reporting with gap in DRX

Parameter	Value		Comment
Test environment	NC		As specified in TS 38.508-1 [14] clause 4.1.
Test frequencies	As specified in Annex E, Table E.3-1 and TS 38.508-1 [14] clause 4.3.1 for E-UTRA, 7.2.3 for NR FR2.		
Channel bandwidth	As specified by the test configuration selected from Table 5.6.1.4.4.1-1.		
Propagation conditions	AWGN		As specified in clause C.2.2
Connection Diagram	TE Part	A.3.3.3.1-2	As specified in TS 38.508-1 [14] Annex A.
	DUT Part	A.3.4.1.1	
Exceptions to connection diagram	TBD		

1. The test parameters for PSCell and neighbour cell are given in Table 5.6.1.4.4.1-3 below.

2. Message contents are defined in clause 5.6.1.4.4.3.

3. There are three cells in the test, E-UTRAN PCell (Cell 1), FR2 PSCell (Cell 2) and a FR2 neighbour cell (Cell 3) on the same frequency as the PSCell. The power levels and settings for Cell 1 are set according to Annex A.6. Cell 2 is the PSCell and Cell 3 is the target cell. The power levels and settings for Cell 2 and Cell 3 are set according to clause C.1.1 and C.1.2.

Table 5.6.1.4.4.1-3: General test parameters for intra-frequency event triggered reporting for EN-DC with TDD PSCell in FR2 with per-UE gaps with DRX

Parameter	Unit	Config	Value		Comment
			Test 1	Test 2	
Active cell		1~4	E-UTRAN PCell (Cell 1) PSCell (Cell 2)		
Neighbour cell		1~4	Cell 3		Cell to be identified.
RF Channel Number		1~4	1: Cell 1 2: Cell 2 and Cell 3		One TDD carrier frequency is used for the NR cells and one TDD or FDD carrier frequency is used for E-UTRAN cell.
Gap type		1~4	Per-UE gaps		
Measurement gap repetition periodicity	ms	1~4	40		
Measurement gap length	ms	1~4	6		
Measurement gap offset	ms	1~4	39		
SMTC configuration		1~4	SMTC.1		
CSI-RS parameters		1~4	CSI-RS.3.2 TDD **resource #0**		
A3-Offset	dB	1~4	-7(Note1)		
CP length		1~4	Normal		
Hysteresis	dB	1~4	0		
Time To Trigger	s	1~4	0		
Filter coefficient		1~4	0		L3 filtering is not used
DRX		1~4	DRX.1	DRX. 7	DRX related parameters are defined in Table 5.6.1.4.5-2
Time offset between Cell 1 and Cell 2		1~4	3μs		Synchronous EN-DC
Time offset between Cell 2 and Cell 3		1~4	3μs		Synchronous cells
T1	s	1~4	5		
T2	s	1~4	10	52	
Note1 : Test tolerance of -1dB applied					

5.6.1.4.4.2 Test procedure

There are three cells in the test, E-UTRAN PCell (Cell 1), FR2 PSCell (Cell 2) and a FR2 neighbour cell (Cell 3) on the same frequency as the PSCell.

In the measurement control information a measurement object is configured for the frequency of the PSCell, and it is indicated to the UE that event-triggered reporting with Event A3 is used.

The test consists of two successive time periods, with time duration of T1, and T2 respectively. During time duration T1, the UE shall not have any timing information of cell 3.

There are two BWPs configured in Cell 2, BWP1 which contains the cell defining SSB, and BWP2 which does not contain any SSB of Cell 2. During the whole test, BWP2 is always scheduled as the active BWP for the UE.

1. Ensure the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity EN-DC, DC bearer MCG and SCG, Connected without release *On* according to TS 38.508-1 [14] clause 4.5.

2. Set the parameters according to T1 in Table 5.6.1.4.5-1.

3. SS shall transmit an *RRCConnectionReconfiguration* message with event A3 configured.

4. The UE shall transmit *RRCConnectionReconfigurationComplete* message.

5. When T1 expires, the SS shall switch the power setting from T1 to T2 as specified in Table 5.6.1.4.5-1. T2 starts.

6. UE shall transmit a *MeasurementReport* message triggered by Event A3 embedded in E-UTRA RRC message *ULInformationTransferMRDC*. If the overall delays measured from the beginning of time period T2 is less than 4322 ms for Test 1 and 30722 ms for Test 2, then the number of successful tests is increased by one. If the UE fails to report the event within the overall delays measured requirement then the number of failure tests is increased by one.

7. After the SS receive the *MeasurementReport* message in step 6 or when T2 expires, the SS shall transmit RRCConnectionReconfiguration message with condition EN-DC_PSCell_Rel according to TS 36.508 [25] Table 4.6.1-8 to release NR cell (PSCell). The UE shall transmit RRCConnectionReconfigurationComplete message.

8. Set Cell 3 physical cell identity = ((current cell 3 physical cell identity + 1) mod 1008) for next iteration of the test procedure loop.

9. The SS then shall transmit *RRCConnectionReconfiguration* message with condition MCG_and_SCG according to TS 36.508 [25] Table 4.6.1-8 to add NR cell (PSCell). The UE shall transmit *RRCConnectionReconfigurationComplete* message.

10. If any the reconfiguration fails, switch off and on the UE and ensure the UE is in RRC_CONNECTED with generic procedure parameters Connectivity EN-DC, DC bearer MCG and SCG, Connected without release On according to TS 38.508-1 [14] clause 4.5].

11. Repeat step 2-10 until the confidence level according to Tables G.2.3-1 in Annex G clause G.2 is achieved.

12. Repeat step 1-11 for each sub-test in Table 5.6.1.2.4.1-3 as appropriate.

5.6.1.4.4.3 Message contents

Message contents are according to TS 38.508-1 [14] clause 7.3 with the following exceptions:

Table 5.6.1.4.4.3-1: Common Exception messages EN-DC FR2 intra frequency event triggered reporting tests with gap in DRX

Default Message Contents	
Common contents of system information blocks exceptions	
Default RRC messages and information elements contents exceptions	Table H.3.1-1 Table H.3.1-2 with Condition INTRA-FREQ and GAP NEEDED Table H.3.1-3 with Condition INTRA-FREQ MO, Synchronous cells and NOT SS-SINR Table H.3.1-4 with A3-offset = -7dB Table H.3.1-7 with Condition INTRA-FREQ Table H.3.1-8 with Condition CSI-RS RLM Table H.3.4-1 Table H.3.4-2 Table H.3.4-4 with Condition gapUE Table H.3.4-5 with Condition Pattern #0 Table H.3.7-1 with Condition DRX.1 and Gap for test 1 Table H.3.7-1 with Condition DRX. 7 and Gap for test 2 Table 7.3.1-3 in TS 38.508-1 [14] with condition SMTC.1
Specific message contents exceptions for Test Configuration 5.6.1.4-1 and 5.6.1.4-2	Table 7.3.1-3a in TS 38.508-1 [14] with condition SSB.3 FR2
Specific message contents exceptions for Test Configuration 5.6.1.4-3 and 5.6.1.4-4	Table 7.3.1-3a in TS 38.508-1 [14] with condition SSB.4 FR2

5.6.1.4.5 Test requirement

Tables 5.6.1.4.4.1-3, 5.6.1.4.5-1 and 5.6.1.4.5-2 define the primary level settings including test tolerances for EN-DC FR2 event triggered reporting test with gap in DRX.

Table 5.6.1.4.5-1: NR Cell specific test parameters for intra-frequency event triggered reporting for EN-DC with TDD PSCell in FR2 with per-UE gaps with DRX

Parameter	Unit	Config	Cell 2	Cell 3

			T1	T2	T1	T2
TDD configuration		1~4	TDDConf.3.1		TDDConf.3.1	
$BW_{channel}$	MHz	1~4	100: $N_{RB,c}$ = 66		100: $N_{RB,c}$ = 66	
Data RBs allocated		1~4	66		66	
Initial BWP configuration		1~4	DLBWP.0.1 ULBWP.0.1		DLBWP.0.1 ULBWP.0.1	
Active DL BWP configuration		1~4	DLBWP.1.2		DLBWP.1.1	
Active UL BWP configuration		1~4	ULBWP.1.2		ULBWP.1.1	
RLM-RS		1~4	CSI-RS		SSB	
PDSCH RMC configuration		1,2	SR.3.2 TDD		N/A	
		3,4	SR.3.3 TDD			
RMSI CORESET RMC configuration		1,2	CR.3.1 TDD		CR.3.1 TDD	
		3,4	CR.3.2 TDD		CR.3.2 TDD	
Dedicated CORESET RMC configuration		1,2	CCR.3.1 TDD		CCR.3.1 TDD	
		3,4	CCR.3.7 TDD		CCR.3.7 TDD	
TRS configuration		1~4	TRS.2.1 TDD		N/A	
PDSCH/PDCCH TCI state		1~4	TCI.State.2		N/A	
PDSCH/PDCCH subcarrier spacing	kHz	1~4	120		120	
OCNG Patterns		1~4	OP.1		OP.1	
SSB		1, 2	SSB.3 FR2		SSB.3 FR2	
		3, 4	SSB.4 FR2		SSB.4 FR2	
Propagation Condition		1~4	AWGN		AWGN	

Table 5.6.1.4.5-2: NR OTA Cell specific test parameters for intra-frequency event triggered reporting for EN-DC with TDD PSCell in FR2 with per-UE gaps with DRX

Parameter	Unit	Config	Cell 2		Cell 3	
			T1	T2	T1	T2
AoA setup		1~4	Setup 1 defined in A.3.9.1			
$\hat{E}_s/I_{ot}$ BB Note 5	dB	1~4	3.77	-1.52	-Infinity	-1.52
N_{oc} Note 2	dBm/15 KHz	1~4	-101.5			
N_{oc} Note 2	dBm/SCS	1, 2	-92.5			
		3, 4	-89.5			
SSB_RP	dBm/SCS	1, 2	-88.47	-88.47	-Infinity	-88.47
		3, 4	-85.46	-85.46	-Infinity	-85.46
$\hat{E}_s/N_{oc}$	dB	1~4	4	4	-Infinity	4
Io	dBm/95.04MHz	1, 2	-58.03	-55.68	See Cell 2 columns	

NOTE 1: The resources for uplink transmission are assigned to the UE prior to the start of time period T2.

NOTE 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for N_{oc} to be fulfilled.

NOTE 3: Es/Iot, SSB_RP and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.

NOTE 4: Information about types of UE beam is given in B.2.1.3, and does not limit UE implementation or test system implementation.

NOTE 5: Calculation of Es/Iot_{BB} includes the effect of UE internal noise up to the value assumed for the associated Refsens requirement in clause 7.3.2 of TS 38.101-2 [3], and an allowance of 1dB for UE multi-band relaxation factor ΔMB_P from TS 38.101-2 [3] Table 6.2.1.3-4.

In test 1, the UE shall send one Event A3 triggered measurement report, with a measurement reporting delay less than 4.32s from the beginning of time period T2

In test 2, the UE shall send one Event A3 triggered measurement report, with a measurement reporting delay less than 30.72s from the beginning of time period T2.

The UE is not required to read the neighbour cell SSB index in this test.

The UE shall not send event triggered measurement reports, as long as the reporting criteria are not fulfilled.

The rate of correct events observed during repeated tests shall be at least 90%.

NOTE: The actual overall delays measured in the test may be up to $2xTTI_{DCCH}$ higher than the measurement reporting delays above because of TTI insertion uncertainty of the measurement report in DCCH.

The overall delays measured shall be less than a total of 4322 ms for Test 1 and 30722 ms for Test 2 in this test case (note: this gives a total measurement reporting delay plus 2 ms for TTI insertion uncertainty).

For the test to pass, the total number of successful tests shall be more than 90% of the cases with a confidence level of 95%.

5.6.2 Inter-frequency measurements

5.6.2.0 Minimum conformance requirements for Inter-frequency measurements

The requirements in Section 9.3 apply, provided:

- The cell being identified or measured is detectable.

An inter-frequency cell shall be considered detectable when for each relevant SSB:

- SS-RSRP related side conditions given in Sections 10.1.4 and 10.1.5 for FR1 and FR2, respectively, for a corresponding Band,
- SS-RSRQ related side conditions given in Sections 10.1.9 and 10.1.10 for FR1 and FR2, respectively, for a corresponding Band,
- SS-SINR related side conditions given in Sections 10.1.14 and 10.1.15 for FR1 and FR2, respectively, for a corresponding Band,
- SSB_RP and SSB Ês/Iot according to Annex B.2.3 for a corresponding Band.

When measurement gaps are provided, or the UE supports capability of conducting such measurements without gaps, the UE shall be able to identify a new detectable inter frequency cell within $T_{identify_inter_without_index}$ if UE is not indicated to report SSB based RRM measurement result with the associated SSB index (*reportQuantityRsIndexes* or *maxNrofRSIndexesToReport* is not configured). Otherwise UE shall be able to identify a new detectable inter frequency cell within $T_{identify_inter_with_index}$. The UE shall be able to identify a new detectable inter frequency SS block of an already detected cell within $T_{identify_inter_without_index}$.

$$T_{identify_inter_without_index} = (T_{PSS/SSS_sync_inter} + T_{SSB_measurement_period_inter}) \text{ ms}$$

$$T_{identify_inter_with_index} = (T_{PSS/SSS_sync_inter} + T_{SSB_measurement_period_inter} + T_{SSB_time_index_inter}) \text{ ms}$$

Where:

T_{PSS/SSS_sync_inter}: it is the time period used in PSS/SSS detection given in table 9.3.4-1 and table 9.3.4-2.

$T_{SSB_time_index_inter}$: it is the time period used to acquire the index of the SSB being measured given in table 9.3.4-3 and table 9.3.4-4.

$T_{SSB_measurement_period_inter}$: equal to a measurement period of SSB based measurement given in table 9.3.5-1 and table 9.3.5-2.

M_{pss/sss_sync_inter}: For a UE supporting FR2 power class 1, M_{pss/sss_sync_inter} = 64 samples. For a UE supporting FR2 power class 2, M_{pss/sss_sync_inter} = 40 samples. For a UE supporting FR2 power class 3, M_{pss/sss_sync_inter} = 40 samples. For a UE supporting FR2 power class 4, M_{pss/sss_sync_inter} = 40 samples.

$M_{SSB_index_inter}$: For a UE supporting power FR2 class 1, $M_{SSB_index_inter}$ = 40 samples. For a vehicle mounted UE supporting power class 2, $M_{SSB_index_inter}$ = 24 samples. For a UE supporting power class 3, $M_{SSB_index_inter}$ = 24 samples. For a UE supporting power class 4, $M_{meas_period_inter}$ = 24 samples.

$M_{meas_period_inter}$: For a UE supporting FR2 power class 1, $M_{meas_period_inter}$ =64 samples. For a UE supporting FR2 power class 2, $M_{meas_period_inter}$=40 samples. For a UE supporting FR2 power class 3, $M_{meas_period_inter}$ =40 samples. For a UE supporting FR2 power class 4, $M_{meas_period_inter}$ = 40 samples.

$CSSF_{inter}$: it is a carrier specific scaling factor and is determined according to $CSSF_{within_gap,i}$ in clause 9.1.5.2 for measurement conducted within measurement gaps.

Table 9.3.4-2: Time period for PSS/SSS detection, (Frequency range FR2)

Condition NOTE1,2	T_{PSS/SSS_sync_inter}
No DRX	$Max(600ms, M_{pss/sss_sync_inter} \times Max(MGRP, SMTC\ period)) \times CSSF_{inter}$
DRX cycle ≤ 320ms	$Max(600ms, (1.5 \times M_{pss/sss_sync_inter}) \times Max(MGRP, SMTC\ period, DRX\ cycle)) \times CSSF_{inter}$
DRX cycle > 320ms	$M_{pss/sss_sync_inter} \times DRX\ cycle \times CSSF_{inter}$
NOTE 1: DRX or non DRX requirements apply according to the conditions described in clause 3.6.1 NOTE 2: In EN-DC operation, the parameters, timers and scheduling requests referred to in clause 3.6.1 are for the secondary cell group. The DRX cycle is the DRX cycle of the secondary cell group.	

Table 9.3.4-4: Time period for time index detection (Frequency range FR2)

Condition NOTE1,2	$T_{SSB_time_index_inter}$
No DRX	$Max(200ms, M_{SSB_index_inter} \times Max(MGRP, SMTC\ period)) \times CSSF_{inter}$
DRX cycle ≤ 320ms	$Max(200ms, (1.5 \times M_{SSB_index_inter}) \times Max(MGRP, SMTC\ period, DRX\ cycle)) \times CSSF_{inter}$
DRX cycle > 320ms	$M_{SSB_index_inter} \times DRX\ cycle \times CSSF_{inter}$
NOTE 1: DRX or non DRX requirements apply according to the conditions described in clause 3.6.1 NOTE 2: In EN-DC operation, the parameters, timers and scheduling requests referred to in clause 3.6.1 are for the secondary cell group. The DRX cycle is the DRX cycle of the secondary cell group.	

When measurement gaps are provided for inter frequency measurements, or the UE supports capability of conducting such measurements without gaps, the UE physical layer shall be capable of reporting SS-RSRP, SS-RSRQ and SS-SINR measurements to higher layers with measurement accuracy as specified in clauses 10.1.4, 10.1.5, 10.1.9, 10.1.10, 10.1.14 and 10.1.15, respectively, as shown in table 9.3.5-1 and 9.3.5-2:

Table 9.3.5-2: Measurement period for inter-frequency measurements with gaps (Frequency FR2)

Condition NOTE1,2	$T_{SSB_measurement_period_inter}$
No DRX	$Max(400ms, M_{meas_period_inter} \times Max(MGRP, SMTC\ period)) \times CSSF_{inter}$
DRX cycle ≤ 320ms	$Max(400ms, (1.5 \times M_{meas_period_inter}) \times Max(MGRP, SMTC\ period, DRX\ cycle)) \times CSSF_{inter}$
DRX cycle > 320ms	$M_{meas_period_inter} \times DRX\ cycle \times CSSF_{inter}$
NOTE 1: DRX or non DRX requirements apply according to the conditions described in clause 3.6.1 NOTE 2: In EN-DC operation, the parameters, timers and scheduling requests referred to in clause 3.6.1 are for the secondary cell group. The DRX cycle is the DRX cycle of the secondary cell group.	

Reported SS-RSRP, SS-RSRQ, and SS-SINR measurements contained in event triggered measurement reports shall meet the requirements in clauses 10.1.4.1, 10.1.5.1, 10.1.9.1, 10.1.10.1, 10.1.14.1 and 10.1.15.1, respectively.

The UE shall not send any event triggered measurement reports, as long as no reporting criteria are fulfilled.

The measurement reporting delay is defined as the time between an event that will trigger a measurement report and the point when the UE starts to transmit the measurement report over the air interface. This requirement assumes that the measurement report is not delayed by other RRC signalling on the DCCH. This measurement reporting delay excludes a delay uncertainty resulted when inserting the measurement report to the TTI of the uplink DCCH. The delay uncertainty is: $2 \times TTI_{DCCH}$. This measurement reporting delay excludes a delay which caused by no UL resources for UE to send the measurement report.

The event triggered measurement reporting delay, measured without L3 filtering shall be within $T_{identify_inter_without_index}$ if UE is not indicated to report SSB based RRM measurement result with the associated SSB index. Otherwise UE shall be able to identify a new detectable inter frequency cell within $T_{identify_inter_with_index}$. Both $T_{identify_inter_without_index}$ and $T_{identify_inter_with_index}$ are defined in clause 9.3.4. When L3 filtering is used an additional delay can be expected.

If a cell which has been detectable at least for the time period $T_{identify_inter_without_index}$ or $T_{identify_inter_with_index}$ defined in clause 9.3.4 and then triggers the measurement report as per TS 38.331 [2], the event triggered measurement reporting delay shall be less than $T_{SSB_measurement_period_inter}$ defined in clause 9.3.5 provided the timing to that cell has not changed more than ± 3200 Tc while measurement gap has not been available and the L3 filter has not been used. When L3 filtering is used an additional delay can be expected.

The normative reference for this requirement is TS 38.133 [6] clause 9.3.2, 9.3.4, 9.3.5, 9.3.6.3.

5.6.2.1 EN-DC FR2-FR2 event-triggered reporting in non-DRX

Editor's Note: This test case has been completed for the following configurations:

- Test frequency f ≤ 40.8 GHz

- UE PC3

- The test is incomplete for UE power classes other than PC3

- The test is incomplete for test frequencies > 40.8 GHz

5.6.2.1.1 Test purpose

The purpose of this test is to verify that the UE makes correct reporting of an event within inter-frequency cell search requirements.

5.6.2.1.2 Test applicability

This test applies to all types of E-UTRA UE release 15 and forward, supporting EN-DC. Test 1 is applicable to UEs not supporting per-FR gap (*IndependentGapConfig*, as defined in TS 38.306) and Test 2 is applicable only to UEs supporting per-FR gap (*IndependentGapConfig*, as defined in TS 38.306) and Gap Pattern Id 13.

5.6.2.1.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 5.6.2.0.

The normative reference for this requirement is TS 38.133 [6] clause A.5.6.2.1.

5.6.2.1.4 Test description

5.6.2.1.4.1 Initial conditions

This test shall be tested using any of the test configurations in Table 5.6.2.1.4.1-1.

Table 5.6.2.1.4.1-1: EN-DC FR2-FR2 event triggered reporting tests in non-DRX supported test configurations

Test Case ID	Description
5.6.2.1-1	LTE FDD, 120 kHz SSB SCS, 100MHz bandwidth, TDD duplex mode
5.6.2.1-2	LTE TDD, 120 kHz SSB SCS, 100MHz bandwidth, TDD duplex mode
NOTE 1: The UE is only required to be tested in one of the supported test configurations NOTE 2: target NR cell has the same SCS, BW and duplex mode as NR serving cell	

Table 5.6.2.1.4.1-2: General test parameters for EN-DC inter-frequency event triggered reporting without SSB time index detection

Parameter	Unit		Value	Comment

		Test configuration	Test 1	Test 2	
E-UTRA RF Channel Number		Config 1,2	1		One E-UTRAN TDD carrier frequencies is used.
NR RF Channel Number		Config 1,2	1, 2		Two FR2 NR carrier frequencies is used.
Active cell		Config 1,2	LTE Cell 1 (PCell) and NR cell 2 (PScell)		LTE Cell 1 is on E-UTRA RF channel number 1. NR Cell 2 is on NR RF channel number 1.
Neighbour cell		Config 1,2	NR cell 3		NR cell 3 is on NR RF channel number 2.
Gap Pattern Id		Config 1,2	0	13	As specified in TS 38.133 [6] clause 9.1.2-1.
Measurement gap offset		Config 1,2	39	39	
SMTC-SSB parameters		Config 1,2	SSB.3 FR2		As specified in clause A.3.2
offsetMO	dB	Config 1,2	16		Applied to NR Cell 3 measurement object
A3-Offset	dB	Config 1,2	-11		
Hysteresis	dB	Config 1,2	0		
CP length		Config 1,2	Normal		
TimeToTrigger	s	Config 1,2	0		
Filter coefficient		Config 1,2	0		L3 filtering is not used
DRX		Config 1,2	OFF		DRX is not used
Time offset between PCell and PSCell		Config 1,2	3 µs		Synchronous EN-DC
Time offset between serving and neighbour cells		Config 1,2	3µs		Synchronous cells.
T1	s	Config 1,2	5		
T2	s	Config 1,2	5.2 for PC1; 3.5 for other PC	5.2 for PC1; 3.5 for other PC	PC1 - power class 1 as specified in TS 38.101-2 [3] Table 6.2.1.0

Table 5.6.2.1.4.1-3: Test Environment test parameters for EN-DC inter-frequency event triggered reporting without SSB time index detection in non-DRX

Parameter	Value		Comment
Test environment	NC		As specified in TS 38.508-1 [14] clause 4.1.
Test frequencies	As specified in Annex E, Table E.3-1 and TS 38.508-1 [14] clause 4.3.1 for E-UTRA, 7.2.3 for NR FR2.		
Channel bandwidth	As specified by the test configuration selected from Table 5.6.2.1.4.1-1.		
Propagation conditions	AWGN		As specified in clause C.2.2.
Connection Diagram	TE Part	A.3.3.3.1	As specified in TS 38.508-1 [14] Annex A.
	DUT Part	A.3.4.1.1	
Exceptions to connection diagram			

1. Message contents are defined in clause 5.6.2.1.4.3.

2. Cell 1 is the E-UTRA serving cell (PCell) for the EN-DC setup. The power levels and settings for Cell 1 are set according to Annex A.6. Cell 2 and Cell 3 are NR FR1 cells in different frequencies. Cell 2 is the PSCell and Cell 3 is the target cell. The power levels and settings for Cell 2 are set according to clause C.1.2 and clause C.1.3. Cell 3 is switched off during the initial connection setup.

3. If a UE supports per-FR gap and gap pattern configuration #13, it is only required to pass test 2. Otherwise it is only required to pass test 1.

4. The AoA setup for this test is Setup 3 as defined in clause A.9. The UE RX spherical coverage direction has been obtained previously using one of the search procedures as described in Annex I.

5.6.2.1.4.2 Test procedure

In this test, there are three cells: LTE cell 1 as PCell on E-UTRA RF channel 1, NR cell 2 as PSCell in FR2 on NR RF channel 1 and NR cell 3 as neighbour cell in FR2 on NR RF channel 2.

In test 1 measurement gap pattern configuration # 0 as defined in Table 5.6.2.1.4.1-2 is provided for UE that does not support per-FR gap and in test 2 measurement gap pattern configuration #13 as defined in Table 5.6.2.1.4.1-2 is provided for UE that supports per-FR gap.

In the measurement control information, it is indicated to the UE that event-triggered reporting with Event A3 is used. The test consists of two successive time periods, with time duration of T1, and T2 respectively. During time duration T1, the UE shall not have any timing information of NR cell 3.

1. Ensure the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity EN-DC, DC bearer MCG and SCG, Connected without release *On* according to TS 38.508-1 [14] clause 4.5.

2. Set the parameters according to T1 in Table 5.6.2.1.4.1-2. The TE shall ensure that the NR FR2 cells are from the set of directions corresponding to the EIS spherical coverage percentile of the DUT as defined in clause 7.3.4 of TS 38.101-2 [3] and relative angular offset between active probes are according to Table A.9.3-1. T1 starts.

3. The SS shall transmit an RRCConnectionReconfiguration message on Cell 1.

4. The UE shall transmit RRCConnectionReconfigurationComplete message.

5. When T1 expires, the SS shall switch the power setting from T1 to T2 as specified in Table 5.6.2.1.4.1-2. T2 starts.

6. UE shall transmit a MeasurementReport message triggered by Event A3 embedded in E-UTRA RRC message *ULInformationTransferMRDC*. If the overall delay measured from the beginning of time period T2 is less than 5122 ms for UE supporting power class 1, or 3202 ms for UE supporting other power class for Test 1 and Test 2 then the number of successful tests is increased by one. If the UE fails to report the event within the overall delays measured requirement then the number of failure tests is increased by one.

7. After the SS receives the MeasurementReport message in step 6 or when T2 expires, the SS shall transmit RRCConnectionReconfiguration message with condition EN-DC_PSCell_Rel according to TS 36.508 [25] Table 4.6.1-8 to release NR cell (PSCell). The UE shall transmit RRCConnectionReconfigurationComplete message.

8. Set Cell 3 physical cell identity = [(current cell 3 physical cell identity + 1) mod 1008] for next iteration of the test procedure loop.]

9. TE shall change the active probes in such way that relative angular offset between active probes differs in the following iteration.

10. The SS shall transmit RRCConnectionReconfiguration message with condition MCG_and_SCG according to TS 36.508 [25] Table 4.6.1-8 to add NR cell (PSCell). The UE shall transmit RRCConnectionReconfigurationComplete message. If either of the reconfiguration in step 7 or step 10 fails, SS switches off and on the UE and ensures the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity EN-DC, DC bearer MCG and SCG, Connected without release *On* according to TS 38.508-1 [14] clause 4.5..

11. Repeat step 2-10 until the confidence level according to Tables G.2.3-1 in Annex G clause G.2 is achieved.

12. Repeat step 1-11 for each sub-test in Table 5.6.2.1.4.1-2 as appropriate.

5.6.2.1.4.3 Message contents

Message contents are according to TS 38.508-1 [14] clause 4.6 with the following exceptions:

Table 5.6.2.1.4.3-1: Common Exception messages for Additional EN-DC FR2-FR2 event triggered reporting tests in non-DRX test requirement

Default Message Contents	
Common contents of system information blocks exceptions	

Default RRC messages and information elements contents exceptions	Table H.3.1-1 Table H.3.1-2 with Condition INTER-FREQ for Test 1. For Test 2, additionally with condition GAP NEEDED Table H.3.1-3 with Conditions INTER-FREQ MO and Synchronous cells Table H.3.1-4 with A3-offset = -11dB Table H.3.1-6 with Conditions gapFR2 and Pattern #13 for Test 2 Table H.3.4-4 with Condition gapUE Test 1 Table H.3.4-5 with Condition Pattern #0 for Test 1 Table H.3.1-7 with Condition INTER-FREQ Table H.3.4-1 Table H.3.4-2 Table H.3.4-3

Table 5.6.2.1.4.3-2: MeasObjectNR-DEFAULT: EN-DC FR2-FR2 measurement object configuration

Derivation Path: Table H.3.1-3			
Information Element	**Value/remark**	**Comment**	**Condition**
MeasObjectNR::= SEQUENCE {			
offsetMO SEQUENCE {			
rsrpOffsetSSB	dB16		
}			

5.6.2.1.5 Test requirement

Table 5.6.2.3.5-1 defines the primary level settings including test tolerances for all tests.

Table 5.6.2.1.5-1: Cell specific test parameters for EN-DC inter-frequency event triggered reporting without SSB time index detection

Parameter	Unit	Test configuration	Cell 2		Cell 3	
			T1	T2	T1	T2
AoA setup		Config 1,2	Setup 3 as specified in clause A.9			
			AoA1		AoA2	
Assumption for UE beams[Note 7]		Config 1,2	Rough		Rough	
NR RF Channel Number		Config 1,2	1		2	
Duplex mode		Config 1,2	TDD		TDD	
$BW_{channel}$	MHz	Config 1,2	100: $N_{RB,c}$ = 66		100: $N_{RB,c}$ = 66	
Data RBs allocated		Config 1,2	66		66	
BWP BW	MHz	Config 1,2	100: $N_{RB,c}$ = 66		100: $N_{RB,c}$ = 66	
TDD configuration		Config 1,2	TDDConf.3.1		TDDConf.3.1	
Initial DL BWP		Config 1,2	DLBWP.0.1		NA	
Initial UL BWP		Config 1,2	ULBWP.0.1		NA	
Dedicated DL BWP		Config 1,2	DLBWP.1.1		NA	
Dedicated UL BWP		Config 1,2	ULBWP.1.1		NA	
OCNG Patterns		Config 1,2	OP.1		OP.1	
TRS configuration		Config 1,2	TRS.2.1 TDD		NA	
PDSCH/PDCCH TCI state		Config 1,2	TCI.State.2		NA	
PDSCH Reference measurement channel		Config 1,2	SR.3.1 TDD		-	
RMSI CORESET Reference Channel		Config 1,2	CR.3.1 TDD		-	
Dedicated CORESET Reference Channel		Config 1,2	CCR.3.1 TDD		-	
SMTC configuration		Config 1,2	SMTC.1		SMTC.1	
PDSCH/PDCCH subcarrier spacing	kHz	Config 1,2	120		120	
EPRE ratio of PSS to SSS		Config 1,2	0		0	
EPRE ratio of PBCH DMRS to SSS						
EPRE ratio of PBCH to PBCH DMRS						

EPRE ratio of PDCCH DMRS to SSS						
EPRE ratio of PDCCH to PDCCH DMRS						
EPRE ratio of PDSCH DMRS to SSS						
EPRE ratio of PDSCH to PDSCH						
EPRE ratio of OCNG DMRS to SSS(Note 1)						
EPRE ratio of OCNG to OCNG DMRS (Note 1)						
$\hat{E}_s$	dBm/SCS	Config 1,2	-87	-87	-Infinity	-87
SSB-RP Note 3	dBm/SCS Note5	Config 1,2	-87	-87	-Infinity	-87
$\hat{E}_s / I_{ot}$ BB Note 8	dB	Config 1,2	1.89	1.89	-Infinity	1.89
Io Note3	dBm/95.04 MHz Note5	Config 1,2	-58.01	-58.01	-Infinity	-58.01
Propagation Condition		Config 1,2	AWGN		AWGN	

NOTE 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.
NOTE 2: Void
NOTE 3: SSB-RP, Es/Iot and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.
NOTE 4: Void
NOTE 5: Equivalent power received by an antenna with 0dBi gain at the centre of the quiet zone
NOTE 6: As observed with 0dBi gain antenna at the centre of the quiet zone
NOTE 7: Information about types of UE beam is given in TS 38.133 [6] Annex B.2.1.3, and does not limit UE implementation or test system implementation.
NOTE 8: Calculation of Es/Iot_{BB} includes the effect of UE internal noise up to the value assumed for the associated Refsens requirement in clause 7.3.2 of TS 38.101-2 [3], and an allowance of 1dB for UE multi-band relaxation factor ΔMB_S from TS 38.101-2 [3] Table 6.2.1.3-4.

In test 1 with per-UE gap and in test 2 with per-FR gap, the UE shall send one Event A3 triggered measurement report, with a measurement reporting delay less than X ms from the beginning of time period T2, where X is

5120 for UE supporting power class 1, or

3200 for UE supporting other power class.

In test 1 and 2 UE is not required to report SSB time index. The UE shall not send event triggered measurement reports, as long as the reporting criteria are not fulfilled. The rate of correct events observed during repeated tests shall be at least 90% with a confidence level of 95%.

NOTE: The actual overall delays measured in the test may be up to $2xTTI_{DCCH}$ higher than the measurement reporting delays above because of TTI insertion uncertainty of the measurement report in DCCH.

TTI insertion uncertainty = TTIDCCH = 1 ms; 2xTTIDCCH = 2 ms

The overall delays measured shall be less than a total of 5122 ms in this test for power class UE and 3202 ms for other power classes.

5.6.2.2 EN-DC FR2-FR2 event-triggered reporting in DRX

Editor's Note: This test case has been completed for the following configurations:

- Test frequency f ≤ 40.8 GHz

- UE PC3

- The test is incomplete for UE power classes other than PC3

- The test is incomplete for test frequencies > 40.8 GHz

5.6.2.2.1 Test purpose

The purpose of this test is to verify that the UE makes correct reporting of an event within inter-frequency cell search requirements.

5.6.2.2.2 Test applicability

This test applies to all types of E-UTRA UE release 15 and forward, supporting EN-DC FR2 and long DRX cycle. Tests 1 and 2 are applicable to UEs not supporting per-FR gap (*IndependentGapConfig*, as defined in TS 38.306) and Tests 3 and 4 are applicable only to UEs supporting per-FR gap (*IndependentGapConfig*, as defined in TS 38.306) and Gap Pattern Id 13.

5.6.2.2.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 5.6.2.0.

The normative reference for this requirement is TS 38.133 [6] clause A.5.6.2.2.

5.6.2.2.4 Test description

5.6.2.2.4.1 Initial conditions

This test shall be tested using any of the test configurations in Table 5.6.2.2.4.1-1.

Table 5.6.2.2.4.1-1: EN-DC FR2-FR2 event triggered reporting tests in DRX supported test configurations

Test Case ID	Description
5.6.2.2-1	LTE FDD, 120 kHz SSB SCS, 100MHz bandwidth, TDD duplex mode
5.6.2.2-2	LTE TDD, 120 kHz SSB SCS, 100MHz bandwidth, TDD duplex mode
NOTE 1: The UE is only required to be tested in one of the supported test configurations NOTE 2: target NR cell has the same SCS, BW and duplex mode as NR serving cell	

Table 5.6.2.2.4-2: General test parameters for EN-DC inter-frequency event triggered reporting without SSB time index detection

Parameter	Unit	Test configuration	Value				Comment
			Test 1	Test 2	Test 3	Test 4	
E-UTRA RF Channel Number		Config 1,2	1				One E-UTRAN TDD carrier frequencies is used.
NR RF Channel Number		Config 1,2	1, 2				Two FR1 NR carrier frequencies is used.
Active cell		Config 1,2	LTE Cell 1 (PCell) and NR cell 2 (PScell)				LTE Cell 1 is on E-UTRA RF channel number 1. NR Cell 2 is on NR RF channel number 1.
Neighbour cell		Config 1,2	NR cell 3				NR cell 3 is on NR RF channel number 2.
Gap Pattern Id		Config 1,2	0		13		As specified in TS 38.133 clause 9.1.2-1.
Measurement gap offset		Config 1,2	39		39		
SMTC-SSB parameters		Config 1,2	SSB.3 FR2				As specified in clause A.3
A3-Offset	dB	Config 1,2	-12				Value modified by TT
Hysteresis	dB	Config 1,2	0				
CP length		Config 1,2	Normal				
TimeToTrigger	s	Config 1,2	0				
Filter coefficient		Config 1,2	0				L3 filtering is not used
DRX		Config 1,2	DRX.1	DRX.7	DRX.1	DRX.7	As specified in clause A.5
Time offset between PCell and PSCell		Config 1,2	3 μs				Synchronous EN-DC

Time offset between serving and neighbour cells		Config 1,2	3μs				Synchronous cells.
T1	s	Config 1,2	5				
T2	s	Config 1,2	8 for PC1; 5 for other PC	82 for PC1; 52 for other PC	8 for PC1; 5 for other PC	82 for PC1; 52 for other PC	PC1 - power class 1 as specified in TS 38.101-2 [3] Table 6.2.1.0

Table 5.6.2.2.4.1-3: Test Environment test parameters for EN-DC inter-frequency event triggered reporting with SSB time index detection in non-DRX

Parameter	Value		Comment
Test environment	NC		As specified in TS 38.508-1 [14] clause 4.1.
Test frequencies	As specified in Annex E, Table E.2-1 and TS 38.508-1 [14] clause 4.3.1 for E-UTRA, 7.2.3 for NR FR2.		
Channel bandwidth	As specified by the test configuration selected from Table 5.6.2.2.4.1-1.		
Propagation conditions	AWGN		As specified in clause C.2.2.
Connection Diagram	TE Part	A.3.3.3.1	As specified in TS 38.508-1 [14] Annex A.
	DUT Part	A.3.4.1.1	
Exceptions to connection diagram			

1. Message contents are defined in clause 5.6.2.2.4.3.
2. Cell 1 is the E-UTRA serving cell (PCell) for the EN-DC setup. The power levels and settings for Cell 1 are set according to Annex A.6. Cell 2 and Cell 3 are NR FR1 cells in different frequencies. Cell 2 is the PSCell and Cell 3 is the target cell. The power levels and settings for Cell 2 and Cell 3 are set according to clause C.1.2.
3. If a UE supports per-FR gap and gap pattern configuration #13, it is only required to pass test 3&4. Otherwise it is only required to pass test 1&2.
4. The UE Rx beam peak direction for Cell 2 has been obtained previously using one of the Rx beam peak search procedures as described in Annex I.

5.6.2.2.4.2 Test procedure

In this test, there are three cells: LTE cell 1 as PCell on E-UTRA RF channel 1, NR cell 2 as PSCell in FR2 on NR RF channel 1 and NR cell 3 as neighbour cell in FR2 on NR RF channel 2.

In test 1&2 measurement gap pattern configuration # 0 as defined in Table 5.6.2.2.4.1-2 is provided for UE that does not support per-FR gap and in test 3&4 measurement gap pattern configuration #13 as defined in Table 5.6.2.2.4.1-2 is provided for UE that supports per-FR gap.

In the measurement control information, it is indicated to the UE that event-triggered reporting with Event A3 is used. The test consists of two successive time periods, with time duration of T1, and T2 respectively. During time duration T1, the UE shall not have any timing information of NR cell 3.

UE needs to be provided at least once every 500ms with new Timing Advance Command MAC control element to restart the Time alignment timer to keep UE uplink time alignment. Furthermore, UE is allocated with PUSCH resource at every DRX cycle.

1. Ensure the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity EN-DC, DC bearer MCG and SCG, Connected without release *On* according to TS 38.508-1 [14] clause 4.5.
2. Set the parameters according to T1 in Table 5.6.2.2.4.1-2. The TE shall ensure that the NR FR2 cell will be received by the UE from the Rx beam peak direction. T1 starts.
3. The SS shall transmit an RRCConnectionReconfiguration message on Cell 1.
4. The UE shall transmit RRCConnectionReconfigurationComplete message.

5. When T1 expires, the SS shall switch the power setting from T1 to T2 as specified in Table 5.6.2.2.4.1-2.

6. UE shall transmit a MeasurementReport message triggered by Event A3 embedded in E-UTRA RRC message *ULInformationTransferMRDC*. If the overall delay measured from the beginning of time period T2 is less than 7682 ms for UE supporting power class 1, or 4802 ms for UE supporting other power class for Test 1 and Test 3 and 81922 ms for UE supporting power class 1, or 51202 ms for UE supporting other power class for Test 2 and Test 4, then the number of successful tests is increased by one. If the UE fails to report the event within the overall delays measured requirement then the number of failure tests is increased by one.

7. After the SS receives the MeasurementReport message in step 6 or when T2 expires, the SS shall transmit RRCConnectionReconfiguration message with condition EN-DC_PSCell_Rel according to TS 36.508 [25] Table 4.6.1-8 to release NR cell (PSCell). The UE shall transmit RRCConnectionReconfigurationComplete message.

8. Set Cell 3 physical cell identity = [(current cell 2 physical cell identity + 1) mod 1008] for next iteration of the test procedure loop.]

9. The SS shall transmit RRCConnectionReconfiguration message with condition MCG_and_SCG according to TS 36.508 [25] Table 4.6.1-8 to add NR cell (PSCell). The UE shall transmit RRCConnectionReconfigurationComplete message. If either of the reconfiguration in step 7 or step 9 fails, SS switches off and on the UE and ensures the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity EN-DC, DC bearer MCG and SCG, Connected without release *On* according to TS 38.508-1 [14] clause 4.5.

10. Repeat step 2-9 until the confidence level according to Tables G.2.3-1 in Annex G clause G.2 is achieved.

11. Repeat step 1-10 for each sub-test in Table 5.6.2.2.4.1-2 as appropriate.

5.6.2.2.4.3 Message contents

Message contents are according to TS 38.508-1 [14] clause 7.3 with the following exceptions:

Table 5.6.2.2.4.3-1: Common Exception messages for Additional EN-DC FR2-FR2 event triggered reporting tests without SSB time index detection in DRX test requirement

Default Message Contents	
Common contents of system information blocks exceptions	
Default RRC messages and information elements contents exceptions	Table H.3.1-1 Table H.3.1-2 with Condition INTER-FREQ. For Test 3 and Test 4, with condition GAP NEEDED additionally. Table H.3.1-3 with Conditions INTER-FREQ MO and Synchronous cells Table H.3.1-4 with A3-offset = -12dB Table H.3.1-6 with Conditions gapFR2 and Pattern #13 for Test 3 and Test 4 Table H.3.4-4 with Condition gapUE Test 1 and Test 2 Table H.3.4-5 with Condition Pattern #0 for Test 1 and Test 2 Table H.3.1-7 with Condition INTER-FREQ Table H.3.7-1 with Condition DRX.1 for Test 1 and Test 3 Table H.3.7-1 with Condition DRX.7 for Test 2 and Test 4 Table H.3.4-1 Table H.3.4-2 Table H.3.4-3

5.6.2.2.5 Test requirement

Table 5.6.2.2.5-1 defines the primary level settings including test tolerances for all tests.

Table 5.6.2.2.5-1: Cell specific test parameters for EN-DC inter-frequency event triggered reporting without SSB time index detection

Parameter	Unit	Test configuration	Cell 2		Cell 3	
			T1	T2	T1	T2
AoA setup		Config 1,2	Setup 1 as specified in clause A.9			

Parameter	Unit	Test configuration	Cell 2		Cell 3	
			T1	T2	T1	T2
Assumption for UE beams Note 7		Config 1,2	Rough			
NR RF Channel Number		Config 1,2	1		2	
Duplex mode		Config 1,2	TDD		TDD	
$BW_{channel}$	MHz	Config 1,2	100: $N_{RB,c}$ = 66		100: $N_{RB,c}$ = 66	
Data RBs allocated		Config 1,2	66		66	
BWP BW	MHz	Config 1,2	100: $N_{RB,c}$ = 66		100: $N_{RB,c}$ = 66	
TDD configuration		Config 1,2	TDDConf.3.1		TDDConf.3.1	
Initial DL BWP		Config 1,2	DLBWP.0.1		NA	
Initial UL BWP		Config 1,2	ULBWP.0.1		NA	
Dedicated DL BWP		Config 1,2	DLBWP.1.1		NA	
Dedicated UL BWP		Config 1,2	ULBWP.1.1		NA	
OCNG Patterns		Config 1,2	OP.1		OP.1	
TRS configuration		Config 1,2	TRS.2.1 TDD		NA	
TRS configuration		Config 1,2	TRS.2.1 TDD		NA	
PDSCH Reference measurement channel		Config 1,2	SR.3.1 TDD		-	
CORESET Reference Channel		Config 1,2	CR.3.1 TDD		-	
SMTC configuration		Config 1,2	SMTC.1		SMTC.1	
PDSCH/PDCCH subcarrier spacing	kHz	Config 1,2 Config 1,2				
EPRE ratio of PSS to SSS						
EPRE ratio of PBCH DMRS to SSS						
EPRE ratio of PBCH to PBCH DMRS						
EPRE ratio of PDCCH DMRS to SSS			120		120	
EPRE ratio of PDCCH to PDCCH DMRS			0		0	
EPRE ratio of PDSCH DMRS to SSS						
EPRE ratio of PDSCH to PDSCH						
EPRE ratio of OCNG DMRS to SSS(Note 1)						
EPRE ratio of OCNG to OCNG DMRS (Note 1)			-104.7		-104.7	
N_{oc} Note2	dBm/15kHz Note5		-104.7		-104.7	
N_{oc} Note2	dBm/SCS Note4	Config 1,2	-95.7	-95.7	-Infinity	-86.7
SSB_RP Note 3	dBm/SCS Note5	Config 1,2	-89.7	-89.7	-Infinity	9
$\hat{E}_s / I_{ot}$	dB	Config 1,2	6	6	-Infinity	9
$\hat{E}_s / N_{oc}$	dB	Config 1,2	6	6	-66.7	-57.2
Io Note3	dBm/95.04 MHz Note5	Config 1,2	-59.7			
Propagation Condition						

In test 1 with per-UE gap and in test 3 with per-FR gap, the UE shall send one Event A3 triggered measurement report, with a measurement reporting delay less than X1 ms from the beginning of time period T2, where X1 is

7680 for UE supporting power class 1, or

4800 for UE supporting other power class.

In test 2 with per-UE gap and in test 4 with per-FR gap, the UE shall send one Event A3 triggered measurement report, with a measurement reporting delay less than X2 ms from the beginning of time period T2, where X2 is

81920 for UE supporting power class 1, or

51200 for UE supporting other power class.

In test 1, 2, 3 and 4 UE is not required to report SSB time index. The UE shall not send event triggered measurement reports, as long as the reporting criteria are not fulfilled. The rate of correct events observed during repeated tests shall be at least 90% with a confidence level of 95%. In test 1, 2, 3 and 4 UE is not required to report SSB time index.

NOTE: The actual overall delays measured in the test may be up to $2xTTI_{DCCH}$ higher than the measurement reporting delays above because of TTI insertion uncertainty of the measurement report in DCCH.

TTI insertion uncertainty = TTIDCCH = 1 ms; 2xTTIDCCH = 2 ms

The overall delays measured shall be less than a total of 7682 ms for power class 1 UE and 4802 ms for other power classes in test 1 and 81922 for power class 1 UE and 51202 ms for other power classes in test 2.

5.6.2.3 EN-DC FR2-FR2 event-triggered reporting in non-DRX with SSB time index detection

Editor's Note: This test case has been completed for the following configurations:

- Test frequency f ≤ 40.8 GHz

- UE PC3

- The test is incomplete for UE power classes other than PC3

- The test is incomplete for test frequencies > 40.8 GHz

5.6.2.3.1 Test purpose

The purpose of this test is to verify that the UE makes correct reporting of an event within inter-frequency cell search requirements.

5.6.2.3.2 Test applicability

This test applies to all types of E-UTRA UE release 15 and forward, supporting EN-DC. Test 1 is applicable to UEs not supporting per-FR gap (*IndependentGapConfig*, as defined in TS 38.306) and Test 2 is applicable only to UEs supporting per-FR gap (*IndependentGapConfig*, as defined in TS 38.306) and Gap Pattern Id 13.

5.6.2.3.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 5.6.2.0.

The normative reference for this requirement is TS 38.133 [6] clause A.5.6.2.3.

5.6.2.3.4 Test description

5.6.2.3.4.1 Initial conditions

This test shall be tested using any of the test configurations in Table 5.6.2.3.4.1-1.

Table 5.6.2.3.4.1-1: EN-DC FR2-FR2 event triggered reporting tests in non-DRX with SSB time index detection supported test configurations

Test Case ID	Description
5.6.2.3-1	LTE FDD, 120 kHz SSB SCS, 100MHz bandwidth, TDD duplex mode
5.6.2.3-2	LTE TDD, 120 kHz SSB SCS, 100MHz bandwidth, TDD duplex mode
NOTE 1: The UE is only required to be tested in one of the supported test configurations NOTE 2: target NR cell has the same SCS, BW and duplex mode as NR serving cell	

Table 5.6.2.3.4.1-2: General test parameters for EN-DC inter-frequency event triggered reporting with SSB time index detection in DRX

Parameter	Unit	Test configuration	Value		Comment
			Test 1	Test 2	
E-UTRA RF Channel Number		Config 1,2	1		One E-UTRAN TDD carrier frequencies is used.
NR RF Channel Number		Config 1,2	1, 2		Two FR2 NR carrier frequencies is used.
Active cell		Config 1,2	LTE Cell 1 (PCell) and NR cell 2 (PScell)		LTE Cell 1 is on E-UTRA RF channel number 1. NR Cell 2 is on NR RF channel number 1.
Neighbour cell		Config 1,2	NR cell 3		NR cell 3 is on NR RF channel number 2.
Gap Pattern Id		Config 1,2	0	13	As specified in TS 38.133 clause 9.1.2-1.
Measurement gap offset		Config 1,2	39	39	
SMTC-SSB parameters		Config 1,2	SSB. 3 FR2		As specified in clause A.3
offsetMO	dB	Config 1,2	16		Applied to NR Cell 3 measurement object
A3-Offset	dB	Config 1,2	-11		
Hysteresis	dB	Config 1,2	0		
CP length		Config 1,2	Normal		
TimeToTrigger	s	Config 1,2	0		
Filter coefficient		Config 1,2	0		L3 filtering is not used
DRX		Config 1,2	OFF		DRX is not used
Time offset between PCell and PSCell		Config 1,2	3 μs		Synchronous EN-DC
Time offset between serving and neighbour cells		Config 1,2	3μs		Synchronous cells.
T1	s	Config 1,2	5		
T2	s	Config 1,2	7 for PC1; 4.5 for other PC	7 for PC1; 4.5 for other PC	PC1 - power class 1 as specified in TS 38.101-2 [3] Table 6.2.1.0

Table 5.6.2.3.4.1-3: Test Environment test parameters for EN-DC inter-frequency event triggered reporting with SSB time index detection in non-DRX

Parameter	Value		Comment
Test environment	NC		As specified in TS 38.508-1 [14] clause 4.1.
Test frequencies	As specified in Annex E, Table E.3-1 and TS 38.508-1 [14] clause 4.3.1 for E-UTRA, 7.2.3 for NR FR2.		
Channel bandwidth	As specified by the test configuration selected from Table 5.6.2.3.4.1-1.		
Propagation conditions	AWGN		As specified in clause C.2.2.
Connection Diagram	TE Part	A.3.3.3.1	As specified in TS 38.508-1 [14] Annex A.
	DUT Part	A.3.4.1.1	
Exceptions to connection diagram			

1. Message contents are defined in clause 5.6.2.3.4.3.

2. Cell 1 is the E-UTRA serving cell (PCell) for the EN-DC setup. The power levels and settings for Cell 1 are set according to Annex A.6. Cell 2 and Cell 3 are NR FR1 cells in different frequencies. Cell 2 is the PSCell and Cell 3 is the target cell. The power levels and settings for Cell 2 and are set according to clause C.1.2 and clause C.1.3. Cell 3 is switched off during the initial connection setup.

3. If a UE supports per-FR gap and gap pattern configuration #13, it is only required to pass test 2. Otherwise it is only required to pass test 1.

4. The AoA setup for this test is Setup 3 as defined in clause A.9. The UE RX spherical coverage direction has been obtained previously using one of the search procedures as described in Annex I.

5.6.2.3.4.2 Test procedure

In this test, there are three cells: LTE cell 1 as PCell on E-UTRA RF channel 1, NR cell 2 as PSCell in FR2 on NR RF channel 1 and NR cell 3 as neighbour cell in FR2 on NR RF channel 2.

In test 1 measurement gap pattern configuration # 0 as defined in Table 5.6.2.3.4.1-1 is provided for UE that does not support per-FR gap and in test 2 measurement gap pattern configuration #13 as defined in Table 5.6.2.3.4.1-1 is provided for UE that supports per-FR gap.

In the measurement control information, it is indicated to the UE that event-triggered reporting with Event A3 is used. The test consists of two successive time periods, with time duration of T1, and T2 respectively. During time duration T1, the UE shall not have any timing information of NR cell 3.

1. Ensure the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity EN-DC, DC bearer MCG and SCG, Connected without release *On* according to TS 38.508-1 [14] clause 4.5.

2. Set the parameters according to T1 in Table 5.6.2.3.4.1-2. The TE shall ensure that the NR FR2 cells are from the set of directions corresponding to the EIS spherical coverage percentile of the DUT as defined in clause 7.3.4 of TS 38.101-2 [3] and relative angular offset between active probes are according to Table A.9.3-1. T1 starts.

3. The SS shall transmit an RRCConnectionReconfiguration message on Cell 1.

4. The UE shall transmit RRCConnectionReconfigurationComplete message.

5. When T1 expires, the SS shall switch the power setting from T1 to T2 as specified in Table 5.6.2.3.4.1-2. T2 starts.

6. UE shall transmit a MeasurementReport message triggered by Event A3 embedded in E-UTRA RRC message *ULInformationTransferMRDC*. If the overall delay measured from the beginning of time period T2 is less than 6722 ms for UE supporting power class 1, or 4162 ms for UE supporting other power class for Test 1 and Test 2, then the number of successful tests is increased by one. If the UE fails to report the event within the overall delays measured requirement then the number of failure tests is increased by one.

7. After the SS receives the MeasurementReport message in step 6 or when T2 expires, the SS shall transmit RRCConnectionReconfiguration message with condition EN-DC_PSCell_Rel according to TS 36.508 [25] Table 4.6.1-8 to release NR cell (PSCell). The UE shall transmit RRCConnectionReconfigurationComplete message.

8. Set Cell 3 physical cell identity = [(current cell 3 physical cell identity + 1) mod 1008] for next iteration of the test procedure loop.]

9. TE shall change the active probes in such way that relative angular offset between active probes differs in the following iteration.

10. The SS shall transmit RRCConnectionReconfiguration message with condition MCG_and_SCG according to TS 36.508 [25] Table 4.6.1-8 to add NR cell (PSCell). The UE shall transmit RRCConnectionReconfigurationComplete message. If either of the reconfiguration in step 7 or step 10 fails, SS switches off and on the UE and ensures the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity EN-DC, DC bearer MCG and SCG, Connected without release *On* according to TS 38.508-1 [14] clause 4.5.

11. Repeat step 2-10 until the confidence level according to Tables G.2.3-1 in Annex G clause G.2 is achieved.

12. Repeat step 1-11 for each sub-test in Table 5.6.2.3.4.1-2 as appropriate.

5.6.2.3.4.3 Message contents

Message contents are according to TS 38.508-1 [14] clause 7.3 with the following exceptions:

Table 5.6.2.3.4.3-1: Common Exception messages for Additional EN-DC FR2-FR2 event triggered reporting tests without SSB time index detection in non-DRX test requirement

Default Message Contents	
Common contents of system information blocks exceptions	
Default RRC messages and information elements contents exceptions	Table H.3.1-1 Table H.3.1-2 with condition INTER-FREQ. For Test 2, additionally with condition GAP NEEDED. Table H.3.1-3 with conditions INTER-FREQ MO and and Synchronous cells Table H.3.1-4 with condition SSB Index and A3-offset = -11dB Table H.3.1-6 with conditions gapFR2 and Pattern #13 for Test 2 Table H.3.4-4 with condition gapUE for Test 1 Table H.3.4-5 with condition Pattern #0 for Test 1 Table H.3.1-7 with condition SSB Index and INTER-FREQ Table H.3.4-1 Table H.3.4-2 Table H.3.4-3

Table 5.6.2.3.4.3-2: MeasObjectNR-DEFAULT: EN-DC FR2-FR2 measurement object configuration

Derivation Path: Table H.3.1-3			
Information Element	**Value/remark**	**Comment**	**Condition**
MeasObjectNR::= SEQUENCE {			
offsetMO SEQUENCE {			
rsrpOffsetSSB	dB16		
}			

5.6.2.3.5 Test requirement

Table 5.6.2.3.5-1 defines the primary level settings including test tolerances for all tests.

Table 5.6.2.3.5-1: Cell specific test parameters for EN-DC inter-frequency event triggered reporting with SSB time index detection in DRX

Parameter	Unit	Test configuration	Cell 2		Cell 3	
			T1	T2	T1	T2
AoA setup		Config 1,2	Setup 3 as specified in clause A.3.9			
			AoA1		AoA2	
Assumption for UE beams[Note 7]		Config 1,2	Rough		Rough	
NR RF Channel Number		Config 1,2	1		2	
Duplex mode		Config 1,2	TDD		TDD	
$BW_{channel}$	MHz	Config 1,2	100: $N_{RB,c}$ = 66		100: $N_{RB,c}$ = 66	
Data RBs allocated		Config 1,2	66		66	
BWP BW	MHz	Config 1,2	100: $N_{RB,c}$ = 66		100: $N_{RB,c}$ = 66	
TDD configuration		Config 1,2	TDDConf.3.1		TDDConf.3.1	
Initial DL BWP		Config 1,2	DLBWP.0.1		NA	
Dedicated DL BWP		Config 1,2	DLBWP.1.1		NA	
Initial UL BWP		Config 1,2	DLBWP.0.1		NA	
Dedicated UL BWP		Config 1,2	ULBWP.1.1		NA	
OCNG Patterns		Config 1,2	OP.1		OP.1	
PDSCH Reference measurement channel		Config 1,2	SR.3.1 TDD		-	
RMSI CORESET Reference Channel		Config 1,2	CR.3.1 TDD		-	
Dedicated CORESET Reference Channel		Config 1,2	CCR.3.1 TDD		-	
TRS configuration		Config 1,2	TRS.2.1 TDD		NA	
PDSCH/PDCCH TCI state		Config 1,2	TCI.State.2		NA	
SMTC configuration		Config 1,2	SMTC.1		SMTC.1	
PDSCH/PDCCH subcarrier spacing	kHz	Config 1,2	120		120	
EPRE ratio of PSS to SSS		Config 1,2	0		0	

Parameter	Unit	Test configuration	Cell 2		Cell 3	
			T1	T2	T1	T2
EPRE ratio of PBCH DMRS to SSS						
EPRE ratio of PBCH to PBCH DMRS						
EPRE ratio of PDCCH DMRS to SSS						
EPRE ratio of PDCCH to PDCCH DMRS						
EPRE ratio of PDSCH DMRS to SSS						
EPRE ratio of PDSCH to PDSCH						
EPRE ratio of OCNG DMRS to SSS(Note 1)						
EPRE ratio of OCNG to OCNG DMRS (Note 1)						
$\hat{E}_s$	dBm/SCS	Config 1	-87	-87	-Infinity	-87
SSB-RP Note 3	dBm/SCS Note5	Config 1,2	-87	-87	-Infinity	-87
$\hat{E}_s / I_{ot}$ BB Note8	dB	Config 1,2	1.89	1.89	-Infinity	1.89
Io Note3	dBm/95.04 MHz Note5	Config 1,2	-58.01	-58.01	-Infinity	-58.01
Propagation Condition		Config 1,2	AWGN		AWGN	

NOTE 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.
NOTE 2: Void
NOTE 3: SSB-RP, Es/Iot and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.
NOTE 4: Void
NOTE 5: Equivalent power received by an antenna with 0dBi gain at the centre of the quiet zone
NOTE 6: As observed with 0dBi gain antenna at the centre of the quiet zone
NOTE 7: Information about types of UE beam is given in TS 38.133 [6] Annex B.2.1.3, and does not limit UE implementation or test system implementation
NOTE 8: Calculation of Es/Iot_{BB} includes the effect of UE internal noise up to the value assumed for the associated Refsens requirement in clause 7.3.2 of TS 38.101-2 [3], and an allowance of 1dB for UE multi-band relaxation factor ΔMB_S from TS 38.101-2 [3] Table 6.2.1.3-4.

In test 1 with per-UE gap and in test 2 with per-FR gap, the UE shall send one Event A3 triggered measurement report, with a measurement reporting delay less than X ms from the beginning of time period T2, where X is

6720 for UE supporting power class 1, or

4160 for UE supporting other power class.

In test 1 and 2 UE is required to report SSB time index. The UE shall not send event triggered measurement reports, as long as the reporting criteria are not fulfilled. The rate of correct events observed during repeated tests shall be at least 90% with a confidence level of 95%. In test 1 and 2 UE is required to report SSB time index.

NOTE: The actual overall delays measured in the test may be up to $2xTTI_{DCCH}$ higher than the measurement reporting delays above because of TTI insertion uncertainty of the measurement report in DCCH.

TTI insertion uncertainty = TTIDCCH = 1 ms; 2xTTIDCCH = 2 ms

The overall delays measured shall be less than a total of 6722 ms in this test for power class UE and 4162 ms for other power classes.

5.6.2.4 EN-DC FR2-FR2 event-triggered reporting in DRX with SSB time index detection

Editor's Note: This test case has been completed for the following configurations:

- Test frequency f ≤ 40.8 GHz

- UE PC3

- The test is incomplete for UE power classes other than PC3

- The test is incomplete for test frequencies > 40.8 GHz

5.6.2.4.1 Test purpose

The purpose of this test is to verify that the UE makes correct reporting of an event within inter-frequency cell search requirements.

5.6.2.4.2 Test applicability

This test applies to all types of E-UTRA UE release 15 and forward, supporting EN-DC FR2 and long DRX cycle. Test 1 and Test 2 are applicable to UEs not supporting per-FR gap (*IndependentGapConfig*, as defined in TS 38.306) and Test 3 and Test 4 applicable only to UEs supporting per-FR gap (*IndependentGapConfig*, as defined in TS 38.306) and Gap Pattern Id 13.

5.6.2.4.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 5.6.2.0.

The normative reference for this requirement is TS 38.133 [6] clause A.5.6.2.4.

5.6.2.4.4 Test description

5.6.2.4.4.1 Initial conditions

This test shall be tested using any of the test configurations in Table 5.6.2.4.4.1-1.

Table 5.6.2.4.4.1-1: EN-DC FR2-FR2 event triggered reporting tests in DRX with SSB time index detection supported test configurations

Test Case ID	Description
5.6.2.4-1	LTE FDD, 120 kHz SSB SCS, 100MHz bandwidth, TDD duplex mode
5.6.2.4-2	LTE TDD, 120 kHz SSB SCS, 100MHz bandwidth, TDD duplex mode
NOTE 1: The UE is only required to be tested in one of the supported test configurations NOTE 2: target NR cell has the same SCS, BW and duplex mode as NR serving cell	

Table 5.6.2.4.4.1-2: General test parameters for EN-DC inter-frequency event triggered reporting with SSB time index detection in DRX

Parameter	Unit	Test configuration	Value				Comment
			Test 1	Test 2	Test 3	Test 4	
E-UTRA RF Channel Number		Config 1,2	1				One E-UTRAN TDD carrier frequencies is used.
NR RF Channel Number		Config 1,2	1, 2				Two FR1 NR carrier frequencies is used.
Active cell		Config 1,2	LTE Cell 1 (PCell) and NR cell 2 (PScell)				LTE Cell 1 is on E-UTRA RF channel number 1. NR Cell 2 is on NR RF channel number 1.
Neighbour cell		Config 1,2	NR cell 3				NR cell 3 is on NR RF channel number 2.
Gap Pattern Id		Config 1,2	0		13		As specified in TS 38.133 clause 9.1.2-1.

Parameter	Unit	Test configuration	Value				Comment
			Test 1	Test 2	Test 3	Test 4	
Measurement gap offset		Config 1,2	39		39		
SMTC-SSB parameters		Config 1,2	SSB.3 FR2				As specified in clause A.3
A3-Offset	dB	Config 1,2	-12				Value modified by TT
Hysteresis	dB	Config 1,2	0				
CP length		Config 1,2	Normal				
TimeToTrigger	s	Config 1,2	0				
Filter coefficient		Config 1,2	0				L3 filtering is not used
DRX		Config 1,2	DRX.1	DRX.7	DRX.1	DRX.7	As specified in caluse A.5
Time offset between PCell and PSCell		Config 1,2	3 μs				Synchronous EN-DC
Time offset between serving and neighbour cells		Config 1,2	3μs				Synchronous cells.
T1	s	Config 1,2	5				
T2	s	Config 1,2	11 for PC1; 6.5 for other PC	108 for PC1; 67 for other PC	11 for PC1; 6.5 for other PC	108 for PC1; 67 for other PC	PC1 - power class 1 as specified in TS 38.101-2 [3] Table 6.2.1.0

Table 5.6.2.4.4.1-3: Test Environment test parameters for EN-DC inter-frequency event triggered reporting with SSB time index detection in DRX

Parameter	Value		Comment
Test environment	NC		As specified in TS 38.508-1 [14] clause 4.1.
Test frequencies	As specified in Annex E, Table E.2-1 and TS 38.508-1 [14] clause 4.3.1 for E-UTRA, 7.2.3 for NR FR2.		
Channel bandwidth	As specified by the test configuration selected from Table 5.6.2.4.4.1-1.		
Propagation conditions	AWGN		As specified in clause C.2.2.
Connection Diagram	TE Part	A.3.3.3.1	As specified in TS 38.508-1 [14] Annex A.
	DUT Part	A.3.4.1.1	
Exceptions to connection diagram			

1. Message contents are defined in clause 5.6.2.4.4.3.

2. Cell 1 is the E-UTRA serving cell (PCell) for the EN-DC setup. The power levels and settings for Cell 1 are set according to Annex A.6. Cell 2 and Cell 3 are NR FR1 cells in different frequencies. Cell 2 is the PSCell and Cell 3 is the target cell. The power levels and settings for Cell 2 and are set according to clause C.1.2 and clause C.1.3. Cell 3 is switched off during the initial connection setup.

3. If a UE supports per-FR gap and gap pattern configuration #13, it is only required to pass test 3&4. Otherwise it is only required to pass test 1&2.

4. The UE Rx beam peak direction for Cell 2 has been obtained previously using one of the Rx beam peak search procedures as described in Annex I.

5.6.2.4.4.2 Test procedure

In this test, there are three cells: LTE cell 1 as PCell on E-UTRA RF channel 1, NR cell 2 as PSCell in FR2 on NR RF channel 1 and NR cell 3 as neighbour cell in FR2 on NR RF channel 2.

In test 1&2 measurement gap pattern configuration # 0 as defined in Table 5.6.2.4.4.1-2 is provided for UE that does not support per-FR gap and in test 3&4 measurement gap pattern configuration #13 as defined in Table 5.6.2.4.4.1-2 is provided for UE that supports per-FR gap.

In the measurement control information, it is indicated to the UE that event-triggered reporting with Event A3 is used. The test consists of two successive time periods, with time duration of T1, and T2 respectively. During time duration T1, the UE shall not have any timing information of NR cell 3.

UE needs to be provided at least once every 500ms with new Timing Advance Command MAC control element to restart the Time alignment timer to keep UE uplink time alignment. Furthermore, UE is allocated with PUSCH resource at every DRX cycle.

1. Ensure the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity EN-DC, DC bearer MCG and SCG, Connected without release *On* according to TS 38.508-1 [14] clause 4.5.

2. Set the parameters according to T1 in Table 5.6.2.4.4.1-2.

3. The SS shall transmit an RRCConnectionReconfiguration message on Cell 1.

4. The UE shall transmit RRCConnectionReconfigurationComplete message.

5. When T1 expires, the SS shall switch the power setting from T1 to T2 as specified in Table 5.6.2.4.4.1-2.

6. UE shall transmit a MeasurementReport message triggered by Event A3 embedded in E-UTRA RRC message *ULInformationTransferMRDC*. If the overall delay measured from the beginning of time period T2 is less than 10082 ms for UE supporting power class 1, or 6242 ms for UE supporting other power class for Test 1 and Test 3 and 107522 ms for UE supporting power class 1, or 66562 ms for UE supporting other power class for Test 2 and Test 4, then the number of successful tests is increased by one. If the UE fails to report the event within the overall delays measured requirement then the number of failure tests is increased by one.

7. After the SS receives the MeasurementReport message in step 6 or when T2 expires, the SS shall transmit RRCConnectionReconfiguration message with condition EN-DC_PSCell_Rel according to TS 36.508 [25] Table 4.6.1-8 to release NR cell (PSCell). The UE shall transmit RRCConnectionReconfigurationComplete message.

8. Set Cell 3 physical cell identity = [(current cell 2 physical cell identity + 1) mod 1008] for next iteration of the test procedure loop.]

9. The SS shall transmit RRCConnectionReconfiguration message with condition MCG_and_SCG according to TS 36.508 [25] Table 4.6.1-8 to add NR cell (PSCell). The UE shall transmit RRCConnectionReconfigurationComplete message. If either of the reconfiguration in step 7 or step 9 fails, SS switches off and on the UE and ensures the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity EN-DC, DC bearer MCG and SCG, Connected without release *On* according to TS 38.508-1 [14] clause 4.5.

10. Repeat step 2-9 until the confidence level according to Tables G.2.3-1 in Annex G clause G.2 is achieved.

11. Repeat step 1-10 for each sub-test in Table 5.6.2.4.4.1-2 as appropriate.

5.6.2.4.4.3 Message contents

Message contents are according to TS 38.508-1 [14] clause 7.3 with the following exceptions:

Table 5.6.2.4.4.3-1: Common Exception messages for Additional EN-DC FR2-FR2 event triggered reporting tests with SSB time index detection in DRX test requirement

Default Message Contents	
Common contents of system information blocks exceptions	
Default RRC messages and information elements contents exceptions	Table H.3.1-1 Table H.3.1-2 with condition INTER-FREQ. For Test 3 and Test 4, additionally with condition GAP NEEDED Table H.3.1-3 with conditions INTER-FREQ MO and and Synchronous cells Table H.3.1-4 with condition SSB Index and A3-offset = -12dB Table H.3.1-6 with conditions gapFR2 and Pattern #13 for Test 3 and Test 4 Table H.3.4-4 with condition gapUE for Test 1 and Test 2 Table H.3.4-5 with condition Pattern #0 for Test 1 and Test 2 Table H.3.1-7 with condition SSB Index and INTER-FREQ Table H.3.7-1 with condition DRX.1 for Test 1 and Test 3 Table H.3.7-1 with condition DRX.7 for Test 2 and Test 4 Table H.3.4-1 Table H.3.4-2 Table H.3.4-3

5.6.2.4.5 Test requirement

Table 5.6.2.4.5-1 defines the primary level settings including test tolerances for all tests.

Table 5.6.2.4.5-1: Cell specific test parameters for EN-DC inter-frequency event triggered reporting with SSB time index detection in DRX

Parameter	Unit	Test configuration	Cell 2		Cell 3	
			T1	T2	T1	T2
AoA setup		Config 1,2	Setup 1 as specified in clause A.3.9			
Assumption for UE beams Note 7		Config 1,2	Rough			
NR RF Channel Number		Config 1,2	1		2	
Duplex mode		Config 1,2	TDD		TDD	
$BW_{channel}$	MHz	Config 1,2	100: $N_{RB,c}$ = 66		100: $N_{RB,c}$ = 66	
Data RBs allocated		Config 1,2	66		66	
BWP BW	MHz	Config 1,2	100: $N_{RB,c}$ = 66		100: $N_{RB,c}$ = 66	
TDD configuration		Config 1,2	TDDConf.3.1		TDDConf.3.1	
Initial DL BWP		Config 1,2	DLBWP.0.1		NA	
Dedicated DL BWP		Config 1,2	DLBWP.1.1		NA	
Initial UL BWP		Config 1,2	ULBWP.0.1		NA	
Dedicated UL BWP		Config 1,2	ULBWP.1.1		NA	
OCNG Patterns		Config 1,2	OP.1		OP.1	
PDSCH Reference measurement channel		Config 1,2	SR.3.1 TDD		-	
CORESET Reference Channel		Config 1,2	CR.3.1 TDD		-	
TRS configuration		Config 1,2	TRS.2.1 TDD		NA	
PDSCH/PDCCH TCI state		Config 1,2	TCI.State.2		NA	
SMTC configuration		Config 1,2	SMTC.1		SMTC.1	
PDSCH/PDCCH subcarrier spacing	kHz	Config 1,2	120		120	
EPRE ratio of PSS to SSS		Config 1,2	0		0	
EPRE ratio of PBCH DMRS to SSS						
EPRE ratio of PBCH to PBCH DMRS						
EPRE ratio of PDCCH DMRS to SSS						
EPRE ratio of PDCCH to PDCCH DMRS						
EPRE ratio of PDSCH DMRS to SSS						
EPRE ratio of PDSCH to PDSCH						
EPRE ratio of OCNG DMRS to SSS(Note 1)						
EPRE ratio of OCNG to OCNG DMRS (Note 1)						
N_{oc} Note2	dBm/15kHz Note5		-104.7		-104.7	
N_{oc} Note2	dBm/SCS Note4	Config 1,2	-95.7		-95.7	
SSB_RP Note 3	dBm/SCS Note5	Config 1,2	-89.7	-89.7	-89.7	-89.7
$\hat{E}_s / I_{ot}$	dB	Config 1,2	6	6	6	6
$\hat{E}_s / N_{oc}$	dB	Config 1,2	6	6	6	6
Io Note3	dBm/95.04 MHz Note5	Config 1,2	-59.7	-59.7	-59.7	-59.7
Propagation Condition		Config 1,2	AWGN			

Parameter	Unit	Test configuration	Cell 2		Cell 3	
			T1	T2	T1	T2
NOTE 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols. NOTE 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for N_{oc} to be fulfilled. NOTE 3: SSB_RP and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves. NOTE 4: Void NOTE 5: Equivalent power received by an antenna with 0dBi gain at the centre of the quiet zone NOTE 6: As observed with 0dBi gain antenna at the centre of the quiet zone NOTE 7: Information about types of UE beam is given in TS 38.133 Annex B.2.1.3, and does not limit UE implementation or test system implementation						

In test 1 with per-UE gap and in test 3 with per-FR gap, the UE shall send one Event A3 triggered measurement report, with a measurement reporting delay less than X1 ms from the beginning of time period T2, where X1 is

10080 for UE supporting power class 1, or

6240 for UE supporting other power class.

In test 2 with per-UE gap and in test 4 with per-FR gap, the UE shall send one Event A3 triggered measurement report, with a measurement reporting delay less than X2 ms from the beginning of time period T2, where X2 is

107520 for UE supporting power class 1, or

66560 for UE supporting other power class.

In test 1, 2, 3 and 4 UE is required to report SSB time index. The UE shall not send event triggered measurement reports, as long as the reporting criteria are not fulfilled. The rate of correct events observed during repeated tests shall be at least 90% with a confidence level of 95%. In test 1, 2, 3 and 4 UE is required to report SSB time index.

NOTE 1: The actual overall delays measured in the test may be up to $2xTTI_{DCCH}$ higher than the measurement reporting delays above because of TTI insertion uncertainty of the measurement report in DCCH.

NOTE 2: The actual overall delays measured in the test may be up to $2xTTI_{DCCH}$ higher than the measurement reporting delays above because of TTI insertion uncertainty of the measurement report in DCCH.

TTI insertion uncertainty = TTIDCCH = 1 ms; 2xTTIDCCH = 2 ms

The overall delays measured shall be less than a total of 10082 ms for power class 1 UE and 6242 ms for other power classes in test 1 and 107522 for power class 1 UE and 66562 ms for other power classes in test 2.

5.6.2.5 EN-DC FR1-FR2 event-triggered reporting in non-DRX

Editor's Note: This test case has been completed for the following configurations:

- Test frequency f ≤ 40.8 GHz

- UE PC3

- The test is incomplete for UE power classes other than PC3

- The test is incomplete for test frequencies > 40.8 GHz

5.6.2.5.1 Test purpose

The purpose of this test is to verify that the UE makes correct reporting of an event within inter-frequency cell search requirements.

5.6.2.5.2 Test applicability

This test applies to all types of E-UTRA UE release 15 and forward, supporting EN-DC. Test 1 is applicable to UEs not supporting per-FR gap (*IndependentGapConfig*, as defined in TS 38.306) and Test 2 is applicable only to UEs supporting per-FR gap (*IndependentGapConfig*, as defined in TS 38.306) and Gap Pattern Id 13.

5.6.2.5.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 5.6.2.0.

The normative reference for this requirement is TS 38.133 [6] clause A.5.6.2.5.

5.6.2.5.4 Test description

5.6.2.5.4.1 Initial conditions

This test shall be tested using any of the test configurations in Table 5.6.2.5.4.1-1. Configure the test equipment and the DUT according to the parameters in Table 5.6.2.5.4.1-2. Test environment parameters are given in Table 5.6.2.5.4.1-3.

Table 5.6.2.5.4.1-1 EN-DC FR1-FR2 event triggered reporting tests in non-DRX supported test configurations

Test Case ID	Description of serving cell	Description of target cell
5.6.2.5-1	LTE FDD, NR 15 kHz SSB SCS, 10MHz bandwidth, FDD duplex mode	120 kHz SSB SCS, 100MHz bandwidth, TDD duplex mode
5.6.2.5-2	LTE FDD, NR 15 kHz SSB SCS, 10MHz bandwidth, TDD duplex mode	
5.6.2.5-3	LTE FDD, NR 30kHz SSB SCS, 40MHz bandwidth, TDD duplex mode	
5.6.2.5-4	LTE TDD, NR 15 kHz SSB SCS, 10MHz bandwidth, FDD duplex mode	
5.6.2.5-5	LTE TDD, NR 15 kHz SSB SCS, 10MHz bandwidth, TDD duplex mode	
5.6.2.5-6	LTE TDD, NR 30kHz SSB SCS, 40MHz bandwidth, TDD duplex mode	
NOTE 1: The UE is only required to be tested in one of the supported test configurations NOTE 2: The target NR cell3 has the same SCS, BW and duplex mode as NR serving cell2		

Table 5.6.2.5.4-2: General test parameters for EN-DC inter-frequency event triggered reporting without SSB time index detection in non-DRX

Parameter	Unit	Test configuration	Value		Comment
			Test 1	Test 2	
E-UTRA RF Channel Number		Config 1,2,3,4,5,6	1		One E-UTRAN TDD carrier frequencies is used.
NR RF Channel Number		Config 1,2,3,4,5,6	1, 2		One FR1 and one FR2 NR carrier frequency is used.
Active cell		Config 1,2,3,4,5,6	LTE Cell 1 (PCell) and NR cell 2 (PScell)		LTE Cell 1 is on E-UTRA RF channel number 1. NR Cell 2 is on NR RF channel number 1.
Neighbour cell		Config 1,2,3,4,5,6	NR cell 3		NR cell 3 is on NR RF channel number 2.
Gap Pattern Id		Config 1,2,3,4,5,6	0	13	As specified in TS 38.133 clause 9.1.2-1.
Measurement gap offset		Config 1,2,3,4,5,6	39	39	
SMTC-SSB parameters on NR RF Channel 1		Config 1,4	SSB.1 FR1		As specified in clause A.3
		Config 2,5	SSB.1 FR1		As specified in clause A.3
		Config 3,6	SSB.2 FR1		As specified in clause A.3
SMTC-SSB parameters on NR RF Channel 2		Config 1,2,3,4,5,6	SSB.3 FR2		As specified in clause A.3
offsetMO	dB	Config 1,2,3,4,5,6	6		
Hysteresis	dB	Config 1,2,3,4,5,6	0		
a4-Threshold	dBm	Config 1,2,3,4,5,6	-105		
CP length		Config 1,2,3,4,5,6	Normal		

TimeToTrigger	s	Config 1,2,3,4,5,6	0		
Filter coefficient		Config 1,2,3,4,5,6	0		L3 filtering is not used
DRX		Config 1,2,3,4,5,6	OFF		DRX is not used
Time offset between PCell and PSCell		Config 1,2,3,4,5,6	3 μs		Synchronous EN-DC
Time offset between serving and neighbour cells		Config 1,4	3ms		Asynchronous cells. The timing of Cell 3 is 3ms later than the timing of Cell 2.
		Config 2,3,5,6	3μs		Synchronous cells.
T1	s	Config 1,2,3,4,5,6	5		
T2	s	Config 1,2,3,4,5,6	5.2 for PC1; 3.5 for other PC	5.2 for PC1; 3.5 for other PC	PC1 - power class 1 as specified in TS 38.101-2 [3] Table 6.2.1.0

Table 5.6.2.5.4-3: Test Environment test parameters for EN-DC inter-frequency event triggered reporting without SSB time index detection in non-DRX

Parameter	Value		Comment
Test environment	NC		As specified in TS 38.508-1 [14] clause 4.1.
Test frequencies	As specified in Annex E, Table TBD and TS 38.508-1 [14] clause 4.3.1 for E-UTRA and NR FR1, 7.2.3 for NR FR2.		
Channel bandwidth	As specified by the test configuration selected from Table 5.6.2.5.4.1-1.		
Propagation conditions	AWGN		As specified in clause C.2.2.
Connection Diagram	TE Part	A.3.3.3.1	As specified in TS 38.508-1 [14] Annex A.
	DUT Part	A.3.4.1.1	
Exceptions to connection diagram			

1. Message contents are defined in clause 5.6.2.5.4.3.
2. Cell 1 is the E-UTRA serving cell (PCell) for the EN-DC setup. The power levels and settings for Cell 1 are set according to Annex A.6. Cell 2 and Cell 3 are NR FR2 cells in different frequencies. Cell 2 is the PSCell and Cell 3 is the target cell. The power levels and settings for Cell 2 and Cell 3 are set according to Annex TBD
3. If a UE supports per-FR gap and gap pattern configuration #13, it is only required to pass test 2. Otherwise it is only required to pass test 1.
4. The UE Rx beam peak direction for Cell 3 has been obtained previously using one of the Rx beam peak search procedures as described in Annex I.

5.6.2.5.4.2 Test procedure

In this test, there are three cells: LTE cell 1 as PCell on E-UTRA RF channel 1, NR cell 2 as PSCell in FR1 on NR RF channel 1 and NR cell 3 as neighbour cell in FR2 on NR RF channel 2.

In test 1 measurement gap pattern configuration # 0 as defined in Table 5.6.2.5.4.1-2 is provided for a UE that does not support per-FR gap and in test 2 measurement gap pattern configuration #13 as defined in Table 5.6.2.5.4.1-2 is provided for UE that support per-FR gap.

In the measurement control information, it is indicated to the UE that event-triggered reporting with Event A4 is used. The test consists of two successive time periods, with time duration of T1, and T2 respectively. During time duration T1, the UE shall not have any timing information of NR cell 3.

1. Ensure the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity EN-DC, DC bearer MCG and SCG, Connected without release *On* according to TS 38.508-1 [14] clause 4.5.

2. Set the parameters according to T1 in Table 5.6.2.5.4.1-2. The TE shall ensure that the NR FR2 cell will be received by the UE from the Rx beam peak direction. T1 starts.

3. The SS shall transmit an RRCConnectionReconfiguration message on Cell 1.

4. The UE shall transmit RRCConnectionReconfigurationComplete message.

5. When T1 expires, the SS shall switch the power setting from T1 to T2 as specified in Table 5.6.2.5.4.1-2.

6. UE shall transmit a MeasurementReport message triggered by Event A4 embedded in E-UTRA RRC message *ULInformationTransferMRDC*. If the overall delay measured from the beginning of time period T2 is less than 5122 ms for UE supporting power class 1, or 3202 ms for UE supporting other power class for Test 1 and Test 2 then the number of successful tests is increased by one. If the UE fails to report the event within the overall delays measured requirement then the number of failure tests is increased by one.

7. After the SS receives the MeasurementReport message in step 6 or when T2 expires, the SS shall transmit RRCConnectionRelease message to release the RRC connection which includes the release of the established radio bearers as well as all radio resources.

8. Set Cell 3 physical cell identity = [(current cell 2 physical cell identity + 1) mod 1008] for next iteration of the test procedure loop.]

9. After the RRC connection release, the SS:

   - transmits in Cell 1 a Paging message (including PagingRecord with ue-Identity) for the UE and ensures the UE in state RRC_CONNECTED with generic procedure parameters Connectivity EN-DC, DC bearer MCG and SCG, Connected without release *On* according to TS 38.508-1 [14] clause 4.5. (if the paging fails, switches off and on the UE and ensures the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity EN-DC, DC bearer MCG and SCG, Connected without release *On* according to TS 38.508-1 [14] clause 4.5.),
   or:
   - switches off and on the UE and ensures the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity EN-DC, DC bearer MCG and SCG, Connected without release *On* according to TS 38.508-1 [14] clause 4.5.

10. Repeat step 2-9 until the confidence level according to Tables G.2.3-1 in Annex G clause G.2 is achieved.

11. Repeat step 1-10 for each sub-test in Table 4.6.2.1.4.1-2 as appropriate.

5.6.2.5.4.3 Message contents

Message contents are according to TS 38.508-1 [14] clause 7.3 with the following exceptions:

Table 5.6.2.5.4.3-1: Common Exception messages for Additional EN-DC FR1-FR2 event triggered reporting tests without SSB time index detection in non-DRX test requirement

Default Message Contents	
Common contents of system information blocks exceptions	
Default RRC messages and information elements contents exceptions	Table H.3.1-1 Table H.3.1-2 with Condition INTER-FREQ. For Test 2, additionally with condition GAP NEEDED Table H.3.1-3 with Conditions INTER-FREQ MO and Synchronous cells Table H.3.1-4AA with A4-threshold = -105 Table H.3.1-6 with Conditions gapFR2 and Pattern #13 for Test 2 Table H.3.4-4 with Condition gapUE Test 1 Table H.3.4-5 with Condition Pattern #0 for Test 1 Table H.3.1-7 with Condition INTER-FREQ Table H.3.4-1 Table H.3.4-2 Table H.3.4-3

Table 5.6.2.5.4.3-2: MeasObjectNR-DEFAULT: EN-DC FR1-FR2 measurement object configuration

Derivation Path: Table H.3.1-3			
Information Element	**Value/remark**	**Comment**	**Condition**
MeasObjectNR::= SEQUENCE {			
offsetMO SEQUENCE {			
rsrpOffsetSSB	6 dB		
}			

5.6.2.5.5 Test requirement

Table 5.6.2.5.5-1 defines the primary level settings including test tolerances for all tests.

Table 5.6.2.5.5-1: Cell specific test parameters for EN-DC inter-frequency event triggered reporting without SSB time index detection in non-DRX

Parameter	Unit	Test configuration	Cell 2		Cell 3	
			T1	T2	T1	T2
AoA setup		Config 1,2,3,4,5,6	NA		Setup 1	
Assumption for UE beams[Note 7]		Config 1,2,3,4,5,6	N/A		Rough	
NR RF Channel Number		Config 1,2,3,4,5,6	1		2	
Duplex mode		Config 1,4	FDD		TDD	
		Config 2,3,5,6	TDD		TDD	
$BW_{channel}$	MHz	Config 1,4	10: $N_{RB,c}$ = 52		100: $N_{RB,c}$ = 66	
		Config 2,5	10: $N_{RB,c}$ = 52		100: $N_{RB,c}$ = 66	
		Config 3,6	40: $N_{RB,c}$ = 106		100: $N_{RB,c}$ = 66	
BWP BW	MHz	Config 1,4	10: $N_{RB,c}$ = 52		100: $N_{RB,c}$ = 66	
		Config 2,5	10: $N_{RB,c}$ = 52		100: $N_{RB,c}$ = 66	
		Config 3,6	40: $N_{RB,c}$ = 106		100: $N_{RB,c}$ = 66	
TDD configuration		Config 2,5	TDDConf.1.1		TDDConf.3.1	
		Config 3,6	TDDConf.2.1		TDDConf.3.1	
Initial DL BWP		Config 1,2,3,4,5,6	DLBWP.0.1		NA	
Initial UL BWP		Config 1,2,3,4,5,6	ULBWP.0.1		NA	
Dedicated DL BWP		Config 1,2,3,4,5,6	DLBWP.1.1		NA	
Dedicated UL BWP		Config 1,2,3,4,5,6	ULBWP.1.1		NA	
OCNG Patterns		Config 1,2,3,4,5,6	OP.1		OP.1	
PDSCH Reference measurement channel		Config 1,4	SR.1.1 FDD		-	
		Config 2,5	SR.1.1 TDD			
		Config 3,6	SR.2.1 TDD			
RMSI CORESET Reference Channel		Config 1,4	CR.1.1 FDD		-	
		Config 2,5	CR.1.1 TDD			
		Config 3,6	CR.2.1 TDD			
Dedicated CORESET RMC configuration		Config 1,4	CCR.1.1 FDD		CCR.3.1 TDD	
		Config 2,5	CCR.1.1 TDD		CCR.3.1 TDD	
		Config 3,6	CCR.2.1 TDD		CCR.3.1 TDD	
SMTC configuration		Config 1,4	SMTC.2		SMTC.2	
		Config 2,3,5,6	SMTC.1		SMTC.1	
PDSCH/PDCCH subcarrier spacing	kHz	Config 1,2,4,5	15		120	
		Config 3,6	30		120	
EPRE ratio of PSS to SSS		Config 1,2,3,4,5,6	0		0	
EPRE ratio of PBCH DMRS to SSS						
EPRE ratio of PBCH to PBCH DMRS						

Parameter	Unit	Test configuration	Cell 2		Cell 3	
			T1	T2	T1	T2
EPRE ratio of PDCCH DMRS to SSS						
EPRE ratio of PDCCH to PDCCH DMRS						
EPRE ratio of PDSCH DMRS to SSS						
EPRE ratio of PDSCH to PDSCH						
EPRE ratio of OCNG DMRS to SSS(Note 1)						
EPRE ratio of OCNG to OCNG DMRS (Note 1)						
$\hat{E}_S$	dBm/SCS	Config 1,2,3,4,5,6	Link only, see clause A.3.7A		-Infinity	-87
SSB_RP Note 3	dBm/SCS Note5	Config 1,2,3,4,5,6			-Infinity	-87
$\hat{E}_s / I_{ot}$ BB Note 8	dB	Config 1,2,3,4,5,6			-Infinity	14.69
Io Note3	dBm/95.04 MHz Note5	Config 1,2,3,4,5,6			-Infinity	-58.01
Propagation Condition		Config 1,2,3,4,5,6			AWGN	

NOTE 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.
NOTE 2: Void
NOTE 3: SSB_RP, Es/Iot and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.
NOTE 4: Void.
NOTE 5: Equivalent power received by an antenna with 0dBi gain at the centre of the quiet zone
NOTE 6: As observed with 0dBi gain antenna at the centre of the quiet zone
NOTE 7: Information about types of UE beam is given in B.2.1.3, and does not limit UE implementation or test system implementation
NOTE 8: Calculation of Es/Iot_{BB} includes the effect of UE internal noise up to the value assumed for the associated Refsens requirement in clause 7.3.2 of TS 38.101-2 [19], and an allowance of 1dB for UE multi-band relaxation factor ΔMB_S from TS 38.101-2 [19] Table 6.2.1.3-4.

In test 1 with per-UE gap and in test 2 with per-FR gap, the UE shall send one Event A4 triggered measurement report, with a measurement reporting delay less than X ms from the beginning of time period T2, where X is

5120 for UE supporting power class 1, or

3200 for UE supporting other power class.

In test 1 and 2 UE is not required to report SSB time index. The UE shall not send event triggered measurement reports, as long as the reporting criteria are not fulfilled. The rate of correct events observed during repeated tests shall be at least 90% with a confidence level of 95%. In test 1 and 2 UE is not required to report SSB time index.

NOTE: The actual overall delays measured in the test may be up to $2xTTI_{DCCH}$ higher than the measurement reporting delays above because of TTI insertion uncertainty of the measurement report in DCCH.

TTI insertion uncertainty = TTIDCCH = 1 ms; 2xTTIDCCH = 2 ms

The overall delays measured shall be less than a total of 5122 ms in this test for power class UE and 3202 ms for other power classes.

5.6.2.6 EN-DC FR1-FR2 event-triggered reporting in DRX

Editor's Note: This test case has been completed for the following configurations:

- Test frequency f ≤ 40.8 GHz

- UE PC3

- The test is incomplete for UE power classes other than PC3

- The test is incomplete for test frequencies > 40.8 GHz

5.6.2.6.1 Test purpose

The purpose of this test is to verify that the UE makes correct reporting of an event in DRX within inter-frequency cell search requirements.

5.6.2.6.2 Test applicability

This test applies to all types of E-UTRA UE release 15 and forward, supporting EN-DC FR2 and long DRX cycle. Tests 1 and 2 are applicable to UEs not supporting per-FR gap (*IndependentGapConfig*, as defined in TS 38.306) and Tests 3 and 4 are applicable only to UEs supporting per-FR gap (*IndependentGapConfig*, as defined in TS 38.306) and Gap Pattern Id 13.

5.6.2.6.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 5.6.2.0.

The normative reference for this requirement is TS 38.133 [6] clause A.5.6.2.6.

5.6.2.6.4 Test description

5.6.2.6.4.1 Initial conditions

This test shall be tested using any of the test configurations in Table 5.6.2.6.4.1-1. Configure the test equipment and the DUT according to the parameters in Table 5.6.2.6.4.1-2. Test environment parameters are given in Table 5.6.2.6.4.1-3.

Table 5.6.2.6.4.1-1: EN-DC FR1-FR2 event triggered reporting tests in DRX supported test configurations

Test Case ID	Description of serving cell	Description of target cell
5.6.2.6-1	LTE FDD, NR 15 kHz SSB SCS, 10MHz bandwidth, FDD duplex mode	120 kHz SSB SCS, 100MHz bandwidth, TDD duplex mode
5.6.2.6-2	LTE FDD, NR 15 kHz SSB SCS, 10MHz bandwidth, TDD duplex mode	
5.6.2.6-3	LTE FDD, NR 30kHz SSB SCS, 40MHz bandwidth, TDD duplex mode	
5.6.2.6-4	LTE TDD, NR 15 kHz SSB SCS, 10MHz bandwidth, FDD duplex mode	
5.6.2.6-5	LTE TDD, NR 15 kHz SSB SCS, 10MHz bandwidth, TDD duplex mode	
5.6.2.6-6	LTE TDD, NR 30kHz SSB SCS, 40MHz bandwidth, TDD duplex mode	
NOTE 1: The UE is only required to be tested in one of the supported test configurations NOTE 2: The target NR cell3 has the same SCS, BW and duplex mode as NR serving cell2		

Table 5.6.2.6.4-2: General test parameters for EN-DC inter-frequency event triggered reporting without SSB time index detection

Parameter	Unit	Test configuration	Value				Comment
			Test 1	Test 2	Test 3	Test 4	
E-UTRA RF Channel Number		Config 1,2,3,4,5,6	1				One E-UTRAN TDD carrier frequencies is used.
NR RF Channel Number		Config 1,2,3,4,5,6	1, 2				One FR1 and one FR2 NR carrier frequency is used.
Active cell		Config 1,2,3,4,5,6	LTE Cell 1 (PCell) and NR cell 2 (PScell)				LTE Cell 1 is on E-UTRA RF channel number 1. NR Cell 2 is on NR RF channel number 1.
Neighbour cell		Config 1,2,3,4,5,6	NR cell 3				NR cell 3 is on NR RF channel number 2.
Gap Pattern Id		Config 1,2,3,4,5,6	0		13		As specified in TS 38.133 clause 9.1.2-1.
Measurement gap offset		Config 1,2,3,4,5,6	39		39		
SMTC-SSB parameters on NR RF Channel 1		Config 1,4	SSB.1 FR1				As specified in clause A.3
		Config 2,5	SSB.1 FR1				As specified in clause A.3

Parameter	Unit	Test configuration	Value				Comment
			Test 1	Test 2	Test 3	Test 4	
		Config 3,6	SSB.2 FR1				As specified in clause A.3
SMTC-SSB parameters on NR RF Channel 2		Config 1,2,3,4,5,6	SSB.3 FR2				As specified in clause A.3
offsetMO	dB	Config 1,2,3,4,5,6	6				
Hysteresis	dB	Config 1,2,3,4,5,6	0				
a4-Threshold	dBm	Config 1,2,3,4,5,6	-105				
CP length		Config 1,2,3,4,5,6	Normal				
TimeToTrigger	s	Config 1,2,3,4,5,6	0				
Filter coefficient		Config 1,2,3,4,5,6	0				L3 filtering is not used
DRX		Config 1,2,3,4,5,6	DRX.1	DRX.2	DRX.1	DRX.2	As specified in clause A.5
Time offset between PCell and PSCell		Config 1,2,3,4,5,6	3 μs				Synchronous EN-DC
Time offset between serving and neighbour cells		Config 1,4	3ms				Asynchronous cells. The timing of Cell 3 is 3ms later than the timing of Cell 2.
		Config 2,3,5,6	3μs				Synchronous cells.
T1	s	Config 1,2,3,4,5,6	5				
T2	s	Config 1,2,3,4,5,6	8 for PC1; 5 for other PC	82 for PC1; 52 for other PC	8 for PC1; 5 for other PC	82 for PC1; 52 for other PC	PC1 - power class 1 as specified in TS 38.101-2 [3] Table 6.2.1.0

Table 5.6.2.6.4-3: Test Environment test parameters for EN-DC inter-frequency event triggered reporting without SSB time index detection in non-DRX

Parameter	Value		Comment
Test environment	NC		As specified in TS 38.508-1 [14] clause 4.1.
Test frequencies	As specified in Annex E, Table TBD and TS 38.508-1 [14] clause 4.3.1 for E-UTRA and NR FR1, 7.2.3 for NR FR2		
Channel bandwidth	As specified by the test configuration selected from Table 4.6.2.3.4.1-1.		
Propagation conditions	AWGN		As specified in clause C.2.2.
Connection Diagram	TE Part	A.3.3.3.1	As specified in TS 38.508-1 [14] Annex A.
	DUT Part	A.3.4.1.1	
Exceptions to connection diagram			

1. Message contents are defined in clause 4.6.2.3.4.3.

2. Cell 1 is the E-UTRA serving cell (PCell) for the EN-DC setup. The power levels and settings for Cell 1 are set according to Annex A.6. Cell 2 and Cell 3 are NR FR2 cells in different frequencies. Cell 2 is the PSCell and Cell 3 is the target cell. The power levels and settings for Cell 2 and Cell 3 are set according to Annex TBD

3. If a UE supports per-FR gap and gap pattern configuration #13, it is only required to pass test 3&4. Otherwise it is only required to pass test 1&2.

4. The UE Rx beam peak direction for Cell 3 has been obtained previously using one of the Rx beam peak search procedures as described in Annex I.

5.6.2.6.4.2 Test procedure

In this test, there are three cells: LTE cell 1 as PCell on E-UTRA RF channel 1, NR cell 2 as PSCell in FR1 on NR RF channel 1 and NR cell 3 as neighbour cell in FR2 on NR RF channel 2.

In test 1&2 measurement gap pattern configuration # 0 as defined in Table 5.6.2.6.4-2 is provided for a UE that does not support per-FR gap and in test 3&4 measurement gap pattern configuration #13 as defined in Table 5.6.2.6.4-2 is provided for UE that support per-FR gap.

In the measurement control information, it is indicated to the UE that event-triggered reporting with Event A4 is used. The test consists of two successive time periods, with time duration of T1, and T2 respectively. During time duration T1, the UE shall not have any timing information of NR cell 3.

UE needs to be provided at least once every 500ms with new Timing Advance Command MAC control element to restart the Time alignment timer to keep UE uplink time alignment. Furthermore UE is allocated with PUSCH resource at every DRX cycle.

1. Ensure the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity EN-DC, DC bearer MCG and SCG, Connected without release *On* according to TS 38.508-1 [14] clause 4.5.

2. Set the parameters according to T1 in Table 5.6.2.6.4-2. The TE shall ensure that the NR FR2 cell will be received by the UE from the Rx beam peak direction. T1 starts.

3. The SS shall transmit an RRCConnectionReconfiguration message on Cell 1.

4. The UE shall transmit RRCConnectionReconfigurationComplete message.

5. When T1 expires, the SS shall switch the power setting from T1 to T2 as specified in Table 5.6.2.6.4-2.

6. UE shall transmit a MeasurementReport message triggered by Event A4 embedded in E-UTRA RRC message *ULInformationTransferMRDC*. If the overall delay measured from the beginning of time period T2 is less than 7682 ms for UE supporting power class 1, or 4802 ms for UE supporting other power class for Test 1 and Test 3 and 81922 ms for UE supporting power class 1, or 51202 ms for UE supporting other power class for Test 2 and Test 4, then the number of successful tests is increased by one. If the UE fails to report the event within the overall delays measured requirement then the number of failure tests is increased by one.

7. After the SS receives the MeasurementReport message in step 6 or when T2 expires, the SS shall transmit RRCConnectionRelease message to release the RRC connection which includes the release of the established radio bearers as well as all radio resources.

8. Set Cell 3 physical cell identity = [(current cell 2 physical cell identity + 1) mod 1008] for next iteration of the test procedure loop.]

9. After the RRC connection release, the SS:

   - transmits in Cell 1 a Paging message (including PagingRecord with ue-Identity) for the UE and ensures the UE in state RRC_CONNECTED with generic procedure parameters Connectivity EN-DC, DC bearer MCG and SCG, Connected without release *On* according to TS 38.508-1 [14] clause 4.5. (if the paging fails, switches off and on the UE and ensures the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity EN-DC, DC bearer MCG and SCG, Connected without release *On* according to TS 38.508-1 [14] clause 4.5.),
   or:
   - switches off and on the UE and ensures the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity EN-DC, DC bearer MCG and SCG, Connected without release *On* according to TS 38.508-1 [14] clause 4.5.

10. Repeat step 2-9 until the confidence level according to Tables G.2.3-1 in Annex G clause G.2 is achieved.

11. Repeat step 1-10 for each sub-test in Table 5.6.2.6.4-2 as appropriate.

5.6.2.6.4.3 Message contents

Message contents are according to TS 38.508-1 [14] clause 7.3 with the following exceptions:

Table 5.6.2.6.4.3-1: Common Exception messages for Additional EN-DC FR1-FR2 event triggered reporting tests without SSB time index detection in DRX test requirement

Default Message Contents	
Common contents of system information blocks exceptions	
Default RRC messages and information elements contents exceptions	Table H.3.1-1 Table H.3.1-2 with Condition INTER-FREQ. For Test 3 and 4, additionally with condition GAP NEEDED Table H.3.1-3 with Conditions INTER-FREQ MO and Synchronous cells Table H.3.1-4AA with A4-threshold = -105 Table H.3.1-6 with Conditions gapFR2 and Pattern #13 for Test 3 and Test 4 Table H.3.4-4 with Condition gapUE Test 1 and Test 2 Table H.3.4-5 with Condition Pattern #0 for Test 1 and Test 2 Table H.3.1-7 with Condition INTER-FREQ Table H.3.7-1 with Condition DRX.1 for Test 1 and Test 3 Table H.3.7-1 with Condition DRX.2 for Test 2 and Test 4 Table H.3.4-1 Table H.3.4-2 Table H.3.4-3

Table 5.6.2.6.4.3-2: MeasObjectNR-DEFAULT: EN-DC FR1-FR2 measurement object configuration

Derivation Path: Table H.3.1-3			
Information Element	**Value/remark**	**Comment**	**Condition**
MeasObjectNR::= SEQUENCE {			
offsetMO SEQUENCE {			
rsrpOffsetSSB	6 dB		
}			

5.6.2.6.5 Test requirement

Table 5.6.2.6.5-1 defines the primary level settings including test tolerances for all tests.

Table 5.6.2.6.5-1: Cell specific test parameters for EN-DC inter-frequency event triggered reporting without SSB time index detection

Parameter	Unit	Test configuration	Cell 2		Cell 3	
			T1	T2	T1	T2
AoA setup		Config 1,2,3,4,5,6	NA		Setup 1 as specified in clause A.9	
Assumption for UE beams[Note 7]		Config 1,2,3,4,5,6	N/A		Rough	
NR RF Channel Number		Config 1,2,3,4,5,6	1		2	
Duplex mode		Config 1,4	FDD		TDD	
		Config 2,3,5,6	TDD		TDD	
$BW_{channel}$	MHz	Config 1,4	10: $N_{RB,c}$ = 52		100: $N_{RB,c}$ = 66	
		Config 2,5	10: $N_{RB,c}$ = 52		100: $N_{RB,c}$ = 66	
		Config 3,6	40: $N_{RB,c}$ = 106		100: $N_{RB,c}$ = 66	
BWP BW	MHz	Config 1,4	10: $N_{RB,c}$ = 52		100: $N_{RB,c}$ = 66	
		Config 2,5	10: $N_{RB,c}$ = 52		100: $N_{RB,c}$ = 66	
		Config 3,6	40: $N_{RB,c}$ = 106		100: $N_{RB,c}$ = 66	
TDD configuration		Config 2,5	TDDConf.1.1		TDDConf.3.1	
		Config 3,6	TDDConf.2.1		TDDConf.3.1	
Initial DL BWP		Config 1,2,3,4,5,6	DLBWP.0.1		NA	
Initial UL BWP		Config 1,2,3,4,5,6	ULBWP.0.1		NA	
Dedicated DL BWP		Config 1,2,3,4,5,6	DLBWP.1.1		NA	
Dedicated UL BWP		Config 1,2,3,4,5,6	ULBWP.1.1		NA	
OCNG Patterns		Config 1,2,3,4,5,6	OP.1		OP.1	
PDSCH Reference measurement channel		Config 1,4	SR.1.1 FDD		-	
		Config 2,5	SR.1.1 TDD			
		Config 3,6	SR2.1 TDD			
RMSI CORESET Reference		Config 1,4	CR.1.1 FDD		-	

Parameter	Unit	Test configuration	Cell 2		Cell 3	
			T1	T2	T1	T2
Channel		Config 2,5	CR.1.1 TDD			
		Config 3,6	CR2.1 TDD			
Dedicated CORESET RMC configuration		Config 1,4	CCR.1.1 FDD		CCR.3.1 TDD	
		Config 2,5	CCR.1.1 TDD		CCR.3.1 TDD	
		Config 3,6	CCR.2.1 TDD		CCR.3.1 TDD	
SMTC configuration		Config 1,4	SMTC.2		SMTC.2	
		Config 2,3,5,6	SMTC.1		SMTC.1	
PDSCH/PDCCH subcarrier spacing	kHz	Config 1,2,4,5	15		120	
		Config 3,6	30		120	
EPRE ratio of PSS to SSS		Config 1,2,3,4,5,6	0		0	
EPRE ratio of PBCH DMRS to SSS						
EPRE ratio of PBCH to PBCH DMRS						
EPRE ratio of PDCCH DMRS to SSS						
EPRE ratio of PDCCH to PDCCH DMRS						
EPRE ratio of PDSCH DMRS to SSS						
EPRE ratio of PDSCH to PDSCH						
EPRE ratio of OCNG DMRS to SSS(Note 1)						
EPRE ratio of OCNG to OCNG DMRS (Note 1)						
N_{oc} Note2	dBm/15kHz Note5		NA Link only, see clause A.3.7A		-104.7	
N_{oc} Note2	dBm/SCS Note4	Config 1,2,4,5			-95.7	
		Config 3,6			-95.7	
SSB_RP Note 3	dBm/SCS Note5	Config 1,2,4,5			-Infinity	-86.7
		Config 3,6			-Infinity	-86.7
$\hat{E}_s / I_{oc}$	dB	Config 1,2,3,4,5,6			-Infinity	9
$\hat{E}_s / N_{oc}$	dB	Config 1,2,3,4,5,6			-Infinity	9
Io Note3	dBm/9.36MHz	Config 1,2,4,5			-	-
	dBm/38.16MHz	Config 3,6			-	-
	dBm/95.04 MHz Note5	Config 1,2,3,4,5,6			-66.7	-57.2
Propagation Condition		Config 1,2,3,4,5,6			AWGN	

NOTE 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.

NOTE 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for N_{oc} to be fulfilled.

NOTE 3: SSB_RP and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.

NOTE 4: SSB_RP minimum requirements are specified assuming independent interference and noise at each receiver antenna port.

NOTE 5: Equivalent power received by an antenna with 0 dBi gain at the centre of the quiet zone

NOTE 6: As observed with 0 dBi gain antenna at the centre of the quiet zone

NOTE 7: Information about types of UE beam is given in B.2.1.3, and does not limit UE implementation or test system implementation

In test 1 with per-UE gap and in test 3 with per-FR gap, the UE shall send one Event A4 triggered measurement report, with a measurement reporting delay less than X1 ms from the beginning of time period T2, where X1 is

7680 for UE supporting power class 1, or

4800 for UE supporting other power class.

In test 2 with per-UE gap and in test 4 with per-FR gap, the UE shall send one Event A4 triggered measurement report, with a measurement reporting delay less than X2 ms from the beginning of time period T2, where X2 is

81920 for UE supporting power class 1, or

51200 for UE supporting other power class.

In test 1, 2, 3 and 4 UE is not required to report SSB time index. The UE shall not send event triggered measurement reports, as long as the reporting criteria are not fulfilled. The rate of correct events observed during repeated tests shall be at least 90% with the confidence level of 95%.

In test 1, 2, 3 and 4 UE is not required to report SSB time index.

NOTE: The actual overall delays measured in the test may be up to $2xTTI_{DCCH}$ higher than the measurement reporting delays above because of TTI insertion uncertainty of the measurement report in DCCH.

TTI insertion uncertainty = TTIDCCH = 1 ms; 2xTTIDCCH = 2 ms

The overall delays measured shall be less than a total of 7682 ms for power class 1 UE and 4802 ms for other power classes in test 1 and test 3 and 81922 for power class 1 UE and 51202 ms for other power classes in test 2 and test 4.

5.6.2.7 EN-DC FR1-FR2 event-triggered reporting in non-DRX with SSB time index detection

Editor's Note: This test case has been completed for the following configurations:

- Test frequency f ≤ 40.8 GHz

- UE PC3

- The test is incomplete for UE power classes other than PC3

- The test is incomplete for test frequencies > 40.8 GHz

5.6.2.7.1 Test purpose

The purpose of this test is to verify that the UE makes correct reporting of an event within inter-frequency cell search requirements with SSB time index detection.

5.6.2.7.2 Test applicability

This test applies to all types of E-UTRA UE release 15 and forward, supporting EN-DC. Test 1 is applicable to UEs not supporting per-FR gap (*IndependentGapConfig*, as defined in TS 38.306) and Test 2 is applicable only to UEs supporting per-FR gap (*IndependentGapConfig*, as defined in TS 38.306) and Gap Pattern Id 13.

5.6.2.7.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 5.6.2.0.

The normative reference for this requirement is TS 38.133 [6] clause A.5.6.2.7.

5.6.2.7.4 Test description

5.6.2.7.4.1 Initial conditions

This test shall be tested using any of the test configurations in Table 5.6.2.7.4.1-1. Configure the test equipment and the DUT according to the parameters in Table 5.6.2.7.4.1-2. Test environment parameters are given in Table 5.6.2.7.4.1-3.

Table 5.6.2.7.4.1-1: EN-DC FR1-FR2 event triggered reporting tests in non-DRX with SSB time index detection supported test configurations

Test Case ID	Description of serving cell	Description of target cell
5.6.2.7-1	LTE FDD, NR 15 kHz SSB SCS, 10MHz bandwidth, FDD duplex mode	120 kHz SSB SCS, 100MHz bandwidth, TDD duplex mode
5.6.2.7-2	LTE FDD, NR 15 kHz SSB SCS, 10MHz bandwidth, TDD duplex mode	
5.6.2.7-3	LTE FDD, NR 30kHz SSB SCS, 40MHz bandwidth, TDD duplex mode	
5.6.2.7-4	LTE TDD, NR 15 kHz SSB SCS, 10MHz bandwidth, FDD duplex mode	
5.6.2.7-5	LTE TDD, NR 15 kHz SSB SCS, 10MHz bandwidth, TDD duplex mode	
5.6.2.7-6	LTE TDD, NR 30kHz SSB SCS, 40MHz bandwidth, TDD duplex mode	
NOTE 1: The UE is only required to be tested in one of the supported test configurations NOTE 2: The target NR cell3 has the same SCS, BW and duplex mode as NR serving cell2		

Table 5.6.2.7.4-2: General test parameters for EN-DC inter-frequency event triggered reporting with SSB time index detection

Parameter	Unit	Test configuration	Value		Comment
			Test 1	Test 2	
E-UTRA RF Channel Number		Config 1,2,3,4,5,6	1		One E-UTRAN TDD carrier frequencies is used.
NR RF Channel Number		Config 1,2,3,4,5,6	1, 2		One FR1 and one FR2 NR carrier frequency is used.
Active cell		Config 1,2,3,4,5,6	LTE Cell 1 (PCell) and NR cell 2 (PScell)		LTE Cell 1 is on E-UTRA RF channel number 1. NR Cell 2 is on NR RF channel number 1.
Neighbour cell		Config 1,2,3,4,5,6	NR cell 3		NR cell 3 is on NR RF channel number 2.
Gap Pattern Id		Config 1,2,3,4,5,6	0	13	As specified in TS 38.133 clause 9.1.2-1.
Measurement gap offset		Config 1,2,3,4,5,6	39	39	
SMTC-SSB parameters on NR RF Channel 1		Config 1,4	SSB.1 FR1		As specified in clause A.3
		Config 2,5	SSB.1 FR1		As specified in clause A.3
		Config 3,6	SSB.2 FR1		As specified in clause A.3
SMTC-SSB parameters on NR RF Channel 2		Config 1,2,3,4,5,6	SSB.3 FR2		As specified in clause A.3
offsetMO	dB	Config 1,2,3,4,5,6	6		
Hysteresis	dB	Config 1,2,3,4,5,6	0		
a4-Threshold	dBm	Config 1,2,3,4,5,6	-105		
CP length		Config 1,2,3,4,5,6	Normal		
TimeToTrigger	s	Config 1,2,3,4,5,6	0		
Filter coefficient		Config 1,2,3,4,5,6	0		L3 filtering is not used
DRX		Config 1,2,3,4,5,6	OFF		DRX is not used
Time offset between PCell and PSCell		Config 1,2,3,4,5,6	3 µs		Synchronous EN-DC
Time offset between serving and neighbour cells		Config 1,4	3ms		Asynchronous cells. The timing of Cell 3 is 3ms later than the timing of Cell 2.
		Config 2,3,5,6	3µs		Synchronous cells.
T1	s	Config 1,2,3,4,5,6	5		
T2	s	Config 1,2,3,4,5,6	7 for PC1; 4.5 for other PC	7 for PC1; 4.5 for other PC	PC1 – power class 1 as specified in TS 38.101-2 [3] Table 6.2.1.0

Table 5.6.2.7.4-3: Test Environment test parameters for EN-DC inter-frequency event triggered reporting without SSB time index detection in non-DRX

Parameter	Value		Comment
Test environment	NC		As specified in TS 38.508-1 [14] clause 4.1.
Test frequencies	As specified in Annex E, Table TBD and TS 38.508-1 [14] clause 4.3.1 for E-UTRA and NR FR1, 7.2.3 for NR FR2		
Channel bandwidth	As specified by the test configuration selected from Table 4.6.2.3.4.1-1.		
Propagation conditions	AWGN		As specified in clause C.2.2.
Connection Diagram	TE Part	A.3.3.3.1	As specified in TS 38.508-1 [14] Annex A.
	DUT Part	A.3.4.1.1	
Exceptions to connection diagram			

1. Message contents are defined in clause 5.6.2.7.4.3.

2. Cell 1 is the E-UTRA serving cell (PCell) for the EN-DC setup. The power levels and settings for Cell 1 are set according to Annex A.6. Cell 2 and Cell 3 are NR FR2 cells in different frequencies. Cell 2 is the PSCell and Cell 3 is the target cell. The power levels and settings for Cell 2 and Cell 3 are set according to Annex TBD

3. If a UE supports per-FR gap and gap pattern configuration #13, it is only required to pass test 2. Otherwise it is only required to pass test 1.

4. The UE Rx beam peak direction for Cell 3 has been obtained previously using one of the Rx beam peak search procedures as described in Annex I.

5.6.2.7.4.2 Test procedure

In this test, there are three cells: LTE cell 1 as Pcell on E-UTRA RF channel 1, NR cell 2 as PSCell in FR1 on NR RF channel 1 and NR cell 3 as neighbour cell in FR2 on NR RF channel 2.

In test 1 measurement gap pattern configuration # 0 as defined in Table 5.6.2.7.4.1-2 is provided for a UE that does not support per-FR gap and in test 2 measurement gap pattern configuration #13 as defined in Table 5.6.2.7.4.1-2 is provided for UE that support per-FR gap.

In the measurement control information, it is indicated to the UE that event-triggered reporting with Event A4 is used. The test consists of two successive time periods, with time duration of T1, and T2 respectively. During time duration T1, the UE shall not have any timing information of NR cell 3.

1. Ensure the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity EN-DC, DC bearer MCG and SCG, Connected without release *On* according to TS 38.508-1 [14] clause 4.5.

2. Set the parameters according to T1 in Table 5.6.2.7.4-2 The TE shall ensure that the NR FR2 cell will be received by the UE from the Rx beam peak direction. T1 starts.

3. The SS shall transmit an RRCConnectionReconfiguration message on Cell 1.

4. The UE shall transmit RRCConnectionReconfigurationComplete message.

5. When T1 expires, the SS shall switch the power setting from T1 to T2 as specified in Table 5.6.2.7.4.1-2.

6. UE shall transmit a MeasurementReport message triggered by Event A4 embedded in E-UTRA RRC message *ULInformationTransferMRDC*. If the overall delay measured from the beginning of time period T2 is less than 6722 ms for UE supporting power class 1, or 4162 ms for UE supporting other power class for Test 1 and Test 2 then the number of successful tests is increased by one. If the UE fails to report the event within the overall delays measured requirement then the number of failure tests is increased by one.

7. After the SS receives the MeasurementReport message in step 6 or when T2 expires, the SS shall transmit RRCConnectionRelease message to release the RRC connection which includes the release of the established radio bearers as well as all radio resources.

8. Set Cell 3 physical cell identity = [(current cell 2 physical cell identity + 1) mod 1008] for next iteration of the test procedure loop.]

9. After the RRC connection release, the SS:

   - transmits in Cell 1 a Paging message (including PagingRecord with ue-Identity) for the UE and ensures the UE in state RRC_CONNECTED with generic procedure parameters Connectivity EN-DC, DC bearer MCG and SCG, Connected without release *On* according to TS 38.508-1 [14] clause 4.5. (if the paging fails, switches off and on the UE and ensures the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity EN-DC, DC bearer MCG and SCG, Connected without release *On* according to TS 38.508-1 [14] clause 4.5.),
   or:
   - switches off and on the UE and ensures the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity EN-DC, DC bearer MCG and SCG, Connected without release *On* according to TS 38.508-1 [14] clause 4.5.

10. Repeat step 2-9 until the confidence level according to Tables G.2.3-1 in Annex G clause G.2 is achieved.

11. Repeat step 1-10 for each sub-test in Table 5.6.2.7.41.-2 as appropriate.

5.6.2.7.4.3 Message contents

Message contents are according to TS 38.508-1 [14] clause 7.3 with the following exceptions:

Table 5.6.2.7.4.3-1: Common Exception messages for Additional EN-DC FR1-FR2 event triggered reporting tests with SSB time index detection in non-DRX test requirement

Default Message Contents	
Common contents of system information blocks exceptions	
Default RRC messages and information elements contents exceptions	Table H.3.1-1 Table H.3.1-2 with conditions and INTER-FREQ. For Test 2, additionally with condition GAP NEEDED Table H.3.1-3 with conditions INTER-FREQ MO and Synchronous cells Table H.3.1-4AA with condition SSB Index and A4-threshold = -105 Table H.3.1-6 with conditions gapFR2 and Pattern #13 for Test 2 Table H.3.4-4 with condition gapUE for Test 1 Table H.3.4-5 with condition Pattern #0 for Test 1 Table H.3.1-7 with condition SSB Index and INTER-FREQ Table H.3.4-1 Table H.3.4-2 Table H.3.4-3 Table H.3.1-4 a4 threshold = TBD

Table 5.6.2.7.4.3-2: MeasObjectNR-DEFAULT: EN-DC FR1-FR2 measurement object configuration

Derivation Path: Table H.3.1-3			
Information Element	**Value/remark**	**Comment**	**Condition**
MeasObjectNR::= SEQUENCE {			
offsetMO SEQUENCE {			
rsrpOffsetSSB	6 dB		
}			

5.6.2.7.5 Test requirement

Table 5.6.2.7.5-1 defines the primary level settings including test tolerances for all tests.

Table 5.6.2.7.5-1: Cell specific test parameters for EN-DC inter-frequency event triggered reporting with SSB time index detection

Parameter	Unit	Test configuration	Cell 2		Cell 3	
			T1	T2	T1	T2
AoA setup		Config 1,2,3,4,5,6	NA		Setup 1	
Assumption for UE beams[Note 7]		Config 1,2,3,4,5,6	N/A		Rough	
NR RF Channel Number		Config 1,2,3,4,5,6	1		2	
Duplex mode		Config 1,4	FDD		TDD	

Parameter	Unit	Test configuration	Cell 2		Cell 3	
			T1	T2	T1	T2
		Config 2,3,5,6	TDD		TDD	
$BW_{channel}$	MHz	Config 1,4	10: $N_{RB,c}$ = 52		100: $N_{RB,c}$ = 66	
		Config 2,5	10: $N_{RB,c}$ = 52		100: $N_{RB,c}$ = 66	
		Config 3,6	40: $N_{RB,c}$ = 106		100: $N_{RB,c}$ = 66	
BWP BW	MHz	Config 1,4	10: $N_{RB,c}$ = 52		100: $N_{RB,c}$ = 66	
		Config 2,5	10: $N_{RB,c}$ = 52		100: $N_{RB,c}$ = 66	
		Config 3,6	40: $N_{RB,c}$ = 106		100: $N_{RB,c}$ = 66	
OCNG Patterns		Config 1,2,3,4,5,6	OP.1		OP.1	
PDSCH Reference measurement channel		Config 1,4	SR.1.1 FDD		-	
		Config 2,5	SR.1.1 TDD			
		Config 3,6	SR.2.1 TDD			
RMSI CORESET Reference Channel		Config 1,4	CR.1.1 FDD		-	
		Config 2,5	CR.1.1 TDD			
		Config 3,6	CR.2.1 TDD			
Dedicated CORESET RMC configuration		Config 1,4	CCR.1.1 FDD		CCR.3.1 TDD	
		Config 2,5	CCR.1.1 TDD		CCR.3.1 TDD	
		Config 3,6	CCR.2.1 TDD		CCR.3.1 TDD	
TDD configuration		Config 2,5	TDDConf.1.1		TDDConf.3.1	
		Config 3,6	TDDConf.2.1		TDDConf.3.1	
Initial DL BWP		Config 1,2,3,4,5,6	DLBWP.0.1		NA	
Initial UL BWP		Config 1,2,3,4,5,6	ULBWP.0.1		NA	
Dedicated DL BWP		Config 1,2,3,4,5,6	DLBWP.1.1		NA	
Dedicated UL BWP		Config 1,2,3,4,5,6	ULBWP.1.1		NA	
SMTC configuration		Config 1,4	SMTC.2		SMTC.2	
		Config 2,3,5,6	SMTC.1		SMTC.1	
PDSCH/PDCCH subcarrier spacing	kHz	Config 1,2,4,5	15		120	
		Config 3,6	30		120	
EPRE ratio of PSS to SSS		Config 1,2,3,4,5,6	0		0	
EPRE ratio of PBCH DMRS to SSS						
EPRE ratio of PBCH to PBCH DMRS						
EPRE ratio of PDCCH DMRS to SSS						
EPRE ratio of PDCCH to PDCCH DMRS						
EPRE ratio of PDSCH DMRS to SSS						
EPRE ratio of PDSCH to PDSCH						
EPRE ratio of OCNG DMRS to SSS(Note 1)						
EPRE ratio of OCNG to OCNG DMRS (Note 1)						
$\hat{E}_s$	dBm/SCS	Config 1,2,3,4,5,6	Link only, see clause A.3.7A		-Infinity	-87
SSB_RP Note 3	dBm/SCS Note5	Config 1,2,3,4,5,6			-Infinity	-87
$\hat{E}_s / I_{ot}$ BB Note 8	dB	Config 1,2,3,4,5,6			-Infinity	14.69
Io Note3	dBm/95.04 MHz Note5	Config 1,2,3,4,5,6			-Infinity	-58.01
Propagation Condition		Config 1,2,3,4,5,6			AWGN	

Parameter	Unit	Test configuration	Cell 2		Cell 3	
			T1	T2	T1	T2
NOTE 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols. NOTE 2: Void NOTE 3: SS-RP, Es/Iot and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves. NOTE 4: Void NOTE 5: Equivalent power received by an antenna with 0dBi gain at the centre of the quiet zone NOTE 6: As observed with 0dBi gain antenna at the centre of the quiet zone NOTE 7: Information about types of UE beam is given in B.2.1.3, and does not limit UE implementation or test system implementation NOTE 8: Calculation of Es/Iot_{BB} includes the effect of UE internal noise up to the value assumed for the associated Refsens requirement in clause 7.3.2 of TS 38.101-2 [19], and an allowance of 1dB for UE multi-band relaxation factor ΔMB_S from TS 38.101-2 [19] Table 6.2.1.3-4.						

In test 1 with per-UE gap and in test 2 with per-FR gap, the UE shall send one Event A4 triggered measurement report, with a measurement reporting delay less than X ms from the beginning of time period T2, where X is

6720 for UE supporting power class 1, or

4160 for UE supporting other power class.

In test 1 and 2 UE is required to report SSB time index. The UE shall not send event triggered measurement reports, as long as the reporting criteria are not fulfilled. The rate of correct events observed during repeated tests shall be at least 90% with a confidence level of 95%.

In test 1 and 2 UE is required to report SSB time index.

NOTE: The actual overall delays measured in the test may be up to $2xTTI_{DCCH}$ higher than the measurement reporting delays above because of TTI insertion uncertainty of the measurement report in DCCH.

TTI insertion uncertainty = TTIDCCH = 1 ms; 2xTTIDCCH = 2 ms

The overall delays measured shall be less than a total of 6722 ms in this test for power class UE and 4162 ms for other power classes.

5.6.2.8 EN-DC FR1-FR2 event-triggered reporting in DRX with SSB time index detection

Editor's Note: This test case has been completed for the following configurations:

- Test frequency f ≤ 40.8 GHz

- UE PC3

- The test is incomplete for UE power classes other than PC3

- The test is incomplete for test frequencies > 40.8 GHz

5.6.2.8.1 Test purpose

The purpose of this test is to verify that the UE makes correct reporting of an event in DRX within inter-frequency cell search requirements with SSB time index detection.

5.6.2.8.2 Test applicability

This test applies to all types of E-UTRA UE release 15 and forward, supporting EN-DC FR2 and long DRX cycle. Tests 1 and 2 are applicable to UEs not supporting per-FR gap (*IndependentGapConfig*, as defined in TS 38.306) and Tests 3 and 4 are applicable only to UEs supporting per-FR gap (*IndependentGapConfig*, as defined in TS 38.306) and Gap Pattern Id 13.

5.6.2.8.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 5.6.2.0.

The normative reference for this requirement is TS 38.133 [6] clause A.5.6.2.8.5.6.2.8.4 Test description

5.6.2.8.4.1 Initial conditions

This test shall be tested using any of the test configurations in Table 5.6.2.8.4.1-1. Configure the test equipment and the DUT according to the parameters in Table 5.6.2.8.4.1-2. Test environment parameters are given in Table 5.6.2.8.4.1-3.

Table 5.6.2.8.4.1-1: EN-DC FR1-FR2 event triggered reporting tests in DRX with SSB time index detection supported test configurations

Test Case ID	Description of serving cell	Description of target cell
5.6.2.8-1	LTE FDD, NR 15 kHz SSB SCS, 10MHz bandwidth, FDD duplex mode	120 kHz SSB SCS, 100MHz bandwidth, TDD duplex mode
5.6.2.8-2	LTE FDD, NR 15 kHz SSB SCS, 10MHz bandwidth, TDD duplex mode	
5.6.2.8-3	LTE FDD, NR 30kHz SSB SCS, 40MHz bandwidth, TDD duplex mode	
5.6.2.8-4	LTE TDD, NR 15 kHz SSB SCS, 10MHz bandwidth, FDD duplex mode	
5.6.2.8-5	LTE TDD, NR 15 kHz SSB SCS, 10MHz bandwidth, TDD duplex mode	
5.6.2.8-6	LTE TDD, NR 30kHz SSB SCS, 40MHz bandwidth, TDD duplex mode	
NOTE 1: The UE is only required to be tested in one of the supported test configurations NOTE 2: The target NR cell3 has the same SCS, BW and duplex mode as NR serving cell2		

Table A.5.6.2.8.4.1-2: General test parameters for EN-DC inter-frequency event triggered reporting with SSB time index detection in DRX

Parameter	Unit	Test configuration	Value				Comment
			Test 1	Test 2	Test 3	Test 4	
E-UTRA RF Channel Number		Config 1,2,3,4,5,6	1				One E-UTRAN TDD carrier frequencies is used.
NR RF Channel Number		Config 1,2,3,4,5,6	1, 2				One FR1 and one FR2 NR carrier frequency is used.
Active cell		Config 1,2,3,4,5,6	LTE Cell 1 (PCell) and NR cell 2 (PScell)				LTE Cell 1 is on E-UTRA RF channel number 1. NR Cell 2 is on NR RF channel number 1.
Neighbour cell		Config 1,2,3,4,5,6	NR cell 3				NR cell 3 is on NR RF channel number 2.
Gap Pattern Id		Config 1,2,3,4,5,6	0		13		As specified in TS 38.133 clause 9.1.2-1.
Measurement gap offset		Config 1,2,3,4,5,6	39		39		
SMTC-SSB parameters on NR RF Channel 1		Config 1,4	SSB.1 FR1				As specified in clause A.3
		Config 2,5	SSB.1 FR1				As specified in clause A.3
		Config 3,6	SSB.2 FR1				As specified in clause A.3
SMTC-SSB parameters on NR RF Channel 2		Config 1,2,3,4,5,6	SSB.3 FR2				As specified in clause A.3
offsetMO	dB	Config 1,2,3,4,5,6	6				
Hysteresis	dB	Config 1,2,3,4,5,6	0				
a4-Threshold	dBm	Config 1,2,3,4,5,6	-105				
CP length		Config 1,2,3,4,5,6	Normal				
TimeToTrigger	s	Config 1,2,3,4,5,6	0				
Filter coefficient		Config 1,2,3,4,5,6	0				L3 filtering is not used
DRX		Config 1,2,3,4,5,6	DRX.1	DRX.2	DRX.1	DRX.2	As specified in clause A.5
Time offset between PCell and PSCell		Config 1,2,3,4,5,6	3 µs				Synchronous EN-DC
Time offset between serving and neighbour cells		Config 1,4	3ms				Asynchronous cells. The timing of Cell 3 is 3ms later than the timing of Cell 2.
		Config 2,3,5,6	3µs				Synchronous cells.

Parameter	Unit	Test configuration	Value				Comment
			Test 1	Test 2	Test 3	Test 4	
T1	s	Config 1,2,3,4,5,6	5				
T2	s	Config 1,2,3,4,5,6	11 for PC1; 6.5 for other PC	108 for PC1; 67 for other PC	11 for PC1; 6.5 for other PC	108 for PC1; 67 for other PC	PC1 - power class 1 as specified in TS 38.101-2 [3] Table 6.2.1.0

Table 5.6.2.8.4-3: Test Environment test parameters for EN-DC inter-frequency event triggered reporting with SSB time index detection in DRX

Parameter	Value		Comment
Test environment	NC		As specified in TS 38.508-1 [14] clause 4.1.
Test frequencies	As specified in Annex E, Table TBD and TS 38.508-1 [14] clause 4.3.1 for E-UTRA and NR FR1, 7.2.3 for NR FR2		
Channel bandwidth	As specified by the test configuration selected from Table 4.6.2.3.4.1-1.		
Propagation conditions	AWGN		As specified in clause C.2.2.
Connection Diagram	TE Part	A.3.3.3.1	As specified in TS 38.508-1 [14] Annex A.
	DUT Part	A.3.4.1.1	
Exceptions to connection diagram			

1. Message contents are defined in clause 5.6.2.8.4.3.
2. Cell 1 is the E-UTRA serving cell (PCell) for the EN-DC setup. The power levels and settings for Cell 1 are set according to Annex A.6. Cell 2 and Cell 3 are NR FR2 cells in different frequencies. Cell 2 is the PSCell and Cell 3 is the target cell. The power levels and settings for Cell 2 and Cell 3 are set according to Annex TBD.
3. If a UE supports per-FR gap and gap pattern configuration #13, it is only required to pass test 3&4. Otherwise it is only required to pass test 1&2.
4. The UE Rx beam peak direction for Cell 3 has been obtained previously using one of the Rx beam peak search procedures as described in Annex I.

5.6.2.8.4.2 Test procedure

In this test, there are three cells: LTE cell 1 as PCell on E-UTRA RF channel 1, NR cell 2 as PSCell in FR1 on NR RF channel 1 and NR cell 3 as neighbour cell in FR2 on NR RF channel 2.

In test 1&2 measurement gap pattern configuration # 0 as defined in Table 5.6.2.8.4.1-2 is provided for a UE that does not support per-FR gap and in test 3&4 measurement gap pattern configuration #13 as defined in Table 5.6.2.8.4.1-2 is provided for UE that support per-FR gap.

In the measurement control information, it is indicated to the UE that event-triggered reporting with Event A4 is used. The test consists of two successive time periods, with time duration of T1, and T2 respectively. During time duration T1, the UE shall not have any timing information of NR cell 3.

1. Ensure the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity EN-DC, DC bearer MCG and SCG, Connected without release *On* according to TS 38.508-1 [14] clause 4.5.
2. Set the parameters according to T1 in Table 5.6.2.8.4-2 The TE shall ensure that the NR FR2 cell will be received by the UE from the Rx beam peak direction.. T1 starts,
3. The SS shall transmit an RRCConnectionReconfiguration message on Cell 1.
4. The UE shall transmit RRCConnectionReconfigurationComplete message.
5. When T1 expires, the SS shall switch the power setting from T1 to T2 as specified in Table 5.6.2.8.4.1-2.

6. UE shall transmit a MeasurementReport message triggered by Event A4 embedded in E-UTRA RRC message *ULInformationTransferMRDC*. If the overall delay measured from the beginning of time period T2 is less than 10082 ms for UE supporting power class 1, or 6242 ms for UE supporting other power class for Test 1 and Test 3 and 107522 ms for UE supporting power class 1, or 66562 ms for UE supporting other power class for Test 2 and Test 4, then the number of successful tests is increased by one. If the UE fails to report the event within the overall delays measured requirement then the number of failure tests is increased by one.

7. After the SS receives the MeasurementReport message in step 6 or when T2 expires, the SS shall transmit RRCConnectionRelease message to release the RRC connection which includes the release of the established radio bearers as well as all radio resources.

8. Set Cell 3 physical cell identity = [(current cell 2 physical cell identity + 1) mod 1008] for next iteration of the test procedure loop.]

9. After the RRC connection release, the SS:

   - transmits in Cell 1 a Paging message (including PagingRecord with ue-Identity) for the UE and ensures the UE in state RRC_CONNECTED with generic procedure parameters Connectivity EN-DC, DC bearer MCG and SCG, Connected without release *On* according to TS 38.508-1 [14] clause 4.5. (if the paging fails, switches off and on the UE and ensures the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity EN-DC, DC bearer MCG and SCG, Connected without release *On* according to TS 38.508-1 [14] clause 4.5.),
   or:
   - switches off and on the UE and ensures the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity EN-DC, DC bearer MCG and SCG, Connected without release *On* according to TS 38.508-1 [14] clause 4.5.

10. Repeat step 2-9 until the confidence level according to Tables G.2.3-1 in Annex G clause G.2 is achieved.

11. Repeat step 1-10 for each sub-test in Table 5.6.2.8.4.1-2 as appropriate.

5.6.2.8.4.3 Message contents

Message contents are according to TS 38.508-1 [14] clause 7.3 with the following exceptions:

Table 5.6.2.8.4.3-1: Common Exception messages for Additional EN-DC FR1-FR2 event triggered reporting tests with SSB time index detection in DRX test requirement

Default Message Contents	
Common contents of system information blocks exceptions	
Default RRC messages and information elements contents exceptions	Table H.3.1-1 Table H.3.1-2 with condition INTER-FREQ. For Test 3 and 4, additionally with condition GAP NEEDED Table H.3.1-3 with conditions INTER-FREQ MO and Synchronous cells Table H.3.1-4AA with condition SSB Index and A4-threshold = -105 Table H.3.1-6 with conditions gapFR2 and Pattern #13 for Test 3 and Test 4 Table H.3.4-4 with condition gapUE for Test 1 and Test 2 Table H.3.4-5 with condition Pattern #0 for Test 1 and Test 2 Table H.3.1-7 with condition SSB Index and INTER-FREQ Table H.3.7-1 with condition DRX.1 for Test 1 and Test 3 Table H.3.7-1 with condition DRX.2 for Test 2 and Test 4 Table H.3.4-1 Table H.3.4-2 Table H.3.4-3

Table 5.6.2.5.8.3-2: MeasObjectNR-DEFAULT: EN-DC FR1-FR2 measurement object configuration

Derivation Path: Table H.3.1-3			
Information Element	**Value/remark**	**Comment**	**Condition**
MeasObjectNR::= SEQUENCE {			
offsetMO SEQUENCE {			
rsrpOffsetSSB	6 dB		
}			

5.6.2.8.5 Test requirement

Table 5.6.2.8.5-1 defines the primary level settings including test tolerances for all tests.

Table 5.6.2.8.5-1: Cell specific test parameters for EN-DC inter-frequency event triggered reporting with SSB time index detection in DRX

Parameter	Unit	Test configuration	Cell 2		Cell 3	
			T1	T2	T1	T2
AoA setup		Config 1,2,3,4,5,6	NA		Setup 1 as specified in clause A.9	
Assumption for UE beams[Note 7]		Config 1,2,3,4,5,6	N/A		Rough	
NR RF Channel Number		Config 1,2,3,4,5,6	1		2	
Duplex mode		Config 1,4	FDD		TDD	
		Config 2,3,5,6	TDD		TDD	
$BW_{channel}$	MHz	Config 1,4	10: $N_{RB,c}$ = 52		100: $N_{RB,c}$ = 66	
		Config 2,5	10: $N_{RB,c}$ = 52		100: $N_{RB,c}$ = 66	
		Config 3,6	40: $N_{RB,c}$ = 106		100: $N_{RB,c}$ = 66	
BWP BW	MHz	Config 1,4	10: $N_{RB,c}$ = 52		100: $N_{RB,c}$ = 66	
		Config 2,5	10: $N_{RB,c}$ = 52		100: $N_{RB,c}$ = 66	
		Config 3,6	40: $N_{RB,c}$ = 106		100: $N_{RB,c}$ = 66	
OCNG Patterns		Config 1,2,3,4,5,6	OP.1		OP.1	
PDSCH Reference measurement channel		Config 1,4	SR.1.1 FDD		-	
		Config 2,5	SR.1.1 TDD			
		Config 3,6	SR2.1 TDD			
RMSI CORESET Reference Channel		Config 1,4	CR.1.1 FDD		-	
		Config 2,5	CR.1.1 TDD			
		Config 3,6	CR2.1 TDD			
Dedicated CORESET RMC configuration		Config 1,4	CCR.1.1 FDD		CCR.3.1 TDD	
		Config 2,5	CCR.1.1 TDD		CCR.3.1 TDD	
		Config 3,6	CCR.2.1 TDD		CCR.3.1 TDD	
TDD configuration		Config 2,5	TDDConf.1.1		TDDConf.3.1	
		Config 3,6	TDDConf.2.1		TDDConf.3.1	
Initial DL BWP		Config 1,2,3,4,5,6	DLBWP.0.1		NA	
Initial UL BWP		Config 1,2,3,4,5,6	ULBWP.0.1		NA	
Dedicated DL BWP		Config 1,2,3,4,5,6	DLBWP.1.1		NA	
Dedicated UL BWP		Config 1,2,3,4,5,6	ULBWP.1.1		NA	
SMTC configuration		Config 1,4	SMTC.2		SMTC.2	
		Config 2,3,5,6	SMTC.1		SMTC.1	
PDSCH/PDCCH subcarrier spacing	kHz	Config 1,2,4,5	15		120	
		Config 3,6	30		120	
EPRE ratio of PSS to SSS		Config 1,2,3,4,5,6	0		0	
EPRE ratio of PBCH DMRS to SSS						
EPRE ratio of PBCH to PBCH DMRS						
EPRE ratio of PDCCH DMRS to SSS						
EPRE ratio of PDCCH to PDCCH DMRS						
EPRE ratio of PDSCH DMRS to SSS						
EPRE ratio of PDSCH to PDSCH						
EPRE ratio of OCNG DMRS to SSS(Note 1)						

Parameter	Unit	Test configuration	Cell 2		Cell 3	
			T1	T2	T1	T2
EPRE ratio of OCNG to OCNG DMRS (Note 1)						
N_{oc} Note2	dBm/15 kHz Note5		NA Link only, see clause A.3.7A		-104.7	
N_{oc} Note2	dBm/SCS Note4	Config 1,2,4,5			-95.7	
		Config 3,6			-95.7	
SSB_RP Note 3	dBm/SCS Note5	Config 1,2,4,5			-Infinity	-86.7
		Config 3,6			-Infinity	-86.7
$\hat{E}_s/I_{ot}$	dB	Config 1,2,3,4,5,6			-Infinity	9
$\hat{E}_s/N_{oc}$	dB	Config 1,2,3,4,5,6			-Infinity	9
Io Note3	dBm/9.36MHz	Config 1,2,4,5			-	-
	dBm/38.16MHz	Config 3,6			-	-
	dBm/95.04 MHz Note5	Config 1,2,3,4,5,6			-66.7	-57.2
Propagation Condition		Config 1,2,3,4,5,6			AWGN	

NOTE 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.
NOTE 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for N_{oc} to be fulfilled.
NOTE 3: SSB_RP and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.
NOTE 4: SSB_RP minimum requirements are specified assuming independent interference and noise at each receiver antenna port.
NOTE 5: Equivalent power received by an antenna with 0dBi gain at the centre of the quiet zone
NOTE 6: As observed with 0dBi gain antenna at the centre of the quiet zone
NOTE 7: Information about types of UE beam is given in B.2.1.3, and does not limit UE implementation or test system implementation

In test 1 with per-UE gap and in test 3 with per-FR gap, the UE shall send one Event A4 triggered measurement report, with a measurement reporting delay less than X1 ms from the beginning of time period T2, where X1 is

10080 for UE supporting power class 1, or

6240 for UE supporting other power class.

In test 2 with per-UE gap and in test 4 with per-FR gap, the UE shall send one Event A4 triggered measurement report, with a measurement reporting delay less than X2 ms from the beginning of time period T2, where X2 is

107520 for UE supporting power class 1, or

66560 for UE supporting other power class.

In test 1, 2, 3 and 4 UE is required to report SSB time index. The UE shall not send event triggered measurement reports, as long as the reporting criteria are not fulfilled. The rate of correct events observed during repeated tests shall be at least 90% with a confidence level of 95%.

In test 1, 2, 3 and 4 UE is required to report SSB time index.

NOTE: The actual overall delays measured in the test may be up to $2xTTI_{DCCH}$ higher than the measurement reporting delays above because of TTI insertion uncertainty of the measurement report in DCCH.

TTI insertion uncertainty = TTIDCCH = 1 ms; 2xTTIDCCH = 2 ms

The overall delays measured shall be less than a total of 10082 ms for power class 1 UE and 6242 ms for other power classes in test 1 and test 3 and 107522 for power class 1 UE and 66562 ms for other power classes in test 2 and test 4.

5.6.3 L1-RSRP measurement for beam reporting

5.6.3.0 Minimum conformance requirements

5.6.3.0.1 Minimum conformance requirements for SSB-based L1-RSRP measurement for beam reporting

The UE shall be capable of performing L1-RSRP measurements based on the configured SSB resource for L1-RSRP computation, and the UE physical layer shall be capable of reporting L1-RSRP measured over the measurement period of $T_{L1\text{-}RSRP_Measurement_Period_SSB}$.

The value of $T_{L1\text{-}RSRP_Measurement_Period_SSB}$ is defined in Table 9.5.4.1-2 for FR2, where

- M=1 if higher layer parameter *timeRestrictionForChannelMeasurement* is configured, and M=3 otherwise
- N= 8.

For FR2,

- $P=\frac{1}{1-\frac{T_{SSB}}{T_{SMTCperiod}}}$, when SSB is not overlapped with measurement gap and SSB is partially overlapped with SMTC occasion ($T_{SSB} < T_{SMTCperiod}$).
- P is $P_{sharing\ factor}$, when SSB is not overlapped with measurement gap and SSB is fully overlapped with SMTC period ($T_{SSB} = T_{SMTCperiod}$).
- $P=\frac{1}{1-\frac{T_{SSB}}{MRGP}-\frac{T_{SSB}}{T_{SMTCperiod}}}$, when SSB is partially overlapped with measurement gap and SSB is partially overlapped with SMTC occasion ($T_{SSB} < T_{SMTCperiod}$) and SMTC occasion is not overlapped with measurement gap and
  - $T_{SMTCperiod} \neq$ MGRP or
  - $T_{SMTCperiod}$ = MGRP and $T_{SSB} < 0.5*T_{SMTCperiod}$
- P is $\frac{P_{sharing\ factor}}{1-\frac{T_{SSB}}{MRGP}}$, when SSB is partially overlapped with measurement gap and SSB is partially overlapped with SMTC occasion ($T_{SSB} < T_{SMTCperiod}$) and SMTC occasion is not overlapped with measurement gap and $T_{SMTCperiod}$ = MGRP and $T_{SSB} = 0.5*T_{SMTCperiod}$
- $P=\frac{1}{1-\frac{T_{SSB}}{\min(T_{SMTCperiod},MGRP)}}$, when SSB is partially overlapped with measurement gap (T_{SSB} <MGRP) and SSB is partially overlapped with SMTC occasion ($T_{SSB} < T_{SMTCperiod}$) and SMTC occasion is partially or fully overlapped with measurement gap.
- P is $\frac{P_{sharing\ factor}}{1-\frac{T_{SSB}}{MRGP}}$, when SSB is partially overlapped with measurement gap and SSB is fully overlapped with SMTC occasion ($T_{SSB} = T_{SMTCperiod}$) and SMTC occasion is partially overlapped with measurement gap ($T_{SMTCperiod}$ < MGRP)
- $P_{sharing\ factor}$ = 1, if the SSB configured for L1-RSRP measurement outside measurement gap is
  - not overlapped with the SSB symbols indicated by *SSB-ToMeasure* and 1 data symbol before each consecutive SSB symbols indicated by *SSB-ToMeasure* and 1 data symbol after each consecutive SSB symbols indicated by *SSB-ToMeasure*, given that *SSB-ToMeasure* is configured, and,
  - not overlapped with the RSSI symbols indicated by *ss-RSSI-Measurement* and 1data symbol before each RSSI symbol indicated by *ss-RSSI-Measurement* and 1 data symbol after each RSSI symbol indicated by *ss-RSSI-Measurement*, given that *ss-RSSI-Measurement* is configured,
- $P_{sharing\ factor}$ = 3, otherwise.

Where:

- T_{SSB} = ssb-periodicityServingCell
- $T_{SMTCperiod}$ = the configured SMTC period

If the high layer in TS 38.331 [2] signalling of *smtc2* is configured, $T_{SMTCperiod}$ corresponds to the value of higher layer parameter *smtc2*; Otherwise $T_{SMTCperiod}$ corresponds to the value of higher layer parameter *smtc1*. $T_{SMTCperiod}$ is the shortest SMTC period among all CCs in the same FR2 band, provided the SMTC offset of all CCs in FR2 have the same offset.

Longer evaluation period would be expected if the combination of SSB, SMTC occasion and measurement gap configurations does not meet pervious conditions.

Table 9.5.4.1-1: Measurement period $T_{L1\text{-}RSRP_Measurement_Period_SSB}$ for FR1

Configuration	$T_{L1\text{-}RSRP_Measurement_Period_SSB}$ (ms)
non-DRX	$\max(T_{Report}, \text{ceil}(M*P)*T_{SSB})$
DRX cycle ≤ 320ms	$\max(T_{Report}, \text{ceil}(1.5\ K\ *M*P)*\max(T_{DRX},T_{SSB}))$
DRX cycle > 320ms	$\text{ceil}(M*P)*T_{DRX}$
NOTE 1: T_{SSB} = ssb-periodicityServingCell is the periodicity of the SSB-Index configured for L1-RSRP measurement. T_{DRX} is the DRX cycle length. T_{Report} is configured periodicity for reporting. NOTE 2: K = 1 when T_{SSB} ≤ 40 ms and RRM enhancements for high speed are configured; otherwise K = 1.5.	

Table 9.5.4.1-2: Measurement period $T_{L1\text{-}RSRP_Measurement_Period_SSB}$ for FR2

Configuration	$T_{L1\text{-}RSRP_Measurement_Period_SSB}$ (ms)
non-DRX	$\max(T_{Report}, \text{ceil}(M*P*N)*T_{SSB})$
DRX cycle ≤ 320ms	$\max(T_{Report}, \text{ceil}(1.5*M*P*N)*\max(T_{DRX},T_{SSB}))$
DRX cycle > 320ms	$\text{ceil}(1.5*M*P*N)*T_{DRX}$
NOTE: T_{SSB} = ssb-periodicityServingCell is the periodicity of the SSB-Index configured for L1-RSRP measurement. T_{DRX} is the DRX cycle length. T_{Report} is configured periodicity for reporting.	

The normative reference for this requirement is TS 38.133 [6] clause 9.5.3.1, 9.5.4.1 and 9.5.5.1.

5.6.3.0.2 Minimum conformance requirements for CSI-RS-based L1-RSRP measurement for beam reporting

The UE shall be capable of performing L1-RSRP measurements based on the configured CSI-RS resource for L1-RSRP computation, and the UE physical layer shall be capable of reporting L1-RSRP measured over the measurement period of $T_{L1\text{-}RSRP_Measurement_Period_CSI\text{-}RS}$.

The value of $T_{L1\text{-}RSRP_Measurement_Period_CSI\text{-}RS}$ is defined in Table 9.5.4.2-2 for FR2, where

- For periodic and semi-persistent CSI-RS resources, M=1 if higher layer parameter *timeRestrictionForChannelMeasurement* is configured, and M=3 otherwise
- For aperiodic CSI-RS resources M=1
- For periodic CSI-RS resources in a resource set configured with higher layer parameter *repetition* set to OFF, N=1. The requirements apply if *qcl-InfoPeriodicCSI-RS* is configured for all the resources in the resource set and for each resource one RS has QCL-TypeD with
  - SSB for L1-RSRP measurement, or
  - another CSI-RS in resource set configured with repetition ON.
- For periodic CSI-RS resources in a resource set configured with higher layer parameter *repetition* set to ON, N=ceil(*maxNumberRxBeam* / $N_{res_per_set}$), where $N_{res_per_set}$ is number of resources in the resource set. The requirements apply provided *qcl-InfoPeriodicCSI-RS* is configured with QCL-TypeD for all resources in the resource set.

- For semi-persistent CSI-RS resources in a resource set configured with higher layer parameter *repetition* set to OFF, N=1. The requirements apply provided TCI state is provided for all resources in the resource set in the MAC CE activating the resource set and for each resource one RS has QCL-TypeD with
  - SSB for L1-RSRP measurement, or
  - another CSI-RS in resource set configured with repetition ON.
- For semi-persistent CSI-RS resources in a resource set configured with higher layer parameter *repetition* set to ON, N=ceil(*maxNumberRxBeam* / $N_{res_per_set}$), where $N_{res_per_set}$ is number of resources in the resource set. The requirements apply provided TCI state is provided with QCL-TypeD for all resources in the resource set in the MAC CE activating the resource set.
- For aperiodic CSI-RS resources in a resource set configured with higher layer parameter *repetition* set to OFF, N=1. The requirements apply provided *qcl-info* is configured for all resources in the resource set and for each resource one RS has QCL-TypeD with
  - SSB for L1-RSRP measurement, or
  - another CSI-RS in resource set configured with repetition ON.
- For aperiodic CSI-RS resources in a resource set configured with higher layer parameter *repetition* set to ON, N=1. UE is not required to meet the accuracy requirements in clause 10.1.19.2 and 10.1.20.2 if number of resources in the resource set is smaller than *maxNumberRxBeam*. The requirements apply provided *qcl-info* is configured with QCL-TypeD for all resources in the resource set.

For FR2,

- P=1, when CSI-RS is not overlapped with measurement gap and also not overlapped with SMTC occasion.
- $P=\frac{1}{1-\frac{T_{CSI-RS}}{MRGP}}$, when CSI-RS is partially overlapped with measurement gap and CSI-RS is not overlapped with SMTC occasion ($T_{CSI-RS} < MGRP$)
- $P=\frac{1}{1-\frac{T_{CSI-RS}}{T_{SMTCperiod}}}$, when CSI-RS is not overlapped with measurement gap and CSI-RS is partially overlapped with SMTC occasion ($T_{CSI-RS} < T_{SMTCperiod}$).
- $P=P_{sharing\ factor}$, when CSI-RS is not overlapped with measurement gap and CSI-RS is fully overlapped with SMTC occasion ($T_{CSI-RS} = T_{SMTCperiod}$).
- $P=\frac{1}{1-\frac{T_{CSI-RS}}{MRGP}-\frac{T_{CSI-RS}}{T_{SMTCperiod}}}$, when CSI-RS is partially overlapped with measurement gap and CSI-RS is partially overlapped with SMTC occasion (TCSI-RS < $T_{SMTCperiod}$) and SMTC occasion is not overlapped with measurement gap and
  - $T_{SMTCperiod} \neq MGRP$ or
  - $T_{SMTCperiod} = MGRP$ and $T_{CSI-RS} < 0.5*T_{SMTCperiod}$
- $P=\frac{3}{1-\frac{T_{CSI-RS}}{MRGP}}$, when CSI-RS is partially overlapped with measurement gap and CSI-RS is partially overlapped with SMTC occasion ($T_{CSI-RS} < T_{SMTCperiod}$) and SMTC occasion is not overlapped with measurement gap and $T_{SMTCperiod} = MGRP$ and $T_{CSI-RS} = 0.5*T_{SMTCperiod}$
- $P=\frac{1}{1-\frac{T_{CSI-RS}}{\min(T_{SMTCperiod},MGRP)}}$, when CSI-RS is partially overlapped with measurement gap ($T_{CSI-RS} < MGRP$) and CSI-RS is partially overlapped with SMTC occasion ($T_{CSI-RS} < T_{SMTCperiod}$) and SMTC occasion is partially or fully overlapped with measurement gap.
- $P=\frac{P_{sharing\ factor}}{1-\frac{T_{CSI-RS}}{MRGP}}$, when CSI-RS is partially overlapped with measurement gap and CSI-RS is fully overlapped with SMTC occasion ($T_{CSI-RS} = T_{SMTCperiod}$) and SMTC occasion is partially overlapped with measurement gap ($T_{SMTCperiod} < MGRP$)

- $P_{sharing\ factor}$ = 1, if the CSI-RS configured for L1-RSRP measurement outside measurement gap is
  - not overlapped with the SSB symbols indicated by *SSB-ToMeasure* and 1 data symbol before each consecutive SSB symbols indicated by *SSB-ToMeasure* and 1 data symbol after each consecutive SSB symbols indicated by *SSB-ToMeasure*, given that *SSB-ToMeasure* is configured, and,
  - not overlapped with the RSSI symbols indicated by *ss-RSSI-Measurement* and 1data symbol before each RSSI symbol indicated by *ss-RSSI-Measurement* and 1 data symbol after each RSSI symbol indicated by *ss-RSSI-Measurement*, given that *ss-RSSI-Measurement* is configured
- $P_{sharing\ factor}$ = 3, otherwise.

Where:

$T_{SMTCperiod}$ = the configured SMTC period.

T_{CSI-RS} = the periodicity of CSI-RS configured for L1-RSRP measurement

If the high layer in TS 38.331 [2] signaling of *smtc2* is configured, $T_{SMTCperiod}$ corresponds to the value of higher layer parameter *smtc2*; Otherwise $T_{SMTCperiod}$ corresponds to the value of higher layer parameter *smtc1*. $T_{SMTCperiod}$ is the shortest SMTC period among all CCs in the same FR2 band, provided the SMTC offset of all CCs in FR2 have the same offset.

NOTE: The overlap between CSI-RS for L1-RSRP measurement and SMTC means that CSI-RS for L1-RSRP measurement is within the SMTC window duration.

Longer evaluation period would be expected if the combination of CSI-RS, SMTC occasion and measurement gap configurations does not meet pervious conditions.

Table 9.5.4.2-2: Measurement period $T_{L1\text{-}RSRP_Measurement_Period_CSI\text{-}RS}$ for FR2

Configuration	$T_{L1\text{-}RSRP_Measurement_Period_CSI\text{-}RS}$ (ms)
non-DRX	max(T_{Report}, ceil(M*P*N)*$T_{CSI\text{-}RS}$)
DRX cycle ≤ 320ms	max(T_{Report}, ceil(1.5*M*P*N)*max(T_{DRX},$T_{CSI\text{-}RS}$))
DRX cycle > 320ms	ceil(M*P*N)*T_{DRX}
NOTE 1: $T_{CSI\text{-}RS}$ is the periodicity of CSI-RS configured for L1-RSRP measurement. T_{DRX} is the DRX cycle length. T_{Report} is configured periodicity for reporting. NOTE 2: the requirements are applicable provided that the CSI-RS resource configured for L1-RSRP measurement is transmitted with Density = 3.	

Reported L1-RSRP measurements contained in aperiodic triggered, aperiodic triggered periodic and aperiodic triggered semi-persistent L1-RSRP reports shall meet the requirements in clauses 10.1.19 for FR1 and 10.1.20 for FR2, respectively.

The UE shall only send aperiodic L1-RSRP measurement reports, if a DCI trigger has been received.

After the UE receives CSI request in DCI, the UE shall transmit the aperiodic L1-RSRP reporting on PUSCH over the air interface at the time specified according to clause 6.2.1.2 in TS 38.214 [26].

For both FR1 and FR2, when the CSI-RS for L1-RSRP measurement is in the same OFDM symbol as SSB for RLM/BFD/CBD/L1-RSRP measurement, UE is not required to receive CSI-RS for L1-RSRP measurement in the PRBs that overlap with an SSB.

For FR2, when the CSI-RS for L1-RSRP measurement is in the same OFDM symbol as SSB for RLM/BFD/L1-RSRP measurement, or in the same symbol as SSB for CBD when beam failure is detected, UE is required to measure one of but not both CSI-RS for L1-RSRP measurement and SSB. Longer measurement period for CSI-RS based L1-RSRP measurement is expected, and no requirements are defined.

For FR2, when the CSI-RS for L1-RSRP measurement is in the same OFDM symbol as another CSI-RS for RLM/BFD/CBD/L1-RSRP measurement,

- In the following cases, UE is required to measure one of but not both CSI-RS for L1-RSRP measurement and the other CSI-RS. Longer measurement period for CSI-RS based L1-RSRP measurement is expected, and no requirements are defined.
  - The CSI-RS for L1-RSRP measurement or the other CSI-RS in a resource set configured with repetition ON, or
  - The other CSI-RS is configured in q1 and beam failure is detected, or
  - The two CSI-RS-es are not QCL-ed w.r.t. QCL-TypeD, or the QCL information is not known to UE,
- Otherwise, UE shall be able to measure the CSI-RS for L1-RSRP measurement without any restriction.

The normative reference for this requirement is TS 38.133 [6] clauses 9.5.3.1, 9.5.4.2 and 9.5.5.2.

5.6.3.1 EN-DC FR2 SSB-based L1-RSRP measurement in non-DRX

Editor's Note: This test case has been completed for the following configurations:

- Test frequency f ≤ 40.8 GHz
- UE PC3
- Normal conditions
- The test is incomplete for UE power classes other than PC3
- The test is incomplete for test frequencies > 40.8 GHz
- The test case is incomplete for extreme conditions

5.6.3.1.1 Test purpose

To verify that the UE makes correct reporting of L1-RSRP measurement in non-DRX within L1-RSRP measurement requirements in TS 38.133 [6] clause 9.5.4.1.

5.6.3.1.2 Test applicability

This test applies to all types of E-UTRA UE release 15 and forward, supporting EN-DC.

5.6.3.1.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 5.6.3.0.1.

The normative reference for this requirement is TS 38.133 [6] clause A.5.6.3.1.

5.6.3.1.4 Test description

5.6.3.1.4.1 Initial conditions

This test shall be tested using any of the test configurations in Table 5.6.3.1.4.1-1. Configure the test equipment and the DUT according to the parameters in Table 5.6.3.1.4.1-2. Test environment parameters are given in Table 5.6.3.1.4.1-3.

Table 5.6.3.1.4.1-1: EN-DC SSB based L1-RSRP measurement supported test configurations

Config	Description
1	LTE FDD, NR 120 kHz SSB SCS, 100 MHz bandwidth, TDD duplex mode
2	LTE TDD, NR 120 kHz SSB SCS, 100 MHz bandwidth, TDD duplex mode
3	LTE FDD, NR 240 kHz SSB SCS, 100 MHz bandwidth, TDD duplex mode
4	LTE TDD, NR 240 kHz SSB SCS, 100 MHz bandwidth, TDD duplex mode
NOTE: The UE is only required to be tested in one of the supported test configurations	

Table 5.6.3.1.4.1-2: General test parameters for EN-DC SSB based L1-RSRP measurement

Parameter	Config	Unit	Value
SSB GSCN	1~4		freq1
Duplex mode	1~4		TDD
TDD Configuration	1~4		TDDConf.3.1
$BW_{channel}$	1~4	MHz	100: $N_{RB,c}$ = 66
Data RBs allocated	1~4		66
PDSCH Reference measurement channel	1,2		SR.3.2 TDD
	3,4		SR.3.3 TDD
RMSI CORESET Reference Channel	1,2		CR.3.1 TDD
	3,4		CR.3.2 TDD
Dedicated CORESET Reference Channel	1,2		CCR.3.1 TDD
	3,4		CCR.3.7 TDD
SSB configuration	1,2		SSB.1 FR2
	3,4		SSB.2 FR2
OCNG Patterns	1~4		OP.1
Initial BWP Configuration	1~4		DLBWP.0.1 ULBWP.0.1
Dedicated BWP configuration	1~4		DLBWP.1.3 ULBWP.1.3
SMTC configuration	1~4		SMTC.1
TRS Configuration	1~4		TRS.2.1 TDD
PDCCH/PDSCH TCI Configuration	1~4		TCI.State.2
DRX configuration	1~4		Off
reportConfigType	1~4		periodic
reportQuantity	1~4		ssb-Index-RSRP
Number of reported RS	1~4		2
L1-RSRP reporting period	1~4	slot	320
T1	1~4	s	5
T2	1~4	s	2
EPRE ratio of PSS to SSS	1~4	dB	0
EPRE ratio of PBCH DMRS to SSS			
EPRE ratio of PBCH to PBCH DMRS			
EPRE ratio of PDCCH DMRS to SSS			
EPRE ratio of PDCCH to PDCCH DMRS			
EPRE ratio of PDSCH DMRS to SSS			
EPRE ratio of PDSCH to PDSCH DMRS			
EPRE ratio of OCNG DMRS to SSS Note 1			
EPRE ratio of OCNG to OCNG DMRS Note 1			
Propagation condition	1~4		AWGN
NOTE 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.			

Table 5.6.3.1.4.1-3: Test Environment parameters for EN-DC SSB based L1-RSRP measurement

Parameter	Value		Comment
Test environment	NC		As specified in TS 38.508-1 [14] clause 4.1.
Test frequencies	As specified in Annex E, Table E.2-1 and TS 38.508-1 [14] clause 4.3.1 for E-UTRA, 7.2.3 for NR FR2.		
Channel bandwidth	As specified by the test configuration selected from Table 5.6.3.1.4.1-1.		
Propagation conditions	AWGN		As specified in clause C.2.2.
Connection Diagram	TE Part	A.3.3.3.1-1	As specified in TS 38.508-1 [14] Annex A.
	DUT Part	A.3.4.1.1	
Exceptions to connection diagram	N/A		

1. Message contents are defined in clause 5.6.3.1.4.3.

2. The AoA setup for this test is Setup 1 as defined in clause A.9. The UE RX Beam Peak direction has been obtained previously using one of the search procedures as described in Annex I.

5.6.3.1.4.2 Test procedure

Prior to the start of the time duration T1, the UE shall be fully synchronized to PSCell. The UE shall be configured for periodic CSI reporting in PUCCH [format 2] with a reporting periodicity as mentioned in the above table 5.6.3.1.4.1-2. Before the test, UE is configured to perform RLM, BFD and L1-RSRP measurement based on the SSBs.

1. Ensure the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity EN-DC, DC bearer MCG and SCG, Connected without release *On* and Test Mode *On*, according to TS 38.508-1 [14] clause 4.5 and general test parameters set according to Table 5.6.3.1.4.1-2. SSB#1 shall be muted during this step.

2. Set the parameters according to T1 in Table 5.6.3.1.5-1.

3. T1 starts. The UE shall be transmitting CSI on PUCCH with a periodicity of 320 slots.

4. When T1 expires, the SS shall set the parameters according to T2 in 5.6.3.1.5-1. T2 starts.

5. The UE shall start sending valid L1-RSRP reports. The SS shall check the following requirements:

   - R1: the UE shall start to transmit valid L1-RSRP reports no later than 1760ms for UE supporting power class 1 in configuration 1 and 2, no later than 1720 ms for UE supporting power class 1 in configuration 3 and 4 , no later than 1280 ms for UE supporting power class other than 1 in configuration 1 and 2, no later than 1240 ms for UE supporting power class other than 1 in configuration 3 and 4 from the beginning of time period T2. A valid report shall meet the absolute L1-RSRP requirement for SSB#1 Table 5.6.3.1.5-2 for test configurations 1 and 2 and the corresponding absolute accuracy requirements in Table 5.6.3.1.5-3 for test configurations 3 and 4. If the first valid report is received before the specified time, the number of passed iterations for R1 is increased by one. Otherwise, the number of failed iterations for R1 is increased by one.

   - R2: the UE shall transmit L1-RSRP reports every 320 slots. If the reports are received accordingly, the number of passed iterations for R2 is increased by one. Otherwise, the number of failed iterations for R2 is increased by one.

   -R3: The L1-RSRP value of SSB#1 reported by the UE is compared to the expected L1-RSRP value for SSB#1. In all consecutive reports after the first valid value is received, if the resulting value is outside the corresponding absolute accuracy requirements in Table 5.6.3.1.5-2 for test configurations 1 and 2 and the corresponding absolute accuracy requirements in Table 5.6.3.1.5-3 for test configurations 3 and 4 the number of failed iterations for R3 is increased by one. Otherwise, the number of passed iterations for R3 is increased by one.

   -R4: The DIFF-RSRP value of SSB#0 reported by the UE is compared to the expected DIFF-RSRP value. In all consecutive reports after the first valid value is received, if the resulting value is outside the corresponding relative accuracy requirements in Table 5.6.3.1.5-4 for all test configurations, the number of failed iterations for R4 is increased by one. Otherwise, the number of passed iterations for R4 is increased by one.

6. The SS waits until T2 expires.

7. The SS shall transmit *RRCConnectionReconfiguration* message with condition EN-DC_PSCell_Rel according to TS 36.508 [25] Table 4.6.1-8 to release NR cell (PSCell). The UE shall transmit *RRCConnectionReconfigurationComplete* message.

8. Set the parameters according to T1 in Table 5.6.3.1.5-1. The SS then shall transmit *RRCConnectionReconfiguration* message with condition MCG_and_SCG according to TS 36.508 [25] Table 4.6.1-8 to add NR cell (PSCell). The UE shall transmit *RRCConnectionReconfigurationComplete* message.

9. If any the reconfiguration fails, switch off and on the UE and ensure the UE is in RRC_CONNECTED with generic procedure parameters Connectivity EN-DC, DC bearer MCG and SCG, Connected without release On and Test Mode *On* according to TS 38.508-1 [14] clause 4.5.

10. Repeat steps 3-9 until the confidence level according to Tables G.2.3-1 in Annex G clause G.2 is achieved.

5.6.3.1.4.3 Message contents

Message contents are according to TS 38.508-1 [14] clause 7.3 with the following exceptions:

Table 5.6.3.1.4.3-1: Common Exception messages EN-DC SSB based L1-RSRP measurement

Default Message Contents	
Common contents of system information blocks exceptions	
Default RRC messages and information elements contents exceptions	Table H.3.6-2 with conditions PERIODIC and SS-RSRP Table H.3.6-3 with condition SSB Table H.3.4-1

Table 5.6.3.1.4.3-2: RadioLinkMonitoringConfig

Derivation Path: TS 38.508-1 [14], Table 4.6.3-133			
Information Element	**Value/remark**	**Comment**	**Condition**
RadioLinkMonitoringConfig ::= SEQUENCE {			
failureDetectionResourcesToAddModList SEQUENCE (SIZE(1..maxNrofFailureDetectionResources)) OF SEQUENCE {	1 entry		
purpose	both	UE is configured to perform RLM and BFD based on the SSBs.	
detectionResource CHOICE {			
ssb-Index	0		
}			
}			
}			

5.6.3.1.5 Test requirement

Table 5.6.3.1.5-1 defines the primary level settings including test tolerances for all tests.

Table 5.6.3.1.5-1: SSB specific test parameters for EN-DC SSB based L1-RSRP measurement

Parameter	Config	Unit	SSB#0		SSB#1	
			T1	T2	T1	T2
Angle of arrival configuration			Setup 1 according to A.9			
Assumption for UE beams Note 4	1~4		Rough			
N_{oc} Note2	1~4	dBm/15kHz	-105			
N_{oc} Note2	1,2	dBm/SSB SCS	-96			
	3,4		-93			
$\hat{E}_s/I_{ot}$	1~4	dB	0	0	-Infinity	9
SSB_RP Note3	1,2	dBm/SSB SCS	-96	-96	-Infinity	-87
	3,4		-93	-93	-Infinity	-84
Io Note3	1,2	dBm/95.04MHz	-63.97	-63.97	-66.98	-57.47
	3,4		-63.97	-63.97	-66.98	-57.47
$\hat{E}_s/N_{oc}$	1~4	dB	0	0	-Infinity	9

NOTE 1: The resources for uplink transmission are assigned to the UE prior to the start of time period T2.
NOTE 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for N_{oc} to be fulfilled.
NOTE 3: SSB_RP and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.
NOTE 4: Information about types of UE beam is given in TS 38.133 Annex B.2.1.3, and does not limit UE implementation or test system implementation

The UE shall send L1-RSRP report every 320 slots. No later than X ms plus 640 slots from the beginning of time period T2, UE shall send L1-RSRP report including the results for both SSB#0 and SSB#1 while meeting the accuracy requirements defined in clause 10.1.20.1, where X is

- 1680 for UE supporting power class 1
- 1200 for UE supporting power class 2, 3 or 4.

Each L1-RSRP measurement report shall meet the corresponding absolute accuracy requirements in Table 5.6.3.1.5-2 for for test configurations 1 and 2 and the corresponding absolute accuracy requirements in Table 5.6.3.1.5-3 for test configurations 3 and 4 and the corresponding relative accuracy requirements in Table 5.6.3.1.5-4 for all test configurations.

Table 5.6.3.1.5-2: L1-RSRP absolute accuracy requirements for the reported values for test configurations 1 and 2 (R1 and R3)

Normal Conditions	T1	T2
Lowest reported value (SSB#1)	-	40
Highest reported value (SSB#1)	-	99

Table 5.6.3.1.5-3: L1-RSRP absolute accuracy requirements for the reported values for test configurations 3 and 4 (R1 and R3)

Normal Conditions	T1	T2
Lowest reported value (SSB#1)	-	43
Highest reported value (SSB#1)	-	102

Table 5.6.3.1.5-4: L1-RSRP relative accuracy requirements for the reported values for all test configurations (R4)

	T1	T2
Lowest DIFF RSRP reported (SSB#0)	-	1
Highest DIFF RSRP reported (SSB#0)	-	7

For the test to pass, the ratio of successful reported valued for each requirement (R1 to R4) shall be at least 90% with a confidence level of 95%. Each requirement is evaluated independently of the others.

5.6.3.2 EN-DC FR2 SSB-based L1-RSRP measurement in DRX

Editor's Note: This test case has been completed for the following configurations:

- Test frequency f ≤ 40.8 GHz
- UE PC3
- Normal conditions
- The test is incomplete for UE power classes other than PC3
- The test is incomplete for test frequencies > 40.8 GHz
- The test case is incomplete for extreme conditions

5.6.3.2.1 Test purpose

To verify that the UE makes correct reporting of L1-RSRP measurement in DRX within L1-RSRP measurement requirements in TS 38.133 [6] clause 9.5.4.1.

5.6.3.2.2 Test applicability

This test applies to all types of E-UTRA UE release 15 and forward, supporting EN-DC FR2 and long DRX cycle.

5.6.3.2.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 5.6.3.0.1.

The normative reference for this requirement is TS 38.133 [6] clause A.5.6.3.2.

5.6.3.2.4 Test description

5.6.3.2.4.1 Initial conditions

This test shall be tested using any of the test configurations in Table 5.6.3.2.4.1-1. Configure the test equipment and the DUT according to the parameters in Table 5.6.3.2.4.1-2. Test environment parameters are given in Table 5.6.3.2.4.1-3.

Table 5.6.3.2.4.1-1: EN-DC SSB based L1-RSRP measurement in DRX supported test configurations

Config	Description
1	LTE FDD, NR 120 kHz SSB SCS, 100 MHz bandwidth, TDD duplex mode
2	LTE TDD, NR 120 kHz SSB SCS, 100 MHz bandwidth, TDD duplex mode
3	LTE FDD, NR 240 kHz SSB SCS, 100 MHz bandwidth, TDD duplex mode
4	LTE TDD, NR 240 kHz SSB SCS, 100 MHz bandwidth, TDD duplex mode
NOTE: The UE is only required to be tested in one of the supported test configurations	

Table 5.6.3.2.4.1-2: General test parameters for EN-DC SSB based L1-RSRP measurement in DRX

Parameter	Config	Unit	Value
SSB GSCN	1~4		freq1
Duplex mode	1~4		TDD
TDD Configuration	1~4		TDDConf.3.1
$BW_{channel}$	1~4	MHz	100: $N_{RB,c}$ = 66
Data RBs allocated	1~4		66
PDSCH Reference measurement channel	1,2		SR.3.2 TDD
	3,4		SR.3.3 TDD
RMSI CORESET Reference Channel	1,2		CR.3.1 TDD
	3,4		CR.3.2 TDD
Dedicated CORESET Reference Channel	1,2		CCR.3.1 TDD
	3,4		CCR.3.7 TDD
SSB configuration	1,2		SSB.1 FR2
	3,4		SSB.2 FR2
OCNG Patterns	1~4		OP.1
Initial BWP Configuration	1~4		DLBWP.0.1 ULBWP.0.1
Dedicated BWP configuration	1~4		DLBWP.1.3 ULBWP.1.3
SMTC configuration	1~4		SMTC.1
TRS Configuration	1~4		TRS.2.1 TDD
PDCCH/PDSCH TCI Configuration	1~4		TCI.State.2
DRX configuration	1~4		DRX.3
reportConfigType	1~4		periodic
reportQuantity	1~4		ssb-Index-RSRP
Number of reported RS	1~4		2
L1-RSRP reporting period	1~4	slot	320
T1	1~4	s	5
T2	1~4	s	3
EPRE ratio of PSS to SSS	1~4	dB	0
EPRE ratio of PBCH DMRS to SSS			
EPRE ratio of PBCH to PBCH DMRS			
EPRE ratio of PDCCH DMRS to SSS			
EPRE ratio of PDCCH to PDCCH DMRS			

Parameter	Config	Unit	Value
EPRE ratio of PDSCH DMRS to SSS			
EPRE ratio of PDSCH to PDSCH DMRS			
EPRE ratio of OCNG DMRS to SSS Note 1			
EPRE ratio of OCNG to OCNG DMRS Note 1			
Propagation condition	1~4		AWGN
NOTE 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.			

Table 5.6.3.2.4.1-3: Test Environment parameters for EN-DC SSB based L1-RSRP measurement in DRX

Parameter	Value		Comment
Test environment	NC		As specified in TS 38.508-1 [14] clause 4.1.
Test frequencies	As specified in Annex E, Table E.2-1 and TS 38.508-1 [14] clause 4.3.1 for E-UTRA, 7.2.3 for NR FR2.		
Channel bandwidth	As specified by the test configuration selected from Table 5.6.3.2.4.1-1.		
Propagation conditions	AWGN		As specified in clause C.2.2.
Connection Diagram	TE Part	A.3.3.3.1-1	As specified in TS 38.508-1 [14] Annex A.
	DUT Part	A.3.4.1.1	
Exceptions to connection diagram	N/A		

1. Message contents are defined in clause 5.6.3.2.4.3.

2. The AoA setup for this test is Setup 1 as defined in clause A.9. The UE RX Beam Peak direction has been obtained previously using one of the search procedures as described in Annex I.

5.6.3.2.4.2 Test procedure

Same as in 5.6.3.1.4.2 with the following exception:

5. The UE shall start sending valid L1-RSRP reports. The SS shall check the following requirements:

   - R1: the UE shall start to transmit valid L1-RSRP reports no later than 2960ms for UE supporting power class 1 in configuration 1 and 2, no later than 2920ms for UE supporting power class 1 in configuration 3 and 4 , no later than 2000ms for UE supporting power class other than 1 in configuration 1 and 2, no later than 1960 ms for UE supporting power class other than 1 in configuration 3 and 4 from the beginning of time period T2. A valid report shall meet the absolute L1-RSRP requirement for SSB#1 Table 5.6.3.2.5-2 for test configurations 1 and 2 and the corresponding absolute accuracy requirements in Table 5.6.3.2.5-3 for test configurations 3 and 4. If the first valid report is received before the specified time, the number of passed iterations for R1 is increased by one. Otherwise, the number of failed iterations for R1 is increased by one.

   - R2: the UE shall transmit L1-RSRP reports every 320 slots. If the reports are received accordingly, the number of passed iterations for R2 is increased by one. Otherwise, the number of failed iterations for R2 is increased by one.

   -R3: The L1-RSRP value of SSB#1 reported by the UE is compared to the expected L1-RSRP value for SSB#1. In all consecutive reports after the first valid value is received, if the resulting value is outside the corresponding absolute accuracy requirements in Table 5.6.3.2.5-2 for test configurations 1 and 2 and the corresponding absolute accuracy requirements in Table 5.6.3.2.5-3 for test configurations 3 and 4 the number of failed iterations for R3 is increased by one. Otherwise, the number of passed iterations for R3 is increased by one.

   -R4: The DIFF-RSRP value of SSB#0 reported by the UE is compared to the expected DIFF-RSRP value. In all consecutive reports after the first valid value is received, if the resulting value is outside the corresponding relative accuracy requirements in Table 5.6.3.2.5-4 for all test configurations, the number of failed iterations for R4 is increased by one. Otherwise, the number of passed iterations for R4 is increased by one.

5.6.3.2.4.3 Message contents

Same message content as in subclause 5.6.3.1.4.3 with the following exception:

Table 5.6.3.2.4.3-1: Common Exception messages EN-DC SSB based L1-RSRP measurement in DRX

Default Message Contents	
Common contents of system information blocks exceptions	
Default RRC messages and information elements contents exceptions	Table H.3.7-1 with condition DRX.3

5.6.3.2.5 Test requirement

Table 5.6.3.2.5-1 defines the primary level settings including test tolerances for all tests.

Table 5.6.3.2.5-1: SSB specific test parameters for EN-DC SSB based L1-RSRP measurement in DRX

Parameter	Config	Unit	SSB#0		SSB#1	
			T1	T2	T1	T2
Angle of arrival configuration			Setup 1 according to A.9			
Assumption for UE beams Note 4	1~4		Rough			
N_{oc} Note2	1~4	dBm/15kHz	-105			
N_{oc} Note2	1,2	dBm/SSB SCS	-96			
	3,4		-93			
$\hat{E}_s / I_{ot}$	1~4	dB	0	0	-Infinity	9
SSB_RP Note3	1,2	dBm/SSB SCS	-96	-96	-Infinity	-87
	3,4		-93	-93	-Infinity	-84
Io Note3	1,2	dBm/95.04MHz	-63.97	-63.97	-66.98	-57.47
	3,4		-63.97	-63.97	-66.98	-57.47
$\hat{E}_s / N_{oc}$	1~4	dB	0	0	-Infinity	9

NOTE 1: The resources for uplink transmission are assigned to the UE prior to the start of time period T2.

NOTE 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for N_{oc} to be fulfilled.

NOTE 3: SSB_RP and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.

The UE shall send L1-RSRP report every 320 slots. No later than X ms plus 640 slots from the beginning of time period T2, UE shall send L1-RSRP report including the results for both SSB#0 and SSB#1 while meeting the accuracy requirements defined in clause 10.1.20.1, where X is

- 2880 for UE supporting power class 1
- 1920 for UE supporting power class 2,3 or 4.

Each L1-RSRP measurement report shall meet the corresponding absolute accuracy requirements in Table 5.6.3.2.5-2 for test configurations 1 and 2 and the corresponding absolute accuracy requirements in Table 5.6.3.2.5-3 for test configurations 3 and 4 and the corresponding relative accuracy requirements in Table 5.6.3.2.5-4 for all test configurations.

Table 5.6.3.2.5-2: L1-RSRP absolute accuracy requirements for the reported values for test configurations 1 and 2 (R1 and R3)

Normal Conditions	T1	T2
Lowest reported value (SSB#1)	-	40
Highest reported value (SSB#1)	-	99

Table 5.6.3.2.5-3: L1-RSRP absolute accuracy requirements for the reported values for test configurations 3 and 4 (R1 and R3)

Normal Conditions	T1	T2
Lowest reported value (SSB#1)	-	43
Highest reported value (SSB#1)	-	102

Table 5.6.3.2.5-4: L1-RSRP relative accuracy requirements for the reported values for all test configurations (R4)

	T1	T2
Lowest DIFF RSRP reported (SSB#0)	-	1
Highest DIFF RSRP reported (SSB#0)	-	7

For the test to pass, the ratio of successful reported valued for each requirement (R1 to R4) shall be at least 90% with a confidence level of 95%. Each requirement is evaluated independently of the others.

5.6.3.3 EN-DC FR2 CSI-RS-based L1-RSRP measurement in non-DRX

Editor's Note: This test case has been completed for the following configurations:

- Test frequency f ≤ 40.8 GHz
- UE PC3
- Normal conditions
- The test is incomplete for UE power classes other than PC3
- The test is incomplete for test frequencies > 40.8 GHz
- The test case is incomplete for extreme conditions

5.6.3.3.1 Test purpose

To verify that the UE makes correct reporting of CSI-RS-based L1-RSRP measurement in non-DRX within L1-RSRP measurement requirements in TS 38.133 [6] clause 9.5.4.2.

5.6.3.3.2 Test applicability

This test applies to all types of E-UTRA UE release 15 and forward, supporting EN-DC.

5.6.3.3.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 4.6.3.0.2.

The normative reference for this requirement is TS 38.133 [6] clause A.5.6.3.3.

5.6.3.3.4 Test description

5.6.3.3.4.1 Initial conditions

This test shall be tested using any of the test configurations in Table 5.6.3.3.4.1-1. Configure the test equipment and the DUT according to the parameters in Table 5.6.3.3.4.1-2. Test environment parameters are given in Table 5.6.3.3.4.1-3.

Table 5.6.3.3.4.1-1: EN-DC FR2 CSI-RS based L1-RSRP measurement supported test configurations

Config	Description
1	LTE FDD, NR 120 kHz SSB SCS, 100 MHz bandwidth, TDD duplex mode
2	LTE TDD, NR 120 kHz SSB SCS, 100 MHz bandwidth, TDD duplex mode

NOTE: The UE is only required to be tested in one of the supported test configurations

Table 5.6.3.3.4.1-2: General test parameters for EN-D FR2 C CSI-RS based L1-RSRP measurement

Parameter	Config	Unit	Value
SSB GSCN	1~2		freq1
Duplex mode	1~2		TDD
TDD Configuration	1~2		TDDConf.3.1
$BW_{channel}$	1~2	MHz	100: $N_{RB,c}$ = 66
Data RBs allocated	1~2		66
PDSCH Reference measurement channel	1~2		SR.3.3 TDD
RMSI CORESET Reference Channel	1~2		CR.3.2 TDD
Dedicated CORESET Reference Channel	1~2		CCR.3.7 TDD
SSB configuration	1~2		SSB.1 FR2
CSI-RS configuration	1~2		CSI-RS.3.3 TDD
OCNG Patterns	1~2		OP.1
Initial BWP Configuration	1~2		DLBWP.0.1 ULBWP.0.1
Dedicated BWP configuration	1~2		DLBWP.1.1 ULBWP.1.1
SMTC configuration	1~2		SMTC.1
TRS Configuration	1~2		TRS.2.1 TDD
PDCCH/PDSCH TCI Configuration	1~2		TCI.State.2
DRX configuration	1~2		Off
reportConfigType	1~2		aperiodic
reportQuantity	1~2		cri-RSRP
Number of reported RS	1~2		2
qcl-Info	1~2		SSB#0 for resource#0 SSB#1 for resource#1
reportSlotOffsetList	1~2		8
Propagation condition	1~2		AWGN
T1	1~2	s	5
EPRE ratio of PSS to SSS	1~2	dB	0
EPRE ratio of PBCH DMRS to SSS			
EPRE ratio of PBCH to PBCH DMRS			
EPRE ratio of PDCCH DMRS to SSS			
EPRE ratio of PDCCH to PDCCH DMRS			
EPRE ratio of PDSCH DMRS to SSS			
EPRE ratio of PDSCH to PDSCH DMRS			
EPRE ratio of OCNG DMRS to SSS Note 1			
EPRE ratio of OCNG to OCNG DMRS Note 1			
NOTE 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.			

Table 5.6.3.3.4.1-3: Test Environment parameters for EN-DC FR2 CSI-RS L1-RSRP measurement

Parameter	Value		Comment
Test environment	NC		As specified in TS 38.508-1 [14] clause 4.1.
Test frequencies	As specified in Annex E, Table E.2-1 and TS 38.508-1 [14] clause 4.3.1 for E-UTRA, 7.2.3 for NR FR2.		
Channel bandwidth	As specified by the test configuration selected from Table 5.6.3.3.4.1-1.		
Propagation conditions	AWGN		As specified in clause C.2.2.
Connection Diagram	TE Part	A.3.3.3.1-1	As specified in TS 38.508-1 [14] Annex A.
	DUT Part	A.3.4.1.1	

Exceptions to connection diagram		

1. Message contents are defined in clause 5.6.3.3.4.3.

2. The AoA setup for this test is Setup 1 as defined in clause A.9. The UE RX Beam Peak direction has been obtained previously using one of the search procedures as described in Annex I.

5.6.3.3.4.2 Test procedure

The test consists of a single time period T1, during which the UE is triggered via DCI to report L1-RSRP on aperiodic CSI-RS resources. Prior to the start of the time duration T1, the UE shall be fully synchronized to PSCell. UE is also configured to measure L1-RSRP based on SSB. Upon receiving the DCI trigger, UE provides the report back based on the reporting configuration as defined in table 5.6.3.3.4.1-2.

1. Ensure the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity EN-DC, DC bearer MCG and SCG, Connected without release *On* and Test Mode *On*, according to TS 38.508-1 [14] clause 4.5.

2. Set the parameters according to T1 in Table 5.6.3.3.5-1. T1 starts.

3. After 480ms from the start of the test the SS transmits the DCI trigger in slot 1.

4. The SS shall check following requirements:

   - R1: the UE shall send L1-RSRP report at slot 9 from the reception of DCI trigger. If the report is received at slot 9 from the reception of DCI trigger, the number of passed iterations for R1 is increased by one. Otherwise, the number of failed iterations for R1 is increased by one.

   - R2: the L1-RSRP value of CSI-RS#1 reported by the UE is compared to the expected L1-RSRP value for CSI-RS #1. If the resulting value is outside the limits in Table 5.6.3.3.5-2 or the UE fails to report the measurement value for CSI-RS #1, the number of failed iterations for R2 is increased by one. Otherwise, the number of passed iterations for R2 is increased by one.

   -R3: The DIFF RSRP value of CSI-RS #0 reported by the UE is compared to the expected DIFF RSRP value. If the resulting value is outside the limits in Table 5.6.3.3.5-33 or the UE fails to report the measurement value for CSI-RS #0, the number of failed iterations for R3 is increased by one. Otherwise, the number of passed iterations for R3 is increased by one.

5. The SS shall transmit *RRCConnectionReconfiguration* message with condition EN-DC_PSCell_Rel according to TS 36.508 [25] Table 4.6.1-8 to release NR cell (PSCell). The UE shall transmit *RRCConnectionReconfigurationComplete* message.

The SS then shall transmit *RRCConnectionReconfiguration* message with condition MCG_and_SCG according to TS 36.508 [25] Table 4.6.1-8 to add NR cell (PSCell). The UE shall transmit *RRCConnectionReconfigurationComplete* message.

8. If any the reconfiguration fails, switch off and on the UE and ensure the UE is in RRC_CONNECTED with generic procedure parameters Connectivity EN-DC, DC bearer MCG and SCG, Connected without release On and Test Mode *On* according to TS 38.508-1 [14] clause 4.5.

9. Repeat steps 2-8 until the confidence level according to Tables G.2.3-1 in Annex G clause G.2 is achieved.

5.6.3.3.4.3 Message contents

Message contents are according to TS 38.508-1 [14] clause 7.3 with the following exceptions:

Table 5.6.3.3.4.3-1: Common Exception messages EN-DC CSI-RS based L1-RSRP measurement

Default Message Contents	
Common contents of system information blocks exceptions	

Default RRC messages and information elements contents exceptions	Table H.3.6-2 with conditions APERIODIC and CSI-RSRP Table H.3.6-3 with conditions CSI-RS and APERIODIC Table H.3.4-1

Table 5.6.3.3.4.3-2: RadioLinkMonitoringConfig

Derivation Path: TS 38.508-1 [14], Table 4.6.3-133			
Information Element	**Value/remark**	**Comment**	**Condition**
RadioLinkMonitoringConfig ::= SEQUENCE {			
failureDetectionResourcesToAddModList SEQUENCE (SIZE(1..maxNrofFailureDetectionResources)) OF SEQUENCE {	1 entry		
purpose	both	UE is configured to perform RLM and BFD based on the SSBs.	
}			
}			

Table 5.6.3.3.4.3-3: Physical layer parameters for DCI format 1_1

Derivation Path: TS 38.508-1 [14], Table 7.2.2.1-1			
Parameter	**Value**	**Value in binary**	**Condition**
PDSCH-to-HARQ_feedback timing indicator	For 120KHz SCS: K1 = N/A if mod(i,5) = 2 - PDSCH not scheduled (K1=2 and K1=12 are the possible settings to fall into a different UL slot than CSI Report. But K1=12 is not defined in RRC and K1=12 > PdschNumHarq Process=8. For K1=2, according to TS38.214 Table 5.3-1, considering PDSCH processing time and PUCCH resource index (symbol#0,1), it is better to use different UL slot) K1 = N/A if mod(i,5) = 0 - PDSCH not scheduled (K1=9 is the only possible setting to fall into a different UL slot than CSI Report but K1=9 > PdschNumHarq Process=8) K1 = 8 if mod(i,5) = 1 where i is slot index per frame; i = {2,5,6}	-	FR2

5.6.3.3.5 Test requirement

Table 5.6.3.3.5-1 defines the primary level settings including test tolerances for all tests.

Table 5.6.3.3.5-1: CSI-RS specific test parameters for EN-DC FR2 CSI-RS L1-RSRP measurement

Parameter	Config	Unit	CSI-RS#0	CSI-RS#1
Angle of arrival configuration	1~2		Setup 1 according to A.9	

Assumption for UE beams Note 3	1~2		Rough	
N_{oc} Note1	1~2	dBm/15kHz	-105	
N_{oc} Note1	1~2	dBm/SSB SCS	-95.97	
$\hat{E}_s/I_{ot}$	1~2	dB	0	9
CSI-RS RSRP Note2	1~2	dBm/SSB SCS	-95.97	-86.97
Io Note2	1~2	dBm/95.04MHz	-63.97	-57.47
$\hat{E}_s/N_{oc}$	1~2	dB	0	9
NOTE 1: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for N_{oc} to be fulfilled. NOTE 2: CSI-RS RSRP and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves. NOTE 3: Information about types of UE beam is given in B.2.1.3, and does not limit UE implementation or test system implementation				

After 480ms from the beginning of the test, the UE shall send L1-RSRP report at slot 9 from the reception of DCI triggering the L1-RSRP measurement. The L1-RSRP report shall include the results for both CSI-RS#0 and CSI-RS#1. Each L1-RSRP measurement report shall meet the corresponding absolute accuracy requirements in Table 5.6.3.3.5-2 the corresponding relative accuracy requirements in Table 5.6.3.3.5-3.

Table 5.6.3.3.5-2: L1-RSRP absolute accuracy requirements for the reported values R2

Normal Conditions	T1
Lowest reported value (CSI-RS#1)	40
Highest reported value (CSI-RS#1)	99

Table 5.6.3.3.5-3: L1-RSRP relative accuracy requirements for the reported values R3

	T1
Lowest DIFF RSRP reported (CSI-RS#0)	1
Highest DIFF RSRP reported (CSI-RS#0)	7

The rate of correct events observed during repeated tests (R1 to R3) shall be at least 90% with a confidence level of 95%.

NOTE: The actual overall delays measured in the test may be up to $2xTTI_{DCCH}$ higher than the measurement reporting delays above because of TTI insertion uncertainty of the measurement report in DCCH.

5.6.3.4 EN-DC FR2 CSI-RS-based L1-RSRP measurement in DRX

Editor's Note: This test case has been completed for the following configurations:

- Test frequency f ≤ 40.8 GHz

- UE PC3

- Normal conditions

- The test is incomplete for UE power classes other than PC3

- The test is incomplete for test frequencies > 40.8 GHz

- The test case is incomplete for extreme conditions

5.6.3.4.1 Test purpose

To verify that the UE makes correct reporting of CSI-RS-based L1-RSRP measurement in non-DRX within L1-RSRP measurement requirements in TS 38.133 [6] clause 9.5.4.2.

5.6.3.4.2 Test applicability

This test applies to all types of E-UTRA UE release 15 and forward, supporting EN-DC FR2 and long DRX cycle.

5.6.3.4.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 4.6.3.0.2.

The normative reference for this requirement is TS 38.133 [6] clause A.5.6.3.4

5.6.3.4.4 Test description

5.6.3.4.4.1 Initial conditions

This test shall be tested using any of the test configurations in Table 5.6.3.3.4.1-1. Configure the test equipment and the DUT according to the parameters in Table 5.6.3.3.4.1-2. Test environment parameters are given in Table 5.6.3.3.4.1-3.

Table 5.6.3.4.4.1-1: EN-DC FR2 CSI-RS based L1-RSRP measurement in DRX supported test configurations

Config	Description
1	LTE FDD, NR 120 kHz SSB SCS, 100 MHz bandwidth, TDD duplex mode
2	LTE TDD, NR 120 kHz SSB SCS, 100 MHz bandwidth, TDD duplex mode
NOTE: The UE is only required to be tested in one of the supported test configurations	

Table 5.6.3.4.4.1-2: General test parameters for EN-D FR2 C CSI-RS based L1-RSRP measurement in DRX

Parameter	Config	Unit	Value
SSB GSCN	1~2		freq1
Duplex mode	1~2		TDD
TDD Configuration	1~2		TDDConf.3.1
$BW_{channel}$	1~2	MHz	100: $N_{RB,c}$ = 66
Data RBs allocated	1~2		66
PDSCH Reference measurement channel	1~2		SR.3.3 TDD
RMSI CORESET Reference Channel	1~2		CR.3.2 TDD
Dedicated CORESET Reference Channel	1~2		CCR.3.7 TDD
SSB configuration	1~2		SSB.1 FR2
CSI-RS configuration	1~2		CSI-RS.3.3 TDD
OCNG Patterns	1~2		OP.1
Initial BWP Configuration	1~2		DLBWP.0.1 ULBWP.0.1
Dedicated BWP configuration	1~2		DLBWP.1.1 ULBWP.1.1
SMTC configuration	1~2		SMTC.1
TRS Configuration	1~2		TRS.2.1 TDD
PDCCH/PDSCH TCI Configuration	1~2		TCI.State.2
DRX configuration	1~2		DRX.3
reportConfigType	1~2		aperiodic
reportQuantity	1~2		cri-RSRP
Number of reported RS	1~2		2
qcl-Info	1~2		SSB#0 for resource#0 SSB#1 for resource#1
reportSlotOffsetList	1~2		8

Propagation condition	1~2		AWGN
T1	1~2	s	5
EPRE ratio of PSS to SSS	1~2	dB	0
EPRE ratio of PBCH DMRS to SSS			
EPRE ratio of PBCH to PBCH DMRS			
EPRE ratio of PDCCH DMRS to SSS			
EPRE ratio of PDCCH to PDCCH DMRS			
EPRE ratio of PDSCH DMRS to SSS			
EPRE ratio of PDSCH to PDSCH DMRS			
EPRE ratio of OCNG DMRS to SSS Note 1			
EPRE ratio of OCNG to OCNG DMRS Note 1			
NOTE 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.			

Table 5.6.3.4.4.1-3: Test Environment parameters for EN-DC FR2 CSI-RS L1-RSRP measurement

Parameter	Value		Comment
Test environment	NC		As specified in TS 38.508-1 [14] clause 4.1.
Test frequencies	As specified in Annex E, Table E.2-1 and TS 38.508-1 [14] clause 4.3.1 for E-UTRA, 7.2.3 for NR FR2.		
Channel bandwidth	As specified by the test configuration selected from Table 5.6.3.3.4.1-1.		
Propagation conditions	AWGN		As specified in clause C.2.2.
Connection Diagram	TE Part	A.3.3.3.1-1	As specified in TS 38.508-1 [14] Annex A.
	DUT Part	A.3.4.1.1	
Exceptions to connection diagram			

1. Message contents are defined in clause 5.6.3.3.4.3.

2. The AoA setup for this test is Setup 1 as defined in clause A.9. The UE RX Beam Peak direction has been obtained previously using one of the search procedures as described in Annex I.

5.6.3.4.4.2 Test procedure

Same test procedure as in subclause 5.6.3.3.4.2 with tables 5.6.3.3.4.1-2 and 5.6.3.3.5-1 replaced by tables 5.6.3.4.4.1-2 and 5.6.3.4.5-1 and following change in step 3.

3. After 1440ms from the start of the test the SS transmits the DCI trigger in slot 1.

5.6.3.4.4.3 Message contents

Same message content as in subclause 5.6.3.3.4.3 with the following exception:

Table 4.6.4.4.4.3-1: Common Exception messages EN-DC CSI-RS based L1-RSRP measurement in DRX

Default Message Contents	
Common contents of system information blocks exceptions	
Default RRC messages and information elements contents exceptions	Table H.3.7-1 with condition DRX.3

5.6.3.4.5 Test requirement

Table 5.6.3.3.5-1 defines the primary level settings including test tolerances for all tests.

Table 5.6.3.4.5-1: CSI-RS specific test parameters for EN-DC FR2 CSI-RS L1-RSRP measurement in DRX

Parameter	Config	Unit	CSI-RS#0	CSI-RS#1
Angle of arrival configuration	1~2		Setup 1 according to A.9	
Assumption for UE beams Note 3	1~2		Rough	
N_{oc} Note1	1~2	dBm/15kHz	-105	
N_{oc} Note1	1~2	dBm/SSB SCS	-95.97	
$\hat{E}_s/I_{ot}$	1~2	dB	0	9
CSI-RS RSRP Note2	1~2	dBm/SSB SCS	-95.97	-86.97
Io Note2	1~2	dBm/95.04MHz	-63.97	-57.47
$\hat{E}_s/N_{oc}$	1~2	dB	0	9
NOTE 1: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for N_{oc} to be fulfilled.				
NOTE 2: CSI-RS RSRP and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.				

After 1440ms from the beginning of the test, the UE shall send L1-RSRP report at slot 9 from the reception of DCI triggering the L1-RSRP measurement. The L1-RSRP report shall include the results for both CSI-RS#0 and CSI-RS#1. Each L1-RSRP measurement report shall meet the corresponding absolute accuracy requirements in Table 5.6.3.4.5-2 the corresponding relative accuracy requirements in Table 5.6.3.4.5-3.

Table 5.6.3.4.5-2: L1-RSRP absolute accuracy requirements for the reported values

Normal Conditions	T1
Lowest reported value (CSI-RS#1)	40
Highest reported value (CSI-RS#1)	99

Table 5.6.3.4.5-3: L1-RSRP relative accuracy requirements for the reported values

	T1
Lowest DIFF RSRP reported (CSI-RS#0)	1
Highest DIFF RSRP reported (CSI-RS#0)	7

The rate of correct events observed during repeated tests shall be at least 90% with a confidence level of 95%.

NOTE: The actual overall delays measured in the test may be up to $2xTTI_{DCCH}$ higher than the measurement reporting delays above because of TTI insertion uncertainty of the measurement report in DCCH.

5.6.4 CLI measurements

5.6.4.0 Minimum conformance requirements

5.6.4.0.1 Minimum conformance requirements for SRS-RSRP measurement period

The UE shall be capable of performing SRS-RSRP measurement based on the configured SRS resource, and the UE shall be capable of reporting SRS-RSRP measured over measurement period of $T_{SRS_RSRP_measurement_period}$ for FR1 and FR2.

Table 5.6.4.0.1-1 Measurement period $T_{SRS_RSRP_measurement_period}$

Configuration	$T_{SRS_measurement_period}$ (ms)

No DRX	Max(60, 3 X T_{SRS})
DRX cycle ≤ 320ms	Max(60, Ceil(1.5 X 3) X max(T_{SRS}, T_{DRX}))
DRX cycle > 320ms	3 X T_{DRX}
Note: T_{SRS} is SRS measurement periodicity configured *SRS-PeriodicityAndOffset*, and T_{DRX} is the DRX cycle length.	

If the SRS resources configured for measurement are partially or fully overlapping with SMTC window, SSB or CSI-RS configured for RLM, BFD, CBD or L1-RSRP measurement or measurement gaps, requirements are not specified for $T_{SRS_RSRP_measurement_period}$.

When configured by the network, the UE shall be able to perform SRS-RSRP measurements of configured *srs-ResourceConfigCLI*. The requirements apply when the subcarrier spacing for SRS-RSRP measurement resource configuration is the same as the subcarrier spacing of the active DL BWP of serving cell. The UE is not required to measure SRS using different SCS compared to the downlink active BWP SCS of the same carrier.

The requirements as provided:

- SRS resources configured for SRS-RSRP measurements are measurable.

An SRS resource configured for SRS-RSRP shall be considered measurable when for each relevant SRS the following conditions are met:

- SRS-RSRP related side conditions given in clauses 10.1.22.1 for FR1 and FR2 for a corresponding band,
- SRS_RP and SRS Ês/Iot according to Annex B.2.7 for a corresponding band.

The UE shall send SRS-RSRP reports only for report configurations according to *reportType* which is *cliPeriodical* or *cliEventTriggered* when SRS-RSRP report is configured.

The UE shall report the SRS-RSRP value as a 7-bit value in the range [-140, -44] dBm with 1dB step size according to clause 10.1.22.1 for FR1 and FR2.

Reported SRS-RSRP measurements contained in periodically triggered measurement reports shall meet the requirements in clause 10.1.22.1.

Reported SRS-RSRP measurements contained in periodically triggered measurement reports shall meet the requirements in clauses 10.1.22.1.

The first report in event triggered periodic measurement reporting shall meet the requirements specified in clause 9.7.2.3.3.

Reported SRS-RSRP measurements contained in periodically triggered measurement reports shall meet the requirements in clause 10.1.22.1.

The UE shall not send any event triggered measurement reports as long as no reporting criteria is fulfilled.

The measurement reporting delay is defined as the time between an event that will trigger a measurement report and the point when the UE starts to transmit the measurement report over the air interface. This requirement assumes that the measurement report is not delayed by other RRC signalling on the DCCH. This measurement reporting delay excludes a delay uncertainty resulted when inserting the measurement report to the TTI of the uplink DCCH. The delay uncertainty is: 2 x TTI_{DCCH}. This measurement reporting delay excludes a delay which caused by no UL resources for UE to send the measurement report on.

The normative reference for this requirement is TS 38.133 [6] clause 9.7.2.5 and 9.7.2.1, 9.7.2.2 and 9.7.2.3

5.6.4.1 EN-DC FR2 SRS-RSRP measurement in non-DRX

Editor's Note: This test case is incomplete. Following aspects are either missing or TBD

- The test applicability is FFS
- The test procedure is incomplete
- The message content is FFS

- MU/TT analysis for UE PC3 and test frequency f ≤ 40.8 GHz is complete.

- MU/TT analysis for UE power class other than PC3 is incomplete.

- MU//TT analysis for test frequency f > 40.8 GHz is incomplete.

5.6.4.1.1 Test purpose

The purpose of this test case is to verify that the UE makes correct reporting of SRS-RSRP measurement in non-DRX within SRS-RSRP measurement requirements in TS 38.133 [6] clause 9.7.2.5

5.6.4.1.2 Test applicability

FFS

5.6.4.1.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 5.6.4.0.1

The normative reference for this requirement is TS 38.133 [6] clause 9.7.2.5 and A.5.6.4.1.

5.6.4.1.4 Test description

Two cells are deployed in the test, which are E-UTRAN PCell (Cell 1) and FR2 PSCell (Cell 2).

5.6.4.1.4.1 Initial conditions

This test shall be tested using any of the test configurations in Table 5.6.4.1.4.1-1.

Table 5.6.4.1.4.1-1: Supported test configurations

Configuration	Description
5.6.4.1 - 1	NR 120 kHz SRS SCS, 100 MHz bandwidth, TDD duplex mode, LTE FDD
5.6.4.1 - 2	NR 120 kHz SRS SCS, 100 MHz bandwidth, TDD duplex mode, LTE TDD
	Note: UE is only required to be tested in one of the supported test configurations

Configure the test equipment and the DUT according to the parameters in Table 5.6.4.1.4.1-2.

Table 5.6.4.1.4.1-2: Initial conditions EN-DC FR2 SRS-RSRP measurement in non-DRX

Parameter	Value	Comment
Test environment	NC	As specified in TS 36.508 [25] clause 4.1.
Test frequencies	As specified in Annex E, E.1.1, E.1.3.1 and Table E.3-1 and TS 38.508-1 [14] clause 4.3.1 for E-UTRA and 7.2.3 for NR.	
Channel bandwidth	As specified by the selected test configuration.	
Propagation conditions	AWGN	As specified in clause C.2.1
Connection Diagram	TE Part: A.3.3.1.1 DUT Part: A.3.4.1.1	As specified in TS 38.508-1 [14] Annex A.
Exceptions to connection diagram	N/A	

1. The test parameters are given in Table 5.6.4.1.4.1-3 below.

2. Message contents are defined in clause 5.6.4.1.4.3.

3. Two cells are deployed in the test, which are E-UTRAN PCell (Cell 1) and FR2 PSCell (Cell 2). The test parameters for PSCell is given in Table A.5.6.4.1.4.1-3

. The UE Rx beam peak direction has been obtained previously using one of the Rx Beam Peak Search procedures as described in Annex I.

Table 5.6.4.1.4.1-3: General test parameters for SRS-RSRP event triggered reporting for PSCell in FR2

Parameter	Unit	Test configuration	Value	Comment
Active cell		1	E-UTRAN Cell 1 and NR Cell 2	
RF Channel Number		1	1: Cell 1 2: Cell 2	
SSB configuration		1	SSB.1 FR2	
SMTC configuration		1	SMTC.1	
SRS configuration		1	SRSConf.1	Table A.5.6.4.1.2-4
CP length		1	Normal	
i1-Threshold	dBm	1	-112	
Hysteresis	dB	1	0	
Time To Trigger	s	1	0	
Filter coefficient		1	0	L3 filtering is not used
DRX	ms	1	DRX.11	
Time offset between DL from serving cell and SRS from test system	µs	1,2	10.67	
T1	s	1	5	
T2	s	1	1	

5.6.4.1.4.2 Test procedure

There are two cells are deployed in the test, which are E-UTRAN PCell (Cell 1) and FR2 PSCell (Cell 2)

In the measurement control information, a measurement object is configured for the frequency of the PSCell, and it is indicated to the UE that event-triggered reporting with Event I1 is used. The test consists of two successive time periods, with time duration of T1 and T2, respectively.

During the test, the test system transmits SRS resource for measurement in the DL slot according to the SRS configuration in Table 5.6.4.1.5-3 and the test parameters for the (virtual) neighbour cell UE in Table 5.6.4.1.5-23. During the test, the test system does not transmit PDCCH/PDSCH/OCNG on SRS symbol to be transmitted and on 2 data symbols before SRS to be transmitted.

1. Ensure the UE is in State 3A-RF according to TS 36.508 [25] clause 7.2A.3.
2. Set the parameters according to Table 5.6.4.1.5-1 as appropriate.
3. The SS shall transmit an *RRCConnectionReconfiguration* message on Cell 1 with event I1 configured.
4. The UE shall transmit an *RRCConnectionReconfigurationComplete* message.

Editor's note: the rest of the steps are FFS.

5.6.4.1.4.3 Message contents

Message contents are according to TS 38.508-1 [14] clause 7.3 with the following exceptions:

FFS

5.6.4.1.5 Test requirement

Table 5.7.1.1.5-1 defines the cell specific settings for all tests. Table 5.7.1.1.5-2 defines the OTA primary level settings including test tolerances for all tests.

Table 5.6.4.1.5-1: NR Cell specific test parameters for SRS-RSRP event triggered reporting for PSCell in FR2

Parameter	Unit	Test configuration	Cell 2	
			T1	T2
TDD configuration		1	TDDConf.3.1	

PDSCH RMC configuration		1	SR.3.1 TDD
RMSI CORESET RMC configuration		1	CR.3.1 TDD
Dedicated CORESET RMC configuration		1	CCR.3.1 TDD
OCNG Patterns		1	OP.1
TRS configuration			TRS.2.1. TDD
PDSCH/PDCCH TCI state		1	TCI.State.2
Initial BWP configuration		1	DLBWP.0.1 ULBWP.0.1
Active DL BWP configuration		1	DLBWP.1.1
Active UL BWP configuration		1	ULBWP.1.1
Propagation Condition		1	AWGN

Table 5.6.4.1.5-2: NR OTA Cell specific test parameters for SRS-RSRP event triggered reporting for PSCell and Neighbour cell UE in FR2

Parameter	Unit	Test configuration	Cell 2		Neighbour cell UE	
			T1	T2	T1	T2
AoA setup		1	Setup 1 defined A.3.15.1			
Beam assumption Note 4		1	Fine			
N_{oc} Note 2	dBm/15 kHz	1	~~-98~~-100.5		~~-98~~-100.5	
N_{oc} Note 2	dBm/SCS	1	-91.5		-91.5	
$\hat{E}_s / I_{ot}$	dB	1	-	-	-infinity	7
$\hat{E}_s / N_{oc}$	dB	1	-	-	-infinity	7
SRS-RSRP Note 3	dBm/SCS kHz	1	-	-	-infinity	-84.5
Io	dBm/95.04 MHz	1	-63.86	-56.07	-63.86	-56.07

Note 1: The resources for uplink transmission are assigned to the UE prior to the start of time period T2.

Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for N_{oc} to be fulfilled.

Note 3: SRS-RSRP levels have been derived from other parameters for information purposes. They are not settable parameters themselves.

Note 4: Information about types of UE beam is given in B.2.1.3, and does not limit UE implementation or test system implementation

Note 5: Cell 2 doesn't transmit during the SRS and the 2 previous symbols. Es/NoC is not applied to those symbols.

Table 5.6.4.1.5-3: SRS configuration for measurement reporting

	Field	SRSConf.1	Comments
SRS-ResourceSet	srs-ResourceSetId	0	
	srs-ResourceIdList	0	
	resourceType	Periodic	
	Usage	Codebook	
SRS-Resource	SRS-ResourceId	0	
	nrofSRS-Ports	Port1	
	transmissionComb	n2	
	combOffset-n2	0	
	cyclicShift-n2	0	

	resourceMapping startPosition	0	
	resourceMapping nrofSymbols	n1	
	resourceMapping repetitionFactor	n1	
	freqDomainPosition	0	
	freqDomainShift	0	
	freqHopping c-SRS	12	
	freqHopping b-SRS	0	
	freqHopping b-hop	0	
	groupOrSequenceHopping	Neither	
	resourceType	Periodic	
	periodicityAndOffset	sl160, 25	
	sequenceId	0	Any 10 bit number

The UE shall send one Event I1 triggered measurement report, with a measurement reporting delay less than 60 ms from the beginning of time period T2.

The UE shall not send event triggered measurement reports, as long as the reporting criteria are not fulfilled.

The rate of correct events observed during repeated tests shall be at least 90%.

NOTE: The actual overall delays measured in the test may be up to $2xTTI_{DCCH}$ higher than the measurement reporting delays above because of TTI insertion uncertainty of the measurement report in DCCH.

5.6.4.2 EN-DC FR2 CLI-RSSI measurement in non-DRX

Editor's Note: This test case is incomplete. Following aspects are either missing or TBD

- The test applicability is FFS

- The test procedure is incomplete

- The message content is FFS

- TT analysis is missing.

5.6.4.2.1 Test purpose

The purpose of this test case is to verify that the UE makes correct reporting of CLI-RSSI measurement in non-DRX within CLICLI-RSSI measurement requirements in TS 38.133 [6] clause 9.7.3.5

5.6.4.2.2 Test applicability

FFS

5.6.4.2.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 5.6.4.0.1

The normative reference for this requirement is TS 38.133 [6] clause 9.7.2.5 and A.5.6.4.2.

5.6.4.2.4 Test description

Two cells are deployed in the test, which are E-UTRAN PCell (Cell 1) and FR2 PSCell (Cell 2).

5.6.4.2.4.1 Initial conditions

This test shall be tested using any of the test configurations in Table 5.6.4.2.4.1-1.

Table 5.6.4.2.1-1: Applicable NR configurations for FR2 CLI-RSSI test

Configuration	Description
1	NR 120 kHz SRS SCS, 100 MHz bandwidth, TDD duplex mode

Configure the test equipment and the DUT according to the parameters in Table 5.6.4.2.4.1-2.

Table 5.6.4.2.4.1-2: Initial conditions EN-DC FR2 CLI-RSSI measurement in non-DRX

Parameter	Value	Comment
Test environment	NC	As specified in TS 36.508 [25] clause 4.1.
Test frequencies	As specified in Annex E, E.1.1, E.1.3.1 and Table E.3-1 and TS 38.508-1 [14] clause 4.3.1 for E-UTRA and 7.2.3 for NR.	
Channel bandwidth	As specified by the selected test configuration.	
Propagation conditions	AWGN	As specified in clause C.2.1
Connection Diagram	TE Part: A.3.3.1.1 DUT Part: A.3.4.1.1	As specified in TS 38.508-1 [14] Annex A.
Exceptions to connection diagram	N/A	

1. The test parameters are given in Table 5.6.4.2.4.1-3 below.

2. Message contents are defined in clause 5.6.4.2.4.3.

3. Two cells are deployed in the test, which are E-UTRAN PCell (Cell 1) and FR2 PSCell (Cell 2). The test parameters for PSCell is given in Table 5.6.4.2.4.1-3

   The UE Rx beam peak direction has been obtained previously using one of the Rx Beam Peak Search procedures as described in Annex I.

Table 5.6.4.2.4.1-3: General test parameters for CLI-RSSI event triggered reporting for PSCell in FR2

Parameter	Unit	Test configuration	Value	Comment
Active cell		1	E-UTRAN Cell 1 and NR Cell 2	
RF Channel Number		1	1: Cell 1 2: Cell 2	
SSB configuration		1	SSB.1 FR2	
SMTC configuration		1	SMTC.1	
CLI-RSSI configuration		1	CLI-RSSIConf.1	Table 5.6.4.2.5-3
CP length		1	Normal	
i1-Threshold	dBm	1	-94.5	
Hysteresis	dB	1	0	
Time To Trigger	s	1	0	
Filter coefficient		1	0	L3 filtering is not used
DRX		1	DRX.11	
Time offset between DL from serving cell and OCNG from test system	µs	1	10.67	
T1	s	1	5	
T2	s	1	1	

5.6.4.2.4.2 Test procedure

There are two cells are deployed in the test, which are E-UTRAN PCell (Cell 1) and FR2 PSCell (Cell 2)

In the measurement control information, a measurement object is configured for the frequency of the PSCell, and it is indicated to the UE that event-triggered reporting with Event I1 is used. The test consists of two successive time periods, with time duration of T1 and T2, respectively.

During the test, the test system transmits SRS resource for measurement in the DL slot according to the SRS configuration in Table 5.6.4.2.5-3 and the test parameters for the (virtual) neighbour cell UE in Table 5.6.4.2.5-23.

During the test, the test system does not transmit PDCCH/PDSCH/OCNG on SRS symbol to be transmitted and on 2 data symbols before SRS to be transmitted.

1. Ensure the UE is in State 3A-RF according to TS 36.508 [25] clause 7.2A.3.
2. Set the parameters according to Table 5.6.4.2.5-1 as appropriate.
3. The SS shall transmit an *RRCConnectionReconfiguration* message on Cell 1 with event I1 configured.
4. The UE shall transmit an *RRCConnectionReconfigurationComplete* message.

Editor's note: the rest of the steps are FFS.

5.6.4.2.4.3 Message contents

Message contents are according to TS 38.508-1 [14] clause 7.3 with the following exceptions:

FFS

5.6.4.2.5 Test requirement

Table 5.7.1.1.5-1 defines the cell specific settings for all tests. Table 5.7.1.1.5-2 defines the OTA primary level settings including test tolerances for all tests.

Table 5.6.4.2.5-1: NR Cell specific test parameters for CLI-RSSI event triggered reporting for PSCell in FR2

Parameter	Unit	Test configuration	Cell 2	
			T1	T2
TDD configuration		1	TDDConf.3.1	
PDSCH RMC configuration		1	SR.3.1 TDD	
PUSCH parameters		1	N/A	
RMSI CORESET RMC configuration		1	CR.3.1 TDD	
Dedicated CORESET RMC configuration		1	CCR.3.1 TDD	
OCNG Patterns Note 1		1	OP.1	
TRS configuration			TRS.2.1. TDD	
PDSCH/PDCCH TCI state		1	TCI.State.2	
Initial BWP configuration		1	DLBWP.0.1 ULBWP.0.1	
Active DL BWP configuration		1	DLBWP.1.1	
Active UL BWP configuration		1	ULBWP.1.1	
Propagation Condition		1	AWGN	
Note 1: OCNG is not transmitted in the CLI-RSSI measurement resources.				

Table 5.6.4.2.5-2: NR OTA Cell specific test parameters for CLI-RSSI event triggered reporting for PSCell in FR2

Parameter	Unit	Test configuration	Cell 2	
			T1	T2
AoA setup		1	Setup 1 defined in A.3.15.1	
Beam assumption Note 3		1	Fine	
N_{oc} on CLI-RSSI measurement resource Note 2	dBm/15 kHz	1	-119+TT	-108+TT
N_{oc} on CLI-RSSI measurement resource Note 2	dBm/SCS	1	-110	-99
Io on CLI-RSSI measurement resource	dBm/95.04 MHz	1	-81.01	-70.01
Io on CLI-RSSI measurement resource	dBm/1.08 MHz	1	-100.46	-89.46

Note 1:	The resources for uplink transmission are assigned to the UE prior to the start of time period T2.
Note 2:	Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for N_{oc} to be fulfilled.
Note 3:	Information about types of UE beam is given in B.2.1.3, and does not limit UE implementation or test system implementation.

Table 5.6.4.2.5-3: CLI-RSSI measurement resource configuration for measurement reporting

	Field	CLI-RSSIConf.1
RSSI-Resource	rssi-ResourceId	0
	rssi-SCS	120
	startPRB	0
	nrofPRBs	66
	startPosition	3
	nrofSymbols	11
	rssi-PeriodicityAndOffset	sl160, 25

The UE shall send one Event I1 triggered measurement report, with a measurement reporting delay less than 20 ms from the beginning of time period T2. The nominal RSSI used to evaluate the requirement shall be based on Io.

The UE shall not send event triggered measurement reports, as long as the reporting criteria are not fulfilled.

The rate of correct events observed during repeated tests shall be at least 90%.

NOTE: The actual overall delays measured in the test may be up to $2xTTI_{DCCH}$ higher than the measurement reporting delays above because of TTI insertion uncertainty of the measurement report in DCCH.

5.6.5

5.6.6 L1-SINR measurement for beam reporting

5.6.6.0 Minimum conformance requirements

5.6.6.0.1 L1-SINR reporting with CSI-RS based CMR and no dedicated IMR configured

The UE shall be capable of performing L1-SINR measurements with the CSI-RS resource configured as CMR and no dedicated resource configured as IMR for L1-SINR computation, and the UE physical layer shall be capable of reporting L1-SINR measured over the measurement period of $T_{L1\text{-}SINR_Measurement_Period_CSI\text{-}RS_CMR_Only}$.

The value of $T_{L1\text{-}SINR_Measurement_Period_CSI\text{-}RS_CMR_Only}$ is defined in Table 9.8.4.1-2 for FR2, where

For the value of M,

- For periodic and semi-persistent CSI-RS resources as CMR, M=1 if higher layer parameter *timeRestrictionForChannelMeasurement* is configured, and M=3 otherwise;

- For aperiodic CSI-RS resources as CMR, M=1.

For the value of N in FR2

- For periodic CSI-RS resources as CMR in a resource set configured with higher layer parameter *repetition* set to OFF, N=1. The requirements apply if *qcl-InfoPeriodicCSI-RS* is configured for all the resources in the resource set and for each resource one RS has QCL-TypeD with

  - SSB for L1-RSRP or L1-SINR measurement, or

  - another CSI-RS in resource set configured with repetition ON.

- For periodic CSI-RS resources as CMR in a resource set configured with higher layer parameter *repetition* set to ON, N=ceil(*maxNumberRxBeam* / $N_{res_per_set}$), where $N_{res_per_set}$ is number of resources in the resource set. The requirements apply provided *qcl-InfoPeriodicCSI-RS* is configured for all resources in the resource set.

- For semi-persistent CSI-RS resources as CMR in a resource set configured with higher layer parameter *repetition* set to OFF, N=1. The requirements apply provided TCI state is provided for all resources in the resource set in the MAC CE activating the resource set and for each resource has QCL-TypeD with

  - SSB for L1-RSRP or L1-SINR measurement, or

  - another CSI-RS in resource set configured with repetition ON.

- For semi-persistent CSI-RS resources as CMR in a resource set configured with higher layer parameter *repetition* set to ON, N=ceil(*maxNumberRxBeam* / $N_{res_per_set}$), where $N_{res_per_set}$ is number of resources in the resource set. The requirements apply provided TCI state is provided for all resources in the resource set in the MAC CE activating the resource set.

- For aperiodic CSI-RS resources as CMR in a resource set configured with higher layer parameter *repetition* set to OFF, N=1. The requirements apply provided *qcl-info* is configured for all resources in the resource set and for each resource has QCL-TypeD with

  - SSB for L1-RSRP or L1-SINR measurement, or

  - another CSI-RS in resource set configured with repetition ON.

- For aperiodic CSI-RS resources as CMR in a resource set configured with higher layer parameter *repetition* set to ON, N=1. UE is not required to meet the accuracy requirements in clause 10.1.28.1 and 10.1.28.3 if number of resources in the resource set is smaller than *maxNumberRxBeam*. The requirements apply provided *qcl-info* is configured for all resources in the resource set.

For the value of P in FR2,

- P=1, when CSI-RS is not overlapped with measurement gap and also not overlapped with SMTC occasion.

- $P=\frac{1}{1-\frac{T_{CSI-RS}}{MRGP}}$, when CSI-RS is partially overlapped with measurement gap and CSI-RS is not overlapped with SMTC occasion (T_{CSI-RS} < MGRP)

- $P=\frac{1}{1-\frac{T_{CSI-RS}}{T_{SMTCperiod}}}$, when CSI-RS is not overlapped with measurement gap and CSI-RS is partially overlapped with SMTC occasion ($T_{CSI-RS} < T_{SMTCperiod}$).

- P=3, when CSI-RS is not overlapped with measurement gap and CSI-RS is fully overlapped with SMTC occasion ($T_{CSI-RS} = T_{SMTCperiod}$).

- $P=\frac{1}{1-\frac{T_{CSI-RS}}{MRGP}-\frac{T_{CSI-RS}}{T_{SMTCperiod}}}$, when CSI-RS is partially overlapped with measurement gap and CSI-RS is partially overlapped with SMTC occasion ($T_{CSI-RS} < T_{SMTCperiod}$) and SMTC occasion is not overlapped with measurement gap and

  - $T_{SMTCperiod} \neq$ MGRP or

  - $T_{SMTCperiod}$ = MGRP and $T_{CSI-RS} < 0.5*T_{SMTCperiod}$

- $P=\frac{3}{1-\frac{T_{CSI-RS}}{MRGP}}$, when CSI-RS is partially overlapped with measurement gap and CSI-RS is partially overlapped with SMTC occasion ($T_{CSI-RS} < T_{SMTCperiod}$) and SMTC occasion is not overlapped with measurement gap and $T_{SMTCperiod}$ = MGRP and $T_{CSI-RS} = 0.5*T_{SMTCperiod}$

- $P=\frac{1}{1-\frac{T_{CSI-RS}}{\min(T_{SMTCperiod},MGRP)}}$, when CSI-RS is partially overlapped with measurement gap (T_{CSI-RS} < MGRP) and CSI-RS is partially overlapped with SMTC occasion ($T_{CSI-RS} < T_{SMTCperiod}$) and SMTC occasion is partially or fully overlapped with measurement gap.

- $P=\frac{3}{1-\frac{T_{CSI-RS}}{MRGP}}$, when CSI-RS is partially overlapped with measurement gap and CSI-RS is fully overlapped with SMTC occasion ($T_{CSI-RS} = T_{SMTCperiod}$) and SMTC occasion is partially overlapped with measurement gap ($T_{SMTCperiod} < MGRP$)

Where:

$T_{SMTCperiod}$ = the configured SMTC1 period or SMTC2 period if configured.

T_{CSI-RS} = the periodicity of CSI-RS configured for L1-SINR measurement

If the high layer in TS 38.331 [2] signalling of *smtc2* is configured, $T_{SMTCperiod}$ corresponds to the value of higher layer parameter *smtc2*; Otherwise $T_{SMTCperiod}$ corresponds to the value of higher layer parameter *smtc1*.

Note: The overlap between CSI-RS for L1-SINR measurement and SMTC means that CSI-RS for L1-SINR measurement is within the SMTC window duration.

Longer evaluation period would be expected if the combination of CSI-RS, SMTC occasion and measurement gap configurations does not meet pervious conditions.

Table 9.8.4.1-2: Measurement period $T_{L1\text{-}SINR_Measurement_Period_CSI\text{-}RS_CMR_Only}$ for FR2

Configuration	$T_{L1\text{-}SINR_Measurement_Period_CSI\text{-}RS_CMR_Only}$ (ms)
non-DRX	$\max(T_{Report}, \text{ceil}(M*P*N)*T_{CSI\text{-}RS})$
DRX cycle ≤ 320ms	$\max(T_{Report}, \text{ceil}(1.5*M*P*N)*\max(T_{DRX},T_{CSI\text{-}RS}))$
DRX cycle > 320ms	$\text{ceil}(M*P*N)*T_{DRX}$
Note 1: $T_{CSI\text{-}RS}$ is the periodicity of CSI-RS configured for L1-SINR measurement. T_{DRX} is the DRX cycle length. T_{Report} is configured periodicity for reporting.	
Note 2: the requirements are applicable provided that the CSI-RS resource configured for L1-SINR measurement is transmitted with Density = 3.	

The UE shall send L1-SINR reports only for report configurations configured for the active BWP.

The UE shall report the L1-SINR value as a 7-bit value in the range [-23, 40] dB with 0.5dB step size if *nrofReportedRS* is configured to one. If *nrofReportedRS* is configured to be larger than one, or if *groupBasedBeamReporting* is enabled, the UE shall use differential L1-SINR based reporting. The differential L1-SINR is quantized to a 4-bit value with 1dB step size. The mapping between the reported L1-SINR value and the measured quantity is described in 10.1.16.

Reported L1-SINR measurements contained in aperiodic triggered, aperiodic triggered periodic and aperiodic triggered semi-persistent L1-SINR reports shall meet the requirements in clauses 10.1.27 for FR1 and 10.1.28 for FR2, respectively.

The UE shall only send aperiodic L1-SINR measurement reports, if a DCI for triggering report has been received.

After the UE receives CSI request in DCI, the UE shall transmit the aperiodic L1-SINR reporting on PUSCH over the air interface at the time specified according to clause 5.2.1.4 in TS 38.214 [26].

The UE is required to be capable of measuring L1-SINR without measurement gaps. The UE is required to perform the SSB and CSI-RS/CSI-IM measurements with measurement restrictions as described in the following clauses.

For both FR1 and FR2, when the CSI-RS configured for L1-SINR measurement is in the same OFDM symbol as SSB for RLM, BFD, CBD, L1-RSRP or L1-SINR measurement, UE is not required to receive CSI-RS for L1-SINR measurement in the PRBs that overlap with an SSB.

For FR2, when the CSI-RS configured for L1-SINR measurement on one CC is in the same OFDM symbol as SSB for RLM, BFD, L1-RSRP or L1-SINR measurement on the same CC or different CCs in the same band, or in the same symbol as SSB for CBD measurement on the same CC or different CCs in the same band when beam failure is detected, UE is required to measure one of but not both CSI-RS for L1-SINR measurement and SSB. Longer measurement period for CSI-RS based L1-SINR measurement is expected, and no requirements are defined.

For FR2, when the CSI-RS configured for L1-SINR measurement on one CC is in the same OFDM symbol as another CSI-RS for RLM, BFD, CBD, L1-RSRP or L1-SINR measurement on the same CC or different CCs in the same band,

- In the following cases, UE is required to measure one of but not both CSI-RS for L1-SINR measurement and the other CSI-RS. Longer measurement period for CSI-RS based L1-SINR measurement is expected, and no requirements are defined.
  - The CSI-RS for L1-SINR measurement or the other CSI-RS in a resource set configured with repetition ON, or
  - The CSI-RS or the other CSI-RS is configured as dedicated IMR for L1-SINR computation with SSB as CMR, or
  - The other CSI-RS is configured in q1 and beam failure is detected, or
  - The two CSI-RS-es are not QCL-ed w.r.t. QCL-TypeD, or the QCL information is not known to UE,
- Otherwise, UE shall be able to measure the CSI-RS configured for L1-SINR measurement without any restriction.

The normative reference for this requirement is TS 38.133 [6] clause 9.8.3, 9.8.4.1 and 9.8.5.

5.6.6.0.2 L1-SINR reporting with SSB based CMR and dedicated IMR configured

The UE shall be capable of performing L1-SINR measurements with the SSB configured as CMR and dedicated resource configured as IMR for L1-SINR computation, in which the NZP-CSI-RS or CSI-IM resource configured as dedicated IMR shall be 1-to-1 mapped to SSB configured as CMR, with the same periodicity. The UE physical layer shall be capable of reporting L1-SINR measured over the measurement period of $T_{L1\text{-}SINR_Measurement_Period_SSB_CMR_IMR}$.

The requirements in this clause are not applicable if NZP-CSI-RS or CSI-IM resource configured as dedicated IMR is scheduled with different periodicity as SSB configured as CMR.

The value of $T_{L1\text{-}SINR_Measurement_Period_SSB_CMR_IMR}$ is defined in Table 9.8.4.2-2 for FR2, where

For the value of M

- For periodic or semi-persistent NZP CSI-RS or CSI-IM resource as dedicated IMR, M=1 if the higher layer parameters *timeRestrictionForChannelMeasurements* and/or *timeRestrictionForInterferenceMeasurements* are configured, and M=3 otherwise;

For the value of N in FR2

- N = 8.

P is defined as the maximum value between P_{CMR} and P_{IMR}, i.e., $P = \max(P_{CMR}, P_{IMR})$, where

- the value of P_{CMR} shall be derived in the same way as the value of P used for SSB based L1-RSRP measurement in clause 9.5.4.1, in which the occasions and period of the SSB for CMR shall be used instead.
- the value of P_{IMR} shall be derived in the same way as the value of P used for CSI-RS based L1-RSRP measurement in clause 9.5.4.2, in which the occasions and period of the NZP CSI-RS for NZP-IMR or CSI-IM for ZP-IMR shall be used instead.

Longer evaluation period would be expected if the combination of SSB, SMTC occasion and measurement gap configurations does not meet pervious conditions.

For L1-SINR measurement with SSB as CMR and CSI-RS or CSI-IM as IMR, the requirement shall apply if the CSI-RS is configured as IMR with repetition field as “repetition = OFF” or CSI-IM is configured as IMR.

For L1-SINR measurement with SSB as CMR and CSI-RS/CSI-IM as IMR, no requirement shall apply if SSB occasions for CMR or CSI-RS/CSI-IM occasions for IMR are fully overlapped with the configured measurement gap.

Table 9.8.4.2-2: Measurement period $T_{L1\text{-}SINR_Measurement_Period_SSB_CMR_IMR}$ for FR2

Configuration	$T_{L1\text{-}SINR_Measurement_Period_SSB_CMR_IMR}$ (ms)
non-DRX	$\max(T_{Report}, \text{ceil}(M*P*N)*T_{SSB})$
DRX cycle ≤ 320ms	$\max(T_{Report}, \text{ceil}(1.5*M*P*N)*\max(T_{DRX},T_{SSB}))$
DRX cycle > 320ms	$\text{ceil}(1.5*M*P*N)*T_{DRX}$

Note 1:	T_{SSB} = ssb-periodicityServingCell is the periodicity of the SSB-Index configured for L1-SINR measurement. T_{DRX} is the DRX cycle length. T_{Report} is configured periodicity for reporting.
Note 2:	The requirements are applicable provided that the CSI-RS resource configured for interference measurement shall be 1-to-1 mapped to SSB configured for channel measurement, with the same periodicity.

The UE shall send L1-SINR reports only for report configurations configured for the active BWP.

The UE shall report the L1-SINR value as a 7-bit value in the range [-23, 40] dB with 0.5dB step size if *nrofReportedRS* is configured to one. If *nrofReportedRS* is configured to be larger than one, or if *groupBasedBeamReporting* is enabled, the UE shall use differential L1-SINR based reporting. The differential L1-SINR is quantized to a 4-bit value with 1dB step size. The mapping between the reported L1-SINR value and the measured quantity is described in 10.1.16.

The UE shall transmit the periodic L1-SINR reporting on PUCCH over the air interface according to the periodicity defined in clause 5.2.1.4 in TS 38.214 [26].

Reported L1-SINR measurements contained in periodic L1-SINR measurement reports shall meet the requirements in clauses 10.1.27 for FR1 and 10.1.28 for FR2, respectively.

For FR2, when the SSB configured as CMR for L1-SINR measurement on one CC is in the same OFDM symbol as CSI-RS for RLM, BFD, CBD, L1-RSRP or L1-SINR measurement on the same CC or different CCs in the same band, UE is required to measure one of but not both SSB for L1-SINR measurement and CSI-RS. Longer measurement period for SSB based L1-RSRP measurement is expected, and no requirements are defined.

For FR2, there is no measurement restriction allowed when the network configures mixed numerology between SSB configured as CMR for L1-SINR measurement on one FR2 band and CSI-RS for RLM, BFD, CBD, L1-RSRP or L1-SINR measurement on the other FR2 band, provided that UE is capable of independent beam management on this FR2 band pair.

For both FR1 and FR2, when the CSI-RS configured for L1-SINR measurement is in the same OFDM symbol as SSB for RLM, BFD, CBD, L1-RSRP or L1-SINR measurement, UE is not required to receive CSI-RS for L1-SINR measurement in the PRBs that overlap with an SSB.

For FR2, when the CSI-RS configured for L1-SINR measurement on one CC is in the same OFDM symbol as SSB for RLM, BFD, L1-RSRP or L1-SINR measurement on the same CC or different CCs in the same band, or in the same symbol as SSB for CBD measurement on the same CC or different CCs in the same band when beam failure is detected, UE is required to measure one of but not both CSI-RS for L1-SINR measurement and SSB. Longer measurement period for CSI-RS based L1-SINR measurement is expected, and no requirements are defined.

For FR2, when the CSI-RS configured for L1-SINR measurement on one CC is in the same OFDM symbol as another CSI-RS for RLM, BFD, CBD, L1-RSRP or L1-SINR measurement on the same CC or different CCs in the same band,

- In the following cases, UE is required to measure one of but not both CSI-RS for L1-SINR measurement and the other CSI-RS. Longer measurement period for CSI-RS based L1-SINR measurement is expected, and no requirements are defined.
  - The CSI-RS for L1-SINR measurement or the other CSI-RS in a resource set configured with repetition ON, or
  - The CSI-RS or the other CSI-RS is configured as dedicated IMR for L1-SINR computation with SSB as CMR, or
  - The other CSI-RS is configured in q1 and beam failure is detected, or
  - The two CSI-RS-es are not QCL-ed w.r.t. QCL-TypeD, or the QCL information is not known to UE,
- Otherwise, UE shall be able to measure the CSI-RS configured for L1-SINR measurement without any restriction.

For both FR1 and FR2, when the CSI-IM configured for L1-SINR measurement is in the same OFDM symbol as SSB for RLM, BFD, CBD, L1-RSRP or L1-SINR measurement, UE is not required to measure CSI-IM for L1-SINR measurement in the PRBs that overlap with an SSB.

For FR2, when the CSI-IM configured for L1-SINR measurement on one CC is in the same OFDM symbol as SSB for RLM, BFD, L1-RSRP or L1-SINR measurement on the same CC or different CCs in the same band, or in the same symbol as SSB for CBD measurement on the same CC or different CCs in the same band when beam failure is detected, UE is required to measure one of but not both CSI-IM for L1-SINR measurement and SSB. Longer measurement period for L1-SINR measurement is expected, and no requirements are defined.

For FR2, when the CSI-IM configured for L1-SINR measurement on one CC is in the same OFDM symbol as the CSI-RS for RLM, BFD, CBD, L1-RSRP or L1-SINR measurement on the same CC or different CCs in the same band,

- In the following cases, UE is required to measure one of but not both CSI-IM for L1-SINR measurement and CSI-RS. Longer measurement period for L1-SINR measurement is expected, and no requirements are defined.
  - The CSI-RS in a resource set configured with repetition ON, or
  - The CSI-IM or the CSI-RS is configured as dedicated IMR for L1-SINR computation with SSB as CMR, or
  - The CSI-RS is configured in q1 and beam failure is detected, or
  - The CMR for L1-SINR measurement and the CSI-RS are not QCL-ed w.r.t. QCL-TypeD, or the QCL information is not known to UE,
- Otherwise, UE shall be able to measure the CSI-IM configured for L1-SINR measurement without any restriction.

The normative reference for this requirement is TS 38.133 [6] clause 9.8.3, 9.8.4.2 and 9.8.5.

5.6.6.0.3 L1-SINR reporting with CSI-RS based CMR and dedicated IMR configured

The UE shall be capable of performing L1-SINR measurements with the CSI-RS resource configured as CMR and dedicated resource configured as IMR for L1-SINR computation, in which the NZP-CSI-RS or CSI-IM resource configured as dedicated IMR shall be 1-to-1 mapped to CSI-RS resource configured as CMR, with the same periodicity. The UE physical layer shall be capable of reporting L1-SINR measured over the measurement period of $T_{L1\text{-}SINR_Measurement_Period_CSI\text{-}RS_CMR_IMR}$.

The requirements in this clause are not applicable if NZP-CSI-RS or CSI-IM resource configured as dedicated IMR is scheduled with different periodicity as CSI-RS resource configured as CMR.

The value of $T_{L1\text{-}SINR_Measurement_Period_CSI\text{-}RS_CMR_IMR}$ is defined in Table 9.8.4.3-2 for FR2, where

For the value of M,

- M=1 shall be applied if
  - aperiodic NZP-CSI-RS as CMR or dedicated IMR, or
  - aperiodic CSI-IMR as dedicated IMR, or
  - periodic and semi-persistent NZP-CSI-RS as CMR or dedicated IMR and the higher layer parameters *timeRestrictionForChannelMeasurement* and/or *timeRestrictionForInterferenceMeasurements* are configured, or
  - periodic and semi-persistent CSI-IM as dedicated IMR and the higher layer parameters *timeRestrictionForChannelMeasurement* and/or *timeRestrictionForInterferenceMeasurements* are configured;
- M=3 otherwise.

For the value of N in FR2

- For periodic CSI-RS resources as CMR in a resource set configured with higher layer parameter *repetition* set to OFF, N=1. The requirements apply if *qcl-InfoPeriodicCSI-RS* is configured for all the resources in the resource set and for each resource one RS has QCL-TypeD with
  - SSB for L1-RSRP or L1-SINR measurement, or
  - another CSI-RS in resource set configured with repetition ON.

- For periodic CSI-RS resources as CMR in a resource set configured with higher layer parameter *repetition* set to ON, N=ceil(*maxNumberRxBeam* / $N_{res_per_set}$), where $N_{res_per_set}$ is number of resources in the resource set. The requirements apply provided *qcl-InfoPeriodicCSI-RS* is configured for all resources in the resource set.

- For semi-persistent CSI-RS resources as CMR in a resource set configured with higher layer parameter *repetition* set to OFF, N=1. The requirements apply provided TCI state is provided for all resources in the resource set in the MAC CE activating the resource set and for each resource has QCL-TypeD with

  - SSB for L1-RSRP or L1-SINR measurement, or

  - another CSI-RS in resource set configured with repetition ON.

- For semi-persistent CSI-RS resources as CMR in a resource set configured with higher layer parameter *repetition* set to ON, N=ceil(*maxNumberRxBeam* / $N_{res_per_set}$), where $N_{res_per_set}$ is number of resources in the resource set. The requirements apply provided TCI state is provided for all resources in the resource set in the MAC CE activating the resource set.

- For aperiodic CSI-RS resources as CMR in a resource set configured with higher layer parameter *repetition* set to OFF, N=1. The requirements apply provided *qcl-info* is configured for all resources in the resource set and for each resource has QCL-TypeD with

  - SSB for L1-RSRP or L1-SINR measurement, or

  - another CSI-RS in resource set configured with repetition ON.

- For aperiodic CSI-RS resources as CMR in a resource set configured with higher layer parameter *repetition* set to ON, N=1. UE is not required to meet the accuracy requirements in clause 10.1.28.1 and 10.1.28.3 if number of resources in the resource set is smaller than *maxNumberRxBeam*. The requirements apply provided *qcl-info* is configured for all resources in the resource set.

P is defined as the maximum value between P_{CMR} and P_{IMR}, i.e., $P = \max(P_{CMR}, P_{IMR})$, where

- The value of P_{CMR} and P_{IMR} shall be derived in the same way as the value of P used for CSI-RS based L1-RSRP measurement in clause 9.5.4.2, in which the occasions and period of the CSI-RS for CMR and NZP CSI-RS for NZP-IMR or CSI-IM for ZP-IMR shall be used instead respectively.

Longer evaluation period would be expected if the combination of CSI-RS, SMTC occasion and measurement gap configurations does not meet pervious conditions.

For L1-SINR measurement with CSI-RS as CMR and CSI-RS as IMR, the requirement shall apply only if CSI-RS resources as CMR and IMR are configured with the same repetition field and the number of CSI-RS resources in the resource sets for CMR and IMR are same.

For L1-SINR measurement with CSI-RS as CMR and CSI-IM as IMR, the requirement shall apply only if the number of CSI-RS resources in the resource set for CMR and the number of CSI-IM resources in the resource set for IMR are same.

For L1-SINR measurement with CSI-RS as CMR and CSI-RS/CSI-IM as IMR, no requirement shall apply if CSI-RS occasions for CMR or CSI-RS/CSI-IM occasions for IMR are fully overlapped with the configured measurement gap.

Table 9.8.4.3-2: Measurement period $T_{L1\text{-}SINR_Measurement_Period_CSI\text{-}RS_CMR_IMR}$ for FR2

Configuration	$T_{L1\text{-}SINR_Measurement_Period_CSI\text{-}RS_CMR_IMR}$ (ms)
non-DRX	$\max(T_{Report}, \text{ceil}(M*P*N)*T_{CSI\text{-}RS})$
DRX cycle ≤ 320ms	$\max(T_{Report}, \text{ceil}(1.5*M*P*N)*\max(T_{DRX},T_{CSI\text{-}RS}))$
DRX cycle > 320ms	$\text{ceil}(M*P*N)*T_{DRX}$
Note 1: $T_{CSI\text{-}RS}$ is the periodicity of CSI-RS configured for L1-SINR measurement. T_{DRX} is the DRX cycle length. T_{Report} is configured periodicity for reporting. Note 2: the requirements are applicable provided that the CSI-RS resource configured for L1-SINR measurement is transmitted with Density = 3. Note 3: The requirements are applicable provided that the CSI-RS resource configured for interference measurement shall be 1-to-1 mapped to CSI-RS configured for channel measurement, with the same periodicity.	

The UE shall send L1-SINR reports only for report configurations configured for the active BWP.

The UE shall report the L1-SINR value as a 7-bit value in the range [-23, 40] dB with 0.5dB step size if *nrofReportedRS* is configured to one. If *nrofReportedRS* is configured to be larger than one, or if *groupBasedBeamReporting* is enabled, the UE shall use differential L1-SINR based reporting. The differential L1-SINR is quantized to a 4-bit value with 1dB step size. The mapping between the reported L1-SINR value and the measured quantity is described in 10.1.16.

Reported L1-SINR measurements contained in aperiodic triggered, aperiodic triggered periodic and aperiodic triggered semi-persistent L1-SINR reports shall meet the requirements in clauses 10.1.27 for FR1 and 10.1.28 for FR2, respectively.

The UE shall only send aperiodic L1-SINR measurement reports, if a DCI for triggering report has been received.

After the UE receives CSI request in DCI, the UE shall transmit the aperiodic L1-SINR reporting on PUSCH over the air interface at the time specified according to clause 5.2.1.4 in TS 38.214 [26].

For both FR1 and FR2, when the CSI-RS configured for L1-SINR measurement is in the same OFDM symbol as SSB for RLM, BFD, CBD, L1-RSRP or L1-SINR measurement, UE is not required to receive CSI-RS for L1-SINR measurement in the PRBs that overlap with an SSB.

For FR2, when the CSI-RS configured for L1-SINR measurement on one CC is in the same OFDM symbol as SSB for RLM, BFD, L1-RSRP or L1-SINR measurement on the same CC or different CCs in the same band, or in the same symbol as SSB for CBD measurement on the same CC or different CCs in the same band when beam failure is detected, UE is required to measure one of but not both CSI-RS for L1-SINR measurement and SSB. Longer measurement period for CSI-RS based L1-SINR measurement is expected, and no requirements are defined.

For FR2, when the CSI-RS configured for L1-SINR measurement on one CC is in the same OFDM symbol as another CSI-RS for RLM, BFD, CBD, L1-RSRP or L1-SINR measurement on the same CC or different CCs in the same band,

- In the following cases, UE is required to measure one of but not both CSI-RS for L1-SINR measurement and the other CSI-RS. Longer measurement period for CSI-RS based L1-SINR measurement is expected, and no requirements are defined.
  - The CSI-RS for L1-SINR measurement or the other CSI-RS in a resource set configured with repetition ON, or
  - The CSI-RS or the other CSI-RS is configured as dedicated IMR for L1-SINR computation with SSB as CMR, or
  - The other CSI-RS is configured in q1 and beam failure is detected, or
  - The two CSI-RS-es are not QCL-ed w.r.t. QCL-TypeD, or the QCL information is not known to UE,
- Otherwise, UE shall be able to measure the CSI-RS configured for L1-SINR measurement without any restriction.

For both FR1 and FR2, when the CSI-IM configured for L1-SINR measurement is in the same OFDM symbol as SSB for RLM, BFD, CBD, L1-RSRP or L1-SINR measurement, UE is not required to measure CSI-IM for L1-SINR measurement in the PRBs that overlap with an SSB.

For FR2, when the CSI-IM configured for L1-SINR measurement on one CC is in the same OFDM symbol as SSB for RLM, BFD, L1-RSRP or L1-SINR measurement on the same CC or different CCs in the same band, or in the same symbol as SSB for CBD measurement on the same CC or different CCs in the same band when beam failure is detected, UE is required to measure one of but not both CSI-IM for L1-SINR measurement and SSB. Longer measurement period for L1-SINR measurement is expected, and no requirements are defined.

For FR2, when the CSI-IM configured for L1-SINR measurement on one CC is in the same OFDM symbol as the CSI-RS for RLM, BFD, CBD, L1-RSRP or L1-SINR measurement on the same CC or different CCs in the same band,

- In the following cases, UE is required to measure one of but not both CSI-IM for L1-SINR measurement and CSI-RS. Longer measurement period for L1-SINR measurement is expected, and no requirements are defined.
  - The CSI-RS in a resource set configured with repetition ON, or
  - The CSI-IM or the CSI-RS is configured as dedicated IMR for L1-SINR computation with SSB as CMR, or

- The CSI-RS is configured in q1 and beam failure is detected, or
- The CMR for L1-SINR measurement and the CSI-RS are not QCL-ed w.r.t. QCL-TypeD, or the QCL information is not known to UE,

- Otherwise, UE shall be able to measure the CSI-IM configured for L1-SINR measurement without any restriction.

The normative reference for this requirement is TS 38.133 [6] clause 9.8.3, 9.8.4.3 and 9.8.5.

5.6.6.1 EN-DC FR2 CSI-RS based CMR and no dedicated IMR L1-SINR measurement in DRX

Editor's Note: This test case has been completed for the following configurations:

- Test frequency f ≤ 40.8 GHz
- UE PC3
- Normal conditions
- The test is incomplete for UE power classes other than PC3
- The test is incomplete for test frequencies > 40.8 GHz
- The test case is incomplete for extreme conditions

5.6.6.1.1 Test purpose

To verify that the UE makes correct reporting of L1-SINR measurement within L1-SINR measurement requirements in TS 38.133 [6] clause 9.8.4.1.

5.6.6.1.2 Test applicability

This test applies to all types of E-UTRA UE release 16 and forward, supporting EN-DC FR2 and long DRX cycle and L1-SINR measurement.

5.6.6.1.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 5.6.6.0.1.

The normative reference for this requirement is TS 38.133 [6] clause A.5.6.6.1.

5.6.6.1.4 Test description

5.6.6.1.4.1 Initial conditions

This test shall be tested using any of the test configurations in Table 5.6.6.1.4.1-1. Configure the test equipment and the DUT according to the parameters in Table 5.6.6.1.4.1-2. Test environment parameters are given in Table 5.6.6.1.4.1-3.

Table 5.6.6.1.4.1-1: Applicable NR configurations for FR2 CSI-RS based L1-SINR test

Config	Description
1	LTE FDD, NR 120 kHz CSI-RS SCS, 100 MHz bandwidth, TDD duplex mode
2	LTE TDD, NR 120 kHz CSI-RS SCS, 100 MHz bandwidth, TDD duplex mode
Note: The UE is only required to be tested in one of the supported test configurations	

Table 5.6.6.1.4.1-2: General test parameters for FR2 CSI-RS based L1-SINR test

Parameter	Config	Unit	Value
SSB GSCN	1~2		freq1
Duplex mode	1~2		TDD

TDD Configuration	1~2		TDDConf.3.1
$BW_{channel}$	1~2	MHz	100: $N_{RB,c}$ = 66
PDSCH Reference measurement channel	1~2		SR.3.1 TDD
RMSI CORESET Reference Channel	1~2		CR.3.1 TDD
Dedicated CORESET Reference Channel	1~2		CCR.3.1 TDD
SSB configuration	1~2		SSB.1 FR2
CSI-RS configuration	1~2		CSI-RS.3.3 TDD
OCNG Patterns	1~2		OP.1
Initial BWP Configuration	1~2		DLBWP.0.1 ULBWP.0.1
Dedicated BWP configuration	1~2		DLBWP.1.3 ULBWP.1.3
SMTC configuration	1~2		SMTC.1
TRS Configuration	1~2		TRS.2.1 TDD
PDCCH/PDSCH TCI Configuration	1~2		TCI.State.2
DRX configuration	1~2		DRX.3
reportConfigType	1~2		aperiodic
reportQuantity-r16	1~2		cri-SINR-r16
Number of reported RS	1~2		2
qcl-Info	1~2		SSB#0 for resource#0 SSB#1 for resource#1
reportSlotOffsetList	1~2		26
Propagation condition	1~2		AWGN
T1	1~2	s	5
EPRE ratio of PSS to SSS	1~2	dB	0
EPRE ratio of PBCH DMRS to SSS			
EPRE ratio of PBCH to PBCH DMRS			
EPRE ratio of PDCCH DMRS to SSS			
EPRE ratio of PDCCH to PDCCH DMRS			
EPRE ratio of PDSCH DMRS to SSS			
EPRE ratio of PDSCH to PDSCH DMRS			
EPRE ratio of OCNG DMRS to SSS Note 1			
EPRE ratio of OCNG to OCNG DMRS Note 1			
Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.			

Table 5.6.6.1.4.1-3: Test Environment parameters for FR2 CSI-RS based L1-SINR test

Parameter	Value		Comment
Test environment	NC		As specified in TS 38.508-1 [14] clause 4.1.
Test frequencies	As specified in Annex E, Table E.2-1 and TS 38.508-1 [14] clause 4.3.1 for E-UTRA, 7.2.3 for NR FR2.		
Channel bandwidth	As specified by the test configuration selected from Table 5.6.6.1.4.1-1.		
Propagation conditions	AWGN		As specified in clause C.2.2.
Connection Diagram	TE Part	A.3.3.3.1-1	As specified in TS 38.508-1 [14] Annex A.
	DUT Part	A.3.4.1.1	
Exceptions to connection diagram	N/A		

1. Message contents are defined in clause 5.6.6.1.4.3.

2. The AoA setup for this test is Setup 1 as defined in clause A.9. The UE RX Beam Peak direction has been obtained previously using one of the search procedures as described in Annex I.

5.6.6.1.4.2 Test procedure

The test consists of a single time period T1, during which the UE is triggered via DCI to report L1-SINR on aperiodic CSI-RS resources. Prior to the start of the time duration T1, the UE shall be fully synchronized to PSCell. UE is also configured to measure L1-SINR based on SSB. Upon receiving the DCI trigger, UE provides the report back based on the reporting configuration as defined in Table 5.6.6.1.4.1-2.

1. Ensure the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity EN-DC, DC bearer MCG and SCG, Connected without release *On* and Test Mode *On*, according to TS 38.508-1 [14] clause 4.5.

2. Set the parameters according to T1 in Table 5.6.6.1.5-1. T1 starts.

3. After 480ms from the start of the test the SS transmits the DCI trigger in slot 8.

4. The SS shall check following requirements:

   - R1: the UE shall send L1-SINR report at slot 26 from the reception of DCI trigger. If the report is received at slot 26 from the reception of DCI trigger, the number of passed iterations for R1 is increased by one. Otherwise, the number of failed iterations for R1 is increased by one.

   - R2: the L1-SINR value of CSI-RS#1 reported by the UE is compared to the expected L1-SINR value for CSI-RS#1. If the resulting value is outside the limits in Table 5.6.6.1.5-2 or the UE fails to report the measurement value for CSI-RS #1, the number of failed iterations for R2 is increased by one. Otherwise, the number of passed iterations for R2 is increased by one.

   -R3: The DIFF SINR value of CSI-RS#0 reported by the UE is compared to the expected DIFF SINR value. If the resulting value is outside the limits in Table 5.6.6.1.5-3 or the UE fails to report the measurement value for CSI-RS 0, the number of failed iterations for R3 is increased by one. Otherwise, the number of passed iterations for R3 is increased by one.

5. The SS shall transmit *RRCConnectionReconfiguration* message with condition EN-DC_PSCell_Rel according to TS 36.508 [25] Table 4.6.1-8 to release NR cell (PSCell). The UE shall transmit *RRCConnectionReconfigurationComplete* message.

6. The SS then shall transmit *RRCConnectionReconfiguration* message with condition MCG_and_SCG according to TS 36.508 [25] Table 4.6.1-8 to add NR cell (PSCell). The UE shall transmit *RRCConnectionReconfigurationComplete* message.

7 If any the reconfiguration fails, switch off and on the UE and ensure the UE is in RRC_CONNECTED with generic procedure parameters Connectivity EN-DC, DC bearer MCG and SCG, Connected without release On and Test Mode *On* according to TS 38.508-1 [14] clause 4.5.

8. Repeat steps 2-7 until the confidence level according to Tables G.2.3-1 in Annex G clause G.2 is achieved.

5.6.6.1.4.3 Message contents

Message contents are according to TS 38.508-1 [14] clause 7.3 with the following exceptions:

Table 5.6.6.1.4.3-1: Common Exception messages for EN-DC FR2 CSI-based CMR and no dedicated IMR L1-SINR measurement

Default Message Contents	
Common contents of system information blocks exceptions	
Default RRC messages and information elements contents exceptions	Table H.3.6A-1 with conditions APERIODIC and CSI-SINR Table H.3.6A-2 with conditions CSI-RS and APERIODIC Table H.3.4-1 Table H.3.7-1 with condition DRX.3

Table 5.6.6.1.4.3-2: RadioLinkMonitoringConfig

Derivation Path: TS 38.508-1 [14], Table 4.6.3-133			
Information Element	**Value/remark**	**Comment**	**Condition**
RadioLinkMonitoringConfig ::= SEQUENCE {			
failureDetectionResourcesToAddModList SEQUENCE (SIZE(1..maxNrofFailureDetectionResources)) OF SEQUENCE {	1 entry		
purpose	both	UE is configured to perform RLM and BFD based on the SSBs.	
}			
}			

5.6.6.1.5 Test requirement

Table 5.6.6.1.5-1 defines the primary level settings including test tolerances for all tests.

Table 5.6.6.1.5-1: CSI-RS specific test parameters for EN-DC FR2 CSI-based CMR and no dedicated IMR L1-SINR measurement

Parameter	Config	Unit	CSI-RS#0	CSI-RS#1
Angle of arrival configuration	1~2		Setup 1 according to A.3.15.1	
Beam assumption Note 3	1~2		Rough	
N_{oc} Note1	1~2	dBm/15kHz	-105	
N_{oc} Note1	1~2	dBm/SSB SCS	-95.97	
$\hat{E}_s / I_{ot}$	1~2	dB	0	9
CSI-RS RSRP Note2	1~2	dBm/SSB SCS	-95.97	-86.97
Io Note2	1~2	dBm/95.04MHz	-63.97	-57.47
$\hat{E}_s / N_{oc}$	1~2	dB	0	9
Note 1: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for N_{oc} to be fulfilled.				
Note 2: CSI-RS RSRP and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.				
Note 3: Information about types of UE beam is given in B.2.1.3, and does not limit UE implementation or test system implementation				

After 480ms from the beginning of the test, the UE shall send L1-SINR report at slot 26 from the reception of DCI triggering the L1-SINR measurement. The L1-SINR report shall include the results for both CSI-RS#0 and CSI-RS#1. Each L1-SINR measurement report shall meet the corresponding absolute accuracy requirements in Table 5.6.6.1.5-2 and the corresponding relative accuracy requirements in Table 5.6.6.1.5-3.

Table 5.6.6.1.5-2: L1-SINR absolute accuracy requirements for the reported values R2

Normal Conditions	T1
Lowest reported value (CSI-RS#1)	51
Highest reported value (CSI-RS #1)	74

Table 5.6.6.1.5-3: L1-SINR relative accuracy requirements for the reported values R3

Normal Conditions	T1
Lowest DIFF SINR reported (CSI-RS #0)	4
Highest DIFF SINR reported (CSI-RS #0)	13

The rate of correct events observed during repeated tests (R1 to R3) shall be at least 90% with a confidence level of 95%.

NOTE: The actual overall delays measured in the test may be up to $2xTTI_{DCCH}$ higher than the measurement reporting delays above because of TTI insertion uncertainty of the measurement report in DCCH.

5.6.6.2 EN-DC FR2 SSB based CMR and dedicated IMR L1-SINR measurement in non-DRX

Editor's Note: This test case has been completed for the following configurations:

- Test frequency f ≤ 40.8 GHz
- UE PC3
- Normal conditions
- The test is incomplete for UE power classes other than PC3
- The test is incomplete for test frequencies > 40.8 GHz
- The test case is incomplete for extreme conditions

5.6.6.2.1 Test purpose

To verify that the UE makes correct reporting of L1-SINR measurement in non-DRX within L1-SINR measurement requirements in TS 38.133 [6] clause 9.8.4.2.

5.6.6.2.2 Test applicability

This test applies to all types of E-UTRA UE release 16 and forward, supporting EN-DC FR2 and L1-SINR measurement reporting.

5.6.6.2.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 5.6.6.0.2.

The normative reference for this requirement is TS 38.133 [6] clause A.5.6.6.2.

5.6.6.2.4 Test description

5.6.6.2.4.1 Initial conditions

This test shall be tested using any of the test configurations in Table 5.6.6.2.4.1-1. Configure the test equipment and the DUT according to the parameters in Table 5.6.6.2.4.1-2. Test environment parameters are given in Table 5.6.6.2.4.1-3.

Table 5.6.6.2.4.1-1: Applicable NR configurations for FR2 L1-SINR measurement test with SSB based CMR and CSI-RS based IMR

Config	Description
1	LTE FDD, NR 120 kHz SSB SCS, 100 MHz bandwidth, TDD duplex mode
2	LTE TDD, NR 120 kHz SSB SCS, 100 MHz bandwidth, TDD duplex mode
3	LTE FDD, NR 240 kHz SSB SCS, 100 MHz bandwidth, TDD duplex mode
4	LTE TDD, NR 240 kHz SSB SCS, 100 MHz bandwidth, TDD duplex mode
Note: The UE is only required to be tested in one of the supported test configurations	

Table 5.6.6.2.4.1-2: General test parameters for FR2 L1-SINR measurement test with SSB based CMR and CSI-RS based IMR

Parameter	Config	Unit	Value
SSB GSCN	1~4		freq1
Duplex mode	1~4		TDD
TDD Configuration	1~4		TDDConf.3.1
$BW_{channel}$	1~4	MHz	100: $N_{RB,c}$ = 66
PDSCH Reference measurement channel	1~4		SR.3.1 TDD
RMSI CORESET Reference Channel	1~4		CR.3.1 TDD
Dedicated CORESET Reference Channel	1~4		CCR.3.1 TDD
SSB configuration	1,2		SSB.1 FR2
	3,4		SSB.2 FR2
CSI-RS configuration	1~4		CSI-RS.3.1A TDD
OCNG Patterns	1~4		OP.1
Initial BWP Configuration	1~4		DLBWP.0.1 ULBWP.0.1
Dedicated BWP configuration	1~4		DLBWP.1.3 ULBWP.1.3
SMTC configuration	1~4		SMTC.1
TRS Configuration	1~4		TRS.2.1 TDD
PDCCH/PDSCH TCI Configuration	1~4		TCI.State.2
DRX configuration	1~4		off
reportConfigType	1~4		periodic
reportQuantity-r16	1~4		ssb-Index-SINR-r16
Number of reported RS	1~4		2
L1-SINR reporting period	1~4	slot	640
T1	1~4	s	5
T2	1~4	s	3
EPRE ratio of PSS to SSS	1~4	dB	0
EPRE ratio of PBCH DMRS to SSS			
EPRE ratio of PBCH to PBCH DMRS			
EPRE ratio of PDCCH DMRS to SSS			
EPRE ratio of PDCCH to PDCCH DMRS			
EPRE ratio of PDSCH DMRS to SSS			
EPRE ratio of PDSCH to PDSCH DMRS			
EPRE ratio of OCNG DMRS to SSS Note 1			
EPRE ratio of OCNG to OCNG DMRS Note 1			
Propagation condition	1~4		AWGN
Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.			

Table 5.6.6.2.4.1-3: Test Environment parameters for FR2 L1-SINR measurement test with SSB based CMR and CSI-RS based IMR

Parameter	Value	Comment
Test environment	NC	As specified in TS 38.508-1 [14] clause 4.1.
Test frequencies	As specified in Annex E, Table E.2-1 and TS 38.508-1 [14] clause 4.3.1 for E-UTRA, 7.2.3 for NR FR2.	
Channel bandwidth	As specified by the test configuration selected from Table 5.6.6.2.4.1-1.	

Propagation conditions	AWGN		As specified in clause C.2.2.
Connection Diagram	TE Part	A.3.3.3.1-1	As specified in TS 38.508-1 [14] Annex A.
	DUT Part	A.3.4.1.1	
Exceptions to connection diagram	N/A		

1. Message contents are defined in clause 5.6.6.2.4.3.

2. The AoA setup for this test is Setup 1 as defined in clause A.9. The UE RX Beam Peak direction has been obtained previously using one of the search procedures as described in Annex I.

5.6.6.2.4.2 Test procedure

Prior to the start of the time duration T1, the UE shall be fully synchronized to PSCell. The UE shall be configured for periodic CSI reporting in PUCCH [format 2] with a reporting periodicity as mentioned in the above Table 5.6.6.2.4.1-2. Before the test, UE is configured to perform RLM, BFD and L1-SINR measurement based on the SSBs, and UE is configured to perform L1-SINR measurement based on the SSBs as CMR and the CSI-RS resources as IMR.

1. Ensure the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity EN-DC, DC bearer MCG and SCG, Connected without release *On* and Test Mode *On*, according to TS 38.508-1 [14] clause 4.5 and general test parameters set according to Table 5.6.6.2.4.1-2.

2. Set the parameters according to T1 in Table 5.6.6.2.5-1. T1 starts.

3. The UE shall be transmitting CSI on PUCCH with a periodicity of 640 slots.

4. When T1 expires, the SS shall set the parameters according to T2 in 5.6.6.2.5-1. T2 starts.

5. The UE shall start sending valid L1-SINR reports. The SS shall check the following requirements:

   - R1: the UE shall start to transmit valid L1-SINR reports no later than 2960ms for UE supporting power class 1 in configuration 1 and 2, no later than 2920 ms for UE supporting power class 1 in configuration 3 and 4, no later than 2000 ms for UE supporting power class other than 1 in configuration 1 and 2, no later than 1960 ms for UE supporting power class other than 1 in configuration 3 and 4 from the beginning of time period T2. A valid report shall meet the absolute L1-SINR requirement for SSB#1 in Table 5.6.6.2.5-3 for test configurations 1 and 2 and the corresponding absolute accuracy requirements in Table 5.6.6.2.5-4 for test configurations 3 and 4. If the first valid report is received before the specified time, the number of passed iterations for R1 is increased by one. Otherwise, the number of failed iterations for R1 is increased by one.

   - R2: the UE shall transmit L1-SINR reports every 640 slots. If the reports are received accordingly, the number of passed iterations for R2 is increased by one. Otherwise, the number of failed iterations for R2 is increased by one.

   - R3: The L1-SINR value of SSB#1 reported by the UE is compared to the expected L1-SINR value for SSB#1. In all consecutive reports after the first valid value is received, if the resulting value is outside the corresponding absolute accuracy requirements in Table 5.6.6.2.5-3 for all test configurations, the number of failed iterations for R3 is increased by one. Otherwise, the number of passed iterations for R3 is increased by one.

   - R4: The DIFF-SINR value of SSB#0 reported by the UE is compared to the expected DIFF-SINR value. In all consecutive reports after the first valid value is received, if the resulting value is outside the corresponding relative accuracy requirements in Table 5.6.6.2.5-4 for all test configurations, the number of failed iterations for R4 is increased by one. Otherwise, the number of passed iterations for R4 is increased by one.

6. The SS waits until T2 expires.

7. The SS shall transmit *RRCConnectionReconfiguration* message with condition EN-DC_PSCell_Rel according to TS 36.508 [25] Table 4.6.1-8 to release NR cell (PSCell). The UE shall transmit *RRCConnectionReconfigurationComplete* message.

8. The SS then shall transmit *RRCConnectionReconfiguration* message with condition MCG_and_SCG according to TS 36.508 [25] Table 4.6.1-8 to add NR cell (PSCell). The UE shall transmit *RRCConnectionReconfigurationComplete* message.

9. If any the reconfiguration fails, switch off and on the UE and ensure the UE is in RRC_CONNECTED with generic procedure parameters Connectivity EN-DC, DC bearer MCG and SCG, Connected without release On and Test Mode *On* according to TS 38.508-1 [14] clause 4.5.

10. Repeat steps 2-9 until the confidence level according to Tables G.2.3-1 in Annex G clause G.2 is achieved.

5.6.6.2.4.3 Message contents

Message contents are according to TS 38.508-1 [14] clause 7.3 with the following exceptions:

Table 5.6.6.2.4.3-1: Common Exception messages for FR2 L1-SINR measurement test with SSB based CMR and CSI-RS based IMR

Default Message Contents	
Common contents of system information blocks exceptions	
Default RRC messages and information elements contents exceptions	Table H.3.6A-1 with conditions PERIODIC and SS-SINR and CSI-RS_IMR Table H.3.6A-2 with conditions SSB and PERIODIC Table H.3.6A-3 with conditions PERIODIC Table H.3.4-1

Table 5.6.6.2.4.3-2: RadioLinkMonitoringConfig

Derivation Path: TS 38.508-1 [14], Table 4.6.3-133			
Information Element	**Value/remark**	**Comment**	**Condition**
RadioLinkMonitoringConfig ::= SEQUENCE {			
failureDetectionResourcesToAddModList SEQUENCE (SIZE(1..maxNrofFailureDetectionResources)) OF SEQUENCE {	1 entry		
purpose	both	UE is configured to perform RLM and BFD based on the SSBs.	
detectionResource CHOICE {			
ssb-Index	0		
}			
}			
}			

5.6.6.2.5 Test requirement

Table 5.6.6.2.5-1 and Table 5.6.6.2.5-1 define the primary level settings including test tolerances for all tests.

Table 5.6.6.2.5-1: SSB specific test parameters for FR2 L1-SINR measurement test with SSB based CMR and CSI-RS based IMR

Parameter	Config	Unit	SSB#0		SSB#1	
			T1	T2	T1	T2
Angle of arrival configuration			Setup 1 according to A.3.15.1			
Beam assumption Note 4			Rough			
N_{oc} Note2	1~4	dBm/15kHz	-105			
N_{oc} Note2	1,2	dBm/SSB SCS	-96			
	3,4		-93			

$\hat{E}_s/I_{ot}$	1~4	dB	0	0	-Infinity	9
SSB RSRP Note3	1,2	dBm/SSB SCS	-94.5	-94.5	-Infinity	-87
	3,4		-91.5	-91.5	-Infinity	-84
Io Note3	1,2	dBm/95.04MHz	-63.2	-63.2	-67	-57.5
	3,4		-63.2	-63.2	-67	-57.5
$\hat{E}_s/N_{oc}$	1~4	dB	1.5	1.5	-Infinity	9

Note 1: The resources for uplink transmission are assigned to the UE prior to the start of time period T2.
Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for N_{oc} to be fulfilled.
Note 3: SSB RSRP and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.
Note 4: Information about types of UE beam is given in B.2.1.3, and does not limit UE implementation or test system implementation

Table 5.6.6.2.5-2: CSI-RS specific test parameters

Parameter	Config	Unit	CSI-RS#0		CSI-RS#1	
			T1	T2	T1	T2
Angle of arrival configuration			Setup 1 according to A.3.15.1			
Beam assumption Note 4			Rough			
N_{oc} Note2	1~4	dBm/15kHz	-105			
N_{oc} Note2	1~4	dBm/CSI-RS SCS	-96			
$\hat{E}_s/I_{ot}$	1~4	dB	1.5	1.5	-Infinity	9
$\hat{E}_s/N_{oc}$	1~4	dB	1.5	1.5	-Infinity	9
CSI-RS RSRP Note3	1~4	dBm/ CSI-RS SCS	-94.5	-94.5	-Infinity	-87
Io Note3	1~4	dBm/95.04MHz	-63.2	-63.2	-67	-57.5

Note 1: The resources for uplink transmission are assigned to the UE prior to the start of time period T2.
Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for N_{oc} to be fulfilled.
Note 3: CSI-RS RSRP and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.
Note 4: Information about types of UE beam is given in B.2.1.3, and does not limit UE implementation or test system implementation

The UE shall send L1-SINR report every 640 slots. No later than X ms plus 640 slots from the beginning of time period T2, UE shall send L1-SINR report including the results for both SSB#0+CSI-RS#0 and SSB#1+CSI-RS#1 while meeting the accuracy requirements defined in clause 10.1.28.2, where X is

- 2880 for UE supporting power class 1
- 1920 for UE supporting power class 2, 3 or 4.

Each L1-SINR measurement report shall meet the corresponding absolute accuracy requirements in Table 5.6.6.2.5-3 for all test configurations and the corresponding relative accuracy requirements in Table 5.6.6.2.5-4 for all test configurations.

Table 5.6.6.2.5-3: L1-SINR absolute accuracy requirements for the reported values for all test configurations R1 and R3

Normal Conditions	T1	T2
Lowest reported value (SSB#1)	-	54
Highest reported value (SSB#1)	-	71

Table 5.6.6.2.5-4: L1-SINR relative accuracy requirements for the reported values for test configurations R1 and R4

	T1	T2
Lowest DIFF SINR reported (SSB#0)	-	4
Highest DIFF SINR reported (SSB#0)	-	10

For the test to pass, the ratio of successful reported valued for each requirement (R1 to R4) shall be at least 90% with a confidence level of 95%. Each requirement is evaluated independently the others.NOTE:
The actual overall delays measured in the test may be up to $2xTTI_{DCCH}$ higher than the measurement reporting delays above because of TTI insertion uncertainty of the measurement report in DCCH.

5.6.6.3 EN-DC FR2 CSI-RS based CMR and dedicated IMR L1-SINR measurement in non-DRX

Editor's Note: This test case has been completed for the following configurations:

- Test frequency f ≤ 40.8 GHz
- UE PC3
- Normal conditions
- The test is incomplete for UE power classes other than PC3
- The test is incomplete for test frequencies > 40.8 GHz
- The test case is incomplete for extreme conditions

5.6.6.3.1 Test purpose

To verify that the UE makes correct reporting of L1-SINR measurement within L1-SINR measurement requirements in TS 38.133 [6] clause 9.8.4.3.

5.6.6.3.2 Test applicability

This test applies to all types of E-UTRA UE release 16 and forward, supporting EN-DC FR2 and L1-SINR measurement.

5.6.6.3.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 5.6.6.0.3.

The normative reference for this requirement is TS 38.133 [6] clause A.5.6.6.3.

5.6.6.3.4 Test description

5.6.6.3.4.1 Initial conditions

This test shall be tested using any of the test configurations in Table 5.6.6.3.4.1-1. Configure the test equipment and the DUT according to the parameters in Table 5.6.6.3.4.1-2. Test environment parameters are given in Table 5.6.6.3.4.1-3.

Table 5.6.6.3.4.1-1: Applicable NR configurations for EN-DC FR2 CSI-RS based CMR and CSI-IM based IMR L1-SINR measurement

Config	Description
1	LTE FDD, NR 120 kHz SSB SCS, 100 MHz bandwidth, TDD duplex mode
2	LTE TDD, NR 120 kHz SSB SCS, 100 MHz bandwidth, TDD duplex mode
Note: The UE is only required to be tested in one of the supported test configurations	

Table 5.6.6.3.4.1-2: General test parameters for FR2 L1-SINR test with CMR and dedicated IMR

Parameter	Config	Unit	Value
SSB GSCN	1~2		freq1
Duplex mode	1~2		TDD
TDD Configuration	1~2		TDDConf.3.1
$BW_{channel}$	1~2	MHz	100: $N_{RB,c}$ = 66
PDSCH Reference measurement channel	1~2		SR.3.1 TDD
RMSI CORESET Reference Channel	1~2		CR.3.1 TDD
Dedicated CORESET Reference Channel	1~2		CCR.3.1 TDD
SSB configuration	1~2		SSB.1 FR2
CSI-RS configuration	1~2		CSI-RS.3.3 TDD
CSI-IM configuration	1~2		CSI-IM.3.2 TDD
OCNG Patterns	1~2		OP.1
Initial BWP Configuration	1~2		DLBWP.0.1 ULBWP.0.1
Dedicated BWP configuration	1~2		DLBWP.1.3 ULBWP.1.3
SMTC configuration	1~2		SMTC.1
TRS Configuration	1~2		TRS.2.1 TDD
PDCCH/PDSCH TCI Configuration	1~2		TCI.State.2
DRX configuration	1~2		Off
reportConfigType	1~2		aperiodic
reportQuantity-r16	1~2		cri-SINR-r16
Number of reported RS	1~2		2
qcl-Info	1~2		SSB#0 for resource#0 SSB#1 for resource#1
reportSlotOffsetList	1~2		26
T1	1~2	s	5
EPRE ratio of PSS to SSS	1~2	dB	0
EPRE ratio of PBCH DMRS to SSS			
EPRE ratio of PBCH to PBCH DMRS			
EPRE ratio of PDCCH DMRS to SSS			
EPRE ratio of PDCCH to PDCCH DMRS			
EPRE ratio of PDSCH DMRS to SSS			
EPRE ratio of PDSCH to PDSCH DMRS			
EPRE ratio of OCNG DMRS to SSS Note 1			
EPRE ratio of OCNG to OCNG DMRS Note 1			
Propagation condition	1~2		AWGN
Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.			

Table 5.6.6.3.4.1-3: Test Environment parameters for FR2 L1-SINR test with CMR and dedicated IMR

Parameter	Value		Comment
Test environment	NC		As specified in TS 38.508-1 [14] clause 4.1.
Test frequencies	As specified in Annex E, Table E.2-1 and TS 38.508-1 [14] clause 4.3.1 for E-UTRA, 7.2.3 for NR FR2.		
Channel bandwidth	As specified by the test configuration selected from Table 5.6.6.3.4.1-1.		
Propagation conditions	AWGN		As specified in clause C.2.2.
Connection Diagram	TE Part	A.3.3.3.1-1	As specified in TS 38.508-1 [14] Annex A.
	DUT Part	A.3.4.1.1	
Exceptions to connection diagram	N/A		

1. Message contents are defined in clause 5.6.6.3.4.3.

2. The AoA setup for this test is Setup 1 as defined in clause A.9. The UE RX Beam Peak direction has been obtained previously using one of the search procedures as described in Annex I.

5.6.6.3.4.2 Test procedure

The test consists of a single time period T1, during which the UE is triggered via DCI to report L1-SINR on aperiodic CSI-RS resources. Prior to the start of the time duration T1, the UE shall be fully synchronized to PSCell. UE is also configured to measure L1-SINR based on SSB. Upon receiving the DCI trigger, UE provides the report back based on the reporting configuration as defined in Table 5.6.6.3.4.1-2.

1. Ensure the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity EN-DC, DC bearer MCG and SCG, Connected without release *On* and Test Mode *On,* according to TS 38.508-1 [14] clause 4.5.

2. Set the parameters according to T1 in Table 5.6.6.3.5-1. T1 starts.

3. After 480ms from the start of the test the SS transmits the DCI trigger in slot 8.

4. The SS shall check following requirements:

   - R1: the UE shall send L1-SINR report at slot 26 from the reception of DCI trigger. If the report is received at slot 26 from the reception of DCI trigger, the number of passed iterations for R1 is increased by one. Otherwise, the number of failed iterations for R1 is increased by one.

   - R2: the L1-SINR value of CSI-RS#1 reported by the UE is compared to the expected L1-SINR value for CSI-RS#1. If the resulting value is outside the limits in Table 5.6.6.3.5-2 or the UE fails to report the measurement value for CSI-RS #1, the number of failed iterations for R2 is increased by one. Otherwise, the number of passed iterations for R2 is increased by one.

   -R3: The DIFF SINR value of CSI-RS#0 reported by the UE is compared to the expected DIFF SINR value. If the resulting value is outside the limits in Table 5.6.6.3.5-3 or the UE fails to report the measurement value for CSI-RS 0, the number of failed iterations for R3 is increased by one. Otherwise, the number of passed iterations for R3 is increased by one.

5. The SS shall transmit *RRCConnectionReconfiguration* message with condition EN-DC_PSCell_Rel according to TS 36.508 [25] Table 4.6.1-8 to release NR cell (PSCell). The UE shall transmit *RRCConnectionReconfigurationComplete* message.

6. The SS then shall transmit *RRCConnectionReconfiguration* message with condition MCG_and_SCG according to TS 36.508 [25] Table 4.6.1-8 to add NR cell (PSCell). The UE shall transmit *RRCConnectionReconfigurationComplete* message.

7 If any the reconfiguration fails, switch off and on the UE and ensure the UE is in RRC_CONNECTED with generic procedure parameters Connectivity EN-DC, DC bearer MCG and SCG, Connected without release On and Test Mode *On* according to TS 38.508-1 [14] clause 4.5.

8. Repeat steps 2-7 until the confidence level according to Tables G.2.3-1 in Annex G clause G.2 is achieved.

5.6.6.3.4.3 Message contents

Message contents are according to TS 38.508-1 [14] clause 7.3 with the following exceptions:

Table 5.6.6.3.4.3-1: Common Exception messages for EN-DC FR2 CSI-RS based CMR and CSI-IM based IMR L1-SINR measurement

Default Message Contents	
Common contents of system information blocks exceptions	
Default RRC messages and information elements contents exceptions	Table H.3.6A-1 with conditions APERIODIC and CSI-SINR and CSI-IM_IMR Table H.3.6A-2 with conditions CSI-RS and APERIODIC Table H.3.6A-4 with conditions APERIODIC Table H.3.4-1

Table 5.6.6.3.4.3-2: RadioLinkMonitoringConfig

Derivation Path: TS 38.508-1 [14], Table 4.6.3-133			
Information Element	**Value/remark**	**Comment**	**Condition**
RadioLinkMonitoringConfig ::= SEQUENCE {			
failureDetectionResourcesToAddModList SEQUENCE (SIZE(1..maxNrofFailureDetectionResources)) OF SEQUENCE {	1 entry		
purpose	both	UE is configured to perform RLM and BFD based on the SSBs.	
}			
}			

5.6.6.3.5 Test requirement

Table 5.6.6.3.5-1 defines the primary level settings including test tolerances for all tests.

Table 5.6.6.3.5-1: CSI-RS specific test parameters for EN-DC FR2 CSI-RS based CMR and CSI-IM based IMR L1-SINR measurement

Parameter	Config	Unit	CSI-RS#0	CSI-RS#1
Angle of arrival configuration	1~2		Setup 1 according to A.9	
Assumption for UE beams Note 3	1~2		Rough	
N_{oc} Note1	1~2	dBm/15kHz	-105	
N_{oc} Note1	1~2	dBm/SSB SCS	-95.97	
$\hat{E}_s / I_{ot}$	1~2	dB	0	9
CSI-RS RSRP Note2	1~2	dBm/SSB SCS	-95.97	-86.97
Io Note2	1~2	dBm/95.04MHz	-63.97	-57.47
$\hat{E}_s / N_{oc}$	1~2	dB	0	9
Note 1: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for N_{oc} to be fulfilled.				
Note 2: CSI-RS RSRP and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.				

Note 3:	Information about types of UE beam is given in B.2.1.3, and does not limit UE implementation or test system implementation

After 480ms from the beginning of the test, the UE shall send L1-SINR report at slot 26 from the reception of DCI triggering the L1-SINR measurement. The L1-SINR report shall include the results for both CSI-RS#0 as CMR + CSI-IM#0 as IMR and CSI-RS#1 as CMR + CSI-IM#1 as IMR. Each L1-SINR measurement report shall meet the corresponding absolute accuracy requirements in Table 5.6.6.3.5-2 and the corresponding relative accuracy requirements in Table 5.6.6.3.5-3. The reported L1-SINR value shall consider the Rx antenna gain in the range of [-10 ~ +20] dB when calculated.

Table 5.6.6.3.5-2: L1-SINR absolute accuracy requirements for the reported values R2

Normal Conditions	T1
Lowest reported value (CSI-RS#1)	53
Highest reported value (CSI-RS #1)	72

Table 5.6.6.3.5-3: L1-SINR relative accuracy requirements for the reported values R3

Normal Conditions	T1
Lowest DIFF SINR reported (CSI-RS #0)	5
Highest DIFF SINR reported (CSI-RS #0)	12

The rate of correct events observed during repeated tests (R1 to R3) shall be at least 90% with a confidence level of 95%.

NOTE: The actual overall delays measured in the test may be up to $2xTTI_{DCCH}$ higher than the measurement reporting delays above because of TTI insertion uncertainty of the measurement report in DCCH.

5.7 Measurement performance requirements

5.7.1 SS-RSRP

5.7.1.0 Minimum conformance requirements

5.7.1.0.1 Intra-frequency SS-RSRP measurement accuracy requirements

5.7.1.0.1.1 Absolute SS-RSRP Accuracy

Unless otherwise specified, the requirements for absolute accuracy of SS-RSRP in this clause apply to a cell on the same frequency as that of the serving cell in FR2.

The accuracy requirements in Table 5.7.1.0.1.1-1 are valid under the following conditions:

- Conditions defined in clause 7.3 of TS 38.101-2 [3] for reference sensitivity are fulfilled.
- Conditions for intra-frequency measurements are fulfilled according to Annex B.2.2 for a corresponding Band for each relevant SSB.
- The measured signals are in the directions covered by the percentile EIS spherical coverage of the UE, defined in clause 7.3.4 of TS 38.101-2 [3].

Table 5.7.1.0.1.1-1: SS-RSRP Intra frequency absolute accuracy in FR2

Accuracy		Conditions			
Normal condition	Extreme condition	SSB Ês/Iot	Io Note 2 range		
			Minimum Io		Maximum Io
dB	dB	dB	dBm / SCS_{SSB} Note 1	dBm/$BW_{Channel}$	dBm/$BW_{Channel}$

			SCS_{SSB} = 120kHz	**SCS_{SSB} = 240kHz**		
±6	±9	≥-6	Same value as SSB_RP in Table B.2.2-2, according to UE Power class, operating band and angle of arrival		N/A	-70
±8	±11		N/A		-70	-50
NOTE 1: Values based on Refsens and EIS spherical coverage as defined in clauses 7.3.2 and 7.3.4 of TS 38.101-2 [3]. Applicable side condition selected depending on angle of arrival. NOTE 2: Io specified at the Reference point, and assumed to have constant EPRE across the bandwidth. NOTE 3: In the test cases, the SSB Ês/Iot and related parameters may need to be adjusted to ensure Ês/Iot at UE baseband is above the value defined in this table.						

The reporting range for SS-RSRP is defined from -156dBm to -31dBm with 1dB resolution. The mapping of the measured quantity to the reported value is defined by Table 4.7.1.0.1-2.

5.7.1.0.1.2 Relative SS-RSRP Accuracy

The relative accuracy of SS-RSRP is defined as the SS-RSRP measured from one cell compared to the SS-RSRP measured from another cell on the same frequency, or between any two SS-RSRP levels measured on the same cell in FR2.

- Conditions defined in clause 7.3 of TS 38.101-2 [3] for reference sensitivity are fulfilled.
- Conditions for intra-frequency measurements are fulfilled according to Annex B.2.2 for a corresponding Band for each relevant SSB.
- The measured signals are in the directions covered by the percentile EIS spherical coverage of the UE, defined in clause 7.3.4 of TS 38.101-2 [3].

Table 5.7.1.0.1.2-1: SS-RSRP Intra frequency relative accuracy in FR2

Accuracy		**Conditions**		
Normal condition	**Extreme condition**	**SSB Ês/Iot**	**Io [Note 2] range**	
			Minimum Io	**Maximum Io**
dB	**dB**	**dB**	**dBm / SCS_{SSB} [Note 1]**	**$dBm/BW_{Channel}$**
			SCS_{SSB} = 120kHz / **SCS_{SSB} = 240kHz**	
±6	±9	≥-6	Same value as SSB_RP in Table B.2.2-2, according to UE Power class, operating band and angle of arrival	-50
NOTE 1: Values based on Refsens and EIS spherical coverage as defined in clauses 7.3.2 and 7.3.4 of TS 38.101-2 [3]. Applicable side condition selected depending on angle of arrival. NOTE 2: Io specified at the Reference point, and assumed to have constant EPRE across the bandwidth. NOTE 3: In the test cases, the SSB Ês/Iot and related parameters may need to be adjusted to ensure Ês/Iot at UE baseband is above the value defined in this table. NOTE 4: The parameter SSB Ês/Iot is the minimum SSB Ês/Iot of the pair of cells to which the requirement applies.				

The reporting range for SS-RSRP is defined from -156dBm to -31dBm with 1dB resolution. The mapping of the measured quantity to the reported value is defined by Table 4.7.1.0.1-2.

The normative reference for this requirement is TS 38.133 [6] clauses 10.1.3.1 and 10.1.6.

5.7.1.0.2 Inter-frequency SS-RSRP measurement accuracy requirements

5.7.1.0.2.1 Absolute SS-RSRP Accuracy

Unless otherwise specified, the requirements for absolute accuracy of SS-RSRP in this clause apply to a cell on a frequency in FR2 that is on a different frequency than the serving cell.

The accuracy requirements in Table 5.7.1.0.2.1-1 are valid under the following conditions:

- Conditions defined in clause 7.3 of TS 38.101-2 [3] for reference sensitivity are fulfilled.
- Conditions for inter-frequency measurements are fulfilled according to Annex B.2.3 for a corresponding Band for each relevant SSB.
- The measured signals are in the directions covered by the percentile EIS spherical coverage of the UE, defined in clause 7.3.4 of TS 38.101-2 [2].

Table 5.7.1.0.2.1-1: SS-RSRP Inter frequency absolute accuracy in FR2

Accuracy		Conditions				
Normal condition	Extreme condition	SSB Ês/Iot	Io Note 2 range			
			Minimum Io			Maximum Io
			dBm / SCS_{SSB} Note 1			
dB	dB	dB	SCS_{SSB} = 120kHz	SCS_{SSB} = 240kHz	dBm/$BW_{Channel}$	dBm/$BW_{Channel}$
±6	±9	≥-4	Same value as SSB_RP in Table B.2.3-2, according to UE Power class, operating band and angle of arrival		N/A	-70
±8	±11		N/A		-70	-50
NOTE 1: Values based on Refsens and EIS spherical coverage as defined in clauses 7.3.2 and 7.3.4 of TS 38.101-2 [3]. Applicable side condition selected depending on angle of arrival. NOTE 2: Io specified at the Reference point, and assumed to have constant EPRE across the bandwidth. NOTE 3: In the test cases, the SSB Ês/Iot and related parameters may need to be adjusted to ensure Ês/Iot at UE baseband is above the value defined in this table.						

The reporting range for SS-RSRP is defined from -156dBm to -31dBm with 1dB resolution. The mapping of the measured quantity to the reported value is defined by Table 4.7.1.0.1-2.

The normative reference for this requirement is TS 38.133 [6] clauses 10.1.5.1 and 10.1.6.

5.7.1.0.2.2 Relative SS-RSRP Accuracy

The relative accuracy of SS-RSRP is defined as the SS-RSRP measured from one cell on a frequency in FR2 compared to the SS-RSRP measured from another cell on another frequency in FR2.

The accuracy requirements in Table 5.7.1.0.2.2-1 are valid under the following conditions:

- Conditions defined in 38.101-2 [3] Clause 7.3 for reference sensitivity are fulfilled.
- Conditions for inter-frequency measurements are fulfilled according to Annex B.2.3 for a corresponding Band for each relevant SSB.
- $|SSB_RP1_{dBm} - SSB_RP2_{dBm}| \leq 27dB$
- $|$ Channel 1_Io -Channel 2_Io $| \leq 20$ dB
- The measured signals are in the directions covered by the percentile EIS spherical coverage of the UE, defined in clause 7.3.4 of TS 38.101-2 [3].

Table 5.7.1.0.2.2-1: SS-RSRP Inter frequency relative accuracy in FR2

Accuracy		Conditions			
Normal condition	Extreme condition	SSB Ês/Iot	Io Note 2 range		
			Minimum Io		Maximum Io
			dBm / SCS_{SSB} Note 1		
dB	dB	dB	SCS_{SSB} = 120kHz	SCS_{SSB} = 240kHz	dBm/$BW_{Channel}$

±6	±9	≥-4	Same value as SSB_RP in Table B.2.3-2, according to UE Power class, operating band and angle of arrival	-50
NOTE 1: Values based on Refsens and EIS spherical coverage as defined in clauses 7.3.2 and 7.3.4 of TS 38.101-2 [3]. Applicable side condition selected depending on angle of arrival. NOTE 2: Io specified at the Reference point, and assumed to have constant EPRE across the bandwidth. NOTE 3: In the test cases, the SSB Ês/Iot and related parameters may need to be adjusted to ensure Ês/Iot at UE baseband is above the value defined in this table. NOTE 4: The parameter SSB Ês/Iot is the minimum SSB Ês/Iot of the pair of cells to which the requirement applies.				

The reporting range for SS-RSRP is defined from -156dBm to -31dBm with 1dB resolution. The mapping of the measured quantity to the reported value is defined by Table 4.7.1.0.1-2.

The normative reference for this requirement is TS 38.133 [6] clauses 10.1.5.1 and 10.1.6.

5.7.1.1 EN-DC FR2 SS-RSRP measurement accuracy

Editor's Note: This test case has been completed for the following configurations:

- Test frequency f ≤ 40.8 GHz
- UE PC3
- Normal conditions
- The test is incomplete for UE power classes other than PC3
- The test is incomplete for test frequencies > 40.8 GHz
- The test is incomplete for extreme conditions

5.7.1.1.1 Test purpose

The purpose of this test is to verify that the intra-frequency SS-RSRP measurement accuracy for NR FR2 is within the specified limits for all bands.

5.7.1.1.2 Test applicability

This test applies to all types of NR UE supporting E-UTRA and EN-DC from Release 15 onwards.

5.7.1.1.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 5.7.1.0.1.

The normative reference for this requirement is TS 38.133 [6] clause A.5.7.1.1.

5.7.1.1.4 Test description

Three cells are configured in this test: E-UTRA Cell 1 is the E-UTRAN PCell, Cell 2 is the NR FR2 PSCell and Cell 3 is the NR FR2 neighbour cell on the same frequency as the PSCell.

5.7.1.1.4.1 Initial conditions

This test shall be tested using any of the test configurations in Table 5.7.1.1.4.1-1.

Table 5.7.1.1.4.1-1: Supported test configurations

Configuration	Description

5.7.1.1-1	NR 120 kHz SSB SCS, 100 MHz bandwidth, TDD duplex mode, LTE FDD
5.7.1.1-2	NR 120 kHz SSB SCS, 100 MHz bandwidth, TDD duplex mode, LTE TDD
NOTE: The UE is only required to be tested in one of the supported test configurations	

Configure the test equipment and the DUT according to the parameters in Table 5.7.1.1.4.1-2.

Table 5.7.1.1.4.1-2: Initial conditions

Parameter	Value	Comment
Test environment	NC	As specified in TS 36.508 [25] clause 4.1.
Test frequencies	As specified in Annex E, E.1.1, E.1.3.1 and Table E.3-1 and TS 38.508-1 [14] clause 4.3.1 for E-UTRA and 7.2.3 for NR.	
Channel bandwidth	As specified by the selected test configuration.	
Propagation conditions	AWGN	As specified in clause C.2.1
Connection Diagram	TE Part: A.3.3.1.1 DUT Part: A.3.4.1.1	As specified in TS 38.508-1 [14] Annex A.
Exceptions to connection diagram	N/A	

1. Message contents are defined in clause 5.7.1.1.4.3.
2. There are two carriers and three cells specified in the test, where E-UTRA Cell 1 is the E-UTRA PCell on the E-UTRA carrier, Cell 2 is the NR PSCell on the NR FR2 carrier and Cell 3 is the neighbour cell on the same NR FR2 carrier. Cell 3 is the target for the SS-RSRP measurements. E-UTRA Cell 1 is configured according to TS 36.521-3 [26] clause C.1.0 and C.1.1.
3. The UE Rx beam peak direction has been obtained previously using one of the Rx Beam Peak Search procedures as described in Annex I.

5.7.1.1.4.2 Test procedure

1. Ensure the UE is in State 3A-RF according to TS 36.508 [25] clause 7.2A.3.
2. Set the parameters according to Table 5.7.1.1.5-1 as appropriate.
3. The SS shall transmit an *RRCConnectionReconfiguration* message on Cell 1.
4. The UE shall transmit an *RRCConnectionReconfigurationComplete* message.
5. The UE shall transmit periodically MeasurementReport messages.
6. After 10s wait from Step 3, the SS shall check the SS-RSRP reported values in the periodic MeasurementReport for the following requirements:

   - R1: The SS-RSRP value of Cell 2 reported by the UE is compared to the expected SS-RSRP for Cell 2. If the value is outside the limits in Table 5.7.1.1.5-3 or the UE fails to report the measurement value for Cell 2, the number of failed iterations for R1 is increased by one. Otherwise, the number of passed iterations for R1 is increased by one.

   - R2: The SS-RSRP value of Cell 3 reported by the UE is compared to the expected SS-RSRP for Cell 3. If the value is outside the limits in Table 5.7.1.1.5-3 or the UE fails to report the measurement value for Cell 3, the number of failed iterations for R2 is increased by one. Otherwise, the number of passed iterations for R2 is increased by one.

   - R3: The SS-RSRP value of Cell 3 reported by the UE is compared to the reported SS-RSRP of Cell 2. If the resulting value is outside the limits in Table 5.7.1.1.5-4 or the UE fails to report the measurement value for Cell 2 or Cell 3, the number of failed iterations for R3 is increased by one. Otherwise, the number of passed iterations for R3 is increased by one.

7. The SS shall continue checking the MeasurementReport messages transmitted by the UE until the confidence level according to Table G.2.3-1 in Annex G for each of the requirements is achieved. The evaluation of a

specific requirement is concluded when the confidence level for that requirement is reached, even if more measurement reports are required for the remaining requirements.

7a The SS shall check all the SS-RSRP reported values during Test 1 for the following requirements:

- R9: The maximum SS-RSRP value is compared to the minimum SS-RSRP of Cell 2 reported by the UE. If the difference exceeds the limits in Table 5.7.1.1.5-3a count a fail for R9. Otherwise, R9 is passed.

- R10: The maximum SS-RSRP value is compared to the minimum SS-RSRP of Cell 3 reported by the UE. If the difference exceeds the limits in Table 5.7.1.1.5-3a count a fail for R10. Otherwise, R10 is passed.

8. Set the parameters according to Test 2 in Table 5.7.1.1.5-2 as appropriate and repeat steps 5-7. In Step 6, the SS shall check the following requirements:

- R4: The SS-RSRP value of Cell 2 reported by the UE is compared to the expected SS-RSRP for Cell 2. If the value is outside the limits in Table 5.7.1.1.5-3 or the UE fails to report the measurement value for Cell 2, the number of failed iterations for R4 is increased by one. Otherwise, the number of passed iterations for R4 is increased by one.

- R5: The SS-RSRP value of Cell 3 reported by the UE is compared to the expected SS-RSRP for Cell 3. If the value is outside the limits in Table 5.7.1.1.5-3 or the UE fails to report the measurement value for Cell 3, the number of failed iterations for R5 is increased by one. Otherwise, the number of passed iterations for R5 is increased by one.

- R6: The SS-RSRP value of Cell 3 reported by the UE is compared to the reported SS-RSRP of Cell 2. If the resulting value is outside the limits in Table 5.7.1.1.5-4 or the UE fails to report the measurement value for Cell 2 or Cell 3, the number of failed iterations for R6 is increased by one. Otherwise, the number of passed iterations for R6 is increased by one.

- R7: The SS-RSRP value of Cell 2 reported by the UE during Test 2 is compared to the reported SS-RSRP of Cell 2 during Test 1 for the same iteration. If the resulting value is outside the limits in Table 5.7.1.1.5-5 or the UE fails to report the measurement value for Cell 2, the number of failed iterations for R7 is increased by one. Otherwise, the number of passed iterations for R7 is increased by one

- R8: The SS-RSRP value of Cell 3 reported by the UE during Test 2 is compared to the reported SS-RSRP of Cell 3 during Test 1 for the same iteration. If the resulting value is outside the limits in Table 5.7.1.1.5-5 or the UE fails to report the measurement value for Cell 3, the number of failed iterations for R8 is increased by one. Otherwise, the number of passed iterations for R8 is increased by one

8a The SS shall check all the SS-RSRP reported values during Test 2 for the following requirements:

- R11: The maximum SS-RSRP value is compared to the minimum SS-RSRP of Cell 2 reported by the UE. If the difference exceeds the limits in Table 5.7.1.1.5-3a count a fail for R11. Otherwise, R11 is passed.

- R12: The maximum SS-RSRP value is compared to the minimum SS-RSRP of Cell 3 reported by the UE. If the difference exceeds the limits in Table 5.7.1.1.5-3a count a fail for R12. Otherwise, R12 is passed.

9. If more measurement reports with Test 1 configuration are needed in order to complete the evaluation R7 or R8, the SS shall set the parameters according to Table 5.7.1.1.5-2 as appropriate and repeat steps 5 to 8, evaluating R7 and / or R8 as appropriate.

5.7.1.1.4.3 Message contents

Message contents are according to TS 38.508-1 [14] clause 7.3 with the following exceptions:

Table 5.7.1.1.4.3-1: Common Exception messages

Default Message Contents	
Common contents of system information blocks exceptions	

Default RRC messages and information elements contents exceptions	Table H.3.1-1 Table H.3.1-2 Table H.3.1-3 with Condition Synchronous cells Table H.3.1-5 Table H.3.1-7 Table H.3.4-1 Table H.3.4-1a Table H.3.4-2 Table 7.3.1-3 in TS 38.508-1 [14] with condition SMTC.1

Table 5.7.1.1.4.3-2: ReportConfigNR-DEFAULT(Periodical)

Derivation Path: 38.508-1 [14] Table 4.6.3-142 with condition PERIODICAL			
Information Element	**Value/remark**	**Comment**	**Condition**
ReportConfigNR::= SEQUENCE {			
reportType CHOICE {			
periodical SEQUENCE {			PERIODICAL
reportQuantityCell SEQUENCE {			
rsrq	false		
sinr	false		
}			
maxReportCells	2		
}			
}			
}			

5.7.1.1.5 Test requirement

Table 5.7.1.1.5-1 defines the cell specific settings for all tests. Table 5.7.1.1.5-2 defines the OTA primary level settings including test tolerances for all tests.

The SS-RSRP measurement accuracy shall fulfil the absolute accuracy requirements in clause 5.7.1.0.1.1 and relative accuracy requirements in clause 5.7.1.0.1.2. The following eight requirements are to be verified:

During T1:

R1: Absolute accuracy of Cell 2. The UE is deemed to meet the requirement if the reported SS-RSRP is in the range shown in Table 5.7.1.1.5-3.

R2: Absolute accuracy of Cell 3. The UE is deemed to meet the requirement if the reported SS-RSRP is in the range shown in Table 5.7.1.1.5-3.

R3: Relative accuracy of Cell 3 compared with Cell 2. The UE is deemed to meet the requirement if the difference in reported SS-RSRP meets the requirements in Table 5.7.1.1.5-4.

R9: Δ(Max-Min) accuracy of Cell 2. The UE is deemed to meet the requirement if the difference between the maximum and the minimum SS-RSRP report does not exceed the limit in Table 5.7.1.1.5-3a.

R10: Δ(Max-Min) accuracy of Cell 3. The UE is deemed to meet the requirement if the difference between the maximum and the minimum SS-RSRP report does not exceed the limit in Table 5.7.1.1.5-3a.

During T2:

R4: Absolute accuracy of Cell 2. The UE is deemed to meet the requirement if the reported SS-RSRP is in the range shown in table 5.7.1.1.5-3 and Table 5.7.1.1.5-3a.

R5: Absolute accuracy of Cell 3. The UE is deemed to meet the requirement if the reported SS-RSRP is in the range shown in table 5.7.1.1.5-3 and Table 5.7.1.1.5-3a.

R6: Relative accuracy of Cell 3 compared with Cell 2. The UE is deemed to meet the requirement if the difference in reported SS-RSRP meets the requirements in Table 5.7.1.1.5-4.

R11: Δ(Max-Min) accuracy of Cell 2. The UE is deemed to meet the requirement if the difference between the maximum and the minimum SS-RSRP report does not exceed the limit in Table 5.7.1.1.5-3a.

R12: Δ(Max-Min) accuracy of Cell 3. The UE is deemed to meet the requirement if the difference between the maximum and the minimum SS-RSRP report does not exceed the limit in Table 5.7.1.1.5-3a.

During T1 and T2:

R7: Relative accuracy of Cell 2 during T2 compared with Cell 2 during T1. The UE is deemed to meet the requirement if the difference in reported SS-RSRP meets the requirements in Table 5.7.1.1.5-5.

R8: Relative accuracy of Cell 3 during T2 compared with Cell 3 during T1. The UE is deemed to meet the requirement if the difference in reported SS-RSRP meets the requirements in Table 5.7.1.1.5-5.

Table 5.7.1.1.5-1: SS-RSRP Intra frequency general test parameters

Parameter[Note 5]	Unit	T1		T2	
		Cell 2	**Cell 3**	**Cell 2**	**Cell 3**
Physical cell ID		**489**	**0**	**489**	**0**
SSB ARFCN		freq1		freq1	
Duplex mode		TDD		TDD	
TDD configuration		TDDConf.3.1		TDDConf.3.1	
$BW_{channel}$	MHz	100: $N_{RB,c}$ = 66		100: $N_{RB,c}$ = 66	
Data RBs allocated		24		24	
Downlink initial BWP configuration		DLBWP.0.1	-	DLBWP.0.1	-
Downlink dedicated BWP configuration		DLBWP.1.1	-	DLBWP.1.1	-
Uplink initial BWP configuration		ULBWP.0.1	-	ULBWP.0.1	-
Uplink dedicated BWP configuration		ULBWP.1.1	-	ULBWP.1.1	-
DRX cycle configuration		Not applicable	-	Not applicable	-
TRS configuration		TRS.2.1 TDD	-	TRS.2.1 TDD	-
TCI state		TCI.State.0	-	TCI.State.0	-
PDSCH Reference measurement channel		SR.3.2 TDD	-	SR.3.2 TDD	-
RMSI CORESET Reference Channel		CR.3.1 TDD	-	CR.3.1 TDD	-
Dedicated CORESET Reference Channel		CCR.3.1 TDD	-	CCR.3.1 TDD	-
OCNG Patterns		OP.3	OP.3	OP.3	OP.3
SSB configuration		SSB.3 FR2	SSB.3 FR2	SSB.3 FR2	SSB.3 FR2
SMTC configuration		SMTC.1	SMTC.1	SMTC.1	SMTC.1
Time offset with Cell 2	μs	-	3	-	3
PDSCH/PDCCH subcarrier spacing	kHz	120	120	120	120
EPRE ratio of PSS to SSS	dB	0	0	0	0
EPRE ratio of PBCH_DMRS to SSS					
EPRE ratio of PBCH to PBCH_DMRS					
EPRE ratio of PDCCH_DMRS to SSS					
EPRE ratio of PDCCH to PDCCH_DMRS					
EPRE ratio of PDSCH_DMRS to SSS					
EPRE ratio of PDSCH to PDSCH_DMRS					
EPRE ratio of OCNG DMRS to SSS[Note 1]					
EPRE ratio of OCNG to OCNG DMRS[Note 1]					
Propagation conditions		AWGN	AWGN	AWGN	AWGN
Antenna configuration		1x2	1x2	1x2	1x2
NOTE 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.					

Parameter[Note 5]	Unit	T1		T2	
		Cell 2	Cell 3	Cell 2	Cell 3
NOTE 2: Void NOTE 3: Void NOTE 4: Void NOTE 5: All parameters apply for configuration 1 and 2 NOTE 6: Void					

Table 5.7.1.1.5-2: SS-RSRP Intra frequency OTA related test parameters

Parameter	Unit	T1		T2	
		Cell 2	Cell 3	Cell 2	Cell 3
Angle of arrival configuration		Setup 1			
Assumption for UE beams[Note 8]		Rough			
N_{oc} [Note1]	dBm/15kHz [Note4]	-97.4		N/A	
N_{oc} [Note1]	dBm/SCS[Note4]	-88.37		N/A	
$\hat{E}_s / N_{oc}$	dB	6.0	1.4	N/A	N/A
E_s	dBm/SCS[Note4]			(Table B.2.2-2 Rx Beam Peak +9.8dB)	(Table B.2.2-2 Rx Beam Peak +9.8dB)
SSB_RP[Note2]	dBm/SCS	-82.37	-86.97	(Table B.2.2-2 Rx Beam Peak +9.8dB)	(Table B.2.2-2 Rx Beam Peak +9.8dB)
$\hat{E}_s / I_{ot\ BB}$ [Note6]	dB	2.20	-5.59	-1.77	-1.77
Io[Note2]	dBm/95.04 MHz [Note4]	-55.74		(Table B.2.2-2 Rx Beam Peak +37.40dB)	
NOTE 1: Where used, interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for N_{oc} to be fulfilled. NOTE 2: SSB_RP, Es/Iot and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves. NOTE 3: Void NOTE 4: Equivalent power received by an antenna with 0 dBi gain at the centre of the quiet zone NOTE 5: Void NOTE 6: Calculation of Es/Iot_{BB} includes the effect of UE internal noise up to the value assumed for the associated Refsens requirement in clause 7.3.2 of TS 38.101-2 [3], and an allowance of 1dB for UE multi-band relaxation factor ΔMB_P from TS 38.101-2 [3] Table 6.2.1.3-4. NOTE 7: All parameters apply for configurations 1 and 2 NOTE 8: Information about types of UE beam is given in B.2.1.3 of TS 38.133 [6], and does not limit UE implementation or test system implementation					

Table 5.7.1.1.5-3: evaluation limits for the reported values for T1 and T2 absolute accuracy rules R1, R2, R4, R5

UE power class 3			
Normal Conditions	Test 1 All bands	Test 2	
Lowest reported value (Cell 2)	50	n257, n258, n261	31
		n260	33
		n259	FFS

UE power class 3			
Normal Conditions	**Test 1 All bands**	**Test 2**	
Highest reported value (Cell 2)	108	n257, n258, n261	88
		n260	90
		n259	FFS
Lowest reported value (Cell 3)	46	n257, n258, n261	31
		n260	33
		n259	FFS
Highest reported value (Cell 3)	103	n257, n258, n261	88
		n260	90
		n259	FFS
Extreme Conditions	**Test 1 All bands**	**Test 2**	
Lowest reported value (Cell 2)	47+ FFS	n257, n258, n261	28 + FFS
		n260	30 + FFS
		n259	FFS
Highest reported value (Cell 2)	111+ FFS	n257, n258, n261	91 + FFS
		n260	93 + FFS
		n259	FFS
Lowest reported value (Cell 3)	46+ FFS	n257, n258, n261	28+ FFS
		n260	30+ FFS
		n259	FFS
Highest reported value (Cell 3)	106+ FFS	n257, n258, n261	91+ FFS
		n260	93+ FFS
		n259	FFS

Table 5.7.1.1.5-3a: evaluation limits for the ∆(Max-Min) reported values for each cell during each time period

UE power class 3		
Normal Conditions	**Test 1 All bands**	**Test 2 All bands**
∆(Max-Min) reported value Cell 2	16	16
∆(Max-Min) reported value Cell 3	16	16
Extreme Conditions	**Test 1 All bands**	**Test 2 All bands**
∆(Max-Min) reported value Cell 2	16 + FFS	16+ FFS
∆(Max-Min) reported value Cell 3	16 + FFS	16 + FFS

Table 5.7.1.1.5-4: evaluation limits for the reported values for T1 and T2 relative accuracy rules R3, R6

UE power class 3		
Normal Conditions	**Test 1 All bands**	**Test 2 All bands**
Lowest reported value (Cell 3)	RSRP_x - 12	RSRP_x - 6
Highest reported value (Cell 3)	RSRP_x + 2	RSRP_x + 6
Extreme Conditions	**Test 1 All bands**	**Test 2 All bands**
Lowest reported value (Cell 3)	RSRP_x - 15+ FFS	RSRP_x - 9+ FFS
Highest reported value (Cell 3)	RSRP_x + 5+ FFS	RSRP_x + 9+ FFS
RSRP_x is the reported value of Cell 2		

Table 5.7.1.1.5-5: evaluation limits for the reported values for T2 with respect to T1 relative accuracy rules R7, R8

UE power class 3			
Test 2	**Bands**	**Normal Conditions**	**Extreme Conditions**
Lowest reported value (Cell 2)	n257, n258, n261	RSRP_x - 28	RSRP_x - 31+ FFS
	n260	RSRP_x - 26	RSRP_x - 29+ FFS
	n259	FFS	FFS
Highest reported value (Cell 2)	n257, n258, n261	RSRP_x - 12	RSRP_x - 9+ FFS
	n260	RSRP_x - 10	RSRP_x - 7+ FFS
	n259	FFS	FFS
Lowest reported value (Cell 3)	n257, n258, n261	RSRP_y - 24	RSRP_y - 27+ FFS
	n260	RSRP_y - 21	RSRP_y - 24+ FFS
	n259	FFS	FFS
Highest reported value (Cell 3)	n257, n258, n261	RSRP_y - 8	RSRP_y - 5+ FFS
	n260	RSRP_y - 5	RSRP_y - 2+ FFS
	n259	FFS	FFS
RSRP_x is the reported value of Cell 2 during T1 RSRP_y is the reported value of Cell 3 during T1			

For the test to pass, the ratio of successful reported values for each requirement (R1 to R8) shall be more than 90% with a confidence level of 95%. Each requirement is evaluated independently of the others.

5.7.1.2 EN-DC FR2-FR2 SS-RSRP measurement accuracy

Editor's Note: This test case has been completed for the following configurations:

- Test frequency f ≤ 40.8 GHz
- UE PC3
- Normal conditions
- The test is incomplete for UE power classes other than PC3
- The test is incomplete for test frequencies > 40.8 GHz
- The test is incomplete for extreme conditions

5.7.1.2.1 Test purpose

The purpose of this test is to verify that the inter-frequency SS-RSRP measurement accuracy for NR FR2 is within the specified limits for all bands.

5.7.1.2.2 Test applicability

This test applies to all types of NR UE supporting E-UTRA and EN-DC from Release 15 onwards.

5.7.1.2.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 5.7.1.0.2.

The normative reference for this requirement is TS 38.133 [6] clause A.5.7.1.2.

5.7.1.2.4 Test description

Three cells are configured in this test: E-UTRA Cell 1 is the E-UTRAN PCell, Cell 2 is the NR FR2 PSCell and Cell 3 is the NR FR2 neighbour cell on a different NR FR2 frequency.

5.7.1.2.4.1 Initial conditions

This test shall be tested using any of the test configurations in Table 5.7.1.2.4.1-1.

Table 5.7.1.2.4.1-1: Supported test configurations

Configuration	Description
5.7.1.2-1	NR 120 kHz SSB SCS, 100 MHz bandwidth, TDD duplex mode, LTE FDD
5.7.1.2-2	NR 120 kHz SSB SCS, 100 MHz bandwidth, TDD duplex mode, LTE TDD
5.7.1.2-3	NR 240 kHz SSB SCS, 100 MHz bandwidth, TDD duplex mode, LTE FDD
5.7.1.2-4	NR 240 kHz SSB SCS, 100 MHz bandwidth, TDD duplex mode, LTE TDD
NOTE: The UE is only required to be tested in one of the supported test configurations	

Configure the test equipment and the DUT according to the parameters in Table 5.7.1.2.4.1-2.

Table 5.7.1.2.4.1-2: Initial conditions

Parameter	Value	Comment
Test environment	NC	As specified in TS 36.508 [25] clause 4.1.
Test frequencies	As specified in Annex E, Table E.3-1 and TS 38.508-1 [14] clause 4.3.1 for E-UTRA and 7.2.3 for NR.	
Channel bandwidth	As specified by the selected test configuration.	
Propagation conditions	AWGN	As specified in clause C.2.1
Connection Diagram	TE Part: A.3.3.1.1 DUT Part: A.3.4.1.1	As specified in TS 38.508-1 [14] Annex A.
Exceptions to connection diagram	N/A	

1. The general test parameter settings are set up according to Table 5.7.1.2.4.1-3.
2. Message contents are defined in clause 5.7.1.2.4.3.
3. There are three carriers and three cells specified in the test, where E-UTRA Cell 1 is the E-UTRA PCell on the E-UTRA carrier, Cell 2 is the NR PSCell on one of the NR FR2 carriers and Cell 3 is the neighbour cell on the other NR FR2 carrier. Cell 3 is the target for the SS-RSRP measurements. E-UTRA Cell 1 is configured according to TS 36.521-3 [26] clause C.1.0 and C.1.1.
4. The rx beam peak and directions in which the UE meets the EIS spherical coverage criteria have been found with one of the procedures from Annex I.

5.7.1.2.4.2 Test procedure

1. Configure the positioning system for a valid test point as defined in A.9.4. Ensure the UE is in state RRC_CONNECTED with generic procedure parameters *Connectivity* EN-DC, DC bearer MCG and SCG, Connected without release *On* and Test Mode *On* according to TS 38.508-1 [14] clause 4.5.
2. Set the parameters according to Table 5.7.1.2.5-1 as appropriate.
3. The SS shall transmit an *RRCConnectionReconfiguration* message on Cell 1.
4. The UE shall transmit an *RRCConnectionReconfigurationComplete* message.
5. The UE shall transmit periodically MeasurementReport messages.
6. After 10s wait from Step 3, the SS shall check the SS-RSRP reported values in the periodic MeasurementReport for the following requirements:

   - R1: The SS-RSRP value of Cell 2 reported by the UE is compared to the expected SS-RSRP for Cell 2. If the value is outside the limits in Table 5.7.1.2.5-3 or the UE fails to report the measurement value for Cell 2, the number of failed samples for R1 is increased by one. Otherwise, the number of passed samples for R1 is increased by one.

   - R2: The SS-RSRP value of Cell 3 reported by the UE is compared to the expected SS-RSRP for Cell 3. If the value is outside the limits in Table 5.7.1.2.5-3 or the UE fails to report the measurement value for Cell 3, the number of failed samples for R2 is increased by one. Otherwise, the number of passed samples for R2 is increased by one.

- R3: The SS-RSRP value of Cell 3 reported by the UE is compared to the reported SS-RSRP of Cell 2. If the resulting value is outside the limits in Table 5.7.1.2.5-4 or the UE fails to report the measurement value for Cell 2 or Cell 3, the number of failed samples for R3 is increased by one. Otherwise, the number of passed samples for R3 is increased by one.

7. The SS shall continue checking the MeasurementReport messages transmitted by the UE until the confidence level according to Table G.2.3-1 in Annex G for each of the requirements is achieved. The evaluation of a specific requirement is concluded when the confidence level for that requirement is reached, even if more measurement reports are required for the remaining requirements.

7a. The SS shall check all the SS-RSRP reported values during Test 1 for the following requirements:

- R7: The maximum SS-RSRP value is compared to the minimum SS-RSRP of Cell 2 reported by the UE. If the difference exceeds the limits in Table 5.7.1.2.5-3a count a fail for R7. Otherwise, R7 is passed.

- R8: The maximum SS-RSRP value is compared to the minimum SS-RSRP of Cell 3 reported by the UE. If the difference exceeds the limits in Table 5.7.1.2.5-3a count a fail for R8. Otherwise, R8 is passed.

8. The SS shall select a new test point as defined in A.9.4 and rotate the positioning system for the selected test point.

9. Set the parameters according to Test 2 in Table 5.7.2.1.5-2 as appropriate and repeat steps 5-7. In Step 6, the SS shall check the following requirements:

- R4: The SS-RSRP value of Cell 2 reported by the UE is compared to the expected SS-RSRP for Cell 2. If the value is outside the limits in Table 5.7.2.1.5-3 or the UE fails to report the measurement value for Cell 2, the number of failed samples for R4 is increased by one. Otherwise, the number of passed samples for R4 is increased by one.

- R5: The SS-RSRP value of Cell 3 reported by the UE is compared to the expected SS-RSRP for Cell 3. If the value is outside the limits in Table 5.7.2.1.5-3 or the UE fails to report the measurement value for Cell 3, the number of failed samples for R5 is increased by one. Otherwise, the number of passed samples for R5 is increased by one.

- R6: The SS-RSRP value of Cell 3 reported by the UE is compared to the reported SS-RSRP of Cell 2. If the resulting value is outside the limits in Table 5.7.2.1.5-4 or the UE fails to report the measurement value for Cell 2 or Cell 3, the number of failed samples for R6 is increased by one. Otherwise, the number of passed samples for R6 is increased by one.

10. The SS shall check all the SS-RSRP reported values during Test 1 for the following requirements:

- R9: The maximum SS-RSRP value is compared to the minimum SS-RSRP of Cell 2 reported by the UE. If the difference exceeds the limits in Table 5.7.1.2.5-3a count a fail for R9. Otherwise, R9 is passed.

- R10: The maximum SS-RSRP value is compared to the minimum SS-RSRP of Cell 3 reported by the UE. If the difference exceeds the limits in Table 5.7.1.2.5-3a count a fail for R10. Otherwise, R10 is passed.

5.7.1.2.4.3 Message contents

Message contents are according to TS 38.508-1 [14] clause 7.3 with the following exceptions:

Table 5.7.1.2.4.3-1: Common Exception messages

Default Message Contents	
Common contents of system information blocks exceptions	

Default RRC messages and information elements contents exceptions	Table H.3.1-1 Table H.3.1-2 with Condition INTER-FREQ Table H.3.1-3 with Condition INTER-FREQ MO, Synchronous cells Table H.3.1-5 Table H.3.1-7 with Condition INTER-FREQ Table H.3.4-1 Table H.3.4-1a Table H.3.4-2 Table H.3.4-4 with Condition gapUE Table H.3.4-5 with Condition Pattern #0 Table 7.3.1-3 in TS 38.508-1 [14] with condition SMTC.1

Table 5.7.1.2.4.3-2: ReportConfigNR-DEFAULT(Periodical)

Derivation Path: 38.508-1 [14] Table 4.6.3-142 with condition PERIODICAL			
Information Element	**Value/remark**	**Comment**	**Condition**
ReportConfigNR::= SEQUENCE {			
reportType CHOICE {			
periodical SEQUENCE {			PERIODICAL
reportQuantityCell SEQUENCE {			
rsrq	false		
sinr	false		
}			
maxReportCells	2		
}			
}			
}			

5.7.1.2.5 Test requirement

Table 5.7.1.2.5-1 defines the cell specific settings for all tests. Table 5.7.1.2.5-2 defines the OTA primary level settings including test tolerances for all tests.

The SS-RSRP measurement accuracy shall fulfil the absolute accuracy requirements in clause 5.7.1.0.2.1 and relative accuracy requirements in clause 5.7.1.0.2.2. The following eight requirements are to be verified:

During T1:

R1: Absolute accuracy of Cell 2. The UE is deemed to meet the requirement if the reported SS-RSRP is in the range shown in Table 5.7.1.2.5-3 for test configuration 1 and in Table 5.7.1.2.5-4 for test configuration 2.

R2: Absolute accuracy of Cell 3. The UE is deemed to meet the requirement if the reported SS-RSRP is in the range shown in Table 5.7.1.2.5-3 for test configuration 1 and in Table 5.7.1.2.5-4 for test configuration 2 and Table 5.7.1.2.5-3a for both configurations.

R3: Relative accuracy of Cell 3 compared with Cell 2. The UE is deemed to meet the requirement if the difference in reported SS-RSRP meets the requirements in Table 5.7.1.2.5-5.

R7: Δ(Max-Min) accuracy of Cell 2. The UE is deemed to meet the requirement if the difference between the maximum and the minimum SS-RSRP report does not exceed the limit in Table 5.7.1.2.5-3a.

R8: Δ(Max-Min) accuracy of Cell 3. The UE is deemed to meet the requirement if the difference between the maximum and the minimum SS-RSRP report does not exceed the limit in Table 5.7.1.2.5-3a.During T2:

R4: Absolute accuracy of Cell 2. The UE is deemed to meet the requirement if the reported SS-RSRP is in the range shown in table 5.7.1.2.5-3 for test configuration 1 and in Table 5.7.1.2.5-4 for test configuration 2.

R5: Absolute accuracy of Cell 3. The UE is deemed to meet the requirement if the reported SS-RSRP is in the range shown in table 5.7.1.2.5-3 for test configuration 1 and in Table 5.7.1.2.5-4 for test configuration 2 and Table 5.7.1.2.5-3a for both configurations.

R6: Relative accuracy of Cell 3 compared with Cell 2. The UE is deemed to meet the requirement if the difference in reported SS-RSRP meets the requirements in Table 5.7.1.2.5-5.

R9: Δ(Max-Min) accuracy of Cell 2. The UE is deemed to meet the requirement if the difference between the maximum and the minimum SS-RSRP report does not exceed the limit in Table 5.7.1.2.5-3a.

R10: Δ(Max-Min) accuracy of Cell 3. The UE is deemed to meet the requirement if the difference between the maximum and the minimum SS-RSRP report does not exceed the limit in Table 5.7.1.2.5-3a.

Table 5.7.1.2.5-1: SS-RSRP Inter frequency general test parameters

Parameter	Config	Unit	Test 1		Test 2	
			Cell 2	Cell 3	Cell 2	Cell 3
SSB ARFCN	1~4		freq1	freq2	freq1	freq2
$BW_{channel}$	1~4		100: $N_{RB,c}$ = 66		100: $N_{RB,c}$ = 66	
Data RBs allocated	1,2		24		24	
	3,4		48		48	
Duplex mode	1~4		TDD		TDD	
TDD configuration	1~4		TDDConf.3.1		TDDConf.3.1	
PDSCH Reference measurement channel	1,2		SR.3. 2 TDD	-	SR.3. 2 TDD	-
	3,4		SR.3.3 TDD		SR.3.3 TDD	
RMSI CORESET Reference Channel	1,2		CR.3.1 TDD	-	CR.3.1 TDD	-
	3,4		CR.3.2 TDD		CR.3.2 TDD	
Dedicated CORESET Reference Channel	1,2		CCR.3.1 TDD	-	CCR.3.1 TDD	-
	3,4		CCR.3.7 TDD		CCR.3.7 TDD	
SSB configuration	1,2		SSB.3 FR2		SSB.3 FR2	
	3,4		SSB.4 FR2		SSB.4 FR2	
PDSCH/PDCCH subcarrier spacing	1~4	kHz	120		120	
OCNG Patterns	1~4		OP.3		OP.3	
Initial BWP Configuration	1~4		DLBWP.0.1 ULBWP.0.1		DLBWP.0.1 ULBWP.0.1	
Dedicated BWP configuration	1~4		DLBWP.1.3 ULBWP.1.3		DLBWP.1.3 ULBWP.1.3	
TRS Configuration	1~4		TRS.2.1 TDD		TRS.2.1 TDD	
PDCCH/PDSCH TCI Configuration	1~4		TCI.State.2		TCI.State.2	
SMTC configuration	1~4		SMTC.1		SMTC.1	
Time offset between Cell 2 and Cell 3	1~4	μs	3		3	
EPRE ratio of PSS to SSS	1~4	dB	0	0	0	0
EPRE ratio of PBCH DMRS to SSS						
EPRE ratio of PBCH to PBCH DMRS						
EPRE ratio of PDCCH DMRS to SSS						
EPRE ratio of PDCCH to PDCCH DMRS						
EPRE ratio of PDSCH DMRS to SSS						
EPRE ratio of PDSCH to PDSCH DMRS						
EPRE ratio of OCNG DMRS to SSS Note 1						
EPRE ratio of OCNG to OCNG DMRS Note 1						
Propagation condition	1~4	-	AWGN	AWGN	AWGN	AWGN
Antenna configuration	1~4	-	1x2	1x2	1x2	1x2
NOTE 1: OCNG shall be used such that a constant total transmitted power spectral density is achieved for all OFDM symbols. NOTE 2: Void						

Table 5.7.1.2.5-2: SS-RSRP Inter frequency OTA related test parameters

Parameter	Config	Unit	Test 1		Test 2	
			Cell 2	Cell 3	Cell 2	Cell 3
Angle of arrival configuration	1~4		Setup 4b according to clause A.9.4		Setup 4b according to clause A.9.4	
			AoA1 Spherical coverage	AoA2 Rx Beam Peak	AoA1 Spherical coverage	AoA2 Rx Beam Peak

Parameter	Config	Unit	Test 1		Test 2	
			Cell 2	Cell 3	Cell 2	Cell 3
Assumption for UE beams Note 7	1~4		Rough		Rough	
N_{oc} Note1	1, 2	dBm/15kHz Note4	-96.3	-96.3	(Table B.2.3-2 Rx Beam Peak Note 8 - 4.63dB)	(Table B.2.3-2 Rx Beam Peak Note 8 - 3.03dB)
	3, 4		-99.3	-99.3		
N_{oc} Note1	1, 2	dBm/SCS Note4	-87.3	-87.3	(Table B.2.3-2 Rx Beam Peak Note 8 +4.4dB)	(Table B.2.3-2 Rx Beam Peak Note 8 +6.0dB)
	3, 4		-87.3	-87.3	(Table B.2.3-2 Rx Beam Peak Note 8 +7.4dB)	(Table B.2.3-2 Rx Beam Peak Note 8 +9.0dB)
$\hat{E}_s / N_{oc}$	1~4	dB	6.0	6.0	17.0	1.0
SSB_RP Note2	1, 2	dBm/SCS	-81.3	-81.3	(Table B.2.3-2 Rx Beam Peak Note 8 +21.4dB)	(Table B.2.3-2 Rx Beam Peak Note 8 +7.0dB)
	3, 4		-81.3	-81.3	(Table B.2.3-2 Rx Beam Peak Note 8 +24.4dB)	(Table B.2. 3-2 Rx Beam Peak Note 8 +10.0dB)
($SSB_RP_{Cell\ 2}$ – $SSB_RP_{Cell\ 3}$)	1~4	dB	0		14.40	
$\hat{E}_s / I_{ot\ BB}$ Note6	1, 2	dB	5.23	5.93	5.38	-1.46
	3, 4		4. 58	5.87		
Io Note2	1, 2	dBm/95.04 MHz Note4	-55.70	-55.70	(Table B.2.3-2 Rx Beam Peak Note 8 +46.08dB)	(Table B.2.3-2 Rx Beam Peak Note 8 +35.13dB)
	3, 4		-55.7	-55.7	(Table B.2.3-2 Rx Beam Peak Note 8 +49.09dB)	(Table B.2.3-2 Rx Beam Peak Note 8 +38.14dB)
($Io_{freq\ 1}$ – $Io_{freq\ 2}$)	1~4	dB	0		11.95	

NOTE 1: Where used, interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for N_{oc} to be fulfilled.

NOTE 2: SSB_RP, Es/Iot, Io, ($SSB_RP_{Cell\ 3}$ – $SSB_RP_{Cell\ 2}$) and ($Io_{freq\ 2}$ – $Io_{freq\ 1}$) levels have been derived from other parameters for information purposes. They are not settable parameters themselves.

NOTE 3: Void

NOTE 4: Equivalent power received by an antenna with 0 dBi gain at the centre of the quiet zone

NOTE 5: Void

NOTE 6: Calculation of Es/Iot_{BB} includes the effect of UE internal noise up to the value assumed for the associated Refsens requirement in clause 7.3.2 of TS 38.101-2 [3], and an allowance of 1dB for UE multi-band relaxation factor ΔMB_P or ΔMB_S from TS 38.101-2 [3] Table 6.2.1.3-4.

NOTE 7: Information about types of UE beam is given in B.2.1.3 of TS 38.133 [6], and does not limit UE implementation or test system implementation

NOTE 8: The value in Table B.2.3-2 of TS 38.133 [6] is the Minimum SSB_RP for SCS_{SSB} = 120 kHz, selected according to the operating band of Cell 3 and UE power class, without $\Delta MB_{P,n}$ adjustment.

Table 5.7.1.2.5-3: evaluation limits for the reported values for T1 and T2 absolute accuracy rules R1, R2, R4, R5 for test configuration 1

UE power class 3				
Normal Conditions	**Test 1**		**Test 2**	
Lowest reported value (Cell 2)	n257, n258, n261	41	n257, n258, n261	33
	n260	39	n260	34
	n259	FFS	n259	FFS
Highest reported value (Cell 2)	All bands: 109		n257, n258, n261	101
			n260	104
			n259	FFS
Lowest reported value (Cell 3)	All bands: 52		n257, n258, n261	32
			n260	34
			n259	FFS
Highest reported value (Cell 3)	All bands: 109		n257, n258, n261	87
			n260	90
			n259	FFS
Extreme Conditions	**Test 1**		**Test 2**	
Lowest reported value (Cell 2)	n257, n258, n261	41 + FFS	n257, n258, n261	33 + FFS
	n260	39 + FFS	n260	34 + FFS
	n259	FFS	n259	FFS
Highest reported value (Cell 2)	All bands: 109 + FFS		n257, n258, n261	101 + FFS
			n260	104 + FFS
			n259	FFS
Lowest reported value (Cell 3)	All bands: 52 + FFS		n257, n258, n261	32+ FFS
			n260	34+ FFS
			n259	FFS
Highest reported value (Cell 3)	All bands: 109 + FFS		n257, n258, n261	87+ FFS
			n260	91+ FFS
			n259	FFS

Table 5.7.1.2.5-3a: evaluation limits for the ∆(Max-Min) reportedabsolute values for cell 3 during each time period

UE power class 3		
Normal Conditions	**Test 1 All bands**	**Test 2 All bands**
∆(Max-Min) reported value Cell 3	16	16
Extreme Conditions	**Test 1 All bands**	**Test 2 All bands**
∆(Max-Min) reported value Cell 3	16 + FFS	16 + FFS

Table 5.7.1.2.5-4: evaluation limits for the reported values for T1 and T2 absolute accuracy rules R1, R2, R4, R5 for test configuration 2

UE power class 3				
Normal Conditions	**Test 1**		**Test 2**	
Lowest reported value (Cell 2)	n257, n258, n261	41	n257, n258, n261	36
	n260	39	n260	37
	n259	FFS	n259	FFS
Highest reported value (Cell 2)	All bands: 109		n257, n258, n261	104
			n260	107
			n259	FFS
Lowest reported value (Cell 3)	All bands: 52		n257, n258, n261	35
			n260	37
			n259	FFS
Highest reported value (Cell 3)	All bands: 109		n257, n258, n261	90
			n260	93
			n259	FFS

Extreme Conditions	Test 1		Test 2	
Lowest reported value (Cell 2)	n257, n258, n261	41 + FFS	n257, n258, n261	28 + FFS
	n260	39 + FFS	n260	30 + FFS
	n259	FFS	n259	FFS
Highest reported value (Cell 2)	All bands: 109 + FFS		n257, n258, n261	91 + FFS
			n260	93 + FFS
			n259	FFS
Lowest reported value (Cell 3)	All bands: 52 + FFS		n257, n258, n261	28+ FFS
			n260	30+ FFS
			n259	FFS
Highest reported value (Cell 3)	All bands: 109 + FFS		n257, n258, n261	91+ FFS
			n260	93+ FFS
			n259	FFS

Table 5.7.1.2.5-5: evaluation limits for the reported values for T1 and T2 relative accuracy rules R3, R6

UE power class 3				
Normal Conditions	**Test 1**		**Test 2 All bands**	
Lowest value (RSRP report Cell 3 – RSRP report Cell 2)	All bands: -15		-29	
Highest value (RSRP report Cell 3 – RSRP report Cell 2)	n257, n258, n261	+25	n257, n258, n261	+11
	n260	+27	n260	+13
	n259	FFS	n259	FFS
Extreme Conditions	**Test 1**		**Test 2 All bands**	
Lowest value (RSRP report Cell 3 – RSRP report Cell 2)	-15 + FFS		-29+ FFS	
Highest value (RSRP report Cell 3 – RSRP report Cell 2)	n257, n258, n261	+25 + FFS	n257, n258, n261	+11 + FFS
	n260	+27+ FFS	n260	+13 + FFS
	n259	FFS	n259	FFS

For the test to pass, the ratio of successful reported values for each requirement (R1 to R6) shall be more than 90% with a confidence level of 95%. Each requirement is evaluated independently of the others.

5.7.1.3 EN-DC FR1-FR2 SS-RSRP measurement accuracy

Editor's Note: This test case has been completed for the following configurations:

- Test frequency f ≤ 40.8 GHz
- UE PC3
- Normal conditions
- The test is incomplete for UE power classes other than PC3
- The test is incomplete for test frequencies > 40.8 GHz
- The test is incomplete for extreme conditions
- E-UTRA - FR2 OTA testability is still FFS.

5.7.1.3.1 Test purpose

The purpose of this test is to verify that the inter-frequency SS-RSRP measurement accuracy for NR FR2 is within the specified limits for all bands, when the PSCell is on an NR FR1 carrier.

5.7.1.3.2 Test applicability

This test applies to all types of NR UE supporting E-UTRA and EN-DC from Release 15 onwards.

5.7.1.3.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 5.7.1.0.2.

The normative reference for this requirement is TS 38.133 [6] clause A.5.7.1.3.

5.7.1.3.4 Test description

Three cells are configured in this test: E-UTRA Cell 1 is the E-UTRAN PCell, Cell 2 is the NR FR1 PSCell and Cell 3 is the NR FR2 neighbour cell on a NR FR2 carrier.

5.7.1.3.4.1 Initial conditions

This test shall be tested using any of the test configurations in Table 5.7.1.3.4.1-1.

Table 5.7.1.3.4.1-1: Supported test configurations

Config	Description of serving cell	Description of target cell
1	LTE FDD, NR 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode	120 kHz SSB SCS, 100 MHz bandwidth, TDD duplex mode
2	LTE FDD, NR 15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode	
3	LTE FDD, NR 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode	
4	LTE TDD, NR 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode	
5	LTE TDD, NR 15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode	
6	LTE TDD, NR 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode	
Note: The UE is only required to be tested in one of the supported test configurations		

Configure the test equipment and the DUT according to the parameters in Table 5.7.1.3.4.1-2.

Table 5.7.1.3.4.1-2: Initial conditions

Parameter	Value	Comment
Test environment	NC	As specified in TS 36.508 [25] clause 4.1.
Test frequencies	As specified in Annex E, Table E.3-1 and TS 38.508-1 [14] clause 4.3.1 for E-UTRA and 7.2.3 for NR.	
Channel bandwidth	As specified by the selected test configuration.	
Propagation conditions	AWGN	As specified in clause C.2.1
Connection Diagram	TE Part: A.3.3.1.1 DUT Part: A.3.4.1.1	As specified in TS 38.508-1 [14] Annex A.
Exceptions to connection diagram	N/A	

1. The general test parameter settings are set up according to Table 5.7.1.3.4.1-3.
2. Message contents are defined in clause 5.7.1.3.4.3.
3. There are three carriers and three cells specified in the test, where E-UTRA Cell 1 is the E-UTRA PCell on the E-UTRA carrier, Cell 2 is the NR PSCell on the NR FR1 carrier and Cell 3 is the neighbour cell on the NR FR2 carrier. Cell 3 is the target for the SS-RSRP measurements. E-UTRA Cell 1 is configured according to TS 36.521-3 [26] clause C.1.0 and C.1.1.
4. The directions in which the UE meets the EIS spherical coverage criteria have been found with one of the procedures from Annex I.

5.7.1.3.4.2 Test procedure

1. Configure the positioning system for a valid test point as defined in A.9.2. Ensure the UE is in state RRC_CONNECTED with generic procedure parameters *Connectivity* EN-DC, DC bearer MCG and SCG, Connected without release *On* and Test Mode *On* according to TS 38.508-1 [14] clause 4.5.

2. Set the parameters according to Table 5.7.1.3.5-1 as appropriate.

3. The SS shall transmit an *RRCConnectionReconfiguration* message on Cell 1.

4. The UE shall transmit an *RRCConnectionReconfigurationComplete* message.

5.

The UE shall transmit periodically MeasurementReport messages.

6. After 10s wait from Step 3, the SS shall check the SS-RSRP reported values in the periodic MeasurementReport for the following requirements:

   - R1: The SS-RSRP value of Cell 3 reported by the UE is compared to the expected SS-RSRP for Cell 3. If the value is outside the limits in Table 5.7.1.3.5-3 or the UE fails to report the measurement value for Cell 3, the number of failed iterations for R1 is increased by one. Otherwise, the number of passed iterations for R1 is increased by one.

7. The SS shall continue checking the MeasurementReport messages transmitted by the UE until the confidence level according to Table G.2.3-1 in Annex G for each of the requirements is achieved. The evaluation of a specific requirement is concluded when the confidence level for that requirement is reached, even if more measurement reports are required for the remaining requirements.

8. The SS shall select a new test point as defined in A.9.2 and rotate the positioning system for the selected test point.

9. Set the parameters according to Test 2 in Table 5.7.1.3.5-2 as appropriate and repeat steps 5-7. In Step 6, the SS shall check the following requirements:

   - R2: The SS-RSRP value of Cell 3 reported by the UE is compared to the expected SS-RSRP for Cell 3. If the value is outside the limits in Table 5.7.1.3.5-3 or the UE fails to report the measurement value for Cell 3, the number of failed iterations for R2 is increased by one. Otherwise, the number of passed iterations for R2 is increased by one.

5.7.1.3.4.3 Message contents

Message contents are according to TS 38.508-1 [14] clause 7.3 with the following exceptions:

Table 5.7.1.3.4.3-1: Common Exception messages

Default Message Contents	
Common contents of system information blocks exceptions	
Default RRC messages and information elements contents exceptions	Table H.3.1-1 Table H.3.1-2 with Condition INTER-FREQ Table H.3.1-3 with Condition INTER-FREQ MO, Synchronous cells Table H.3.1-5 Table H.3.1-7 with Condition INTER-FREQ Table H.3.4-1 Table H.3.4-1a Table H.3.4-2 Table H.3.4-4 with Condition gapUE Table H.3.4-5 with Condition Pattern #0 Table 7.3.1-3 in TS 38.508-1 [14] with condition SMTC.1

Table 5.7.1.3.4.3-2: ReportConfigNR-DEFAULT(Periodical)

Derivation Path: 38.508-1 [14] Table 4.6.3-142 with condition PERIODICAL			
Information Element	**Value/remark**	**Comment**	**Condition**

ReportConfigNR::= SEQUENCE {			
reportType CHOICE {			
periodical SEQUENCE {			PERIODICAL
reportQuantityCell SEQUENCE {			
rsrq	false		
sinr	false		
}			
maxReportCells	2		
}			
}			
}			

5.7.1.3.5 Test requirement

Table 5.7.1.3.5-1 defines the cell specific settings for all tests. Table 5.7.1.3.5-2 defines the OTA primary level settings including test tolerances for all tests.

The SS-RSRP measurement accuracy shall fulfil the absolute accuracy requirements in clause 5.7.1.0.2. The following requirements are to be verified:

During Test 1:

R1: Absolute accuracy of Cell 3. The UE is deemed to meet the requirement if the reported SS-RSRP is in the range shown in Table 5.7.1.3.5-3.

During Test 2:

R2: Absolute accuracy of Cell 3. The UE is deemed to meet the requirement if the reported SS-RSRP is in the range shown in Table 5.7.1.3.5-3.

Table 5.7.1.3.5-1: SS-RSRP inter-frequency test parameters

Parameter	Config	Unit	Test 1		Test 2	
			Cell 2	Cell 3	Cell 2	Cell 3
SSB ARFCN	1~6		freq1	freq2	freq1	freq2
$BW_{channel}$	1,4	MHz	10: $N_{RB,c}$ = 52	100: $N_{RB,c}$ = 66	10: $N_{RB,c}$ = 52	100: $N_{RB,c}$ = 66
	2,5		10: $N_{RB,c}$ = 52		10: $N_{RB,c}$ = 52	
	3,6		40: $N_{RB,c}$ = 106		40: $N_{RB,c}$ = 106	
Data RBs allocated	1,2,4,5		52	24	52	66
	3,6		106		106	
Gap pattern ID			0		0	
Duplex mode	1,4		FDD	TDD	FDD	TDD
	2,5		TDD		TDD	
	3,6		TDD		TDD	
TDD configuration	1,4		N/A	TDDConf. 3.1	N/A	TDDConf. 3.1
	2,5		TDDConf. 1.1		TDDConf. 1.1	
	3,6		TDDConf. 2.1		TDDConf. 2.1	
PDSCH Reference measurement channel	1,4		SR.1.1 FDD	-	SR.1.1 FDD	-
	2,5		SR.1.1 TDD		SR.1.1 TDD	
	3,6		SR.2.1 FDD		SR.2.1 FDD	
RMSI CORESET Reference Channel	1,4		CR.1.1 FDD	-	CR.1.1 FDD	-
	2,5		CR.1.1 TDD	-	CR.1.1 TDD	-
	3,6		CR.2.1 FDD	-	CR.2.1 FDD	-
Dedicated CORESET Reference Channel	1,4		CCR.1.1 FDD	-	CCR.1.1 FDD	-
	2,5		CCR.1.1 TDD	-	CCR.1.1 TDD	-
	3,6		CCR.2.1 TDD	-	CCR.2.1 TDD	-
SSB configuration	1,4		SSB.1 FR1	SSB.3 FR2	SSB.1 FR1	SSB.3 FR2
	2,5		SSB.1 FR1		SSB.1 FR1	

	3,6		SSB.2 FR1		SSB.2 FR1	
OCNG Patterns	1~6		OP.1	OP.3	OP.1	OP.1
Initial BWP Configuration	1~6		DLBWP.0.1 ULBWP.0.1		DLBWP.0.1 ULBWP.0.1	
Dedicated BWP configuration	1~6		DLBWP.1.3 ULBWP.1.3		DLBWP.1.3 ULBWP.1.3	
TRS Configuration	1~6		TRS.2.1 TDD		TRS.2.1 TDD	
PDCCH/PDSCH TCI Configuration	1~6		TCI.State.2		TCI.State.2	
SMTC configuration	1~6		SMTC.1		SMTC.1	
Time offset between Cell 2 and Cell 3	1~6	µs	3		3	
EPRE ratio of PSS to SSS	1~6	dB	0	0	0	0
EPRE ratio of PBCH DMRS to SSS						
EPRE ratio of PBCH to PBCH DMRS						
EPRE ratio of PDCCH DMRS to SSS						
EPRE ratio of PDCCH to PDCCH DMRS						
EPRE ratio of PDSCH DMRS to SSS						
EPRE ratio of PDSCH to PDSCH DMRS						
EPRE ratio of OCNG DMRS to SSS Note 1						
EPRE ratio of OCNG to OCNG DMRS Note 1						
Propagation condition	1~6	-	NA	AWGN	NA	AWGN
Antenna configuration	1~6	-	Link only, see clause A.3.7A of TS 38.133 [6]	1x2	Link only, see clause A.3.7A of TS 38.133 [6]	1x2
Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols. Note 2: Void						

Table 5.7.1.3.5-2: SS-RSRP inter-frequency OTA related test parameters

Parameter	Config	Unit	Test 1		Test 2 NOTE 3	
			Cell 2	Cell 3	Cell 2	Cell 3
Angle of arrival configuration according to clause A.9			NA	Setup 2b	NA	Setup 2b
Assumption for UE beams Note 4			N/A	Rough	N/A	Rough
N_{oc}	1~6	dBm/15 kHz	NA Link only, see clause A.3.7A of TS 38.133 [6]	-95.5	NA Link only, see clause A.3.7A of TS 38.133 [6]	NA
N_{oc}	1~6	dBm/SSB SCS		-86.47		NA
$\hat{E}_s / N_{oc}$	1~6	dB		5		NA
E_s	1~6	dBm/SCS		NA		(Table B.2.3-2 Spherical coverage +6.5dB)
SSB_RP Note1	1~6	dBm/SCS		-81.47		(Table B.2.3-2 Spherical coverage +6.5dB)

$\hat{E}_s/I_{otBB}$ Note6	1~6	dB		4.35		1.69
Io Note1	1~6	dBm/ 95.04M Hz		-55.68		SSB_RP+34.48

Note 1: Es/Iot, SSB_RP and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.
Note 2: Void
Note 3: No additional noise is added by the test system in Test 2.
Note 4: Information about types of UE beam is given in B.2.1.3, of TS 38.133 [6] and does not limit UE implementation or test system implementation.
Note 5: Where used, interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for N_{OC} to be fulfilled.
Note 6: Calculation of Es/Iot_{BB} includes the effect of UE internal noise up to the value assumed for the associated Refsens requirement in clause 7.3.2 of TS 38.101-2 [2], and an allowance of 1dB for UE multi-band relaxation factor ΔMB_S from TS 38.101-2 [2] Table 6.2.1.3-4.

Table 5.7.1.3.5-3: evaluation limits for the reported values for Test 1 and Test 2 absolute accuracy rules R1, R2

UE power class 3				
Normal Conditions	**Test 1**		**Test 2**	
Lowest reported value (Cell 3)	n257, n258, n261	46	n257, n258, n261	46
	n260	45	n260	47
	n259	FFS	n259	FFS
Highest reported value (Cell 3)	n257, n258, n261	103	n257, n258, n261	101
	n260	102	n260	104
	n259	FFS	n259	FFS
Extreme Conditions	**Test 1**		**Test 2**	
Lowest reported value (Cell 3)	n257, n258, n261	FFS	n257, n258, n261	FFS
	n260	FFS	n260	FFS
	n259	FFS	n259	FFS
Highest reported value (Cell 3)	n257, n258, n261	FFS	n257, n258, n261	FFS
	n260	FFS	n260	FFS
	n259	FFS	n259	FFS

For the test to pass, the ratio of successful reported values for each requirement (R1 and R2) shall be more than 90% with a confidence level of 95%. Each requirement is evaluated independently of the others.

5.7.2 SS-RSRQ

5.7.2.0 Minimum conformance requirements

5.7.2.0.1 Intra-frequency SS-RSRQ measurement accuracy requirements

Unless otherwise specified, the requirements for absolute accuracy of SS-RSRQ in this clause apply to a cell on the same frequency as that of the serving cell in FR2.

The accuracy requirements in Table 5.7.2.0.1-1 are valid under the following conditions:

- Conditions defined in clause 7.3 of TS 38.101-2 [3] for reference sensitivity are fulfilled.

- Conditions for intra-frequency measurements are fulfilled according to Annex B.2.2 for a corresponding Band for each relevant SSB.

- The measured signals are in the directions covered by the percentile EIS spherical coverage of the UE, defined in clause 7.3.4 of TS 38.101-2 [3].

Table 5.7.2.0.1-1: SS-RSRQ Intra frequency absolute accuracy in FR2

Accuracy		Conditions		
Normal condition	Extreme condition	SSB Ês/Iot	Io Note 2 range	
			Minimum Io	Maximum Io
dB	dB	dB	dBm / SCS_{SSB} Note 1	$dBm/BW_{Channel}$
			SCS_{SSB} = 120kHz / SCS_{SSB} = 240kHz	
±2.5	±4	≥-3	Same value as SSB_RP in Table B.2.2-2, according to UE Power class, operating band and angle of arrival	-50
±3.5	±4	≥-6		
NOTE 1: Values based on Refsens and EIS spherical coverage as defined in clauses 7.3.2 and 7.3.4 of TS 38.101-2 [3]. Applicable side condition selected depending on angle of arrival.				
NOTE 2: Io specified at the Reference point, and assumed to have constant EPRE across the bandwidth.				
NOTE 3: In the test cases, the SSB Ês/Iot and related parameters may need to be adjusted to ensure Ês/Iot at UE baseband is above the value defined in this table.				

The reporting range of SS-RSRQ is defined from -43 dB to 20 dB with 0.5 dB resolution. The mapping of measured quantity is defined in Table 4.7.2.0.1-2. The range in the signalling may be larger than the guaranteed accuracy range.

The normative reference for this requirement is TS 38.133 [6] clauses 10.1.8.1 and 10.1.11.

5.7.2.0.2 Inter-frequency SS-RSRQ measurement accuracy requirements

5.7.2.0.2.1 Absolute SS-RSRQ Accuracy

The requirements for absolute accuracy of SS-RSRQ in this clause apply to a cell on a frequency in FR2 that has different carrier frequency from the serving cell.

The accuracy requirements in Table 5.7.2.0.2.1-1 are valid under the following conditions:

- Conditions defined in clause 7.3 of TS 38.101-2 [3] for reference sensitivity are fulfilled.

- Conditions for inter-frequency measurements are fulfilled according to Annex B.2.3 for a corresponding Band for each relevant SSB.

- The measured signals are in the directions covered by the percentile EIS spherical coverage of the UE, defined in clause 7.3.4 of TS 38.101-2 [3].

Table 5.7.2.0.2.1-1: SS-RSRQ Inter frequency absolute accuracy in FR2

Accuracy		Conditions		
Normal condition	Extreme condition	SSB Ês/Iot	Io Note 2 range	
			Minimum Io	Maximum Io
dB	dB	dB	dBm / SCS_{SSB} Note 1	$dBm/BW_{Channel}$
			SCS_{SSB} = 120kHz / SCS_{SSB} = 240kHz	
±2.5	±4	≥-3	Same value as SSB_RP in Table B.2.2-2, according to UE Power class, operating band and angle of arrival	-50
±3.5	±4	≥-4		
NOTE 1: Values based on Refsens and EIS spherical coverage as defined in clauses 7.3.2 and 7.3.4 of TS 38.101-2 [3]. Applicable side condition selected depending on angle of arrival.				
NOTE 2: Io specified at the Reference point, and assumed to have constant EPRE across the bandwidth.				
NOTE 3: In the test cases, the SSB Ês/Iot and related parameters may need to be adjusted to ensure Ês/Iot at UE baseband is above the value defined in this table.				

The reporting range of SS-RSRQ is defined from -43 dB to 20 dB with 0.5 dB resolution. The mapping of measured quantity is defined in Table 4.7.2.0.1-2. The range in the signalling may be larger than the guaranteed accuracy range.

The normative reference for this requirement is TS 38.133 [6] clauses 10.1.10.1 and 10.1.11.

5.7.2.0.2.2 Relative SS-RSRQ Accuracy

The relative accuracy of SS-RSRQ in inter frequency case is defined as the RSRQ measured from one cell on a frequency in FR2 compared to the RSRP measured from another cell on a different frequency in FR2.

The accuracy requirements in Table 5.7.2.0.2.2-1 are valid under the following conditions:

- Conditions defined in clause 7.3 of TS 38.101-2 [3] for reference sensitivity are fulfilled.
- Conditions for inter-frequency measurements are fulfilled according to Annex B.2.3 for a corresponding Band for each relevant SSB.
- $|SSB_RP1_{dBm} - SSB_RP2_{dBm}| \leq 27$ dB
- | Channel 1_Io -Channel 2_Io | ≤ 20 dB
- The measured signals are in the directions covered by the percentile EIS spherical coverage of the UE, defined in clause 7.3.4 of TS 38.101-2 [3].

Table 5.7.2.0.2.2-1: SS-RSRQ Inter frequency relative accuracy in FR2

Accuracy		Conditions		
Normal condition	Extreme condition	SSB Ês/Iot	Io Note 2 range	
			Minimum Io	Maximum Io
dB	dB	dB	dBm / SCS_{SSB} Note 1	dBm/$BW_{Channel}$
			SCS_{SSB} = 120kHz | SCS_{SSB} = 240kHz	
±3	±4	≥-3	Same value as SSB_RP in Table B.2.2-2, according to UE Power class, operating band and angle of arrival	-50
±4	±4	≥-4		

NOTE 1: Values based on Refsens and EIS spherical coverage as defined in clauses 7.3.2 and 7.3.4 of TS 38.101-2 [3]. Applicable side condition selected depending on angle of arrival.
NOTE 2: Io specified at the Reference point, and assumed to have constant EPRE across the bandwidth.
NOTE 3: The parameter SSB Ês/Iot is the minimum SSB Ês/Iot of the pair of cells to which the requirement applies.
NOTE 4: In the test cases, the SSB Ês/Iot and related parameters may need to be adjusted to ensure Ês/Iot at UE baseband is above the value defined in this table.

The reporting range of SS-RSRQ is defined from -43 dB to 20 dB with 0.5 dB resolution. The mapping of measured quantity is defined in Table 4.7.2.0.1-2. The range in the signalling may be larger than the guaranteed accuracy range.

The normative reference for this requirement is TS 38.133 [6] clauses 10.1.10.1 and 10.1.11.

5.7.2.1 EN-DC FR2 SS-RSRQ measurement accuracy

Editor's Note: This test case has been completed for the following configurations:

- Test frequency f ≤ 40.8 GHz
- UE PC3
- Normal conditions
- The test is incomplete for UE power classes other than PC3
- The test is incomplete for test frequencies > 40.8 GHz
- The test is incomplete for extreme conditions

5.7.2.1.1 Test purpose

The purpose of this test is to verify that the intra-frequency SS-RSRQ measurement accuracy for NR FR2 is within the specified limits for all bands.

5.7.2.1.2 Test applicability

This test applies to all types of NR UE supporting E-UTRA and EN-DC from Release 15 onwards.

5.7.2.1.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 5.7.2.0.1.

The normative reference for this requirement is TS 38.133 [6] clause A.5.7.2.1.

5.7.2.1.4 Test description

Three cells are configured in this test: E-UTRA Cell 1 is the E-UTRAN PCell, Cell 2 is the NR FR2 PSCell and Cell 3 is the NR FR2 neighbour cell on the same frequency as the PSCell.

5.7.2.1.4.1 Initial conditions

This test shall be tested using any of the test configurations in Table 5.7.2.1.4.1-1.

Table 5.7.2.1.4.1-1: Supported test configurations

Configuration	Description
5.7.2.1-1	NR 120 kHz SSB SCS, 100 MHz bandwidth, TDD duplex mode, LTE FDD
5.7.2.1-2	NR 120 kHz SSB SCS, 100 MHz bandwidth, TDD duplex mode, LTE TDD
NOTE: The UE is only required to be tested in one of the supported test configurations	

Configure the test equipment and the DUT according to the parameters in Table 5.7.2.1.4.1-2.

Table 5.7.2.1.4.1-2: Initial conditions

Parameter	Value	Comment
Test environment	NC	As specified in TS 36.508 [25] clause 4.1.
Test frequencies	As specified in Annex E, E.1.1, E.1.3.1 and Table E.3-1 and TS 38.508-1 [14] clause 4.3.1 for E-UTRA and 7.2.3 for NR.	
Channel bandwidth	As specified by the selected test configuration.	
Propagation conditions	AWGN	As specified in clause C.2.1
Connection Diagram	TE Part: A.3.3.1.1 DUT Part: A.3.4.1.1	As specified in TS 38.508-1 [14] Annex A.
Exceptions to connection diagram	N/A	

1. Message contents are defined in clause 5.7.2.1.4.3.

2. There are two carriers and three cells specified in the test, where E-UTRA Cell 1 is the E-UTRA PCell on the E-UTRA carrier, Cell 2 is the NR PSCell on the NR FR2 carrier and Cell 3 is the neighbour cell on the same NR FR2 carrier. Cell 3 is the target for the SS-RSRQ measurements. E-UTRA Cell 1 is configured according to TS 36.521-3 [26] clause C.1.0 and C.1.1.

3. The UE Rx beam peak direction has been obtained previously using one of the Rx Beam Peak Search procedures as described in Annex I.

5.7.2.1.4.2 Test procedure

1. Ensure the UE is in State 3A-RF according to TS 36.508 [25] clause 7.2A.3.

2. Set the parameters according to Table 5.7.2.1.5-1 as appropriate.
3. The SS shall transmit an *RRCConnectionReconfiguration* message on Cell 1.
4. The UE shall transmit an *RRCConnectionReconfigurationComplete* message.
5. The UE shall transmit periodically MeasurementReport messages.
6. After 10s wait from Step 3, the SS shall check the SS-RSRQ reported values in the periodic MeasurementReport. The SS-RSRQ value of Cell 3 reported by the UE is compared to the expected SS-RSRQ. If the value is outside the limits in Table 5.7.2.1.5-3 or the UE fails to report the measurement value for Cell 3, the number of failed iterations is increased by one. Otherwise, the number of passed iterations is increased by one.
7. The SS shall continue checking the MeasurementReport messages transmitted by the UE until the confidence level according to Table G.2.3-1 in Annex G is achieved.
8. Set the parameters according to each sub-test in Table 5.7.2.1.5-2 as appropriate and repeat steps 5-7.

5.7.2.1.4.3 Message contents

Message contents are according to TS 38.508-1 [14] clause 7.3 with the following exceptions:

Table 5.7.2.1.4.3-1: Common Exception messages

Default Message Contents	
Common contents of system information blocks exceptions	
Default RRC messages and information elements contents exceptions	Table H.3.1-1 Table H.3.1-2 Table H.3.1-3 with Condition Synchronous cells Table H.3.1-5 Table H.3.1-7 Table H.3.4-1 Table H.3.4-1a Table H.3.4-2 Table 7.3.1-3 in TS 38.508-1 [14] with condition SMTC.1

Table 5.7.2.1.4.3-2: ReportConfigNR-DEFAULT(Periodical)

Derivation Path: 38.508-1 [14] Table 4.6.3-142 with condition PERIODICAL			
Information Element	**Value/remark**	**Comment**	**Condition**
ReportConfigNR::= SEQUENCE {			
reportType CHOICE {			
periodical SEQUENCE {			PERIODICAL
reportQuantityCell SEQUENCE {			
rsrp	false		
sinr	false		
}			
maxReportCells	2		
}			
}			
}			

5.7.2.1.5 Test requirement

Table 5.7.2.1.5-1 defines the cell specific settings for all tests. Table 5.7.2.1.5-2 defines the OTA primary level settings including test tolerances for all tests.

Each SS-RSRQ measurement report for each of the tests in Table 5.7.2.1.5-2 shall meet the corresponding absolute accuracy requirements in Table 5.7.2.1.5-3.

Table 5.7.2.1.5-1: SS-RSRQ Intra frequency test parameters

Parameter		Unit	Test 1		Test 2	
			Cell 2	Cell 3	Cell 2	Cell 3
SSB ARFCN			Freq1		Freq1	
Duplex mode			TDD		TDD	
TDD configuration			TDDConf.3.1		TDDConf.3.1	
$BW_{channel}$		MHz	100: $N_{RB,c}$ = 66		100: $N_{RB,c}$ = 66	
BWP configuration	Initial DL BWP		DLBWP.0.1			
	Dedicated DL BWP		DLBWP.1.1			
	Initial UL BWP		ULBWP.0.1			
	Dedicated UL BWP		ULBWP.1.1			
TRS configuration			TRS.2.1 TDD		TRS.2.1 TDD	
TCI state			TCI.State.0		TCI.State.0	
PDSCH Reference measurement channel			SR.3.1 TDD		SR.3.1 TDD	
RMSI CORESET Reference Channel			CR.3.1 TDD	-	CR.3.1 TDD	-
Control channel RMC			CCR.3.1 TDD	-	CCR.3.1 TDD	-
OCNG Patterns			OP.1	OP.1	OP.1	OP.1
SMTC configuration			SMTC.1			
SSB configuration			SSB.3 FR2	SSB.3 FR2	SSB.3 FR2	SSB.3 FR2
PDSCH/PDCCH subcarrier spacing		kHz	120	120	120	120
SS-RSSI-Measurement			Not Applicable			
EPRE ratio of PSS to SSS		dB	0	0	0	0
EPRE ratio of PBCH_DMRS to SSS						
EPRE ratio of PBCH to PBCH_DMRS						
EPRE ratio of PDCCH_DMRS to SSS						
EPRE ratio of PDCCH to PDCCH_DMRS						
EPRE ratio of PDSCH_DMRS to SSS						
EPRE ratio of PDSCH to PDSCH_DMRS						
EPRE ratio of OCNG DMRS to SSS Note 1						
EPRE ratio of OCNG to OCNG DMRS Note 1						
Propagation condition			AWGN		AWGN	
Antenna Configuration			1x2		1x2	

NOTE 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.
NOTE 2: Void.
NOTE 3: Void.
NOTE 4: Void.
NOTE 5: Void

Table 5.7.2.1.5-2: SS-RSRQ Intra frequency OTA related test parameters

Parameter	Unit	Test 1		Test 2	
		Cell 2	Cell 3	Cell 2	Cell 3
Angle of arrival configuration		Setup 1		Setup 1	
Assumption for UE beams Note 9		Rough			
N_{oc} Note1	dBm/15kHz Note4	-100.7		-96.7	
N_{oc} Note1	dBm/SCS Note3	-91.67		-87.67	
SSB_RP Note2	dBm/SCS Note4	-88.67	-88.67	-90.67	-90.67
SS-RSRQ Note2	dB	-14.81	-14.81	-16.84	-16.84
$\hat{E}_s / I_{ot}$	dB	-1.76	-1.76	-4.76	-4.76
$\hat{E}_s / N_{oc}$	dB	3	3	-3	-3
Io Note2	dBm/95.04 MHz Note4	-55.7		-55.67	-55.67

NOTE 1: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for N_{oc} to be fulfilled.
NOTE 2: SS-RSRQ, SSB_RP, and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.
NOTE 3: SS-RSRQ and SSB_RP minimum requirements are specified assuming independent interference and noise at each receiver antenna port.
NOTE 4: Equivalent power received by an antenna with 0dBi gain at the centre of the quiet zone
NOTE 5: As observed with 0dBi gain antenna at the centre of the quiet zone
NOTE 6: Void.
NOTE 7: Void
NOTE 8: Void
NOTE 9: Information about types of UE beam is given in B.2.1.3 of TS 38.133 [6], and does not limit UE implementation or test system implementation

Table 5.7.2.1.5-3: SS-RSRQ Intra frequency absolute accuracy requirements for the reported values

UE Power Class 3	Test 1 (All bands)	Test 2	
Normal Conditions			
Lowest reported value (Cell 3)	SS-RSRQ_41	n257, n258, n261	SS-RSRQ_35
		n260	SS-RSRQ_34
		n259	FFS
Highest reported value (Cell 3)	SS-RSRQ_73	All bands	SS-RSRQ_71
Extreme Conditions			
Lowest reported value (Cell 3)	SS-RSRQ_38+ FFS	n257, n258, n261	SS-RSRQ_34+ FFS
		n260	SS-RSRQ_33+ FFS
		n259	FFS
Highest reported value (Cell 3)	SS-RSRQ_76+ FFS	All bands	SS-RSRQ_72+ FFS

For the test to pass, the ratio of successful reported values in each test shall be more than 90% with a confidence level of 95%.

5.7.2.2 EN-DC FR2-FR2 SS-RSRQ measurement accuracy

Editor's Note: This test case has been completed for the following configurations:

- Test frequency f ≤ 40.8 GHz

- UE PC3

- Normal conditions

- The test is incomplete for UE power classes other than PC3

- The test is incomplete for test frequencies > 40.8 GHz

- The test is incomplete for extreme conditions

5.7.2.2.1 Test purpose

The purpose of this test is to verify that the inter-frequency SS-RSRQ measurement accuracy for NR FR2 is within the specified limits for all bands.

5.7.2.2.2 Test applicability

This test applies to all types of NR UE supporting E-UTRA and EN-DC from Release 15 onwards.

5.7.2.2.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 5.7.2.0.2.

The normative reference for this requirement is TS 38.133 [6] clause A.5.7.2.2.

5.7.2.2.4 Test description

Three cells are configured in this test: E-UTRA Cell 1 is the E-UTRAN PCell, Cell 2 is the NR FR2 PSCell and Cell 3 is the NR FR2 neighbour cell on a different NR FR2 frequency.

5.7.2.2.4.1 Initial conditions

This test shall be tested using any of the test configurations in Table 5.7.2.2.4.1-1.

Table 5.7.2.2.4.1-1: Supported test configurations

Configuration	Description
5.7.2.2-1	NR 120 kHz SSB SCS, 100 MHz bandwidth, TDD duplex mode, LTE FDD
5.7.2.2-2	NR 120 kHz SSB SCS, 100 MHz bandwidth, TDD duplex mode, LTE TDD
NOTE: The UE is only required to be tested in one of the supported test configurations	

Configure the test equipment and the DUT according to the parameters in Table 5.7.2.2.4.1-2.

Table 5.7.2.2.4.1-2: Initial conditions

Parameter	Value	Comment
Test environment	NC	As specified in TS 36.508 [25] clause 4.1.
Test frequencies	As specified in Annex E, Table E.3-1 and TS 38.508-1 [14] clause 4.3.1 for E-UTRA and 7.2.3 for NR.	
Channel bandwidth	As specified by the selected test configuration.	
Propagation conditions	AWGN	As specified in clause C.2.1
Connection Diagram	TE Part: A.3.3.1.1 DUT Part: A.3.4.1.1	As specified in TS 38.508-1 [14] Annex A.
Exceptions to connection diagram	N/A	

1. The general test parameter settings are set up according to Table 5.7.2.2.4.1-3.
2. Message contents are defined in clause 5.7.2.2.4.3.
3. There are three carriers and three cells specified in the test, where E-UTRA Cell 1 is the E-UTRA PCell on the E-UTRA carrier, Cell 2 is the NR PSCell on one of the NR FR2 carriers and Cell 3 is the neighbour cell on the other NR FR2 carrier. Cell 3 is the target for the SS-RSRQ measurements. E-UTRA Cell 1 is configured according to TS 36.521-3 [26] clause C.1.0 and C.1.1.
4. The UE Rx beam peak direction has been obtained previously using one of the Rx Beam Peak Search procedures as described in Annex I.

5.7.2.2.4.2 Test procedure

1. Ensure the UE is in state RRC_CONNECTED with generic procedure parameters *Connectivity* EN-DC, DC bearer MCG and SCG, Connected without release *On* and Test Mode *On* according to TS 38.508-1 [14] clause 4.5..
2. Set the parameters according to Table 5.7.2.2.5-1 as appropriate.
3. The SS shall transmit an *RRCConnectionReconfiguration* message on Cell 1.
4. The UE shall transmit an *RRCConnectionReconfigurationComplete* message.
5. The UE shall transmit periodically MeasurementReport messages.

6. After 10s wait from Step 3, the SS shall check the SS-RSRQ reported values in the periodic MeasurementReport for the following requirements:

   - R1: The SS-RSRQ value of Cell 2 reported by the UE is compared to the expected SS-RSRQ for Cell 2. If the value is outside the limits in Table 5.7.2.2.5-3 or the UE fails to report the measurement value for Cell 2, the number of failed iterations for R1 is increased by one. Otherwise, the number of passed iterations for R1 is increased by one.

   - R2: The SS-RSRQ value of Cell 3 reported by the UE is compared to the expected SS-RSRQ for Cell 3. If the value is outside the limits in Table 5.7.2.2.5-3 or the UE fails to report the measurement value for Cell 3, the number of failed iterations for R2 is increased by one. Otherwise, the number of passed iterations for R2 is increased by one.

   - R3: The SS-RSRQ value of Cell 3 reported by the UE is compared to the reported SS-RSRQ of Cell 2. If the resulting value is outside the limits in Table 5.7.2.2.5-4 or the UE fails to report the measurement value for Cell 2 or Cell 3, the number of failed iterations for R3 is increased by one. Otherwise, the number of passed iterations for R3 is increased by one.

7. The SS shall continue checking the MeasurementReport messages transmitted by the UE until the confidence level according to Table G.2.3-1 in Annex G is achieved.

8. Set the parameters according to each sub-test in Table 5.7.2.2.5-2 as appropriate and repeat steps 5-7. In Step 6, the SS shall check the following requirements:

   - R4: The SS-RSRQ value of Cell 2 reported by the UE is compared to the expected SS-RSRQ for Cell 2. If the value is outside the limits in Table 5.7.2.2.5-3 or the UE fails to report the measurement value for Cell 2, the number of failed iterations for R4 is increased by one. Otherwise, the number of passed iterations for R4 is increased by one.

   - R5: The SS-RSRQ value of Cell 3 reported by the UE is compared to the expected SS-RSRQ for Cell 3. If the value is outside the limits in Table 5.7.2.2.5-3 or the UE fails to report the measurement value for Cell 3, the number of failed iterations for R5 is increased by one. Otherwise, the number of passed iterations for R5 is increased by one.

   - R6: The SS-RSRQ value of Cell 3 reported by the UE is compared to the reported SS-RSRQ of Cell 2. If the resulting value is outside the limits in Table 5.7.2.2.5-4 or the UE fails to report the measurement value for Cell 2 or Cell 3, the number of failed iterations for R6 is increased by one. Otherwise, the number of passed iterations for R6 is increased by one.

5.7.2.2.4.3 Message contents

Message contents are according to TS 38.508-1 [14] clause 7.3 with the following exceptions:

Table 5.7.2.2.4.3-1: Common Exception messages

Default Message Contents	
Common contents of system information blocks exceptions	
Default RRC messages and information elements contents exceptions	Table H.3.1-1 Table H.3.1-2 with Condition INTER-FREQ Table H.3.1-3 with Condition INTER-FREQ MO, Synchronous cells Table H.3.1-5 Table H.3.1-7 with Condition INTER-FREQ Table H.3.4-1 Table H.3.4-1a Table H.3.4-2 Table H.3.4-4 with Condition gapUE Table H.3.4-5 with Condition Pattern #0 Table 7.3.1-3 in TS 38.508-1 [14] with condition SMTC.1

Table 5.7.2.2.4.3-2: ReportConfigNR-DEFAULT(Periodical)

Derivation Path: 38.508-1 [14] Table 4.6.3-142 with condition PERIODICAL			
Information Element	**Value/remark**	**Comment**	**Condition**

ReportConfigNR::= SEQUENCE {			
reportType CHOICE {			
periodical SEQUENCE {			PERIODICAL
reportQuantityCell SEQUENCE {			
rsrp	false		
sinr	false		
}			
maxReportCells	2		
}			
}			
}			

5.7.2.2.5 Test requirement

Table 5.7.2.2.5-1 defines the cell specific settings for all tests. Table 5.7.2.2.5-2 defines the OTA primary level settings including test tolerances for all tests.

The SS-RSRQ measurement accuracy shall fulfil the absolute accuracy requirements in clause 5.7.2.0.2.1 and relative accuracy requirements in clause 5.7.2.0.2.2. The following eight requirements are to be verified:

During T1:

R1: Absolute accuracy of Cell 2. The UE is deemed to meet the requirement if the reported SS-RSRQ is in the range shown in Table 5.7.2.2.5-3.

R2: Absolute accuracy of Cell 3. The UE is deemed to meet the requirement if the reported SS-RSRQ is in the range shown in Table 5.7.2.2.5-3.

R3: Relative accuracy of Cell 3 compared with Cell 2. The UE is deemed to meet the requirement if the difference in reported SS-RSRQ meets the requirements in Table 5.7.2.2.5-4.

During T2:

R4: Absolute accuracy of Cell 2. The UE is deemed to meet the requirement if the reported SS-RSRQ is in the range shown in table 5.7.2.2.5-3.

R5: Absolute accuracy of Cell 3. The UE is deemed to meet the requirement if the reported SS-RSRQ is in the range shown in table 5.7.2.2.5-3.

R6: Relative accuracy of Cell 3 compared with Cell 2. The UE is deemed to meet the requirement if the difference in reported SS-RSRQ meets the requirements in Table 5.7.2.2.5-4.

Table 5.7.2.2.5-1: SS-RSRQ Inter frequency general test parameters

Parameter	Unit	Test 1		Test 2	
		Cell 2	Cell 3	Cell 2	Cell 3
SSB ARFCN		Freq1	freq2	freq1	Freq2
Duplex mode		TDD		TDD	
TDD configuration		TDDConf.3.1		TDDConf.3.1	
$BW_{channel}$	MHz	100: $N_{RB,c}$ = 66		100: $N_{RB,c}$ = 66	
Data RBs allocated		66		66	
Downlink initial BWP configuration		DLBWP.0.1	-	DLBWP.0.1	-
Downlink dedicated BWP configuration		DLBWP.1.1	-	DLBWP.1.1	-
Uplink initial BWP configuration		ULBWP.0.1	-	ULBWP.0.1	-
Uplink dedicated BWP configuration		ULBWP.1.1	-	ULBWP.1.1	-
DRX cycle configuration		Not applicable	-	Not applicable	-
TRS configuration		TRS.2.1 TDD	-	TRS.2.1 TDD	-

Parameter	Unit	Test 1		Test 2	
		Cell 2	Cell 3	Cell 2	Cell 3
TCI state		TCI.State.0	-	TCI.State.0	-
PDSCH Reference measurement channel		SR.3.1 TDD	-	SR.3.1 TDD	-
RMSI CORESET Reference Channel		CR.3.1 TDD	-	CR.3.1 TDD	-
OCNG Patterns		OP.1	OP.1	OP.1	OP.1
SSB configuration		SSB.3 FR2	SSB.3 FR2	SSB.3 FR2	SSB.3 FR2
SMTC configuration		SMTC.1 FR2	SMTC.1 FR2	SMTC.1 FR2	SMTC.1 FR2
PDSCH/PDCCH subcarrier spacing	kHz	120	120	120	120
EPRE ratio of PSS to SSS	dB	0	0	0	0
EPRE ratio of PBCH_DMRS to SSS					
EPRE ratio of PBCH to PBCH_DMRS					
EPRE ratio of PDCCH_DMRS to SSS					
EPRE ratio of PDCCH to PDCCH_DMRS					
EPRE ratio of PDSCH_DMRS to SSS					
EPRE ratio of PDSCH to PDSCH_DMRS					
EPRE ratio of OCNG DMRS to SSS Note 1					
EPRE ratio of OCNG to OCNG DMRS Note 1					
Propagation conditions		AWGN	AWGN	AWGN	AWGN
Antenna configuration		1x2	1x2	1x2	1x2
NOTE 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols. NOTE 2: Void NOTE 3: Void NOTE 4: Void					

Table 5.7.2.2.5-2: SS-RSRQ Inter frequency OTA related test parameters

Parameter	Unit	Test 1		Test 2	
		Cell 2	Cell 3	Cell 2	Cell 3
AoA setup		Setup 1		Setup 1	
Assumption for UE beams Note 8		Rough		Rough	
N_{oc} Note1	dBm/15kHz Note4	-95.93	-95.93	-95.44	-95.44
N_{oc} Note1	dBm/SCS Note3	-86.9	-86.9	-86.41	-86.41
$\hat{E}_s / N_{oc}$	dB	-1.75	-1.75	-3	-3
SSB_RP Note2	dBm/SCS Note4	-88.65	-88.65	-89.41	-89.41
SS-RSRQ Note2	dB	-14.75	-14.75	-15.56	-15.56
$\hat{E}_s / I_{ot}$	dB	-1.75	-1.75	-3	-3
Io Note2	dBm/95.04 MHz Note4	-55.7	-55.7	-55.7	-55.7
NOTE 1: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for N_{oc} to be fulfilled. NOTE 2: SS-RSRQ, SSB_RP, and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves. NOTE 3: SS-RSRQ and SS-RSRP minimum requirements are specified assuming independent interference and noise at each receiver antenna port. NOTE 4: Equivalent power received by an antenna with 0dBi gain at the centre of the quiet zone NOTE 5: As observed with 0dBi gain antenna at the centre of the quiet zone NOTE 6: Void NOTE 7: Void NOTE 8: Information about types of UE beam is given in B.2.1.3 of TS 38.133 [6], and does not limit UE implementation or test system implementation					

Table 5.7.2.2.5-3: evaluation limits for the reported values for T1 and T2 absolute accuracy rules R1, R2, R4, R5

UE power class 3		
Normal Conditions	**Test 1 All bands**	**Test 2 All bands**
Lowest reported value (Cell 2)	RSRQ_41	RSRQ_37
Highest reported value (Cell 2)	RSRQ_73	RSRQ_74
Lowest reported value (Cell 3)	RSRQ_41	RSRQ_37
Highest reported value (Cell 3)	RSRQ_73	RSRQ_74
Extreme Conditions	**Test 1 All bands**	**Test 2 All bands**
Lowest reported value (Cell 2)	RSRQ_41 + FFS	RSRQ_37 + FFS
Highest reported value (Cell 2)	RSRQ_73 + FFS	RSRQ_74 + FFS
Lowest reported value (Cell 3)	RSRQ_41 + FFS	RSRQ_37 + FFS
Highest reported value (Cell 3)	RSRQ_73 + FFS	RSRQ_74 + FFS

Table 5.7.2.2.5-4: evaluation limits for the reported values for T1 and T2 relative accuracy rules R3, R6

UE power class 3		
Normal Conditions	**Test 1 All bands**	**Test 2 All bands**
Lowest value (RSRQ report Cell 3 – RSRQ report Cell 2)	- 7	- 9
Highest value (RSRQ report Cell 3 – RSRQ report Cell 2)	+ 7	+ 9
Extreme Conditions	**Test 1 All bands**	**Test 2 All bands**
Lowest value (RSRQ report Cell 3 – RSRQ report Cell 2)	– 7 + FFS	– 9 + FFS
Highest value (RSRQ report Cell 3 – RSRQ report Cell 2)	+ 7 + FFS	+ 9 + FFS

For the test to pass, the ratio of successful reported values for each requirement (R1 to R6) shall be more than 90% with a confidence level of 95%. Each requirement is evaluated independently of the others.

5.7.3 SS-SINR

5.7.3.0 Minimum conformance requirements

5.7.3.0.1 Intra-frequency SS-SINR measurement accuracy requirements

Unless otherwise specified, the requirements for absolute accuracy of SS-SINR in this clause apply to a cell on the same frequency as that of the serving cell in FR2.

The accuracy requirements in Table 5.7.3.0.1-1 are valid under the following conditions:

- Conditions defined in clause 7.3 of TS 38.101-2 [3] for reference sensitivity are fulfilled.
- Conditions for intra-frequency measurements are fulfilled according to Annex B.2.2 for a corresponding Band.
- The measured signals are in the directions covered by the percentile EIS spherical coverage of the UE, defined in clause 7.3.4 of TS 38.101-2 [3].

Table 5.7.3.0.1-1: SS-SINR Intra frequency absolute accuracy in FR2

Accuracy		**Conditions**		
Normal condition	**Extreme condition**	**SSB Ês/Iot**	**Io [Note 2] range**	
			Minimum Io	**Maximum Io**

dB	dB	dB	dBm / SCS_{SSB} Note 1		dBm/$BW_{Channel}$
			SCS_{SSB} = 120kHz	SCS_{SSB} = 240kHz	
±3	±4	≥-3	Same value as SSB_RP in Table B.2.2-2, according to UE Power class, operating band and angle of arrival		-50
±3.5	±4	≥-6			
NOTE 1: Values based on Refsens and EIS spherical coverage as defined in clauses 7.3.2 and 7.3.4 of TS 38.101-2 [3]. Applicable side condition selected depending on angle of arrival. NOTE 2: Io specified at the Reference point, and assumed to have constant EPRE across the bandwidth. NOTE 3: In the test cases, the SSB Ês/Iot and related parameters may need to be adjusted to ensure Ês/Iot at UE baseband is above the value defined in this table. NOTE 4: The requirements apply for SSB Ês/Iot ≤ 25 dB.						

The reporting range of SS-SINR and CSI-SINR is defined from -23 dB to 40 dB with 0.5 dB resolution. The mapping of measured quantity is defined in Table 4.7.3.0.1-2. The range in the signalling may be larger than the guaranteed accuracy range.

The normative reference for this requirement is TS 38.133 [6] clauses 10.1.13.1 and 10.1.16.

5.7.3.0.2 Inter-frequency SS-SINR measurement accuracy requirements

5.7.3.0.2.1 Absolute SS-SINR Accuracy

The requirements for absolute accuracy of SS-SINR in this clause apply to a cell on a frequency in FR2 that has different carrier frequency from the serving cell.

The accuracy requirements in Table 5.7.3.0.2.1-1 are valid under the following conditions:

- Conditions defined in clause 7.3 of TS 38.101-2 [3] for reference sensitivity are fulfilled.
- Conditions for inter-frequency measurements are fulfilled according to Annex B.2.3 for a corresponding Band.
- The measured signals are in the directions covered by the percentile EIS spherical coverage of the UE, defined in clause 7.3.4 of TS 38.101-2 [3].

Table 5.7.3.0.2.1-1: SS-SINR Inter frequency absolute accuracy in FR2

Accuracy		Conditions			
Normal condition	Extreme condition	SSB Ês/Iot	Io Note 2 range		
			Minimum Io		Maximum Io
dB	dB	dB	dBm / SCS_{SSB} Note 1		dBm/$BW_{Channel}$
			SCS_{SSB} = 120kHz	SCS_{SSB} = 240kHz	
±3	±4	≥-3	Same value as SSB_RP in Table B.2.2-2, according to UE Power class, operating band and angle of arrival		-50
±3.5	±4	≥-4			
NOTE 1: Values based on Refsens and EIS spherical coverage as defined in clauses 7.3.2 and 7.3.4 of TS 38.101-2 [3]. Applicable side condition selected depending on angle of arrival. NOTE 2: Io specified at the Reference point, and assumed to have constant EPRE across the bandwidth. NOTE 3: In the test cases, the SSB Ês/Iot and related parameters may need to be adjusted to ensure Ês/Iot at UE baseband is above the value defined in this table. NOTE 4: The requirements apply for SSB Ês/Iot ≤ 25 dB.					

The reporting range of SS-SINR and CSI-SINR is defined from -23 dB to 40 dB with 0.5 dB resolution. The mapping of measured quantity is defined in Table 4.7.3.0.1-2. The range in the signalling may be larger than the guaranteed accuracy range.

The normative reference for this requirement is TS 38.133 [6] clauses 10.1.15.1 and 10.1.16.

5.7.3.0.2.2 Relative SS-SINR Accuracy

The relative accuracy of SS-SINR in inter frequency case is defined as the SS-SINR measured from one cell on a frequency in FR2 compared to the SS-SINR measured from another cell on a different frequency in FR2.

The accuracy requirements in Table 5.7.3.0.2.2-1 are valid under the following conditions:

- Conditions defined in clause 7.3 of TS 38.101-2 [3] for reference sensitivity are fulfilled.
- Conditions for inter-frequency measurements are fulfilled according to Annex B.2.3 for a corresponding Band.
- $|SSB_RP1_{dBm} - SSB_RP2_{dBm}| \leq 27$ dB
- | Channel 1_Io -Channel 2_Io | ≤ 20 dB
- The measured signals are in the directions covered by the percentile EIS spherical coverage of the UE, defined in clause 7.3.4 of TS 38.101-2 [3].

Table 5.7.3.0.2.2-1: SS-SINR Inter frequency relative accuracy in FR2

Accuracy		Conditions		
Normal condition	Extreme condition	SSB Ês/Iot	Io Note 2 range	
			Minimum Io	Maximum Io
dB	dB	dB	dBm / SCS_{SSB} Note 1	dBm/$BW_{Channel}$
			SCS_{SSB} = 120kHz | SCS_{SSB} = 240kHz	
±3.5	±4	≥-3	Same value as SSB_RP in Table B.2.2-2, according to UE Power class, operating band and angle of arrival	-50
±4	±4	≥-6		

NOTE 1: Values based on Refsens and EIS spherical coverage as defined in clauses 7.3.2 and 7.3.4 of TS 38.101-2 [3]. Applicable side condition selected depending on angle of arrival.
NOTE 2: Io specified at the Reference point, and assumed to have constant EPRE across the bandwidth.
NOTE 3: The parameter SSB Ês/Iot is the minimum SSB Ês/Iot of the pair of cells to which the requirement applies.
NOTE 4: In the test cases, the SSB Ês/Iot and related parameters may need to be adjusted to ensure Ês/Iot at UE baseband is above the value defined in this table.
NOTE 5: The requirements apply for SSB Ês/Iot ≤ 25 dB.

The reporting range of SS-SINR and CSI-SINR is defined from -23 dB to 40 dB with 0.5 dB resolution. The mapping of measured quantity is defined in Table 4.7.3.0.1-2. The range in the signalling may be larger than the guaranteed accuracy range.

The normative reference for this requirement is TS 38.133 [6] clauses 10.1.15.1 and 10.1.16.

5.7.3.1 EN-DC FR2 SS-SINR measurement accuracy

Editor's Note: This test case has been completed for the following configurations:

- Test frequency f ≤ 40.8 GHz
- UE PC3
- Normal conditions
- The test is incomplete for UE power classes other than PC3
- The test is incomplete for test frequencies > 40.8 GHz
- The test is incomplete for extreme conditions

5.7.3.1.1 Test purpose

The purpose of this test is to verify that the intra-frequency SS-SINR measurement accuracy for NR FR2 is within the specified limits for all bands.

5.7.3.1.2 Test applicability

This test applies to all types of NR UE supporting E-UTRA and EN-DC from Release 15 onwards, which support ss-SINR-Meas.

5.7.3.1.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 5.7.3.0.1.

The normative reference for this requirement is TS 38.133 [6] clause A.5.7.3.1.

5.7.3.1.4 Test description

Three cells are configured in this test: E-UTRA Cell 1 is the E-UTRAN PCell, Cell 2 is the NR FR2 PSCell and Cell 3 is the NR FR2 neighbour cell on the same frequency as the PSCell.

5.7.3.1.4.1 Initial conditions

This test shall be tested using any of the test configurations in Table 5.7.3.1.4.1-1.

Table 5.7.3.1.4.1-1: Supported test configurations

Configuration	Description
5.7.3.1-1	NR 120 kHz SSB SCS, 100 MHz bandwidth, TDD duplex mode, LTE FDD
5.7.3.1-2	NR 120 kHz SSB SCS, 100 MHz bandwidth, TDD duplex mode, LTE TDD
NOTE: The UE is only required to be tested in one of the supported test configurations	

Configure the test equipment and the DUT according to the parameters in Table 5.7.3.1.4.1-2.

Table 5.7.3.1.4.1-2: Initial conditions

Parameter	Value	Comment
Test environment	NC	As specified in TS 36.508 [25] clause 4.1.
Test frequencies	As specified in Annex E, E.1.1, E.1.3.1 and Table E.3-1 and TS 38.508-1 [14] clause 4.3.1 for E-UTRA and 7.2.3 for NR.	
Channel bandwidth	As specified by the selected test configuration.	
Propagation conditions	AWGN	As specified in clause C.2.1
Connection Diagram	TE Part: A.3.3.1.1 DUT Part: A.3.4.1.1	As specified in TS 38.508-1 [14] Annex A.
Exceptions to connection diagram	N/A	

1. Message contents are defined in clause 5.7.3.1.4.3.

2. There are two carriers and three cells specified in the test, where E-UTRA Cell 1 is the E-UTRA PCell on the E-UTRA carrier, Cell 2 is the NR PSCell on the NR FR2 carrier and Cell 3 is the neighbour cell on the same NR FR2 carrier. Cell 3 is the target for the SS-SINR measurements. E-UTRA Cell 1 is configured according to TS 36.521-3 [26] clause C.1.0 and C.1.1.

3. The UE Rx beam peak direction has been obtained previously using one of the Rx Beam Peak Search procedures as described in Annex I.

5.7.3.1.4.2 Test procedure

1. Ensure the UE is in State 3A-RF according to TS 36.508 [25] clause 7.2A.3.

2. Set the parameters according to Table 5.7.3.1.5-1 as appropriate.

3. The SS shall transmit an *RRCConnectionReconfiguration* message on Cell 1.

4. The UE shall transmit an *RRCConnectionReconfigurationComplete* message.

5. The UE shall transmit periodically MeasurementReport messages.

6. After 10s wait from Step 3, the SS shall check the SS-SINR reported values in the periodic MeasurementReport. The SS-SINR value of Cell 3 reported by the UE is compared to the expected SS-SINR. If the value is outside

the limits in Table 5.7.3.1.5-2 or the UE fails to report the measurement value for Cell 3, the number of failed iterations is increased by one. Otherwise, the number of passed iterations is increased by one.

7. The SS shall continue checking the MeasurementReport messages transmitted by the UE until the confidence level according to Table G.2.3-1 in Annex G is achieved.

8. Set the parameters according to each sub-test in Table 5.7.3.1.5-1 as appropriate and repeat steps 5-7.

5.7.3.1.4.3 Message contents

Message contents are according to TS 38.508-1 [14] clause 7.3 with the following exceptions:

Table 5.7.3.1.4.3-1: Common Exception messages

Default Message Contents	
Common contents of system information blocks exceptions	
Default RRC messages and information elements contents exceptions	Table H.3.1-1 Table H.3.1-2 Table H.3.1-3 with Condition Synchronous cells, SS-SINR Table H.3.1-5 Table H.3.1-7 Table H.3.4-1 Table H.3.4-1a Table H.3.4-2 Table 7.3.1-3 in TS 38.508-1 [14] with condition SMTC.1

Table 5.7.3.1.4.3-2: ReportConfigNR-DEFAULT(Periodical)

Derivation Path: 38.508-1 [14] Table 4.6.3-142 with condition PERIODICAL			
Information Element	**Value/remark**	**Comment**	**Condition**
ReportConfigNR::= SEQUENCE {			
reportType CHOICE {			
periodical SEQUENCE {			PERIODICAL
reportQuantityCell SEQUENCE {			
rsrp	false		
rsrq	false		
sinr	true		
}			
maxReportCells	2		
}			
}			
}			

5.7.3.1.5 Test requirement

Table 5.7.3.1.5-1 defines the cell specific settings for all tests. Table 5.7.3.1.5-2 defines the OTA primary level settings including test tolerances for all tests.

Each SS-SINR measurement report for each of the tests in Table 5.7.3.1.5-2 shall meet the corresponding absolute accuracy requirements in Table 5.7.3.1.5-3.

Table 5.7.3.1.5-1: SS-SINR Intra frequency test parameters

Parameter	Unit	Test 1		Test 2	
		Cell 2	Cell 3	Cell 2	Cell 3
SSB ARFCN		Freq2		Freq2	
Duplex mode		TDD		TDD	
TDD configuration		TDDConf.3.1		TDDConf.3.1	
$BW_{channel}$	MHz	100: $N_{RB,c}$ = 66		100: $N_{RB,c}$ = 66	
Downlink initial BWP configuration		DLBWP.0.1			
Downlink dedicated BWP configuration		DLBWP.1.1			
Uplink initial BWP configuration		ULBWP.0.1			

Uplink dedicated BWP configuration		ULBWP.1.1			
DRX cycle configuration	ms	Not applicable			
TRS configuration		TRS.2.1 TDD			
TCI state		TCI.State.0			
PDSCH Reference measurement channel		SR.3.1 TDD		SR.3.1 TDD	
RMSI CORESET Reference Channel		CR.3.1 TDD	-	CR.3.1 TDD	-
Dedicated RMSI CORESET Reference Channel		CCR.3.1 TDD	-	CCR.3.1 TDD	-
OCNG Patterns		OP.1	OP.1	OP.1	OP.1
SMTC configuration		SMTC.1			
SSB configuration		SSB.3 FR2	SSB.3 FR2	SSB.3 FR2	SSB.3 FR2
PDSCH/PDCCH subcarrier spacing	kHz	120	120	120	120
SS-RSSI-Measurement		Not Applicable			
EPRE ratio of PSS to SSS	dB	0	0	0	0
EPRE ratio of PBCH_DMRS to SSS					
EPRE ratio of PBCH to PBCH_DMRS					
EPRE ratio of PDCCH_DMRS to SSS					
EPRE ratio of PDCCH to PDCCH_DMRS					
EPRE ratio of PDSCH_DMRS to SSS					
EPRE ratio of PDSCH to PDSCH_DMRS					
EPRE ratio of OCNG DMRS to SSS Note 1					
EPRE ratio of OCNG to OCNG DMRS Note 1					
Propagation condition		AWGN		AWGN	
Antenna Configuration		1x2		1x2	
NOTE 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols. NOTE 2: Void NOTE 3: Void NOTE 4: Void					

Table 5.7.3.1.5-2: SS-SINR Intra frequency OTA related test parameters

Parameter		Unit	Test 1		Test 2	
			Cell 2	Cell 3	Cell 2	Cell 3
Angle of arrival configuration			Setup 1		Setup 1	
Assumption for UE beams Note 9			Rough		Rough	
N_{oc} Note1		dBm/15kHz Note4	-105		-105	
N_{oc} Note1		dBm/SCS Note3	-96		-96	
SSB_RP Note2		dBm/SCS Note4	-91.46	-93.34	-98.8	-98.8
SS-SINR Note2	n257, 258, n261	dB	-0.18	-3.32	-4.95	-4.95
	n260		-0.31	-3.42	-5.20	-5.20
	n259		-0.39	-3.48	-5.48	-5.48
$\hat{E}_s / I_{ot}$	n257, 258, n261	dB	-0.18	-3.32	-4.95	-4.95
	n260		-0.31	-3.42	-5.20	-5.20
	n259		-0.39	-3.48	-5.48	-5.48
$\hat{E}_s / N_{oc}$		dB	4.54	2.66	-3	-3
Io Note2		dBm/95.04 MHz Note4	-59.43		-63.87	
NOTE 1: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for N_{oc} to be fulfilled. NOTE 2: SS-SINR, SSB_RP, and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves. NOTE 3: SS-SINR and SSB_RP minimum requirements are specified assuming independent interference and noise at each receiver antenna port. NOTE 4: Equivalent power received by an antenna with 0dBi gain at the centre of the quiet zone NOTE 5: As observed with 0dBi gain antenna at the centre of the quiet zone						

Parameter	Unit	Test 1		Test 2	
		Cell 2	Cell 3	Cell 2	Cell 3
NOTE 6: Void NOTE 7: Void NOTE 8: Void NOTE 9: Information about types of UE beam is given in B.2.1.3 of TS 38.133 [6], and does not limit UE implementation or test system implementation					

Table 5.7.3.1.5-3: SS-SINR Intra frequency absolute accuracy requirements for the reported values

UE Power Class 3	Test 1		Test 2	
Normal Conditions				
Lowest reported value (Cell 3)	n257, n258, n261	SS-SINR_22	All bands	SS-SINR_18
	n260	SS-SINR_21		
	n259	FFS		
Highest reported value (Cell 3)	All bands	SS-SINR_58	n257, n258, n261	SS-SINR_55
			n260	SS-SINR_54
			n259	FFS
Extreme Conditions				
Lowest reported value (Cell 3)	n257, n258, n261	SS-SINR_21+ FFS	All bands	SS-SINR_17+ FFS
	n260	SS-SINR_20+ FFS		
	n259	FFS		
Highest reported value (Cell 3)	All bands	SS-SINR_59+ FFS	n257, n258, n261	SS-SINR_56+ FFS
			n260	SS-SINR_55+ FFS
			n259	FFS

For the test to pass, the ratio of successful reported values in each test shall be more than 90% with a confidence level of 95%.

5.7.3.2 EN-DC FR2-FR2 SS-SINR measurement accuracy

Editor's Note: This test case has been completed for the following configurations:

- Test frequency f ≤ 40.8 GHz
- UE PC3
- Normal conditions
- The test is incomplete for UE power classes other than PC3
- The test is incomplete for test frequencies > 40.8 GHz
- The test is incomplete for extreme conditions

5.7.3.2.1 Test purpose

The purpose of this test is to verify that the inter-frequency SS-SINR measurement accuracy for NR FR2 is within the specified limits for all bands

5.7.3.2.2 Test applicability

This test applies to all types of NR UE supporting E-UTRA and EN-DC from Release 15 onwards, which support ss-SINR-Meas.

5.7.3.2.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 5.7.3.0.2.

The normative reference for this requirement is TS 38.133 [6] clause A.5.7.3.2.

5.7.3.2.4 Test description

Three cells are configured in this test: E-UTRA Cell 1 is the E-UTRAN PCell, Cell 2 is the NR FR2 PSCell and Cell 3 is the NR FR2 neighbour cell on a different NR FR2 frequency.

5.7.3.2.4.1 Initial conditions

This test shall be tested using any of the test configurations in Table 5.7.3.2.4.1-1.Table 5.7.3.2.4.1-1: Supported test configurations

Configuration	Description
5.7.3.2-1	NR 120 kHz SSB SCS, 100 MHz bandwidth, TDD duplex mode, LTE FDD
5.7.3.2-2	NR 120 kHz SSB SCS, 100 MHz bandwidth, TDD duplex mode, LTE TDD
NOTE: The UE is only required to be tested in one of the supported test configurations	

Configure the test equipment and the DUT according to the parameters in Table 5.7.3.2.4.1-2.

Table 5.7.3.2.4.1-2: Initial conditions

Parameter	Value	Comment
Test environment	NC	As specified in TS 36.508 [25] clause 4.1.
Test frequencies	As specified in Annex E, Table E.3-1 and TS 38.508-1 [14] clause 4.3.1 for E-UTRA and 7.2.3 for NR.	
Channel bandwidth	As specified by the selected test configuration.	
Propagation conditions	AWGN	As specified in clause C.2.1
Connection Diagram	TE Part: A.3.3.1.1 DUT Part: A.3.4.1.1	As specified in TS 38.508-1 [14] Annex A.
Exceptions to connection diagram	N/A	

1. The general test parameter settings are set up according to Table 5.7.3.2.4.1-3.
2. Message contents are defined in clause 5.7.3.2.4.3.
3. There are three carriers and three cells specified in the test, where E-UTRA Cell 1 is the E-UTRA PCell on the E-UTRA carrier, Cell 2 is the NR PSCell on one of the NR FR2 carriers and Cell 3 is the neighbour cell on the other NR FR2 carrier. Cell 3 is the target for the SS-SINR measurements. E-UTRA Cell 1 is configured according to TS 36.521-3 [26] clause C.1.0 and C.1.1.
4. The UE Rx beam peak direction has been obtained previously using one of the Rx Beam Peak Search procedures as described in Annex I.

5.7.3.2.4.2 Test procedure

1. Ensure the UE is in state RRC_CONNECTED with generic procedure parameters *Connectivity* EN-DC, DC bearer MCG and SCG, Connected without release *On* and Test Mode *On* according to TS 38.508-1 [14] clause 4.5
2. Set the parameters according to Table 5.7.3.2.5-1 as appropriate.
3. The SS shall transmit an *RRCConnectionReconfiguration* message on Cell 1.
4. The UE shall transmit an *RRCConnectionReconfigurationComplete* message.
5. The UE shall transmit periodically MeasurementReport messages.
6. After 10s wait from Step 3, the SS shall check the SS-SINR reported values in the periodic MeasurementReport for the following requirements:

- R1: The SS-SINR value of Cell 2 reported by the UE is compared to the expected SS-SINR for Cell 2. If the value is outside the limits in Table 5.7.3.2.5-3 or the UE fails to report the measurement value for Cell 2, the number of failed iterations for R1 is increased by one. Otherwise, the number of passed iterations for R1 is increased by one.

- R2: The SS-SINR value of Cell 3 reported by the UE is compared to the expected SS-SINR for Cell 3. If the value is outside the limits in Table 5.7.3.2.5-3 or the UE fails to report the measurement value for Cell 3, the number of failed iterations for R2 is increased by one. Otherwise, the number of passed iterations for R2 is increased by one.

- R3: The SS-SINR value of Cell 3 reported by the UE is compared to the reported SS-SINR of Cell 2. If the resulting value is outside the limits in Table 5.7.3.2.5-4 or the UE fails to report the measurement value for Cell 2 or Cell 3, the number of failed iterations for R3 is increased by one. Otherwise, the number of passed iterations for R3 is increased by one.

7. The SS shall continue checking the MeasurementReport messages transmitted by the UE until the confidence level according to Table G.2.3-1 in Annex G is achieved.

8. Set the parameters according to each sub-test in Table 5.7.3.2.5-2 as appropriate and repeat steps 5-7. In Step 6, the SS shall check the following requirements for Test 2:

   - R4: The SS-SINR value of Cell 2 reported by the UE is compared to the expected SS-SINR for Cell 2. If the value is outside the limits in Table 5.7.3.2.5-3 or the UE fails to report the measurement value for Cell 2, the number of failed iterations for R4 is increased by one. Otherwise, the number of passed iterations for R4 is increased by one.

   - R5: The SS-SINR value of Cell 3 reported by the UE is compared to the expected SS-SINR for Cell 3. If the value is outside the limits in Table 5.7.3.2.5-3 or the UE fails to report the measurement value for Cell 3, the number of failed iterations for R5 is increased by one. Otherwise, the number of passed iterations for R5 is increased by one.

   - R6: The SS-SINR value of Cell 3 reported by the UE is compared to the reported SS-SINR of Cell 2. If the resulting value is outside the limits in Table 5.7.3.2.5-4 or the UE fails to report the measurement value for Cell 2 or Cell 3, the number of failed iterations for R6 is increased by one. Otherwise, the number of passed iterations for R6 is increased by one.

   And the following requirements for Test 3:

   - R7: The SS-SINR value of Cell 2 reported by the UE is compared to the expected SS-SINR for Cell 2. If the value is outside the limits in Table 5.7.3.2.5-3 or the UE fails to report the measurement value for Cell 2, the number of failed iterations for R7 is increased by one. Otherwise, the number of passed iterations for R7 is increased by one.

   - R8: The SS-SINR value of Cell 3 reported by the UE is compared to the expected SS-SINR for Cell 3. If the value is outside the limits in Table 5.7.3.2.5-3 or the UE fails to report the measurement value for Cell 3, the number of failed iterations for R8 is increased by one. Otherwise, the number of passed iterations for R8 is increased by one.

   - R9: The SS-SINR value of Cell 3 reported by the UE is compared to the reported SS-SINR of Cell 2. If the resulting value is outside the limits in Table 5.7.3.2.5-4 or the UE fails to report the measurement value for Cell 2 or Cell 3, the number of failed iterations for R9 is increased by one. Otherwise, the number of passed iterations for R9 is increased by one.

5.7.3.2.4.3 Message contents

Message contents are according to TS 38.508-1 [14] clause 7.3 with the following exceptions:

Table 5.7.3.2.4.3-1: Common Exception messages

Default Message Contents	
Common contents of system information blocks exceptions	

Default RRC messages and information elements contents exceptions	Table H.3.1-1 Table H.3.1-2 with Condition INTER-FREQ Table H.3.1-3 with Condition INTER-FREQ MO, Synchronous cells, SS-SINR Table H.3.1-5 Table H.3.1-7 with Condition INTER-FREQ Table H.3.4-1 Table H.3.4-1a Table H.3.4-2 Table H.3.4-4 with Condition gapUE Table H.3.4-5 with Condition Pattern #0 Table 7.3.1-3 in TS 38.508-1 [14] with condition SMTC.1

Table 5.7.3. 2.4.3-2: ReportConfigNR-DEFAULT(Periodical)

Derivation Path: 38.508-1 [14] Table 4.6.3-142 with condition PERIODICAL			
Information Element	**Value/remark**	**Comment**	**Condition**
ReportConfigNR::= SEQUENCE {			
reportType CHOICE {			
periodical SEQUENCE {			PERIODICAL
reportQuantityCell SEQUENCE {			
rsrp	false		
rsrq	false		
sinr	true		
}			
maxReportCells	2		
}			
}			
}			

5.7.3.2.5 Test requirement

Table 5.7.3.2.5-1 defines the cell specific settings for all tests. Table 5.7.3.2.5-2 defines the OTA primary level settings including test tolerances for all tests.

The SS-SINR measurement accuracy shall fulfil the absolute accuracy requirements in clause 5.7.3.0.2.1 and relative accuracy requirements in clause 5.7.3.0.2.2. The following eight requirements are to be verified:

During Test 1:

R1: Absolute accuracy of Cell 2. The UE is deemed to meet the requirement if the reported SS-SINR is in the range shown in Table 5.7.3.2.5-3.

R2: Absolute accuracy of Cell 3. The UE is deemed to meet the requirement if the reported SS-SINR is in the range shown in Table 5.7.3.2.5-3.

R3: Relative accuracy of Cell 3 compared with Cell 2. The UE is deemed to meet the requirement if the difference in reported SS-SINR meets the requirements in Table 5.7.3.2.5-4.

During Test 2:

R4: Absolute accuracy of Cell 2. The UE is deemed to meet the requirement if the reported SS-SINR is in the range shown in table 5.7.3.2.5-3.

R5: Absolute accuracy of Cell 3. The UE is deemed to meet the requirement if the reported SS-SINR is in the range shown in table 5.7.3.2.5-3.

R6: Relative accuracy of Cell 3 compared with Cell 2. The UE is deemed to meet the requirement if the difference in reported SS-SINR meets the requirements in Table 5.7.3.2.5-4.

During Test 3:

R7: Absolute accuracy of Cell 2. The UE is deemed to meet the requirement if the reported SS-SINR is in the range shown in table 5.7.3.2.5-3.

R8: Absolute accuracy of Cell 3. The UE is deemed to meet the requirement if the reported SS-SINR is in the range shown in table 5.7.3.2.5-3.

R9: Relative accuracy of Cell 3 compared with Cell 2. The UE is deemed to meet the requirement if the difference in reported SS-SINR meets the requirements in Table 5.7.3.2.5-4.

Table 5.7.3.2.5-1: SS-SINR Inter frequency general test parameters

Parameter	Unit	Test 1		Test 2		Test 3	
		Cell 2	Cell 3	Cell 2	Cell 3	Cell 2	Cell 3
SSB ARFCN		Freq1	freq2	freq1	Freq2	freq1	Freq2
Duplex mode		TDD		TDD		TDD	
TDD configuration		TDDConf.3.1		TDDConf.3.1		TDDConf.3.1	
$BW_{channel}$	MHz	100: $N_{RB,c}$ = 66		100: $N_{RB,c}$ = 66		100: $N_{RB,c}$ = 66	
Data RBs allocated		66		66		66	
Downlink initial BWP configuration		DLBWP.0.1					
Downlink dedicated BWP configuration		DLBWP.1.1					
Uplink initial BWP configuration		ULBWP.0.1					
Uplink dedicated BWP configuration		ULBWP.1.1					
DRX cycle configuration	ms	Not applicable					
TRS configuration		TRS.2.1 TDD					
TCI state		TCI.State.0					
PDSCH Reference measurement channel		SR.3.1 TDD	-	SR.3.1 TDD	-	SR.3.1 TDD	-
RMSI CORESET Reference Channel		CR.3.1 TDD	-	CR.3.1 TDD	-	CR.3.1 TDD	-
OCNG Patterns		OP.1	OP.1	OP.1	OP.1	OP.1	OP.1
SMTC configuration		SMTC.1 FR2	SMTC.1 FR2	SMTC.1 FR2	SMTC.1 FR2	SMTC.1 FR2	SMTC.1 FR2
SSB configuration		SSB.3 FR2	SSB.3 FR2	SSB.3 FR2	SSB.3 FR2	SSB.3 FR2	SSB.3 FR2
PDSCH/PDCCH subcarrier spacing	kHz	120	120	120	120	120	120
EPRE ratio of PSS to SSS EPRE ratio of PBCH_DMRS to SSS EPRE ratio of PBCH to PBCH_DMRS EPRE ratio of PDCCH_DMRS to SSS EPRE ratio of PDCCH to PDCCH_DMRS EPRE ratio of PDSCH_DMRS to SSS EPRE ratio of PDSCH to PDSCH_DMRS EPRE ratio of OCNG DMRS to SSS Note 1 EPRE ratio of OCNG to OCNG DMRS Note 1	dB	0	0	0	0	0	0
Propagation conditions		AWGN	AWGN	AWGN	AWGN	AWGN	AWGN
Antenna Configuration		1x2	1x2	1x2	1x2	1x2	1x2

NOTE 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.
NOTE 2: Void
NOTE 3: Void
NOTE 4: Void

Table 5.7.3.2.5-2: SS-SINR Inter frequency OTA related test parameters

Parameter	Unit	Test 1		Test 2		Test 3	
		Cell 2	Cell 3	Cell 2	Cell 3	Cell 2	Cell 3
Angle of arrival configuration	degrees	Setup 1		Setup 1		Setup 1	
Assumption for UE beams Note 10		Rough		Rough		Rough	
N_{oc} Note1	dBm/15kHz Note4	-105	-105	-105.1	-105.1	-105	-105
N_{oc} Note1	dBm/SCS Note3	-96	-96	-96.1	-96.1	-96	-96
$\hat{E}_s / N_{oc}$	dB	-0.5	-0.5	11	11	-2.1	-2.1
SS-RSRP Note2	dBm/SCS Note4	-96.5	-96.5	-85.1	-85.1	-98.1	-98.1
SS-SINR Note2	dB	-0.5	-0.5	11	11	-2.1	-2.1
$\hat{E}_s / I_{ot}$	dB	-0.5	-0.5	11	11	-2.1	-2.1

Io[Note2]	dBm/95.04 MHz [Note4]	-69.3	-69.3	-55.75	-55.75	-64.9	-64.9

NOTE 1: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for N_{oc} to be fulfilled.
NOTE 2: SS-SINR, SSB_RP, and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.
NOTE 3: SS-SINR and SS-RSRP minimum requirements are specified assuming independent interference and noise at each receiver antenna port.
NOTE 4: Equivalent power received by an antenna with 0dBi gain at the centre of the quiet zone
NOTE 5: As observed with 0dBi gain antenna at the centre of the quiet zone
NOTE 6: Void
NOTE 7: Void
NOTE 8: Void
NOTE 9: Void
NOTE 10: Information about types of UE beam is given in B.2.1.3 of TS 38.133 [6], and does not limit UE implementation or test system implementation

Table 5.7.3.2.5-3: evaluation limits for the reported values for T1 and T2 absolute accuracy rules R1, R2, R4, R5

UE power class 3						
Normal Conditions	**Test 1 All bands**		**Test 2 All bands**		**Test 3 All bands**	
Lowest reported value (Cell 2)	SINR_27		SINR_48		n257, n258, n261	SINR_23
					n260	SINR_22
					n259	FFS
Highest reported value (Cell 2)	n257, n258, n261	SINR_62	n257, n258, n261	SINR_87	n257, n258, n261	SINR_60
	n260	SINR_61	n260	SINR_86	n260	SINR_59
	n259	FFS	n259	FFS	n259	FFS
Lowest reported value (Cell 3)	SINR_27		SINR_48		n257, n258, n261	SINR_23
					n260	SINR_22
					n259	FFS
Highest reported value (Cell 3)	n257, n258, n261	SINR_62	n257, n258, n261	SINR_87	n257, n258, n261	SINR_60
	n260	SINR_61	n260	SINR_86	n260	SINR_59
	n259	FFS	n259	FFS	n259	FFS
Extreme Conditions	**Test 1 All bands**		**Test 2 All bands**		**Test 3 All bands**	
Lowest reported value (Cell 2)	SINR_27 + FFS		SINR_48 + FFS		n257, n258, n261	SINR_23 + FFS
					n260	SINR_22 + FfS
					n259	FFS
Highest reported value (Cell 2)	n257, n258, n261	SINR_62 + FFS	n257, n258, n261	SINR_87 + FFS	n257, n258, n261	SINR_60 + FFS
	n260	SINR_61 + FFS	n260	SINR_86 + FFS	n260	SINR_59 + FFS
	n259	FFS	n259	FFS	n259	FFS
Lowest reported value (Cell 3)	SINR_27 + FFS		SINR_48 + FFS		n257, n258, n261	SINR_23 + FFS
					n260	SINR_22 + FfS
					n259	FFS
Highest reported value (Cell 3)	n257, n258, n261	SINR_62 + FFS	n257, n258, n261	SINR_87 + FFS	n257, n258, n261	SINR_60 + FFS
	n260	SINR_61 + FFS	n260	SINR_86 + FFS	n260	SINR_59 + FFS
	n259	FFS	n259	FFS	n259	FFS

Table 5.7.3.2.5-4: evaluation limits for the reported values for T1 and T2 relative accuracy rules R3, R6

UE power class 3			
Normal Conditions	**Test 1 All bands**	**Test 2 All bands**	**Test 3 All bands**

Lowest value (SINR report Cell 3 – SINR report Cell 2)	- 8	- 17	- 9
Highest value (SINR report Cell 3 – SINR report Cell 2)	+ 8	+ 17	+ 9
Extreme Conditions	**Test 1 All bands**	**Test 2 All bands**	**Test 3 All bands**
Lowest value (SINR report Cell 3 – SINR report Cell 2)	– 8 + FFS	– 17 + FFS	– 9 + FFS
Highest value (SINR report Cell 3 – SINR report Cell 2)	+ 8 + FFS	+ 17 + FFS	+ 9 + FFS

For the test to pass, the ratio of successful reported values for each requirement (R1 to R6) shall be more than 90% with a confidence level of 95%. Each requirement is evaluated independently of the others.

5.7.4 L1-RSRP

5.7.4.0 Minimum conformance requirements

5.7.4.0.1 SSB-based L1-RSRP absolute measurement accuracy requirements

Unless otherwise specified, the requirements for absolute accuracy of SSB based L1-RSRP in this clause apply to all SSBs of the serving cell configured for L1-RSRP measurement.

The accuracy requirements in Table 5.7.4.0.1-1 are valid under the following conditions:

- Conditions defined in clause 7.3 of TS 38.101-2 [3] for reference sensitivity are fulfilled.
- Conditions for L1-RSRP measurements are fulfilled according to Annex B.2.4.1 for a corresponding Band for each relevant SSB.
- The measured signals are in the directions covered by the percentile EIS spherical coverage of the UE, defined in clause 7.3.4 of TS 38.101-2 [3].

Table 5.7.4.0.1-1: SSB based L1-RSRP absolute accuracy in FR2

Accuracy		**Conditions**			
Normal condition	**Extreme condition**	**SSB Ês/Iot**	**Io [Note 1] range**		
			Minimum Io		**Maximum Io**
dB	**dB**	**dB**	**dBm / SCS_{SSB} [Note 2]**	**dBm/$BW_{Channel}$**	**dBm/$BW_{Channel}$**
			SCS_{SSB} = 120kHz / **SCS_{SSB} = 240kHz**		
±6.5	±9.5	≥-3	Same value as SSB_RP in Table B.2.4.1-2, according to UE Power class, operating band and angle of arrival	N/A	-70
±8.5	±11.5	≥-3	N/A	-70	-50

NOTE 1: Io specified at the Reference point, and assumed to have constant EPRE across the bandwidth.
NOTE 2: Values based on Refsens and EIS spherical coverage as defined in clauses 7.3.2 and 7.3.4 of TS 38.101-2 [3]. Applicable side condition selected depending on angle of arrival.
NOTE 3: In the test cases, the SSB Ês/Iot and related parameters may need to be adjusted to ensure Ês/Iot at UE baseband is above the value defined in this table.

The reporting range of SS-RSRP and CSI-RSRP for L1 reporting is defined from -140 to -44 dBm with 1 dB resolution.

The mapping of measured quantity is defined in Table 4.7.4.0.1-2. The range in the signalling may be larger than the guaranteed accuracy range.

The normative reference for this requirement is TS 38.133 [6] clauses 10.1.20.1.1 and 10.1.6.

5.7.4.0.2 SSB-based L1-RSRP relative measurement accuracy requirements

The relative accuracy of SSB based L1-RSRP is defined as the L1-RSRP measured from one SSB compared to the largest measured value of L1-RSRP among all SSBs of the serving cell.

The accuracy requirements in Table 5.7.4.0.2-1 are valid under the following conditions:

- Conditions defined in clause 7.3 of TS 38.101-2 [3] for reference sensitivity are fulfilled.
- Conditions for L1-RSRP measurements are fulfilled according to Annex B.2.4.1 of TS 38.133 [6] for a corresponding Band for each relevant SSB.
- The measured signals are in the directions covered by the percentile EIS spherical coverage of the UE, defined in clause 7.3.4 of TS 38.101-2 [3].

Table 5.7.4.0.2-1: SSB based L1-RSRP relative accuracy in FR2

Accuracy		Conditions			
Normal condition	Extreme condition	SSB Ês/Iot	Io Note 1 range		
			Minimum Io		Maximum Io
dB	dB	dB	dBm / SCS_{SSB} Note 3		$dBm/BW_{Channel}$
			SCS_{SSB} = 120kHz	SCS_{SSB} = 240kHz	
±6.5	±9.5	≥-3	Same value as SSB_RP in Table B.2.4.1-2, according to UE Power class, operating band and angle of arrival		-50

NOTE 1: Io specified at the Reference point, and assumed to have constant EPRE across the bandwidth.
NOTE 2: The parameter SSB Ês/Iot is the minimum SSB Ês/Iot of the pair of SSBs to which the requirement applies.
NOTE 3: Values based on Refsens and EIS spherical coverage as defined in clauses 7.3.2 and 7.3.4 of TS 38.101-2 [3]. Applicable side condition selected depending on angle of arrival.
NOTE 4: In the test cases, the SSB Ês/Iot and related parameters may need to be adjusted to ensure Ês/Iot at UE baseband is above the value defined in this table.

The reporting range of SS-RSRP and CSI-RSRP for L1 reporting is defined from -140 to -44 dBm with 1 dB resolution.

The mapping of measured quantity is defined in Table 4.7.4.0.1-2. The range in the signalling may be larger than the guaranteed accuracy range.

The normative reference for this requirement is TS 38.133 [6] clauses 10.1.20.1.2 and 10.1.6.

5.7.4.0.3 CSI-RS-based L1-RSRP absolute measurement accuracy requirements

Unless otherwise specified, the requirements for absolute accuracy of CSI-RS based L1-RSRP in this clause apply to all CSI-RS resources of the serving cell configured for L1-RSRP measurement.

The accuracy requirements in Table 5.7.4.0.3-1 are valid under the following conditions:

- Conditions defined in clause 7.3 of TS 38.101-2 [3] for reference sensitivity are fulfilled.
- Conditions for L1-RSRP measurements are fulfilled according to Annex B.2.4.2 of TS 38.133 [6] for a corresponding Band for each relevant CSI-RS.
- The bandwidth of CSI-RS is 48 PRBs and the density is 3.
- The measured signals are in the directions covered by the percentile EIS spherical coverage of the UE, defined in clause 7.3.4 of TS 38.101-2 [3].

The performance with larger bandwidth of CSI-RS is equal to or better than the accuracy requirements in Table 5.7.4.0.3-1.

Table 5.7.4.0.3-1: CSI-RS based L1-RSRP absolute accuracy in FR2

Accuracy		Conditions			
Normal condition	Extreme condition	CSI-RS Ês/Iot	Io [Note 1] range		
			Minimum Io		Maximum Io
dB	dB	dB	dBm / SCS_{CSI-RS} [Note 2]		dBm/$BW_{Channel}$	dBm/$BW_{Channel}$
			SCS_{CSI-RS} = 60kHz	SCS_{CSI-RS} = 120kHz		
±6.5	±9.5	≥-3	Same value as CSI-RS_RP in Table B.2.4.2-2, according to UE Power class, operating band and angle of arrival		N/A	-70
±8.5	±11.5	≥-3	N/A		-70	-50

NOTE 1: Io specified at the Reference point, and assumed to have constant EPRE across the bandwidth.
NOTE 2: Values based on Refsens and EIS spherical coverage as defined in clauses 7.3.2 and 7.3.4 of TS 38.101-2 [3]. Applicable side condition selected depending on angle of arrival.
NOTE 3: In the test cases, the CSI-RS Ês/Iot and related parameters may need to be adjusted to ensure Ês/Iot at UE baseband is above the value defined in this table.

The reporting range of SS-RSRP and CSI-RSRP for L1 reporting is defined from -140 to -44 dBm with 1 dB resolution.

The mapping of measured quantity is defined in Table 4.7.4.0.1-2. The range in the signalling may be larger than the guaranteed accuracy range.

The normative reference for this requirement is TS 38.133 [6] clauses 10.1.20.2.1 and 10.1.6.

5.7.4.0.4 CSI-RS-based L1-RSRP relative measurement accuracy requirements

The relative accuracy of CSI-RS based L1-RSRP is defined as the L1-RSRP measured from one CSI-RS compared to the largest measured value of L1-RSRP among all CSI-RS resources of the serving cell.

The accuracy requirements in Table 5.7.4.0.4-1 are valid under the following conditions:

- Conditions defined in clause 7.3 of TS 38.101-2 [3] for reference sensitivity are fulfilled.
- Conditions for L1-RSRP measurements are fulfilled according to Annex B.2.4.2 of TS 38.133 for a corresponding Band for each relevant CSI-RS.
- The bandwidth of CSI-RS is 48 PRBs and the density is 3.
- The measured signals are in the directions covered by the percentile EIS spherical coverage of the UE, defined in clause 7.3.4 of TS 38.101-2 [3].

The performance with larger bandwidth of CSI-RS is equal to or better than the accuracy requirements in Table 5.7.4.0.4-1.

Table 5.7.4.0.4-1: CSI-RS based L1-RSRP relative accuracy in FR2

Accuracy		Conditions			
Normal condition	Extreme condition	CSI-RS Ês/Iot	Io [Note 1] range		
			Minimum Io		Maximum Io
dB	dB	dB	dBm / SCS_{CSI-RS}		dBm/$BW_{Channel}$
			SCS_{CSI-RS} = 60kHz	SCS_{CSI-RS} = 120kHz	
±6.5	±9.5	≥-3	Same value as CSI-RS RP in Table B.2.4.2-2, according to UE Power class, operating band and angle of arrival		-50

NOTE 1: Io specified at the Reference point, and assumed to have constant EPRE across the bandwidth.

NOTE 2:	The parameter CSI-RS Ês/Iot is the minimum CSI-RS Ês/Iot of the pair of CSI-RS resources to which the requirement applies.
NOTE 3:	Values based on Refsens and EIS spherical coverage as defined in clauses 7.3.2 and 7.3.4 of TS 38.101-2 [3]. Applicable side condition selected depending on angle of arrival.
NOTE 4:	In the test cases, the CSI-RS Ês/Iot and related parameters may need to be adjusted to ensure Ês/Iot at UE baseband is above the value defined in this table.

The reporting range of SS-RSRP and CSI-RSRP for L1 reporting is defined from -140 to -44 dBm with 1 dB resolution.

The mapping of measured quantity is defined in Table 4.7.4.0.1-2. The range in the signalling may be larger than the guaranteed accuracy range.

The normative reference for this requirement is TS 38.133 [6] clauses 10.1.20.2.2 and 10.1.6.

5.7.4.1 EN-DC FR2 SSB based L1-RSRP measurement accuracy

Editor's Note: This test case has been completed for the following configurations:

- Test frequency f ≤ 40.8 GHz

- UE PC3

- Normal conditions

- The test is incomplete for UE power classes other than PC3

- The test is incomplete for test frequencies > 40.8 GHz

- The test is incomplete for extreme conditions

5.7.4.1.1 Test purpose

The purpose of this test is to verify that the SSB based L1-RSRP absolute measurement accuracy is within the specified limits for all bands.

5.7.4.1.2 Test applicability

This test applies to all types of NR UE supporting E-UTRA and EN-DC from Release 15 onwards.

5.7.4.1.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 5.7.4.0.1 and 5.7.4.0.2.

The normative reference for this requirement is TS 38.133 [6] clause A.5.7.4.1.

5.7.4.1.4 Test description

5.7.4.1.4.1 Initial conditions

This test shall be tested using any of the test configurations in Table 5.7.4.1.4.1-1.

Table 5.7.4.1.4.1-1: Supported test configurations

Test Case ID	Description
5.7.4.1-1	LTE FDD, NR 120 kHz SSB SCS, 100 MHz bandwidth, TDD duplex mode
5.7.4.1-2	LTE TDD, NR 120 kHz SSB SCS, 100 MHz bandwidth, TDD duplex mode
5.7.4.1-3	LTE FDD, NR 240 kHz SSB SCS, 100 MHz bandwidth, TDD duplex mode
5.7.4.1-4	LTE TDD, NR 240 kHz SSB SCS, 100 MHz bandwidth, TDD duplex mode
Note: The UE is only required to be tested in one of the supported test configurations	

Configure the test equipment and the DUT according to the parameters in Table 5.7.4.1.4.1-2.

Table 5.7.4.1.4.1-2: Initial conditions

Parameter	Value		Comment
Test environment	NC, TL/VL, TL/VH, TH/VL, TH/VH		As specified in TS 38.508-1 [14] clause 4.1.
Test frequencies	As specified in Annex E, Table E.4-1 and TS 38.508-1 [14] clause 4.3.1.		
Channel bandwidth	As specified by the test configuration selected from Table 5.7.4.1.4.1-1.		
Propagation conditions	AWGN		As specified in Annex C.2.2.
Connection Diagram	TE Part	A.3.3.3.1-1	As specified in TS 38.508-1 [14] Annex A.
	DUT Part	A.3.4.1.1	
Exceptions to connection diagram	N/A		

1. Message contents are defined in clause 5.7.4.1.4.3.

2. Cell 1 is the E-UTRA serving cell (PCell) for the EN-DC setup. The power levels and settings for Cell 1 are set according to Annex A.6. Cell 2 is the NR FR2 cell. Cell 2 is the PSCell and the target for SSB-based L1-RSRP measurements. The UE is configured to perform RLM, BFD and L1-RSRP measurement based on the SSBs. The connection setup is done according to the settings in Annex C.1.1.

3. The UE Rx beam peak direction has been obtained previously using one of the Rx Beam Peak Search procedures as described in Annex I.

5.7.4.1.4.2 Test procedure

Prior to the start of the time duration T1, the UE shall be fully synchronized to PSCell. The UE shall be configured for periodic CSI reporting in PUCCH [format 2] with a reporting periodicity as mentioned in the above table 5.7.4.1.4.1-2.

The test sequence shall be carried out in RRC_CONNECTED for every test case. Unless otherwise stated, the downlink signal and noise are aligned to arrive in the UE Rx beam peak direction.

1. Ensure the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity EN-DC, DC bearer MCG and SCG, Connected without release *On* and Test Mode *On*, according to TS 38.508-1 [14] clause 4.5 and general test parameters set according to Table 5.7.4.1.4.1-2.

2. Set the parameters according to T1 in Table 5.7.4.1.5-1. Allow at least BEAM_SELECT_WAIT_TIME (NOTE 1) for the UE Rx beam selection to complete. Afterwards, T1 starts.

3. After 320 ms from the beginning of T1, the UE shall start sending L1-RSRP report including results of both SSB#0 and SSB#1 every 320 slots.

4. The UE shall start sending valid L1-RSRP reports, a valid report shall meet the absolute L1-RSRP requirement for SSB#0 and the relative L1-RSRP requirement for SSB#1. The SS shall checkfollowing requirements:

   - R1: The L1-RSRP value of SSB#0 reported by the UE is compared to the expected L1-RSRP value for SSB#0. If the value is outside the limits in Table 5.7.4.1.5-3, Table 5.7.4.1.5-3a or Table 5.7.4.1.5-4 (depending on the test configuration) or the UE fails to report the measurement value for SSB#0, the number of failed iterations for R1 is increased by one. Otherwise, the number of passed iterations for R1 is increased by one.

   - R2: The DIFF-RSRP value of SSB#1 reported by the UE is compared to the expected DIFF-RSRP value. If the resulting value is outside the limits in Table 5.7.1.1.5-5 or the UE fails to report the measurement value for SSB#1, the number of failed iterations for R2 is increased by one. Otherwise, the number of passed iterations for R2 is increased by one.

5. The SS shall continue checking the L1-RSRP report messages transmitted by the UE until the confidence level according to Table G.2.3-1 in Annex G is achieved.

6. Set the parameters according T2 in Table 5.7.4.1.5-1. Allow at least BEAM_SELECT_WAIT_TIME (NOTE 1) for the UE Rx beam selection to complete. Afterwards, T2 starts.

7. Repeat steps 3-5. In Step 4, The SS shall check the L1-RSRP reported values of SSB#0 and SSB#1 in the periodic L1-RSRP reports for the following requirements.

   - R3: The L1-RSRP value of SSB#0 or SSB#1 reported by the UE is compared to the expected L1-RSRP value. If the value is outside the limits in Table 5.7.4.1.5-3, Table 5.7.4.1.5-3b or Table 5.7.4.1.5-4 (depending on the test configuration) or the UE fails to report the measurement value for SSB#0 or SSB#1, the number of failed iterations for R3 is increased by one. Otherwise, the number of passed iterations for R3 is increased by one.

   - R4: The DIFF-RSRP value of SSB#0 or SSB#1 reported by the UE is compared to the expected DIFF-RSRP value. If the resulting value is outside the limits in Table 5.7.1.1.5-5 or the UE fails to report the measurement value for SSB#0 or SSB#1, the number of failed iterations for R4 is increased by one. Otherwise, the number of passed iterations for R4 is increased by one.

NOTE: The BEAM_SELECT_WAIT_TIME default value is defined in Annex K.1.1 in TS 38.521-2 [18].

5.7.4.1.4.3 Message contents

Message contents are according to TS 38.508-1 [14] clause 7.3 with the following exceptions:

Table 5.7.4.1.4.3-1: Common Exception messages EN-DC SSB based L1-RSRP measurement

Default Message Contents	
Common contents of system information blocks exceptions	
Default RRC messages and information elements contents exceptions	Table H.3.6-2 with conditions PERIODIC and SS-RSRP Table H.3.6-3 with conditions SSB and PERIODIC Table H.3.4-1 Table 7.3.1-3 in TS 38.508-1 [14] with condition SMTC.1

Table 5.7.4.1.4.3-2: RadioLinkMonitoringConfig

Derivation Path: TS 38.508-1 [14], Table 4.6.3-133			
Information Element	**Value/remark**	**Comment**	**Condition**
RadioLinkMonitoringConfig ::= SEQUENCE {			
failureDetectionResourcesToAddModList SEQUENCE (SIZE(1..maxNrofFailureDetectionResources)) OF SEQUENCE {	1 entry		
purpose	both	UE is configured to perform RLM and BFD based on the SSBs.	
detectionResource CHOICE {			
ssb-Index	0		
}			
}			
}			

5.7.4.1.5 Test requirement

Table 5.7.4.1.5-1 defines the primary level settings including test tolerances for all tests.

Each L1-RSRP measurement report for each of the tests in Table 5.7.4.1.5-1 shall meet the corresponding absolute accuracy requirements in Table 5.7.4.1.5-2 for test configurations 1, 2, 4 and 5, and the corresponding absolute accuracy requirements in Table 5.7.4.1.5-3 for test configurations 3 and 6 and Table 5.7.4.1.5-3a for all configurations.

Table 5.7.4.1.5-1: L1-RSRP test parameters

Parameter	Config	Unit	Test 1	Test 2
SSB GSCN	1~4		freq1	freq1
Duplex mode	1~4		TDD	TDD

TDD Configuration	1~4		TDDConf.3.1	TDDConf.3.1
$BW_{channel}$	1~4	MHz	100: $N_{RB,c}$ = 66	100: $N_{RB,c}$ = 66
Data RBs allocated	1~4		66	66
PDSCH Reference measurement channel	1,2		SR.3.2 TDD	SR.3.2 TDD
	3,4		SR.3.3 TDD	SR.3.3 TDD
RMSI CORESET Reference Channel	1,2		CR.3.1 TDD	CR.3.1 TDD
	3,4		CR.3.2 TDD	CR.3.2 TDD
Dedicated CORESET Reference Channel	1,2		CCR.3.1 TDD	CCR.3.1 TDD
	3,4		CCR.3.7 TDD	CCR.3.7 TDD
SSB configuration	1,2		SSB.1 FR2	SSB.1 FR2
	3,4		SSB.2 FR2	SSB.2 FR2
OCNG Patterns	1~4		OP.1	OP.1
Initial BWP Configuration	1~4		DLBWP.0.1 ULBWP.0.1	DLBWP.0.1 ULBWP.0.1
Dedicated BWP configuration	1~4		DLBWP.1.3 ULBWP.1.3	DLBWP.1.3 ULBWP.1.3
TRS Configuration	1~4		TRS.2.1 TDD	TRS.2.1 TDD
PDCCH/PDSCH TCI Configuration	1~4		TCI.State.2	TCI.State.2
SMTC configuration	1~4		SMTC.1	SMTC.1
reportConfigType	1~4		periodic	periodic
reportQuantity	1~4		ssb-Index-RSRP	ssb-Index-RSRP
Number of reported RS	1~4		2	2
L1-RSRP reporting period	1~4		slot320	slot320
Propagation condition	1~4		AWGN	AWGN
Antenna configuration			1x2	1x2
EPRE ratio of PSS to SSS	1~4	dB	0	0
EPRE ratio of PBCH DMRS to SSS				
EPRE ratio of PBCH to PBCH DMRS				
EPRE ratio of PDCCH DMRS to SSS				
EPRE ratio of PDCCH to PDCCH DMRS				
EPRE ratio of PDSCH DMRS to SSS				
EPRE ratio of PDSCH to PDSCH DMRS				
EPRE ratio of OCNG DMRS to SSS Note 1				
EPRE ratio of OCNG to OCNG DMRS Note 1				

Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.

Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for N_{oc} to be fulfilled.

Table 5.7.4.1.5-2: L1-RSRP OTA related test parameters

Parameter	Config	Unit	Test 1		Test 2 NOTE 3	
			SSB0	SSB1	SSB0	SSB1
Angle of arrival configuration			Setup 1 according to A.3.15.1		Setup 1 according to A.3.15.1	

Assumption for UE beams[Note 4]			Rough		Rough
N_{oc}	1~4	dBm/15 kHz	-104.1		n.a.
N_{oc}	1,2	dBm/SSB SCS	-95.1		n.a.
	3,4		-92.1		n.a.
$\hat{E}_s / I_{ot}$	1~4	dB	10	-1.6	n.a.
SSB_RP[Note1]	1,2	dBm/SCS	-85.1	-96.9	As in Table B.2.4-2 + 5.7
	3,4		-78	-90	As in Table B.2.4-2 + 5.7
Io[Note1]	1~4	dBm/ 95.04MHz	-55.67		SSB_RP+34.68
$\hat{E}_s / N_{oc}$	1~4	dB	10	-1.6	n.a.

Note 1: SSB_RP and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.
Note 2: Void
Note 3: No additional noise is added by the test system in Test 2.
Note 4: Information about types of UE beam is given in B.2.1.3, and does not limit UE implementation or test system implementation

Table 5.7.4.1.5-3: L1-RSRP absolute accuracy requirements for the reported values for test configurations 1 and 2 for the absolute accuracy rules R1, R3

UE power class 3			
Normal Conditions	**Test 1 (SSB#0) All bands**	**Test 2 (SSB#0 or SSB#1)**	
Lowest reported value	42	n257, n258, n261	27
		n260	30
		n259	FFS
Highest reported value	101	n257, n258, n261	83
		n260	86
		n259	FFS
Extreme Conditions	**Test 1 (SSB#0) All bands**	**Test 2 (SSB#0 or SSB#1)**	
Lowest reported value	39+ FFS	n257, n258, n261	24 + FFS
		n260	27 + FFS
		n259	FFS
Highest reported value	104+ FFS	n257, n258, n261	86 + FFS
		n260	89 + FFS
		n259	FFS

Table 5.7.4.1.5-3a: evaluation limits for the Δ(Max-Min) reported values for SSB#0 for rules R1

UE power class 3		
Normal Conditions	**Test 1 All bands**	**Test 2 All bands**
Δ(Max-Min) reported value SSB#0	18	18
Extreme Conditions	**Test 1 All bands**	**Test 2 All bands**
Δ(Max-Min) reported value SSB#0	18 + FFS	18+ FFS

Table 5.7.4.1.5-3b: evaluation limits for the Δ(Max-Min) reported values for SSB#0 or SSB#1 for rules R3

UE power class 3

Normal Conditions	Test 1 All bands	Test 2 All bands
Δ(Max-Min) reported value SSB#0 or SSB#1	18	18
Extreme Conditions	**Test 1 All bands**	**Test 2 All bands**
Δ(Max-Min) reported value SSB#0 or SSB#1	18 + FFS	18+ FFS

Table 5.7.4.1.5-4: L1-RSRP absolute accuracy requirements for the reported values for test configurations 3 and 4 for the absolute accuracy rules R1, R3

UE power class 3			
Normal Conditions	**Test 1 (SSB#0) All bands**	**Test 2 (SSB#0 or SSB#1)**	
Lowest reported value	45	n257, n258, n261	30
		n260	33
		n259	FFS
Highest reported value	104	n257, n258, n261	86
		n260	90
		n259	FFS
Extreme Conditions	**Test 1 (SSB#0) All bands**	**Test 2 (SSB#0 or SSB#1)**	
Lowest reported value	42+ FFS	n257, n258, n261	27 + FFS
		n260	30 + FFS
		n259	FFS
Highest reported value	107+ FFS	n257, n258, n261	89 + FFS
		n260	92 + FFS
		n259	FFS

Table 5.7.4.1.5-5: evaluation limits for the reported values for T1 and T2 relative accuracy rules R2, R4

UE power class 3		
Normal Conditions	**Test 1 All bands**	**Test 2 All bands**
Lowest DIFF RSRP reported value	2	0
Highest DIFF RSRP reported value	9	+4
Extreme Conditions	**Test 1 All bands**	**Test 2 All bands**
Lowest DIFF RSRP reported value	1+ FFS	0+ FFS
Highest DIFF RSRP reported value	12+ FFS	+ 7+ FFS

For the test to pass, the ratio of successful reported values for each requirement (R1 to R6) shall be more than 90% with a confidence level of 95%. Each requirement is evaluated independently of the others.

5.7.4.2 EN-DC FR2 CSI-RS based L1-RSRP measurement accuracy

Editor's Note: This test case has been completed for the following configurations:

- Test frequency f ≤ 40.8 GHz

- UE PC3

- Normal conditions

- The test is incomplete for UE power classes other than PC3

- The test is incomplete for test frequencies > 40.8 GHz

- The test is incomplete for extreme conditions

5.7.4.2.1 Test purpose

The purpose of this test is to verify that the CSI-RS based L1-RSRP absolute measurement accuracy is within the specified limits for all bands.

5.7.4.2.2 Test applicability

This test applies to all types of NR UE supporting E-UTRA and EN-DC from Release 15 onwards.

5.7.4.2.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 5.7.4.0. 3 and 5.7.4.0.4.

The normative reference for this requirement is TS 38.133 [6] clause A.5.7.4.1.

5.7.4.2.4 Test description

5.7.4.2.4.1 Initial conditions

This test shall be tested using any of the test configurations in Table 5.7.4.2.4.1-1.

Table 5.7.4.2.4.1-1: Supported test configurations

Test Case ID	Description
5.7.4.2-1	LTE FDD, NR 120 kHz SSB SCS, 100 MHz bandwidth, TDD duplex mode
5.7.4.2-2	LTE TDD, NR 120 kHz SSB SCS, 100 MHz bandwidth, TDD duplex mode
Note: The UE is only required to be tested in one of the supported test configurations	

Configure the test equipment and the DUT according to the parameters in Table 5.7.4.2.4.1-2.

Table 5.7.4.2.4.1-2: Initial conditions

Parameter	Value		Comment
Test environment	NC, TL/VL, TL/VH, TH/VL, TH/VH		As specified in TS 38.508-1 [14] clause 4.1.
Test frequencies	As specified in Annex E, Table E.4-1 and TS 38.508-1 [14] clause 4.3.1.		
Channel bandwidth	As specified by the test configuration selected from Table 5.7.4.2.4.1-1.		
Propagation conditions	AWGN		As specified in Annex C.2.2.
Connection Diagram	TE Part	A.3.3.1.1	As specified in TS 38.508-1 [14] Annex A.
	DUT Part	A.3.4.1.1	
Exceptions to connection diagram	N/A		

1. Message contents are defined in clause 5.7.4.2.4.3.

2. Cell 1 is the E-UTRA serving cell (PCell) for the EN-DC setup. The power levels and settings for Cell 1 are set according to Annex A.6. Cell 2 is the NR FR2 cell. Cell 2 is the PSCell and the target for CSI-RS-based L1-RSRP measurements. The UE is configured to perform RLM, BFD and L1-RSRP measurement based on the SSBs. The connection setup is done according to the settings in Annex C.1.1.

3. The UE Rx beam peak direction has been obtained previously using one of the Rx Beam Peak Search procedures as described in Annex I.

5.7.4.2.4.2 Test procedure

Prior to the start of the time duration T1, the UE shall be fully synchronized to PSCell. The UE shall be configured for periodic CSI reporting in PUCCH [format 2] with a reporting periodicity as mentioned in the above table 5.7.4.2.4.1-2.

The test sequence shall be carried out in RRC_CONNECTED for every test case. Unless otherwise stated, the downlink signal and noise are aligned to arrive in the UE Rx beam peak direction.

1. Ensure the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity EN-DC, DC bearer MCG and SCG, Connected without release *On* and Test Mode *On*, according to TS 38.508-1 [14] clause 4.5 and general test parameters set according to Table 5.7.4.2.4.1-2.

2. Set the parameters according to T1 in Table 5.7.4.2.5-1. Allow at least BEAM_SELECT_WAIT_TIME (NOTE 1) for the UE Rx beam selection to complete. Afterwards, T1 starts.

3. After 320 ms from the beginning of T1, the UE shall start sending L1-RSRP report including results of both CSI-RS0 and CSI-RS1.

4. The UE shall start sending valid L1-RSRP reports, a valid report shall meet the absolute L1-RSRP requirement for CSI-RS0 and the relative L1-RSRP requirement for CSI-RS1. The SS shall check for the following requirements:

   - R1: The L1-RSRP value of CSI-RS0 reported by the UE is compared to the expected L1-RSRP value for CSI-RS0. If the value is outside the limits in Table 5.7.4.2.5-3, Table 5.7.4.2.5-3a or Table 5.7.4.2.5-4 (depending on the test configuration) or the UE fails to report the measurement value for CSI-RS0, the number of failed iterations for R1 is increased by one. Otherwise, the number of passed iterations for R1 is increased by one.

   - R2: The DIFF-RSRP value of CSI-RS1 reported by the UE is compared to the expected DIFF-RSRP value. If the resulting value is outside the limits in Table 5.7.1.1.5-5 or the UE fails to report the measurement value for CSI-RS1, the number of failed iterations for R2 is increased by one. Otherwise, the number of passed iterations for R2 is increased by one.

5. The SS shall continue checking the L1-RSRP report messages transmitted by the UE until the confidence level according to Table G.2.3-1 in Annex G is achieved.

6. Set the parameters according T2 in Table 5.7.4.2.5-1. Allow at least BEAM_SELECT_WAIT_TIME (NOTE 1) for the UE Rx beam selection to complete. Afterwards, T2 starts.

7. Repeat steps 3-5. In Step 4, The SS shall check the L1-RSRP reported values of CSI-RS0 and CSI-RS1 in the periodic L1-RSRP reports for the following requirements.

   - R3: The L1-RSRP value of CSI-RS0 or CSI-RS1 reported by the UE is compared to the expected L1-RSRP value. If the value is outside the limits in Table 5.7.4.2.5-3, Table 5.7.4.2.5-3b or Table 5.7.4.2.5-4 (depending on the test configuration) or the UE fails to report the measurement value for CSI-RS0 or CSI-RS1, the number of failed iterations for R3 is increased by one. Otherwise, the number of passed iterations for R3 is increased by one.

   - R4: The DIFF-RSRP value of CSI-RS0 or CSI-RS1 reported by the UE is compared to the expected DIFF-RSRP value. If the resulting value is outside the limits in Table 5.7.1.1.5-5 or the UE fails to report the measurement value for CSI-RS0 or CSI-RS1, the number of failed iterations for R4 is increased by one. Otherwise, the number of passed iterations for R4 is increased by one.

NOTE: The BEAM_SELECT_WAIT_TIME default value is defined in Annex K.1.1 in TS 38.521-2 [18].

5.7.4.2.4.3 Message contents

Message contents are according to TS 38.508-1 [14] clause 7.3 with the following exceptions:

Table 5.7.4.2.4.3-1: Common Exception messages EN-DC CSI-RS based L1-RSRP measurement

Default Message Contents	
Common contents of system information blocks exceptions	

Default RRC messages and information elements contents exceptions	Table H.3.6-2 with conditions PERIODIC and CSI-RSRP Table H.3.6-3 with conditions CSI-RS and PERIODIC Table H.3.4-1 Table 7.3.1-3 in TS 38.508-1 [14] with condition SMTC.1

Table 5.7.4.2.4.3-2: RadioLinkMonitoringConfig

Derivation Path: TS 38.508-1 [14], Table 4.6.3-133			
Information Element	**Value/remark**	**Comment**	**Condition**
RadioLinkMonitoringConfig ::= SEQUENCE {			
failureDetectionResourcesToAddModList SEQUENCE (SIZE(1..maxNrofFailureDetectionResources)) OF SEQUENCE {	1 entry		
purpose	both	UE is configured to perform RLM and BFD based on the SSBs.	
detectionResource CHOICE {			
ssb-Index	0		
}			
}			
}			

5.7.4.2.5 Test requirement

Table 5.7.4.2.5-1 defines the primary level settings including test tolerances for all tests.

Each L1-RSRP measurement report for each of the tests in Table 5.7.4.2.5-1 shall meet the corresponding absolute accuracy requirements in Table 5.7.4.2.5-2 for test configurations 1, 2, 4 and 5, and the corresponding absolute accuracy requirements in Table 5.7.4.2.5-3 for test configurations 3 and 6 and Table 5.7.4.2.5-3a for all configurations.

Table 5.7.4.2.5-1: L1-RSRP test parameters

Parameter	Config	Unit	Test 1	Test 2
SSB GSCN	1~2		freq1	freq1
Duplex mode	1~2		TDD	TDD
TDD Configuration	1~2		TDDConf.3.1	TDDConf.3.1
$BW_{channel}$	1~2	MHz	100: $N_{RB,c}$ = 66	100: $N_{RB,c}$ = 66
PDSCH Reference measurement channel	1~2		SR.3.1 TDD	SR.3.1 TDD
RMSI CORESET Reference Channel	1~2		CR.3.1 TDD	CR.3.1 TDD
Dedicated CORESET Reference Channel	1~2		CCR.3.1 TDD	CCR.3.1 TDD
SSB configuration	1~2		SSB.1 FR2	SSB.1 FR2
OCNG Patterns	1~2		OP.1	OP.1
Initial BWP Configuration	1~2		DLBWP.0.1 ULBWP.0.1	DLBWP.0.1 ULBWP.0.1
Dedicated BWP configuration	1~2		DLBWP.1.1 ULBWP.1.1	DLBWP.1.1 ULBWP.1.1
TRS Configuration	1~2		TRS.2.1 TDD	TRS.2.1 TDD
PDCCH/PDSCH TCI Configuration	1~2		TCI.State.2	TCI.State.2
SMTC configuration	1~2		SMTC.1	SMTC.1
CSI-RS	1~2		CSI-RS.3.2 TDD	CSI-RS.3.2 TDD
reportConfigType	1~2		periodic	periodic
reportQuantity	1~2		cri-RSRP	cri-RSRP
Number of reported RS	1~2		2	2
L1-RSRP reporting period	1~2		slot320	slot320
Propagation condition	1~2		AWGN	AWGN
Antenna configuration	1~2		1x2	1x2

EPRE ratio of PSS to SSS	1~2	dB	0	0
EPRE ratio of PBCH DMRS to SSS				
EPRE ratio of PBCH to PBCH DMRS				
EPRE ratio of PDCCH DMRS to SSS				
EPRE ratio of PDCCH to PDCCH DMRS				
EPRE ratio of PDSCH DMRS to SSS				
EPRE ratio of PDSCH to PDSCH DMRS				
EPRE ratio of OCNG DMRS to SSS Note 1				
EPRE ratio of OCNG to OCNG DMRS Note 1				
Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols. Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for N_{oc} to be fulfilled.				

Table 5.7.4.2.5-2: L1-RSRP OTA related test parameters

Parameter	Config	Unit	Test 1		Test 2 NOTE 3	
			CSI-RS0	CSI-RS1	CSI-RS0	CSI-RS1
Angle of arrival configuration			Setup 1 according to A.3.15.1		Setup 1 according to A.3.15.1	
Assumption for UE beams Note 4			Rough		Rough	
N_{oc}	1~2	dBm/15 kHz	-104.10		n.a.	
N_{oc}	1~2	dBm/SSB SCS	-95.11		n.a. n.a.	
$\hat{E}_s / I_{ot}$	1~2	dB	10	-1.8	n.a.	
CSI-RS_RP Note1	1~2	dBm/SCS	-85.11	-96.93	As in Table B.2.4.2-2 + 5.7	
Io Note1	1~2	dBm/ 95.04MHz	-55.67		CSI-RS_RP+34.68	
$\hat{E}_s / N_{oc}$	1~2	dB	10	-1.82	n.a.	
Note 1: RSRP and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves. Note 2: RSRP minimum requirements are specified assuming independent interference and noise at each receiver antenna port. Note 3: No additional noise is added by the test system in Test 2. Note 4: Information about types of UE beam is given in B.2.1.3, and does not limit UE implementation or test system implementation						

Table 5.7.4.2.5-3: L1-RSRP absolute accuracy requirements for the reported values for the absolute accuracy rules R1, R3

UE power class 3			
Normal Conditions	Test 1 (CSI-RS0) All bands	Test 2 (CSI-RS0 or CSI-RS1)	
Lowest reported value	42	n257, n258, n261	27
		n260	30
		n259	FFS
Highest reported value	101	n257, n258, n261	83
		n260	86
		n259	FFS

Extreme Conditions	Test 1 (CSI-RS0) All bands	Test 2 (CSI-RS0 or CSI-RS1)	
Lowest reported value	39+ FFS	n257, n258, n261	25 + FFS
		n260	27 + FFS
		n259	FFS
Highest reported value	104+ FFS	n257, n258, n261	86 + FFS
		n260	89 + FFS
		n259	FFS

Table 5.7.4.2.5-3a: evaluation limits for the Δ(Max-Min) reported values for CSI-RS#0 for rules R1

UE power class 3		
Normal Conditions	**Test 1 All bands**	**Test 2 All bands**
Δ(Max-Min) reported value CSI-RS#0	18	18
Extreme Conditions	**Test 1 All bands**	**Test 2 All bands**
Δ(Max-Min) reported value CSI-RS#0	18 + FFS	18+ FFS

Table 5.7.4.2.5-3b: evaluation limits for the Δ(Max-Min) reported values for CSI-RS#0 or CSI-RS#1 for rules R3

UE power class 3		
Normal Conditions	**Test 1 All bands**	**Test 2 All bands**
Δ(Max-Min) reported value CSI-RS#0 or CSI-RS#1	18	18
Extreme Conditions	**Test 1 All bands**	**Test 2 All bands**
Δ(Max-Min) reported value CSI-RS#0 or CSI-RS#1	18 + FFS	18+ FFS

Table 5.7.4.2.5-4: evaluation limits for the reported values for T1 and T2 relative accuracy rules R2, R4

UE power class 3		
Normal Conditions	**Test 1 All bands**	**Test 2 All bands**
Lowest DIFF RSRP reported value	2	0
Highest DIFF RSRP reported value	9	+ 4
Extreme Conditions	**Test 1 All bands**	**Test 2 All bands**
Lowest DIFF RSRP reported value	1+ FFS	0+ FFS
Highest DIFF RSRP reported value	12+ FFS	+ 7+ FFS

For the test to pass, the ratio of successful reported values for each requirement (R1 to R6) shall be more than 90% with a confidence level of 95%. Each requirement is evaluated independently of the others.

5.7.5 SRS-RSRP

5.7.5.0 Minimum conformance requirements

5.7.5.0.1 Minimum conformance requirements for SRS-RSRP measurement accuracy

The SRS-RSRP measurement reported by the UE shall fulfil the accuracy requirements defined in Table 5.7.5.0.1-1 for FR1 and Table 5.7.7.0.1-2 for FR2, provided that the following conditions are met. The accuracy requirements in this clause are derived based on AWGN radio propagation conditions.

- Conditions defined in clause 7.3 of TS 38.101-1 [18] for reference sensitivity are fulfilled.
- Conditions for SRS-RSRP measurements are fulfilled according to Annex B.2.z for a corresponding Band for each relevant SRS resource configured for measurement.
- The time difference between UE's DL reference timing in the serving cell and SRS arrival time is no larger than $T_{error_SRS_RSRP}$, where
  - $T_{error_SRS_RSRP} = T_C \times N_{TA_offset}$ + 4.67us for FR1
  - $T_{error_SRS_RSRP} = T_C \times N_{TA_offset}$ + 3.67us for FR2
  - N_{TA_offset} is defined in Table 7.1.2-2
  - T_C is 0.509ns
- The number of SRS ports in the SRS resource configured for measurement is 1,
- The number of symbols in the SRS resource configured for measurement is 1,
- The number of repetitions in the SRS resource configured for measurement is 1,
- Frequency hopping, sequence group hopping or sequence hopping is disabled in the SRS resource configured for measurement,
- The bandwidth of the SRS resource is 48 PRBs.
- One of the following conditions is met
  - There is no other SRS resource with the same root sequence and on the same symbol and with same comb as the relevant SRS resource.
  - If multiple SRS resources are on the same symbol and with same comb, the distance between cyclic shifts of any two resources is no less than 6 if transmissionComb = n4, and no less than 4 if transmissionComb = n2.

Table 5.7.5.0.1-1: SRS-RSRP absolute accuracy in FR1

Accuracy						Conditions						
Normal condition			Extreme condition			SRS Ês/Iot	Io [Note 1] range					
							NR operating band groups [Note 2]	Minimum Io				Maximum Io
dB						dB		dBm / SCS_{SRS}			dBm/BW Channel	dBm/BW Channel
SCS_{SRS} (kHz)			SCS_{SRS} (kHz)									
15	30	60	15	30	60			SCS_{SRS} = 15 kHz	SCS_{SRS} = 30 kHz	SCS_{SRS} = 60 kHz		
±3	±3.5	±5	±7.5	±8	±9.5	≥1	NR_TDD_FR1_A,	-120	-117	-114	N/A	-70
							NR_TDD_FR1_C	-119	-116	-113	N/A	-70
							NR_TDD_FR1_D	-118.5	-115.5	-112.5	N/A	-70
							NR_TDD_FR1_E	-118	-115	-112	N/A	-70

±6.5	±7	±8.5	±9.5	±10	±11.5	≥1	NR_TDD_FR1_A, NR_TDD_FR1_C, NR_TDD_FR1_D, NR_TDD_FR1_E	N/A	N/A	N/A	-70	-50

NOTE 1: Io is assumed to have constant EPRE across the bandwidth.
NOTE 2: NR operating band groups in FR1 are as defined in clause 3.5.2.

Table 5.7.5.0.1-2: SRS-RSRP absolute accuracy in FR2

Accuracy				**Conditions**			
Normal condition		**Extreme condition**		**SRS Ês/Iot**	**Io [Note 1] range**		
					Minimum Io		**Maximum Io**
dB				**dB**	**dBm / SCS_{SRS} [Note 2]**	**$dBm/BW_{Channel}$**	**$dBm/BW_{Channel}$**
SCS_{SRS} (kHz)		**SCS_{SRS} (kHz)**			**SCS_{SRS} = 60kHz** / **SCS_{SRS} = 120kHz**		
60	**120**	**60**	**120**				
±6	±8.5	±9	±11.5	≥1	Same value as SRS_RP in Table B.2.7-2, according to UE Power class, operating band and angle of arrival	N/A	-70
±9	±11.5	±11	±13.5	≥1	N/A	-70	-50

NOTE 1: Io specified at the Reference point, and assumed to have constant EPRE across the bandwidth.
NOTE 2: Values based on Refsens and EIS spherical coverage as defined in clauses 7.3.2 and 7.3.4 of TS 38.101-2 [19]. Applicable side condition selected depending on angle of arrival.
NOTE 3: In the test cases, the SSB Ês/Iot and related parameters may need to be adjusted to ensure Ês/Iot at UE baseband is above the value defined in this table.

5.7.5.0.1.1 SRS-RSRP report mapping

The reporting range of SRS-RSRP is defined from -140 dBm to -44 dBm with 1 dB resolution. The mapping of measured quantity is defined in Table 5.7.7.0.1.2-1. The range in the signalling may be larger than the guaranteed accuracy range.

Table 5.7.7.0.1.2-1: SRS-RSRP measurement report mapping

Reported value	Measured quantity value	Unit
SRS-RSRP_0	SRS-RSRP<-140	dBm
SRS-RSRP_1	-140≤ SRS-RSRP<-139	dBm
SRS-RSRP_2	-139≤ SRS-RSRP<-138	dBm
SRS-RSRP_3	-138≤ SRS-RSRP<-137	dBm
SRS-RSRP_4	-137≤ SRS-RSRP<-136	dBm
..	..	…
SRS-RSRP_95	-46≤ SRS-RSRP<-45	dBm
SRS-RSRP_96	-45≤ SRS-RSRP<-44	dBm
SRS-RSRP_97	-44≤ SRS-RSRP	dBm
SRS-RSRP_98	Infinity	
Note: 'Infinity' means that UE cannot detect SRS due to too strong signal to measure.		

The normative reference for this requirement is TS 38.133 [6] clause 10.1.22.1.

5.7.5.1 EN-DC FR2 SRS-RSRP measurement accuracy

Editor's Note: This test case is incomplete. Following aspects are either missing or TBD:

- The test procedure is incomplete
- The message content is FFS
- MU/TT analysis for UE PC3 and test frequency f ≤ 40.8 GHz is complete.
- MU/TT analysis for UE power class other than PC3 is incomplete.
- MU//TT analysis for test frequency f > 40.8 GHz is incomplete.

5.7.5.1.1 Test purpose

The purpose of this test is to verify that the SRS-RSRP measurement accuracy is within the specified limits with SRS-RSRP measurement requirements in TS 38.133 [6] clause 10.1.22.1.1.

5.7.5.1.2 Test applicability

This test applies to all types of NR UE supporting E-UTRA and EN-DC from Release 16 onwards and CLI-SRS-RSRP

5.7.5.1.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 5.7.5.0.1.

The normative reference for this requirement is TS 38.133 [6] clause A.5.7.5.1.

5.7.5.1.4 Test description

5.7.5.1.4.1 Initial conditions

This test shall be tested using any of the test configurations in Table 5.7.5.1.4.1-1.

Table 5.7.5.1.4.1-1: EN-DC FR2 SRS-RSRP accuracy supported test configurations

Config	Description
5.7.5.1 - 1	LTE FDD, NR 120 kHz SRS SCS, 100 MHz bandwidth, TDD duplex mode
5.7.5.1 - 2	LTE TDD, NR 120 kHz SRS SCS, 100 MHz bandwidth, TDD duplex mode
Note: The UE is only required to be tested in one of the supported test configurations in each supported band	

Configure the test equipment and the DUT according to the parameters in Table 5.7.5.1.4.1-2.

Table 5.7.5.1.4.1-2: Initial conditions EN-DC FR2 SRS-RSRP measurement accuracy

Parameter	Value	Comment
Test environment	NC	As specified in TS 36.508 [25] clause 4.1.
Test frequencies	As specified in Annex E, E.1.1, E.1.3.1 and Table E.3-1 and TS 38.508-1 [14] clause 4.3.1 for E-UTRA and 7.2.3 for NR.	
Channel bandwidth	As specified by the selected test configuration.	
Propagation conditions	AWGN	As specified in clause C.2.1
Connection Diagram	TE Part: A.3.3.1.1 DUT Part: A.3.4.1.1	As specified in TS 38.508-1 [14] Annex A.
Exceptions to connection diagram	N/A	

1. Message contents are defined in clause 5.7.5.1.4.3.
2. In this set of test cases there are two cells in the test, E-UTRAN PCell (Cell 1), FR2 PSCell (Cell 2).
3. The UE Rx beam peak direction has been obtained previously using one of the Rx Beam Peak Search procedures as described in Annex I.

5.7.5.1.4.2 Test procedure

There are two cells are deployed in the test, which are E-UTRAN PCell (Cell 1) and FR2 PSCell (Cell 2)

The test parameters and applicability for Cell 1 are defined in A.3.7.2 of 38.133. The test parameters for the Cell 2 are given in Table 5.7.5.1.5-1 and 5.7.5.1.5-2 below. The test parameter for the (virtual) neighbour cell UE transmitting SRS are given in Table 5.7.5.1.5-2.

Before the test UE is configured to perform SRS-RSRP measurement. During the test, the test system transmits SRS resources for measurement in the DL slots according to the SRS configuration in Table 5.7.5.1.5-3. There is no measurement gap configured in the test. During the test, the test system does not transmit PDCCH/PDSCH/OCNG on SRS symbol to be transmitted and on 2 data symbols before SRS to be transmitted.

1. Ensure the UE is in State 3A-RF according to TS 36.508 [25] clause 7.2A.3.
2. Set the parameters according to Table 5.7.5.1.5-1 as appropriate.
3. The SS shall transmit an *RRCConnectionReconfiguration* message on Cell 1.
4. The UE shall transmit an *RRCConnectionReconfigurationComplete* message.
5. The UE shall transmit periodically MeasurementReport messages.

<rest of the steps are FFS>

5.7.5.1.4.3 Message contents

Message contents are according to TS 38.508-1 [14] clause 7.3 with the following exceptions:

FFS

5.7.5.1.5 Test requirement

Table 5.7.5.1.5-1 defines the cell specific settings for all tests. Table 5.7.5.1.5-2 defines the OTA primary level settings including test tolerances for all tests.

The SS-RSRP measurement accuracy shall fulfil the absolute accuracy requirements in table 5.7.5.1.5-3 and absolute accuracy requirements in table 5.7.5.1.5-4. The following requirements are to be verified:

During T1:

The UE is deemed to meet the requirement if the reported SRS-RSRP is in the range shown in table 5.7.5.1.5-4.

During T2:

The UE is deemed to meet the requirement if the reported SRS-RSRP is in the range shown in table 5.7.5.1.5-4.

Table 5.7.5.1.5-1: FR2 test parameters for SRS-RSRP accuracy

Parameter	Config	Unit	Test 1	Test 2
SSB GSCN	1~2		freq1	freq1
Duplex mode	1~2		TDD	TDD
TDD configuration	1~2		TDDConf.3.1	TDDConf.3.1
$BW_{channel}$	1~2	MHz	100: $N_{RB,c}$ = 66	100: $N_{RB,c}$ = 66
PDSCH Reference measurement channel	1~2		SR.3.1 TDD	SR.3.1 TDD
RMSI CORESET Reference Channel	1~2		CR.3.1 TDD	CR.3.1 TDD

Dedicated CORESET Reference Channel	1~2		CCR.3.1 TDD	CCR.3.1 TDD
SSB configuration	1~2		SSB.3 FR2	SSB.3 FR2
OCNG Patterns	1~2		OP.1	OP.1
TRS configuration	1~2		TRS.2.1 TDD	TRS.2.1 TDD
Initial BWP Configuration	1~2		DLBWP.0.1 ULBWP.0.1	DLBWP.0.1 ULBWP.0.1
Dedicated BWP configuration	1~2		DLBWP.1.3 ULBWP.1.3	DLBWP.1.3 ULBWP.1.3
SMTC configuration	1~2		SMTC.1	SMTC.1
Time offset between DL from serving cell and SRS from test system	1~2	μs	10.76	10.67
EPRE ratio of PSS to SSS	1~2	dB	0	0
EPRE ratio of PBCH DMRS to SSS				
EPRE ratio of PBCH to PBCH DMRS				
EPRE ratio of PDCCH DMRS to SSS				
EPRE ratio of PDCCH to PDCCH DMRS				
EPRE ratio of PDSCH DMRS to SSS				
EPRE ratio of PDSCH to PDSCH DMRS				
EPRE ratio of OCNG DMRS to SSS Note 1				
EPRE ratio of OCNG to OCNG DMRS Note 1				
Propagation condition	1~2		AWGN	AWGN
Antenna configuration	1~2		1x2	1x2
SRS configuration	1~2		SRSConf.1	SRSConf.1
Note 1: OCNG shall be used such that a constant total transmitted power spectral density is achieved for all OFDM symbols.				

Table 5.7.5.1.5-2: SRS-RSRP accuracy OTA related test parameters for PSCell and Neighbour cell UE in FR2

Parameter	Unit	T1	T2
Angle of arrival configuration		Setup 1 defined A.3.15.1	Setup 1 defined A.3.15.1
Beam assumption Note 5		Fine	Fine
N_{oc} Note1	dBm/15kHz Note3	-100	N/A
N_{oc} Note1	dBm/SCS Note3	-91	N/A
$\hat{E}_s / N_{oc}$	dB	2	N/A
E_S	dBm/SCS Note3		(Table B.2.7-2 Rx Beam Peak)+5
SRS_RP Note2	dBm/SCS	-89	(Table B.2.7-2 Rx Beam Peak) +5
$\hat{E}_s / I_{ot\ BB}$ Note4	dB	>1	1
Io Note2	dBm/95.04 MHz Note3	-57.89	(Table B.2.7-2 Rx Beam Peak +50.79dB)
Note 1: Where used, interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for N_{oc} to be fulfilled.			
Note 2: SRS_RP, Es/Iot and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.			
Note 3: Equivalent power received by an antenna with 0 dBi gain at the centre of the quiet zone			
Note 4: Calculation of Es/Iot_{BB} includes the effect of UE internal noise up to the value assumed for the associated Refsens requirement in clause 7.3.2 of TS 36.101-2 [19], and an allowance of 2dB for UE multi-band relaxation factor $\sum MB_P$ from TS 38.101-2 [19] Table 6.2.1.3-4.			

Note 5:	Information about types of UE beam is given in B.2.1.3, and does not limit UE implementation or test system implementation.

Table 5.7.5.1.5-3: SRS configuration parameters for FR2 SRS-RSRP accuracy

	Field	SRSConf.1
SRS-ResourceSet	srs-ResourceSetId	0
	srs-ResourceIdList	0
	resourceType	Periodic
	Usage	Codebook
SRS-Resource	SRS-ResourceId	0
	nrofSRS-Ports	Port1
	transmissionComb	n2
	combOffset-n2	0
	cyclicShift-n2	0
	resourceMapping startPosition	0
	resourceMapping nrofSymbols	n1
	resourceMapping repetitionFactor	n1
	freqDomainPosition	0
	freqDomainShift	0
	freqHopping c-SRS	12
	freqHopping b-SRS	0
	freqHopping b-hop	0
	groupOrSequenceHopping	Neither
	resourceType	Periodic
	periodicityAndOffset-p	sl160,25
	sequenceId	0

Table 5.7.5.1.5-4: SRS-RSRP absolute accuracy test requirement

	Test requirement Notes1,2,3
SRS	SRS_RP -δ +G_{min} ≤ Reported SRS-RSRP(dBm) ≤SRS_RP +δ +G_{max}
Note 1:	SRS_RP is the equivalent power received by an antenna with 0dBi gain at the centre of the quiet zone configured in the test
Note 2:	δ is the RSRP absolute accuracy requirement from Table 10.1.22.1.1-2, selected according to the Io used in the test
Note 3:	G_{min} and G_{max} are the minimum and maximum UE gain values from Table B.2.1.5.1-1, selected according to the UE power class

The SRS-RSRP measurement accuracy shall fulfil the absolute accuracy requirements in clauses 5.7.5.0.10.1 The following requirements are to be verified:

During T1:

The UE is deemed to meet the requirement if the reported SRS-RSRP is in the range shown in table 5.7.5.1.5-4.

During T2:

The UE is deemed to meet the requirement if the reported SRS-RSRP is in the range shown in table 5.7.5.1.5-4.

For the test to pass, the ratio of successful reported values for each requirement shall be more than 90% with a confidence level of 95%. Each requirement is evaluated independently of the others.

5.7.5.2 EN-DC FR2 CLI-RSSI measurement accuracy

Editor's Note: This test case is incomplete. Following aspects are either missing or TBD:

- The test procedure is incomplete

- The message content is FFS

- TT analysis is missing.

5.7.5.2.1 Test purpose

The purpose of this test is to verify that the CLI-RSSI measurement accuracy is within the specified limits with CLI-RSSI measurement requirements in TS 38.133 [6] clause 10.1.22.2.1.

5.7.5.2.2 Test applicability

This test applies to all types of NR UE supporting E-UTRA and EN-DC from Release 16 onwards and CLI-CLI-RSSI

5.7.5.2.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 5.7.5.0.1.

The normative reference for this requirement is TS 38.133 [6] clause A.5.7.5.2.

5.7.5.2.4 Test description

5.7.5.2.4.1 Initial conditions

This test shall be tested using any of the test configurations in Table 5.7.5.2.4.1-1.

Table 5.7.5.2.4.1-1: Applicable NR configurations for FR2 CLI-RSSI accuracy test

Config	Description
1	LTE FDD, NR 120 kHz SRS SCS, 100 MHz bandwidth, TDD duplex mode
2	LTE TDD, NR 120 kHz SRS SCS, 100 MHz bandwidth, TDD duplex mode
Note: The UE is only required to be tested in one of the supported test configurations in each supported band	

Configure the test equipment and the DUT according to the parameters in Table 5.7.5.2.4.1-2.

Table 5.7.5.2.4.1-2: Initial conditions EN-DC FR2 CLI-RSSI measurement accuracy

Parameter	Value	Comment
Test environment	NC	As specified in TS 36.508 [25] clause 4.1.
Test frequencies	As specified in Annex E, E.1.1, E.1.3.1 and Table E.3-1 and TS 38.508-1 [14] clause 4.3.1 for E-UTRA and 7.2.3 for NR.	
Channel bandwidth	As specified by the selected test configuration.	
Propagation conditions	AWGN	As specified in clause C.2.1
Connection Diagram	TE Part: A.3.3.1.1 DUT Part: A.3.4.1.1	As specified in TS 38.508-1 [14] Annex A.
Exceptions to connection diagram	N/A	

1. Message contents are defined in clause 5.7.5.2.4.3.

2. In this set of test cases there are two cells in the test, E-UTRAN PCell (Cell 1), FR2 PSCell (Cell 2).

3. The UE Rx beam peak direction has been obtained previously using one of the Rx Beam Peak Search procedures as described in Annex I.

5.7.5.2.4.2 Test procedure

There are two cells are deployed in the test, which are E-UTRAN PCell (Cell 1) and FR2 PSCell (Cell 2)

The test parameters and applicability for Cell 1 are defined in A.3.7.2 of 38.133. The test parameters for the Cell 2 are given in Table 5.7.5.2.5-1 and 5.7.5.2.5-2 below. The test parameter for the (virtual) neighbour cell UE transmitting SRS are given in Table 5.7.5.2.5-2.

Before the test UE is configured to perform CLI-RSSI measurement. During the test, the test system transmits SRS resources for measurement in the DL slots according to the SRS configuration in Table 5.7.5.2.5-3. There is no measurement gap configured in the test. During the test, the test system does not transmit PDCCH/PDSCH/OCNG on SRS symbol to be transmitted and on 2 data symbols before SRS to be transmitted.

1. Ensure the UE is in State 3A-RF according to TS 36.508 [25] clause 7.2A.3.
2. Set the parameters according to Table 5.7.5.2.5-1 as appropriate.
3. The SS shall transmit an *RRCConnectionReconfiguration* message on Cell 1.
4. The UE shall transmit an *RRCConnectionReconfigurationComplete* message.
5. The UE shall transmit periodically MeasurementReport messages.

<rest of the steps are FFS>

5.7.5.2.4.3 Message contents

Message contents are according to TS 38.508-1 [14] clause 7.3 with the following exceptions:

FFS

5.7.5.2.5 Test requirement

Table 5.7.5.2.5-1 defines the cell specific settings for all tests. Table 5.7.5.2.5-2 defines the OTA primary level settings including test tolerances for all tests.

The SS-RSRP measurement accuracy shall fulfil the absolute accuracy requirements in table 5.7.5.2.5-3 and absolute accuracy requirements in table 5.7.5.2.5-4. The following requirements are to be verified:

During T1:

The UE is deemed to meet the requirement if the reported CLI-RSSI is in the range shown in table 5.7.5.2.5-4.

During T2:

The UE is deemed to meet the requirement if the reported CLI-RSSI is in the range shown in table 5.7.5.2.5-4.

Table 5.7.5.2.5-1: FR2 test parameters for CLI-RSSI accuracy

Parameter	Config	Unit	Test 1	Test 2
SSB GSCN	1~2		freq1	freq1
Duplex mode	1~2		TDD	TDD
TDD configuration	1~2		TDDConf.3.1	TDDConf.3.1
$BW_{channel}$	1~2	MHz	100: $N_{RB,c}$ = 66	100: $N_{RB,c}$ = 66
PDSCH Reference measurement channel	1~2		SR.3.1 TDD	SR.3.1 TDD
RMSI CORESET Reference Channel	1~2		CR.3.1 TDD	CR.3.1 TDD
Dedicated CORESET Reference Channel	1~2		CCR.3.1 TDD	CCR.3.1 TDD
SSB configuration	1~2		SSB.3 FR2	SSB.3 FR2
OCNG Patterns Note2	1~2		OP.1	OP.1
TRS configuration	1~2		TRS.2.1 TDD	TRS.2.1 TDD
Initial BWP Configuration	1~2		DLBWP.0.1 ULBWP.0.1	DLBWP.0.1 ULBWP.0.1

Dedicated BWP configuration	1~2		DLBWP.1.3 ULBWP.1.3	DLBWP.1.3 ULBWP.1.3
SMTC configuration	1~2		SMTC.1	SMTC.1
Time offset between DL from serving cell and OCNG from test system	1~2	μs	10.67	10.67
EPRE ratio of PSS to SSS	1~2	dB	0	0
EPRE ratio of PBCH DMRS to SSS				
EPRE ratio of PBCH to PBCH DMRS				
EPRE ratio of PDCCH DMRS to SSS				
EPRE ratio of PDCCH to PDCCH DMRS				
EPRE ratio of PDSCH DMRS to SSS				
EPRE ratio of PDSCH to PDSCH DMRS				
EPRE ratio of OCNG DMRS to SSS Note 1				
EPRE ratio of OCNG to OCNG DMRS Note 1				
Propagation condition	1~2		AWGN	AWGN
Antenna configuration	1~2		1x2	1x2
Note 1: OCNG shall be used such that a constant total transmitted power spectral density is achieved for all OFDM symbols. Note 2: OCNG is not transmitted in the CLI-RSSI measurement resources.				

Table 5.7.5.2.5-2: CLI-RSSI accuracy OTA related test parameters

Parameter	Unit	T1	T2
Angle of arrival configuration		Setup 1 defined A.3.15.1	
Beam assumption Note 5		Fine	
N_{oc} on CLI-RSSI measurement resource Note1	dBm/15kHz Note3	-100+TT	
N_{oc} on CLI-RSSI measurement resource Note1	dBm/SCS Note3	-91	
$\hat{E}_s / N_{oc}$ on CLI-RSSI measurement resource	dB	-Infinity	
RSRP on CLI-RSSI measurement resource Note2	dBm/SCS	-Infinity	
$\hat{E}_s / I_{ot\ BB}$ on CLI-RSSI measurement resource Note4	dB	-Infinity	
Io on CLI-RSSI measurement resource Note2	dBm/95.04 MHz Note3	-62.01	
Io on CLI-RSSI measurement resource Note2	dBm/1.08 MHz	-81.46	
Note 1: Where used, interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for N_{oc} to be fulfilled. Note 2: SRS_RP, Es/Iot and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves. Note 3: Equivalent power received by an antenna with 0 dBi gain at the centre of the quiet zone Note 4: Calculation of Es/Iot_{BB} includes the effect of UE internal noise up to the value assumed for the associated Refsens requirement in clause 7.3.2 of TS 36.101-2 [19], and an allowance of 2dB for UE multi-band relaxation factor $\sum MB_P$ from TS 38.101-2 [19] Table 6.2.1.3-4.			

Note 5:	Information about types of UE beam is given in B.2.1.3, and does not limit UE implementation or test system implementation.

Table 5.7.5.2.5-3: CLI-RSSI measurement resource configuration for FR2 CLI-RSSI accuracy

	Field	SRSConf.1
CLI-RSSI measurement resource	rssi-ResourceId	0
	rssi-SCS	120kHz
	startPRB	0
	nrofPRBs	66
	startPosition	3
	nrofSymbols	11
	rssi-PeriodicityAndOffset	sl160, 25

Table 5.7.5.2.5-4: CLI-RSSI absolute accuracy test requirement

	Test requirement Notes1,2,3
	Io -δ +G_{min} ≤ Reported CLI-RSSI(dBm) ≤Io +δ +G_{max}
Note 1:	Io is the equivalent power received by an antenna with 0dBi gain at the centre of the quiet zone configured in the test for 1.08MHz
Note 2:	δ is the RSRP absolute accuracy requirement from Table 10.1.22.1.1-2, selected according to the Io used in the test
Note 3:	G_{min} and G_{max} are the minimum and maximum UE gain values from Table B.2.1.5.1-1, selected according to the UE power class

The CLI-RSSI measurement accuracy shall fulfil the absolute accuracy requirements in clauses 10.1.22.2.1. The following requirements are to be verified:

During T1:

The UE is deemed to meet the requirement if the reported CLI-RSSI is in the range shown in table 5.7.5.2.5-4.

During T2:

The UE is deemed to meet the requirement if the reported CLI-RSSI is in the range shown in table 5.7.5.2.5-4.

5.7.6 L1-SINR measurement for beam reporting

5.7.6.0 Minimum conformance requirements

5.7.6.0.1 L1-SINR accuracy requirements with CSI-RS based CMR and no dedicated IMR configured

5.7.6.0.1.1 Absolute Accuracy

Unless otherwise specified, the requirements for absolute accuracy of CSI-RS based L1-SINR in this clause apply to all CSI-RS resources configured as CMR and no dedicated resource configured as IMR of the serving cell configured for L1-SINR measurement.

The accuracy requirements in Table 5.7.6.0.1.1-1 are valid under the following conditions:

- Conditions defined in clause 7.3 of TS 38.101-2 [3] for reference sensitivity are fulfilled.
- Conditions for L1-SINR measurements are fulfilled according to Annex B.2.8.1 for a corresponding Band for each relevant CSI-RS based CMR.
- The bandwidth of CSI-RS as CMR is 48 PRBs and the density is 3.
- The measured signals are in the directions covered by the percentile EIS spherical coverage of the UE, defined in clause 7.3.4 of TS 38.101-2 [3].

- AWGN radio propagation conditions.

The performance with larger bandwidth of CSI-RS as CMR is equal to or better than the accuracy requirements in Table 5.7.6.0.1.1-1.

Table 5.7.6.0.1.1-1: L1-SINR absolute accuracy for CSI-RS based CMR only in FR2

Accuracy		Conditions			
Normal condition	Extreme condition	CSI-RS CMR Ês/Iot Note 3	Io Note 1 range		
			Minimum Io		Maximum Io
dB	dB	dB	dBm / SCS_{CSI-RS} Note 2	dBm/$BW_{Channel}$	dBm/$BW_{Channel}$
			SCS_{CSI-RS} = 60kHz	SCS_{CSI-RS} = 120kHz	
±5.5	±6.5	≥-3	Same value as CSI-RS_RP in Table in B.2.8.1, according to UE Power class, operating band and angle of arrival	N/A	-50
NOTE 1: Io specified at the Reference point, and assumed to have constant EPRE across the bandwidth. NOTE 2: Values based on Refsens and EIS spherical coverage as defined in clauses 7.3.2 and 7.3.4 of TS 38.101-2 [3]. Applicable side condition selected depending on angle of arrival. NOTE 3: In the test cases, the CSI-RS CMR Ês/Iot and related parameters may need to be adjusted to ensure Ês/Iot at UE baseband is above the value defined in this table.					

5.7.6.0.1.2 Relative Accuracy

The relative accuracy of CSI-RS based L1-SINR is defined as the L1-SINR measured from one CSI-RS compared to the largest measured value of L1-SINR among all CSI-RS resources of the serving cell.

The accuracy requirements in Table 5.7.6.0.1.2-1 are valid under the following conditions:

- Conditions defined in clause 7.3 of TS 38.101-2 [3] for reference sensitivity are fulfilled.
- Conditions for L1-SINR measurements are fulfilled according to Annex B.2.8.1 for a corresponding Band for each relevant CSI-RS based CMR.
- The bandwidth of CSI-RS as CMR is 48 PRBs and the density is 3.
- The measured signals are in the directions covered by the percentile EIS spherical coverage of the UE, defined in clause 7.3.4 of TS 38.101-2 [3].
- AWGN radio propagation conditions.

The performance with larger bandwidth of CSI-RS as CMR is equal to or better than the accuracy requirements in Table 5.7.6.0.1.2-1.

Table 5.7.6.0.2.1-1: L1-SINR relative accuracy for CSI-RS based CMR only in FR2

Accuracy		Conditions			
Normal condition	Extreme condition	CSI-RS CMR Ês/Iot Note 2, Note 4	Io Note 1 range		
			Minimum Io		Maximum Io
dB	dB	dB	dBm / SCS_{CSI-RS} Note 3	dBm/$BW_{Channel}$	dBm/$BW_{Channel}$
			SCS_{CSI-RS} = 60kHz	SCS_{CSI-RS} = 120kHz	
±[4.5]	±[5.5]	≥-3	Same value as CSI-RS_RP in Table in B.2.8.1, according to UE Power class, operating band and angle of arrival	N/A	-50
NOTE 1: Io specified at the Reference point, and assumed to have constant EPRE across the bandwidth. NOTE 2: The parameter CSI-RS CMR Ês/Iot is the minimum CSI-RS CMR Ês/Iot of the pair of CSI-RS resources to which the requirement applies.					

NOTE 3: Values based on Refsens and EIS spherical coverage as defined in clauses 7.3.2 and 7.3.4 of TS 38.101-2 [3]. Applicable side condition selected depending on angle of arrival.
NOTE 4: In the test cases, the CSI-RS CMR Ês/Iot and related parameters may need to be adjusted to ensure Ês/Iot at UE baseband is above the value defined in this table.

5.7.6.0.2 L1-SINR accuracy requirements with SSB based CMR and dedicated IMR configured

5.7.6.0.2.1 Absolute Accuracy

Unless otherwise specified, the requirements for absolute accuracy of SSB based L1-SINR in this clause apply to all SSBs configured as CMR and dedicated resources configured as IMR of the serving cell configured for L1-SINR measurement.

The accuracy requirements are defined in Table 5.7.6.0.2.1-1 for SSB based CMR and NZP-IMR and in Table 5.7.6.0.2.1-2 for SSB based CMR and ZP-IMR.

The accuracy requirements in Tables 5.7.6.0.2.1-1 and 5.7.6.0.2.1-2 are valid under the following conditions:

- Conditions defined in clause 7.3 of TS 38.101-2 [3] for reference sensitivity are fulfilled.
- Conditions for L1-SINR measurements are fulfilled according to Annex B.2.8.2 for a corresponding Band for each relevant SSB based CMR and IMR.
- The bandwidth of NZP-IMR and ZP-IMR is 48 PRBs and the density is 3.
- The measured signals are in the directions covered by the percentile EIS spherical coverage of the UE, defined in clause 7.3.4 of TS 38.101-2 [3].
- AWGN radio propagation conditions.
- SSB based CMR and IMR in the test come from the same direction.

The performance with larger bandwidth of NZP-IMR and ZP-IMR is equal to or better than the accuracy requirements in Tables 5.7.6.0.2.1-1 and 5.7.6.0.2.1-2.

Table 5.7.6.0.2.1-1: L1-SINR absolute accuracy for SSB based CMR and NZP-IMR in FR2

Accuracy		Conditions				
Normal condition	Extreme condition	SSB CMR Ês/Iot Note 3	NZP-IMR Ês/Iot Note 3	Io Note 1 range		
				Minimum Io		Maximum Io
dB	dB	dB	dB	dBm / SCS_{SSB} Note 2	dBm/$BW_{Channel}$	dBm/$BW_{Channel}$
				SCS_{SSB} = 120kHz	SCS_{SSB} = 240kHz	
±4.0	±5.0	≥0	≥0	Same value as SSB_RP in Table in B.2.8.2, according to UE Power class, operating band and angle of arrival	N/A	-50

NOTE 1: Io specified at the Reference point, and assumed to have constant EPRE across the bandwidth.
NOTE 2: Values based on Refsens and EIS spherical coverage as defined in clauses 7.3.2 and 7.3.4 of TS 38.101-2 [3]. Applicable side condition selected depending on angle of arrival.
NOTE 3: In the test cases, the SSB Ês/Iot, NZP-IMR Ês/Iot and related parameters may need to be adjusted to ensure Ês/Iot at UE baseband is above the value defined in this table.

Table 5.7.6.0.2.1-2: L1-SINR absolute accuracy for SSB based CMR and ZP-IMR in FR2

Accuracy	Conditions

Normal condition	Extreme condition	SSB CMR Ês/Iot Note 3	Io Note 1 range			
			Minimum Io			Maximum Io
dB	dB	dB	dBm / SCS_{SSB} Note 2		dBm/$BW_{Channel}$	dBm/$BW_{Channel}$
			SCS_{SSB} = 120kHz	SCS_{SSB} = 240kHz		
±4.5	±5.5	≥-3	Same value as SSB_RP in Table in B.2.8.2, according to UE Power class, operating band and angle of arrival		N/A	-50
NOTE 1: Io specified at the Reference point, and assumed to have constant EPRE across the bandwidth. NOTE 2: Values based on Refsens and EIS spherical coverage as defined in clauses 7.3.2 and 7.3.4 of TS 38.101-2 [3]. Applicable side condition selected depending on angle of arrival. NOTE 3: In the test cases, the SSB CMR Ês/Iot and related parameters may need to be adjusted to ensure Ês/Iot at UE baseband is above the value defined in this table.						

5.7.6.0.2.2 Relative Accuracy

The relative accuracy of SSB based L1-SINR is defined as the L1-SINR measured from one SSB configured as CMR and one IMR configured as IMR compared to the largest measured value of L1-SINR among all SSB based CMRs and IMRs of the serving cell.

The accuracy requirements are defined in Table 5.7.6.0.2.2-1 for SSB based CMR and NZP-IMR and in Table 5.7.6.0.2.2-2 for SSB based CMR and ZP-IMR.

The accuracy requirements in Tables 5.7.6.0.2.2-1 and 5.7.6.0.2.2-2 are valid under the following conditions:

- Conditions defined in clause 7.3 of TS 38.101-2 [3] for reference sensitivity are fulfilled.
- Conditions for L1-SINR measurements are fulfilled according to Annex B.2.8.2 for a corresponding Band for each relevant SSB based CMR and IMR.
- The bandwidth of NZP-IMR and ZP-IMR is 48 PRBs and the density is 3.
- The measured signals are in the directions covered by the percentile EIS spherical coverage of the UE, defined in clause 7.3.4 of TS 38.101-2 [3].
- AWGN radio propagation conditions.
- SSB based CMR and IMR in the test come from the same direction.

The performance with larger bandwidth of NZP-IMR and ZP-IMR is equal to or better than the accuracy requirements in Tables 5.7.6.0.2.2-1 and 5.7.6.0.2.2-2.

Table 5.7.6.0.2.2-1: L1-SINR relative accuracy for SSB based CMR and NZP-IMR in FR2

Accuracy		Conditions				
Normal condition	Extreme condition	SSB CMR Ês/Iot Note 2, Note 4	NZP-IMR Ês/Iot Note 4	Io Note 1 range		
				Minimum Io		Maximum Io
dB	dB	dB	dB	dBm / SCS_{SSB} Note 3	dBm/$BW_{Channel}$	dBm/$BW_{Channel}$
				SCS_{SSB} = 120kHz / SCS_{SSB} = 240kHz		
±[3.0]	±[4.0]	≥0	≥0	Same value as SSB_RP in Table in B.2.8.2, according to UE Power class, operating band and angle of arrival	N/A	-50
NOTE 1: Io specified at the Reference point, and assumed to have constant EPRE across the bandwidth.						

NOTE 2: The parameter SSB CMR Ês/Iot is the minimum SSB CMR Ês/Iot of the pair of SSBs to which the requirement applies.
NOTE 3: Values based on Refsens and EIS spherical coverage as defined in clauses 7.3.2 and 7.3.4 of TS 38.101-2 [3]. Applicable side condition selected depending on angle of arrival.
NOTE 4: In the test cases, the SSB CMR Ês/Iot, NZP-IMR Ês/Iot and related parameters may need to be adjusted to ensure Ês/Iot at UE baseband is above the value defined in this table.

Table 5.7.6.0.2.2-2: L1-SINR relative accuracy for SSB based CMR and ZP-IMR in FR2

Accuracy		Conditions			
Normal condition	Extreme condition	SSB CMR Ês/Iot Note 2, Note 4	Io Note 1 range		
			Minimum Io		Maximum Io
dB	dB	dB	dBm / SCS_{SSB} Note 3		$dBm/BW_{Channel}$	$dBm/BW_{Channel}$
			SCS_{SSB} = 120kHz	SCS_{SSB} = 240kHz		
±[3.5]	±[4.5]	≥-3	Same value as SSB_RP in Table in B.2.8.2, according to UE Power class, operating band and angle of arrival		N/A	-50

NOTE 1: Io specified at the Reference point, and assumed to have constant EPRE across the bandwidth.
NOTE 2: The parameter SSB CMR Ês/Iot is the minimum SSB CMR Ês/Iot of the pair of SSBs to which the requirement applies.
NOTE 3: Values based on Refsens and EIS spherical coverage as defined in clauses 7.3.2 and 7.3.4 of TS 38.101-2 [3]. Applicable side condition selected depending on angle of arrival.
NOTE 4: In the test cases, the SSB CMR Ês/Iot and related parameters may need to be adjusted to ensure Ês/Iot at UE baseband is above the value defined in this table.

5.7.6.0.3 L1-SINR accuracy requirements with CSI-RS based CMR and dedicated IMR configured

5.7.6.0.3.1 Absolute Accuracy

Unless otherwise specified, the requirements for absolute accuracy of CSI-RS based L1-SINR in this clause apply to all CSI-RS resources as CMR and dedicated resources configured as IMR of the serving cell configured for L1-SINR measurement.

The accuracy requirements are defined in Table 5.7.6.0.3.1-1 for CSI-RS based CMR and NZP-IMR and in Table 5.7.6.0.3.1-2 for CSI-RS based CMR and ZP-IMR.

The accuracy requirements in Tables 5.7.6.0.3.1-1 and 5.7.6.0.3.1-2 are valid under the following conditions:

- Conditions defined in clause 7.3 of TS 38.101-2 [3] for reference sensitivity are fulfilled.
- Conditions for L1-SINR measurements are fulfilled according to Annex B.2.8.3 for a corresponding Band for each relevant CSI-RS based CMR and IMR.
- The bandwidth of CSI-RS as CMR, NZP-IMR and ZP-IMR is 48 PRBs and the density is 3.
- The measured signals are in the directions covered by the percentile EIS spherical coverage of the UE, defined in clause 7.3.4 of TS 38.101-2 [3].
- AWGN radio propagation conditions.
- CSI-RS based CMR and IMR in the test come from the same direction.

The performance with larger bandwidth of CSI-RS as CMR, NZP-IMR and ZP-IMR is equal to or better than the accuracy requirements in Tables 5.7.6.0.3.1-1 and 5.7.6.0.3.1-2.

Table 5.7.6.0.3.1-1: L1-SINR absolute accuracy for CSI-RS based CMR and NZP-IMR in FR2

Accuracy	Conditions

Normal condition	Extreme condition	CSI-RS CMR Ês/Iot Note 3	NZP-IMR Ês/Iot Note 3	Io Note 1 range		
				Minimum Io		Maximum Io
dB	dB	dB	dB	dBm / SCS_{CSI-RS} Note 2	dBm/$BW_{Channel}$	dBm/$BW_{Channel}$
				SCS_{CSI-RS} = 60kHz	SCS_{CSI-RS} = 120kHz	
±4.0	±5.0	≥0	≥0	Same value as CSI-RS_RP in Table in B.2.8.3, according to UE Power class, operating band and angle of arrival	N/A	-50
NOTE 1: Io specified at the Reference point, and assumed to have constant EPRE across the bandwidth. NOTE 2: Values based on Refsens and EIS spherical coverage as defined in clauses 7.3.2 and 7.3.4 of TS 38.101-2 [3]. Applicable side condition selected depending on angle of arrival. NOTE 3: In the test cases, the CSI-RS Ês/Iot, NZP-IMR Ês/Iot and related parameters may need to be adjusted to ensure Ês/Iot at UE baseband is above the value defined in this table.						

Table 5.7.6.0.3.1-2: L1-SINR absolute accuracy for CSI-RS based CMR and ZP-IMR in FR2

Accuracy		Conditions			
Normal condition	Extreme condition	CSI-RS CMR Ês/Iot Note 3	Io Note 1 range		
			Minimum Io		Maximum Io
dB	dB	dB	dBm / SCS_{CSI-RS} Note 2	dBm/$BW_{Channel}$	dBm/$BW_{Channel}$
			SCS_{CSI-RS} = 60kHz	SCS_{CSI-RS} = 120kHz	
±4.5	±5.5	≥-3	Same value as CSI-RS_RP in Table in B.2.8.3, according to UE Power class, operating band and angle of arrival	N/A	-50
NOTE 1: Io specified at the Reference point, and assumed to have constant EPRE across the bandwidth. NOTE 2: Values based on Refsens and EIS spherical coverage as defined in clauses 7.3.2 and 7.3.4 of TS 38.101-2 [3]. Applicable side condition selected depending on angle of arrival. NOTE 3: In the test cases, the CSI-RS Ês/Iot and related parameters may need to be adjusted to ensure Ês/Iot at UE baseband is above the value defined in this table.					

5.7.6.0.3.2 Relative Accuracy

The relative accuracy of CSI-RS based L1-SINR is defined as the L1-SINR measured from one CSI-RS configured as CMR and one IMR configured as IMR compared to the largest measured value of L1-SINR among all CSI-RS based CMRs and IMRs of the serving cell.

The accuracy requirements are defined in Table 5.7.6.0.3.2-1 for CSI-RS based CMR and NZP-IMR and in Table 5.7.6.0.3.2-2 for CSI-RS based CMR and ZP-IMR.

The accuracy requirements in Tables 5.7.6.0.3.2-1 and 5.7.6.0.3.2-2 are valid under the following conditions:

- Conditions defined in clause 7.3 of TS 38.101-2 [3] for reference sensitivity are fulfilled.
- Conditions for L1-SINR measurements are fulfilled according to Annex B.2.8.3 for a corresponding Band for each relevant CSI-RS based CMR and IMR.
- The bandwidth of CSI-RS as CMR, NZP-IMR and ZP-IMR is 48 PRBs and the density is 3.
- The measured signals are in the directions covered by the percentile EIS spherical coverage of the UE, defined in clause 7.3.4 of TS 38.101-2 [3].
- AWGN radio propagation conditions.

- CSI-RS based CMR and IMR in the test come from the same direction.

The performance with larger bandwidth of CSI-RS as CMR, NZP-IMR and ZP-IMR is equal to or better than the accuracy requirements in Tables 5.7.6.0.3.2-1 and 5.7.6.0.3.2-2.

Table 5.7.6.0.3.2-1: L1-SINR relative accuracy for CSI-RS based CMR and NZP-IMR in FR2

Accuracy		Conditions				
Normal condition	Extreme condition	CSI-RS CMR Ês/Iot Note 2, Note 4	NZP-IMR Ês/Iot Note 4	Io Note 1 range		
				Minimum Io		Maximum Io
dB	dB	dB	dB	dBm / SCS_{CSI-RS} Note 3	dBm/$BW_{Channel}$	dBm/$BW_{Channel}$
				SCS_{CSI-RS} = 60kHz	SCS_{CSI-RS} = 120kHz	
±[3.0]	±[4.0]	≥0	≥0	Same value as CSI-RS_RP in Table in B.2.8.3, according to UE Power class, operating band and angle of arrival	N/A	-50

NOTE 1: Io specified at the Reference point, and assumed to have constant EPRE across the bandwidth.
NOTE 2: The parameter CSI-RS CMR Ês/Iot is the minimum CSI-RS CMR Ês/Iot of the pair of CSI-RS resources to which the requirement applies.
NOTE 3: Values based on Refsens and EIS spherical coverage as defined in clauses 7.3.2 and 7.3.4 of TS 38.101-2 [3]. Applicable side condition selected depending on angle of arrival.
NOTE 4: In the test cases, the CSI-RS CMR Ês/Iot, NZP-IMR Ês/Iot and related parameters may need to be adjusted to ensure Ês/Iot at UE baseband is above the value defined in this table.

Table 5.7.6.0.3.2-2: L1-SINR relative accuracy for CSI-RS based CMR and ZP-IMR in FR2

Accuracy		Conditions			
Normal condition	Extreme condition	CSI-RS CMR Ês/Iot Note 2, Note 4	Io Note 1 range		
			Minimum Io		Maximum Io
dB	dB	dB	dBm / SCS_{CSI-RS} Note 3	dBm/$BW_{Channel}$	dBm/$BW_{Channel}$
			SCS_{CSI-RS} = 60kHz	SCS_{CSI-RS} = 120kHz	
±[3.5]	±[4.5]	≥-3	Same value as CSI-RS_RP in Table in B.2.8.3, according to UE Power class, operating band and angle of arrival	N/A	-50

NOTE 1: Io specified at the Reference point, and assumed to have constant EPRE across the bandwidth.
NOTE 2: The parameter CSI-RS CMR Ês/Iot is the minimum CSI-RS CMR Ês/Iot of the pair of CSI-RS resources to which the requirement applies.
NOTE 3: Values based on Refsens and EIS spherical coverage as defined in clauses 7.3.2 and 7.3.4 of TS 38.101-2 [3]. Applicable side condition selected depending on angle of arrival.
NOTE 4: In the test cases, the CSI-RS CMR Ês/Iot and related parameters may need to be adjusted to ensure Ês/Iot at UE baseband is above the value defined in this table.

5.7.6.1 EN-DC FR2 CSI-RS based CMR and no dedicated IMR configured and CSI-RS resource set with repetition off L1-SINR measurement accuracy

Editor's Note: This test case has been completed for the following configurations:

- Test frequency f ≤ 40.8 GHz

- UE PC3

- Normal conditions

- The test is incomplete for UE power classes other than PC3

- The test is incomplete for test frequencies > 40.8 GHz

5.7.6.1.1 Test purpose

The purpose of this test is to verify that the L1-SINR measurement accuracy is within the specified limits.

5.7.6.1.2 Test applicability

This test applies to all types of NR UE supporting E-UTRA and EN-DC from Release 16 onwards, and supporting L1-SINR measurement.

5.7.6.1.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 5.7.6.0.1.

The normative reference for this requirement is TS 38.133 [6] clause A.5.7.6.1.

5.7.6.1.4 Test description

5.7.6.1.4.1 Initial conditions

This test shall be tested using any of the test configurations in Table 5.7.6.1.4.1-1.

Table 5.7.6.1.4.1-1: Supported test configurations

Config	Description
1	LTE FDD, NR 120 kHz CSI-RS SCS, 100 MHz bandwidth, TDD duplex mode
2	LTE TDD, NR 120 kHz CSI-RS SCS, 100 MHz bandwidth, TDD duplex mode
Note: The UE is only required to be tested in one of the supported test configurations in each supported band	

Configure the test equipment and the DUT according to the parameters in Table 5.7.6.1.4.1-2.

Table 5.7.6.1.4.1-2: Initial conditions

Parameter	Value	Comment
Test environment	NC	As specified in TS 36.508 [25] clause 4.1.
Test frequencies	As specified in Annex E, E.1.1, E.1.3.1 and Table E.3-1 and TS 38.508-1 [14] clause 4.3.1.	
Channel bandwidth	As specified by the selected test configuration.	
Propagation conditions	AWGN	As specified in Annex C.2.1
Connection Diagram	TE Part: A.3.3.1.1 DUT Part: A.3.4.1.1	As specified in TS 38.508-1 [14] Annex A.
Exceptions to connection diagram	N/A	

1. Message contents are defined in clause 5.7.6.1.4.3.

2. Cell 1 is the E-UTRA serving cell (PCell) for the EN-DC setup. The power levels and settings for Cell 1 are set according to Annex A.6. Cell 2 is the NR FR2 cell. Cell 2 is the PSCell and the target for CSI-RS-based L1-SINR measurements. The UE is configured to perform RLM, BFD and L1-SINR measurement based on the SSBs. The connection setup is done according to the settings in Annex C.1.1.

3. The UE Rx beam peak direction has been obtained previously using one of the Rx Beam Peak Search procedures as described in Annex I.

5.7.6.1.4.2 Test procedure

Prior to the start of testing, the UE shall be fully synchronized to PSCell. The UE shall be configured for periodic CSI reporting in PUCCH format 2 with a reporting periodicity as mentioned in Table 5.7.6.1.5-1.

1. Ensure the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity EN-DC, DC bearer MCG and SCG, Connected without release *On* and Test Mode *On*, according to TS 38.508-1 [14] clause 4.5 and general test parameters set according to Table 5.7.6.1.5-1.

2. Set the parameters according to Table 5.7.6.1.5-1.

3. After 640 ms from step 2, the UE shall start sending L1-SINR report including results of both CSI-RS#0 and CSI-RS#1.

4. The SS shall check the L1-SINR reported values of CSI-RS0 and CSI-RS1 in the periodic L1-SINR reports for the following requirements:

   - R1: The L1-SINR value of CSI-RS0 reported by the UE is compared to the expected L1-SINR value for CSI-RS0. If the value is outside the limits in Table 5.7.6.1.5-3 or the UE fails to report the measurement value for CSI-RS0, the number of failed iterations for R1 is increased by one. Otherwise, the number of passed iterations for R1 is increased by one.

   - R2: The DIFF SINR value of CSI-RS1 reported by the UE is compared to the expected DIFF SINR value. If the resulting value is outside the limits in Table 5.7.6.1.5-4 or the UE fails to report the measurement value for CSI-RS1, the number of failed iterations for R2 is increased by one. Otherwise, the number of passed iterations for R2 is increased by one.

5. The SS shall continue checking the L1-SINR report messages transmitted by the UE until the confidence level according to Table G.2.3-1 in Annex G is achieved.

5.7.6.1.4.3 Message contents

Message contents are according to TS 38.508-1 [14] clause 7.3 with the following exceptions:

Table 5.7.6.1.4.3-1: Common Exception messages

Default Message Contents	
Common contents of system information blocks exceptions	
Default RRC messages and information elements contents exceptions	Table H.3.6A-1 with conditions PERIODIC and CSI-SINR Table H.3.6A-2 with conditions CSI-RS and PERIODIC Table H.3.4-1 Table 7.3.1-3 in TS 38.508-1 [14] with condition SMTC.1

Table 5.7.6.1.4.3-2: RadioLinkMonitoringConfig

Derivation Path: TS 38.508-1 [14], Table 4.6.3-133			
Information Element	**Value/remark**	**Comment**	**Condition**
RadioLinkMonitoringConfig ::= SEQUENCE {			
failureDetectionResourcesToAddModList SEQUENCE (SIZE(1..maxNrofFailureDetectionResources)) OF SEQUENCE {	1 entry		
purpose	both	UE is configured to perform RLM and BFD based on the SSBs.	
detectionResource CHOICE {			
csi-RS-Index	0		
}			
}			

}			

5.7.6.1.5 Test requirement

Table 5.7.6.1.5-2 defines the OTA primary level settings including test tolerances for all tests.

Each L1-SINR measurement report for each of the tests in Table 5.7.6.1.5-1 shall meet the corresponding absolute accuracy requirements in Table 5.7.6.1.5-3 for all test configurations, and the corresponding relative accuracy requirements in Table 5.7.6.1.5-4 for all test configurations.

Table 5.7.6.1.5-1: FR2 CSI-RS based L1-SINR general test parameters

Parameter	Config	Unit	Test 1
SSB GSCN	1~2		freq1
Duplex mode	1~2		TDD
TDD Configuration	1~2		TDDConf.3.1
$BW_{channel}$	1~2	MHz	100: $N_{RB,c}$ = 66
PDSCH Reference measurement channel	1~2		SR.3.1 TDD
RMSI CORESET Reference Channel	1~2		CR.3.1 TDD
Dedicated CORESET Reference Channel	1~2		CCR.3.1 TDD
SSB configuration	1~2		SSB.1 FR2
OCNG Patterns	1~2		OP.1
Initial BWP Configuration	1~2		DLBWP.0.1 ULBWP.0.1
Dedicated BWP configuration	1~2		DLBWP.1.1 ULBWP.1.1
TRS Configuration	1~2		TRS.2.1 TDD
PDCCH/PDSCH TCI Configuration	1~2		TCI.State.2
SMTC configuration	1~2		SMTC.1
CSI-RS	1~2		CSI-RS.3.2 TDD
reportConfigType	1~2		periodic
reportQuantity-r16	1~2		cri-SINR-r16
nrofReportedRS	1~2		2
L1-RSRP reporting period	1~2		slot640
Propagation condition	1~2		AWGN
Antenna configuration	1~2		1x2
EPRE ratio of PSS to SSS	1~2	dB	0
EPRE ratio of PBCH DMRS to SSS			
EPRE ratio of PBCH to PBCH DMRS			
EPRE ratio of PDCCH DMRS to SSS			
EPRE ratio of PDCCH to PDCCH DMRS			
EPRE ratio of PDSCH DMRS to SSS			
EPRE ratio of PDSCH to PDSCH DMRS			
EPRE ratio of OCNG DMRS to SSS Note 1			
EPRE ratio of OCNG to OCNG DMRS Note 1			
Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.			

Note 2:	Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for N_{oc} to be fulfilled.

Table 5.7.6.1.5-2: FR2 CSI-RS based L1-SINR OTA related test parameters

Parameter	Config	Unit	Test 1	
			CSI-RS0	CSI-RS1
Angle of arrival configuration			Setup 1 according to A.9	
Assumption for UE beams[Note 4]			Rough	
N_{oc}	1~2	dBm/15 kHz	-104.1	
N_{oc}	1~2	dBm/SSB SCS	-95.1	
$\hat{E}_s / I_{ot}$	1~2	dB	10	-1.8
CSI-RS-RSRP[Note1]	1~2	dBm/SCS	-85.07	-96.87
Io[Note1]	1~2	dBm/ 95.04MHz	-55.67	-63.88
$\hat{E}_s / N_{oc}$	1~2	dB	10	-1.8
Note 1: RSRP and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves. Note 2: RSRP minimum requirements are specified assuming independent interference and noise at each receiver antenna port. Note 3: Void. Note 4: Information about types of UE beam is given in B.2.1.3, and does not limit UE implementation or test system implementation				

Table 5.7.6.1.5-3: L1-SINR absolute accuracy requirements for the reported values for the absolute accuracy rules R1

UE power class 3	
Normal Conditions	**Test 1 All bands**
Lowest reported value (CSI-RS0)	53
Highest reported value (CSI-RS0)	76
Extreme Conditions	**Test 1 All bands**
Lowest reported value (CSI-RS0)	51
Highest reported value (CSI-RS0)	78

Table 5.7.6.1.5-4: Evaluation limits for the reported values for T1 and T2 relative accuracy rules R2

UE power class 3	
Normal Conditions	**Test 1 All bands**

Lowest DIFF L1-SINR reported value	6
Highest DIFF L1-SINR reported value	15
Extreme Conditions	**Test 1 All bands**
Lowest DIFF L1-SINR reported value	5
Highest DIFF L1-SINR reported value	15

For the test to pass, the ratio of successful reported values for each requirement (R1 and R2) shall be more than 90% with a confidence level of 95%. Each requirement is evaluated independently of the others.

5.7.6.2 EN-DC FR2 SSB based CMR and dedicated IMR L1-SINR absolute measurement accuracy

Editor's Note: This test case has been completed for the following configurations:

- Test frequency f ≤ 40.8 GHz
- UE PC3
- Normal conditions
- The test is incomplete for UE power classes other than PC3
- The test is incomplete for test frequencies > 40.8 GHz

5.7.6.2.1 Test purpose

The purpose of this test is to verify that the L1-SINR measurement accuracy is within the specified limits.

5.7.6.2.2 Test applicability

This test applies to all types of NR UE supporting E-UTRA and EN-DC from Release 16 onwards, and supporting L1-SINR measurement.

5.7.6.2.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 5.7.6.0.2.

The normative reference for this requirement is TS 38.133 [6] clause A.5.7.6.2.

5.7.6.2.4 Test description

5.7.6.2.4.1 Initial conditions

This test shall be tested using any of the test configurations in Table 5.7.6.2.4.1-1. Test environment parameters are given in Table 5.7.6.2.4.1-3.

Table 5.7.6.2.4.1-1: Supported test configurations

Config	Description
1	LTE FDD, NR 120 kHz SSB SCS, 100 MHz bandwidth, TDD duplex mode
2	LTE TDD, NR 120 kHz SSB SCS, 100 MHz bandwidth, TDD duplex mode
3	LTE FDD, NR 240 kHz SSB SCS, 100 MHz bandwidth, TDD duplex mode
4	LTE TDD, NR 240 kHz SSB SCS, 100 MHz bandwidth, TDD duplex mode
Note: The UE is only required to be tested in one of the supported test configurations in each supported band	

Configure the test equipment and the DUT according to the parameters in Table 5.7.6.2.4.1-2.

Table 5.7.6.2.4.1-2: Initial conditions

Parameter	Value	Comment
Test environment	NC	As specified in TS 36.508 [25] clause 4.1.
Test frequencies	As specified in Annex E, E.1.1, E.1.3.1 and Table E.3-1 and TS 38.508-1 [14] clause 4.3.1.	
Channel bandwidth	As specified by the selected test configuration.	
Propagation conditions	AWGN	As specified in Annex C.2.1
Connection Diagram	TE Part: A.3.3.1.1 DUT Part: A.3.4.1.1	As specified in TS 38.508-1 [14] Annex A.
Exceptions to connection diagram	N/A	

1. Message contents are defined in clause 5.7.6.2.4.3.

2. Cell 1 is the E-UTRA serving cell (PCell) for the EN-DC setup. The power levels and settings for Cell 1 are set according to Annex A.6. Cell 2 is the NR FR2 cell. Cell 2 is the PSCell and the target for SSB-based L1-SINR measurements. The UE is configured to perform RLM, BFD and L1-SINR measurement based on the SSBs. The connection setup is done according to the settings in Annex C.1.1.

3. The UE Rx beam peak direction has been obtained previously using one of the Rx Beam Peak Search procedures as described in Annex I.

5.7.6.2.4.2 Test procedure

Prior to the start of testing, the UE shall be fully synchronized to PSCell. The UE shall be configured for periodic CSI reporting in PUCCH [format 2] with a reporting periodicity as mentioned in Table 5.7.6.2.5-1.

1. Ensure the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity EN-DC, DC bearer MCG and SCG, Connected without release *On* and Test Mode *On*, according to TS 38.508-1 [14] clause 4.5 and general test parameters set according to Table 5.7.6.2.5-1.

2. Set the parameters according to Table 5.7.6.2.5-1.

3. After 640 ms from step 2, the UE shall start sending L1-SINR report including results of both SSB#0+CSI-RS#0 and SSB#1+CSI-RS#1.

4. The SS shall check the L1-SINR reported values of SSB#0 and SSB#1 in the periodic L1-SINR reports for the following requirements:

- R1: The L1-SINR value of SSB#0+CSI-RS#0 reported by the UE is compared to the expected L1-SINR value for SSB#0+CSI-RS#0. If the value is outside the limits in Table 5.7.6.2.5-4 or the UE fails to report the measurement value for SSB#0+CSI-RS#0, the number of failed iterations for R1 is increased by one. Otherwise, the number of passed iterations for R1 is increased by one.

- R2: The DIFF L1-SINR value of SSB#1+CSI-RS#1 reported by the UE is compared to the expected DIFF L1-SINR value. If the resulting value is outside the limits in Table 5.7.6.2.5-5 or the UE fails to report the measurement value for SSB#0+CSI-RS#0 or SSB#1+CSI-RS#1, the number of failed iterations for R2 is increased by one. Otherwise, the number of passed iterations for R2 is increased by one.

5. The SS shall continue checking the L1-SINR report messages transmitted by the UE until the confidence level according to Table G.2.3-1 in Annex G is achieved.

5.7.6.2.4.3 Message contents

Message contents are according to TS 38.508-1 [14] clause 7.3 with the following exceptions:

Table 5.7.6.2.4.3-1: Common Exception messages

Default Message Contents	
Common contents of system information blocks exceptions	
Default RRC messages and information elements contents exceptions	Table H.3.6A-1 with conditions PERIODIC and SS-SINR and CSI-RS_IMR Table H.3.6A-2 with conditions SSB and PERIODIC Table H.3.6A-3 with conditions PERIODIC Table H.3.4-1

Table 5.7.6.2.4.3-2: RadioLinkMonitoringConfig

Derivation Path: TS 38.508-1 [14], Table 4.6.3-133			
Information Element	**Value/remark**	**Comment**	**Condition**
RadioLinkMonitoringConfig ::= SEQUENCE {			
failureDetectionResourcesToAddModList SEQUENCE (SIZE(1..maxNrofFailureDetectionResources)) OF SEQUENCE {	1 entry		
purpose	both	UE is configured to perform RLM and BFD based on the SSBs.	
detectionResource CHOICE {			
ssb-Index	0		
}			
}			
}			

5.7.6.2.5 Test requirement

Table 5.7.6.2.5-2 defines the OTA primary level settings including test tolerances for all tests.

Table 5.7.6.2.5-1: FR2 L1-SINR measurement test parameters with SSB based CMR and CSI-IM based IMR

Parameter	Config	Unit	Test 1
SSB GSCN	1~4		freq1
Duplex mode	1~4		TDD
TDD Configuration	1~4		TDDConf.3.1
$BW_{channel}$	1~4	MHz	100: $N_{RB,c}$ = 66
PDSCH Reference measurement channel	1~4		SR.3.1 TDD
RMSI CORESET Reference Channel	1~4		CR.3.1 TDD
Dedicated CORESET Reference Channel	1~4		CCR.3.1 TDD
SSB configuration	1,2		SSB.1 FR2
	3,4		SSB.2 FR2
CSI-RS configuration	1~4		CSI-RS 3.1A TDD
OCNG Patterns	1~4		OP.1
Initial BWP Configuration	1~4		DLBWP.0.1 ULBWP.0.1
Dedicated BWP configuration	1~4		DLBWP.1.3 ULBWP.1.3
TRS Configuration	1~4		TRS.2.1 TDD
PDCCH/PDSCH TCI Configuration	1~4		TCI.State.2
SMTC configuration	1~4		SMTC.1
reportConfigType	1~4		periodic
reportQuantity-r16	1~4		ssb-Index-SINR-r16
Number of reported RS	1~4		2

L1-SINR reporting period	1~4		slot640
Propagation condition	1~4		AWGN
Antenna configuration	1~4		1x2
EPRE ratio of PSS to SSS	1~4	dB	0
EPRE ratio of PBCH DMRS to SSS			
EPRE ratio of PBCH to PBCH DMRS			
EPRE ratio of PDCCH DMRS to SSS			
EPRE ratio of PDCCH to PDCCH DMRS			
EPRE ratio of PDSCH DMRS to SSS			
EPRE ratio of PDSCH to PDSCH DMRS			
EPRE ratio of OCNG DMRS to SSS Note 1			
EPRE ratio of OCNG to OCNG DMRS Note 1			

Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.
Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for N_{oc} to be fulfilled.

Table 5.7.6.2.5-2: FR2 SSB specific test parameters

Parameter	Config	Unit	Test 1	
			SSB#0	SSB#1
Angle of arrival configuration			Setup 1 according to A.3.15.1	
Assumption for UE beams Note 4			Rough	
N_{oc}	1~4	dBm/15 kHz	-104.1	
N_{oc}	1,2	dBm/SSB SCS	-95.1	
	3,4		-92.1	
$\hat{E}_s / I_{ot}$	1~4	dB	10	1.2
SSB RSRP Note1	1,2	dBm/SCS	-85.07	-93.87
	3,4		-82.07	-90.87
Io Note1	1~4	dBm/ 95.04MHz	-55.67	-62.43
$\hat{E}_s / N_{oc}$	1~4	dB	10	1.2

Note 1: RSRP and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.
Note 2: RSRP minimum requirements are specified assuming independent interference and noise at each receiver antenna port.
Note 3: Information about types of UE beam is given in B.2.1.3, and does not limit UE implementation or test system implementation

Table 5.7.6.2.5-3: FR2 CSI-RS specific test parameters

Parameter	Config	Unit	Test 1	
			CSI-RS#0	CSI-RS#1
Angle of arrival configuration			Setup 1 according to A.3.15.1	
Assumption for UE beams Note 4			Rough	
N_{oc}	1~4	dBm/15kHz	-104.1	
N_{oc}	1~4	dBm/CSI-RS SCS	-95.1	
$\hat{E}_s / I_{ot}$	1~4	dB	10	1.2
CSI-RS RSRP Note1	1~4	dBm/SCS	-85.07	-93.87

Io[Note1]	1~4	dBm/ 95.04MHz	-55.67	-62.43
$\hat{E}_s / N_{oc}$	1~4	dB	10	1.2
Note 1: RSRP and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves. Note 2: RSRP minimum requirements are specified assuming independent interference and noise at each receiver antenna port. Note 3: Information about types of UE beam is given in B.2.1.3, and does not limit UE implementation or test system implementation				

Table 5.7.6.2.5-4: L1-SINR absolute accuracy requirements for the reported values for the absolute accuracy rules R1

UE power class 3	
Normal Conditions	**Test 1 All bands**
Lowest reported value (SSB#0+CSI-RS#0)	56
Highest reported value (SSB#0+CSI-RS#0)	73
Extreme Conditions	**Test 1 All bands**
Lowest reported value (SSB#0+CSI-RS#0)	54
Highest reported value (SSB#0+CSI-RS#0)	75

Table 5.7.6.2.5-5: Evaluation limits for the reported values for T1 and T2 relative accuracy rules R2

UE power class 3	
Normal Conditions	**Test 1 All bands**
Lowest DIFF L1-SINR reported value	5
Highest DIFF L1-SINR reported value	12
Extreme Conditions	**Test 1 All bands**
Lowest DIFF L1-SINR reported value	4
Highest DIFF L1-SINR reported value	13

For the test to pass, the ratio of successful reported values for each requirement (R1 and R2) shall be more than 90% with a confidence level of 95%. Each requirement is evaluated independently of the others.

5.7.6.3 EN-DC FR2 CSI-RS based CMR and dedicated IMR L1-SINR measurement accuracy

Editor's Note: This test case has been completed for the following configurations:

- Test frequency f ≤ 40.8 GHz
- UE PC3
- Normal conditions
- The test is incomplete for UE power classes other than PC3
- The test is incomplete for test frequencies > 40.8 GHz

5.7.6.3.1 Test purpose

The purpose of this test is to verify that the L1-SINR measurement accuracy is within the specified limits.

5.7.6.3.2 Test applicability

This test applies to all types of NR UE supporting E-UTRA and EN-DC from Release 16 onwards, and supporting L1-SINR measurement.

5.7.6.3.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 5.7.6.0.3.

The normative reference for this requirement is TS 38.133 [6] clause A.5.7.6.3.

5.7.6.3.4 Test description

5.7.6.3.4.1 Initial conditions

This test shall be tested using any of the test configurations in Table 5.7.6.3.4.1-1.

Table 5.7.6.3.4.1-1: Supported test configurations

Config	Description
1	LTE FDD, NR 120 kHz CSI-RS SCS, 100 MHz bandwidth, TDD duplex mode
2	LTE TDD, NR 120 kHz CSI-RS SCS, 100 MHz bandwidth, TDD duplex mode
Note: The UE is only required to be tested in one of the supported test configurations in each supported band	

Configure the test equipment and the DUT according to the parameters in Table 5.7.6.3.4.1-2.

Table 5.7.6.3.4.1-2: Initial conditions

Parameter	Value	Comment
Test environment	NC	As specified in TS 36.508 [25] clause 4.1.
Test frequencies	As specified in Annex E, E.1.1, E.1.3.1 and Table E.3-1 and TS 38.508-1 [14] clause 4.3.1.	
Channel bandwidth	As specified by the selected test configuration.	
Propagation conditions	AWGN	As specified in Annex C.2.1
Connection Diagram	TE Part: A.3.3.1.1 DUT Part: A.3.4.1.1	As specified in TS 38.508-1 [14] Annex A.
Exceptions to connection diagram	N/A	

1. Message contents are defined in clause 5.7.6.3.4.3.

2. Cell 1 is the E-UTRA serving cell (PCell) for the EN-DC setup. The power levels and settings for Cell 1 are set according to Annex A.6. Cell 2 is the NR FR2 cell. Cell 2 is the PSCell and the target for CSI-RS-based L1-SINR measurements. The UE is configured to perform RLM, BFD and L1-SINR measurement based on the SSBs. The connection setup is done according to the settings in Annex C.1.1.

3. The UE Rx beam peak direction has been obtained previously using one of the Rx Beam Peak Search procedures as described in Annex I.

5.7.6.3.4.2 Test procedure

Prior to the start of testing, the UE shall be fully synchronized to PSCell. The UE shall be configured for periodic CSI reporting in PUCCH format 2 with a reporting periodicity as mentioned in Table 5.7.6.3.5-1.

1. Ensure the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity EN-DC, DC bearer MCG and SCG, Connected without release *On* and Test Mode *On*, according to TS 38.508-1 [14] clause 4.5 and general test parameters set according to Table 5.7.6.3.5-1.

2. Set the parameters according to T1 in Table 5.7.6.3.5-1.

3. After 640 ms from step 2, the UE shall start sending L1-SINR report including results of both CSI-RS#0+CSI-IM#0 and CSI-RS#1+CSI-IM#1.

4. The SS shall check the L1-SINR reported values of CSI-RS#0+CSI-IM#0 and CSI-RS#1+CSI-IM#1 in the periodic L1-SINR reports for the following requirements:

   - R1: The L1-SINR value of CSI-RS#0+CSI-IM#0 reported by the UE is compared to the expected L1-SINR value for CSI-RS#0+CSI-IM#0. If the value is outside the limits in Table 5.7.6.3.5-3 or the UE fails to report the measurement value for CSI-RS#0+CSI-IM#0, the number of failed iterations for R1 is increased by one. Otherwise, the number of passed iterations for R1 is increased by one.

   - R2: The DIFF L1-SINR value of CSI-RS#1+CSI-IM#1 reported by the expected DIFF L1-SINR. If the resulting value is outside the limits in Table 5.7.6.3.5-4 or the UE fails to report the measurement value for CSI-RS#1+CSI-IM#1, the number of failed iterations for R2 is increased by one. Otherwise, the number of passed iterations for R2 is increased by one.

5. The SS shall continue checking the L1-SINR report messages transmitted by the UE until the confidence level according to Table G.2.3-1 in Annex G is achieved.

5.7.6.3.4.3 Message contents

Message contents are according to TS 38.508-1 [14] clause 7.3 with the following exceptions:

Table 5.7.6.3.4.3-1: Common Exception messages

Default Message Contents	
Common contents of system information blocks exceptions	
Default RRC messages and information elements contents exceptions	Table H.3.6A-1 with conditions PERIODIC and CSI-SINR Table H.3.6A-2 with conditions CSI-RS and PERIODIC Table H.3.6A-4 with conditions APERIODIC Table H.3.4-1 Table 7.3.1-3 in TS 38.508-1 [14] with condition SMTC.1

Table 5.7.6.3.4.3-2: RadioLinkMonitoringConfig

Derivation Path: TS 38.508-1 [14], Table 4.6.3-133			
Information Element	**Value/remark**	**Comment**	**Condition**
RadioLinkMonitoringConfig ::= SEQUENCE {			
failureDetectionResourcesToAddModList SEQUENCE (SIZE(1..maxNrofFailureDetectionResources)) OF SEQUENCE {	1 entry		

purpose	both	UE is configured to perform RLM and BFD based on the SSBs.	
detectionResource CHOICE {			
csi-RS-Index	0		
}			
}			
}			

5.7.6.3.5 Test requirement

Table 5.7.6.3.5-2 defines the OTA primary level settings including test tolerances for all tests.

Each L1-SINR measurement report for each of the tests in Table 5.7.6.3.5-1 shall meet the corresponding absolute accuracy requirements in Table 5.7.6.3.5-3 for all test configurations, and the corresponding relative accuracy requirements in Table 5.7.6.1.5-4 for all test configurations.

Table 5.7.6.3.5-1: FR2 L1-SINR measurement test with CSI-RS based CMR and CSI-IM based IMR

Parameter	Config	Unit	Test 1
SSB GSCN	1~2		freq1
Duplex mode	1~2		TDD
TDD Configuration	1~2		TDDConf.3.1
$BW_{channel}$	1~2	MHz	100: $N_{RB,c}$ = 66
PDSCH Reference measurement channel	1~2		SR.3.1 TDD
RMSI CORESET Reference Channel	1~2		CR.3.1 TDD
Dedicated CORESET Reference Channel	1~2		CCR.3.1 TDD
SSB configuration	1~2		SSB.1 FR2
OCNG Patterns	1~2		OP.1
Initial BWP Configuration	1~2		DLBWP.0.1 ULBWP.0.1
Dedicated BWP configuration	1~2		DLBWP.1.1 ULBWP.1.1
TRS Configuration	1~2		TRS.2.1 TDD
PDCCH/PDSCH TCI Configuration	1~2		TCI.State.2
SMTC configuration	1~2		SMTC.1
CSI-RS configuration as CMR	1~2		CSI-RS.3.2 TDD
CSI-IM configuration as IMR	1~2		CSI-IM.3.3 TDD
reportConfigType	1~2		periodic
reportQuantity-r16	1~2		cri-SINR-r16
nrofReportedRS	1~2		2
L1-RSRP reporting period	1~2		slot640
Propagation condition	1~2		AWGN
Antenna configutaion	1~2		1x2
EPRE ratio of PSS to SSS	1~2	dB	0
EPRE ratio of PBCH DMRS to SSS			
EPRE ratio of PBCH to PBCH DMRS			
EPRE ratio of PDCCH DMRS to SSS			
EPRE ratio of PDCCH to PDCCH DMRS			
EPRE ratio of PDSCH DMRS to SSS			
EPRE ratio of PDSCH to PDSCH DMRS			

EPRE ratio of OCNG DMRS to SSS Note 1			
EPRE ratio of OCNG to OCNG DMRS Note 1			
Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols. Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for N_{oc} to be fulfilled.			

Table 5.7.6.3.5-2: FR2 CSI-RS based L1-SINR OTA related test parameters

Parameter	Config	Unit	Test 1	
			CSI-RS0	CSI-RS1
Angle of arrival configuration			Setup 1 according to A.3.15.1	
Assumption for UE beams Note 4			Rough	
N_{oc}	1~2	dBm/15 kHz	-104.1	
N_{oc}	1~2	dBm/SSB SCS	-95.1	
$\hat{E}_s/I_{ot}$	1~2	dB	10	-1.8
CSI-RS-RSRP Note1	1~2	dBm/SCS	-85.07	-96.87
Io Note1	1~2	dBm/ 95.04MHz	-55.67	-63.88
$\hat{E}_s/N_{oc}$	1~2	dB	10	-1.8
Note 1: RSRP and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves. Note 2: RSRP minimum requirements are specified assuming independent interference and noise at each receiver antenna port. Note 3: No additional noise is added by the test system in Test 2. Note 4: Information about types of UE beam is given in B.2.1.3, and does not limit UE implementation or test system implementation				

Table 5.7.6.3.5-3: L1-SINR absolute accuracy requirements for the reported values for the absolute accuracy rules R1

UE power class 3	
Normal Conditions	**Test 1 All bands**
Lowest reported value (CSI-RS0)	55
Highest reported value (CSI-RS0)	74
Extreme Conditions	**Test 1 All bands**
Lowest reported value (CSI-RS0)	53
Highest reported value (CSI-RS0)	76

Table 5.7.6.3.5-4: Evaluation limits for the reported values for T1 and T2 relative accuracy rules R2

UE power class 3	
Normal Conditions	**Test 1 All bands**
Lowest DIFF L1-SINR reported value	7
Highest DIFF L1-SINR reported value	15
Extreme Conditions	**Test 1 All bands**
Lowest DIFF L1-SINR reported value	6
Highest DIFF L1-SINR reported value	15

For the test to pass, the ratio of successful reported values for each requirement (R1 and R2) shall be more than 90% with a confidence level of 95%. Each requirement is evaluated independently of the others.

6 NR standalone in FR1

6.0 General

This clause contains test scenarios for NR standalone. This configuration is also known as NR/5GC. All NR cells are in Frequency Range 1.

6.1 RRC_IDLE state mobility

6.1.1 NR cell re-selection

6.1.1.0 Minimum conformance requirements

6.1.1.0.1 Minimum conformance requirements for intra-frequency cell re-selection

The cell re-selection delay shall be less than $T_{evaluate\ NR_Intra} + T_{SI\text{-}NR}$ in RRC_IDLE state.

The UE shall be able to identify new intra-frequency cells and perform SS-RSRP and SS-RSRQ measurements of the identified intra-frequency cells without an explicit intra-frequency neighbour list containing physical layer cell identities.

The UE shall be able to evaluate whether a newly detectable intra-frequency cell meets the reselection criteria defined in TS38.304 [30] within T_{detect,NR_Intra} as defined in table 4.2.2.3-1 of TS 38.133 [6] when that Treselection= 0. An intra frequency cell is considered to be detectable according to the conditions defined in Annex B.1.2 of TS 38.133 [6] for a corresponding Band.

The UE shall measure SS-RSRP and SS-RSRQ at least every $T_{measure,NR_Intra}$ (see table 4.2.2.3-1 of TS 38.133 [6]) for intra-frequency cells that are identified and measured according to the measurement rules.

The UE shall filter SS-RSRP and SS-RSRQ measurements of each measured intra-frequency cell using at least 2 measurements. Within the set of measurements used for the filtering, at least two measurements shall be spaced by at least $T_{measure,NR_Intra}/2$.

The UE shall not consider a NR neighbour cell in cell reselection, if it is indicated as not allowed in the measurement control system information of the serving cell.

For an intra-frequency cell that has been already detected, but that has not been reselected to, the filtering shall be such that the UE shall be capable of evaluating that the intra-frequency cell has met reselection criterion defined within $T_{evaluate,NR_Intra}$ when $T_{reselection} = 0$ as specified in table 4.2.2.3-1 of TS 38.133 [6] provided that the cell has at least [3]dB better ranked.

When evaluating cells for reselection, the SSB side conditions apply to both serving and non-serving intra-frequency cells.

If $T_{reselection}$ timer has a non-zero value and the intra-frequency cell is satisfied with the reselection criteria which are defined in TS38.304 [30], the UE shall evaluate this intra-frequency cell for the $T_{reselection}$ time. If this cell remains satisfied with the reselection criteria within this duration, then the UE shall reselect that cell.

The normative reference for this requirement is TS 38.133 [6] clause 4.2.2.2 and 4.2.2.3.

6.1.1.0.2 Minimum conformance requirements for inter-frequency cell re-selection

The cell re-selection delay shall be less than $T_{evaluate\ NR_Intra} + T_{SI\text{-}NR}$ in RRC_IDLE state.

The UE shall be able to identify new inter-frequency cells and perform SS-RSRP or SS-RSRQ measurements of identified inter-frequency cells if carrier frequency information is provided by the serving cell, even if no explicit neighbour list with physical layer cell identities is provided.

If Srxlev > $S_{nonIntraSearchP}$ and Squal > $S_{nonIntraSearchQ}$ then the UE shall search for inter-frequency layers of higher priority at least every $T_{higher_priority_search}$ where $T_{higher_priority_search}$ is described in clause 4.2.2.7 of TS 38.133 [6].

If Srxlev ≤ $S_{nonIntraSearchP}$ or Squal ≤ $S_{nonIntraSearchQ}$ then the UE shall search for and measure inter-frequency layers of higher, equal or lower priority in preparation for possible reselection. In this scenario, the minimum rate at which the UE is required to search for and measure higher priority layers shall be the same as that defined below in this clause.

The UE shall be able to evaluate whether a newly detectable inter-frequency cell meets the reselection criteria defined in TS38.304 [30] within $K_{carrier} * T_{detect,NR_Inter} + K_{carrier_HST} * T_{detect,NR_Inter_HST}$ if at least carrier frequency information is provided for inter-frequency neighbour cells by the serving cells when $T_{reselection} = 0$ provided that the reselection criteria is met by a margin of at least 5 dB for reselections based on ranking or 6dB for SS-RSRP reselections based on absolute priorities or 4dB for SS-RSRQ reselections based on absolute priorities.

The parameter $K_{carrier}$ is the number of NR inter-frequency carriers which are not configured with *highSpeedMeasInterFreq-r17* for FR1 indicated by the serving cell. The parameter $K_{carrier_HST}$ is the number of NR inter-frequency carriers which are configured with *highSpeedMeasInterFreq-r17* for FR1 indicated by the serving cell. The parameter $K_{carrier}$ for a UE configured with idle mode CA measurements (while T331 is running), is the combined number of NR inter-frequency carriers indicated by the serving cell and the number of NR inter-frequency carriers configured for idle mode CA measurements which are not configured with *highSpeedMeasInterFreq-r17* for FR1. The parameter $K_{carrier_HST}$ for a UE configured with idle mode CA measurements (while T331 is running), is the combined number of NR inter-frequency carriers indicated by the serving cell and the number of NR inter-frequency carriers configured for idle mode CA measurements which are configured with *highSpeedMeasInterFreq-r17* for FR1.

Note: combined total number means that if a carrier is an inter-frequency carrier indicated by the serving cell for mobility and additionally a carrier configured for idle mode CA measurements, it only counts as one carrier.

An inter-frequency cell is considered to be detectable according to the conditions defined in TS 38.133 [6] Annex B.1.3 for a corresponding Band.

When higher priority cells are found by the higher priority search, they shall be measured at least every $T_{measure,NR_Inter}$. If, after detecting a cell in a higher priority search, it is determined that reselection has not occurred then the UE is not required to continuously measure the detected cell to evaluate the ongoing possibility of reselection. However, the minimum measurement filtering requirements specified later in this clause shall still be met by the UE before it makes any determination that it may stop measuring the cell. If the UE detects on a NR carrier a cell whose physical identity is indicated as not allowed for that carrier in the measurement control system information of the serving cell, the UE is not required to perform measurements on that cell.

The UE shall measure SS-RSRP or SS-RSRQ at least every $K_{carrier} * T_{measure,NR_Inter} + K_{carrier_HST} * T_{measure,NR_Inter_HST}$ (see table 6.1.1.0.2-1 and table 6.1.1.0.2-2 if UE declares support of idle mode inter-frequency measurement enhancement when configured with highSpeedMeasInterFreq-r17 for FR1, otherwise see table 6.1.1.0.2-1 only of TS 38.133 [6]) for identified lower or equal priority inter-frequency cells. If the UE detects on a NR carrier a cell whose physical identity is indicated as not allowed for that carrier in the measurement control system information of the serving cell, the UE is not required to perform measurements on that cell.

The UE shall filter SS-RSRP or SS-RSRQ measurements of each measured higher, lower and equal priority inter-frequency cell using at least 2 measurements. Within the set of measurements used for the filtering, at least two measurements shall be spaced by at least $T_{measure,NR_Inter}/2$ for carriers which are not configured with highSpeedMeasInterFreq-r17 for FR1or Tmeasure,NR_Inter_HST /2 for carriers which are configured with highSpeedMeasInterFreq-r17 forFR1.

The UE shall not consider a NR neighbour cell in cell reselection, if it is indicated as not allowed in the measurement control system information of the serving cell.

For an inter-frequency cell that has been already detected, but that has not been reselected to, the filtering shall be such that the UE shall be capable of evaluating that the inter-frequency cell has met reselection criterion defined TS 38.304 [30] within

$K_{carrier} * T_{evaluate,NR_Inter} + K_{carrier_HST} * T_{evaluate,NR_Inter_HST}$ when $T_{reselection} = 0$ as specified in table 6.1.1.0.2-1 and table 6.1.1.0.2-2 in TS 38.133 [6] if UE declares support of idle mode inter-frequency measurement enhancement when configured with *highSpeedMeasInterFreq-r17* for FR1, otherwise see table 6.1.1.0.2-1 only, provided that the reselection criteria is met by

6.1.1.0.2-1

- the condition when performing equal priority reselection and

- when *rangeToBestCell* is not configured:
  - the cell is at least 5dB better ranked in FR1 or 6.5dB better ranked in FR2 or.

  when *rangeToBestCell* is configured:
  - the cell has the highest number of beams above the threshold *absThreshSS-BlocksConsolidation* among all detected cells whose cell-ranking criterion R value in TS38.304 [30] is within *rangeToBestCell* of the cell-ranking criterion R value of the highest ranked cell.
    - if there are multiple such cells, the cell has the highest rank among them
- the cell is at least 5dB better ranked in FR1 or 6.5dB better ranked in FR2 if the current serving cell is among them. or- 6dB for SS-RSRP reselections based on absolute priorities or
- 4dB for SS-RSRQ reselections based on absolute priorities.

When evaluating cells for reselection, the SSB side conditions apply to both serving and inter-frequency cells.

If $T_{reselection}$ timer has a non-zero value and the inter-frequency cell is satisfied with the reselection criteria, the UE shall evaluate this inter-frequency cell for the $T_{reselection}$ time. If this cell remains satisfied with the reselection criteria within this duration, then the UE shall reselect that cell.

The UE is not expected to meet the measurement requirements for an inter-frequency carrier under DRX cycle=320 ms defined in Table 6.1.1.0.2-1 of TS 38.133 [6] under the following conditions:

- $T_{SMTC_intra} = T_{SMTC_inter} = 160$ ms; where T_{SMTC_intra} and T_{SMTC_inter} are periodicities of the SMTC occasions configured for the intra-frequency carrier and the inter-frequency carrier respectively, and
- SMTC occasions configured for the inter-frequency carrier occur up to 1 ms before the start or up to TBD ms after the end of the SMTC occasions configured for the intra-frequency carrier, and
- SMTC occasions configured for the intra-frequency carrier and for the inter-frequency carrier occur up to TBD ms before the start or up to TBD ms after the end of the paging occasion [1].

Table 6.1.1.0.2-1: T_{detect,NR_Inter}, $T_{measure,NR_Inter}$ and $T_{evaluate,NR_Inter}$

DRX cycle length [s]	Scaling Factor (N1)			T_{detect,NR_Inter} [s] (number of DRX cycles)	$T_{measure,NR_Inter}$ [s] (number of DRX cycles)	$T_{evaluate,NR_Inter}$ [s] (number of DRX cycles)
	FR1	FR2-1 Note1	FR2-2 Note2			
0.32	1	8	12	11.52 x N1 x 1.5 (36 x N1 x 1.5)	1.28 x N1 x 1.5 (4 x N1 x 1.5)	5.12 x N1 x 1.5 (16 x N1 x 1.5)
0.64		5	8	17.92x N1 (28 x N1)	1.28 x N1 (2 x N1)	5.12 x N1 (8 x N1)
1.28		4	6	32 x N1 (25 x N1)	1.28 x N1 (1 x N1)	6.4 x N1 (5 x N1)
2.56		3	5	58.88 x N1 (23 x N1)	2.56 x N1 (1 x N1)	7.68 x N1 (3 x N1)
Note 1: Applies for UE supporting FR2-1 power class 2&3&4. For UE supporting FR2-1 power class 1 or 5, N1 = 8 for all DRX cycle length. Note 2: Applies for UE supporting FR2-2 power class 2&3. For UE supporting FR2-2 power class 1, N1 = 12 for all DRX cycle length.						

Table 6.1.1.0.2-2: T_{detect,NR_Inter_HST}, $T_{measure,NR_Inter_HST}$ and $T_{evaluate,NR_Inter_HST}$ for FR1 configured with *highSpeedMeasInterFreq-r17* note2

DRX cycle length [s]	T_{detect,NR_Inter_HST} [s] (number of DRX cycles)	$T_{measure,NR_Inter_HST}$ [s] (number of DRX cycles)	$T_{evaluate,NR_Inter_HST}$ [s] (number of DRX cycles)
0.32	[3.2 x M2 (10 x M2)] Note 1	[0.32 x M3 ([1] x M3)] Note 1	0.96 x M4 (3 x M4) Note 1
0.64	[6.4 (10)]	[0.64 (1)]	1.92 (3)
1.28	[10.24 (8)]	1.28 (1)	3.84 (3)
2.56	58.88 (23)	2.56 (1)	7.68 (3)

Note 1:	When SMTC < = 40 ms, M2 = M3 = M4 = 1; and when SMTC > 40 ms, M2 = 1.5, M3 = M4 = 2
Note 2:	The support of HST Idle mode inter-frequency measurement enhancement is optional without capability signalling. Apply for UE declaring supports idle mode inter-frequency measurement enhancement for HST, otherwise Table 6.1.1.0.2-1 shall be used.

The normative reference for this requirement is TS 38.133 [6] clause 4.2.2.4.

6.1.1.0.3 Minimum conformance requirements for intra-frequency cell re-selection for UE configured with highSpeedMeasFlag-r16

The cell re-selection delay shall be less than $T_{evaluate\ NR_Intra} + T_{SI\text{-}NR}$ in RRC_IDLE state.

The UE shall be able to identify new intra-frequency cells and perform SS-RSRP and SS-RSRQ measurements of the identified intra-frequency cells without an explicit intra-frequency neighbour list containing physical layer cell identities.

The UE shall be able to evaluate whether a newly detectable intra-frequency cell meets the reselection criteria defined in TS38.304 [30] within T_{detect,NR_Intra} as defined in table 4.2.2.3-2 of TS 38.133 [6] when that Treselection= 0. An intra frequency cell is considered to be detectable according to the conditions defined in Annex B.1.2 of TS 38.133 [6] for a corresponding Band.

The UE shall measure SS-RSRP and SS-RSRQ at least every $T_{measure,NR_Intra}$ (see table 4.2.2.3-2 of TS 38.133 [6]) for intra-frequency cells that are identified and measured according to the measurement rules.

The UE shall filter SS-RSRP and SS-RSRQ measurements of each measured intra-frequency cell using at least 2 measurements. Within the set of measurements used for the filtering, at least two measurements shall be spaced by at least $T_{measure,NR_Intra}/2$.

The UE shall not consider a NR neighbour cell in cell reselection, if it is indicated as not allowed in the measurement control system information of the serving cell.

For an intra-frequency cell that has been already detected, but that has not been reselected to, the filtering shall be such that the UE shall be capable of evaluating that the intra-frequency cell has met reselection criterion defined within $T_{evaluate,NR_Intra}$ when $T_{reselection} = 0$ as specified in table 4.2.2.3-2 of TS 38.133 [6] provided that the cell has at least 3dB better ranked.

When evaluating cells for reselection, the SSB side conditions apply to both serving and non-serving intra-frequency cells.

If $T_{reselection}$ timer has a non-zero value and the intra-frequency cell is satisfied with the reselection criteria which are defined in TS38.304 [30], the UE shall evaluate this intra-frequency cell for the $T_{reselection}$ time. If this cell remains satisfied with the reselection criteria within this duration, then the UE shall reselect that cell.

The normative reference for this requirement is TS 38.133 [6] clause 4.2.2.2 and 4.2.2.3.

6.1.1.0.4 Minimum conformance requirements for intra-frequency cell re-selection when UE configured with relaxed measurement criterion

[TS 38.133, clause 4.2.2.3]

An intra frequency cell is considered to be detectable according to the conditions defined in Annex B.1.2 for a corresponding Band.

The UE shall measure SS-RSRP and SS-RSRQ at least every $T_{measure,NR_Intra}$ for intra-frequency cells that are identified and measured according to the measurement rules.

The UE shall filter SS-RSRP and SS-RSRQ measurements of each measured intra-frequency cell using at least 2 measurements. Within the set of measurements used for the filtering, at least two measurements shall be spaced by at least $T_{measure,NR_Intra}/2$.

The UE shall not consider a NR neighbour cell in cell reselection, if it is indicated as not allowed in the measurement control system information of the serving cell.

For an intra-frequency cell that has been already detected, but that has not been reselected to, the filtering shall be such that the UE shall be capable of evaluating that the intra-frequency cell has met reselection criterion defined in TS38.304 [1] within $T_{evaluate,NR_Intra}$ when $T_{reselection} = 0$ provided that:

when *rangeToBestCell* is not configured:

- the cell is at least 3dB better ranked in FR1.

When evaluating cells for reselection, the SSB side conditions apply to both serving and non-serving intra-frequency cells.

[TS 38.133, clause 4.2.2.9.2]

This clause contains requirements for measurements on intra-frequency NR cells provided that:

- UE is configured with *lowMobilityEvalutation* [2] criterion and UE has fulfilled, or
- UE is configured with both *lowMobilityEvalutation* [2] criterion and *cellEdgeEvaluation* [2] criterion and *combineRelaxedMeasCondition* [2] not configured, and UE has fulfilled only the *lowMobilityEvalutation* [2] criterion.

The requirements defined in clause 4.2.2.3 apply for this clause except that:

- T_{detect,NR_Intra} as specified in Table 4.2.2.9.2-1.
- $T_{measure,NR_Intra}$ as specified in Table 4.2.2.9.2-1.
- $T_{evaluate,NR_Intra}$ as specified in Table 4.2.2.9.2-1.

Table 4.2.2.9.2-1: T_{detect,NR_Intra}, $T_{measure,NR_Intra}$ and $T_{evaluate,NR_Intra}$

DRX cycle length [s]	Scaling Factor (N1)		T_{detect,NR_Intra} [s] (number of DRX cycles)	$T_{measure,NR_Intra}$ [s] (number of DRX cycles)	$T_{evaluate,NR_Intra}$ [s] (number of DRX cycles)
	FR1	FR2[Note1]			
0.32	1	8	11.52 x N1 x M2 x K1 (36 x N1 x M2 x K1)	1.28 x N1 x M2 x K1 (4 x N1 x M2 x K1)	5.12 x N1 x M2 x K1 (16 x N1 x M2 x K1)
0.64		5	17.92 x N1 x K1 (28 x N1 x K1)	1.28 x N1 x K1 (2 x N1 x K1)	5.12 x N1 x K1 (8 x N1 x K1)
1.28		4	32 x N1 x K1 (25 x N1 x K1)	1.28 x N1 x K1 (1 x N1 x K1)	6.4 x N1 x K1 (5 x N1 x K1)
2.56		3	58.88 x N1 x K1 (23 x N1 x K1)	2.56 x N1 x K1 (1 x N1 x K1)	7.68 x N1 x K1 (3 x N1 x K1)
Note 1: Applies for UE supporting power class 2&3&4. For UE supporting power class 1, N1 = 8 for all DRX cycle length. Note 2: M2 = 1.5 if SMTC periodicity of measured intra-frequency cell > 20 ms; otherwise M2=1. Note 3: K1 = 3 is the measurement relaxation factor applicable for UE fulfilling the *lowMobilityEvalutation* [13] criterion.					

[TS 38.133, clause 4.2.2.9.3]

This clause contains requirements for measurements on intra-frequency NR cells provided that:

- UE is configured with *cellEdgeEvaluation* [2] criterion and UE has fulfilled, or
- UE is configured with both *lowMobilityEvalutation* [2] criterion and *cellEdgeEvaluation* [2] criteria and *combineRelaxedMeasCondition* [2] not configured, and UE has fulfilled only the *cellEdgeEvaluation* [2] criterion.

The requirements defined in clause 4.2.2.3 apply for this clause except that:

- T_{detect,NR_Intra} as specified in Table 4.2.2.9.3-1.
- $T_{measure,NR_Intra}$ as specified in Table 4.2.2.9.3-1.
- $T_{evaluate,NR_Intra}$ as specified in Table 4.2.2.9.3-1.

Table 4.2.2.9.3-1: T_{detect,NR_Intra}, $T_{measure,NR_Intra}$ and $T_{evaluate,NR_Intra}$

DRX cycle length [s]	Scaling Factor (N1)		T_{detect,NR_Intra} [s] (number of DRX cycles)	$T_{measure,NR_Intra}$ [s] (number of DRX cycles)	$T_{evaluate,NR_Intra}$ [s] (number of DRX cycles)
	FR1	FR2[Note1]			
0.32	1	8	11.52 x N1 x M2 x K1 (36 x N1 x M2 x K1)	1.28 x N1 x M2 x K1 (4 x N1 x M2 x K1)	5.12 x N1 x M2 x K1 (16 x N1 x M2 x K1)
0.64		5	17.92 x N1 x K1 (28 x N1 x K1)	1.28 x N1 x K1 (2 x N1 x K1)	5.12 x N1 x K1 (8 x N1 x K1)
1.28		4	32 x N1 x K1 (25 x N1 x K1)	1.28 x N1 x K1 (1 x N1 x K1)	6.4 x N1 x K1 (5 x N1 x K1)
2.56		3	58.88 x N1 x K1 (23 x N1 x K1)	2.56 x N1 x K1 (1 x N1 x K1)	7.68 x N1 x K1 (3 x N1 x K1)
Note 1: Applies for UE supporting power class 2&3&4. For UE supporting power class 1, N1 = 8 for all DRX cycle length. Note 2: M2 = 1.5 if SMTC periodicity of measured intra-frequency cell > 20 ms; otherwise M2=1. Note 3: K1 = 3 is the measurement relaxation factor applicable for UE fulfilling the *cellEdgeEvaluation* [2] criterion.					

[TS 38.133, Annex B.1.2]

This clause defines the following conditions for NR intra-frequency measurements performed based on SSBs for cell re-selection: SSB_RP and SSB Ês/Iot, applicable for a corresponding operating band.

The conditions are defined in Table B.1.2-1 for FR1 NR cells.

Table B.1.2-1: Conditions for intra-frequency cell re-selection in FR1

Parameter	NR operating band groups [Note1]	Minimum SSB_RP		SSB Ês/Iot
		dBm / SCS_{SSB}		dB
		SCS_{SSB} = 15 kHz	SCS_{SSB} = 30 kHz	
Conditions	Depending on band group	-124+ Δ_{BG_offset}	-121+ Δ_{BG_offset}	≥ -4
NOTE 1: NR operating band groups are defined in TS 38.133 [6] clause 3.5.2. NOTE 2: For NR operating band groups, Δ_{BG_offset} is defined in clause 3A.4, Table 3A.4.1-2.				

6.1.1.0.5 Minimum conformance requirements for inter-frequency cell re-selection when UE configured with relaxed measurement criterion

[TS 38.133, clause 4.2.2.4]

An inter-frequency cell is considered to be detectable according to the conditions defined in Annex B.1.3 for a corresponding Band.

When higher priority cells are found by the higher priority search, they shall be measured at least every $T_{measure,NR_Inter}$. If, after detecting a cell in a higher priority search, it is determined that reselection has not occurred then the UE is not required to continuously measure the detected cell to evaluate the ongoing possibility of reselection. However, the minimum measurement filtering requirements specified later in this clause shall still be met by the UE before it makes any determination that it may stop measuring the cell. If the UE detects on a NR carrier a cell whose physical identity is indicated as not allowed for that carrier in the measurement control system information of the serving cell, the UE is not required to perform measurements on that cell.

The UE shall measure SS-RSRP or SS-RSRQ at least every $K_{carrier} * T_{measure,NR_Inter}$ for identified lower or equal priority inter-frequency cells. If the UE detects on a NR carrier a cell whose physical identity is indicated as not allowed for that carrier in the measurement control system information of the serving cell, the UE is not required to perform measurements on that cell.

The UE shall filter SS-RSRP or SS-RSRQ measurements of each measured higher, lower and equal priority inter-frequency cell using at least 2 measurements. Within the set of measurements used for the filtering, at least two measurements shall be spaced by at least $T_{measure,NR_Inter}/2$.

The UE shall not consider a NR neighbour cell in cell reselection, if it is indicated as not allowed in the measurement control system information of the serving cell.

For an inter-frequency cell that has been already detected, but that has not been reselected to, the filtering shall be such that the UE shall be capable of evaluating that the inter-frequency cell has met reselection criterion defined TS 38.304 [1] within $K_{carrier}$ * $T_{evaluate,NR_Inter}$ when $T_{reselection}$ = 0 provided that the reselection criteria is met by

- the condition when performing equal priority reselection and
- 6dB in FR1 or 7.5dB in FR2 for SS-RSRP reselections based on absolute priorities

When evaluating cells for reselection, the SSB side conditions apply to both serving and inter-frequency cells.

[TS 38.133, clause 4.2.2.10.2]

This clause contains requirements for measurements on inter-frequency NR cells provided that:

- T331 timer is not running for EMR measurements on inter-frequency NR carrier, and
- UE is configured with *lowMobilityEvalutation* [2] criterion and UE has fulfilled, or
- UE is configured with both *lowMobilityEvalutation* [2] and *cellEdgeEvaluation* [2] criterion and *combineRelaxedMeasCondition* [2] not configured, and
- UE has fulfilled only the *lowMobilityEvalutation* [2] criterion.

When Srxlev ≤ $S_{nonIntraSearchP}$ or Squal ≤ $S_{nonIntraSearchQ}$ then the requirements defined in clause 4.2.2.4 apply for this clause except that:

- T_{detect,NR_Inter} as specified in Table 4.2.2.10.2-1.
- $T_{measure,NR_Inter}$ as specified in Table 4.2.2.10.2-1.
- $T_{evaluate,NR_Inter}$ as specified in Table 4.2.2.10.2-1.

Table 4.2.2.10.2-1: T_{detect,NR_Inter}, $T_{measure,NR_Inter}$ and $T_{evaluate,NR_Inter}$

DRX cycle length [s]	Scaling Factor (N1)		T_{detect,NR_Inter} [s] (number of DRX cycles)	$T_{measure,NR_Inter}$ [s] (number of DRX cycles)	$T_{evaluate,NR_Inter}$ [s] (number of DRX cycles)
	FR1	FR2[Note1]			
0.32	1	8	11.52 x N1 x 1.5 x K1 (36 x N1 x 1.5 x K1)	1.28 x N1 x 1.5 x K1 (4 x N1 x 1.5 x K1)	5.12 x N1 x 1.5 x K1 (16 x N1 x 1.5 x K1)
0.64		5	17.92x N1 x K1 (28 x N1 x K1)	1.28 x N1 x K1 (2 x N1 x K1)	5.12 x N1 x K1 (8 x N1 x K1)
1.28		4	32 x N1 x K1 (25 x N1 x K1)	1.28 x N1 x K1 (1 x N1 x K1)	6.4 x N1 x K1 (5 x N1 x K1)
2.56		3	58.88 x N1 x K1 (23 x N1 x K1)	2.56 x N1 x K1 (1 x N1 x K1)	7.68 x N1 x K1 (3 x N1 x K1)
Note 1: Applies for UE supporting power class 2&3&4. For UE supporting power class 1, N1 = 8 for all DRX cycle length. Note 2: K1 = 3 is the measurement relaxation factor applicable for UE fulfilling the low mobility.					

[TS 38.133, clause 4.2.2.10.3]

This clause contains requirements for measurements on inter-frequency NR cells provided that:

- T331 timer is not running for EMR measurements on inter-frequency NR carrier, and
- UE is configured with *cellEdgeEvaluation* [2] criterion, and UE has fulfilled or
- UE is configured with both *lowMobilityEvalutation* [2] criterion and *cellEdgeEvaluation* [2] criterion and *combineRelaxedMeasCondition* [2] not configured, and
- UE has fulfilled only the *cellEdgeEvaluation* [2] criterion.

When Srxlev ≤ $S_{nonIntraSearchP}$ or Squal ≤ $S_{nonIntraSearchQ}$ then the requirements defined in clause 4.2.2.4 apply for this clause except that:

- T_{detect,NR_Inter} as specified in Table 4.2.2.10.3-1.

- $T_{measure,NR_Inter}$ as specified in Table 4.2.2.10.3-1.
- $T_{evaluate,NR_Inter}$ as specified in Table 4.2.2.10.3-1.

Table 4.2.2.10.3-1: T_{detect,NR_Inter}, $T_{measure,NR_Inter}$ and $T_{evaluate,NR_Inter}$

DRX cycle length [s]	Scaling Factor (N1)		T_{detect,NR_Inter} [s] (number of DRX cycles)	$T_{measure,NR_Inter}$ [s] (number of DRX cycles)	$T_{evaluate,NR_Inter}$ [s] (number of DRX cycles)
	FR1	FR2[Note1]			
0.32	1	8	11.52 x N1 x 1.5 x K1 (36 x N1 x 1.5 x K1)	1.28 x N1 x 1.5 x K1 (4 x N1 x 1.5 x K1)	5.12 x N1 x 1.5 x K1 (16 x N1 x 1.5 x K1)
0.64		5	17.92x N1 x K1 (28 x N1 x K1)	1.28 x N1 x K1 (2 x N1 x K1)	5.12 x N1 x K1 (8 x N1 x K1)
1.28		4	32 x N1 x K1 (25 x N1 x K1)	1.28 x N1 x K1 (1 x N1 x K1)	6.4 x N1 x K1 (5 x N1 x K1)
2.56		3	58.88 x N1 x K1 (23 x N1 x K1)	2.56 x N1 x K1 (1 x N1 x K1)	7.68 x N1 x K1 (3 x N1 x K1)
Note 1: Applies for UE supporting power class 2&3&4. For UE supporting power class 1, N1 = 8 for all DRX cycle length. Note 2: K1 = 3 is the measurement relaxation factor applicable for UE fulfilling the *cellEdgeEvaluation* [2] criterion.					

[TS 38.133, Annex B.1.3]

This clause defines the following conditions for NR inter-frequency measurements performed based on SSBs for cell re-selection: SSB_RP and SSB Ês/Iot, applicable for a corresponding operating band.

The conditions defined in Table B.1.2-1 for FR1 NR intra-frequency cell re-selection shall also apply for FR1 NR inter-frequency cells in this clause.

[TS 38.133, Annex B.1.2]

This clause defines the following conditions for NR intra-frequency measurements performed based on SSBs for cell re-selection: SSB_RP and SSB Ês/Iot, applicable for a corresponding operating band.

The conditions are defined in Table B.1.2-1 for FR1 NR cells.

Table B.1.2-1: Conditions for intra-frequency cell re-selection in FR1

Parameter	NR operating band groups [Note1]	Minimum SSB_RP		SSB Ês/Iot
		dBm / SCS_{SSB}		dB
		SCS_{SSB} = 15 kHz	SCS_{SSB} = 30 kHz	
Conditions	Depending on band group	-124+ Δ_{BG_offset}	-121+ Δ_{BG_offset}	≥ -4
NOTE 1: NR operating band groups are defined in TS 38.133 [6] clause 3.5.2. NOTE 2: For NR operating band groups, Δ_{BG_offset} is defined in clause 3A.4, Table 3A.4.1-2.				

6.1.1.1 NR SA FR1 cell re-selection

6.1.1.1.1 Test purpose

The purpose of this test is to verify that when the current and target cell operates on the same carrier frequency the UE is able to search and measure cells to meet the intra-frequency NR cell re-selection requirements.

6.1.1.1.2 Test applicability

This test applies to all types of NR UE from release 15 onwards.

6.1.1.1.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 6.1.1.0.1.

The normative reference for this requirement is TS 38.133 [6] clause A.6.1.1.1.

6.1.1.1.4 Test description

6.1.1.1.4.1 Initial conditions

This test shall be run in one of the configurations defined in Table 6.1.1.1.4.1-1.

Table 6.1.1.1.4.1-1: Supported test configurations for NR SA FR1 cell re-selection

Configuration	Description
6.1.1.1-1	15 kHz SSB SCS, 10MHz bandwidth, FDD duplex mode
6.1.1.1-2	15 kHz SSB SCS, 10MHz bandwidth, TDD duplex mode
6.1.1.1-3	30 kHz SSB SCS, 40MHz bandwidth, TDD duplex mode
Note: The UE is only required to be tested in one of the supported test configurations.	

Configure the test equipment and the DUT according to the parameters in Table 6.1.1.1.4.1-2.

Table 6.1.1.1.4.1-2: Initial conditions for NR SA FR1 cell re-selection

Parameter	Value		Comment
Test environment	NC		As specified in TS 38.508-1 [14] clause 4.1.
Test frequencies	As specified in Annex E, table E.4-1 and TS 38.508-1 [14] clause 4.3.1.		
Channel bandwidth	As specified by the test configuration selected from Table 6.1.1.1.4.1-1.		
Propagation conditions	AWGN		As specified in Annex C.2.2.
Connection Diagram	TE Part	A.3.1.8.2	As specified in TS 38.508-1 [14] Annex A.
	DUT Part	A.3.2.3.4	
Exceptions to connection diagram	- Without LTE link - For 4Rx capable UEs without any 2Rx RF bands use A.3.2.5.2 for DUT part and A.3.1.8.4 for TE part.		

1. The general test parameter settings are set up according to Table 6.1.1.1.4.1-3.

2. Message contents are defined in clause 6.1.1.1.4.3.

3. There is one NR carrier and 2 NR Cells specified in the test. Cell 1 is the PCell and Cell 2 is the neighbour cell. Cell 1 and Cell 2 are configured according to Annex C.1.1 and C.1.2.

Table 6.1.1.1.4.1-3: General test parameters for NR SA FR1 cell re-selection

Parameter		Unit	Test configuration	Value	Comment
Initial condition	Active cell		1, 2, 3	Cell1	
T2 end condition	Active cell		1, 2, 3	Cell2	
	Neighbour cells		1, 2, 3	Cell1	
Final condition	Active cell		1, 2, 3	Cell1	
	Neighbour cell		1, 2, 3	Cell2	
RF Channel Number			1, 2, 3	1	
Time offset between cells			1	3 ms	Asynchronous cells
			2	3 µs	Synchronous cells
			3	3 µs	Synchronous cells
Access Barring Information		-	1, 2, 3	Not Sent	No additional delays in random access procedure.
SSB configuration			1	SSB.1 FR1	
			2	SSB.1 FR1	
			3	SSB.2 FR1	
SMTC configuration			1	SMTC.2	Configured in SIB2 of Cell 1
				SMTC.6	Configured in SIB2 of Cell 2
			2	SMTC.1	
			3	SMTC.1	
DRX cycle length		s	1, 2, 3	1.28	The value shall be used for all cells in the test.

PRACH configuration index		1, 2, 3	102	The detailed configuration is specified in TS 38.211 clause 6.3.3.2
rangeToBestCell		1, 2, 3	Not configured	
T1	s	1, 2, 3	>7	During T1, Cell 2 shall be powered off, and during the off time the physical cell identity shall be changed, The intention is to ensure that Cell 2 has not been detected by the UE prior to the start of period T2
T2	s	1, 2, 3	40	T2 needs to be defined so that cell re-selection reaction time is taken into account.
T3	s	1, 2, 3	15	T3 needs to be defined so that cell re-selection reaction time is taken into account.

6.1.1.1.4.2 Test procedure

Two cells are deployed in the test, which are one FR1 NR PCell (Cell 1) and an NR neighbour cell (Cell 2) on the same frequency. The test consists of 3 successive time periods, with time duration of T1, T2, and T3 respectively. Only cell 1 is already identified by the UE prior to the start of the test. Cell 1 and cell 2 belong to different tracking areas. Furthermore, UE has not registered with network for the tracking area containing cell 2.

In the following test procedure "UE responds" means "UE starts transmitting preamble on PRACH for sending the *RRCSetupRequest* message to perform a Registration procedure for mobility.

1. Ensure the UE is in state RRC_IDLE with generic procedure parameters connectivity *NR* with Test Mode *On* according to TS 38.508-1 [14] clause 4.5 on Cell 1. Set Cell 2 physical cell identity = initial cell 2 physical cell identity.

2. Set the parameters according to T1 in Table 6.1.1.1.5-1. T1 starts.

3. Set Cell 2 physical cell identity = ((current Cell 2 physical cell identity + 1) mod 1008) for one iteration of the test procedure loop.

4. When T1 expires, the SS shall switch the power setting from T1 to T2 as specified in Table 6.1.1.1.5-1. T2 starts.

5. The SS waits for random access requests information from the UE to perform cell re-selection to a newly detectable cell, Cell 2.

6. If the UE responds on the newly detectable cell, Cell 2 during time duration T2 within 34 seconds from the beginning of time period T2, then count a success for the event “Re-select newly detected Cell 2”. Otherwise count a fail for the event “Re-select newly detected Cell 2”.

7. If the UE has re-selected Cell 2 within T2, after the re-selection or when T2 expires, continue with step 7a. Otherwise, if T2 expires and the UE has not yet re-selected Cell 2, the TE shall switch off and on the UE and skip to step 12.

7a The SS shall send an *RRCRelease* message to ensure that the UE is in state RRC_IDLE on Cell 2.

8. The SS shall switch the power setting from T2 to T3 as specified in Table 6.1.1.1.5-1. T3 starts.

9. The SS waits for random access requests information from the UE to perform cell re-selection to an already detected cell, Cell 1.

10. If the UE responds on the already detected cell, Cell 1 during time duration T3 within 8 seconds from the beginning of time period T3, then count a success for the event “Re-select already detected Cell 1”. Otherwise count a fail for the event “Re-select already detected Cell 1”.

11. If the UE has re-selected Cell 1 within T3, after the re-selection or when T3 expires, continue with step 11a. Otherwise, if T3 expires and the UE has not yet re-selected Cell 1, the TE shall switch off and on the UE and skip to step 12.

11a. The SS shall send an *RRCRelease* message to ensure that the UE is in state RRC_IDLE on Cell 1.12.
Ensure the UE is in state RRC_IDLE with generic procedure parameters connectivity *NR* according to TS 38.508-1 [14] clause 4.5 in Cell 1.

13. Repeat step 2-12 until a test verdict has been achieved.
Each of the events "Re-select newly detected Cell 2" and "Re-select already detected Cell 1" is evaluated independently for the statistic, resulting in an event verdict: pass or fail. Each event is evaluated only until the confidence level according to Table G.2.3-1 in Annex G clause G.2 is achieved. Different events may require different times for a verdict.
If both events pass, the test passes. If one event fails, the test fails.

6.1.1.1.4.3 Message contents

Message contents are according to TS 38.508-1 [14] clause 4.6 with the following exceptions:

Table 6.1.1.1.4.3-1: Common Exception messages

Default Message Contents	
Common contents of system information blocks exceptions	Table H.2.1-2
Default RRC messages and information elements contents exceptions	

Table 6.1.1.1.4.3-2: SIB1 (Cell 1 and Cell 2)

Derivation Path: Table H.2.1-3			
Information Element	**Value/remark**	**Comment**	**Condition**
SIB1 ::= SEQUENCE {			
cellSelectionInfo SEQUENCE {			
q-RxLevMin	-65	-130 is actual value in dBm (-65 * 2 dBm)	6.1.1.1-1, 6.1.1.1-2
	-64	-128 is actual value in dBm (-64 * 2 +1 dBm)	6.1.1.1-3
}			
}			

Table 6.1.1.1.4.3-3: SIB2 (Cell 1 and Cell 2)

Derivation Path: Table H.2.1-1			
Information Element	**Value/remark**	**Comment**	**Condition**
SIB2 ::= SEQUENCE {			
intraFreqCellReselectionInfo SEQUENCE {			
q-RxLevMin	-65	Actual value is -65*2 = -130dBm	6.1.1.1-1, 6.1.1.1-2
	-64	Actual value is -64*2 = -128dBm	6.1.1.1-3
smtc	SSB-MTC specified in TS 38.508-1 [14] Table 7.3.1-3 with condition SMTC.2		6.1.1.1-1 AND Cell 1
	SSB-MTC specified in TS 38.508-1 [14] Table 7.3.1-3 with condition SMTC.6		6.1.1.1-1 AND Cell 2
	SSB-MTC specified in TS 38.508-1 [14] Table 7.3.1-3		6.1.1.1-2, 6.1.1.1-3

	with condition SMTC.2		
deriveSSB-IndexFromCell	false		6.1.1.1-1
	true		6.1.1.1-2, 6.1.1.1-3
}			
}			

6.1.1.1.5 Test requirement

Tables 6.1.1.1.4.1-3 and 6.1.1.1.5-1 define the primary level settings including test tolerances for intra frequency NR cell re-selection test case.

Table 6.1.1.1.5-1: Cell specific test parameters for NR SA FR1 cell re-selection

Parameter	Unit	Test configuration	Cell 1			Cell 2		
			T1	T2	T3	T1	T2	T3
TDD configuration		1	N/A			N/A		
		2	TDDConf.1.1			TDDConf.1.1		
		3	TDDConf.2.1			TDDConf.2.1		
PDSCH RMC configuration		1	SR.1.1 FDD			SR.1.1 FDD		
		2	SR.1.1 TDD			SR.1.1 TDD		
		3	SR.2.1 TDD			SR.2.1 TDD		
RMSI CORESET RMC configuration		1	CR.1.1 FDD			CR.1.1 FDD		
		2	CR.1.1 TDD			CR.1.1 TDD		
		3	CR.2.1 TDD			CR.2.1 TDD		
Dedicated CORESET RMC configuration		1	CCR.1.1 FDD			CCR.1.1 FDD		
		2	CCR.1.1 TDD			CCR.1.1 TDD		
		3	CCR.2.1 TDD			CCR.2.1 TDD		
OCNG Pattern		1, 2, 3	OP.1 defined in A.2.1-1			OP.1 defined in A.2.1-1		
Initial DL BWP configuration		1, 2, 3	DLBWP.0.1			DLBWP.0.1		
Initial UL BWP configuration		1, 2, 3	ULBWP.0.1			ULBWP.0.1		
RLM-RS		1, 2, 3	SSB			SSB		
Qrxlevmin	dBm/SCS	1, 2	-130			-130		
		3	-127			-127		
Pcompensation	dB	1, 2, 3	0			0		
$Qhyst_s$	dB	1, 2, 3	0			0		
$Qoffset_{s,n}$	dB	1, 2, 3	0			0		
Cell_selection_and_reselection_quality_measurement		1, 2, 3	SS-RSRP			SS-RSRP		
$\hat{E}_s/I_{ot}$	dB	1	16	-3.55	3.24	-infinity	3.24	-3.55
		2						
		3						
N_{oc} Note2	dBm/SCS	1	-98					
		2	-98					
		3	-95					
N_{oc} Note2	dBm/15 kHz	1	-98					
		2						
		3						
$\hat{E}_s/N_{oc}$	dB	1	16	13	16.45	-infinity	16.45	13
		2						
		3						
SS-RSRP Note3	dBm/SCS	1	-82	-85	-81.55	-infinity	-81.55	-85
		2	-82	-85	-81.55	-infinity	-81.55	-85
		3	-79	-82	-78.54	-infinity	-78.54	-82
Io	dBm/9.36 MHz	1	-53.94	-51.91	-51.91	Specified in Cell 1 columns		
	dBm/9.36 MHz	2	-53.94	-51.91	-51.91			
	dBm/38.16 MHz	3	-47.85	-45.81	-45.81			
Treselection	s	1, 2, 3	0	0	0	0	0	0
SintrasearchP	dB	1, 2, 3	60			60		
Propagation Condition		1, 2, 3	AWGN					

Note 1:	OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.
Note 2:	Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for N_{oc} to be fulfilled.
Note 3:	SS-RSRP levels have been derived from other parameters for information purposes. They are not settable parameters themselves.

The cell re-selection delay to a newly detectable cell is defined as the time from the beginning of time period T2, to the moment when the UE camps on Cell 2, and starts to send preambles on the PRACH for sending the *RRCSetupRequest* message to perform a Registration procedure for mobility and periodic registration update on Cell 2.

The cell re-selection delay to a newly detectable cell test requirement in this case is expressed as:

Cell re-selection delay to a newly detectable cell = $T_{detect,NR_Intra} + T_{SI-NR}$

T_{detect,NR_Intra} = 32 s; as specified in TS 38.133 [6] clause 4.2.2.3.

T_{SI-NR} = 1280 ms; maximum repetition period of relevant system info blocks that needs to be received by the UE to camp on a cell is assumed in this test.

The cell re-selection delay to a newly detectable cell shall be less than a total of 33.28 seconds in this test case (note: this gives a total of 33.28 seconds but the test allows 34 seconds).

The cell re-selection delay to an already detected cell is defined as the time from the beginning of time period T3, to the moment when the UE camps on Cell 1, and starts to send preambles on the PRACH for sending the *RRCSetupRequest* message to perform a Registration procedure for mobility and periodic registration update on Cell 1.

The cell re-selection delay to an already detected cell test requirement in this case is expressed as:

Cell re-selection to an already detected cell delay = $T_{evaluate,NR_Intra} + T_{SI-NR}$

$T_{evaluate,NR_Intra}$ = 6.4 s; as specified in TS 38.133 [6] clause 4.2.2.3.

T_{SI-NR} = 1280 ms; maximum repetition period of relevant system info blocks that needs to be received by the UE to camp on a cell is assumed in this test.

The cell re-selection delay to an already detected cell shall be less than a total of 7.68 seconds in this test case (note: this gives a total of 7.68 seconds but the test allows 8 seconds).

For the test to pass, both events above shall pass.

The statistical pass/fail decisions are done separated for each event. For an event to pass, the total number of successful loops shall be more than 90% of the cases with a confidence level of 95%.

6.1.1.2 NR SA FR1-FR1 cell re-selection

6.1.1.2.1 Test purpose

The purpose of this test is to verify the requirement for the inter frequency NR cell reselection.

6.1.1.2.2 Test applicability

This test applies to all types of NR UE from Release 15 onwards.

6.1.1.2.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 6.1.1.0.2.

The normative reference for this requirement is TS 38.133 [6] clause A.6.1.1.2.

6.1.1.2.4 Test description

6.1.1.2.4.1 Initial conditions

This test shall be run in one of the configurations defined in Table 6.1.1.2.4.1-1.

Table 6.1.1.2.4.1-1: Supported test configurations for NR SA FR1-FR1 cell re-selection

Configuration	Description of serving cell	Description of target cell
6.1.1.2-1	15 kHz SSB SCS, 10MHz bandwidth, FDD duplex mode	15 kHz SSB SCS, 10MHz bandwidth, FDD duplex mode
6.1.1.2-2	15 kHz SSB SCS, 10MHz bandwidth, TDD duplex mode	15 kHz SSB SCS, 10MHz bandwidth, TDD duplex mode
6.1.1.2-3	30 kHz SSB SCS, 40MHz bandwidth, TDD duplex mode	30 kHz SSB SCS, 40MHz bandwidth, TDD duplex mode
Note: The UE is only required to be tested in one of the supported test configurations.		

Configure the test equipment and the DUT according to the parameters in Table 6.1.1.2.4.1-2.

Table 6.1.1.2.4.1-2: Initial conditions for NR SA FR1-FR1 cell re-selection

Parameter	Value		Comment
Test environment	NC		As specified in TS 38.508-1 [14] clause 4.1.
Test frequencies	As specified in Annex E, table E.4-1 and TS 38.508-1 [14] clause 4.3.1.		
Channel bandwidth	As specified by the test configuration selected from Table 6.1.1.2.4.1-1.		
Propagation conditions	AWGN		As specified in Annex C.2.2.
Connection Diagram	TE Part	A.3.1.8.2	As specified in TS 38.508-1 [14] Annex A.
	DUT Part	A.3.2.3.4	
Exceptions to connection diagram	N/A		

1. The general test parameter settings are set up according to Table 6.1.1.2.4.1-3.

2. Message contents are defined in clause 6.1.1.2.4.3.

3. There is two NR carrier and 2 NR Cells specified in the test. Cell 2 is the PCell and Cell 1 is the neighbour cell in a different carrier than cell 2. Cell 1 and Cell 2 are configured according to Annex C.1.2.

Table 6.1.1.2.4.1-3: General test parameters for NR SA FR1-FR1 cell re-selection

Parameter		Unit	Test configuration	Value	Comment
Initial condition	Active cell		1, 2, 3	Cell2	The UE camps on cell 2 in the initial phase and during T1 period the UE reselects to cell 1
	Neighbour cell		1, 2, 3	Cell1	
T1 end condition	Active cell		1, 2, 3	Cell1	The UE shall perform reselection to cell 1 during T1
	Neighbour cells		1, 2, 3	Cell2	
T3 end condition	Active cell		1, 2, 3	Cell2	The UE shall perform reselection to cell 2 with higher priority during T3
	Neighbour cell		1, 2, 3	Cell1	
RF Channel Number			1, 2, 3	1, 2	
Time offset between cells			1	3 ms	Asynchronous cells
			2	3 µs	Synchronous cells
			3	3 µs	Synchronous cells
Access Barring Information		-	1, 2, 3	Not Sent	No additional delays in random access procedure.
SSB configuration			1	SSB.1 FR1	
			2	SSB.1 FR1	
			3	SSB.2 FR1	
SMTC configuration			1	SMTC 2	Configured in SIB4 of Cell 1
				SMTC.6	Configured in SIB4 of Cell 2
			2	SMTC 1	
			3	SMTC 1	
DRX cycle length		s	1, 2, 3	1.28	The value shall be used for all cells in the test.
PRACH configuration index			1, 2, 3	102	The detailed configuration is specified in TS 38.211 clause 6.3.3.2

rangeToBestCell		1, 2, 3	Not configured	
T1	s	1, 2, 3	15	T1 needs to be defined so that cell re-selection reaction time is taken into account.
T2	s	1, 2, 3	>7	During T2, cell 2 shall be powered off, and during the off time the physical cell identity shall be changed. The intention is to ensure that cell 2 has not been detected by the UE prior to the start of period T3.
T3	s	1, 2, 3	75	T3 needs to be defined so that cell re-selection reaction time is taken into account.

6.1.1.2.4.2 Test procedure

The test consists of one active cell and one neighbour cell. The UE is requested to monitor the neighbouring cell on one of the NR carriers. The test consists of three successive time periods, with time duration of T1, T2, and T3 respectively. Both cell 1 and cell 2 are already identified by the UE prior to the start of the test. Cell 1 and cell 2 belong to different tracking areas and cell 2 is of higher priority than cell 1.

In the following test procedure “UE responds” means “UE starts transmitting preamble on PRACH for sending the *RRCSetupRequest* message to perform a Registration procedure for mobility.

1. Ensure the UE is in state RRC_IDLE with generic procedure parameters connectivity *NR* with Test Mode *On* according to TS 38.508-1 [14] clause 4.5 on Cell 2.

2. Set the parameters according to T1 in Table 6.1.1.2.5-1. T1 starts.

3. The SS waits for random access requests information from the UE to perform cell re-selection on the lower priority cell, Cell 1.

4. If the UE responds on lower priority cell, Cell 1 during time duration T1 within 8 seconds from the beginning of time period T1, then count a success for the event “Re-select lower priority Cell 1”. Otherwise count a fail for the event “Re-select lower priority Cell 1”.

5. If the UE has re-selected Cell 1 within T1, after the re-selection or when T1 expires, continue with step 5a. Otherwise, if T1 expires and the UE has not yet re-selected Cell 1, the TE shall switch off and on the UE and skip to step 11.

5a. The SS shall send an *RRCRelease* message to ensure that the UE is in state RRC_IDLE on Cell 1.

6. The SS shall switch the power setting from T1 to T2 as specified in Table 6.1.1.2.5-1. T2 starts. During time duration T2, Cell 2 shall be powered OFF and the physical cell identity = ((current Cell 2 physical cell identity + 1) mod 1008) shall be changed to ensure Cell 2 is not detected by the UE.

7. When T2 expires, the SS shall switch the power setting from T2 to T3 as specified in Table 6.1.1.2.5-1. T3 starts.

8. The SS waits for random access requests information from the UE to perform cell re-selection on the higher priority cell, Cell 2.

9. If the UE responds on higher priority cell, Cell 2 during time duration T3 within 68 seconds from the beginning of time period T3, then count a success for the event “Re-select higher priority Cell 2”. Otherwise count a fail for the event “Re-select higher priority Cell 2”.

10. If the UE has re-selected Cell 2 within T3, after the re-selection or when T3 expires, continue with step 10a. Otherwise, if T3 expires and the UE has not yet re-selected Cell 2, the TE shall switch off and on the UE and skip to step 11.

10a. The SS shall send an *RRCRelease* message to ensure that the UE is in state RRC_IDLE on Cell 2.

11. Ensure the UE is in state RRC_IDLE with generic procedure parameters connectivity *NR* according to TS 38.508-1 [14] clause 4.5 on Cell 2.

12. Repeat step 2-11 until a test verdict has been achieved.
    Each of the events "Re-select lower priority Cell 1" and "Re-select higher priority Cell 2" is evaluated independently for the statistic, resulting in an event verdict: pass or fail. Each event is evaluated only until the confidence level according to Table G.2.3-1 in Annex G clause G.2 is achieved. Different events may require different times for a verdict.
    If both events pass, the test passes. If one event fails, the test fails.

6.1.1.2.4.3 Message contents

Message contents are according to TS 38.508-1 [14] clause 4.6 with the following exceptions:

Table 6.1.1.2.4.3-1: Common Exception messages

Default Message Contents	
Common contents of system information blocks exceptions	Table H.2.2-1 Table H.2.2-2 with Condition SSB.1 FR1, SMTC.2 and Asynchronous cells for configuration 6.1.1.2-1 and Cell 1 Table H.2.2-2 with Condition SSB.1 FR1, SMTC.6 and Asynchronous cells for configuration 6.1.1.2-1 and Cell 2 Table H.2.2-2 with Condition SSB.1 FR1, SMTC.1 and synchronous cells for configuration 6.1.1.2-2 Table H.2.2-2 with Condition SSB.2 FR1, SMTC.1 and synchronous cells for configuration 6.1.1.2-3 Table H.2.2-3
Default RRC messages and information elements contents exceptions	

6.1.1.2.5 Test requirement

Tables 6.1.1.2.4.1-3 and 6.1.1.2.5-1 define the primary level settings including test tolerances for inter frequency NR cell re-selection test case.

Table 6.1.1.2.5-1: Cell specific test parameters for NR SA FR1-FR1 cell re-selection

Parameter	Unit	Test configuration	Cell 1			Cell 2		
			T1	T2	T3	T1	T2	T3
TDD configuration		1	N/A			N/A		
		2	TDDConf.1.1			TDDConf.1.1		
		3	TDDConf.2.1			TDDConf.2.1		
PDSCH RMC configuration		1	SR.1.1 FDD			SR.1.1 FDD		
		2	SR.1.1 TDD			SR.1.1 TDD		
		3	SR.2.1 TDD			SR.2.1 TDD		
RMSI CORESET RMC configuration		1	CR.1.1 FDD			CR.1.1 FDD		
		2	CR.1.1 TDD			CR.1.1 TDD		
		3	CR.2.1 TDD			CR.2.1 TDD		
Dedicated CORESET RMC configuration		1	CCR.1.1 FDD			CCR.1.1 FDD		
		2	CCR.1.1 TDD			CCR.1.1 TDD		
		3	CCR.2.1 TDD			CCR.2.1 TDD		
OCNG Pattern		1, 2, 3	OP.1 defined in A.2.1-1			OP.1 defined in A.2.1-1		
Initial DL BWP configuration		1, 2, 3	DLBWP.0.1			DLBWP.0.1		
Initial UL BWP configuration		1, 2, 3	ULBWP.0.1			ULBWP.0.1		
RLM-RS		1, 2, 3	SSB			SSB		
Qrxlevmin	dBm/SCS	1, 2	-140			-140		
		3	-137			-137		
Pcompensation	dB	1, 2, 3	0			0		
Cell_selection_and_reselection_quality_measurement		1, 2, 3	SS-RSRP			SS-RSRP		
$\hat{E}_s / I_{ot}$	dB	1	15.6	15.6	15.6	-3.6	-infinity	13.6
		2						

Parameter	Unit	Test configuration	Cell 1			Cell 2		
			T1	T2	T3	T1	T2	T3
		3						
N_{oc} Note2	dBm/SCS	1	-98			-100	-98	-98
		2	-98			-100	-98	-98
		3	-95			-97	-95	-95
N_{oc} Note2	dBm/15 kHz	1	-98			-100	-98	-98
		2						
		3						
$\hat{E}_s / N_{oc}$	dB	1	15.6	15.6	15.6	-3.6	-infinity	13.6
		2						
		3						
SS-RSRP Note3	dBm/SCS	1	-82.4	-82.4	-82.4	-103.6	-infinity	-84.4
		2	-82.4	-82.4	-82.4	-103.6	-infinity	-84.4
		3	-79.39	-79.39	-79.39	-100.59	-infinity	-81.39
Io	dBm/9.36 MHz	1	-54.33	-54.33	-54.33	-70.46	-infinity	-56.26
	dBm/9.36 MHz	2	-54.33	-54.33	-54.33	-70.46	-infinity	-56.26
	dBm/38.16 MHz	3	-48.23	-48.23	-48.23	-67.37	-infinity	-53.17
Treselection	s	1, 2, 3	0	0	0	0	0	0
SnonintrasearchP	dB	1, 2, 3	50			50		
$Thresh_{x, highP}$	dB	1, 2, 3	48			48		
$Thresh_{serving, lowP}$	dB	1, 2, 3	44			44		
$Thresh_{x, lowP}$	dB	1, 2, 3	50			50		
Propagation Condition		1, 2, 3	AWGN					

Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.

Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for N_{oc} to be fulfilled.

Note 3: SS-RSRP levels have been derived from other parameters for information purposes. They are not settable parameters themselves.

The cell reselection delay to a higher priority cell is defined as the time from the beginning of time period T3, to the moment when the UE camps again on cell 2, and starts to send preambles on the PRACH for sending the *RRCSetupRequest* message to perform a Registration procedure for mobility and periodic registration update on cell 2.

The cell re-selection delay to a higher priority cell shall be less than 68 s.

The cell reselection delay to a lower priority cell is defined as the time from the beginning of time period T1, to the moment when the UE camps on cell 1, and starts to send preambles on the PRACH for sending the *RRCSetupRequest* message to perform a Registration procedure for mobility and periodic registration updateon cell 1.

The cell re-selection delay to a lower priority cell shall be less than 8 s.

The rate of correct cell reselections observed during repeated tests shall be at least 90%.

NOTE: The cell re-selection delay to a higher priority cell can be expressed as: $T_{higher_priority_search} + T_{evaluate, NR_ inter} + T_{SI\text{-}NR}$, and to a lower priority cell can be expressed as: $T_{evaluate, NR_ inter} + T_{SI\text{-}NR}$,

Where:

$T_{higher_priority_search}$ See clause 4.2.2.7 of TS 38.133 [6]

$T_{evaluate, NR_ inter}$ See Table 4.2.2.4-1 in clause 4.2.2.4 of TS 38.133 [6]

$T_{SI\text{-}NR}$ Maximum repetition period of relevant system info blocks that needs to be received by the UE to camp on a cell; 1280 ms is assumed in this test case.

This gives a total of 67.68 s, allow 68 s for the cell re-selection delay to a higher priority cell and 7.68 s for the cell re-selection delay to a lower priority cell in the test case, which we allow 8 s.

For the test to pass, both events above shall pass.

The statistical pass/fail decisions are done separated for each event. For an event to pass, the total number of successful loops shall be more than 90% of the cases with a confidence level of 95%.

6.1.1.3 NR SA FR1 cell re-selection for UE fulfilling low mobility relaxed measurement criterion

6.1.1.3.1 Test purpose

The purpose of this test is to verify the requirement for the intra frequency NR cell reselection requirements for UE fulfilling low mobility criterion specified in TS 38.133 [6] clause 4.2.2.9.2.

6.1.1.3.2 Test applicability

This test applies to all types of NR UE from release 16 onwards and supporting relaxed measurement.

6.1.1.3.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 6.1.1.0.3.

The normative reference for this requirement is TS 38.133 [6] clause A.6.1.1.3.

6.1.1.3.4 Test description

6.1.1.3.4.1 Initial conditions

This test shall be run in one of the configurations defined in Table 6.1.1.3.4.1-1.

Table 6.1.1.3.4.1-1: Supported test configurations for NR SA FR1 cell re-selection for UE fulfilling low mobility relaxed measurement criterion

Configuration	Description
6.1.1.3-1	15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode
6.1.1.3-2	15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode
6.1.1.3-3	30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode
Note: The UE is only required to be tested in one of the supported test configurations.	

Configure the test equipment and the DUT according to the parameters in Table 6.1.1.3.4.1-2.

Table 6.1.1.3.4.1-2: Initial conditions for NR SA FR1 cell re-selection for UE fulfilling low mobility relaxed measurement criterion

Parameter	Value		Comment
Test environment	NC		As specified in TS 38.508-1 [14] clause 4.1.
Test frequencies	As specified in Annex E, table E.4-1 and TS 38.508-1 [14] clause 4.3.1.		
Channel bandwidth	As specified by the test configuration selected from Table 6.1.1.3.4.1-1.		
Propagation conditions	AWGN		As specified in Annex C.2.2.
Connection Diagram	TE Part	A.3.1.8.2	As specified in TS 38.508-1 [14] Annex A.
	DUT Part	A.3.2.3.4	
Exceptions to connection diagram	- Without LTE link - For 4Rx capable UEs without any 2Rx RF bands use A.3.2.5.2 for DUT part and A.3.1.8.4 for TE part.		

1. The general test parameter settings are set up according to Table 6.1.1.3.4.1-3.

2. Message contents are defined in clause 6.1.1.3.4.3.

3. There is one NR carrier and 2 NR Cells specified in the test. Cell 1 is the PCell and Cell 2 is the neighbour cell. Cell 1 and Cell 2 are configured according to Annex C.1.1 and C.1.2.

Table 6.1.1.3.4.1-3: General test parameters for NR SA FR1 cell re-selection for UE fulfilling low mobility relaxed measurement criterion

Parameter	Unit	Test configuration	Value	Comment

Initial condition	Active cell		1, 2, 3	Cell1	The UE camps on cell 1 in the initial phase
	Neighbour cells		1, 2, 3	Cell2	
T1 end condition	Active cell		1, 2, 3	Cell2	The UE reselects to cell 2 during T1 period
	Neighbour cells		1, 2, 3	Cell1	
Final condition	Active cell		1, 2, 3	Cell1	The UE reselects to cell 1 during T2 period
	Neighbour cells		1, 2, 3	Cell2	
RF Channel Number			1, 2, 3	1	
Time offset between cells			1	3 ms	Asynchronous cells
			2	3 μs	Synchronous cells
			3	3 μs	Synchronous cells
Access Barring Information		-	1, 2, 3	Not Sent	No additional delays in random access procedure.
SSB configuration			1	SSB.1 FR1	
			2	SSB.1 FR1	
			3	SSB.2 FR1	
SMTC configuration			1	SMTC pattern 2	Configured in SIB2 of Cell 1
				SMTC pattern 6	Configured in SIB2 of Cell 2
			2	SMTC pattern 1	
			3	SMTC pattern 1	
DRX cycle length		s	1, 2, 3	0.64	The value shall be used for all cells in the test.
PRACH configuration index			1, 2, 3	102	The detailed configuration is specified in TS 38.211 clause 6.3.3.2
rangeToBestCell			1, 2, 3	Not configured	
T1		s	1, 2, 3	25	T1 needs to be defined so that cell re-selection reaction time is taken into account.
T2		s	1, 2, 3	25	T2 needs to be defined so that cell re-selection reaction time is taken into account.

6.1.1.3.4.2 Test procedure

Two cells are deployed in the test, which are one FR1 NR PCell (Cell 1) and an NR neighbour cell (Cell 2) on the same frequency. The test consists of 2 successive time periods, with time duration of T1, and T2 respectively. Both cell 1 and cell 2 are already identified by the UE prior to the start of the test. Cell 1 and cell 2 belong to different tracking areas. Furthermore, UE has not registered with network for the tracking area containing cell 2.

In the following test procedure "UE responds" means "UE starts transmitting preamble on PRACH for sending the *RRCSetupRequest* message to perform a Registration procedure for mobility.

Ensure the UE is in state RRC_IDLE with generic procedure parameters connectivity *NR* with Test Mode *On* according to TS 38.508-1 [14] clause 4.5 on Cell 1. *lowMobilityEvaluation-r16* is provided in SIB2 of Cell 1 and Cell 2. Set Cell 2 physical cell identity = initial cell 2 physical cell identity.

SIB2 of Cell 1 and Cell 2 are configured as follows:

- *lowMobilityEvaluation-r16* is configured according to the parameters listed in Table 6.1.1.3.5-1.
- *cellEdgeEvaluation-r16* and *combineRelaxedMeasCondition* are not configured.

1. Set the parameters according to T2 in Table 6.1.1.3.5-1. Then wait 54s to ensure that Cell 2 has been detected by the UE.
2. Set the parameters according to T1 in Table 6.1.1.3.5-1. T1 starts.
3. The SS waits for random access requests information from the UE to perform cell re-selection to Cell 2.

4. If the UE responds on Cell 2 within 17 seconds from the beginning of time period T1, then count a success for the event “Re-select Cell 2”. Otherwise count a fail for the event “Re-select Cell 2”.

5. If the UE has re-selected Cell 2 within T1, after the re-selection or when T1 expires, continue with step 7. Otherwise, if T2 expires and the UE has not yet re-selected Cell 2, the TE shall switch off and on the UE and skip to step 13.

6. The SS shall send an *RRCRelease* message to ensure that the UE is in state RRC_IDLE on Cell 2.

7. The SS shall switch the power setting from T1 to T2 as specified in Table 6.1.1.3.5-1. T2 starts.

8. The SS waits for random access requests information from the UE to perform cell re-selection to Cell 1.

9. If the UE responds on Cell 1 within 17 seconds from the beginning of time period T2, then count a success for the event “Re-select Cell 1”. Otherwise count a fail for the event “Re-select Cell 1”.

10. If the UE has re-selected Cell 1 within T2, after the re-selection or when T2 expires, continue with step 12. Otherwise, if T2 expires and the UE has not yet re-selected Cell 1, the TE shall switch off and on the UE and skip to step 13.

11. The SS shall send an *RRCRelease* message to ensure that the UE is in state RRC_IDLE on Cell 1. skip to 15

12. Ensure the UE is in state RRC_IDLE with generic procedure parameters connectivity *NR* according to TS 38.508-1 [14] clause 4.5 in Cell 1.

13. Set the parameters according to T2 in Table 6.1.1.3.5-1. Then wait 54s to ensure that Cell 2 has been detected by the UE.

14. Repeat step 2-14 until a test verdict has been achieved. Each of the events “Re-select Cell 2” and “Re-select Cell 1” is evaluated independently for the statistic, resulting in an event verdict: pass or fail. Each event is evaluated only until the confidence level according to Table G.2.3-1 in Annex G clause G.2 is achieved. Different events may require different times for a verdict. If both events pass, the test passes. If one event fails, the test fails.

6.1.1.3.4.3 Message contents

Message contents are according to TS 38.508-1 [14] clause 7.3 with the following exceptions:

Table 6.1.1.3.4.3-1: Common Exception messages

Default Message Contents	
Common contents of system information blocks exceptions	Table H.2.1-2
Default RRC messages and information elements contents exceptions	

Table 6.1.1.3.4.3-2: SIB1 (Cell 1 and Cell 2)

Derivation Path: Table H.2.1-3			
Information Element	**Value/remark**	**Comment**	**Condition**
SIB1 ::= SEQUENCE {			
servingCellConfigCommon SEQUENCE {			
downlinkConfigCommon SEQUENCE {			
pcch-Config SEQUENCE {			
defaultPagingCycle	rf64		
}			
}			
}			
}			

Table 6.1.1.3.4.3-3: SIB2 (Cell 1)

Derivation Path: Table H.2.1-1			
Information Element	**Value/remark**	**Comment**	**Condition**

SIB2 ::= SEQUENCE {			
intraFreqCellReselectionInfo SEQUENCE {			
smtc	SSB-MTC specified in 38.508-1 [14] Table 7.3.1-3 with condition SMTC.2		6.1.1.3-1
	SSB-MTC specified in 38.508-1 [14] Table 7.3.1-3 with condition SMTC.1		6.1.1.3-2, 6.1.1.3-3
deriveSSB-IndexFromCell	false		6.1.1.3-1
	true		6.1.1.3-2, 6.1.1.3-3
}			
relaxedMeasurement-r16 SEQUENCE {			
lowMobilityEvaluation-r16 SEQUENCE {			
s-SearchDeltaP-r16	dB6		
t-SearchDeltaP-r16	s5		
}			
cellEdgeEvaluation-r16	Not present		
combineRelaxedMeasCondition-r16	Not present		
highPriorityMeasRelax-r16	Not present		
}			
}			

Table 6.1.1.3.4.3-4: SIB2 (Cell 2)

Derivation Path: Table H.2.1-1			
Information Element	**Value/remark**	**Comment**	**Condition**
SIB2 ::= SEQUENCE {			
intraFreqCellReselectionInfo SEQUENCE {			
smtc	SSB-MTC specified in 38.508-1 [14] Table 7.3.1-3 with condition SMTC.6		6.1.1.3-1
	SSB-MTC specified in 38.508-1 [14] Table 7.3.1-3 with condition SMTC.1		6.1.1.3-2, 6.1.1.3-3
deriveSSB-IndexFromCell	false		6.1.1.3-1
	true		6.1.1.3-2, 6.1.1.3-3
}			
relaxedMeasurement-r16 SEQUENCE {			
lowMobilityEvaluation-r16 SEQUENCE {			
s-SearchDeltaP-r16	dB6		
t-SearchDeltaP-r16	s5		
}			
cellEdgeEvaluation-r16	Not present		
combineRelaxedMeasCondition-r16	Not present		
highPriorityMeasRelax-r16	Not present		
}			
}			

6.1.1.3.5 Test requirement

Tables 6.1.1.3.4.1-3 and 6.1.1.3.5-1 define the primary level settings including test tolerances for NR SA FR1 cell re-selection for UE fulfilling low mobility relaxed measurement criterion test case.

Table 6.1.1.3.5-1: Cell specific test parameters for NR SA FR1 cell re-selection for UE fulfilling low mobility relaxed measurement criterion

Parameter	Unit	Test configuration	Cell 1		Cell 2	
			T1	T2	T1	T2
TDD configuration		1	N/A		N/A	
		2	TDDConf.1.1		TDDConf.1.1	
		3	TDDConf.2.1		TDDConf.2.1	
PDSCH RMC configuration		1	SR.1.1 FDD		N/A	

		2	SR.1.1 TDD			
		3	SR.2.1 TDD			
RMSI CORESET RMC configuration		1	CR.1.1 FDD		CR.1.1 FDD	
		2	CR.1.1 TDD		CR.1.1 TDD	
		3	CR.2.1 TDD		CR.2.1 TDD	
Dedicated CORESET RMC configuration		1	CCR.1.1 FDD		CCR.1.1 FDD	
		2	CCR.1.1 TDD		CCR.1.1 TDD	
		3	CCR.2.1 TDD		CCR.2.1 TDD	
OCNG Pattern		1, 2, 3	OP.1 defined in A.3.2.1		OP.1 defined in A.3.2.1	
Initial DL BWP configuration		1, 2, 3	DLBWP.0.1		DLBWP.0.1	
Initial UL BWP configuration		1, 2, 3	ULBWP.0.1		ULBWP.0.1	
RLM-RS		1, 2, 3	SSB		SSB	
Qrxlevmin	dBm/SCS	1, 2	-140		-140	
		3	-137		-137	
Pcompensation	dB	1, 2, 3	0		0	
$Qhyst_s$	dB	1, 2, 3	0		0	
$Qoffset_{s,n}$	dB	1, 2, 3	0		0	
$S_{SearchDeltaP}$	dB	1, 2, 3	6		6	
$T_{SearchDeltaP}$	s	1, 2, 3	5		5	
Cell_selection_and_reselection_quality_measurement		1, 2, 3	SS-RSRP		SS-RSRP	
$\hat{E}_s / I_{ot}$	dB	1, 2, 3	-3.56	3.22	3.22	-3.56
N_{oc} Note2	dBm/SCS	1	-98			
		2	-98			
		3	-95			
N_{oc} Note2	dBm/15 kHz	1, 2, 3	-98			
$\hat{E}_s / N_{oc}$	dB	1, 2, 3	12.55	16	16	12.55
SS-RSRP Note3	dBm/SCS	1	-85.45	-82	-82	-85.45
		2	-85.45	-82	-82	-85.45
		3	-82.45	-79	-79	-82.45
Io	dBm/9.36 MHz	1	-52.35	-52.35	specified in Cell 1 columns-	
	dBm/9.36 MHz	2	-52.35	-52.35		
	dBm/38.16 MHz	3	-46.25	-46.25		
Treselection	s	1, 2, 3	0	0	0	0
SintrasearchP	dB	1, 2, 3	60		60	
Propagation Condition		1, 2, 3	AWGN			

Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.

Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for N_{oc} to be fulfilled.

Note 3: SS-RSRP levels have been derived from other parameters for information purposes. They are not settable parameters themselves.

The cell re-selection delay to detected cell for UE fulfilling low mobility criterion is defined as the time from the beginning of time period T1, to the moment when the UE camps on Cell 2, and starts to send preambles on the PRACH for sending the *RRCSetupRequest* message to perform a Registration procedure for mobility and periodic registration update on Cell 2.

The cell re-selection delay to detected cell for UE fulfilling low mobility criterion is also defined as the time from the beginning of time period T2, to the moment when the UE camps on Cell 1, and starts to send preambles on the PRACH for sending the *RRCSetupRequest* message to perform a Registration procedure for mobility and periodic registration update on Cell 1.

The cell re-selection delay to a detected cell test requirement for UE fulfilling low mobility criterion in this case is expressed as:

Cell re-selection delay to an already detected cell = $T_{evaluate,NR_Intra} + T_{SI-NR}$

$T_{evaluate,NR_Intra}$ = 15.36 s; as specified in TS 38.133 [6] Table 4.2.2.9.2-1.

T_{SI-NR} = 1.28 s; maximum repetition period of relevant system info blocks that needs to be received by the UE to camp on a cell is assumed in this test.

This gives a total of 16.64 s, allow 17 s for the cell re-selection delay to an already detected cell for UE fulfilling low mobility criterion in the test case.

For the test to pass, both events above shall pass.

The statistical pass/fail decisions are done separated for each event. For an event to pass, the total number of successful loops shall be more than 90% of the cases with a confidence level of 95%.

6.1.1.4 NR SA FR1 cell re-selection for UE fulfilling not-at-cell edge relaxed measurement criterion

6.1.1.4.1 Test purpose

The purpose of this test is to verify the requirement for the intra frequency NR cell reselection requirements for UE fulfilling not-at-cell edge criterion specified in TS 38.133 [6] clause 4.2.2.9.3.

6.1.1.4.2 Test applicability

This test applies to all types of NR UE from release 16 onwards and supporting relaxed measurement.

6.1.1.4.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 6.1.1.0.3.

The normative reference for this requirement is TS 38.133 [6] clause A.6.1.1.4.

6.1.1.4.4 Test description

6.1.1.4.4.1 Initial conditions

This test shall be run in one of the configurations defined in Table 6.1.1.4.4.1-1.

Table 6.1.1.4.4.1-1: Supported test configurations for NR SA FR1 cell re-selection for UE fulfilling not-at-cell edge relaxed measurement criterion

Configuration	Description
6.1.1.4-1	15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode
6.1.1.4-2	15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode
6.1.1.4-3	30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode
Note: The UE is only required to be tested in one of the supported test configurations.	

Configure the test equipment and the DUT according to the parameters in Table 6.1.1.4.4.1-2.

Table 6.1.1.4.4.1-2: Initial conditions for NR SA FR1 cell re-selection for UE fulfilling not-at-cell edge relaxed measurement criterion

Parameter	Value		Comment
Test environment	NC		As specified in TS 38.508-1 [14] clause 4.1.
Test frequencies	As specified in Annex E, table E.4-1 and TS 38.508-1 [14] clause 4.3.1.		
Channel bandwidth	As specified by the test configuration selected from Table 6.1.1.4.4.1-1.		
Propagation conditions	AWGN		As specified in Annex C.2.2.
Connection Diagram	TE Part	A.3.1.8.2	As specified in TS 38.508-1 [14] Annex A.
	DUT Part	A.3.2.3.4	
Exceptions to connection diagram	- Without LTE link - For 4Rx capable UEs without any 2Rx RF bands use A.3.2.5.2 for DUT part and A.3.1.8.4 for TE part.		

1. The general test parameter settings are set up according to Table 6.1.1.4.4.1-3.

2. Message contents are defined in clause 6.1.1.4.4.3.

3. There is one NR carrier and 2 NR Cells specified in the test. Cell 1 is the PCell and Cell 2 is the neighbour cell. Cell 1 and Cell 2 are configured according to Annex C.1.1 and C.1.2.

Table 6.1.1.4.4.1-3: General test parameters for NR SA FR1 cell re-selection for UE fulfilling not-at-cell edge relaxed measurement criterion

Parameter		Unit	Test configuration	Value	Comment
Initial condition	Active Cell		1, 2, 3	Cell1	The UE camps on Cell 1 in the initial phase
	Neighbour Cells		1, 2, 3	Cell2	
T1 end condition	Active Cell		1, 2, 3	Cell2	The UE shall fulfil the not-at-cell edge criterion and reselect to cell 2 during T1 period during T1.
	Neighbour Cells		1, 2, 3	Cell1	
T2 end condition	Active Cell		1, 2, 3	Cell1	The UE shall perform reselection to Cell 1 during T2
	Neighbour Cells		1, 2, 3	Cell2	
RF Channel Number			1, 2, 3	1	
Time offset between Cells			1	3 ms	Asynchronous Cells
			2	3 µs	Synchronous Cells
			3	3 µs	Synchronous Cells
Access Barring Information		-	1, 2, 3	Not Sent	No additional delays in random access procedure.
SSB configuration			1	SSB.1 FR1	
			2	SSB.1 FR1	
			3	SSB.2 FR1	
SMTC configuration			1	SMTC pattern 2	Configured in SIB2 of Cell 1
				SMTC pattern 6	Configured in SIB2 of Cell 2
			2	SMTC pattern 1	
			3	SMTC pattern 1	
DRX cycle length		s	1, 2, 3	0.64	The value shall be used for all Cells in the test.
PRACH configuration index			1, 2, 3	102	The detailed configuration is specified in TS 38.211 clause 6.3.3.2
rangeToBestCell			1, 2, 3	Not configured	
T1		s	1, 2, 3	20	T1 needs to be defined so that Cell re-selection reaction time is taken into account.
T2		s	1, 2, 3	20	T2 needs to be defined so that Cell re-selection reaction time is taken into account.

6.1.1.4.4.2 Test procedure

Two cells are deployed in the test, which are one FR1 NR PCell (Cell 1) and an NR neighbour cell (Cell 2) on the same frequency. The test consists of 2 successive time periods, with time duration of T1, and T2 respectively. Both cell 1 and cell 2 are already identified by the UE prior to the start of the test. Cell 1 and cell 2 belong to different tracking areas. Furthermore, UE has not registered with network for the tracking area containing cell 2.

In the following test procedure "UE responds" means "UE starts transmitting preamble on PRACH for sending the *RRCSetupRequest* message to perform a Registration procedure for mobility.

1. Ensure the UE is in state RRC_IDLE with generic procedure parameters connectivity *NR* with Test Mode *On* according to TS 38.508-1 [14] clause 4.5 on Cell 1. *cellEdgeEvaluation-r16* is provided in SIB2 of Cell 1 and Cell 2. Set Cell 2 physical cell identity = initial cell 2 physical cell identity.

2. Set the parameters according to T2 in Table 6.1.1.4.5-1. Then wait 54s to ensure that Cell 2 has been detected by the UE.
3. Set the parameters according to T1 in Table 6.1.1.4.5-1. T1 starts.
4. The SS waits for random access requests information from the UE to perform cell re-selection to Cell 2.
5. If the UE responds on Cell 2 within 17 seconds from the beginning of time period T1, then count a success for the event “Re-select Cell 2”. Otherwise count a fail for the event “Re-select Cell 2”.
6. If the UE has re-selected Cell 2 within T1, after the re-selection or when T1 expires, continue with step 7. Otherwise, if T2 expires and the UE has not yet re-selected Cell 2, the TE shall switch off and on the UE and skip to step 13.
7. The SS shall send an *RRCRelease* message to ensure that the UE is in state RRC_IDLE on Cell 2.
8. The SS shall switch the power setting from T1 to T2 as specified in Table 6.1.1.4.5-1. T2 starts.
9. The SS waits for random access requests information from the UE to perform cell re-selection to Cell 1.
10. If the UE responds on Cell 1 within 17 seconds from the beginning of time period T2, then count a success for the event “Re-select Cell 1”. Otherwise count a fail for the event “Re-select Cell 1”.
11. If the UE has re-selected Cell 1 within T2, after the re-selection or when T2 expires, continue with step 12. Otherwise, if T2 expires and the UE has not yet re-selected Cell 1, the TE shall switch off and on the UE and skip to step 13.
12. The SS shall send an *RRCRelease* message to ensure that the UE is in state RRC_IDLE on Cell 1. skip to 15
13. Ensure the UE is in state RRC_IDLE with generic procedure parameters connectivity *NR* according to TS 38.508-1 [14] clause 4.5 in Cell 1.
14. Set the parameters according to T2 in Table 6.1.1.4.5-1. Then wait 54s to ensure that Cell 2 has been detected by the UE.
15. Repeat step 2-14 until a test verdict has been achieved. Each of the events “Re-select Cell 2” and “Re-select Cell 1” is evaluated independently for the statistic, resulting in an event verdict: pass or fail. Each event is evaluated only until the confidence level according to Table G.2.3-1 in Annex G clause G.2 is achieved. Different events may require different times for a verdict. If both events pass, the test passes. If one event fails, the test fails.

6.1.1.4.4.3 Message contents

Message contents are according to TS 38.508-1 [14] clause 7.3 with the following exceptions:

Table 6.1.1.4.4.3-1: Common Exception messages

Default Message Contents	
Common contents of system information blocks exceptions	Table H.2.1-2
Default RRC messages and information elements contents exceptions	

Table 6.1.1.4.4.3-2: SIB1 (Cell 1 and Cell 2)

Derivation Path: TS 38.508-1 [14], Table 4.6.1-28			
Information Element	**Value/remark**	**Comment**	**Condition**
SIB1 ::= SEQUENCE {			
servingCellConfigCommon SEQUENCE {			
downlinkConfigCommon SEQUENCE {			
pcch-Config SEQUENCE {			
defaultPagingCycle	rf64		
}			
}			
}			

}			

Table 6.1.1.4.4.3-3: SIB2 (Cell 1)

Derivation Path: Table H.2.1-1			
Information Element	**Value/remark**	**Comment**	**Condition**
SIB2 ::= SEQUENCE {			
intraFreqCellReselectionInfo SEQUENCE {			
smtc	SSB-MTC specified in 38.508-1 [14] Table 7.3.1-3 with condition SMTC.2		6.1.1.4-1
	SSB-MTC specified in 38.508-1 [14] Table 7.3.1-3 with condition SMTC.1		6.1.1.4-2, 6.1.1.4-3
deriveSSB-IndexFromCell	false		6.1.1.4-1
	true		6.1.1.4-2, 6.1.1.4-3
}			
relaxedMeasurement-r16 SEQUENCE {			
cellEdgeEvaluation-r16 SEQUENCE {			
s-SearchThresholdP-r16	25	Actual value is 35*2 = 50dB	T1
	Not present		T2
s-SearchThresholdQ-r16	Not present		
}			
cellEdgeEvaluation-r16	Not present		
combineRelaxedMeasCondition-r16	Not present		
highPriorityMeasRelax-r16	Not present		
}			
}			

Table 6.1.1.4.4.3-4: SIB2 (Cell 2)

Derivation Path: Table H.2.1-1			
Information Element	**Value/remark**	**Comment**	**Condition**
SIB2 ::= SEQUENCE {			
intraFreqCellReselectionInfo SEQUENCE {			
smtc	SSB-MTC specified in 38.508-1 [14] Table 7.3.1-3 with condition SMTC.6		6.1.1.4-1
	SSB-MTC specified in 38.508-1 [14] Table 7.3.1-3 with condition SMTC.1		6.1.1.4-2, 6.1.1.4-3
deriveSSB-IndexFromCell	false		6.1.1.4-1
	true		6.1.1.4-2, 6.1.1.4-3
}			
relaxedMeasurement-r16 SEQUENCE {			
cellEdgeEvaluation-r16 SEQUENCE {			
s-SearchThresholdP-r16	25	Actual value is 35*2 = 50dB	T2
	Not present		T1
s-SearchThresholdQ-r16	Not present		
}			
cellEdgeEvaluation-r16	Not present		
combineRelaxedMeasCondition-r16	Not present		
highPriorityMeasRelax-r16	Not present		
}			
}			

6.1.1.4.5 Test requirement

Tables 6.1.1.4.4.1-3 and 6.1.1.4.5-1 define the primary level settings including test tolerances for NR SA FR1 cell re-selection for UE fulfilling not-at-cell edge relaxed measurement criterion test case.

Table 6.1.1.4.5-1: Cell specific test parameters for NR SA FR1 cell re-selection for UE fulfilling not-at-cell edge relaxed measurement criterion

Parameter	Unit	Test configuration	Cell 1		Cell 2	
			T1	T2	T1	T2
TDD configuration		1	N/A		N/A	
		2	TDDConf.1.1		TDDConf.1.1	
		3	TDDConf.2.1		TDDConf.2.1	
PDSCH RMC configuration		1	SR.1.1 FDD		N/A	
		2	SR.1.1 TDD			
		3	SR.2.1 TDD			
RMSI CORESET RMC configuration		1	CR.1.1 FDD		CR.1.1 FDD	
		2	CR.1.1 TDD		CR.1.1 TDD	
		3	CR.2.1 TDD		CR.2.1 TDD	
Dedicated CORESET RMC configuration		1	CCR.1.1 FDD		CCR.1.1 FDD	
		2	CCR.1.1 TDD		CCR.1.1 TDD	
		3	CCR.2.1 TDD		CCR.2.1 TDD	
OCNG Pattern		1, 2, 3	OP.1 defined in A.3.2.1		OP.1 defined in A.3.2.1	
Initial DL BWP configuration		1, 2, 3	DLBWP.0.1		DLBWP.0.1	
Initial UL BWP configuration		1, 2, 3	ULBWP.0.1		ULBWP.0.1	
RLM-RS		1, 2, 3	SSB		SSB	
Qrxlevmin	dBm/SCS	1, 2	-140		-140	
		3	-137		-137	
Pcompensation	dB	1, 2, 3	0		0	
$Qhyst_s$	dB	1, 2, 3	0		0	
$Qoffset_{s,n}$	dB	1, 2, 3	0		0	
Cell_selection_and_reselection_quality_measurement		1, 2, 3	SS-RSRP		SS-RSRP	
$\hat{E}_s / I_{ot}$	dB	1	-3.56	3.22	3.22	-3.56
		2				
		3				
N_{oc} Note2	dBm/SCS	1	-98			
		2	-98			
		3	-95			
N_{oc} Note2	dBm/15 kHz	1	-98			
		2				
		3				
$\hat{E}_s / N_{oc}$	dB	1	12.55	16	16	12.55
		2				
		3				
SS-RSRP Note3	dBm/SCS	1	-85.45	-82	-82	-85.45
		2	-85.45	-82	-82	-85.45
		3	-82.45	-79	-79	-82.45
Io	dBm/9.36 MHz	1	-52.35	-52.35	-52.35	-52.35
	dBm/9.36 MHz	2	-52.35	-52.35	-52.35	-52.35
	dBm/38.16 MHz	3	-46.25	-46.25	-46.25	-46.25
Treselection	s	1, 2, 3	0	0	0	0
SintrasearchP	dB	1, 2, 3	60		60	
$S_{searchThresholdP}$	dB	1, 2, 3	50	Not sent	Not sent	50

Parameter	Unit	Test configuration	Cell 1		Cell 2	
			T1	T2	T1	T2
Propagation Condition		1, 2, 3	AWGN			
Note 1: OCNG shall be used such that both Cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.						
Note 2: Interference from other Cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for N_{oc} to be fulfilled.						
Note 3: SS-RSRP levels have been derived from other parameters for information purposes. They are not settable parameters themselves.						

The cell re-selection delay to detected cell for UE fulfilling not-at-cell edge criterion is defined as the time from the beginning of time period T1, to the moment when the UE camps on Cell 2, and starts to send preambles on the PRACH for sending the *RRCSetupRequest* message to perform a Registration procedure for mobility and periodic registration update on Cell 2.

The cell re-selection delay to detected cell for UE fulfilling not-at-cell edge criterion is also defined as the time from the beginning of time period T2, to the moment when the UE camps on Cell 1, and starts to send preambles on the PRACH for sending the *RRCSetupRequest* message to perform a Registration procedure for mobility and periodic registration update on Cell 1.

The cell re-selection delay to a detected cell test requirement for UE fulfilling not-at-cell edge criterion in this case is expressed as:

Cell re-selection delay to a detected cell = $T_{evaluate,NR_Intra} + T_{SI-NR}$

$T_{evaluate,NR_Intra}$ = 15.36 s; as specified in TS 38.133 [6] Table 4.2.2.9.3-1.

T_{SI-NR} = 1.28 s; maximum repetition period of relevant system info blocks that needs to be received by the UE to camp on a cell is assumed in this test.

This gives a total of 16.64 s, allow 17 s for the cell re-selection delay to an already detected cell for UE fulfilling not-at-cell edge criterion in the test case.

For the test to pass, both events above shall pass.

The statistical pass/fail decisions are done separated for each event. For an event to pass, the total number of successful loops shall be more than 90% of the cases with a confidence level of 95%.

6.1.1.5 NR SA FR1-FR1 cell re-selection for UE fulfilling low mobility relaxed measurement criterion

6.1.1.5.1 Test purpose

The purpose of this test is to verify the requirement for the inter-frequency NR cell reselection requirements for UE fulfilling low mobility criterion specified in TS 38.133 [6] clause 4.2.2.10.2.

6.1.1.5.2 Test applicability

This test applies to all types of NR UE from release 16 onwards and supporting relaxed measurement.

6.1.1.5.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 6.1.1.0.4.

The normative reference for this requirement is TS 38.133 [6] clause A.6.1.1.5.

6.1.1.5.4 Test description

6.1.1.5.4.1 Initial conditions

This test shall be run in one of the configurations defined in Table 6.1.1.5.4.1-1.

Table 6.1.1.5.4.1-1: Supported test configurations for NR SA FR1-FR1 cell re-selection for UE fulfilling low mobility relaxed measurement criterion

Configuration	Description of serving cell	Description of target cell
6.1.1.5-1	15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode	15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode
6.1.1.5-2	15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode	15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode
6.1.1.5-3	30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode	30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode
Note: The UE is only required to be tested in one of the supported test configurations.		

Configure the test equipment and the DUT according to the parameters in Table 6.1.1.5.4.1-2.

Table 6.1.1.5.4.1-2: Initial conditions for NR SA FR1-FR1 cell re-selection for UE fulfilling low mobility relaxed measurement criterion

Parameter	Value		Comment
Test environment	NC		As specified in TS 38.508-1 [14] clause 4.1.
Test frequencies	As specified in Annex E, table E.4-1 and TS 38.508-1 [14] clause 4.3.1.		
Channel bandwidth	As specified by the test configuration selected from Table 6.1.1.5.4.1-1.		
Propagation conditions	AWGN		As specified in Annex C.2.2.
Connection Diagram	TE Part	A.3.1.8.2	As specified in TS 38.508-1 [14] Annex A.
	DUT Part	A.3.2.3.4	
Exceptions to connection diagram	- Without LTE link - For 4Rx capable UEs without any 2Rx RF bands use A.3.2.5.2 for DUT part and A.3.1.8.4 for TE part.		

1. The general test parameter settings are set up according to Table 6.1.1.5.4.1-3.

2. Message contents are defined in clause 6.1.1.5.4.3.

3. There is 2 NR carriers and 2 NR Cells specified in the test. Cell 1 is the PCell and Cell 2 is the neighbour cell. Cell 1 and Cell 2 are configured according to Annex C.1.1 and C.1.2.

Table 6.1.1.5.4.1-3: General test parameters for NR SA FR1-FR1 cell re-selection for UE fulfilling low mobility relaxed measurement criterion

Parameter		Unit	Test configuration	Value	Comment
Initial condition	Active cell		1, 2, 3	Cell2	The UE camps on cell 2 in the initial phase, it fulfils Low Mobility relaxation measurements criterion, and during T1 period the UE reselects to cell 1
	Neighbour cells		1, 2, 3	Cell1	
T1 end condition	Active cell		1, 2, 3	Cell1	The UE shall perform reselection to cell 1 during T1
	Neighbour cells		1, 2, 3	Cell2	
T2 end condition	Active cell		1, 2, 3	Cell2	The UE shall perform reselection to cell 2 with higher priority during T2
	Neighbour cells		1, 2, 3	Cell1	
RF Channel Number			1, 2, 3	1, 2	
Time offset between cells			1	3 ms	Asynchronous cells
			2	3 µs	Synchronous cells
			3	3 µs	Synchronous cells
Access Barring Information		-	1, 2, 3	Not Sent	No additional delays in random access procedure.
SSB Configuration			1	SSB.1 FR1	
			2	SSB.1 FR1	
			3	SSB.2 FR1	
SMTC configuration			1	SMTC pattern 2	Configured in SIB4 of Cell 1
				SMTC pattern 6	Configured in SIB4 of Cell 2
			2	SMTC pattern 1	

Parameter	Unit	Test configuration	Value	Comment
		3	SMTC pattern 1	
DRX cycle length	s	1, 2, 3	0.64	The value shall be used for all cells in the test.
PRACH configuration index		1, 2, 3	102	The detailed configuration is specified in TS 38.211 clause 6.3.3.2
rangeToBestCell		1, 2, 3	Not configured	
T1	s	1, 2, 3	25 s	T1 is defined so that cell re-selection reaction time is taken into account.
T2	s	1, 2, 3	25 s	T2 is defined so that cell re-selection reaction time is taken into account.

6.1.1.5.4.2 Test procedure

Two cells are deployed in the test, which are one FR1 NR Cell 1 and Cell 2 on different frequencies. The test consists of 2 successive time periods, with time duration of T1, and T2 respectively. Both cell 1 and cell 2 are already identified by the UE prior to the start of the test. Cell 1 and cell 2 belong to different tracking areas and Cell 2 is of higher priority than Cell 1. Furthermore, UE has not registered with network for the tracking area containing cell 1.

In the following test procedure "UE responds" means "UE starts transmitting preamble on PRACH for sending the *RRCSetupRequest* message to perform a Registration procedure for mobility.

1. Ensure the UE is in state RRC_IDLE with generic procedure parameters connectivity *NR* with Test Mode *On* according to TS 38.508-1 [14] clause 4.5 on Cell 2. SIB2 of Cell 1 and Cell 2 are configured as follows:

   lowMobilityEvaluation-r16 is configured according to the parameters listed in Table 6.1.1.5.5-1.

   cellEdgeEvaluation-r16 and *combineRelaxedMeasCondition* are not configured.

2. Set the parameters according to T1 in Table 6.1.1.5.5-1. T1 starts.

3. The SS waits for random access requests information from the UE to perform cell re-selection to Cell 1.

4. If the UE responds on Cell 1 within 17 seconds from the beginning of time period T1, then count a success for the event “Re-select Cell 1”. Otherwise count a fail for the event “Re-select Cell 1”.

5. If the UE has re-selected Cell 1 within T1, after the re-selection or when T1 expires, continue with step 6. Otherwise, if T2 expires and the UE has not yet re-selected Cell 1, the TE shall switch off and on the UE and skip to step 12.

6. The SS shall send an *RRCRelease* message to ensure that the UE is in state RRC_IDLE on Cell 1.

7. The SS shall switch the power setting from T1 to T2 as specified in Table 6.1.1.5.5-1. T2 starts.

8. The SS waits for random access requests information from the UE to perform cell re-selection to Cell 2.

9. If the UE responds on Cell 2 within 17 seconds from the beginning of time period T2, then count a success for the event “Re-select Cell 2”. Otherwise count a fail for the event “Re-select Cell 2”.

10. If the UE has re-selected Cell 2 within T2, after the re-selection or when T2 expires, continue with step 11. Otherwise, if T2 expires and the UE has not yet re-selected Cell 2, the TE shall switch off and on the UE and skip to step 12.

11. The SS shall send an *RRCRelease* message to ensure that the UE is in state RRC_IDLE on Cell 2. skip to 13

12. Ensure the UE is in state RRC_IDLE with generic procedure parameters connectivity *NR* according to TS 38.508-1 [14] clause 4.5 in Cell 2.

13. Repeat step 2-12 until a test verdict has been achieved. Each of the events “Re-select Cell 2” and “Re-select Cell 1” is evaluated independently for the statistic, resulting in an event verdict: pass or fail. Each event is evaluated only until the confidence level according to Table G.2.3-1 in Annex G clause G.2 is achieved. Different events may require different times for a verdict. If both events pass, the test passes. If one event fails, the test fails.

6.1.1.5.4.3 Message contents

Message contents are according to TS 38.508-1 [14] clause 7.3 with the following exceptions:Table 6.1.1.5.4.3-1: SIB1 (Cell 1 and Cell 2)

Derivation Path: TS 38.508-1 [14], Table 4.6.1-28			
Information Element	**Value/remark**	**Comment**	**Condition**
SIB1 ::= SEQUENCE {			
servingCellConfigCommon SEQUENCE {			
downlinkConfigCommon SEQUENCE {			
pcch-Config SEQUENCE {			
defaultPagingCycle	rf64		
}			
}			
}			
}			

Table 6.1.1.5.4.3-2: SIB2 (Cell 1)

Derivation Path: Table H.2.2-1			
Information Element	**Value/remark**	**Comment**	**Condition**
SIB2 ::= SEQUENCE {			
cellReselectionServingFreqInfo SEQUENCE {			
s-NonIntraSearchP	Not present		
threshServingLowP	22	Actual value = 22*2 = 44dB	
}			
relaxedMeasurement-r16 SEQUENCE {			
lowMobilityEvaluation-r16 SEQUENCE {			
s-SearchDeltaP-r16	dB3		
t-SearchDeltaP-r16	s5		
}			
cellEdgeEvaluation-r16	Not present		
combineRelaxedMeasCondition-r16	Not present		
highPriorityMeasRelax-r16	Not present		
}			
}			

Table 6.1.1.5.4.3-3: SIB2 (Cell 2)

Derivation Path: Table H.2.2-1			
Information Element	**Value/remark**	**Comment**	**Condition**
SIB2 ::= SEQUENCE {			
cellReselectionServingFreqInfo SEQUENCE {			
s-NonIntraSearchP	Not present		
threshServingLowP	23	Actual value = 23*2 = 46dB	Cell 2
}			
relaxedMeasurement-r16 SEQUENCE {			
lowMobilityEvaluation-r16 SEQUENCE {			
s-SearchDeltaP-r16	dB15		Cell 2
t-SearchDeltaP-r16	s5		
}			
cellEdgeEvaluation-r16	Not present		
combineRelaxedMeasCondition-r16	Not present		
highPriorityMeasRelax-r16	Not present		
}			
}			

Table 6.1.1.5.4.3-4: SIB4 (Cell 1)

Derivation Path: Table H.2.2-2			
Information Element	**Value/remark**	**Comment**	**Condition**

SIB4 ::= SEQUENCE {			
interFreqCarrierFreqList SEQUENCE (SIZE (1..maxFreq)) OF InterFreqCarrierFreqInfo {	1 entry		
InterFreqCarrierFreqInfo[1] SEQUENCE {		entry 1	
dl-CarrierFreq	ARFCN-ValueNR for Cell 2		
smtc	SSB-MTC specified in 38.508-1 [14] Table 7.3.1-3 with condition SMTC.2		6.1.1.5-1
	SSB-MTC specified in 38.508-1 [14] Table 7.3.1-3 with condition SMTC.1		6.1.1.5-2, 6.1.1.5-3
deriveSSB-IndexFromCell	false		6.1.1.5-1
	true		6.1.1.5-2, 6.1.1.5-3
threshX-HighP	24	Actual value = 24*2 = 48dB	
threshX-LowP	24	Actual value = 24*2 = 48dB	
cellReselectionPriority	5	Same as the priority in SIB 2 of Cell 2.	
}			
}			
}			

Table 6.1.1.5.4.3-5: SIB4 (Cell 2)

Derivation Path: Table H.2.2-2			
Information Element	**Value/remark**	**Comment**	**Condition**
SIB4 ::= SEQUENCE {			
interFreqCarrierFreqList SEQUENCE (SIZE (1..maxFreq)) OF InterFreqCarrierFreqInfo {	1 entry		
InterFreqCarrierFreqInfo[1] SEQUENCE {		entry 1	
dl-CarrierFreq	ARFCN-ValueNR for Cell 1 SSB		Cell 2
smtc	SSB-MTC specified in 38.508-1 [14] Table 7.3.1-3 with condition SMTC.6		6.1.1.5-1
	SSB-MTC specified in 38.508-1 [14] Table 7.3.1-3 with condition SMTC.1		6.1.1.5-2, 6.1.1.5-3
deriveSSB-IndexFromCell	false		6.1.1.5-1
	true		6.1.1.5-2, 6.1.1.5-3
threshX-HighP	22	Actual value = 22*2 = 44dB	Cell 2
threshX-LowP	25	Actual value = 25*2 = 50dB	Cell 2
cellReselectionPriority	4	Same as the priority in SIB 2 of Cell 1.	Cell 2
}			
}			
}			

6.1.1.5.5 Test requirement

Tables 6.1.1.5.4.1-3 and 6.1.1.5.5-1 define the primary level settings including test tolerances for NR SA FR1-FR1 cell re-selection for UE fulfilling low mobility relaxed measurement criterion test case.

Table 6.1.1.5.5-1: Cell specific test parameters for NR SA FR1-FR1 cell re-selection for UE fulfilling low mobility relaxed measurement criterion

Parameter	Unit	Test configuration	Cell 1		Cell 2	
			T1	T2	T1	T2
TDD configuration		1	N/A		N/A	
		2	TDDConf.1.1		TDDConf.1.1	
		3	TDDConf.2.1		TDDConf.2.1	
PDSCH RMC configuration		1	SR.1.1 FDD		SR.1.1 FDD	
		2	SR.1.1 TDD		SR.1.1 TDD	
		3	SR.2.1 TDD		SR.2.1 TDD	
RMSI CORESET RMC configuration		1	CR.1.1 FDD		CR.1.1 FDD	
		2	CR.1.1 TDD		CR.1.1 TDD	
		3	CR.2.1 TDD		CR.2.1 TDD	
Dedicated CORESET RMC configuration		1	CCR.1.1 FDD		CCR.1.1 FDD	
		2	CCR.1.1 TDD		CCR.1.1 TDD	
		3	CCR.2.1 TDD		CCR.2.1 TDD	
OCNG Pattern		1, 2, 3	OP.1 defined in A.3.2.1		OP.1 defined in A.3.2.1	
Initial DL BWP configuration		1, 2, 3	DLBWP.0.1		DLBWP.0.1	
Initial UL BWP configuration		1, 2, 3	ULBWP.0.1		ULBWP.0.1	
RLM-RS		1, 2, 3	SSB		SSB	
Qrxlevmin	dBm/SCS	1, 2	-140		-140	
		3	-137		-137	
Pcompensation	dB	1, 2, 3	0		0	
$Qhyst_s$	dB	1, 2, 3	0		0	
$Qoffset_{s,n}$	dB	1, 2, 3	0		0	
Cell_selection_and_ reselection_quality_measurement		1, 2, 3	SS-RSRP		SS-RSRP	
$\hat{E}_s/I_{ot}$	dB	1	14	14	-3.70	9.75
		2				
		3				
N_{oc} Note2	dBm/SCS	1	-98			
		2	-98			
		3	-95			
N_{oc} Note2	dBm/15 kHz	1	-98			
		2				
		3				
$\hat{E}_s/N_{oc}$	dB	1	14	14	-3.70	9.75
		2				
		3				
SS-RSRP Note3	dBm/SCS	1	-84	-84	-101.70	-88.25
		2	-84	-84	-101.70	-88.25
		3	-81	-81	-98.70	-85.25
Io	dBm/9.36 MHz	1	-55.88	-55.88	-68.50	-59.86
	dBm/9.36 MHz	2	-55.88	-55.88	-68.50	-59.86
	dBm/38.16 MHz	3	-49.79	-49.79	-62.40	-53.76
Treselection	s	1, 2, 3	0	0	0	0
SnonintrasearchP	dB	1, 2, 3	Not sent		Not sent	
$Thresh_{x,highP}$	dB	1, 2, 3	48		44	
$Thresh_{serving,lowP}$	dB	1, 2, 3	44		46	

Parameter	Unit	Test configuration	Cell 1		Cell 2	
			T1	T2	T1	T2
$Thresh_{x, lowP}$	dB	1, 2, 3	48		50	
$S_{SearchDeltaP}$	dB	1, 2, 3	3		15	
$T_{SearchDeltaP}$	s	1, 2, 3	5		5	
Propagation Condition		1, 2, 3	AWGN			
Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.						
Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for N_{oc} to be fulfilled.						
Note 3: SS-RSRP levels have been derived from other parameters for information purposes. They are not settable parameters themselves.						

The cell re-selection delay to detected lower priority cell for UE fulfilling low mobility criterion is defined as the time from the beginning of time period T1, to the moment when the UE camps on Cell 2, and starts to send preambles on the PRACH for sending the *RRCSetupRequest* message to perform a Registration procedure for mobility and periodic registration update on Cell 2.

The cell re-selection delay to a detected cell test requirement for UE fulfilling low mobility criterion in this case is expressed as:

Cell re-selection delay to a detected lower priority cell = $T_{evaluate,NR_Inter} + T_{SI-NR}$

$T_{evaluate,NR_Inter}$ = 15.36 s; as specified in TS 38.133 [6] Table 4.2.2.10.2-1.

T_{SI-NR} = 1.28 s; maximum repetition period of relevant system info blocks that needs to be received by the UE to camp on a cell is assumed in this test.

This gives a total of 16.64 s, allow 17 s for the cell re-selection delay to an already detected lower priority cell for UE fulfilling low mobility criterion in the test case.

The cell re-selection delay to detected higher priority cell for UE fulfilling low mobility criterion is defined as the time from the beginning of time period T2, to the moment when the UE camps on Cell 1, and starts to send preambles on the PRACH for sending the *RRCSetupRequest* message to perform a Registration procedure for mobility and periodic registration update on Cell 1.

The cell re-selection delay to a detected higher priority cell test requirement for UE fulfilling low mobility criterion in this case is expressed as:

Cell re-selection delay to a detected higher priority cell = $T_{evaluate,NR_Inter} + T_{SI-NR}$

$T_{evaluate,NR_Inter}$ = 15.36 s; as specified in TS 38.133 [6] Table 4.2.2.10.2-1.

T_{SI-NR} = 1.28 s; maximum repetition period of relevant system info blocks that needs to be received by the UE to camp on a cell is assumed in this test.

This gives a total of 16.64 s, allow 17 s for the cell re-selection delay to an already detected higher priority cell for UE fulfilling low mobility criterion in the test case.

For the test to pass, both events above shall pass.

The statistical pass/fail decisions are done separated for each event. For an event to pass, the total number of successful loops shall be more than 90% of the cases with a confidence level of 95%.

6.1.1.6 NR SA FR1-FR1 cell re-selection for UE fulfilling not-at-cell edge relaxed measurement criterion

6.1.1.6.1 Test purpose

The purpose of this test is to verify the requirement for the inter-frequency NR cell reselection requirements for UE fulfilling not-at-cell edge criterion specified in TS 38.133 [6] clause 4.2.2.10.3.

6.1.1.6.2 Test applicability

This test applies to all types of NR UE from release 16 onwards and supporting relaxed measurement.

6.1.1.6.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 6.1.1.0.4.

The normative reference for this requirement is TS 38.133 [6] clause A.6.1.1.6.

6.1.1.6.4 Test description

6.1.1.6.4.1 Initial conditions

This test shall be run in one of the configurations defined in Table 6.1.1.6.4.1-1.

Table 6.1.1.6.4.1-1: Supported test configurations for NR SA FR1-FR1 cell re-selection for UE fulfilling not-at-cell edge relaxed measurement criterion

Configuration	Description of serving cell	Description of target cell
6.1.1.6-1	15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode	15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode
6.1.1.6-2	15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode	15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode
6.1.1.6-3	30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode	30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode
Note: The UE is only required to be tested in one of the supported test configurations.		

Configure the test equipment and the DUT according to the parameters in Table 6.1.1.6.4.1-2.

Table 6.1.1.6.4.1-2: Initial conditions for NR SA FR1-FR1 cell re-selection for UE fulfilling not-at-cell edge relaxed measurement criterion

Parameter	Value		Comment
Test environment	NC		As specified in TS 38.508-1 [14] clause 4.1.
Test frequencies	As specified in Annex E, table E.4-1 and TS 38.508-1 [14] clause 4.3.1.		
Channel bandwidth	As specified by the test configuration selected from Table 6.1.1.6.4.1-1.		
Propagation conditions	AWGN		As specified in Annex C.2.2.
Connection Diagram	TE Part	A.3.1.8.2	As specified in TS 38.508-1 [14] Annex A.
	DUT Part	A.3.2.3.4	
Exceptions to connection diagram	- Without LTE link - For 4Rx capable UEs without any 2Rx RF bands use A.3.2.5.2 for DUT part and A.3.1.8.4 for TE part.		

1. The general test parameter settings are set up according to Table 6.1.1.6.4.1-3.
2. Message contents are defined in clause 6.1.1.6.4.3.
3. There is 2 NR carriers and 2 NR Cells specified in the test. Cell 1 is the PCell and Cell 2 is the neighbour cell. Cell 1 and Cell 2 are configured according to Annex C.1.1 and C.1.2.

Table 6.1.1.6.4.1-3: General test parameters for NR SA FR1-FR1 cell re-selection for UE fulfilling not-at-cell edge relaxed measurement criterion

Parameter		Unit	Test configuration	Value	Comment
Initial condition	Active cell		1, 2, 3	Cell2	The UE camps on cell 2 in the initial phase, it fulfils Not-at-cell edge relaxation measurements criterion, and during T1 period the UE reselects to cell 1
	Neighbour cells		1, 2, 3	Cell1	
T1 end condition	Active cell		1, 2, 3	Cell1	The UE shall perform reselection to cell 1 during T1
	Neighbour cells		1, 2, 3	Cell2	
	Active cell		1, 2, 3	Cell2	

T2 end condition	Neighbour cells		1, 2, 3	Cell1	The UE shall perform reselection to cell 2 with higher priority during T2
RF Channel Number			1, 2, 3	1, 2	
Time offset between cells			1	3 ms	Asynchronous cells
			2	3 µs	Synchronous cells
			3	3 µs	Synchronous cells
Access Barring Information		-	1, 2, 3	Not Sent	No additional delays in random access procedure.
SSB Configuration			1	SSB.1 FR1	
			2	SSB.1 FR1	
			3	SSB.2 FR1	
SMTC configuration			1	SMTC pattern 2	Configured in SIB4 of Cell 1
				SMTC pattern 6	Configured in SIB4 of Cell 2
			2	SMTC pattern 1	
			3	SMTC pattern 1	
DRX cycle length		s	1, 2, 3	0.64	The value shall be used for all cells in the test.
PRACH configuration index			1, 2, 3	102	The detailed configuration is specified in TS 38.211 clause 6.3.3.2
rangeToBestCell			1, 2, 3	Not configured	
T1		s	1, 2, 3	20 s	T1 is defined so that cell re-selection reaction time is taken into account.
T2		s	1, 2, 3	20 s	T2 is defined so that cell re-selection reaction time is taken into account.

6.1.1.6.4.2 Test procedure

Two cells are deployed in the test, which are FR1 NR Cell 1 and Cell 2 on different frequencies. The test consists of 2 successive time periods, with time duration of T1, and T2 respectively. Both cell 1 and cell 2 are already identified by the UE prior to the start of the test. Cell 1 and cell 2 belong to different tracking areas and Cell 2 is of higher priority than Cell 1. Furthermore, UE has not registered with network for the tracking area containing cell 1.

In the following test procedure "UE responds" means "UE starts transmitting preamble on PRACH for sending the *RRCSetupRequest* message to perform a Registration procedure for mobility.

1. Ensure the UE is in state RRC_IDLE with generic procedure parameters connectivity *NR* with Test Mode *On* according to TS 38.508-1 [14] clause 4.5 on Cell 2. SIB2 of Cell 1 and Cell 2 are configured as follows:
   - *cellEdgeEvaluation-r16* is configured according to the parameters listed in Table 6.1.1.6.5-1.
   - *lowMobilityEvaluation-r16* and *combineRelaxedMeasCondition* are not configured.
2. Set the parameters according to T1 in Table 6.1.1.6.5-1. T1 starts.
3. The SS waits for random access requests information from the UE to perform cell re-selection to Cell 1.
4. If the UE responds on Cell 1 within 17 seconds from the beginning of time period T1, then count a success for the event “Re-select Cell 1”. Otherwise count a fail for the event “Re-select Cell 1”.
5. If the UE has re-selected Cell 1 within T1, after the re-selection or when T1 expires, continue with step 6. Otherwise, if T2 expires and the UE has not yet re-selected Cell 1, the TE shall switch off and on the UE and skip to step 12.
6. The SS shall send an *RRCRelease* message to ensure that the UE is in state RRC_IDLE on Cell 1.
7. The SS shall switch the power setting from T1 to T2 as specified in Table 6.1.1.6.5-1. T2 starts.
8. The SS waits for random access requests information from the UE to perform cell re-selection to Cell 1.
9. If the UE responds on Cell 2 within 17 seconds from the beginning of time period T2, then count a success for the event “Re-select Cell 2”. Otherwise count a fail for the event “Re-select Cell 2”.

10. If the UE has re-selected Cell 2 within T2, after the re-selection or when T2 expires, continue with step 11. Otherwise, if T2 expires and the UE has not yet re-selected Cell 2, the TE shall switch off and on the UE and skip to step 12.

11. The SS shall send an *RRCRelease* message to ensure that the UE is in state RRC_IDLE on Cell 2. skip to 13

12. Ensure the UE is in state RRC_IDLE with generic procedure parameters connectivity *NR* according to TS 38.508-1 [14] clause 4.5 in Cell 2.

13. Repeat step 2-12 until a test verdict has been achieved. Each of the events “Re-select Cell 2” and “Re-select Cell 1” is evaluated independently for the statistic, resulting in an event verdict: pass or fail. Each event is evaluated only until the confidence level according to Table G.2.3-1 in Annex G clause G.2 is achieved. Different events may require different times for a verdict. If both events pass, the test passes. If one event fails, the test fails.

6.1.1.6.4.3 Message contents

Message contents are according to TS 38.508-1 [14] clause 7.3 with the following exceptions:

Table 6.1.1.6.4.3-1: SIB1 (Cell 1 and Cell 2)

Derivation Path: TS 38.508-1 [14], Table 4.6.1-28			
Information Element	**Value/remark**	**Comment**	**Condition**
SIB1 ::= SEQUENCE {			
servingCellConfigCommon SEQUENCE {			
downlinkConfigCommon SEQUENCE {			
pcch-Config SEQUENCE {			
defaultPagingCycle	rf64		
}			
}			
}			
}			

Table 6.1.1.6.4.3-2: SIB2 (Cell 1)

Derivation Path: Table H.2.2-1			
Information Element	**Value/remark**	**Comment**	**Condition**
SIB2 ::= SEQUENCE {			
cellReselectionServingFreqInfo SEQUENCE {			
s-NonIntraSearchP	Not present		
}			
relaxedMeasurement-r16 SEQUENCE {			
lowMobilityEvaluation-r16	Not present		
cellEdgeEvaluation-r16 SEQUENCE {	Not present		
s-SearchThresholdP-r16	25	Actual value = 25*2 = 50dB	
s-SearchThresholdQ-r16	Not present		
}			
combineRelaxedMeasCondition-r16	Not present		
highPriorityMeasRelax-r16	Not present		
}			
}			

Table 6.1.1.6.4.3-3: SIB2 (Cell 2)

Derivation Path: Table H.2.2-1			
Information Element	**Value/remark**	**Comment**	**Condition**
SIB2 ::= SEQUENCE {			
cellReselectionServingFreqInfo SEQUENCE {			
s-NonIntraSearchP	Not present		
}			
relaxedMeasurement-r16 SEQUENCE {			
lowMobilityEvaluation-r16	Not present		
cellEdgeEvaluation-r16 SEQUENCE {	Not present		

s-SearchThresholdP-r16	17	Actual value = 17*2 = 34dB	
s-SearchThresholdQ-r16	Not present		
}			
combineRelaxedMeasCondition-r16	Not present		
highPriorityMeasRelax-r16	Not present		
}			
}			

Table 6.1.1.6.4.3-4: SIB4 (Cell 1)

Derivation Path: Table H.2.2-2			
Information Element	**Value/remark**	**Comment**	**Condition**
SIB4 ::= SEQUENCE {			
interFreqCarrierFreqList SEQUENCE (SIZE (1..maxFreq)) OF InterFreqCarrierFreqInfo {	1 entry		
InterFreqCarrierFreqInfo[1] SEQUENCE {		entry 1	
dl-CarrierFreq	ARFCN-ValueNR for Cell 2 SSB		
smtc	SSB-MTC specified in 38.508-1 [14] Table 7.3.1-3 with condition SMTC.2		6.1.1.6-1
	SSB-MTC specified in 38.508-1 [14] Table 7.3.1-3 with condition SMTC.1		6.1.1.6-2, 6.1.1.6-3
deriveSSB-IndexFromCell	false		6.1.1.6-1
	true		6.1.1.6-2, 6.1.1.6-3
cellReselectionPriority	5	Same as the priority in SIB 2 of Cell 2.	
}			
}			
}			

Table 6.1.1.6.4.3-5: SIB4 (Cell 2)

Derivation Path: Table H.2.2-2			
Information Element	**Value/remark**	**Comment**	**Condition**
SIB4 ::= SEQUENCE {			
interFreqCarrierFreqList SEQUENCE (SIZE (1..maxFreq)) OF InterFreqCarrierFreqInfo {	1 entry		
InterFreqCarrierFreqInfo[1] SEQUENCE {		entry 1	
dl-CarrierFreq	ARFCN-ValueNR for Cell 1 SSB		
smtc	SSB-MTC specified in 38.508-1 [14] Table 7.3.1-3 with condition SMTC.6		6.1.1.6-1
	SSB-MTC specified in 38.508-1 [14] Table 7.3.1-3 with condition SMTC.1		6.1.1.6-2, 6.1.1.6-3
deriveSSB-IndexFromCell	false		6.1.1.6-1
	true		6.1.1.6-2, 6.1.1.6-3
cellReselectionPriority	4	Same as the priority in SIB 2 of Cell 1.	Cell 2
}			
}			
}			

6.1.1.6.5 Test requirement

Tables 6.1.1.6.4.1-3 and 6.1.1.6.5-1 define the primary level settings including test tolerances for NR SA FR1-FR1 cell re-selection for UE fulfilling not-at-cell edge relaxed measurement criterion test case.

Table 6.1.1.6.5-1: Cell specific test parameters for NR SA FR1-FR1 cell re-selection for UE fulfilling not-at-cell edge relaxed measurement criterion

Parameter	Unit	Test configuration	Cell 1		Cell 2	
			T1	T2	T1	T2
TDD configuration		1	N/A		N/A	
		2	TDDConf.1.1		TDDConf.1.1	
		3	TDDConf.2.1		TDDConf.2.1	
PDSCH RMC configuration		1	SR.1.1 FDD		SR.1.1 FDD	
		2	SR.1.1 TDD		SR.1.1 TDD	
		3	SR.2.1 TDD		SR.2.1 TDD	
RMSI CORESET RMC configuration		1	CR.1.1 FDD		CR.1.1 FDD	
		2	CR.1.1 TDD		CR.1.1 TDD	
		3	CR.2.1 TDD		CR.2.1 TDD	
Dedicated CORESET RMC configuration		1	CCR.1.1 FDD		CCR.1.1 FDD	
		2	CCR.1.1 TDD		CCR.1.1 TDD	
		3	CCR.2.1 TDD		CCR.2.1 TDD	
OCNG Pattern		1, 2, 3	OP.1 defined in A.3.2.1		OP.1 defined in A.3.2.1	
Initial DL BWP configuration		1, 2, 3	DLBWP.0.1		DLBWP.0.1	
Initial UL BWP configuration		1, 2, 3	ULBWP.0.1		ULBWP.0.1	
RLM-RS		1, 2, 3	SSB		SSB	
Qrxlevmin	dBm/SCS	1, 2	-140		-140	
		3	-137		-137	
Pcompensation	dB	1, 2, 3	0		0	
$Qhyst_s$	dB	1, 2, 3	0		0	
$Qoffset_{s,n}$	dB	1, 2, 3	0		0	
Cell_selection_and_ reselection_quality_measurement		1, 2, 3	SS-RSRP		SS-RSRP	
$\hat{E}_s/I_{ot}$	dB	1	16	14	-3.65	16
		2				
		3				
N_{oc} Note2	dBm/SCS	1	-98		-100	
		2	-98		-100	
		3	-95		-97	
N_{oc} Note2	dBm/15 kHz	1	-98		-100	
		2				
		3				
$\hat{E}_s/N_{oc}$	dB	1	16	14	-3.65	16
		2				
		3				
SS-RSRP Note3	dBm/SCS	1	-82	-84	-103.65	-84
		2	-82	-84	-103.65	-84
		3	-79	-81	-100.65	-81
Io	dBm/9.36 MHz	1	-53.94	-55.88	-70.49	-55.94
	dBm/9.36 MHz	2	-53.94	-55.88	-70.49	-55.94
	dBm/38.16 MHz	3	-47.84	-49.79	-63.39	-49.84

Parameter	Unit	Test configuration	Cell 1		Cell 2	
			T1	T2	T1	T2
Treselection	s	1, 2, 3	0	0	0	0
SnonintrasearchP	dB	1, 2, 3	Not sent		Not sent	
$Thresh_{x, highP}$	dB	1, 2, 3	48		48	
$Thresh_{serving, lowP}$	dB	1, 2, 3	44		44	
$Thresh_{x, lowP}$	dB	1, 2, 3	50		50	
$S_{SearchDeltaP}$	dB	1, 2, 3	3		3	
$T_{SearchDeltaP}$	s	1, 2, 3	5		5	
Propagation Condition		1, 2, 3	AWGN			

Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.

Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for N_{oc} to be fulfilled.

Note 3: SS-RSRP levels have been derived from other parameters for information purposes. They are not settable parameters themselves.

The cell re-selection delay to detected lower priority cell for UE fulfilling not-at-cell edge criterion is defined as the time from the beginning of time period T1, to the moment when the UE camps on Cell 2, and starts to send preambles on the PRACH for sending the *RRCSetupRequest* message to perform a Registration procedure for mobility and periodic registration update on Cell 2.

The cell re-selection delay to a detected cell test requirement for UE fulfilling not-at-cell edge criterion in this case is expressed as:

Cell re-selection delay to a detected lower priority cell = $T_{evaluate,NR_Inter} + T_{SI-NR}$

$T_{evaluate,NR_Inter}$ = 15.36 s; as specified in TS 38.133 [6] Table 4.2.2.10.2-1.

T_{SI-NR} = 1.28 s; maximum repetition period of relevant system info blocks that needs to be received by the UE to camp on a cell is assumed in this test.

This gives a total of 16.64 s, allow 17 s for the cell re-selection delay to an already detected lower priority cell for UE fulfilling not-at-cell edge criterion in the test case.

The cell re-selection delay to detected higher priority cell for UE fulfilling not-at-cell edge criterion is defined as the time from the beginning of time period T2, to the moment when the UE camps on Cell 1, and starts to send preambles on the PRACH for sending the *RRCSetupRequest* message to perform a Registration procedure for mobility and periodic registration update on Cell 1.

The cell re-selection delay to a detected higher priority cell test requirement for UE fulfilling not-at-cell edge criterion in this case is expressed as:

Cell re-selection delay to a detected higher priority cell = $T_{evaluate,NR_Inter} + T_{SI-NR}$

$T_{evaluate,NR_Inter}$ = 15.36 s; as specified in TS 38.133 [6] Table 4.2.2.10.2-1.

T_{SI-NR} = 1.28 s; maximum repetition period of relevant system info blocks that needs to be received by the UE to camp on a cell is assumed in this test.

This gives a total of 16.64 s, allow 17 s for the cell re-selection delay to an already detected higher priority cell for UE fulfilling not-at-cell edge criterion in the test case.

For the test to pass, both events above shall pass.

The statistical pass/fail decisions are done separated for each event. For an event to pass, the total number of successful loops shall be more than 90% of the cases with a confidence level of 95%.

6.1.1.7 NR SA FR1 cell re-selection for UE configured with highSpeedMeasFlag-r16

6.1.1.7.1 Test purpose

The purpose of this test is to verify that when the current and target cell operates on the same carrier frequency the UE configured with *highSpeedMeasFlag-r16* is able to search and measure cells to meet the intra-frequency NR cell re-selection requirements.

6.1.1.7.2 Test applicability

This test applies to all types of NR UE from release 15 onwards that supports measurement enhancements in high speed scenario

6.1.1.7.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 6.1.1.0.3.

The normative reference for this requirement is TS 38.133 [6] clause A.6.1.1.7.

6.1.1.7.4 Test description

6.1.1.7.4.1 Initial conditions

This test shall be run in one of the configurations defined in Table 6.1.1.7.4.1-1.

Table 6.1.1.7.4.1-1: Supported test configurations for NR SA FR1 cell re-selection for UE configured with highSpeedMeasFlag-r16

Configuration	Description
6.1.1.7-1	15 kHz SSB SCS, 10MHz bandwidth, FDD duplex mode
6.1.1.7-2	15 kHz SSB SCS, 10MHz bandwidth, TDD duplex mode
6.1.1.7-3	30 kHz SSB SCS, 40MHz bandwidth, TDD duplex mode
Note: The UE is only required to be tested in one of the supported test configurations.	

Configure the test equipment and the DUT according to the parameters in Table 6.1.1.7.4.1-2.

Table 6.1.1.7.4.1-2: Initial conditions for NR SA FR1 cell re-selection for UE configured with highSpeedMeasFlag-r16

Parameter	Value		Comment
Test environment	NC		As specified in TS 38.508-1 [14] clause 4.1.
Test frequencies	As specified in Annex E, table E.4-1 and TS 38.508-1 [14] clause 4.3.1.		
Channel bandwidth	As specified by the test configuration selected from Table 6.1.1.7.4.1-1.		
Propagation conditions	AWGN		As specified in Annex C.2.2.
Connection Diagram	TE Part	A.3.1.8.2	As specified in TS 38.508-1 [14] Annex A.
	DUT Part	A.3.2.3.4	
Exceptions to connection diagram	- Without LTE link - For 4Rx capable UEs without any 2Rx RF bands use A.3.2.5.2 for DUT part and A.3.1.8.4 for TE part.		

1. The general test parameter settings are set up according to Table 6.1.1.7.4.1-3.

2. Message contents are defined in clause 6.1.1.7.4.3.

3. There is one NR carrier and 2 NR Cells specified in the test. Cell 1 is the PCell and Cell 2 is the neighbour cell. Cell 1 and Cell 2 are configured according to Annex C.1.1 and C.1.2.

Table 6.1.1.7.4.1-3: General test parameters for NR SA FR1 cell re-selection for UE configured with highSpeedMeasFlag-r16

Parameter	Unit	Test configuration	Value	Comment

Initial condition	Active cell		1, 2, 3	Cell1	
	Neighbour cells		1, 2, 3	Cell2	
T2 end condition	Active cell		1, 2, 3	Cell2	
	Neighbour cells		1, 2, 3	Cell1	
Final condition	Active cell		1, 2, 3	Cell1	
RF Channel Number			1, 2, 3	1	
Time offset between cells			1	3 ms	Asynchronous cells
			2	3 µs	Synchronous cells
			3	3 µs	Synchronous cells
Access Barring Information		-	1, 2, 3	Not Sent	No additional delays in random access procedure.
SSB configuration			1	SSB.1 FR1	
			2	SSB.1 FR1	
			3	SSB.2 FR1	
SMTC configuration			1	SMTC.2	Configured in SIB2 of Cell 1
				SMTC.6	Configured in SIB2 of Cell 2
			2	SMTC.1	
			3	SMTC.1	
DRX cycle length		s	1, 2, 3	0.32	The value shall be used for all cells in the test.
PRACH configuration index			1, 2, 3	102	The detailed configuration is specified in TS 38.211 clause 6.3.3.2
rangeToBestCell			1, 2, 3	Not configured	
T1		s	1, 2, 3	>7	During T1, Cell 2 shall be powered off, and during the off time the physical cell identity shall be changed, The intention is to ensure that Cell 2 has not been detected by the UE prior to the start of period T2
T2		s	1, 2, 3	4	T2 needs to be defined so that cell re-selection reaction time is taken into account.
T3		s	1, 2, 3	3	T3 needs to be defined so that cell re-selection reaction time is taken into account.

6.1.1.7.4.2 Test procedure

Two cells are deployed in the test, which are one FR1 NR PCell (Cell 1) and an NR neighbour cell (Cell 2) on the same frequency. The test consists of 3 successive time periods, with time duration of T1, T2, and T3 respectively. Only cell 1 is already identified by the UE prior to the start of the test. Cell 1 and cell 2 belong to different tracking areas. Furthermore, UE has not registered with network for the tracking area containing cell 2. *highSpeedMeasFlag-r16* is broadcasted to UE.

In the following test procedure "UE responds" means "UE starts transmitting preamble on PRACH for sending the *RRCSetupRequest* message to perform a Registration procedure for mobility.

1. Ensure the UE is in state RRC_IDLE with generic procedure parameters connectivity *NR* with Test Mode *On* according to TS 38.508-1 [14] clause 4.5 on Cell 1. Set Cell 2 physical cell identity = initial Cell 2 physical cell identity.

2. Set the parameters according to T1 in Table 6.1.1.7.5-1. T1 starts.

3. Set Cell 2 physical cell identity = ((current Cell 2 physical cell identity + 1) mod 1008) for one iteration of the test procedure loop.

4. When T1 expires, the SS shall switch the power setting from T1 to T2 as specified in Table 6.1.1.7.5-1. T2 starts.

5. The SS waits for random access requests information from the UE to perform cell re-selection to a newly detectable cell, Cell 2.

6. If the UE responds on the newly detectable cell, Cell 2 during time duration T2 within 4 seconds from the beginning of time period T2, then count a success for the event “Re-select newly detected Cell 2”. Otherwise count a fail for the event “Re-select newly detected Cell 2”.

7. If the UE has re-selected Cell 2 within T2, after the re-selection or when T2 expires, continue with step 7a. Otherwise, if T2 expires and the UE has not yet re-selected Cell 2, the TE shall switch off and on the UE and skip to step 12.

7a The SS shall send an *RRCRelease* message to ensure that the UE is in state RRC_IDLE on Cell 2.

8. The SS shall switch the power setting from T2 to T3 as specified in Table 6.1.1.7.5-1. T3 starts.

9. The SS waits for random access requests information from the UE to perform cell re-selection to an already detected cell, Cell 1.

10. If the UE responds on the already detected cell, Cell 1 during time duration T3 within 3 seconds from the beginning of time period T3, then count a success for the event “Re-select already detected Cell 1”. Otherwise count a fail for the event “Re-select already detected Cell 1”.

11. If the UE has re-selected Cell 1 within T3, after the re-selection or when T3 expires, continues with step 11a. Otherwise, if T3 expires and the UE has not yet re-selected Cell 1, the TE shall switch off and on the UE and skip to step 12.

11a.The SS shall send an *RRCRelease* message to ensure that the UE is in state RRC_IDLE on Cell 1.

12. Ensure the UE is in state RRC_IDLE with generic procedure parameters connectivity *NR* according to TS 38.508-1 [14] clause 4.5 on Cell 1.

13. Repeat step 2-12 until a test verdict has been achieved.
    Each of the events “Re-select newly detected Cell 2” and “Re-select already detected Cell 1” is evaluated independently for the statistic, resulting in an event verdict: pass or fail. Each event is evaluated only until the confidence level according to Table G.2.3-1 in Annex G clause G.2 is achieved. Different events may require different times for a verdict.
    If both events pass, the test passes. If one event fails, the test fails.

6.1.1.7.4.3 Message contents

Message contents are according to TS 38.508-1 [14] clause 4.6 with the following exceptions:

Table 6.1.1.7.4.3-1: Common Exception messages

Default Message Contents	
Common contents of system information blocks on condition of HighSpeedMeas with exceptions	Table H.2.1-1 with Condition SMTC.2 and Asynchronous cells for configuration 6.1.1.7-1 and Cell 1 Table H.2.1-1 with Condition SMTC.6 and Asynchronous cells for configuration 6.1.1.7-1 and Cell 2 Table H.2.1-1 with Condition SMTC.1 and synchronous cells for configuration 6.1.1.7-2 Table H.2.1-1 with Condition SMTC.1 and synchronous cells for configuration 6.1.1.7-3 Table H.2.1-2 Table H.2.1-3 with Condition HighSpeedMeas
Default RRC messages and information elements contents exceptions	

6.1.1.7.5 Test requirement

Tables 6.1.1.7.4.1-3 and 6.1.1.7.5-1 define the primary level settings including test tolerances for intra frequency NR cell re-selection test case for UE configured with highSpeedMeasFlag-r16.

Table 6.1.1.7.5-1: Cell specific test parameters for intra frequency NR cell re-selection test case for UE configured with highSpeedMeasFlag-r16

Parameter	Unit	Test configuration	Cell 1			Cell 2		
			T1	T2	T3	T1	T2	T3
TDD configuration		1	N/A			N/A		
		2	TDDConf.1.1			TDDConf.1.1		
		3	TDDConf.2.1			TDDConf.2.1		
PDSCH RMC configuration		1	SR.1.1 FDD			SR.1.1 FDD		
		2	SR.1.1 TDD			SR.1.1 TDD		
		3	SR.2.1 TDD			SR.2.1 TDD		
RMSI CORESET RMC configuration		1	CR.1.1 FDD			CR.1.1 FDD		
		2	CR.1.1 TDD			CR.1.1 TDD		
		3	CR.2.1 TDD			CR.2.1 TDD		
Dedicated CORESET RMC configuration		1	CCR.1.1 FDD			CCR.1.1 FDD		
		2	CCR.1.1 TDD			CCR.1.1 TDD		
		3	CCR.2.1 TDD			CCR.2.1 TDD		
OCNG Pattern		1, 2, 3	OP.1 defined in A.2.1-1			OP.1 defined in A.2.1-1		
Initial DL BWP configuration		1, 2, 3	DLBWP.0.1			DLBWP.0.1		
Initial UL BWP configuration		1, 2, 3	ULBWP.0.1			ULBWP.0.1		
RLM-RS		1, 2, 3	SSB			SSB		
Qrxlevmin	dBm/SCS	1, 2	-140			-140		
		3	-137			-137		
Pcompensation	dB	1, 2, 3	0			0		
$Qhyst_s$	dB	1, 2, 3	0			0		
$Qoffset_{s,n}$	dB	1, 2, 3	0			0		
Cell_selection_and_reselection_quality_measurement		1, 2, 3	SS-RSRP			SS-RSRP		
$\hat{E}_s / I_{ot}$	dB	1	16	-3.55	3.24	-infinity	3.24	-3.55
		2						
		3						
N_{oc} Note2	dBm/SCS	1	-98					
		2	-98					
		3	-95					
N_{oc} Note2	dBm/15 kHz	1	-98					
		2						
		3						
$\hat{E}_s / N_{oc}$	dB	1	16	13	16.45	-infinity	16.45	13
		2						
		3						
SS-RSRP Note3	dBm/SCS	1	-82	-85	81.55	-infinity	-81.55	-85
		2	-82	-85	-81.55	-infinity	-81.55	-85
		3	-79	-82	-78.54	-infinity	-78.54	-82
Io	dBm/9.36 MHz	1	-53.94	-51.91	-51.91	specified in Cell 1 columns-		
	dBm/9.36 MHz	2	-53.94	-51.91	-51.91			
	dBm/38.16 MHz	3	-47.85	-45.81	-45.81			
Treselection	s	1, 2, 3	0	0	0	0	0	0
SintrasearchP	dB	1, 2, 3	60			60		
Propagation Condition		1, 2	AWGN			AWGN 1944Hz Note4		
Propagation Condition		3	AWGN			AWGN 3334Hz Note5		

Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.

Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for N_{oc} to be fulfilled.

Note 3: SS-RSRP levels have been derived from other parameters for information purposes. They are not settable parameters themselves.

Note 4: The AWGN 1944 Hz condition is a non-fading propagation channel with one tap. Doppler shift is a constant 1944 Hz.

Note 5: The AWGN 3334 Hz condition is a non-fading propagation channel with one tap. Doppler shift is a constant 3334 Hz.

The cell reselection delay to a newly detectable cell is defined as the time from the beginning of time period T2, to the moment when the UE camps on Cell 2, and starts to send preambles on the PRACH for sending the *RRCSetupRequest* message to perform a Tracking Area Update procedure on Cell 2.

The cell re-selection delay to a newly detectable cell test requirement in this case is expressed as:

Cell re-selection delay to a newly detectable cell = T_{detect,NR_Intra} + T_{SI-NR}

T_{detect,NR_Intra} = 2.56 s; as specified in Table 4.2.2.3-2 in clause 4.2.2.3 TS 38.133 [6].

T_{SI-NR} = 1280 ms; maximum repetition period of relevant system info blocks that needs to be received by the UE to camp on a cell is assumed in this test.

The cell re-selection delay to a newly detectable cell shall be less than a total of 3.84 seconds in this test case (note: this gives a total of 3.84 seconds but the test allows 4 seconds).

The cell reselection delay to an already detected cell is defined as the time from the beginning of time period T3, to the moment when the UE camps on cell 1, and starts to send preambles on the PRACH for sending the *RRCSetupRequest* message to perform a Tracking Area Update procedure on cell 1.

The cell re-selection delay to an already detected cell test requirement in this case is expressed as:

Cell re-selection to an already detected cell delay = $T_{evaluate,NR_Intra}$ + T_{SI-NR}

$T_{evaluate,NR_Intra}$ = 0.96 s; as specified in Table 4.2.2.3-2 in clause 4.2.2.3 TS 38.133 [6].

T_{SI-NR} = 1280 ms; maximum repetition period of relevant system info blocks that needs to be received by the UE to camp on a cell is assumed in this test.

The cell re-selection delay to an already detected cell shall be less than a total of 2.24 seconds in this test case (note: this gives a total of 2.24 seconds but the test allows 3 seconds).

For the test to pass, both events above shall pass.

The statistical pass/fail decisions are done separated for each event. For an event to pass, the total number of successful loops shall be more than 90% of the cases with a confidence level of 95%.

6.1.1.8 NR SA FR1-FR1 Cell reselection for UE configured with highSpeedMeasInterFreq-r17

Editor's Note: This test case is incomplete in following aspects:

- TT analysis is missing.

6.1.1.8.1 Test purpose

The purpose of this test is to verify the requirement for the inter frequency NR cell reselection requirements for UE configured with *highSpeedMeasInterFreq-r17* specified in TS 38.133 [6] in clause 4.2.2.4.

6.1.1.8.2 Test applicability

This test applies to all types of NR UE release 16 and forward supporting the high-speed inter-frequency IDLE/INACTIVE measurements.

6.1.1.8.3 Minimum conformance requirements

The minimum conformance requirements are defined in clause TBD

The normative reference for this requirement is TS 38.133 [6] clause A.6.1.1.8

6.1.1.8.4 Test description

6.1.1.8.4.1 Initial conditions

This test shall be tested using any of the test configurations in Table 6.1.1.8.4.1-1.

Table 6.1.1.8.4.1-1: Supported test configurations for NR SA FR1-FR1 Cell reselection for UE configured with highSpeedMeasInterFreq-r17

Configuration	Description of serving cell	Description of target cell
6.1.1.8-1	15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode	15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode
6.1.1.8-2	15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode	15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode
6.1.1.8-3	30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode	30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode
Note: The UE is only required to be tested in one of the supported test configurations.		

Configure the test equipment and the DUT according to the parameters in Table 6.1.1.8.4.1-2.

Table 6.1.1.8.4.1-2: Initial conditions for NR SA FR1-FR1 Cell reselection for UE configured with highSpeedMeasInterFreq-r17

Parameter	Value		Comment
Test environment	NC		As specified in TS 38.508-1 [14] clause 4.1.
Test frequencies	As specified in Annex E, table E.2-1 and TS 38.508-1 [14] clause 4.3.1.		
Channel bandwidth	As specified by the test configuration selected from Table 6.1.1.8.4.1-1.		
Propagation conditions	AWGN		As specified in clause C.2.1.
Connection Diagram	TE Part	A.3.1.8.2	As specified in TS 38.508-1 [14] Annex A.
	DUT Part	A.3.2.3.4	
Exceptions to connection diagram	- Without LTE link - For 4Rx capable UEs without any 2Rx RF bands use A.3.2.5.2 for DUT part and A.3.1.8.4 for TE part.		

1. The general test parameter settings are set up according to Table 6.1.1.8.4.1-3.
2. Message contents are defined in clause 6.1.1.8.4.3.
3. There is two NR carrier and 2 NR Cells specified in the test. Cell 2 is the PCell and Cell 1 is the neighbour cell in a different carrier than cell 2. Cell 1 and Cell 2 are configured according to Annex C.1.2.

Table 6.1.1.8.4.1-3: General test parameters for NR SA FR1-FR1 Cell reselection for UE configured with highSpeedMeasInterFreq-r17

Parameter		Unit	Test configuration	Value	Comment
Initial condition	Active cell		1, 2, 3	Cell2	The UE camps on cell 2 in the initial phase and during T1 period the UE reselects to cell 1
	Neighbour cell		1, 2, 3	Cell 1	
T1 end condition	Active cell		1, 2, 3	Cell1	The UE shall perform reselection to cell 1 during T1
	Neighbour cells		1, 2, 3	Cell2	
T3 end condition	Active cell		1, 2, 3	Cell2	The UE shall perform reselection to cell 2 during T3
	Neighbour cell		1, 2, 3	Cell 1	
RF Channel Number			1, 2, 3	1, 2	
Time offset between cells			1	3 ms	Asynchronous cells
			2	3 μs	Synchronous cells
			3	3 μs	Synchronous cells
Access Barring Information		-	1, 2, 3	Not Sent	No additional delays in random access procedure.
SSB configuration			1	SSB.1 FR1	
			2	SSB.1 FR1	
			3	SSB.2 FR1	
SMTC configuration			1	SMTC.2	
			2	SMTC.1	
			3	SMTC.1	

DRX cycle length	s	1, 2, 3	0.32	The value shall be used for all cells in the test.
PRACH configuration index		1, 2, 3	102	The detailed configuration is specified in TS 38.211 clause 6.3.3.2
rangeToBestCell		1, 2, 3	Not configured	
T1	s	1, 2, 3	10	T1 needs to be defined so that cell re-selection reaction time is taken into account.
T2	s	1, 2, 3	>7	During T2, cell 2 shall be powered off, and during the off time the physical cell identity shall be changed. The intention is to ensure that cell 2 has not been detected by the UE prior to the start of period T3.
T3	s	1, 2, 3	12	T3 needs to be defined so that cell re-selection reaction time is taken into account.

6.1.1.8.4.2 Test procedure

The test consists of one active cell and one neighbour cell. The UE is requested to monitor the neighbouring cell on one of the NR carriers. The test consists of three successive time periods, with time duration of T1, T2, and T3 respectively. Both cell 1 and cell 2 are already identified by the UE prior to the start of the test. Cell 1 and cell 2 belong to different tracking areas. Cell 2 is of higher priority than cell 1.

In the following test procedure “UE responds” means “UE starts transmitting preamble on PRACH for sending the *RRCSetupRequest* message to perform a Registration procedure for mobility.

1. Ensure the UE is in state RRC_IDLE with generic procedure parameters connectivity *NR* with Test Mode *On* according to TS 38.508-1 [14] clause 4.5 on Cell 2.
2. Set the parameters according to T1 in Table 6.1.1.8.5-1. T1 starts.
3. The SS waits for random access requests information from the UE to perform cell re-selection to Cell 1.
4. If the UE responds on Cell 1 during time duration T1 within 3 seconds from the beginning of time period T1, then count a success for the event “Re-select Cell 1”. Otherwise count a fail for the event “Re-select Cell 1”.
5. If the UE has re-selected Cell 1 within T1, after the re-selection or when T1 expires, continue with step 6. Otherwise, if T1 expires and the UE has not yet re-selected Cell 1, the TE shall switch off and on the UE and skip to step 13.
6. The SS shall send an *RRCRelease* message to ensure that the UE is in state RRC_IDLE on Cell 1.
7. The SS shall switch the power setting from T1 to T2 as specified in Table 6.1.1.8.5-1. T2 starts. During time duration T2, Cell 2 shall be powered OFF and the physical cell identity = ((current Cell 2 physical cell identity + 1) mod 14) shall be changed to ensure Cell 2 is not detected by the UE.
8. When T2 expires, the SS shall switch the power setting from T2 to T3 as specified in Table 6.1.1.8.5-1. T3 starts.
9. The SS waits for random access requests information from the UE to perform cell re-selection on cell 2.
10. If the UE responds on Cell 2 during time duration T3 within 5 seconds from the beginning of time period T3, then count a success for the event “Re-select Cell 2”. Otherwise count a fail for the event “Re-select Cell 2”.
11. If the UE has re-selected Cell 2 within T3, after the re-selection or when T3 expires, continue with step 12. Otherwise, if T3 expires and the UE has not yet re-selected Cell 2, the TE shall switch off and on the UE and skip to step 13.
12. The SS shall send an *RRCRelease* message to ensure that the UE is in state RRC_IDLE on Cell 2.
13. Ensure the UE is in state RRC_IDLE with generic procedure parameters connectivity *NR* according to TS 38.508-1 [14] clause 4.5 on Cell 2.

14. Repeat step 2-13 until a test verdict has been achieved.
    Each of the events “Re-select Cell 1” and “Re-select Cell 2” is evaluated independently for the statistic, resulting in an event verdict: pass or fail. Each event is evaluated only until the confidence level according to Table G.2.3-1 in Annex G clause G.2 is achieved. Different events may require different times for a verdict.
    If both events pass, the test passes. If one event fails, the test fails.

6.1.1.8.4.3 Message contents

Message contents are according to TS 38.508-1 [14] clause 4.6 with the following exceptions:

Table 6.1.1.8.4.3-1: Common Exception messages

Default Message Contents	
Common contents of system information blocks exceptions	Table H.2.2-1 Table H.2.2-2 with Condition SSB.1 FR1, SMTC.2 and Asynchronous cells for configuration 6.1.1.2-1 and Cell 1 Table H.2.2-2 with Condition SSB.1 FR1, SMTC.6 and Asynchronous cells for configuration 6.1.1.2-1 and Cell 2 Table H.2.2-2 with Condition SSB.1 FR1, SMTC.1 and synchronous cells for configuration 6.1.1.2-2 Table H.2.2-2 with Condition SSB.2 FR1, SMTC.1 and synchronous cells for configuration 6.1.1.2-3 Table H.2.2-3
Default RRC messages and information elements contents exceptions	

Table 6.1.1.8.4.3-2: *SIB4*: NR inter frequency cell re-selection with highSpeedMeasInterFreq-r17

Derivation Path: Table H.2.2-2			
Information Element	**Value/remark**	**Comment**	**Condition**
SIB4 ::= SEQUENCE {			
InterFreqCarrierFreqInfo-v1700 ::= SEQUENCE {			
highSpeedMeasInterFreq-r17	TRUE		
}			
}			

6.1.1.8.5 Test requirement

Table 6.1.1.8.5-1 defines the primary level settings including test tolerances for EN-DC FR1 interruptions at SRS carrier based switching in asynchronous EN-DC.

Table 6.1.1.8.5-1: NR cell specific test parameters for NR SA FR1-FR1 Cell reselection for UE configured with highSpeedMeasInterFreq-r17

Parameter	Unit	Test configuration	Cell 1			Cell 2		
			T1	T2	T3	T1	T2	T3
TDD configuration		1	N/A			N/A		
		2	TDDConf.1.1			TDDConf.1.1		
		3	TDDConf.2.1			TDDConf.2.1		
PDSCH RMC configuration		1	SR.1.1 FDD			SR.1.1 FDD		
		2	SR.1.1 TDD			SR.1.1 TDD		
		3	SR.2.1 TDD			SR.2.1 TDD		
RMSI CORESET RMC configuration		1	CR.1.1 FDD			CR.1.1 FDD		
		2	CR.1.1 TDD			CR.1.1 TDD		
		3	CR.2.1 TDD			CR.2.1 TDD		
Dedicated CORESET RMC configuration		1	CCR.1.1 FDD			CCR.1.1 FDD		
		2	CCR.1.1 TDD			CCR.1.1 TDD		
		3	CCR.2.1 TDD			CCR.2.1 TDD		
OCNG Pattern		1, 2, 3	OP.1 defined in A.3.2.1			OP.1 defined in A.3.2.1		

Initial DL BWP configuration		1, 2, 3	DLBWP.0.1			DLBWP.0.1		
Initial UL BWP configuration		1, 2, 3	ULBWP.0.1			ULBWP.0.1		
RLM-RS		1, 2, 3	SSB			SSB		
Qrxlevmin	dBm/SCS	1, 2	-140			-140		
		3	-137			-137		
Pcompensation	dB	1, 2, 3	0			0		
Cell_selection_and_reselection_quality_measurement		1, 2, 3	SS-RSRP			SS-RSRP		
$\hat{E}_s / I_{ot}$	dB	1	14+TT	14+TT	14+TT	-4+TT	-infinity	12+TT
		2						
		3						
N_{oc} Note2	dBm/SCS	1	-98+TT					
		2	-98+TT					
		3	-95+TT					
N_{oc} Note2	dBm/15 kHz	1	-98+TT					
		2						
		3						
$\hat{E}_s / N_{oc}$	dB	1	14+TT	14+TT	14+TT	-4+TT	-infinity	12+TT
		2						
		3						
SS-RSRP Note3	dBm/SCS	1	-84+TT	-84+TT	-91+TT	-102+TT	-infinity	-86+TT
		2	-84+TT	-84+TT	-84+TT	-102+TT	-infinity	-86+TT
		3	-81+TT	-81+TT	-81+TT	-99+TT	-infinity	-83+TT
Io	dBm/9.36 MHz	1	-55.88+TT	-55.88+TT	-55.88+TT	-68.60+TT	-70.05+TT	-57.78+TT
	dBm/9.36 MHz	2	-55.88+TT	-55.88+TT	-55.88+TT	-68.60+TT	-70.05+TT	-57.78+TT
	dBm/38.16 MHz	3	-49.79+TT	-49.79+TT	-49.79+TT	-62.50+TT	-63.96+TT	-51.69+TT
Treselection	s	1, 2, 3	0	0	0	0	0	0
SnonintrasearchP	dB	1, 2, 3	50			50		
$Thresh_{x, highP}$	dB	1, 2, 3	48			48		
$Thresh_{serving, lowP}$	dB	1, 2, 3	44			44		
$Thresh_{x, lowP}$	dB	1, 2, 3	50			50		
Propagation Condition		1, 2	AWGN for active cell, AWGN 1944Hz Note 4 for neighbour cell					
Propagation Condition		3	AWGN for active cell, AWGN 3334Hz Note 5 for neighbour cell					

Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.

Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for N_{oc} to be fulfilled.

Note 3: SS-RSRP levels have been derived from other parameters for information purposes. They are not settable parameters themselves.

Note 4: The AWGN 1944 Hz condition is a non fading propagation channel with one tap. Doppler shift is a constant 1944 Hz.

Note 5: The AWGN 3334 Hz condition is a non fading propagation channel with one tap. Doppler shift is a constant 3334 Hz.

The cell reselection delay to a newly detectable cell is defined as the time from the beginning of time period T3, to the moment when the UE camps on Cell 2, and starts to send preambles on the PRACH for sending the *RRCSetupRequest* message to perform a Tracking Area Update procedure on Cell 2.

The cell re-selection delay to a newly detectable cell shall be less than 5 s.

The cell reselection delay to an already detected cell is defined as the time from the beginning of time period T1, to the moment when the UE camps on cell 1, and starts to send preambles on the PRACH for sending the *RRCSetupRequest* message to perform a Tracking Area Update procedure on cell 1.

The cell re-selection delay to an already detected cell shall be less than 3 s.

The rate of correct events observed during repeated tests shall be at least 90% with the confidence level of 95%.

6.1.2 NR – E-UTRA cell re-selection

6.1.2.0 Minimum conformance requirements

6.1.2.0.1 Minimum conformance requirements for NR – E-UTRA cell re-selection

The cell re-selection delay to a higher priority cell shall be less than $T_{higher_priority_search} + T_{evaluate,\ EUTRAN} + T_{SI\text{-}E\text{-}UTRA}$ in RRC_IDLE state.

The cell re-selection delay to a lower priority E-UTRA cell shall be less than $T_{evaluate,\ E\text{-}UTRAN} + T_{SI\text{-}E\text{-}UTRA}$ in RRC_IDLE state.

If Srxlev > $S_{nonIntraSearchP}$ and Squal > $S_{nonIntraSearchQ}$ then the UE shall search for inter-RAT E-UTRAN layers of higher priority at least every $T_{higher_priority_search}$ where $T_{higher_priority_search}$ is described in clause 4.2.2 of TS 38.133 [6].

If Srxlev ≤ $S_{nonIntraSearchP}$ or Squal ≤ $S_{nonIntraSearchQ}$ then the UE shall search for and measure inter-RAT E-UTRAN layers of higher, lower priority in preparation for possible reselection. In this scenario, the minimum rate at which the UE is required to search for and measure higher priority inter-RAT E-UTRAN layers shall be the same as that defined below for lower priority RATs.

The requirements in this section apply for inter-RAT E-UTRAN FDD measurements and E-UTRA TDD measurements. When the measurement rules indicate that inter-RAT E-UTRAN cells are to be measured, the UE shall measure RSRP and RSRQ of detected E-UTRA cells in the neighbour frequency list at the minimum measurement rate specified in this section. The parameter $N_{EUTRA_carrier}$ is the total number of configured E-UTRA carriers in the neighbour frequency list. The UE shall filter RSRP and RSRQ measurements of each measured E-UTRA cell using at least 2 measurements. Within the set of measurements used for the filtering, at least two measurements shall be spaced by at least $T_{measure,EUTRAN}/2$.

The parameter $N_{EUTRA_carrier}$ is the total number of configured E-UTRA carriers indicated to meet non high speed requirements in the neighbour frequency list. The parameter $N_{EUTRA_carrier_HST}$ is the total number of configured E-UTRA carriers indicated to meet high speed requirements in the neighbour frequency list. If Srxlev ≤ $S_{nonIntraSearchP}$ or Squal ≤ $S_{nonIntraSearchQ}$, an inter-RAT E-UTRAN layer is indicated to meet high speed requirements if highSpeedMeasFlag-r16 is configured and the carrier to be measured is configured with highSpeedEUTRACarrier-r16 and UE supports the enhanced inter-RAT E-UTRAN measurement requirements. If Srxlev > $S_{nonIntraSearchP}$ and Squal > $S_{nonIntraSearchQ}$, UE is required to meet non high speed requirements no matter whether highSpeedMeasFlag-r16 or highSpeedEUTRACarrier-r16 is configured or not.

An inter-RAT E-UTRA cell is considered to be detectable provided the following conditions are fulfilled:

- the same conditions as for inter-frequency RSRP measurements specified in TS 36.133 [15, Annex B.1.2] are fulfilled for a corresponding Band, and
- the same conditions as for inter-frequency RSRQ measurements specified in TS 36.133 [15, Annex B.1.2] are fulfilled for a corresponding Band.
- SCH conditions specified in TS 36.133 [15, Annex B.1.2] are fulfilled for a corresponding Band.

The UE shall be able to evaluate whether a newly detectable inter-RAT E-UTRAN cell meets the reselection criteria defined in TS38.304 [1] within $N_{EUTRA_carrier_HST} * T_{detect,EUTRAN_HST} + N_{EUTRA_carrier} * T_{detect,EUTRAN}$ when Srxlev ≤ $S_{nonIntraSearchP}$ or Squal ≤ $S_{nonIntraSearchQ}$ when $T_{reselection} = 0$ provided that the reselection criteria is met by a margin of at least 6dB for RSRP reselections based on absolute priorities or 4dB for RSRQ reselections based on absolute priorities.

Cells which have been detected shall be measured at least every ($N_{EUTRA_carrier}$) * $T_{measure,EUTRAN}$ when Srxlev ≤ $S_{nonIntraSearchP}$ or Squal ≤ $S_{nonIntraSearchQ}$.

When higher priority cells are found by the higher priority search, they shall be measured at least every $T_{measure,EUTRAN}$. If, after detecting a cell in a higher priority search, it is determined that reselection has not occurred then the UE is not required to continuously measure the detected cell to evaluate the ongoing possibility of reselection. However, the minimum measurement filtering requirements specified later in this section shall still be met by the UE before it makes any determination that it may stop measuring the cell.

If the UE detects on an inter-RAT E-UTRAN carrier a cell whose physical identity is indicated as not allowed for that carrier in the measurement control system information of the serving cell, the UE is not required to perform measurements on that cell.

The UE shall not consider an inter-RAT E-UTRA cell in cell reselection, if it is indicated as not allowed in the measurement control system information of the serving cell.

For a cell that has been already detected, but that has not been reselected to, the filtering shall be such that the UE shall be capable of evaluating that an already identified inter-RAT E-UTRA cell has met reselection criterion defined in TS 38.304 [30] within ($N_{EUTRA_carrier}$) * $T_{evaluate,EUTRAN}$ when $T_{reselection}$ = 0 as specified in table 4.2.2.5-1 of TS 38.133 [6] provided that the reselection criteria is met by a margin of at least 6dB for RSRP reselections based on absolute priorities or 4dB for RSRQ reselections based on absolute priorities.

If $T_{reselection}$ timer has a non-zero value and the inter-RAT E-UTRA cell is satisfied with the reselection criteria which are defined in TS 38.304 [30], the UE shall evaluate this E-UTRA cell for the $T_{reselection}$ time. If this cell remains satisfied with the reselection criteria within this duration, then the UE shall reselect that cell.

The normative reference for this requirement is TS 38.133 [6] clause 4.2.2.5.

Table 6.1.2.0.1-1: $T_{detect,EUTRAN}$, $T_{measure,EUTRAN}$, and $T_{evaluate,EUTRAN}$

DRX cycle length [s]	$T_{detect,EUTRAN}$ [s] (number of DRX cycles)	$T_{measure,EUTRAN}$ [s] (number of DRX cycles)	$T_{evaluate,EUTRAN}$ [s] (number of DRX cycles)
0.32	11.52 (36)	1.28 (4)	5.12 (16)
0.64	17.92 (28)	1.28 (2)	5.12 (8)
1.28	32(25)	1.28 (1)	6.4 (5)
2.56	58.88 (23)	2.56 (1)	7.68 (3)

Table 6.1.2.0.1-2: $T_{detect,EUTRAN_HST}$, $T_{measure,EUTRAN_HST}$, and $T_{evaluate,EUTRAN_HST}$ for UE configured with highSpeedMeasFlag-r16

DRX cycle length [s]	$T_{detect,EURAN_HST}$ [s] (number of DRX cycles)	$T_{measure,EUTRAN_HST}$ [s] (number of DRX cycles)	$T_{evaluate,EUTRAN_HST}$ [s] (number of DRX cycles)
0.32	4.16 (13)	0.64 (2)	0.96 (3)
0.64	7.68 (12)	1.28 (2)	1.92 (3)
1.28	8.96 (7)	1.28 (1)	3.84 (3)
2.56	58.88 (23)	2.56 (1)	7.68 (3)
Note 1: When highSpeedMeasFlag-r16 is configured, the requirements apply only to UE supporting either *measurementEnhancement-r16* or *[interRAT-MeasurementEnhancement-r16]*.			

The requirements in Table 6.1.2.0.1-2 apply only when the UE supports *measurementEnhancement-r16* or *interRAT-MeasurementEnhancement-r16*. For UE not supporting either *measurementEnhancement-r16* or *interRAT-MeasurementEnhancement-r16*, the UE is not required to meet the requirements specified in Table 6.1.2.0.1-2.

6.1.2.0.2 Minimum conformance requirement for inter-RAT E-UTRAN cells for UE configured with relaxed measurement criterion

6.1.2.0.2.1 Introduction

This clause contains the requirements for measurements on inter-RAT E-UTRAN cells when the UE is configured with any of following relaxed measurement critera:

- Relaxed measurement criterion for UE with low mobility defined in clause 5.2.4.9.1 in TS 38.304 [30],
- Relaxed measurement criterion for UE not-at-cell edge defined in clause 5.2.4.9.2 in TS 38.304 [30],
- Both low mobility criterion and not-at-cell edge criterion as defined in clauses 5.2.4.9.1 and 5.2.4.9.2 in TS 38.304 [30] respectively.

6.1.2.0.2.2 Measurements for UE fulfilling low mobility criterion

This clause contains requirements for measurements on inter-RAT E-UTRAN cells provided that:

- T331 timer is not running for EMR measurements on inter-RAT E-UTRAN, and
- UE is configured with *lowMobilityEvalutation* [13] criterion and UE has fulfilled, or
- UE is configured with both *lowMobilityEvalutation* [13] criterion and *cellEdgeEvaluation* [13] criterion and *combineRelaxedMeasCondition* [13] not configured, and
- UE has fulfilled only the *lowMobilityEvalutation* [13] criterion.

When Srxlev $\leq S_{nonIntraSearchP}$ or Squal $\leq S_{nonIntraSearchQ}$ then the requirements defined in clause 6.1.2.0.1 apply for this clause except that:

- $T_{detect,EUTRAN}$ as specified in Table 6.1.2.0.2.2-1.
- $T_{measure,EUTRAN}$ as specified in Table 6.1.2.0.2.2-1.
- $T_{evaluate,EUTRAN}$ as specified in Table 6.1.2.0.2.2-1.

When Srxlev > $S_{nonIntraSearchP}$ and Squal > $S_{nonIntraSearchQ}$ and the UE is configured with *highPriorityMeasRelax* [13] then the UE shall search for E-UTRA inter-RAT frequency layers of higher priority at least every $K2*T_{higher_priority_search}$ seconds where $T_{higher_priority_search}$ is described in clause 4.2.2.7 of TS 38.133 [6] and, K2 = 60. Otherwise if the UE is not configured with *highPriorityMeasRelax* [13] then the UE shall search for E-UTRA inter-RAT frequency layers of higher priority at least every $T_{higher_priority_search}$ where $T_{higher_priority_search}$ is described in clause 4.2.2.7 of TS 38.133 [6].

Table 6.1.2.0.2.2-1: $T_{detect,EUTRAN}$, $T_{measure,EUTRAN}$, and $T_{evaluate,EUTRAN}$

DRX cycle length [s]	$T_{detect,EUTRAN}$ [s] (number of DRX cycles)	$T_{measure,EUTRAN}$ [s] (number of DRX cycles)	$T_{evaluate,EUTRAN}$ [s] (number of DRX cycles)
0.32	11.52 x K1 (36 x K1)	1.28 x K1 (4 x K1)	5.12 x K1 (16 x K1)
0.64	17.92 x K1 (28 x K1)	1.28 x K1 (2 x K1)	5.12 x K1 (8 x K1)
1.28	32 x K1 (25 x K1)	1.28 x K1 (1 x K1)	6.4 x K1 (5 x K1)
2.56	58.88 x K1 (23 x K1)	2.56 x K1 (1 x K1)	7.68 x K1 (3 x K1)
Note 1: K1 = 3 is the measurement relaxation factor applicable for UE fulfilling the *lowMobilityEvalutation* [13] criterion.			

6.1.2.0.2.3 Measurements for UE fulfilling with not-at-cell edge criterion

This clause contains requirements for measurements on inter-RAT E-UTRAN cells provided that:

- T331 timer is not running for EMR measurements on inter-RAT E-UTRAN, and
- UE is configured with *cellEdgeEvaluation* [13] criterion and UE has fulfilled, or
- UE is configured with both *lowMobilityEvalutation* [13] criterion and *cellEdgeEvaluation* [13] criterion and *combineRelaxedMeasCondition* [13] not configured, and
- UE has fulfilled only the *cellEdgeEvaluation* [13] criterion.

When Srxlev $\leq S_{nonIntraSearchP}$ or Squal $\leq S_{nonIntraSearchQ}$ then the requirements defined in clause 6.1.2.0.1 apply for this clause except that:

- $T_{detect,EUTRAN}$ as specified in Table 6.1.2.0.2.3-1.
- $T_{measure,EUTRAN}$ as specified in Table 6.1.2.0.2.3-1.
- $T_{evaluate,EUTRAN}$ as specified in Table 6.1.2.0.2.3-1.

When Srxlev > $S_{nonIntraSearchP}$ and Squal > $S_{nonIntraSearchQ}$ and regardless of whether the UE is configured with *highPriorityMeasRelax* [13] or not, the UE shall search for inter-RAT E-UTRAN frequency layers of higher priority at least every $T_{higher_priority}$_search where $T_{higher_priority_search}$ is described in clause 4.2.2.7 of TS 38.133 [6].

Table 6.1.2.0.2.3-1: $T_{detect,EUTRAN}$, $T_{measure,EUTRAN}$, and $T_{evaluate,EUTRAN}$

DRX cycle length [s]	$T_{detect,EUTRAN}$ [s] (number of DRX cycles)	$T_{measure,EUTRAN}$ [s] (number of DRX cycles)	$T_{evaluate,EUTRAN}$ [s] (number of DRX cycles)
0.32	11.52 x K1 (36 x K1)	1.28 x K1 (4 x K1)	5.12 x K1 (16 x K1)
0.64	17.92 x K1 (28 x K1)	1.28 x K1 (2 x K1)	5.12 x K1 (8 x K1)
1.28	32 x K1 (25 x K1)	1.28 x K1 (1 x K1)	6.4 x K1 (5 x K1)
2.56	58.88 x K1 (23 x K1)	2.56 x K1 (1 x K1)	7.68 x K1 (3 x K1)
Note 1: K1 = 3 is the measurement relaxation factor applicable for UE fulfilling the *lowMobilityEvalutation* [13] criterion.			

6.1.2.0.2.4 Measurements for UE fulfilling low mobility and not-at-cell edge criterion

This clause contains requirements for measurements on inter-RAT E-UTRAN cells provided that:

- T331 timer is not running for EMR measurements on inter-RAT E-UTRAN, and
- UE is configured with both *lowMobilityEvalutation* [13] criterion and *cellEdgeEvaluation* [13] criterion, and
- has also fulfilled both criteria, and
- less than 1 hour have passed since measurements for cell reselection were last performed,

In this case the UE is not required to meet $T_{detect,EUTRAN}$, $T_{measure,EUTRAN}$ and $T_{evaluate,EUTRAN}$ as defined in Table 6.1.2.0.1-1.

The normative reference for this requirement is TS 38.133 [6] clause 4.2.2.11.

6.1.2.1 NR SA FR1 – E-UTRA cell re-selection to higher priority E-UTRA

6.1.2.1.1 Test purpose

This test is to verify the requirement for the NR to E-UTRAN inter-RAT cell reselection requirements specified in clause 4.2.2.5 of TS 38.133 [6] when the E-UTRAN cell is of higher priority.

6.1.2.1.2 Test applicability

This test applies to all types of NR UE from Release 15 onwards.

6.1.2.1.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 6.1.2.0.1.

The normative reference for this requirement is TS 38.133 [6] clause A.6.1.2.1.

6.1.2.1.4 Test description

6.1.2.1.4.1 Initial conditions

The Test shall be tested using any of the test configuration in Table 6.1.2.1.4.1-1.

Table 6.1.2.1.4.1-1: Supported test configurations

Configuration	Description of serving cell	Description of target cell
6.1.2.1-1	NR 15 kHz SSB SCS, 10MHz bandwidth, FDD duplex mode	LTE 10MHz bandwidth, TDD duplex mode
6.1.2.1-2	NR 15 kHz SSB SCS, 10MHz bandwidth, TDD duplex mode	LTE 10MHz bandwidth, TDD duplex mode

6.1.2.1-3	NR 30 kHz SSB SCS, 40MHz bandwidth, TDD duplex mode	LTE 10MHz bandwidth, TDD duplex mode
6.1.2.1-4	NR 15 kHz SSB SCS, 10MHz bandwidth, FDD duplex mode	LTE 10MHz bandwidth, FDD duplex mode
6.1.2.1-5	NR 15 kHz SSB SCS, 10MHz bandwidth, TDD duplex mode	LTE 10MHz bandwidth, FDD duplex mode
6.1.2.1-6	NR 30 kHz SSB SCS, 40MHz bandwidth, TDD duplex mode	LTE 10MHz bandwidth, FDD duplex mode
Note: The UE is only required to be tested in one of the supported test configurations.		

Configure the test requirement and the DUT according to the parameters in Table 6.1.2.1.4.1-2.

Table 6.1.2.1.4.1-2: Initial conditions for NR SA FR1 – E-URTA cell re-selection to higher priority E-UTRA

Parameter	Value		Comment
Test environment	NC		As specified in TS 38.508-1 [14] clause 4.1.
Test frequencies	As specified in Annex E, Table E.4-2 and TS 38.508-1 [14] clause 4.3.1.		
Channel bandwidth	As specified by the test configuration selected from Table 6.1.2.1.4.1-1.		
Propagation conditions	AWGN		As specified in Annex C.2.2.
Connection Diagram	TE Part	A.3.1.6.1	As specified in TS 38.508-1 [14] Annex A.
	DUT Part	A.3.2.3.2	
Exceptions to connection diagram	N/A		

1. The general test parameter settings are set up according to Table 6.1.2.1.4.1-3.

2. Message contents are defined in clause 6.1.2.1.4.3.

3. The test scenario comprises of one NR cell and one E-UTRAN cell. Cell 1 is the NR PCell and Cell 2 is the E-UTRA neighbour cell. Cell 1 is configured according to Annex C.1.1 and C.1.2, Cell 2 is configured according to TS 36.521-3 [26] Annex C.1.0 and C.1.1.

Table 6.1.2.1.4.1-3: General test parameters for NR to higher priority E-UTRAN cell re-selection test case

Parameter		Unit	Test configuration	Value	Comment
Initial condition	Active cell		1, 2, 3, 4, 5, 6	Cell1	The UE camps on cell 1 in the initial phase and during T2 period the UE reselects to cell 2.
T2 end condition	Active cell		1, 2, 3, 4, 5, 6	Cell2	The UE shall perform reselection to cell 2 during T2.
	Neighbour cell		1, 2, 3, 4, 5, 6	Cell1	
T3 end condition	Active cell		1, 2, 3, 4, 5, 6	Cell1	The UE shall perform reselection to cell 1 during T3 for iteration of the tests.
	Neighbour cell		1, 2, 3, 4, 5, 6	Cell2	
Access Barring Information		-	1, 2, 3, 4, 5, 6	Not Sent	No additional delays in random access procedure.
DRX cycle length		s	1, 2, 3, 4, 5, 6	1.28	The value shall be used for all cells in the test.
NR PRACH configuration index			1, 2, 3, 4, 5, 6	102	The detailed configuration is specified in TS 38.211 clause 6.3.3.2
E-UTRAN PRACH configuration index			1, 2, 3	53	As specified in table 5.7.1-2 in TS 36.211
			4, 5, 6	4	
T1		s	1, 2, 3, 4, 5, 6	>7	During T1, cell 2 shall be powered off, and during the off time the physical cell identity shall be changed. The intention is to ensure that cell 2 has not been detected by the UE prior to the start of period T2.
T2		s	1, 2, 3, 4, 5, 6	75	T2 needs to be defined so that cell re-selection reaction time is taken into account.

T3	s	1, 2, 3, 4, 5, 6	15	T3 needs to be defined so that cell re-selection reaction time is taken into account.

6.1.2.1.4.2 Test procedure

Two cells are deployed in the test, which are one FR1 NR PCell (Cell 1) and an E-UTRA neighbour cell (Cell 2). The test consists of three successive time periods, with time duration of T1, T2, and T3 respectively. NR cell 1 is already identified by the UE prior to the start of the test. E-UTRAN cell 2 is of higher priority than cell 1.

Before T1 the UE is camped on to cell 1. During T1, cell 2 shall be powered off. At the start of T2 the UE is expected to detect cell 2, send preambles on the PRACH for sending the RRC CONNECTION REQUEST message to perform a Tracking Area Update procedure on cell 2. At the start of T3 cell 2 becomes weaker than cell 1, and the UE reselects to Cell 1.

In the following test procedure “UE responds” means “UE starts transmitting preamble on PRACH for sending the RRC CONNECTION REQUEST message to perform a Tracking Area Update procedure.

1. Ensure the UE is in state RRC_IDLE with generic procedure parameters connectivity *NR* with Test Mode *On* according to TS 38.508-1 [14] clause 4.5 on Cell 1.
2. Set the parameters according to T1 in Table 6.1.2.1.5-1 and 6.1.2.1.5-2. T1 starts.
3. During T1, Cell 2 shall be powered off and set Cell 2 physical cell identity = ((current Cell 2 physical cell identity + 1) mod 1008) for one iteration of the test procedure loop.
4. When T1 expires, the SS shall switch the power setting from T1 to T2 as specified in Table 6.1.2.1.5-1 and 6.1.2.1.5-2. T2 starts.
5. The SS waits for random access requests information from the UE to perform cell re-selection to a higher priority cell, Cell 2.
6. If the UE responds on Cell 2 during time duration T2 within 68 seconds from the beginning of time period T2, then the number of successful tests is increased by one. Otherwise, the number of failure tests is increased by one.
7. If the UE has re-selected Cell 2 within T2, after the re-selection or when T2 expires, continue with step 7a. Otherwise, if T2 expires and the UE has not yet re-selected Cell 2, the TE shall switch off and on the UE and skip to step 11.

7a The SS shall send an *RRCConnectionRelease* message to ensure that the UE is in state RRC_IDLE on Cell 2.

8. The SS shall switch the power setting from T2 to T3 as specified in Table 6.1.2.1.5-1 and 6.1.2.1.5-2. T3 starts.
9. The SS waits for random access requests information from the UE to perform cell re-selection to a lower priority cell, Cell 1.
10. If the UE has re-selected Cell 1 within T3, after the re-selection or when T3 expires, continue with step 10a. Otherwise, if T3 expires and the UE has not yet re-selected Cell 1, the TE shall switch off and on the UE and skip to step 11.

10a. The SS shall send an *RRCRelease* message to ensure that the UE is in state RRC_IDLE on Cell 1.

11. Ensure the UE is in state RRC_IDLE with generic procedure parameters connectivity *NR* according to TS 38.508-1 [14] clause 4.5.
12. Repeat step 2-11 until a test verdict has been achieved.

6.1.2.1.4.3 Message contents

Message contents are according to TS 38.508-1 [14] clause 4.6 with the following exceptions:

Table 6.1.2.1.4.3-1: Common Exception messages

Default Message Contents

Common contents of system information blocks exceptions	Table H.2.3-1 Table H.2.3-2 with Condition SMTC 1 and higher priority for configuration 6.1.2.1-2, 6.1.2.1-3, 6.1.2.1-5 and 6.1.2.1-6 Table H.2.3-2 with Condition SMTC 2 and higher priority for configuration 6.1.2.1-1 and 6.1.2.1-4 Table H.2.3-3 with Condition higher priority
Default RRC messages and information elements contents exceptions	

Table 6.1.2.1.4.3-2: SystemInformationBlockType3

Derivation Path: TS 36.508 [25] Table 4.4.3.3-2			
Information Element	**Value/remark**	**Comment**	**Condition**
SystemInformationBlockType3 ::= SEQUENCE {			
cellReselectionServingFreqInfo SEQUENCE {			
threshServingLow	22	Actual value = 44 dB	
cellReselectionPriority	5		higher priority E-UTRA
}			
}			

Table 6.1.2.1.4.3-3: SystemInformationBlockType24

Derivation Path: TS 36.508 [25] Table 4.4.3.3-20			
Information Element	**Value/remark**	**Comment**	**Condition**
SystemInformationBlockType24-r15 ::= SEQUENCE {			
carrierFreqListNR-r15 SEQUENCE (SIZE (1..maxFreq)) OF SEQUENCE {	1 entry		
cellReselectionPriority-r15[*n*]	4		higher priority E-UTRA
threshX-High-r15[1]	24	Actual value = 48 dB	
threshX-Low-r15[1]	25	Actual value = 50 dB	
}			
}			

6.1.2.1.5 Test requirement

Tables 6.1.2.1.4.1-3, 6.1.2.1.5-1 and 6.1.2.1.5-2 define the primary level settings including test tolerances for higher priority E-UTRA cell re-selection test case.

Table 6.1.2.1.5-1: Cell specific test parameters for NR cell 1

Parameter	**Unit**	**Test configuration**	**Cell 1**		
			T1	**T2**	**T3**
TDD configuration		1, 4	N/A		
		2, 5	TDDConf.1.1		
		3, 6	TDDConf.2.1		
PDSCH parameters		1, 4	SR.1.1 FDD		
		2, 5	SR.1.1 TDD		
		3, 6	SR.2.1 TDD		
RMSI CORESET parameters		1, 4	CR.1.1 FDD		
		2, 5	CR.1.1 TDD		
		3, 6	CR.2.1 TDD		
Dedicated CORESET parameters		1, 4	CCR.1.1 FDD		
		2, 5	CCR.1.1 TDD		
		3, 6	CCR.2.1 TDD		
SSB parameters		1, 4	SSB.1 FR1		
		2, 5	SSB.1 FR1		
		3, 6	SSB.2 FR1		

Parameter	Unit	Test configuration	Cell 1		
			T1	T2	T3
NR SMTC parameters		1, 4	SMTC 2		
		2, 5	SMTC 1		
		3, 6	SMTC 1		
OCNG Pattern		1, 2, 3, 4, 5, 6	OP.1 defined in A.2.1-1		
Initial DL BWP configuration		1, 2, 3, 4, 5, 6	DLBWP.0.1		
Initial UL BWP configuration		1, 2, 3, 4, 5, 6	ULBWP.0.1		
RLM-RS		1, 2, 3, 4, 5, 6	SSB		
Qrxlevmin	dBm/SCS	1, 2, 4, 5	-140		
		3, 6	-137		
N_{oc}	dBm/SCS	1, 4	-98		
		2, 5	-98		
		3, 6	-95		
N_{oc}	dBm/15 kHz	1, 2, 3, 4, 5, 6	-98		
SS-RSRP	dBm/SCS	1, 4	-84	-82.4	-82.4
		2, 5	-84	-82.4	-82.4
		3, 6	-81	-79.39	-79.39
$\hat{E}_s/I_{ot}$	dB	1, 4	14	15.6	15.6
		2, 5			
		3, 6			
$\hat{E}_s/N_{oc}$	dB	1, 4	14	15.6	15.6
		2, 5			
		3, 6			
Io	dBm/9.36 MHz	1, 4	-55.88	-54.33	-54.33
	dBm/9.36 MHz	2, 5	-55.88	-54.33	-54.33
	dBm/38.16 MHz	3, 6	-49.79	-48.23	-48.23
Treselection	S	1, 2, 3, 4, 5, 6	0		
SnonintrasearchP	dB	1, 2, 3, 4, 5, 6	50		
$Thresh_{x, highP}$ (Note 2)	dB	1, 2, 3, 4, 5, 6	48		
$Thresh_{serving, lowP}$	dB	1, 2, 3, 4, 5, 6	44		
$Thresh_{x, lowP}$	dB	1, 2, 3, 4, 5, 6	50		
Propagation Condition		1, 2, 3, 4, 5, 6	AWGN		
Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.					
Note 2: This refers to the value of threshX-High which is included in NR system information, and is a threshold for the E-UTRA target cell.					

Table 6.1.2.1.5-2: Cell specific test parameters for E-UTRA cell 2

Parameter	Unit	Cell 2		
		T1	T2	T3
E-UTRA RF Channel number		1		
$BW_{channel}$	MHz	10		
OCNG Patterns defined in TS 36.133 clause A.3.2		OP.2 TDD for test configuration 1, 2, 3; OP.2 FDD for test configuration 4, 5, 6		
PBCH_RA	dB	0		
PBCH_RB	dB			
PSS_RA	dB			
SSS_RA	dB			
PCFICH_RB	dB			
PHICH_RA	dB			
PHICH_RB	dB			
PDCCH_RA	dB			
PDCCH_RB	dB			
PDSCH_RA	dB			
PDSCH_RB	dB			
OCNG_RA[Note 1]	dB			
OCNG_RB[Note 1]	dB			
Qrxlevmin	dBm	-140		
N_{oc}	dBm/15 kHz	-98	-98	-100

Parameter	Unit	Cell 2		
		T1	T2	T3
RSRP	dBm/15 KHz	-infinity	-84.4	-103.6
$\hat{E}_s/I_{ot}$	dB	-infinity	13.6	-3.6
$\hat{E}_s/N_{oc}$	dB	-infinity	13.6	-3.6
$Treselection_{EUTRAN}$	S	0		
SnonintrasearchP	dB	Not sent		
$Thresh_{x, highP}$	dB	48		
$Thresh_{serving, lowP}$	dB	44		
$Thresh_{x, lowP (Note 2)}$	dB	50		
Propagation Condition		AWGN		
Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols. Note 2: This refers to the value of threshX-Low-r15 which is included in E-UTRA system information, and is a threshold for the NR target cell.				

The cell reselection delay to a higher priority E-UTRAN cell is defined as the time from the beginning of time period T2, to the moment when the UE camps on cell 2, and starts to send preambles on the PRACH for sending the RRC CONNECTION REQUEST message to perform a Tracking Area Update procedure on cell 2.

The cell re-selection delay to a higher priority cell shall be less than 68 s.

The rate of correct cell reselections observed during repeated tests shall be at least 90%.

NOTE: The cell re-selection delay to a higher priority cell can be expressed as: $T_{higher_priority_search} + T_{evaluate, E-UTRAN} + T_{SI-E-UTRA}$,

Where:

$T_{higher_priority_search}$ See clause 4.2.2.7 of TS 38.133 [6]

$T_{evaluate, E-UTRAN}$ See Table 4.2.2.5-1 in clause 4.2.2.5 of TS 38.133 [6]

$T_{SI-E-UTRA}$ Maximum repetition period of relevant system info blocks that needs to be received by the UE to camp on a cell; 1280 ms is assumed in this test case.

This gives a total of 67.68 s, allow 68 s for the cell re-selection delay to a higher priority E-UTRAN cell.

6.1.2.2 NR SA FR1 – E-UTRA cell re-selection to lower priority E-UTRA

6.1.2.2.1 Test purpose

This test is to verify the requirement for the NR to E-UTRAN inter-RAT cell reselection requirements specified in clause 4.2.2.5 of TS 38.133 [6] when the E-UTRAN cell is of lower priority.

6.1.2.2.2 Test applicability

This test applies to all types of NR UE from Release 15 onwards.

6.1.2.2.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 6.1.2.0.1.

The normative reference for this requirement is TS 38.133 [6] clause A.6.1.2.2.

6.1.2.2.4 Test description

6.1.2.2.4.1 Initial conditions

The Test shall be tested using any of the test configuration in Table 6.1.2.2.4.1-1.

Table 6.1.2.2.4.1-1: Supported test configurations

Configuration	Description of serving cell	Description of target cell
6.1.2.2-1	NR 15 kHz SSB SCS, 10MHz bandwidth, FDD duplex mode	LTE 10MHz bandwidth, TDD duplex mode
6.1.2.2-2	NR 15 kHz SSB SCS, 10MHz bandwidth, TDD duplex mode	LTE 10MHz bandwidth, TDD duplex mode
6.1.2.2-3	NR 30 kHz SSB SCS, 40MHz bandwidth, TDD duplex mode	LTE 10MHz bandwidth, TDD duplex mode
6.1.2.2-4	NR 15 kHz SSB SCS, 10MHz bandwidth, FDD duplex mode	LTE 10MHz bandwidth, FDD duplex mode
6.1.2.2-5	NR 15 kHz SSB SCS, 10MHz bandwidth, TDD duplex mode	LTE 10MHz bandwidth, FDD duplex mode
6.1.2.2-6	NR 30 kHz SSB SCS, 40MHz bandwidth, TDD duplex mode	LTE 10MHz bandwidth, FDD duplex mode
Note: The UE is only required to be tested in one of the supported test configurations.		

Configure the test equirement and the DUT according to the parameters in Table 6.1.2.2.4.1-2.

Table 6.1.2.2.4.1-2: Initial conditions for NR SA FR1 – E-URTA cell re-selection to lower priority E-UTRA

Parameter	Value		Comment
Test environment	NC		As specified in TS 38.508-1 [14] clause 4.1.
Test frequencies	As specified in Annex E, Table E.4-1 and TS 38.508-1 [14] clause 4.3.1.		
Channel bandwidth	As specified by the test configuration selected from Table 6.1.2.2.4.1-1.		
Propagation conditions	AWGN		As specified in Annex C.2.2.
Connection Diagram	TE Part	A.3.1.6.1	As specified in TS 38.508-1 [14] Annex A.
	DUT Part	A.3.2.3.2	
Exceptions to connection diagram	N/A		

1. The general test parameter settings are set up according to Table 6.1.2.2.4.1-3.

2. Message contents are defined in clause 6.1.2.2.4.3.

3. The test scenario comprises of one NR cell and one E-UTRAN cell. Cell 1 is the NR PCell and Cell 2 is the E-UTRA neighbour cell. Cell 1 is configured according to Annex C.1.1 and C.1.2, Cell 2 is configured according to TS 36.521-3 [26] Annex C.1.0 and C.1.1.

Table 6.1.2.2.4.1-3: General test parameters for NR to lower priority E-UTRAN cell re-selection test case

Parameter		Unit	Test configuration	Value	Comment
Initial condition	Active cell		1, 2, 3, 4, 5, 6	Cell1	The UE camps on cell 1 in the initial phase.
	Neighbour cell		1, 2, 3, 4, 5, 6	Cell2	
T1 end condition	Active cell		1, 2, 3, 4, 5, 6	Cell2	The UE shall perform reselection to cell 2 during T1.
	Neighbour cell		1, 2, 3, 4, 5, 6	Cell1	
T2 end condition	Active cell		1, 2, 3, 4, 5, 6	Cell1	The UE shall perform reselection to cell 1 during T2 for iteration of the tests.
	Neighbour cell		1, 2, 3, 4, 5, 6	Cell2	
Access Barring Information		-	1, 2, 3, 4, 5, 6	Not Sent	No additional delays in random access procedure.
DRX cycle length		s	1, 2, 3, 4, 5, 6	1.28	The value shall be used for all cells in the test.
NR PRACH configuration index			1, 2, 3, 4, 5, 6	102	The detailed configuration is specified in TS 38.211 clause 6.3.3.2
E-UTRAN PRACH configuration index			1, 2, 3	53	As specified in table 5.7.1-2 in TS 36.211
			4, 5, 6	4	
T1		s	1, 2, 3, 4, 5, 6	15	T1 needs to be defined so that cell re-selection reaction time is taken into account.

T2	s	1, 2, 3, 4, 5, 6	75	T2 needs to be defined so that cell re-selection reaction time is taken into account.

6.1.2.2.4.2 Test procedure

Two cells are deployed in the test, which are one FR1 NR PCell (Cell 1) and an E-UTRA neighbour cell (Cell 2). The test consists of two successive time periods, with time duration of T1 and T2 respectively. Both NR cell 1 and E-UTRAN cell 2 are already identified by the UE prior to the start of the test. E-UTRAN cell 2 is of lower priority than cell 1.

The cell reselection delay to a lower priority E-UTRAN cell is defined as the time from the beginning of time period T1, to the moment when the UE camps on cell 2, and starts to send preambles on the PRACH for sending the RRC CONNECTION REQUEST message to perform a Tracking Area Update procedure on cell 2.

1. Ensure the UE is in state RRC_IDLE with generic procedure parameters connectivity *NR* according to TS 38.508-1 [14] clause 4.5 on Cell 1.

1a. Set the parameters according to T2 in Table 6.1.2.2.5-1 and 6.1.2.2.5-2. SS waits at least for 32sec($T_{detect,EUTRAN}$) to ensure the UE can detect E-UTRA neighbor cell(Cell2).

2. Set the parameters according to T1 in Table 6.1.2.2.5-1 and 6.1.2.2.5-2. T1 starts.

3. The SS waits for random access requests information from the UE to perform cell re-selection on Cell 2.

4. If the UE responds on Cell 2 during time duration T1 within 8 seconds from the beginning of time period T1 then the number of successful tests is increased by one. Otherwise, the number of failure tests is increased by one.

5. If the UE has re-selected Cell 2 within T1, after the re-selection or when T1 expires, continue with step 5a. Otherwise, if T1 expires and the UE has not yet re-selected Cell 2, the TE shall switch off and on the UE and skip to step 9.

5a The SS shall send an *RRCConnectionRelease* message to ensure that the UE is in state RRC_IDLE on Cell 2.

6. The SS shall switch the power setting from T1 to T2 as specified in Table 6.1.2.2.5-1 and 6.1.2.2.5-2. T2 starts.

7. The SS waits for random access requests information from the UE to perform cell re-selection on Cell 1.

8. If the UE has re-selected Cell 1 within T2, after the re-selection or when T2 expires, continue with step 8a. Otherwise, if T2 expires and the UE has not yet re-selected Cell 1, the TE shall switch on and off the UE and skip to step 9.

8a. The SS shall send an *RRCRelease* message to ensure that the UE is in state RRC_IDLE on Cell 1.

9. Ensure the UE is in state RRC_IDLE with generic procedure parameters connectivity *NR* according to TS 38.508-1 [14] clause 4.5.

9a. Set the parameters according to T2 in Table 6.1.2.2.5-1 and 6.1.2.2.5-2. SS waits at least for 32sec($T_{detect,EUTRAN}$) to ensure the UE can detect E-UTRA neighbor cell(Cell2).

10. Repeat step 2-9 until the confidence level according to Tables G.2.3-1 in Annex G clause G.2 is achieved.

6.1.2.2.4.3 Message contents

Message contents are according to TS 38.508-1 [14] clause 4.6 with the following exceptions:

Table 6.1.2.2.4.3-1: Common Exception messages

Default Message Contents	
Common contents of system information blocks exceptions	Table H.2.3-1 Table H.2.3-3 with Condition lower priority
Default RRC messages and information elements contents exceptions	

Table 6.1.2.2.4.3-1A: SIB2

Derivation Path: Table H.2.3-2 with condition lower priority			
Information Element	**Value/remark**	**Comment**	**Condition**
SIB2 ::= SEQUENCE {			
cellReselectionServingFreqInfo SEQUENCE {			
s-NonIntraSearchP	Not present	UE applies the default value of infinity	
}			
intraFreqCellReselectionInfo SEQUENCE {			
smtc	SSB-MTC specified in TS 38.508-1 [14] Table 7.3.1-3 with condition SMTC.1		6.1.2.2-2, 6.1.2.2-3, 6.1.2.2-5, 6.1.2.2-6
	SSB-MTC specified in TS 38.508-1 [14] Table 7.3.1-3 with condition SMTC.2		6.1.2.2-1, 6.1.2.2-4,
}			
}			

Table 6.1.2.2.4.3-2: SystemInformationBlockType3

Derivation Path: TS 36.508 [25] Table 4.4.3.3-2			
Information Element	**Value/remark**	**Comment**	**Condition**
SystemInformationBlockType3 ::= SEQUENCE {			
cellReselectionServingFreqInfo SEQUENCE {			
threshServingLow	22	Actual value = 44 dB	
cellReselectionPriority	4		lower priority E-UTRA
}			
}			

Table 6.1.2.2.4.3-3: SystemInformationBlockType24

Derivation Path: TS 36.508 [25] Table 4.4.3.3-20			
Information Element	**Value/remark**	**Comment**	**Condition**
SystemInformationBlockType24-r15 ::= SEQUENCE {			
carrierFreqListNR-r15 SEQUENCE (SIZE (1..maxFreq)) OF SEQUENCE {	1 entry		
cellReselectionPriority-r15[*n*]	5		lower priority E-UTRA
threshX-High-r15[1]	24	Actual value = 48 dB	
threshX-Low-r15[1]	25	Actual value = 50 dB	
}			
}			

6.1.2.2.5 Test requirement

Tables 6.1.2.2.4.1-3, 6.1.2.2.5-1 and 6.1.2.2.5-2 define the primary level settings including test tolerances for lower priority E-UTRA cell re-selection test case.

Table 6.1.2.2.5-1: Cell specific test parameters for NR cell 1

Parameter	Unit	Test configuration	Cell 1	
			T1	T2
TDD configuration		1, 4	N/A	
		2, 5	TDDConf.1.1	
		3, 6	TDDConf.2.1	
PDSCH RMC configuration		1, 4	SR.1.1 FDD	
		2, 5	SR.1.1 TDD	

		3, 6	SR.2.1 TDD	
RMSI CORESET RMC configuration		1, 4	CR.1.1 FDD	
		2, 5	CR.1.1 TDD	
		3, 6	CR.2.1 TDD	
Dedicated CORESET RMC configuration		1, 4	CCR.1.1 FDD	
		2, 5	CCR.1.1 TDD	
		3, 6	CCR.2.1 TDD	
SSB configuration		1, 4	SSB.1 FR1	
		2, 5	SSB.1 FR1	
		3, 6	SSB.2 FR1	
SMTC configuration		1, 4	SMTC pattern 2	
		2, 5	SMTC pattern 1	
		3, 6	SMTC pattern 1	
OCNG Pattern		1, 2, 3, 4, 5, 6	OP.1 defined in A.2.1-1	
Initial DL BWP configuration		1, 2, 3, 4, 5, 6	DLBWP.0.1	
Initial UL BWP configuration		1, 2, 3, 4, 5, 6	ULBWP.0.1	
RLM-RS		1, 2, 3, 4, 5, 6	SSB	
Qrxlevmin	dBm/SCS	1, 2, 4, 5	-140	
		3, 6	-137	
N_{oc}	dBm/SCS	1, 4	-100	-98
		2, 5	-100	-98
		3, 6	-97	-95
N_{oc}	dBm/15 kHz	1, 2, 3, 4, 5, 6	-100	-98
SS-RSRP	dBm/SCS	1, 4	-103.6	-84.4
		2, 5	-103.6	-84.4
		3, 6	-100.59	-81.39
$\hat{E}_s/I_{ot}$	dB	1, 4	-3.6	13.6
		2, 5		
		3, 6		
$\hat{E}_s/N_{oc}$	dB	1, 4	-3.6	13.6
		2, 5		
		3, 6		
Io	dBm/9.36 MHz	1, 4	-70.46	-56.26
	dBm/9.36 MHz	2, 5	-70.46	-56.26
	dBm/38.16 MHz	3, 6	-64.38	-50.16
Treselection	S	1, 2, 3, 4, 5, 6	0	
SnonintrasearchP	dB	1, 2, 3, 4, 5, 6	Not sent	
$Thresh_{x, highP}$	dB	1, 2, 3, 4, 5, 6	48	
$Thresh_{serving, lowP}$	dB	1, 2, 3, 4, 5, 6	44	
$Thresh_{x, low P (Note 2)}$	dB	1, 2, 3, 4, 5, 6	50	
Propagation Condition		1, 2, 3, 4, 5, 6	AWGN	
Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.				
Note 2: This refers to the value of $Thresh_{x, LowP}$ which is included in NR system information, and is a threshold for the E-UTRA target cell				

Table 6.1.2.2.5-2: Cell specific test parameters for E-UTRA cell 2

Parameter	Unit	Cell 2	
		T1	T2 T3
E-UTRA RF Channel number		1	
$BW_{channel}$	MHz	10	
OCNG Patterns defined in TS 36.133 clause A.3.2		OP.2 TDD for test configuration 1, 2, 3; OP.2 FDD for test configuration 4, 5, 6	
PBCH_RA	dB	0	
PBCH_RB	dB		
PSS_RA	dB		
SSS_RA	dB		
PCFICH_RB	dB		
PHICH_RA	dB		
PHICH_RB	dB		

PDCCH_RA	dB		
PDCCH_RB	dB		
PDSCH_RA	dB		
PDSCH_RB	dB		
OCNG_RA Note 1	dB		
OCNG_RB Note 1	dB		
Qrxlevmin	dBm	-140	
N_{oc}	dBm/15 kHz	-98	
RSRP	dBm/15 KHz	-82.4	-84
$\hat{E}_s / I_{ot}$	dB	15.6	14
$\hat{E}_s / N_{oc}$	dB	15.6	14
$Treselection_{EUTRAN}$	S	0	
SnonintrasearchP	dB	Not sent	
$Thresh_{x, highP}$ (Note 2)	dB	48	
$Thresh_{serving, lowP}$	dB	44	
$Thresh_{x, lowP}$	dB	50	
Propagation Condition		AWGN	
Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.			
Note 2: This refers to the value of $Thresh_{x, highP}$ which is included in E-UTRA system information, and is a threshold for the NR target cell			

The cell reselection delay to a lower priority E-UTRAN cell is defined as the time from the beginning of time period T1, to the moment when the UE camps on cell 2, and starts to send preambles on the PRACH for sending the RRC CONNECTION REQUEST message to perform a Tracking Area Update procedure on cell 2.

The cell re-selection delay to a lower priority cell shall be less than 8 s.

The rate of correct cell reselections observed during repeated tests shall be at least 90%.

NOTE: The cell re-selection delay to a lower priority cell can be expressed as: $T_{evaluate, E-UTRAN} + T_{SI-E-UTRA}$,

Where:

$T_{evaluate, E-UTRAN}$ See Table 4.2.2.5-1 in clause 4.2.2.5 of TS 38.133 [6]

$T_{SI-E-UTRA}$ Maximum repetition period of relevant system info blocks that needs to be received by the UE to camp on a cell; 1280 ms is assumed in this test case.

This gives a total of 7.68 s, allow 8 s for the cell re-selection delay to a lower priority E-UTRAN cell.

6.1.2.3 NR SA FR1 – E-UTRA cell re-selection to lower priority E-UTRAN for UE fulfilling low mobility relaxed measurement criterion

6.1.2.3.1 Test purpose

This test is to verify the requirement for the NR to E-UTRAN inter-RAT cell reselection when UE fulfils the low mobility criterion specified in clause 4.2.2.11.2 of TS 38.133 [6] and the E-UTRAN cell is of lower priority.

6.1.2.3.2 Test applicability

This test applies to all types of NR UE from Release 16 onwards supporting relaxed RRM measurement.

6.1.2.3.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 6.1.2.0.2.

The normative reference for this requirement is TS 38.133 [6] clause A.6.1.2.3.

6.1.2.3.4 Test description

6.1.2.3.4.1 Initial conditions

The Test shall be tested using any of the test configuration in Table 6.1.2.3.4.1-1.

Table 6.1.2.3.4.1-1: Supported test configurations

Configuration	Description of serving cell	Description of target cell
6.1.2.3-1	NR 15 kHz SSB SCS, 10MHz bandwidth, FDD duplex mode	LTE 10MHz bandwidth, TDD duplex mode
6.1.2.3-2	NR 15 kHz SSB SCS, 10MHz bandwidth, TDD duplex mode	LTE 10MHz bandwidth, TDD duplex mode
6.1.2.3-3	NR 30 kHz SSB SCS, 40MHz bandwidth, TDD duplex mode	LTE 10MHz bandwidth, TDD duplex mode
6.1.2.3-4	NR 15 kHz SSB SCS, 10MHz bandwidth, FDD duplex mode	LTE 10MHz bandwidth, FDD duplex mode
6.1.2.3-5	NR 15 kHz SSB SCS, 10MHz bandwidth, TDD duplex mode	LTE 10MHz bandwidth, FDD duplex mode
6.1.2.3-6	NR 30 kHz SSB SCS, 40MHz bandwidth, TDD duplex mode	LTE 10MHz bandwidth, FDD duplex mode
Note: The UE is only required to be tested in one of the supported test configurations.		

Configure the test requirement and the DUT according to the parameters in Table 6.1.2.3.4.1-2.

Table 6.1.2.3.4.1-2: Initial conditions for NR SA FR1 – E-URTA cell re-selection to lower priority E-UTRA for UE fulfilling low mobility relaxed measurement criterion

Parameter	Value		Comment
Test environment	NC		As specified in TS 38.508-1 [14] clause 4.1.
Test frequencies	As specified in Annex E, Table E.4-1 and TS 38.508-1 [14] clause 4.3.1.		
Channel bandwidth	As specified by the test configuration selected from Table 6.1.2.3.4.1-1.		
Propagation conditions	AWGN		As specified in Annex C.2.2.
Connection Diagram	TE Part	A.3.1.6.1	As specified in TS 38.508-1 [14] Annex A.
	DUT Part	A.3.2.3.2	
Exceptions to connection diagram	N/A		

1. The general test parameter settings are set up according to Table 6.1.2.3.4.1-3.

2. Message contents are defined in clause 6.1.2.3.4.3.

3. The test scenario comprises of one NR cell and one E-UTRAN cell. Cell 1 is the NR PCell and Cell 2 is the E-UTRA neighbour cell. Cell 1 is configured according to Annex C.1.1 and C.1.2, Cell 2 is configured according to TS 36.521-3 [26] Annex C.1.0 and C.1.1.

Table 6.1.2.3.4.1-3: General test parameters for NR to lower priority E-UTRAN cell re-selection test case

Parameter		Unit	Test configuration	Value	Comment
Initial condition	Active cell		1, 2, 3, 4, 5, 6	Cell1	The UE camps on cell 1 in the initial phase, it fulfils Low Mobility relaxation measurements criterion, and during T1 period the UE reselects to cell 2.
	Neighbour cell		1, 2, 3, 4, 5, 6	Cell2	
T1 end condition	Active cell		1, 2, 3, 4, 5, 6	Cell2	The UE shall perform reselection to cell 2 during T1.
	Neighbour cell		1, 2, 3, 4, 5, 6	Cell1	
T2 end condition	Active cell		1, 2, 3, 4, 5, 6	Cell1	The UE shall perform reselection to cell 1 with higher priority during T2 for iteration of the tests.
	Neighbour cell		1, 2, 3, 4, 5, 6	Cell2	
Access Barring Information		-	1, 2, 3, 4, 5, 6	Not Sent	No additional delays in random access procedure.

DRX cycle length	s	1, 2, 3, 4, 5, 6	0.64	The value shall be used for all cells in the test.
NR PRACH configuration index		1, 2, 3, 4, 5, 6	102	The detailed configuration is specified in TS 38.211 clause 6.3.3.2
E-UTRAN PRACH configuration index		1, 2, 3	53	As specified in table 5.7.1-2 in TS 36.211
		4, 5, 6	4	
T1	s	1, 2, 3, 4, 5, 6	24	T1 needs to be defined so that cell re-selection reaction time is taken into account.
T2	s	1, 2, 3, 4, 5, 6	24	T2 needs to be defined so that cell re-selection reaction time is taken into account.

6.1.2.3.4.2 Test procedure

Two cells are deployed in the test, which are one FR1 NR PCell (Cell 1) and an E-UTRA neighbour cell (Cell 2). The test consists of two successive time periods, with time duration of T1 and T2 respectively. Both NR cell 1 and E-UTRAN cell 2 are already identified by the UE prior to the start of the test. E-UTRAN cell 2 is of lower priority than cell 1.

The UE is configured with the relaxed measurement criterion for UE with low mobility defined in clause 5.2.4.9.1 in TS 38.304 [30]. So, Cell 1 configures the UE as follows:

- *lowMobilityEvalutation* [13] criterion is configured according to the parameters listed in Table 6.1.2.3.5-1;
- *cellEdgeEvaluation* [13] criterion is not configured;
- *combineRelaxedMeasCondition* [13] is not configured

The cell reselection delay to a lower priority E-UTRAN cell with UE fulfilling low mobility criterion is defined as the time from the beginning of time period T1, to the moment when the UE camps on cell 2, and starts to send preambles on the PRACH for sending the RRC CONNECTION REQUEST message to perform a Tracking Area Update procedure on cell 2.

1. Ensure the UE is in state RRC_IDLE with generic procedure parameters Connectivity NR according to TS 38.508-1 [14] clause 4.5.
2. Set the parameters according to T1 in Table 6.1.2.3.5-1 and 6.1.2.3.5-2. T1 starts.
3. The SS waits for random access requests information from the UE to perform cell re-selection on Cell 2.
4. If the UE responds on Cell 2 during time duration T1 within 17 seconds from the beginning of time period T1 then the number of successful tests is increased by one. Otherwise, the number of failure tests is increased by one.
5. If the UE has re-selected Cell 2 within T1, after the re-selection or when T1 expires, continue with step 6. Otherwise, if T1 expires and the UE has not yet re-selected Cell 2, the TE shall switch off and on the UE and skip to step 11.

6 The SS shall send an RRCConnectionRelease to ensure that the UE is in state RRC_IDLE.

7. The SS shall switch the power setting from T1 to T2 as specified in Table 6.1.2.3.5-1 and 6.1.2.3.5-2. T2 starts.
8. The SS waits for random access requests information from the UE to perform cell re-selection on Cell 1.
9. If the UE has re-selected Cell 1 within T2, after the re-selection or when T2 expires, continue with step 10. Otherwise, if T2 expires and the UE has not yet re-selected Cell 1, the TE shall switch off and on the UE and skip to step 11.

10 The SS shall send an RRCConnectionRelease to ensure that the UE is in state RRC_IDLE, and then skip to step 12.

11. Ensure the UE is in state RRC_IDLE with generic procedure parameters Connectivity NR according to TS 38.508-1 [14] clause 4.5.
12. Repeat step 2-11 until the confidence level according to Tables G.2.3-1 in Annex G clause G.2 is achieved.

6.1.2.3.4.3 Message contents

Message contents are according to TS 38.508-1 [14] clause 4.6 with the following exceptions:

Table 6.1.2.3.4.3-1: Common Exception messages

Default Message Contents	
Common contents of system information blocks exceptions	Table H.2.3-1 Table H.2.3-2 with Condition SMTC 1 and lower priority for configuration 6.1.2.3-2, 6.1.2.3-3, 6.1.2.3-5 and 6.1.2.3-6 Table H.2.3-2 with Condition SMTC 2 and lower priority for configuration 6.1.2.3-1 and 6.1.2.3-4 Table H.2.3-3 with Condition lower priority
Default RRC messages and information elements contents exceptions	Table H.3.2-1

Table 6.1.2.3.4.3-2: SIB2

Derivation Path: TS 38.508-1 [14] Table 4.6.2-1			
Information Element	**Value/remark**	**Comment**	**Condition**
SIB2 ::= SEQUENCE {			
relaxedMeasurement-r16 SEQUENCE {			
lowMobilityEvaluation-r16 SEQUENCE {			
s-SearchDeltaP-r16	dB3		
t-SearchDeltaP-r16	s5		
}			
cellEdgeEvaluation-r16	Not present		
combineRelaxedMeasCondition-r16	Not present		
highPriorityMeasRelax-r16	Not present		
}			
}			

Table 6.1.2.3.4.3-3: SystemInformationBlockType3

Derivation Path: TS 36.508 [25] Table 4.4.3.3-2			
Information Element	**Value/remark**	**Comment**	**Condition**
SystemInformationBlockType3 ::= SEQUENCE {			
relaxedMeasurement-r16 SEQUENCE {			
threshServingLow	22	Actual value = 44 dB	
cellReselectionPriority	4		lower priority E-UTRA
}			
}			

Table 6.1.2.3.4.3-4: SystemInformationBlockType24

Derivation Path: TS 36.508 [25] Table 4.4.3.3-20			
Information Element	**Value/remark**	**Comment**	**Condition**
SystemInformationBlockType24-r15 ::= SEQUENCE {			
carrierFreqListNR-r15 SEQUENCE (SIZE (1..maxFreq)) OF SEQUENCE {	1 entry		
cellReselectionPriority-r15[*n*]	5		lower priority E-UTRA
threshX-High-r15[1]	24	Actual value = 48 dB	
threshX-Low-r15[1]	25	Actual value = 50 dB	
}			
}			

6.1.2.3.5 Test requirement

Tables 6.1.2.3.4.1-3, 6.1.2.3.5-1 and 6.1.2.3.5-2 define the primary level settings including test tolerances for lower priority E-UTRA cell re-selection test case.

Table 6.1.2.3.5-1: Cell specific test parameters for NR cell 1

Parameter	Unit	Test configuration	Cell 1	
			T1	T2
TDD configuration		1, 4	N/A	
		2, 5	TDDConf.1.1	
		3, 6	TDDConf.2.1	
PDSCH RMC configuration		1, 4	SR.1.1 FDD	
		2, 5	SR.1.1 TDD	
		3, 6	SR.2.1 TDD	
RMSI CORESET RMC configuration		1, 4	CR.1.1 FDD	
		2, 5	CR.1.1 TDD	
		3, 6	CR.2.1 TDD	
Dedicated CORESET RMC configuration		1, 4	CCR.1.1 FDD	
		2, 5	CCR.1.1 TDD	
		3, 6	CCR.2.1 TDD	
SSB configuration		1, 4	SSB.1 FR1	
		2, 5	SSB.1 FR1	
		3, 6	SSB.2 FR1	
SMTC configuration		1, 4	SMTC pattern 2	
		2, 5	SMTC pattern 1	
		3, 6	SMTC pattern 1	
OCNG Pattern		1, 2, 3, 4, 5, 6	OP.1 defined in A.3.2.1	
Initial DL BWP configuration		1, 2, 3, 4, 5, 6	DLBWP.0.1	
Initial UL BWP configuration		1, 2, 3, 4, 5, 6	ULBWP.0.1	
RLM-RS		1, 2, 3, 4, 5, 6	SSB	
Qrxlevmin	dBm/SCS	1, 2, 4, 5	-140	
		3, 6	-137	
N_{oc}	dBm/SCS	1, 4	-100	-98
		2, 5	-100	-98
		3, 6	-97	-95
N_{oc}	dBm/15 kHz	1, 2, 3, 4, 5, 6	-100	-98
SS-RSRP	dBm/SCS	1, 4	-103.6	-84.4
		2, 5	-103.6	-84.4
		3, 6	-100.6	-81.4
$\hat{E}_s/I_{ot}$	dB	1, 4	-3.6	13.6
		2, 5		
		3, 6		
$\hat{E}_s/N_{oc}$	dB	1, 4	-3.6	13.6
		2, 5		
		3, 6		
Io	dBm/9.36 MHz	1, 4	-70.48	-56.26
	dBm/9.36 MHz	2, 5	-70.48	-56.26
	dBm/38.16 MHz	3, 6	-64.37	-50.16
Treselection	S	1, 2, 3, 4, 5, 6	0	
SnonintrasearchP	dB	1, 2, 3, 4, 5, 6	50	
$Thresh_{x, highP}$	dB	1, 2, 3, 4, 5, 6	48	
$Thresh_{serving, lowP}$	dB	1, 2, 3, 4, 5, 6	44	
$Thresh_{x, low P (Note 2)}$	dB	1, 2, 3, 4, 5, 6	50	
$S_{SearchDeltaP}$	dB	1, 2, 3, 4, 5, 6	3	
$T_{SearchDeltaP}$	s	1, 2, 3, 4, 5, 6	5	
Propagation Condition		1, 2, 3, 4, 5, 6	AWGN	

Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.

Note 2: This refers to the value of $Thresh_{x, Low}$ which is included in NR system information, and is a threshold for the E-UTRA target cell

Table 6.1.2.3.5-2: Cell specific test parameters for E-UTRA cell 2

Parameter	Unit	Cell 2	
		T1	T2 T3
E-UTRA RF Channel number		1	
$BW_{channel}$	MHz	10	
OCNG Patterns defined in TS 36.133 clause A.3.2		OP.2 TDD for test configuration 1, 2, 3; OP.2 FDD for test configuration 4, 5, 6	
PBCH_RA	dB	0	
PBCH_RB	dB		
PSS_RA	dB		
SSS_RA	dB		
PCFICH_RB	dB		
PHICH_RA	dB		
PHICH_RB	dB		
PDCCH_RA	dB		
PDCCH_RB	dB		
PDSCH_RA	dB		
PDSCH_RB	dB		
OCNG_RA Note 1	dB		
OCNG_RB Note 1	dB		
Qrxlevmin	dBm	-140	
N_{oc}	dBm/15 kHz	-98	
RSRP	dBm/15 KHz	-82.4	-84
$\hat{E}_s / I_{ot}$	dB	15.6	14
$\hat{E}_s / N_{oc}$	dB	15.6	14
$Treselection_{EUTRAN}$	S	0	
SnonintrasearchP	dB	Not sent	
$Thresh_{x, highP}$ (Note 2)	dB	48	
$Thresh_{serving, lowP}$	dB	44	
$Thresh_{x, lowP}$	dB	50	
Propagation Condition		AWGN	

Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.

Note 2: This refers to the value of $Thresh_{x, high}$ which is included in E-UTRA system information, and is a threshold for the NR target cell

The cell reselection delay to a lower priority E-UTRAN cell with UE fulfilling low mobility criterion is defined as the time from the beginning of time period T1, to the moment when the UE camps on cell 2, and starts to send preambles on the PRACH for sending the *RRCConnectionRequest* message to perform a Tracking Area Update procedure on cell 2.

The cell re-selection delay to a lower priority cell shall be less than 17 s.

The rate of correct cell reselections observed during repeated tests shall be at least 90%.

NOTE: The cell re-selection delay to a lower priority cell can be expressed as: $T_{evaluate, E-UTRAN} + T_{SI-E-UTRA}$,

Where:

$T_{evaluate, E-UTRAN}$ See Table 4.2.2.11.2-1 in clause 4.2.2.11.2 of TS 38.133 [6]

$T_{SI-E-UTRA}$ Maximum repetition period of relevant system info blocks that needs to be received by the UE to camp on a cell; 1280 ms is assumed in this test case.

This gives a total of 16.64 s, allow 17 s for the cell re-selection delay to a lower priority E-UTRAN cell for UE fulfilling low mobility criterion.

6.1.2.4 NR SA FR1 – E-UTRA cell re-selection to lower priority E-UTRAN for UE fulfilling not-at-cell edge relaxed measurement criterion

6.1.2.4.1 Test purpose

This test is to verify the requirement for the NR to E-UTRAN inter-RAT cell reselection when UE fulfils the not-at-cell edge criterion specified in clause 4.2.2.11.3 of TS 38.133 [6] and the E-UTRAN cell is of lower priority.

6.1.2.4.2 Test applicability

This test applies to all types of NR UE from Release 16 onwards supporting relaxed RRM measurement.

6.1.2.4.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 6.1.2.0.2.

The normative reference for this requirement is TS 38.133 [6] clause A.6.1.2.4.

6.1.2.4.4 Test description

6.1.2.4.4.1 Initial conditions

The Test shall be tested using any of the test configuration in Table 6.1.2.4.4.1-1.

Table 6.1.2.4.4.1-1: Supported test configurations

Configuration	Description of serving cell	Description of target cell
6.1.2.4-1	NR 15 kHz SSB SCS, 10MHz bandwidth, FDD duplex mode	LTE 10MHz bandwidth, TDD duplex mode
6.1.2.4-2	NR 15 kHz SSB SCS, 10MHz bandwidth, TDD duplex mode	LTE 10MHz bandwidth, TDD duplex mode
6.1.2.4-3	NR 30 kHz SSB SCS, 40MHz bandwidth, TDD duplex mode	LTE 10MHz bandwidth, TDD duplex mode
6.1.2.4-4	NR 15 kHz SSB SCS, 10MHz bandwidth, FDD duplex mode	LTE 10MHz bandwidth, FDD duplex mode
6.1.2.4-5	NR 15 kHz SSB SCS, 10MHz bandwidth, TDD duplex mode	LTE 10MHz bandwidth, FDD duplex mode
6.1.2.4-6	NR 30 kHz SSB SCS, 40MHz bandwidth, TDD duplex mode	LTE 10MHz bandwidth, FDD duplex mode
Note: The UE is only required to be tested in one of the supported test configurations.		

Configure the test requirement and the DUT according to the parameters in Table 6.1.2.4.4.1-2.

Table 6.1.2.4.4.1-2: Initial conditions for NR SA FR1 – E-URTA cell re-selection to lower priority E-UTRA for UE fulfilling not-at-cell edge relaxed measurement criterion

Parameter	Value		Comment
Test environment	NC		As specified in TS 38.508-1 [14] clause 4.1.
Test frequencies	As specified in Annex E, Table E.4-1 and TS 38.508-1 [14] clause 4.3.1.		
Channel bandwidth	As specified by the test configuration selected from Table 6.1.2.4.4.1-1.		
Propagation conditions	AWGN		As specified in Annex C.2.2.
Connection Diagram	TE Part	A.3.1.6.1	As specified in TS 38.508-1 [14] Annex A.
	DUT Part	A.3.2.3.2	
Exceptions to connection diagram	N/A		

1. The general test parameter settings are set up according to Table 6.1.2.4.4.1-3.

2. Message contents are defined in clause 6.1.2.4.4.3.

3. The test scenario comprises of one NR cell and one E-UTRAN cell. Cell 1 is the NR PCell and Cell 2 is the E-UTRA neighbour cell. Cell 1 is configured according to Annex C.1.1 and C.1.2, Cell 2 is configured according to TS 36.521-3 [26] Annex C.1.0 and C.1.1.

Table 6.1.2.4.4.1-3: General test parameters for NR to lower priority E-UTRAN cell re-selection test case

Parameter		Unit	Test configuration	Value	Comment
Initial condition	Active cell		1, 2, 3, 4, 5, 6	Cell1	The UE camps on cell 1 in the initial phase and fulfil the not at the cell edge criteria.
	Neighbour cell		1, 2, 3, 4, 5, 6	Cell2	
T1 end condition	Active cell		1, 2, 3, 4, 5, 6	Cell2	The UE shall perform reselection to cell 2 during T1.
	Neighbour cell		1, 2, 3, 4, 5, 6	Cell1	
T2 end condition	Active cell		1, 2, 3, 4, 5, 6	Cell1	The UE shall perform reselection to cell 1 during T2 for iteration of the tests.
	Neighbour cell		1, 2, 3, 4, 5, 6	Cell2	
Access Barring Information		-	1, 2, 3, 4, 5, 6	Not Sent	No additional delays in random access procedure.
DRX cycle length		s	1, 2, 3, 4, 5, 6	0.64	The value shall be used for all cells in the test.
NR PRACH configuration index			1, 2, 3, 4, 5, 6	102	The detailed configuration is specified in TS 38.211 clause 6.3.3.2
E-UTRAN PRACH configuration index			1, 2, 3	53	As specified in table 5.7.1-2 in TS 36.211
			4, 5, 6	4	
T1		s	1, 2, 3, 4, 5, 6	24	T1 needs to be defined so that cell re-selection reaction time is taken into account.
T2		s	1, 2, 3, 4, 5, 6	24	T2 needs to be defined so that cell re-selection reaction time is taken into account.

6.1.2.4.4.2 Test procedure

Two cells are deployed in the test, which are one FR1 NR PCell (Cell 1) and an E-UTRA neighbour cell (Cell 2). The test consists of two successive time periods, with time duration of T1 and T2 respectively. Both NR cell 1 and E-UTRAN cell 2 are already identified by the UE prior to the start of the test. E-UTRAN cell 2 is of lower priority than cell 1.

The UE is configured with the relaxed measurement criterion for UE with not-at-cell edge defined in clause 5.2.4.9.2 in TS 38.304 [30]. So, Cell 1 configures the UE as follows:

- *lowMobilityEvalutation* [2] criterion is not configured;
- *cellEdgeEvaluation* [2] criterion is configured according to the parameters listed in Table 6.1.2.4.5-1;
- *combineRelaxedMeasCondition* [2] is not configured

The cell reselection delay to a lower priority E-UTRAN cell with UE fulfilling not-at-cell edge criterion is defined as the time from the beginning of time period T1, to the moment when the UE camps on cell 2, and starts to send preambles on the PRACH for sending the RRC CONNECTION REQUEST message to perform a Tracking Area Update procedure on cell 2.

1. Ensure the UE is in state RRC_IDLE with generic procedure parameters Connectivity NR according to TS 38.508-1 [14] clause 4.5.
2. Set the parameters according to T1 in Table 6.1.2.4.5-1 and 6.1.2.4.5-2. T1 starts.
3. The SS waits for random access requests information from the UE to perform cell re-selection on Cell 2.
4. If the UE responds on Cell 2 during time duration T1 within 17 seconds from the beginning of time period T1 then the number of successful tests is increased by one. Otherwise, the number of failure tests is increased by one.
5. If the UE has re-selected Cell 2 within T1, after the re-selection or when T1 expires, continue with step 6. Otherwise, if T1 expires and the UE has not yet re-selected Cell 2, the TE shall switch off and on the UE and skip to step 11.

6 The SS shall send an RRCConnectionRelease to ensure that the UE is in state RRC_IDLE.

7. The SS shall switch the power setting from T1 to T2 as specified in Table 6.1.2.4.5-1 and 6.1.2.4.5-2. T2 starts.

8. The SS waits for random access requests information from the UE to perform cell re-selection on Cell 1.

9. If the UE has re-selected Cell 1 within T2, after the re-selection or when T2 expires, continue with step 10. Otherwise, if T2 expires and the UE has not yet re-selected Cell 1, the TE shall switch off and on the UE and skip to step 11.

10 The SS shall send an RRCConnectionRelease to ensure that the UE is in state RRC_IDLE, and then skip to step 12.

11. Ensure the UE is in state RRC_IDLE with generic procedure parameters Connectivity NR according to TS 38.508-1 [14] clause 4.5.

12. Repeat step 2-11 until the confidence level according to Tables G.2.3-1 in Annex G clause G.2 is achieved.

6.1.2.4.4.3 Message contents

Message contents are according to TS 38.508-1 [14] clause 4.6 with the following exceptions:

Table 6.1.2.4.4.3-1: Common Exception messages

Default Message Contents	
Common contents of system information blocks exceptions	Table H.2.3-1 Table H.2.3-2 with Condition SMTC 1 and lower priority for configuration 6.1.2.4-2, 6.1.2.4-3, 6.1.2.4-5 and 6.1.2.4-6 Table H.2.3-2 with Condition SMTC 2 and lower priority for configuration 6.1.2.4-1 and 6.1.2.4-4 Table H.2.3-3 with Condition lower priority
Default RRC messages and information elements contents exceptions	Table H.3.2-1

Table 6.1.2.4.4.3-2: SIB2

Derivation Path: TS 38.508-1 [14] Table 4.6.2-1			
Information Element	**Value/remark**	**Comment**	**Condition**
SIB2 ::= SEQUENCE {			
relaxedMeasurement-r16 SEQUENCE {			
lowMobilityEvaluation-r16	Not present		
cellEdgeEvaluation-r16 SEQUENCE {			
s-SearchTHresholdP-r16	16	Actual value is 16*2 = 32dB	
}			
combineRelaxedMeasCondition-r16	Not present		
highPriorityMeasRelax-r16	Not present		
}			
}			

Table 6.1.2.4.4.3-3: SystemInformationBlockType3

Derivation Path: TS 36.508 [25] Table 4.4.3.3-2			
Information Element	**Value/remark**	**Comment**	**Condition**
SystemInformationBlockType3 ::= SEQUENCE {			
cellReselectionServingFreqInfo SEQUENCE {			
threshServingLow	22	Actual value = 44 dB	
cellReselectionPriority	4		lower priority E-UTRA
}			
}			

Table 6.1.2.4.4.3-4: SystemInformationBlockType24

Derivation Path: TS 36.508 [25] Table 4.4.3.3-20

Information Element	Value/remark	Comment	Condition
SystemInformationBlockType24-r15 ::= SEQUENCE {			
carrierFreqListNR-r15 SEQUENCE (SIZE (1..maxFreq)) OF SEQUENCE {	1 entry		
cellReselectionPriority-r15[*n*]	5		lower priority E-UTRA
threshX-High-r15[1]	24	Actual value = 48 dB	
threshX-Low-r15[1]	25	Actual value = 50 dB	
}			
}			

6.1.2.4.5 Test requirement

Tables 6.1.2.4.4.1-3, 6.1.2.4.5-1 and 6.1.2.4.5-2 define the primary level settings including test tolerances for lower priority E-UTRA cell re-selection test case.

Table 6.1.2.4.5-1: Cell specific test parameters for NR cell 1

Parameter	Unit	Test configuration	Cell 1	
			T1	T2
TDD configuration		1, 4	N/A	
		2, 5	TDDConf.1.1	
		3, 6	TDDConf.2.1	
PDSCH RMC configuration		1, 4	SR.1.1 FDD	
		2, 5	SR.1.1 TDD	
		3, 6	SR.2.1 TDD	
RMSI CORESET RMC configuration		1, 4	CR.1.1 FDD	
		2, 5	CR.1.1 TDD	
		3, 6	CR.2.1 TDD	
Dedicated CORESET RMC configuration		1, 4	CCR.1.1 FDD	
		2, 5	CCR.1.1 TDD	
		3, 6	CCR.2.1 TDD	
SSB configuration		1, 4	SSB.1 FR1	
		2, 5	SSB.1 FR1	
		3, 6	SSB.2 FR1	
SMTC configuration		1, 4	SMTC pattern 2	
		2, 5	SMTC pattern 1	
		3, 6	SMTC pattern 1	
OCNG Pattern		1, 2, 3, 4, 5, 6	OP.1 defined in A.3.2.1	
Initial DL BWP configuration		1, 2, 3, 4, 5, 6	DLBWP.0.1	
Initial UL BWP configuration		1, 2, 3, 4, 5, 6	ULBWP.0.1	
RLM-RS		1, 2, 3, 4, 5, 6	SSB	
Qrxlevmin	dBm/SCS	1, 2, 4, 5	-140	
		3, 6	-137	
N_{oc}	dBm/SCS	1, 4	-100	-98
		2, 5	-100	-98
		3, 6	-97	-95
N_{oc}	dBm/15 kHz	1, 2, 3, 4, 5, 6	-100	-98
SS-RSRP	dBm/SCS	1, 4	-103.6	-84.4
		2, 5	-103.6	-84.4
		3, 6	-100.6	-81.4
$\hat{E}_s/I_{ot}$	dB	1, 4	-3.6	13.6
		2, 5		
		3, 6		
$\hat{E}_s/N_{oc}$	dB	1, 4	-3.6	13.6
		2, 5		
		3, 6		
$S_{SearchThresholdP}$	dB	1, 2, 3, 4, 5, 6	32	32
Io	dBm/9.36 MHz	1, 4	-70.48	-56.26
	dBm/9.36 MHz	2, 5	-70.48	-56.26
	dBm/38.16 MHz	3, 6	-64.38	-50.17
Treselection	S	1, 2, 3, 4, 5, 6	0	

Parameter	Unit	Test configuration	Cell 1	
			T1	T2
SnonintrasearchP	dB	1, 2, 3, 4, 5, 6	60	
$Thresh_{x, highP}$	dB	1, 2, 3, 4, 5, 6	48	
$Thresh_{serving, lowP}$	dB	1, 2, 3, 4, 5, 6	44	
$Thresh_{x, low P (Note 2)}$	dB	1, 2, 3, 4, 5, 6	50	
Propagation Condition		1, 2, 3, 4, 5, 6	AWGN	
Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols. Note 2: This refers to the value of $Thresh_{x, Low}$ which is included in NR system information, and is a threshold for the E-UTRA target cell				

Table 6.1.2.4.5-2: Cell specific test parameters for E-UTRA cell 2

Parameter	Unit	Cell 2	
		T1	T2 T3
E-UTRA RF Channel number		1	
$BW_{channel}$	MHz	10	
OCNG Patterns defined in TS 36.133 clause A.3.2		OP.2 TDD for test configuration 1, 2, 3; OP.2 FDD for test configuration 4, 5, 6	
PBCH_RA	dB	0	
PBCH_RB	dB		
PSS_RA	dB		
SSS_RA	dB		
PCFICH_RB	dB		
PHICH_RA	dB		
PHICH_RB	dB		
PDCCH_RA	dB		
PDCCH_RB	dB		
PDSCH_RA	dB		
PDSCH_RB	dB		
OCNG_RA Note 1	dB		
OCNG_RB Note 1	dB		
Qrxlevmin	dBm	-140	
N_{oc}	dBm/15 kHz	-98	
RSRP	dBm/15 KHz	-82.4	-84
$\hat{E}_s / I_{ot}$	dB	15.6	14
$\hat{E}_s / N_{oc}$	dB	15.6	14
$Treselection_{EUTRAN}$	S	0	
SnonintrasearchP	dB	Not sent	
$Thresh_{x, highP (Note 2)}$	dB	48	
$Thresh_{serving, lowP}$	dB	44	
$Thresh_{x, lowP}$	dB	50	
Propagation Condition		AWGN	
Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols. Note 2: This refers to the value of $Thresh_{x, high}$ which is included in E-UTRA system information, and is a threshold for the NR target cell			

The cell reselection delay to a lower priority E-UTRAN cell with UE fulfilling not-at-cell edge criterion is defined as the time from the beginning of time period T1, to the moment when the UE camps on cell 2, and starts to send preambles on the PRACH for sending the *RRCConnectionRequest* message to perform a Tracking Area Update procedure on cell 2.

The cell re-selection delay to a lower priority cell shall be less than 17 s.

The rate of correct cell reselections observed during repeated tests shall be at least 90%.

NOTE: The cell re-selection delay to a lower priority cell can be expressed as: $T_{evaluate, E-UTRAN} + T_{SI-E-UTRA}$,

Where:

$T_{evaluate, E-UTRAN}$ See Table 4.2.2.11.3-1 in clause 4.2.2.11.3 of TS 38.133 [6]

$T_{SI-E-UTRA}$ Maximum repetition period of relevant system info blocks that needs to be received by the UE to camp on a cell; 1280 ms is assumed in this test case.

This gives a total of 16.64 s, allow 17 s for the cell re-selection delay to a lower priority E-UTRAN cell for UE fulfilling not-at-cell edge criterion.

6.1.2.5 NR SA FR1 – E-UTRA cell re-selection to lower priority E-UTRA for UE configured with highSpeedMeasFlag-r16

6.1.2.5.1 Test purpose

This test is to verify the requirement for the NR to E-UTRAN inter-RAT cell reselection requirements specified in TS 38.133 [6] clause 4.2.2.5 when the E-UTRAN cell is of lower priority.

6.1.2.5.2 Test applicability

This test applies to all types of NR UE from Release 15 onwards and supporting measurement enhancements in high speed scenario.

6.1.2.5.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 6.1.2.0.1.

The normative reference for this requirement is TS 38.133 [6] clause A.6.1.2.5.

6.1.2.5.4 Test description

6.1.2.5.4.1 Initial conditions

The Test shall be tested using any of the test configuration in Table 6.1.2.5.4.1-1.

Table 6.1.2.5.4.1-1: Supported test configurations for NR SA FR1 – E-UTRA cell re-selection to lower priority E-UTRA for UE configured with highSpeedMeasFlag-r16

Configuration	Description of serving cell	Description of target cell
6.1.2.5-1	NR 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode	LTE 10 MHz bandwidth, TDD duplex mode
6.1.2.5-2	NR 15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode	LTE 10 MHz bandwidth, TDD duplex mode
6.1.2.5-3	NR 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode	LTE 10 MHz bandwidth, TDD duplex mode
6.1.2.5-4	NR 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode	LTE 10 MHz bandwidth, FDD duplex mode
6.1.2.5-5	NR 15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode	LTE 10 MHz bandwidth, FDD duplex mode
6.1.2.5-6	NR 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode	LTE 10 MHz bandwidth, FDD duplex mode
Note: The UE is only required to be tested in one of the supported test configurations.		

Configure the test requirement and the DUT according to the parameters in Table 6.1.2.5.4.1-2.

Table 6.1.2.5.4.1-2: Initial conditions for NR SA FR1 – E-UTRA cell re-selection to lower priority E-UTRA for UE configured with highSpeedMeasFlag-r16

Parameter	Value	Comment
Test environment	NC	As specified in TS 38.508-1 [14] clause 4.1.
Test frequencies	As specified in Annex E, Table E.4-2 and TS 38.508-1 [14] clause 4.3.1.	
Channel bandwidth	As specified by the test configuration selected from Table 6.1.2.5.4.1-1.	
Propagation conditions	AWGN	As specified in Annex C.2.2.

Connection Diagram	TE Part	A.3.1.6.1	As specified in TS 38.508-1 [14] Annex A.
	DUT Part	A.3.2.3.2	
Exceptions to connection diagram	N/A		

1. The general test parameter settings are set up according to Table 6.1.2.5.4.1-3.

2. Message contents are defined in clause 6.1.2.5.4.3.

3. The test scenario comprises of one NR cell and one E-UTRAN cell. Cell 1 is the NR PCell and Cell 2 is the E-UTRA neighbour cell. Cell 1 is configured according to Annex C.1.1 and C.1.2, Cell 2 is configured according to TS 36.521-3 [26] Annex C.1.0 and C.1.1.

Table 6.1.2.5.4.1-3: General test parameters for NR SA FR1 – E-UTRA cell re-selection to lower priority E-UTRA for UE configured with highSpeedMeasFlag-r16

Parameter		Unit	Test configuration	Value	Comment
Initial condition	Active cell		1, 2, 3, 4, 5, 6	Cell1	The UE camps on cell 1 in the initial phase.
T1 end condition	Active cell		1, 2, 3, 4, 5, 6	Cell2	The UE shall perform reselection to cell 2 during T1.
	Neighbour cells		1, 2, 3, 4, 5, 6	Cell1	
T2 end condition	Active cell		1, 2, 3, 4, 5, 6	Cell1	The UE shall perform reselection to cell 1 during T2 for iteration of the tests.
	Neighbour cells		1, 2, 3, 4, 5, 6	Cell2	
Access Barring Information		-	1, 2, 3, 4, 5, 6	Not Sent	No additional delays in random access procedure.
DRX cycle length		ms	1, 2, 3, 4, 5, 6	320	The value shall be used for all cells in the test.
NR PRACH configuration index			1, 2, 3, 4, 5, 6	102	The detailed configuration is specified in TS 38.211 [7] clause 6.3.3.2
E-UTRAN PRACH configuration index			1, 2, 3	53	As specified in table 5.7.1-2 in TS 36.211 [23]
			4, 5, 6	4	
T1		s	1, 2, 3, 4, 5, 6	15	T1 needs to be defined so that cell re-selection reaction time is taken into account.
T2		s	1, 2, 3, 4, 5, 6	75	T2 needs to be defined so that cell re-selection reaction time is taken into account.

6.1.2.5.4.2 Test procedure

Two cells are deployed in the test, which are one FR1 NR PCell (Cell 1) and an E-UTRA low priority neighbour cell (Cell 2) on different frequencies. The test consists of 2 successive time periods, with time duration of T1, and T2 respectively. Both Cell 1 and Cell 2 are already identified by the UE prior to the start of the test. Cell 1 and cell 2 belong to different tracking areas. Furthermore, UE has not registered with network for the tracking area containing Cell 2. The E-UTRAN Cell 2 is indicated by NR Cell 1 as an HST cell.

In the following test procedure "UE responds" means "UE starts transmitting preamble on PRACH for sending the *RRCSetupRequest* or *RRCConnectionRequest* message to perform a Registration procedure for mobility on NR Cell or E-UTRA Cell respectively.

1. Ensure the UE is in state RRC_IDLE with generic procedure parameters connectivity *NR* with Test Mode *On* according to TS 38.508-1 [14] clause 4.5 on Cell 1. Set Cell 2 physical cell identity = initial cell 2 physical cell identity. *highSpeedMeasFlag-r16* is provided by *SIB1* of Cell 1.

2. Set the parameters according to T2 in Table 6.1.2.5.5-1 and 6.1.2.5.5-2. Then wait 5s to ensure that Cell 2 has been detected by the UE.

3. Set the parameters according to T1 in Table 6.1.2.5.5-1 and 6.1.2.5.5-2. T1 starts.

4. The SS waits for random access requests information from the UE to perform cell re-selection to Cell 2.

5. If the UE responds on Cell 2 within 3 seconds from the beginning of time period T1, then count a success for the event “Re-select Cell 2”. Otherwise count a failure for the event “Re-select Cell 2”.

6. If the UE has re-selected Cell 2 within T1, after the re-selection or when T1 expires, continue with step 7. Otherwise, if T1 expires and the UE has not yet re-selected Cell 2, the TE shall switch off and on the UE and skip to step 13.

7. The SS shall send an *RRCConnectionRelease* message to ensure that the UE is in state RRC_IDLE on Cell 2.

8. The SS shall switch the power setting from T1 to T2 as specified in Table 6.1.2.5.5-1 and 6.1.2.5.5-2. T2 starts.

9. The SS waits for random access requests information from the UE to perform cell re-selection to Cell 1.

10. If the UE has re-selected Cell 1 within T2, after the re-selection or when T2 expires, continue with step 11. Otherwise, if T2 expires and the UE has not yet re-selected Cell 1, the TE shall switch off and on the UE and skip to step 12.

11. The SS shall send an *RRCRelease* message to ensure that the UE is in state RRC_IDLE on Cell 1. skip to 13

12. Ensure the UE is in state RRC_IDLE with generic procedure parameters connectivity *NR* according to TS 38.508-1 [14] clause 4.5 in Cell 1.

13. Set the parameters according to T2 in Table 6.1.2.5.5-1 and 6.1.2.5.5-2. Then wait 5s to ensure that Cell 2 has been detected by the UE.

14. Repeat step 3-13 until a test verdict for the event “Re-select Cell 2” has been achieved, resulting in an event verdict: pass or fail. The event is evaluated only until the confidence level according to Table G.2.3-1 in Annex G clause G.2 is achieved. The test passes if the event pass, otherwise the test fails.

6.1.2.5.4.3 Message contents

Same as message contents in 6.1.2.2.4.3 except that

- Table H.2.3-1 in common contents of SIB exceptions is replaced by Table 6.1.2.5.4.3-1.
- Table H.2.3-3 in common contents of SIB exceptions is replaced by Table 6.1.2.5.4.3-3.
- In addition to the message contents mentioned above, exceptions given in Table 6.1.2.5.4.3-4 and Table 6.1.2.5.4.3-5 also apply.

Table 6.1.2.5.4.3-1: SIB1 (Cell 2)

Derivation Path: TS 38.508-1 [14], Table 4.6.1-28			
Information Element	**Value/remark**	**Comment**	**Condition**
SIB1 ::= SEQUENCE {			
servingCellConfigCommon	ServingCellConfigCommonSIB	Table 6.1.2.5.4.3-2	
}			

Table 6.1.2.5.4.3-2: ServingCellConfigCommonSIB (Table 6.1.2.5.4.3-1)

Derivation Path: TS 38.508-1 [14], Table 4.6.1-28 with condition HST			
Information Element	**Value/remark**	**Comment**	**Condition**
ServingCellConfigCommonSIB ::= SEQUENCE {			
highSpeedConfig-r16 SEQUENCE {			
highSpeedMeasFlag-r16	true		
}			
}			

Table 6.1.2.5.4.3-3: SIB5 (Cell 1)

Derivation Path: Table H.2.3-3 with Condition lower priority			
Information Element	**Value/remark**	**Comment**	**Condition**
SIB5 ::= SEQUENCE {			
carrierFreqListEUTRA-v1610 SEQUENCE (SIZE (1..maxEUTRA-Carrier)) OF CarrierFreqEUTRA-v1610 {	1 entry	carrierFreqListEUTRA-v1610 and carrierFreqListEUTRA	

		contain same number of entries. And the entries are listed in the same order	
CarrierFreqEUTRA-v1610[1] SEQUENCE {		entry 1	
highSpeedEUTRACarrier-r16	true		
}			
}			
}			

Table 6.1.2.5.4.3-4: SystemInformationBlockType2 (Cell2)

Derivation Path: TS 36.508 [25] Table 4.4.3.3-1			
Information Element	**Value/remark**	**Comment**	**Condition**
SystemInformationBlockType2 ::= SEQUENCE {			
radioResourceConfigCommon SEQUENCE {			
highSpeedInterRAT-NR-r16	true		
}			
}			

Table 6.1.2.5.4.3-5: SystemInformationBlockType24 (Cell2)

Derivation Path: TS 36.508 [25], Table 4.4.3.3-20			
Information Element	**Value/remark**	**Comment**	**Condition**
SystemInformationBlockType24-r15 ::= SEQUENCE {			
carrierFreqListNR-v1610 SEQUENCE (SIZE (1..maxFreq)) OF CarrierFreqNR-v1610 {	1 entry		
CarrierFreqNR-v1610[1] SEQUENCE {		entry 1	
highSpeedCarrierNR-r16	true		
}			
}			
}			

6.1.2.5.5 Test requirement

Tables 6.1.2.5.4.1-3, 6.1.2.5.5-1 and 6.1.2.5.5-2 define the primary level settings including test tolerances for NR SA FR1 – E-UTRA cell re-selection to lower priority E-UTRA for UE configured with highSpeedMeasFlag-r16 test case.

Table 6.1.2.5.5-1: NR cell specific test parameters for NR SA FR1 – E-UTRA cell re-selection to lower priority E-UTRA for UE configured with highSpeedMeasFlag-r16

Parameter	**Unit**	**Test configuration**	**Cell 1**	
			T1	**T2**
TDD configuration		1, 4	N/A	
		2, 5	TDDConf.1.1	
		3, 6	TDDConf.2.1	
PDSCH RMC configuration		1, 4	SR.1.1 FDD	
		2, 5	SR.1.1 TDD	
		3, 6	SR.2.1 TDD	
RMSI CORESET RMC configuration		1, 4	CR.1.1 FDD	
		2, 5	CR.1.1 TDD	
		3, 6	CR.2.1 TDD	
Dedicated CORESET RMC configuration		1, 4	CCR.1.1 FDD	

Parameter	Unit	Test configuration	Cell 1	
			T1	T2
		2, 5	CCR.1.1 TDD	
		3, 6	CCR.2.1 TDD	
SSB configuration		1, 4	SSB.1 FR1	
		2, 5	SSB.1 FR1	
		3, 6	SSB.2 FR1	
SMTC configuration		1, 4	SMTC pattern 2	
		2, 5	SMTC pattern 1	
		3, 6	SMTC pattern 1	
OCNG Pattern		1, 2, 3, 4, 5, 6	OP.1 defined in A. 2.1	
Initial DL BWP configuration		1, 2, 3, 4, 5, 6	DLBWP.0	
Initial UL BWP configuration		1, 2, 3, 4, 5, 6	ULBWP.0	
RLM-RS		1, 2, 3, 4, 5, 6	SSB	
Qrxlevmin	dBm/SCS	1, 2, 4, 5	-140	
		3, 6	-137	
N_{oc}	dBm/SCS	1, 4	-100	-98
		2, 5	-100	-98
		3, 6	-97	-95
N_{oc}	dBm/15 kHz	1, 2, 3, 4, 5, 6	-100	-98
SS-RSRP	dBm/SCS	1, 4	-103.60	-84.40
		2, 5	-103.60	-84.40
		3, 6	-100.60	-81.40
$\hat{E}_s/I_{ot}$	dB	1, 4	-3.6	13.6
		2, 5		
		3, 6		
$\hat{E}_s/N_{oc}$	dB	1, 4	-3.6	13.6
		2, 5		
		3, 6		
Io	dBm/9.36 MHz	1, 4	-70.46	-56.26
	dBm/9.36 MHz	2, 5	-70.46	-56.26
	dBm/38.16 MHz	3, 6	-64.38	-50.16
Treselection	S	1, 2, 3, 4, 5, 6	0	
Snonintrasearch	dB	1, 2, 3, 4, 5, 6	50	
$Thresh_{x, high (Note 2)}$	dB	1, 2, 3, 4, 5, 6	48	
$Thresh_{serving, low}$	dB	1, 2, 3, 4, 5, 6	44	
$Thresh_{x, low}$	dB	1, 2, 3, 4, 5, 6	50	
Propagation Condition		1, 2, 3, 4, 5, 6	AWGN 1944Hz[Note3]	

Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.

Note 2: This refers to the value of $Thresh_{x, high}$ which is included in NR system information, and is a threshold for the E-UTRA target cell.

Note 3: The AWGN 1944 Hz condition is a non-fading propagation channel with one tap. Doppler shift is a constant 1944 Hz.

Table 6.1.2.5.5-2: E-UTRA cell specific test parameters for NR SA FR1 – E-UTRA cell re-selection to lower priority E-UTRA for UE configured with highSpeedMeasFlag-r16

Parameter	Unit	Cell 2	
		T1	T2
E-UTRA RF Channel number		1	
$BW_{channel}$	MHz	10	
OCNG Patterns defined in TS 36.133 [15] clause A.3.2		OP.2 TDD for test configuration 1, 2, 3; OP.2 FDD for test configuration 4, 5, 6	
PBCH_RA	dB	0	
PBCH_RB	dB		
PSS_RA	dB		
SSS_RA	dB		
PCFICH_RB	dB		
PHICH_RA	dB		
PHICH_RB	dB		
PDCCH_RA	dB		
PDCCH_RB	dB		
PDSCH_RA	dB		
PDSCH_RB	dB		
OCNG_RA Note 1	dB		
OCNG_RB Note 1	dB		
Qrxlevmin	dBm	-140	
N_{oc}	dBm/15 kHz	-98	
RSRP	dBm/15 KHz	-82.40	-84
$\hat{E}_s / I_{ot}$	dB	15.60	14
$\hat{E}_s / N_{oc}$	dB	15.60	14
$Treselection_{EUTRAN}$	S	0	
Snonintrasearch	dB	Not sent	
$Thresh_{x, high (Note 2)}$	dB	48	
$Thresh_{serving, low}$	dB	44	
$Thresh_{x, low}$	dB	50	
Propagation Condition		AWGN 1944Hz	

Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.

Note 2: This refers to the value of $Thresh_{x, high}$ which is included in E-UTRA system information, and is a threshold for the NR target cell

The cell reselection delay to a lower priority E-UTRAN cell for UE configured with *highSpeedMeasFlag-r16* is defined as the time from the beginning of time period T1, to the moment when the UE camps on Cell 2, and starts to send preambles on the PRACH for sending the *RRCConnectionRequest* message to perform a Tracking Area Update procedure on cell 2.

The cell re-selection delay to a lower priority cell shall be less than 3 s.

The rate of correct cell reselections observed during repeated tests shall be at least 90%.

NOTE: The cell re-selection delay to a lower priority cell can be expressed as: $T_{evaluate, E-UTRAN_HST} + T_{SI-E-UTRA}$,

Where:

$T_{evaluate, E-UTRAN_HST}$ = 0.96s, as defined in TS 38.133 [6] Table 4.2.2.5-2.

$T_{SI-E-UTRA}$ = 1.28s, is the maximum repetition period of relevant system info blocks that needs to be received by the UE to camp on a cell.

This gives a total of 2.24 s, allow 3 s for the cell re-selection delay to a lower priority E-UTRAN cell for UE configured with *highSpeedMeasFlag-r16*.

6.2 RRC_INACTIVE state mobility

6.2.0 General

The requirements in this clause are applicable when the UE is configured with timing alignment (TA) validation using *cg-SDT-RSRP-ChangeThreshold* for transmitting in uplink using CG-SDT as specified in TS 38.331 [13].

The requirements in this clause are applicable for the UE performing small data tranmissions using configured resources as per TS 38.331 [13].

The UE is allowed to transmit using the configured uplink resources provided that the UE is synchronized towards (i.e. using the timing derived using the latest available N_{TA} value as specified in 38.133 [6] clause 7.1.2) the serving cell prior to transmission. If the UE is not able to obtain the synchronization towards the serving cell then the UE shall drop the small data transmission. The UE determines the small data transmission occasion according to the received CG-SDT configuration TS 38.331 [13].

The normative reference for this requirement is TS 38.133 [6] clauses 5.5.1 and 5.5.2.

6.2.0.1 Minimum conformance requirements for TA validation using CG-SDT

When *cg-SDT-RSRP-ChangeThreshold* is configured for TA validation based on the RSRP change criterion according to clause 5.8.2 in TS 38.321 [12], the UE is allowed to transmit using CG-SDT using the timing derived using the latest available N_{TA} value as specified in TS 38.133 [6] clause 7.1 provided that

- the first RSRP ($RSRP_1$) measurement and the second RSRP ($RSRP_2$) measurements used in the TA validation are valid measurements and,
- timing alignment validation for transmission using CG-SDT is valid according to the validation criteria in clause 5.8.2 in TS 38.321 [12].

$RSRP_1$ and $RSRP_2$ are considered valid provided that the conditions in Table 6.2.0.1-1 are met for FR1.

Table 6.2.0.1-1: Valid measurement for FR1

Measurement	FR1
$RSRP_1$	$(T1 - \min(640ms, M1*T_{DRX})) \le T1' \le (T1 + \min(640ms, M1*T_{DRX}))$
$RSRP_2$	$(T2 - \min(640ms, M1*T_{DRX})) \le T2' \le T2$

If at least one of $RSRP_1$ and $RSRP_2$ is considered to be invalid based on the above conditions, then the UE shall not validate the CG-SDT using $RSRP_1$ and $RSRP_2$ and shall not transmit using CG-SDT. Additionally, the UE shall not transmit in an CG-SDT occasion that occurs more than 640 ms after T2.

Where:

- T1 is the time when
  - *RRCRelease* with CG-SDT configuration (TS 38.331 [13]) is received
  - the latest TA is received if TA is received while in RRC_INACTIVE state.
- T1' is the time when the UE has completed $RSRP_1$.

- T2 is the time when the UE performs TA validation as defined in clause 5.27.2 in (TS 38.321 [12]) for transmission using CG-SDT.
- T2' is the time when the UE has completed $RSRP_2$.
- T_{DRX} is the DRX cycle length in ms.
- M1 the scaling factor as defined in TS 38.133 [6] clause 4.2.2.2.

The normative reference for this requirement is TS 38.133 [6] clause 5.5.3.

6.2.1 NR SA FR1 Configured Grant based Small Data Transmissions (CG-SDT)

Editor's Note:

- MU and TT analysis is incomplete
- Message contents are either FFS or need to be updated
- Multiple aspects of call setup and test procedure need to be updated
- Applicability needs to be updated
- Some test parameters are still in brackets

6.2.1.1 Test Purpose

The purpose of this test is to verify that the UE properly perform TA validation for CG-SDT transmission in clause 6.2.0.1.

6.2.1.2 Test Applicability

This test applies to all types of NR UE [release 17 and forward], supporting NR SA and [CG-SDT].

6.2.1.3 Minimum Conformance Requirement

The minimum requirements are specified in clause 6.2.0.1.

The normative reference for this requirement is TS 38.133 [6] clause A.6.2.1.

6.2.1.4 Test Description

In the test, UE is configured two CG-SDT configurations at different time. The test consists of five successive time periods, with time duration of T1, T2, T3, T4 and T5 repectively. There is one cell, which is the active NR cell in FR1. Figure 6.2.1.4-1 shows the variation of the RSRP per time. Prior to the time point TA, the UE shall be fully synchronized to PCell (Cell 1).

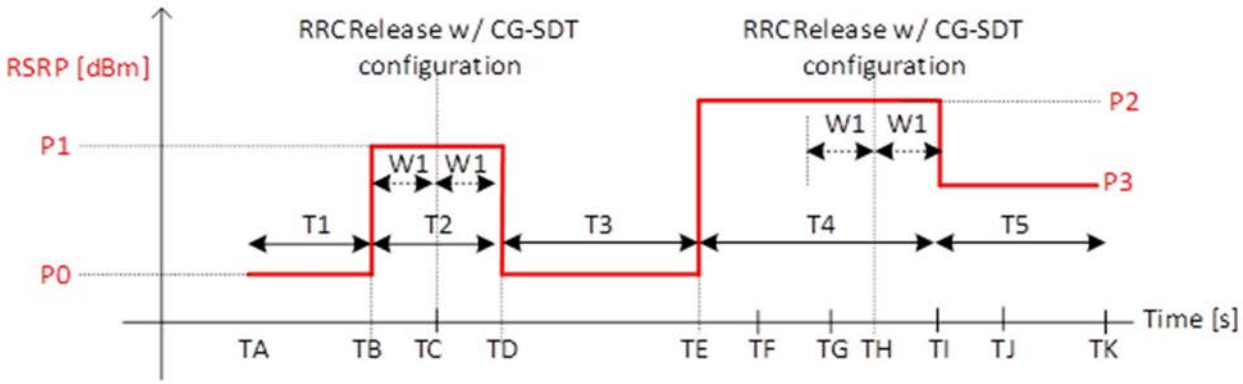


Figure 6.2.1.4-1: RSRP variation model for NR SA FR1 Configured Grant based Small Data Transmissions (CG-SDT)

Before starting the test at time point TA, test equipment configures RSRP to P0.

At time point TB, RSRP is changed from P0 to P1.

At time point TC, UE expect to receive RRC release with CG SDT configuration and RRC status is changed to INACTIVE status.

At time point TD, RSRP is changed from P1 to P0.

At time point TE, RSRP is changed from P0 to P2.

Test equipment triggers UL data arrival at UE lower layer at time point TF.

At time point TH, UE expect to receive a RRC release with CG-SDT configurations.

At time point TI, RSRP is changed from P2 to P3.

Test equipment triggers UL data arrival at UE lower layer at time point TJ.

6.2.1.4.1 Initial conditions

This test shall be tested using any of the test configurations in Table 6.2.1.4.1-1.

Table 6.2.1.4.1-1: NR configuration for NR SA FR1 Configured Grant based Small Data Transmissions (CG-SDT)

Config	Description
1	15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode
2	15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode
3	30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode
Note: The UE is only required to be tested in one of the supported test configurations	

Configure the test equipment and the DUT according to the parameters in Table 6.2.1.4.1-2.

Table 6.2.1.4.1-2: Initial conditions for NR SA FR1 Configured Grant based Small Data Transmissions (CG-SDT)

Parameter	Value		Comment
Test environment	NC		As specified in TS 38.508-1 [14] clause 4.1.
Test frequencies	As specified in Annex E, table E.2-1 and TS 38.508-1 [14] clause 4.3.1 and 4.4.2.		
Channel bandwidth	As specified by the test configuration selected from Table 6.2.1.4.1-1.		
Propagation conditions	AWGN		As specified in clause C.2.2.
Connection Diagram	TE Part	A.3.1.6.1 without fading	As specified in TS 38.508-1 [14] Annex A.
	DUT Part	A.3.2.3.4	
Exceptions to connection diagram	For 4Rx capable UEs without any 2 Rx RF bands use A.3.2.5.2 for DUT part and A.3.1.8.4 for TE Part		

1. Message contents are defined in clause 6.2.1.4.3.
2. The power levels and settings for Cell 1 are set according to Annex C.1.2 and C.1.3.
3. The test parameters are given in Table 6.2.1.4.1-3. Supplementary timeline events are given in Table 6.2.1.4.1-4.

Table 6.2.1.4.1-3 : General test parameters for NR SA FR1 Configured Grant based Small Data Transmissions (CG-SDT)

Parameter	Unit	Test configuration	Value	Comment
TDD Configuration		1	N/A	
		2	TDDConf.1.1	
		3	TDDConf.2.1	
$BW_{channel}$	MHz		10: $N_{RB,c}$ = 52	

PDSCH Reference measurement channel		1	SR.1.1 FDD	
		2	SR.1.1 TDD	
		3	SR.2.1 TDD	
RMSI CORESET Reference Channel		1	CR.1.1 FDD	
		2	CR.1.1 TDD	
		3	CR.2.1 TDD	
Dedicated CORESET Reference Channel		1	CCR.1.1 FDD	
		2	CCR.1.1 TDD	
		3	CCR.2.1 TDD	
SSB configuration		1,2,3	SSB.1 FR1	
OCNG Patterns		1,2,3	OP.1	
Initial BWP Configuration		1,2,3	DLBWP.0.1 ULBWP.0.1	
Dedicated BWP configuration		1,2,3	DLBWP.1.1 ULBWP.1.1	
SMTC configuration		1,2,3	SMTC.1	
DRX configuration		1,2,3	DRX.7	
T1	s	1,2,3	[1]	
T2	s	1,2,3	[1.28]	
T3	s	1,2,3	[2.36]	
T4	s	1,2,3	[2.56]	
T5	s	1,2,3	[2.36]	
cg-SDT-RSRP-ChangeThreshold	dB	1,2,3	[8]	
cg-SDT-TimeAlignmentTime		1,2,3	infinity	
CG-SDT resource period	ms		640	configuredGrantConfig Peridocity at 38.331 [13] Config 1,2 : sym640x14, config 3 : sym1024x14
Propagation condition		1,2,3	AWGN	

Table 6.2.1.4.1-4 : Supplementary timeline event derivations for NR SA FR1 Configured Grant based Small Data Transmissions (CG-SDT)

Time Period	Unit	Test configuration	Value	Derivation
T_delay_modeB	ms	1,2,3	[4000]	Test configuration for step 4
T_delay_modeB	ms	1,2,3	[2000]	Test configuration for step 10
W1	ms	1,2,3	[640]	W1 = T2/2 (see Table 6.2.0-1)
TAtoTB	ms	1,2,3	[1000]	TAtoTB = T1
TBtoTC	ms	1,2,3	[640]	TBtoTC = W1
TCtoTD	ms	1,2,3	[640]	TCtoTD = W1
TDtoTE	ms	1,2,3	[2360]	TDtoTE = T3
TEtoTF	ms	1,2,3	[1000]	TEtoTF = T_delay_modeB – TDtoTE – TCtoTD = T_delay_modeB – T3 – W1
TFtoTG	ms	1,2,3	[480]	TFtoTG = 640*k – T_delay_modeB, where k = ceil(argmin(640*k > T_delay_modeB))
TGtoTH	ms	1,2,3	[440]	TGtoTH = T4 – TEtoTF – TFtoTG – W1
THtoTI	ms	1,2,3	[640]	THtoTI = W1
TItoTJ	ms	1,2,3	>[1720]	TItoTK = T5 – TJtoTK
TJtoTK	ms	1,2,3	<640	TJtoTK < CG-SDT resource periodicity = 640ms
Note 1: These timeline derivations are useful to understand different timeline events other than T1, T2, T3, T4 and T5. Calculations are informative.				

6.2.1.4.2 Test Procedure

There is one cell in the test, the FR1 PCell, which is the active NR cell. The test parameters for the PCell are given in Table 6.2.1.4.1-1, Table 6.2.1.4.1-3, and Table 6.2.1.5-1. Prior to the start of the test, the UE shall be fully synchronized to PCell (Cell 1). According to Table 6.2.1.5-1, in time intervals T1 to T5 the SS configures the SS-RSRP by fixing N_{oc} and adjusting SNR correspondingly.

1. Ensure the UE is in [State RRC_CONNECTED with generic procedure parameters Connectivity *NR*, Connected without release *On*] [and UE test loop mode B is activated] according to TS 38.508-1 [14] clause 4.5. Cell 1 is the active cell.

2. Set the parameters of NR Cell according to T1 in Table 6.2.1.5-1. Propagation conditions are set according to clause C.2.3. T1 starts.

3. When T1 expires the SS shall change the SS-RSRP value to T2 as specified in Table 6.2.1.5-1. T2 starts.

4. W1=[640]ms seconds after the start of T2 (time event TC), the SS shall send CLOSE UE TEST LOOP message (as per Table 6.2.1.4.1-4, step 4) and transmit one PDCP SDU (which will get buffered at the UE) immediately followed by an *RRCRelease* message containing CG-SDT configuration for the UE to change its RRC state to RRC_INACTIVE, according to section 6.2.1.4.3.

5. When T2 expires the SS shall change the SS-RSRP value to T3 as specified in Table 6.2.1.5-1. T3 starts.

6. When T3 expires the SS shall change the SS-RSRP value to T4 as specified in Table 6.2.1.5-1. T4 starts.

7. TEtoTF seconds after the start of T4 (time event TF). If the UE transmits PUSCH at the next CG-SDT resource within 640ms + Z after T_delay_modeB expiration (time event TG), then the number of successful tests for CG-SDT transmit event is increased by one. Otherwise, the number of failed tests for CG-SDT transmit event is increased by one and proceed with step 13.

8. SS sends OPEN UE TEST LOOP message to UE.

9. UE sends OPEN UE TEST LOOP COMPLETE message to SS.

10. W1=[640]ms before the end of T4 (time event TH), the SS shall send CLOSE UE TEST LOOP message (as per Table 6.2.1.4.1-4, step 10) and transmit one PDCP SDU (which will get buffered at the UE) immediately followed by an *RRCRelease* message to the UE with CG-SDT configuration for the UE to change its RRC state to RRC_INACTIVE, according to section 6.2.1.4.3.

11. When T4 expires the SS shall change the SS-RSRP value to T5 as specified in Table 6.2.1.5-1. T5 starts.

12. T_delay_modeB expires TItoTJ seconds after the start of T5. If the UE transmits PUSCH at CG-SDT resource [between TJ and until T5 expires] (time event TK), then the number of failed tests for CG-SDT don't transmit event is increased by one and proceed with step 13. Otherwise, the number of successful tests for CG-SDT don't transmit event is increased by one and proceed with step 14.

13. The SS shall switch off and then on the UE and then proceed with step 14.

14. Repeat steps 1-12 until the confidence level according to Tables G.2.3-1 in Annex G clause G.2 is achieved.

6.2.1.4.3 Message Contents

Editor's Note: Message contents specific to CG-SDT are still FFS

Message contents are according to TS 38.508-1 [14] clauses 4.6.1 and 7.3 with the following exceptions:

Table 6.2.1.4.3-1: Common Exception messages for NR SA FR1 Configured Grant based Small Data Transmissions (CG-SDT)

Default Message Contents	
Common contents of system information blocks exceptions	
Default RRC messages and information elements contents exceptions	38.508-1 [14] Table 4.6.1-16 with conditions NR_RRC_INACTIVE and SDT

Table 6.2.1.4.3-2: *SDT-MAC-PHY-CG-Config-r17* for NR SA FR1 Configured Grant based Small Data Transmissions (CG-SDT)

Derivation Path: TS 38.508-1 [6], Table 4.6.1-16			
Information Element	**Value/remark**	**Comment**	**Condition**
SDT-MAC-PHY-CG-Config-r17::= SEQUENCE {			
cg-SDT-ConfigLCH-RestrictionToAddModList-r17 SEQUENCE (SIZE(1..maxLC-ID)) OF CG-SDT-Config-LCH-restriction-r17 {		[FFS]	
logicalChannelIdentity-r17	LogicalChannelIdentity with condition DRB1		

configuredGrantType1Allowed-r17	true		
allowedCG-List-r17	Not present		
}			
cg-SDT-ConfigInitialBWP-NUL-r17 CHOICE {			
setup	BWP-UplinkDedicatedSDT-r17		
}			
cg-SDT-ConfigInitialBWP-SUL-r17	Not present		
cg-SDT-ConfigInitialBWP-DL-r17			
setup	BWP-DownlinkDedicatedSDT-r17		
}			
cg-SDT-TimeAlignmentTimer-r17	infinity		
cg-SDT-RSRP-ThresholdSSB-r17	FFS		
cg-SDT-TA-ValiditationConfig-r17 SEQUENCE {			
cg-SDT-RSRP-ChangeThreshold-r17	dB8		
}			
cg-SDT-CS-RNTI-r17	FFS		
}			

Table 6.2.1.4.3-3: *BWP-UplinkDedicatedSDT-r17* for NR SA FR1 Configured Grant based Small Data Transmissions (CG-SDT)

Derivation Path: TS 38.331 [6], clause 6.2.2			
Information Element	**Value/remark**	**Comment**	**Condition**
BWP-UplinkDedicatedSDT-r17::= SEQUENCE {			
pusch-Config-r17 CHOICE {			
setup	PUSCH-Config		
}			
configuredGrantConfigToAddModList-r17 SEQUENCE (SIZE (1..maxNrofConfiguredGrantConfig-r16)) OF ConfiguredGrantConfig	1 entry		
}			

Table 6.2.1.4.3-4: *ConfiguredGrantConfig* for NR SA FR1 Configured Grant based Small Data Transmissions (CG-SDT)

Derivation Path: TS 38.331 [6], clause 6.2.2			
Information Element	**Value/remark**	**Comment**	**Condition**
ConfiguredGrantConfig ::= SEQUENCE {			
periodicity	sym640x14		Config 1,2
	sym1040640x14		Config 3
}			

6.2.1.5 Test Requirement

Table 6.2.1.5-1 defines the cell specific primary level settings including test tolerances for NR SA FR1 Configured Grant based Small Data Transmissions (CG-SDT).

Table 6.2.1.5-1: Cell-specific test parameters for NR SA FR1 Configured Grant based Small Data Transmissions (CG-SDT)

Parameter	Config	Unit	SSB#0				
			T1	T2	T3	T4	T5
N_{oc}	1,2,3	dBm/15kHz	-100+TT				
N_{oc}	1,2	dBm/SSB SCS	-100+TT				
	3	dBm/SSB SCS	-103+TT				
$\hat{E}_s/I_{ot}$	1,2,3	dB	[0]+TT	[10.35]+TT	[0]+TT	[15.25]+TT	[6]+TT
SS RSRP	1,2,3	dBm/SSB SCS	[-100]+TT	[-89.65]+TT	[-100]+TT	[-84.75]+TT	[-96]+TT
Io	1,2	dBm/9.36MHz	[-69.04]+TT	[-61.31]+TT	[-69.04]+TT	[-56.67]+TT	[-65.07]+TT
	3	dBm/38.16MHz	[-69.04]+TT	[-61.31]+TT	[-69.04]+TT	[-56.67]+TT	[-65.07]+TT
$\hat{E}_s/N_{oc}$	1,2,3	dB	[0]+TT	[10.35]+TT	[0]+TT	[15.25]+TT	[6]+TT

The UE behaviour in each test during time durations shall be as follows:

During T4, UE shall transmit PUSCH at CG-SDT resource within 640ms + Z after time point TF.

During T5, UE shall not transmit PUSCH at CG-SDT resources after TJ until the end of the test at time point TK.

The rate of correct events observed during repeated tests shall be at least 90%.

6.3 RRC_CONNECTED state mobility

6.3.1 Handover

6.3.1.0 Minimum conformance requirements

6.3.1.0.1 Minimum conformance requirements for NR – E-UTRAN handover

When the UE receives a RRC message implying handover to E-UTRAN the UE shall be ready to start the transmission of the uplink PRACH channel in E-UTRA within $D_{handover}$ seconds from the end of the last TTI containing the RRC command. $D_{handover}$ is defined as

$$D_{handover} = T_{RRC_procedure_delay} + T_{interruption}$$

Where:

$T_{RRC_procedure_delay}$: it is the RRC procedure delay, which is 50ms

$T_{interruption}$: it is the time between end of the last TTI containing the RRC command on the NR PDSCH and the time the UE starts transmission of the PRACH in E-UTRAN, excluding $T_{RRC_procedure_delay}$.

When the inter-RAT handover to E-UTRAN is commanded, the interruption time shall be less than $T_{interrupt}$

$$T_{interrupt} = T_{search} + T_{IU} + 20 \text{ ms}$$

Where:

T_{search} is the time required to search the target cell when the target cell is not already known when the handover command is received by the UE. If the target cell is known, then T_{search} = 0 ms. If the target cell is unknown and signal quality is sufficient for successful cell detection on the first attempt, then T_{search} = 80 ms. Regardless of whether DRX is in use by the UE, T_{search} shall still be based on non-DRX target cell search times.

T_{IU} is the interruption uncertainty in acquiring the first available PRACH occasion in the new cell. T_{IU} can be up to 30 ms.

NOTE: The actual value of T_{IU} shall depend upon the PRACH configuration used in the target cell.

In the interruption requirement a cell is know if it has been meeting the relevant cell identification requirement during the last 5 seconds otherwise it is unknown. Relevant cell identification requirements are described in TS 36.133 [6] clause [9.4.1].

The normative reference for this requirement is TS 38.133 [6] clause 6.1.2.1.

6.3.1.0.2 Minimum conformance requirements for NR FR1 – NR FR1 handover

When the UE receives a RRC message implying handover the UE shall be ready to start the transmission of the new uplink PRACH channel within $D_{handover}$ seconds from the end of the last TTI containing the RRC command.

Where:

$D_{handover}$ equals the maximum RRC procedure delay to be defined in clause12 in TS 38.331 [2] plus the interruption time stated in clause 6.1.1.2.2.

The interruption time is the time between end of the last TTI containing the RRC command on the old PDSCH and the time the UE starts transmission of the new PRACH, excluding the RRC procedure delay.

When intra-frequency or inter-frequency handover is commanded, the interruption time shall be less than $T_{interrupt}$

$$T_{interrupt} = T_{search} + T_{IU} + 20 + T_{\Delta} \text{ ms}$$

Where:

T_{search} is the time required to search the target cell when the target cell is not already known when the handover command is received by the UE. If the target cell is known, then T_{search} = 0 ms. If the target cell is an unknown intra-frequency cell and the target cell Es/Iot≥[-2] dB, then $T_{search} = T_{rs} + 2$ ms. If the target cell is an unknown inter-frequency cell and the target cell Es/Iot≥[-2] dB, then $T_{search} = [3* T_{rs} + 2]$ ms. Regardless of whether DRX is in use by the UE, T_{search} shall still be based on non-DRX target cell search times.

T_{Δ} is time for fine time tracking and acquiring full timing information of the target cell. $T_{\Delta} = T_{rs}$.

T_{IU} is the interruption uncertainty in acquiring the first available PRACH occasion in the new cell. T_{IU} can be up to the summation of SSB to PRACH occasion association period and 10 ms. SSB to PRACH occasion associated period is defined in the table 8.1-1 of TS 38.213 [3].

T_{rs} is the SMTC periodicity of the target NR cell if the UE has been provided with an SMTC configuration for the target cell in the handover command, otherwise Trs is the SMTC configured in the measObjectNR having the same SSB frequency and subcarrier spacing. If the UE is not provided SMTC configuration or measurement object on this frequency, the requirement in this section is applied with Trs=[5]ms assuming the SSB transmission periodicity is 5ms. There is no requirement if the SSB transmission periodicity is not 5ms.

NOTE 1: The actual value of T_{IU} shall depend upon the PRACH configuration used in the target cell.

In the interruption requirement a cell is known if it has been meeting the relevant cell identification requirement during the last 5 seconds otherwise it is unknown. Relevant cell identification requirements are described in Clause [9.2.5] for intra-frequency handover and Clause [9.3.1] for inter-frequency handover.

The normative reference for this requirement is TS 38.133 [6] clause 6.1.1.2.

6.3.1.0.3 Minimum conformance requirements for NR – UTRAN handover

When the UE receives a RRC message implying handover to UTRAN the UE shall be ready to start the transmission of the new UTRA uplink DPCCH within Dhandover msfrom the end of the last NR TTI containing the RRC MobilityfromNRCommand command.

where:

- Dhandover equals the RRC procedure delay, which is 50 ms plus the interruption time stated in TS 38.133 [6] clause 6.1.2.2.3.

The interruption time is the time between the end of the last TTI containing the RRC command on the NR PDSCH and the time the UE starts transmission on the uplink DPCCH in UTRAN, excluding the RRC procedure delay. The interruption time depends on whether the target cell is known to the UE or not.

The target cell is known if it has been measured by the UE during the last 5 seconds otherwise it is unknown. The UE shall always perform a UTRA synchronisation procedure as part of the handover procedure.

If the target cell is known the interruption time shall be less than Tinterrupt1

$$Tinterrupt1 = TIU+Tsync+50+ 10*Fmax + TMC \text{ ms}$$

If the target cell is unknown the interruption time shall be less than Tinterrupt2

$$Tinterrupt2 = TIU+Tsync+150 + 10*Fmax + TMC \text{ ms}$$

This requirement shall be met, provided that there is one target cell in the MobilityfromNRCommand command. Performance requirements for E-UTRA to UTRA soft handover are not specified. When UE is connected to an NR cell, UTRA SFN timing measurements are not reported. This implies that the timing of the DPCH of the UTRA target cells in the active set cannot be configured by UTRAN to guarantee that all target cells fall within the UE reception window of T0 +/- 148 chips.

Where:

- TIU is the interruption uncertainty when changing the timing from the NR to the new UTRAN cell. TIU can be up to one UTRA frame (10 ms).

- Fmax denotes the maximum number of radio frames within the transmission time intervals of all transport channels that are multiplexed into the same CCTrCH on the UTRA target cell. If HS-PDSCH is configured in the UTRA target cell, Fmax is 4 radio frames.

- Tsync is the time required for measuring the downlink DPCCH channel as stated in TS 25.214, clause 4.3.1.2. In case higher layers indicate the usage of a post-verification period Tsync=0 ms. Otherwise Tsync=40 ms.

- TMC is 0ms if a single UTRA cell is configured as the handover target, otherwise 20ms if handover to UTRA with 1, 2 or 3 UTRA carriers with secondary HS-PDSCH is configured.

The phase reference is the primary CPICH.

The requirements in this clause assume that N312 has the smallest possible value i.e. only one insync is required.

6.3.1.0.4 Minimum conformance requirements for NR FR1- NR FR1 DAPS handover

The requirements in this clause are applicable to both intra-frequency and inter-frequency handovers from NR FR1 cell to NR FR1 cell. A DAPS handover is intra-frequency if the centre frequency of the SSB of the source cell and the centre frequency of the SSB of the target cell are the same, and the subcarrier spacing of the two SSBs are also the same.

Note 1: For intra-frequency DAPS handover, no requirement applies if active DL and UL BWP of target cell is not confined within the active DL and UL BWP of the source cell respectively.

Note 2: For inter-frequency DAPS handover, no requirement applies if the BWP of target cell is overlapped with the BWP of source cell in frequency domain.

An FR1 DAPS handover is synchronous if it meets the conditions in table 6.3.1.0.4-1, otherwise it is asynchronous

Table 6.3.1.0.4-1: Sync conditions for FR1 DAPS handover

Type of handover	Maximum receive timing difference between source and target cell (μs) for sync DAPS handover	Maximum transmit timing difference between source and target cell (μs) for sync DAPS handover
Intra-frequency Note 1,2,3	6μs	7.6 μs
Intra-band inter-frequency Note 1,2,3	6μs	7.6 μs
Inter-band inter-frequency	33 μs	34.6 μs
Note 1: For synchronous DAPS handover, if the receive time difference exceeds the cyclic prefix length of that SCS, demodulation performance degradation is expected for the first symbol of the slot. For asynchronous DAPS handover, if the receive time difference exceeds the cyclic prefix length of that SCS, interruptions may occur depending on UE implementation. The duration and frequency of occurrence of such interruptions is not specified. Note 2: For DAPS handover on a TDD band, a UE is not expected to transmit in the uplink earlier than N_{RX-TX} after the end of the last received downlink symbol in the same cell where N_{RX-TX}=25600Tc. Note 3: For DAPS handover on a TDD band, a UE is not expected to receive in the downlink earlier than N_{TX-RX} after the end of the last transmitted uplink symbol in the same cell where N_{TX-RX}=25600Tc.		

When the UE receives a RRC message implying DAPS handover to NR FR1 the UE shall be ready to start the transmission of the new uplink PRACH channel in NR within $D_{handover1}$ seconds from the end of the last TTI containing the RRC command when UE is configured with dual active protocol stack handover.

$$D_{handover1} = T_{RRC_procedure} + T_{search} + T_{IU} + T_{processing} + T_{\Delta} + T_{margin} \text{ ms}$$

Where:

$T_{RRC_procedure}$ is the maximum RRC procedure delay as specified in clause 12 in TS 38.331 [13].

T_{search}, T_{IU}, $T_{processing}$, T_{Δ} and T_{margin} are defined in TS 38.133 [6] clause 6.1.1.2.2.

After successful RACH procedure of the target cell, when the UE receives an RRC message implying source cell release command, the UE shall accomplish the release actions specified in TS 38.331 [13] within $D_{handover2}$.

$D_{handover2} = T_{RRC_procedure} + T_{interrupt2}$

Where:

$T_{RRC_procedure}$ is the RRC procedure delay as specified in clause 12 in TS 38.331 [2].

$T_{interrupt2}$ is defined in TS 38.133 [6] clause 6.3.1.0.4.

During $D_{handover1}$, the UE is allowed an interruption of up to $T_{interrupt1}$ on source cell.

For FR1-to-FR1 intra-frequency handover, $T_{interrupt1}$ is specified in Table 6.3.1.0.4-2.

Table 6.3.1.0.4-2: $T_{interrupt1}$ for FR1-to-FR1 intra-frequency DAPS HO

μ	NR Slot length (ms)	Interruption length $T_{interrupt1}$ (slots[Note 1]), synchronous DAPS HO	Interruption length $T_{interrupt1}$ (slots[Note 1]), asynchronous DAPS HO
0	1	1	2
1	0.5	2	3
2	0.25	4	5
Note 1: The same SCS of source cell and target cell is assumed. Note 2: It is assumed that the BWP of target cell is not larger than the BWP of source cell. It is assumed that the CBW of target cell is not larger than the CBW of source cell Note 3: Void			

For FR1-to-FR1 intra-band inter-frequency handover, $T_{interrupt1}$ is specified in Table 6.3.1.0.4-3.

Table 6.3.1.0.4-3: $T_{interrupt1}$ for FR1-to-FR1 intra-band inter-frequency DAPS HO

μ	NR Slot length (ms)	$T_{interrupt1}$ (slots[Note 1]), synchronous DAPS HO	$T_{interrupt1}$ (slots[Note 1]), asynchronous DAPS HO
0	1	$1 + T_{SMTC_duration} * N_{slot}^{subframe,\mu}$	$2+ T_{SMTC_duration} * N_{slot}^{subframe,\mu}$
1	0.5	$2 + T_{SMTC_duration} * N_{slot}^{subframe,\mu}$	$3+ T_{SMTC_duration} * N_{slot}^{subframe,\mu}$
2	0.25	$4 + T_{SMTC_duration} * N_{slot}^{subframe,\mu}$	$5+ T_{SMTC_duration} * N_{slot}^{subframe,\mu}$
Note 1: The same SCS of source cell and target cell is assumed. Note 2: $T_{SMTC_duration}$ measured in subframes is the longest SMTC duration between source cell and target cell. Note 3: Void Note 4: $N_{slot}^{subframe,\mu}$ is as defined in TS 38.211 [6].			

For FR1-to-FR1 inter-band handover, $T_{interrupt1}$ is specified in Table 6.3.1.0.4-4.

Table 6.3.1.0.4-4: $T_{interrupt1}$ for FR1-to-FR1 inter-band DAPS HO

μ	NR Slot length (ms) of source cell	$T_{interrupt1}$ (slots)	
		Sync	Async
0	1	1	2
1	0.5	2	3
2	0.25	5	5

For FR1-to-FR1 intra-frequency handover, $T_{interrupt2}$ is specified in Table 6.3.1.0.4-5 when the BWP of target cell is smaller than the BWP of source cell, and $T_{interrupt2}$ is specified in Table 6.3.1.0.4-6 when the same BWP is used for target cell and source cell.

Table 6.3.1.0.4-5: $T_{interrupt2}$ for FR1-to-FR1 intra-frequency DAPS HO

μ	NR Slot length (ms)	Interruption length X (slots[Note 1])	$T_{interrupt2}$ (slots[Note 1]) for asynchronous DAPS HO
0	1	2	3
1	0.5	4	5
2	0.25	8	9
Note 1: The same SCS of source cell and target cell is assumed. Note 2: It is assumed that the BWP of target cell is smaller than the BWP of source cell.			

Table 6.3.1.0.4-6: $T_{interrupt2}$ for FR1-to-FR1 intra-frequency DAPS HO

μ	NR Slot length (ms)	Interruption length X (slots[Note 1])	$T_{interrupt2}$ (slots[Note 1]) for asynchronous DAPS HO
0	1	1	2
1	0.5	2	3
2	0.25	4	5
Note 1: The same SCS of source cell and target cell is assumed. Note 2: It is assumed that the BWP of target cell is the same as the BWP of source cell. Note 3: Void			

For FR1-to-FR1 intra-band inter-frequency handover, $T_{interrupt2}$ is specified in Table 6.3.1.0.4-7.

Table 6.3.1.0.4-7: $T_{interrupt2}$ for FR1-to-FR1 intra-band inter-frequency DAPS HO

μ	NR Slot length (ms)	$T_{interrupt2}$ (slots[Note 1]) for synchronous DAPS HO	$T_{interrupt2}$ (slots[Note 1]) for asynchronous DAPS HO
0	1	1 + $T_{SMTC_duration}$ * $N_{slot}^{subframe,\mu}$	2+ $T_{SMTC_duration}$ * $N_{slot}^{subframe,\mu}$
1	0.5	2 + $T_{SMTC_duration}$ * $N_{slot}^{subframe,\mu}$	3+ $T_{SMTC_duration}$ * $N_{slot}^{subframe,\mu}$
2	0.25	4 + $T_{SMTC_duration}$ * $N_{slot}^{subframe,\mu}$	5+ $T_{SMTC_duration}$ * $N_{slot}^{subframe,\mu}$
Note 1: The same SCS of source cell and target cell is assumed. Note 2: $T_{SMTC_duration}$ measured in subframes is the longest SMTC duration between source cell and target cell. Note 3: Void. Note 4: $N_{slot}^{subframe,\mu}$ is as defined in TS 38.211 [6].			

For FR1-to-FR1 inter-band handover, $T_{interrupt2}$ is specified in Table 6.3.1.0.4-8.

Table 6.3.1.0.4-8: $T_{interrupt2}$ for FR1-to-FR1 inter-band DAPS HO

μ	NR slot length (ms) of target cell	$T_{interrupt2}$ (slots)	
		Sync	Async
0	1	1	2
1	0.5	2	3
2	0.25	5	5

The normative reference for this requirement is TS 38.133 [6] clause 6.1.1.2.

6.3.1.1 NR SA FR1 handover with known target cell

6.3.1.1.1 Test purpose

To verify the UE's ability to perform NR FR1-NR FR1 intra frequency handover in RRC_CONNECTED state by meeting the delay requirement and interruption length for handover to a known target cell.

6.3.1.1.2 Test applicability

This test applies to all types of NR UE from Release 15 onwards.

6.3.1.1.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 6.3.1.0.2.

The normative reference for this requirement is TS 38.133 [6] clause A.6.3.1.1.

6.3.1.1.4 Test description

6.3.1.1.4.1 Initial conditions

Initial conditions are a set of test configurations the UE needs to be tested in and the steps for the SS to take with the UE to reach the correct measurement state.

This test shall be tested using any of the test configurations in Table 6.3.1.1.4.1-1.

Table 6.3.1.1.4.1-1: Intra-frequency handover from FR1 to FR1 test configurations

Config	Description
1	Source cell: NR 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode Target cell: NR 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode
2	Source cell: NR 15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode Target cell: NR 15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode
3	Source cell: NR 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode Target cell: NR 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode
Note: The UE is only required to be tested in one of the supported test configurations	

Configure the test equipment and the DUT according to the parameters in Table 6.3.1.1.4.1-2

Table 6.3.1.1.4.1-2: Initial conditions for NR SA FR1 handover with known target cell

Parameter	Value		Comment
Test environment	NC		As specified in TS 38.508-1 [14] clause 4.1.
Test frequencies	As specified in Annex E, Table E.4-1 and TS 38.508-1 [14] clause 4.3.1.		
Channel bandwidth	As specified by the test configuration selected from Table 6.3.1.1.4.1-1		
Propagation conditions	AWGN		As specified in Annex C.2.2.
Connection Diagram	TE Part	A.3.1.8.2	As specified in TS 38.508-1 [14] Annex A.
	DUT Part	A.3.2.3.4	
Exceptions to connection diagram	N/A		

1. Message contents are defined in clause 6.3.1.1.4.3.
2. The power levels and settings for NR Cell 1 are set according to Annex C.1.2 and C.1.3. Cell 2 is NR FR1 target Cell, and its power levels and settings are also set according to Annex C.1.2 and C.1.3.
3. The test parameters are given in Table 6.3.1.1.4.1-3 below, with A3-Offset modified by Test Tolerance.

Table 6.3.1.1.4.1-3: General test parameters Intra-frequency handover from FR1 to FR1

Parameter		Unit	Value	Comment
Initial conditions	Active cell		Cell 1	
	Neighbouring cell		Cell 2	
Final condition	Active cell		Cell 2	
A3-Offset		dB	-1	Original Value 0dB, post TT Analysis, its -1 dB
Hysteresis		dB	0	
Time To Trigger		s	0	
Filter coefficient			0	L3 filtering is not used
Access Barring Information		-	Not Sent	No additional delays in random access procedure.
Time offset between cells			3 μs	Synchronous cells
T1		s	5	
T2		s	≤5	

T3	s	1	

6.3.1.1.4.2 Test procedure

The test scenario comprises of one NR carrier and two cells as given in tables 6.3.1.1.4.1-3 and 6.3.1.1.5-1. No gap patterns are configured in the test case. The test consists of three successive time periods, with time durations of T1, T2 and T3 respectively. At the start of time duration T1, the UE does not have any timing information of Cell 2. Starting T2, Cell 2 becomes detectable and the UE is expected to detect and send measurement report A3. An RRC message implying handover shall be sent to the UE during period T2, after the UE has reported Event A3. The start of T3 is the instant when the last TTI containing the RRC message implying handover is sent to the UE.

1. Ensure the UE is in State RRC_CONNECTED with generic procedure parameters Connectivity *NR*, Connected without release *On* according to TS 38.508-1 [14] clause 4.5. Establish SRB2 and DRB in the RRC Reconfiguration message. Cell 1 is the active cell.
2. Set the parameters according to T1 in Table 6.3.1.1.5-1. Propagation conditions are set according to Annex C clause C.2.2. T1 starts.
3. SS shall transmit an RRCReconfiguration message, configuring measurement object.
4. UE shall transmit RRCReconfigurationComplete message.
5. When T1 expires, the SS shall switch the power setting from T1 to T2 as specified in Table 6.3.1.15-1.
6. UE shall transmit a MeasurementReport message triggered by Event A3.
7. SS shall transmit the RRCReconfiguration message implying handover is sent to the UE, at that instant the SS shall switch the power settings from T2 to T3 as specified in Table 6.3.1.1.5-1. T3 starts.
8. The UE shall transmit RRCReconfigurationComplete message.
9. If the UE transmits the uplink PRACH channel to Cell 2 less than 72 ms from the beginning of time period T3 then the number of successful tests is increased by one. Otherwise, the number of failure tests is increased by one.
10. After T3 expires, cause UE handover back to Cell 1 (if the handover fails, switch off the UE) or switch off the UE. Then ensure the UE is in State RRC_CONNECTED with generic procedure parameters Connectivity *NR*, Connected without release *On* according to TS 38.508-1 [14] clause 4.5. Cell 1 is the active cell.
11. Set Cell 2 physical cell identity = ((current cell 2 physical cell identity + 1) mod 14 + 2) for next iteration of the test procedure loop.
12. Repeat steps 2-8 until the confidence level according to Tables G.2.3-1 in Annex G clause G.2 is achieved.

6.3.1.1.4.3 Message contents

Message contents are according to TS 38.508-1 [14] clause 4.6 with the following exceptions:

Table 6.3.1.1.4.3-1: Common Exception messages

Default Message Contents	
Common contents of system information blocks exceptions	
Default RRC messages and information elements contents exceptions	Table H.3.1-1 Table H.3.1-2 with Condition INTRA-FREQ and no GAP NEEDED Table H.3.1-3 with Condition INTRA-FREQ MO, SSB.1 FR1, SMTC pattern 1 and Synchronous cells for Config 1 and 2 Table H.3.1-3 with Condition INTRA-FREQ MO, SSB.2 FR1, SMTC pattern 1 and Synchronous cells for Config 3 Table H.3.1-4 with A3-offset = -1dB Table H.3.1-5 Table H.3.1-7 with Condition INTRA-FREQ Table H.3.2-2 with Condition RBConfig_KeyChange

6.3.1.1.5 Test requirements

Table 6.3.1.1.5-1 defines the primary level settings including test tolerances for all tests.

Table 6.3.1.1.5-1: Cell specific test parameters for NR FR1-FR1 Intra frequency handover test case

Parameter		Unit	Cell 1			Cell 2		
			T1	T2	T3	T1	T2	T3
NR RF Channel Number			1			1		
Duplex mode	Config 1		FDD					
	Config 2,3		TDD					
TDD configuration	Config 1		Not Applicable					
	Config 2		TDDConf.1.1					
	Config 3		TDDConf.2.1					
$BW_{channel}$	Config 1	MHz	10: $N_{RB,c}$ = 52					
	Config 2		10: $N_{RB,c}$ = 52					
	Config 3		40: $N_{RB,c}$ = 106					
BWP BW	Config 1	MHz	10: $N_{RB,c}$ = 52					
	Config 2		10: $N_{RB,c}$ = 52					
	Config 3		40: $N_{RB,c}$ = 106					
DRx Cycle		ms	Not Applicable					
PDSCH Reference measurement channel	Config 1		SR.1.1 FDD					
	Config 2		SR.1.1 TDD					
	Config 3		SR2.1 TDD					
CORESET Reference Channel	Config 1		CR.1.1 FDD					
	Config 2		CR.1.1 TDD					
	Config 3		CR2.1 TDD					
TRS configuration	Config 1		TRS.1.1 FDD					
	Config 2		TRS.1.1 TDD					
	Config 3		TRS.1.2 TDD					
OCNG Patterns			OP.1					
SMTC Configuration			SMTC.1					
SSB Configuration	Config 1,2		SSB.1 FR1					
	Config 3		SSB.2 FR1					
PDSCH/PDCCH subcarrier spacing	Config 1,2	kHz	15 kHz					
	Config 3		30 kHz					
PUCCH/PUSCH subcarrier spacing	Config 1,2	kHz	15 kHz					
	Config 3		30 kHz					
PRACH configuration			PRACH.1 FR1					
BWP configuration	Initial DL BWP		DLBWP.0.1					
	Dedicated DL BWP		DLBWP.1.1					
	Initial UL BWP		ULBWP.0.1					
	Dedicated UL BWP		ULBWP.1.1					
EPRE ratio of PSS to SSS		dB	0					
EPRE ratio of PBCH DMRS to SSS								
EPRE ratio of PBCH to PBCH DMRS								
EPRE ratio of PDCCH DMRS to SSS								
EPRE ratio of PDCCH to PDCCH DMRS								
EPRE ratio of PDSCH DMRS to SSS								
EPRE ratio of PDSCH to PDSCH								
EPRE ratio of OCNG DMRS to SSS(Note 1)								
EPRE ratio of OCNG to OCNG DMRS (Note 1)								
N_{oc} Note2		dBm/15kHz	-98			-98		
N_{oc} Note2	Config 1,2	dBm/SCS	-98			-98		
	Config 3		-95			-95		
$\hat{E}_s / I_{ot}$	Config 1,2	dB	8	-2.41	-2.41	-Infinity	1.36	1.36
	Config 3	dB	8	-2.41	-2.41	-Infinity	1.36	1.36
$\hat{E}_s / N_{oc}$	Config 1,2	dB	8	8	8	-Infinity	10	10
	Config 3	dB	8	8	8	-Infinity	10	10
SSB_RP	Config 1,2	dBm/SCS	-90	-90	-90	Infinity	-88	-88
	Config 3	dBm/SCS	-87	-87	-87	Infinity	-84.99	-84.99
Io Note3	Config 1,2	dBm/ 9.36MHz	-61.41	-57.67	-57.67	-61.41	-57.67	-57.67
	Config 3	dBm/	-55.31	-51.56	-51.56	-55.31	-51.56	-51.56

Parameter	Unit	Cell 1			Cell 2		
		T1	T2	T3	T1	T2	T3
	38.16MHz						
Propagation condition	-	AWGN					
Note 1: OCNG shall be used such that both cells are fully allocated, and a constant total transmitted power spectral density is achieved for all OFDM symbols.							
Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for N_{oc} to be fulfilled.							
Note 3: Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.							

The UE shall start to transmit the PRACH to Cell 2 less than 72 ms from the beginning of time period T3.
The rate of correct handovers observed during repeated tests shall be at least 90%.

NOTE: The handover delay can be expressed as: RRC procedure delay + $T_{interrupt}$, where:

RRC procedure delay = 10 ms and is specified in clause 12 in TS 38.331 [2].

$T_{interrupt}$ = 62 ms in the test. $T_{interrupt}$ is defined in clause 6.3.1.0.2.

This gives a total of 72 ms.

6.3.1.2 NR SA FR1 handover with unknown target cell

6.3.1.2.1 Test purpose

To verify the UE's ability to perform NR FR1-NR FR1 intra frequency handover in RRC_CONNECTED state by meeting the delay requirement and interruption length for handover to an unknown target cell.

6.3.1.2.2 Test applicability

This test applies to all types of NR UE from Release 15 onwards.

6.3.1.2.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 6.3.1.0.2.

The normative reference for this requirement is TS 38.133 [6] clause A.6.3.1.2.

6.3.1.2.4 Test description

6.3.1.2.4.1 Initial conditions

Initial conditions are a set of test configurations the UE needs to be tested in and the steps for the SS to take with the UE to reach the correct measurement state.

This test shall be tested using any of the test configurations in Table 6.3.1.2.4.1-1.

Table 6.3.1.2.4.1-1: Intra-frequency handover from FR1 to FR1 test configurations

Config	Description
1	Source cell: NR 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode Target cell: NR 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode
2	Source cell: NR 15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode Target cell: NR 15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode
3	Source cell: NR 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode Target cell: NR 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode
Note: The UE is only required to be tested in one of the supported test configurations	

Configure the test equipment and the DUT according to the parameters in Table 6.3.1.2.4.1-2

Table 6.3.1.2.4.1-2: Initial conditions for NR SA FR1 handover with unknown target cell

Parameter	Value	Comment

Test environment	NC		As specified in TS 38.508-1 [14] clause 4.1.
Test frequencies	As specified in Annex E, Table E.4-1 and TS 38.508-1 [14] clause 4.3.1.		
Channel bandwidth	As specified by the test configuration selected from Table 6.3.1.2.4.1-1		
Propagation conditions	AWGN		As specified in Annex C.2.2.
Connection Diagram	TE Part	A.3.1.8.2	As specified in TS 38.508-1 [14] Annex A.
	DUT Part	A.3.2.3.4	
Exceptions to connection diagram	N/A		

1. Message contents are defined in clause 6.3.1.2.4.3.

2. The power levels and settings for NR Cell 1 are set according to Annex C.1.2 and C.1.3. Cell 2 is NR FR1 target Cell, and its power levels and settings are also set according to Annex C.1.2 and C.1.3.

3. The test parameters are given in Table 6.3.1.2.4.1-4 below.

Table 6.3.1.2.4.1-3: General test parameters Intra-frequency handover from FR1 to FR1

Parameter		Unit	Value	Comment
Initial conditions	Active cell		Cell 1	
	Neighbouring cell		Cell 2	
Final condition	Active cell		Cell 2	
Access Barring Information		-	Not Sent	No additional delays in random access procedure.
Time offset between cells			3 μs	Synchronous cells
T1		s	5	
T2		s	≤5	

6.3.1.2.4.2 Test procedure

The test scenario comprises of two NR carriers and one cell on each carrier as given in tables 6.3.1.2.4.1-3 and 6.3.1.2.5-1. No gap patterns are configured in the test case. The test consists of two successive time periods, with time durations of T1and T2 respectively. At the start of time duration T1, the UE does not have any timing information of Cell 2. Starting T2, Cell 2 becomes detectable and the UE is expected to detect and start to transmit the PRACH to Cell 2. The start of T2 is the instant when the last TTI containing the RRC message implying handover is sent to the UE.

1. Ensure the UE is in State RRC_CONNECTED with generic procedure parameters Connectivity *NR*, Connected without release *On* according to TS 38.508-1 [14] clause 4.5. Establish SRB2 and DRB in the RRC Reconfiguration message. Cell 1 is the active cell.

2. Set the parameters according to T1 in Table 6.3.1.2.5-1. Propagation conditions are set according to Annex C clause C.2.2. T1 starts.

3. SS shall transmit an RRCReconfiguration message implying handover to Cell 2.

4. The start of T2 is the instant when the last TTI containing the RRC reconfiguration message implying handover is sent to the UE, at that instant the SS shall switch the power settings from T1 to T2 as specified in Table 6.3.1.2.5-1. T2 starts.

5. The UE shall transmit RRCReconfigurationComplete message.

6. If the UE transmits the uplink PRACH channel to Cell 2 less than 92 ms from the beginning of time period T2 then the number of successful tests is increased by one. Otherwise, the number of failure tests is increased by one.

7. After T2 expires, cause UE handover back to Cell 1 (if the handover fails, switch off the UE) or switch off the UE. Then ensure the UE is in State RRC_CONNECTED with generic procedure parameters Connectivity *NR*, Connected without release *On* according to TS 38.508-1 [14] clause 4.5. Cell 1 is the active cell.

8. Set Cell 2 physical cell identity = ((current cell 2 physical cell identity + 1) mod 14 + 2) for next iteration of the test procedure loop.

9. Repeat step 2-8 until the confidence level according to Tables G.2.3-1 in Annex G clause G.2 is achieved.

6.3.1.2.4.3 Message contents

Message contents are according to TS 38.508-1 [14] clause 4.6 with the following exceptions:

Table 6.3.1.2.4.3-1: Common Exception messages

Default Message Contents	
Common contents of system information blocks exceptions	
Default RRC messages and information elements contents exceptions	Table H.3.2-2 with Condition RBConfig_KeyChange

6.3.1.2.5 Test requirements

Table 6.3.1.2.5-1 defines the primary level settings including test tolerances for all tests.

Table 6.3.1.2.5-1: Cell specific test parameters for NR FR1-FR1 Intra frequency handover test case

Parameter		Unit	Cell 1		Cell 2	
			T1	T2	T1	T2
NR RF Channel Number			1		1	
Duplex mode	Config 1		FDD			
	Config 2,3		TDD			
TDD configuration	Config 1		Not Applicable			
	Config 2		TDDConf.1.1			
	Config 3		TDDConf. 2.1			
$BW_{channel}$	Config 1	MHz	10: $N_{RB,c}$ = 52			
	Config 2		10: $N_{RB,c}$ = 52			
	Config 3		40: $N_{RB,c}$ = 106			
BWP BW	Config 1	MHz	10: $N_{RB,c}$ = 52			
	Config 2		10: $N_{RB,c}$ = 52			
	Config 3		40: $N_{RB,c}$ = 106			
DRx Cycle		ms	Not Applicable			
PDSCH Reference measurement channel	Config 1		SR.1.1 FDD			
	Config 2		SR.1.1 TDD			
	Config 3		SR2.1 TDD			
CORESET Reference Channel	Config 1		CR.1.1 FDD			
	Config 2		CR.1.1 TDD			
	Config 3		CR2.1 TDD			
TRS configuration	Config 1		TRS.1.1 FDD			
	Config 2		TRS.1.1 TDD			
	Config 3		TRS.1.2 TDD			
OCNG Patterns			OP.1			
SMTC Configuration			SMTC.1 FR1			
SSB configuration	Config 1,2		SSB.1 FR1			
	Config 3		SSB.2 FR1			
PDSCH/PDCCH subcarrier spacing	Config 1,2	kHz	15 kHz			
	Config 3		30 kHz			
PUCCH/PUSCH subcarrier spacing	Config 1,2	kHz	15 kHz			
	Config 3		30 kHz			
PRACH configuration			PRACH.1 FR1			
BWP configuration	Initial DL BWP		DLBWP.0.1			
	Dedicated DL BWP		DLBWP.1.1			
	Initial UL BWP		ULBWP.0.1			
	Dedicated UL BWP		ULBWP.1.1			
EPRE ratio of PSS to SSS		dB	0			
EPRE ratio of PBCH DMRS to SSS						
EPRE ratio of PBCH to PBCH DMRS						
EPRE ratio of PDCCH DMRS to SSS						
EPRE ratio of PDCCH to PDCCH DMRS						
EPRE ratio of PDSCH DMRS to SSS						
EPRE ratio of PDSCH to PDSCH						
EPRE ratio of OCNG DMRS to SSS(Note 1)						

Parameter		Unit	Cell 1		Cell 2	
			T1	T2	T1	T2
EPRE ratio of OCNG to OCNG DMRS (Note 1)						
N_{oc} Note2		dBm/15kHz	-98		-98	
N_{oc} Note2	Config 1,2	dBm/SCS	-98		-98	
	Config 3		-95		-95	
$\hat{E}_s/I_{ot}$		dB	8	-0.64	-Infinity	-0.64
$\hat{E}_s/N_{oc}$		dB	8	8	-Infinity	8
SSB_RP	Config 1,2	dBm/SCS	-90	-90	-Infinity	-90
	Config 3	dBm/SCS	-87	-87	-Infinity	-87
Io Note3	Config 1,2	dBm/ 9.36MHz	-61.41	-57.95	-61.41	-57.95
	Config 3	dBm/ 38.16MHz	-55.31	-51.84	-55.31	-51.84
Propagation condition		-	AWGN			

Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.

Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for N_{oc} to be fulfilled.

Note 3: Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.

The UE shall start to transmit the PRACH to Cell 2 less than 92 ms from the beginning of time period T2.
The rate of correct handovers observed during repeated tests shall be at least 90%.

NOTE: The handover delay can be expressed as: RRC procedure delay + $T_{interrupt}$, where:

RRC procedure delay = 10 ms and is specified in clause 12 in TS 38.331 [2].

$T_{interrupt}$ = 82 ms in the test. $T_{interrupt}$ is defined in clause 6.3.1.0.2.

This gives a total of 92 ms.

6.3.1.3 NR SA FR1-FR1 handover with unknown target cell

6.3.1.3.1 Test purpose

To verify the UE's ability to perform NR FR1-NR FR1 inter frequency handover in RRC_CONNECTED state by meeting the delay requirement and interruption length for handover to an unknown target cell.

6.3.1.3.2 Test applicability

This test applies to all types of NR UE from Release 15 onwards.

6.3.1.3.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 6.3.1.0.2.

The normative reference for this requirement is TS 38.133 [6] clause A.6.3.1.3.

6.3.1.3.4 Test description

6.3.1.3.4.1 Initial conditions

Initial conditions are a set of test configurations the UE needs to be tested in and the steps for the SS to take with the UE to reach the correct measurement state.

This test shall be tested using any of the test configurations in Table 6.3.1.3.4-1.

Table 6.3.1.3.4.1-1: Inter-frequency handover from FR1 to FR1 test configurations

Config	Description
1	Source cell: NR 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode Target cell: NR 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode
2	Source cell: NR 15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode Target cell: NR 15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode
3	Source cell: NR 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode Target cell: NR 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode
Note: The UE is only required to be tested in one of the supported test configurations	

Configure the test equipment and the DUT according to the parameters in Table 6.3.1.3.4-2

Table 6.3.1.3.4.1-2: Initial conditions for NR SA FR1 handover with unknown target cell

Parameter	Value		Comment
Test environment	NC		As specified in TS 38.508-1 [14] clause 4.1.
Test frequencies	As specified in Annex E, Table E.4-1 and TS 38.508-1 [14] clause 4.3.1.		
Channel bandwidth	As specified by the test configuration selected from Table 6.3.1.3.4-3		
Propagation conditions	AWGN		As specified in Annex C.2.2.
Connection Diagram	TE Part	A.3.1.8.2	As specified in TS 38.508-1 [14] Annex A.
	DUT Part	A.3.2.3.4	
Exceptions to connection diagram	N/A		

1. Message contents are defined in clause 6.3.1.3.4.3.

2. The power levels and settings for NR Cell 1 are set according to Annex C.1.2 and C.1.3. Cell 2 is NR FR1 target Cell, and its power levels and settings are also set according to Annex C.1.2 and C.1.3.

3. The test parameters are given in Tables 6.3.1.3.4.1-3 and 6.3.1.3.5-1 below.

Table 6.3.1.3.4.1-3: General test parameters Inter-frequency handover from FR1 to FR1

Parameter		Unit	Value	Comment
Initial conditions	Active cell		Cell 1	
	Neighbouring cell		Cell 2	
Final condition	Active cell		Cell 2	
Access Barring Information		-	Not Sent	No additional delays in random access procedure.
T1		s	5	
T2		s	≤5	

6.3.1.3.4.2 Test procedure

The test scenario comprises of two NR carriers and one cell on each carrier as given in tables 6.3.1.3.4-3 and 6.3.1.3.5-1. No gap patterns are configured in the test case. The test consists of two successive time periods, with time durations of T1and T2 respectively. At the start of time duration T1, the UE does not have any timing information of Cell 2. Starting T2, Cell 2 becomes detectable and the UE is expected to detect and start to transmit the PRACH to Cell 2.

1. Ensure the UE is in State RRC_CONNECTED with generic procedure parameters Connectivity *NR*, Connected without release *On* according to TS 38.508-1 [14] clause 4.5. Establish SRB2 and DRB in the RRC Reconfiguration message. Cell 1 is the active cell.

2. Set the parameters according to T1 in Table 6.3.1.3.5-1. Propagation conditions are set according to Annex C clause C.2.2. T1 starts.

3. SS shall transmit an RRCReconfiguration message implying handover to Cell 2.

4. The start of T2 is the instant when the last TTI containing the RRC reconfiguration message implying handover is sent to the UE, at that instant the SS shall switch the power settings from T1 to T2 as specified in Table 6.3.1.3.5-1. T2 starts.

5. The UE shall transmit RRCReconfigurationComplete message.

6. If the UE transmits the uplink PRACH channel to Cell 2 less than 132 ms from the beginning of time period T2 then the number of successful tests is increased by one. Otherwise, the number of failure tests is increased by one.

7. After T2 expires, cause UE handover back to Cell 1 (if the handover fails, switch off the UE) or switch off the UE. Then ensure the UE is in State RRC_CONNECTED with generic procedure parameters Connectivity *NR*, Connected without release *On* according to TS 38.508-1 [14] clause 4.5. Cell 1 is the active cell.

8. Set Cell 2 physical cell identity = ((current cell 2 physical cell identity + 1) mod 14 + 2) for next iteration of the test procedure loop.

9. Repeat step 2-8 until the confidence level according to Tables G.2.3-1 in Annex G clause G.2 is achieved.

6.3.1.3.4.3 Message contents

Message contents are according to TS 38.508-1 [14] clause 4.6 with the following exceptions:

Table 6.3.1.3.4.3-1: Common Exception messages

Default Message Contents	
Common contents of system information blocks exceptions	
Default RRC messages and information elements contents exceptions	Table H.3.2-2 with Condition RBConfig_KeyChange

6.3.1.3.5 Test requirements

Table 6.3.1.3.5-1 defines the primary level settings including test tolerances for all tests.

Table 6.3.1.3.5-1: Cell specific test parameters for NR FR1-FR1 Intra frequency handover test case

Parameter		Unit	Cell 1		Cell 2	
			T1	T2	T1	T2
NR RF Channel Number			1		2	
Duplex mode	Config 1		FDD			
	Config 2,3		TDD			
TDD configuration	Config 1		Not Applicable			
	Config 2		TDDConf.1.1			
	Config 3		TDDConf.2.1			
$BW_{channel}$	Config 1	MHz	10: $N_{RB,c}$ = 52			
	Config 2		10: $N_{RB,c}$ = 52			
	Config 3		40: $N_{RB,c}$ = 106			
BWP BW	Config 1	MHz	10: $N_{RB,c}$ = 52			
	Config 2		10: $N_{RB,c}$ = 52			
	Config 3		40: $N_{RB,c}$ = 106			
TRS configuration	Config 1		TRS.1.1 FDD			
	Config 2		TRS.1.1 TDD			
	Config 3		TRS.1.2 TDD			
DRx Cycle		ms	Not Applicable			
PDSCH Reference measurement channel	Config 1		SR.1.1 FDD			
	Config 2		SR.1.1 TDD			
	Config 3		SR2.1 TDD			
CORESET Reference Channel	Config 1		CR.1.1 FDD			
	Config 2		CR.1.1 TDD			
	Config 3		CR2.1 TDD			
OCNG Patterns			OP.1			
SMTC configuration	Config 1,2		SMTC.1 FR1			
	Config 3		SMTC.2 FR1			
PDSCH/PDCCH subcarrier spacing	Config 1,2	kHz	15 kHz			
	Config 3		30 kHz			
PUCCH/PUSCH subcarrier spacing	Config 1,2	kHz	15 kHz			
	Config 3		30 kHz			
PRACH configuration			FR1 PRACH configuration 1			

Parameter		Unit	Cell 1		Cell 2	
			T1	T2	T1	T2
BWP	Initial DL BWP		DLBWP.0.1			
	Dedicated DL BWP		DLBWP.1.1			
	Initial UL BWP		ULBWP.0.1			
	Dedicated UL BWP		ULBWP.1.1			
EPRE ratio of PSS to SSS		dB	0			
EPRE ratio of PBCH DMRS to SSS						
EPRE ratio of PBCH to PBCH DMRS						
EPRE ratio of PDCCH DMRS to SSS						
EPRE ratio of PDCCH to PDCCH DMRS						
EPRE ratio of PDSCH DMRS to SSS						
EPRE ratio of PDSCH to PDSCH						
EPRE ratio of OCNG DMRS to SSS(Note 1)						
EPRE ratio of OCNG to OCNG DMRS (Note 1)						
N_{oc} Note2		dBm/15kHz	-98		-98	
N_{oc} Note2	Config 1,2	dBm/SCS	-98		-98	
	Config 3		-95		-95	
$\hat{E}_s / I_{ot}$		dB	4	4	-Infinity	5
$\hat{E}_s / N_{oc}$		dB	4	4	-Infinity	5
SSB_RP	Config 1,2	dBm/SCS	-94	-94	-Infinity	-93
	Config 3	dBm/SCS	-91	-91	-Infinity	-90
Io Note3	Config 1,2	dBm/ 9.36MHz	-64.59	-64.59	-70.05	-63.85
	Config 3	dBm/ 38.16MHz	-58.49	-58.49	-63.94	-57.75
Propagation condition		-	AWGN		AWGN	

Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.

Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for N_{oc} to be fulfilled.

Note 3: Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.

The UE shall start to transmit the PRACH to Cell 2 less than 132 ms from the beginning of time period T2.
The rate of correct handovers observed during repeated tests shall be at least 90%.

NOTE: The handover delay can be expressed as: RRC procedure delay + $T_{interrupt}$, where:

RRC procedure delay = 10 ms and is specified in clause 12 in TS 38.331 [2].

$T_{interrupt}$ = 122 ms in the test. $T_{interrupt}$ is defined in clause 6.3.1.0.2.

This gives a total of 132 ms.

6.3.1.4 NR SA FR1 – E-UTRA handover with known target cell

6.3.1.4.1 Test purpose

To verify that the UE can make correct inter-RAT E-UTRAN handover when operating in standalone (SA) operation with PCell in FR1.

6.3.1.4.2 Test applicability

This test applies to all types of NR UE from Release 15 onwards.

6.3.1.4.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 6.3.1.0.1.

The normative reference for this requirement is TS 38.133 [6] clause A.6.3.1.4.

6.3.1.4.4 Test description

6.3.1.4.4.1 Initial conditions

The Test shall be tested using any of the test configuration in Table 6.3.1.4.4.1-1.

Table 6.3.1.4.4.1-1: Supported test configurations

Configuration	Description
6.3.1.4-1	NR 15 kHz SSB SCS, 10MHz bandwidth, FDD duplex mode, LTE FDD
6.3.1.4-2	NR 15 kHz SSB SCS, 10MHz bandwidth, TDD duplex mode, LTE FDD
6.3.1.4-3	NR 30 kHz SSB SCS, 40MHz bandwidth, TDD duplex mode, LTE FDD
6.3.1.4-4	NR 15 kHz SSB SCS, 10MHz bandwidth, FDD duplex mode, LTE TDD
6.3.1.4-5	NR 15 kHz SSB SCS, 10MHz bandwidth, TDD duplex mode, LTE TDD
6.3.1.4-6	NR 30 kHz SSB SCS, 40MHz bandwidth, TDD duplex mode, LTE TDD
Note: The UE is only required to be tested in one of the supported test configurations.	

Configure the test requirement and the DUT according to the parameters in Table 6.3.1.4.4.1-2.

Table 6.3.1.4.4.1-2: Initial conditions for NR SA FR1 – E-UTRA handover with known target cell

Parameter	Value		Comment
Test environment	NC		As specified in TS 38.508-1 [14] clause 4.1.
Test frequencies	As specified in Annex E, Table E.4-1 and TS 38.508-1 [14] clause 4.3.1.		
Channel bandwidth	As specified by the test configuration selected from Table 6.3.1.4.4.1-1.		
Propagation conditions	AWGN		As specified in Annex C.2.2.
Connection Diagram	TE Part	A.3.1.6.1	As specified in TS 38.508-1 [14] Annex A.
	DUT Part	A.3.2.3.2	
Exceptions to connection diagram	N/A		

1. The general test parameter settings are set up according to Table 6.3.1.4.4.1-3.

2. Message contents are defined in clause 6.3.1.4.4.3.

3. The test comprises of one NR carrier and one E-UTRA carrier. There are two cells and one cell on each carrier. Cell 1 is the NR PCell and Cell 2 is an inter-RAT E-UTRAN neighbour cell. Cell 1 is configured according to Annex C.1.1 and C.1.2, Cell 2 is configured according to TS 36.521-3 [26] Annex C.1.0 and C.1.1.

Table 6.3.1.4.4.1-3: General test parameters for SA inter-RAT E-UTRAN handover

Parameter		Unit	Value	Comment
NR RF Channel Number			1	1 NR carrier frequency is used in the test
LTE RF Channel Number			2	1 E-UTRAN carrier frequency is used in the test
Initial conditions	Active cell		Cell 1	NR cell
	Neighbouring cell		Cell 2	E-UTRAN cell
Final condition	Active cell		Cell 2	
NR measurement quantity			SS-RSRP	
E-UTRAN measurement quantity			RSRP	
b2-Threshold1		dBm	As specified in Table 6.3.1.4.5-1	Absolute NR SS-RSRP threshold for event B2
b2-Threshold2EUTRAN		dBm	-98	Absolute E-UTRAN RSRP threshold for event B2
Hysteresis		dB	0	
TimeToTrigger		s	0	
Filter coefficient			0	L3 filtering is not used
DRX			OFF	Non-DRX test
Access Barring Information		-	Not sent	No additional delays in random access procedure

Time offset between cells		3 ms	Asynchronous cells
Gap pattern configuration Id		0	As specified in TS 38.133 [6], table 9.1.2-1 started before T2 starts
T1	s	5	
T2	s	≤5	
T3	s	1	

6.3.1.4.4.2 Test procedure

The test comprises of one NR carrier and one E-UTRA carrier. There are two cells and one cell on each carrier. Cell 1 is the NR PCell and Cell 2 is an inter-RAT E-UTRAN neighbour cell. The test consists of three successive time periods, with time durations of T1, T2 and T3 respectively. At the start of time duration T1, the UE does not have any timing information of Cell 2. Starting T2, Cell 2 becomes detectable and the UE is expected to detect and send a measurement report. Gap pattern configuration with id #0 as specified in Table 9.1.2-1 of TS 38.133 [6] is configured before T2 begins to enable inter-RAT frequency monitoring.

A RRC message implying handover shall be sent to the UE during period T2 after the UE has reported Event B2. The start of T3 is the instant when the last TTI containing the RRC message implying handover is sent to the UE. The handover message shall contain Cell 2 as the target cell.

1. Ensure the UE is in State RRC_CONNECTED with generic procedure parameters Connectivity *NR*, Connected without release *On* and Test Mode *On* according to TS 38.508-1 [14] clause 4.5. Establish SRB2 and DRB in the RRC Reconfiguration message. Cell 1 is the active cell.
2. Set the parameters according to T1 in Table 6.3.1.4.5-1 and 6.3.1.4.5-2. T1 starts.
3. The SS shall transmit an RRCReconfiguration message.
4. The UE shall transmit RRCReconfigurationComplete message.
5. When T1 expires, the SS shall switch the power setting from T1 to T2 as specified in Table 6.3.1.4.5-1 and 6.3.1.4.5-2.
6. UE shall transmit a MeasurementReport message triggered by Event B2.
7. SS shall transmit an RRCReconfiguration message implying handover to Cell 2.
8. The start of T3 is the instant when the last TTI containing the RRCReconfiguration message implying handover is sent to the UE, at that instant the SS shall switch the power setting from T2 to T3 as specified in Table 6.3.1.4.5-1 and 6.3.1.4.5-2.
9. The UE shall transmit RRCConnectionReconfigurationComplete message on Cell 2.
10. If the UE transmits the uplink PRACH channel to Cell 2 less than 85 ms from the beginning of time period T3 then the number of successful tests is increased by one. Otherwise, the number of failure tests is increased by one.
11. After T3 expires, cause UE handover back to Cell 1 (if the handover fails, switch off the UE) or switch off the UE. Then ensure the UE is in State RRC_CONNECTED with generic procedure parameters Connectivity *NR*, Connected without release *On* according to TS 38.508-1 [14] clause 4.5. Cell 1 is the active cell.
12. Set Cell 2 physical cell identity = ((current cell 2 physical cell identity + 1) mod 14 + 2) for next iteration of the test procedure loop.
13. Repeat step 2-12 until the confidence level according to Tables G.2.3-1 in Annex G clause G.2 is achieved.

6.3.1.4.4.3 Message contents

Message contents are according to TS 38.508-1 [14] clause 7.3 with the following exceptions:

Table 6.3.1.4.4.3-1: Common Exception messages

Default Message Contents	
Common contents of system information blocks exceptions	

Default RRC messages and information elements contents exceptions	Table H.3.1-1 Table H.3.1-2 with Condition INTER-RAT and GAP NEEDED Table H.3.1-3A Table H.3.1-4A Table H.3.1-5 Table H.3.1-6 with Condition Pattern #0 Table H.3.1-7 with Condition INTER-RAT Table H.3.3-1
Specific message contents exceptions for Test Configuration 6.3.1.4-1, 6.3.1.4-2, 6.3.1.4-4 and 6.3.1.4-5	Table H.3.1-3 with Condition SSB.1 FR1 Table 7.3.1-3 in TS 38.508-1 [14] with condition SMTC.1
Specific message contents exceptions for Test Configuration 6.3.1.4-3 and 6.3.1.4-6	Table H.3.1-3 with Condition SSB.2 FR1 Table 7.3.1-3 in TS 38.508-1 [14] with condition SMTC.1

Table 6.3.1.4.4.3-2: *PRACH-Config-DEFAULT*: Inter-RAT handover to E-UTRAN known cell

Derivation Path: TS 36.508 [25], Table 4.6.3-7			
Information Element	**Value/remark**	**Comment**	**Condition**
PRACH-Config-DEFAULT ::= SEQUENCE {			
prach-ConfigInfo SEQUENCE {			
prach-ConfigIndex	4		Config 1, 2, 3
	53		Config 4, 5, 6
}			
}			

Table 6.3.1.4.4.3-3: *RRCConnectionReconfiguration*: Inter-RAT handover to E-UTRAN known cell

Derivation Path: TS 36.508 [25], Table 4.6.1-8			
Information Element	**Value/remark**	**Comment**	**Condition**
RRCConnectionReconfiguration ::= SEQUENCE {			
securityConfigHO	Not present		
nonCriticalExtension SEQUENCE {		RRCConnectionReconfiguration-v890-IEs	
nonCriticalExtension SEQUENCE {		RRCConnectionReconfiguration-v920-IEs	
nonCriticalExtension SEQUENCE {		RRCConnectionReconfiguration-v1020-IEs	
nonCriticalExtension SEQUENCE {		RRCConnectionReconfiguration-v1130-IEs	
nonCriticalExtension SEQUENCE {		RRCConnectionReconfiguration-v1250-IEs	
nonCriticalExtension SEQUENCE {		RRCConnectionReconfiguration-v1310-IEs	
nonCriticalExtension SEQUENCE {		RRCConnectionReconfiguration-v1430-IEs	
nonCriticalExtension SEQUENCE {		RRCConnectionReconfiguration-v1510-IEs	
nonCriticalExtension SEQUENCE {		RRCConnectionReconfiguration-v1530-IEs	
securityConfigHO-v1530 {			
handoverType-v1530 CHOICE {	fivegc-ToEPC-r15		
fivegc-ToEPC-r15 {			
securityAlgorithmConfig-r15 {			
cipheringAlgorithm	eea0		

integrityProtAlgorithm	eia1		
}			
nextHopChainingCount-r15	2		
}			
}			
}			
}			
}			
}			
}			
}			
}			
}			
}			
}			

6.3.1.4.5 Test requirement

Tables 6.3.1.4.4.1-3, 6.3.1.4.5-1 and 6.3.1.4.5-2 define the primary level settings including test tolerances for intra frequency NR cell re-selection test case.

Table 6.3.1.4.5-1: Cell specific test parameters for SA inter-RAT E-UTRA handover (Cell 1)

Parameter		Unit	Configuration	Cell 1		
				T1	T2	T3
RF channel number			1, 2, 3, 4, 5, 6	1		
Duplex mode			1, 4	FDD		
			2, 3, 5, 6	TDD		
TDD Configuration			2, 5	TDDConf.1.1		
			3, 6	TDDConf.2.1		
$BW_{channel}$		MHz	1, 4	10: $N_{RB,c}$ = 52 (FDD)		
			2, 5	10: $N_{RB,c}$ = 52 (TDD)		
			3, 6	40: $N_{RB,c}$ = 106 (TDD)		
PDSCH reference measurement channel			1, 4	SR.1.1 FDD		
			2, 5	SR.1.1 TDD		
			3, 6	SR.2.1 TDD		
CORSET reference channel			1, 4	CR.1.1 FDD		
			2, 5	CR.1.1 TDD		
			3, 6	CR.2.1 TDD		
OCNG pattern[Note1]			1, 2, 3, 4, 5, 6	OP.1		
BWP	Initial DL BWP		1, 2, 3, 4, 5, 6	DL BWP.0.1		
	Dedicated DL BWP			DL BWP.1.1		
	Initial UL BWP			UL BWP.0.1		
	Dedicated UL BWP			UL BWP.1.1		
SMTC configuration			1, 2, 3, 4, 5, 6	SMTC.1		
SSB configuration			1, 2, 4, 5	SSB.1 FR1		
			3, 6	SSB.2 FR1		
b2-Threshold1		dBm	1, 2, 4, 5	-96		
			3, 6	-93		
EPRE ratio of PSS to SSS		dB	1, 2, 3, 4, 5, 6	0		
EPRE ratio of PBCH_DMRS to SSS						
EPRE ratio of PBCH to PBCH_DMRS						
EPRE ratio of PDCCH_DMRS to SSS						
EPRE ratio of PDCCH to PDCCH_DMRS						
EPRE ratio of PDSCH_DMRS to SSS						
EPRE ratio of PDSCH to PDSCH_DMRS						
EPRE ratio of OCNG DMRS to SSS						

Parameter	Unit	Configuration	Cell 1		
			T1	T2	T3
EPRE ratio of OCNG to OCNG DMRS					
N_{oc}[Note2]	dBm/15 KHz	1, 2, 3, 4, 5, 6	-100	-104	-100
N_{oc}[Note2]	dBm/SCS	1, 2, 4, 5	-100	-104	-100
		3, 6	-97	-101	-97
$\hat{E}_s/N_{oc}$	dB	1, 2, 3, 4, 5, 6	13.55	-1.55	-5.55
$\hat{E}_s/I_{ot}$[Note3]	dB	1, 2, 3, 4, 5, 6	13.55	-1.55	-5.55
SS-RSRP[Note3]	dBm/SCS	1, 2, 4, 5	-86.45	-105.55	-105.55
		3, 6	-83.44	-102.54	-102.54
Io[Note3]	dBm/9.36 MHz	1, 2, 4, 5	-58.31	-73.04	-70.98
	dBm/38.16 MHz	3, 6	-52.21	-66.94	-64.88
Propagation condition		1, 2, 3, 4, 5, 6	AWGN		
Antenna Configuration and Correlation Matrix		1, 2, 3, 4, 5, 6	1x2 Low		

Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.
Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for N_{oc} to be fulfilled.
Note 3: $\hat{E}_s/I_{ot}$, SS-RSRP, and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.

Table 6.3.1.4.5-2: Cell specific test parameters for SA inter-RAT E-UTRA handover (Cell 2)

Parameter	Unit	Configuration	Cell 2		
			T1	T2	T3
RF channel number		1, 2, 3, 4, 5, 6	2		
Duplex mode		1, 2, 3	FDD		
		4, 5, 6	TDD		
TDD special subframe configuration[Note1]		4, 5, 6	6		
TDD uplink-downlink configuration[Note1]		4, 5, 6	1		
$BW_{channel}$	MHz	1, 2, 3, 4, 5, 6	5MHz: $N_{RB,c}$ = 25 10MHz: $N_{RB,c}$ = 50 20MHz: $N_{RB,c}$ = 100		
PRACH Configuration[Note2]		1, 2, 3	4		
		4, 5, 6	53		
PDSCH parameters: DL Reference Measurement Channel[Note3]		1, 2, 3	5MHz: R.7 FDD 10MHz: R.3 FDD 20MHz: R.6 FDD		
		4, 5, 6	5MHz: R.4 TDD 10MHz: R.0 TDD 20MHz: R.3 TDD		
PCFICH/PDCCH/PHICH parameters: DL Reference Measurement Channel[Note3]		1, 2, 3	5MHz: R.11 FDD 10MHz: R.6 FDD 20MHz: R.10 FDD		
		4, 5, 6	5MHz: R.11 TDD 10MHz: R.6 TDD 20MHz: R.10 TDD		
OCNG Patterns[Note3]		1, 2, 3	5MHz: OP.20 FDD 10MHz: OP.10 FDD 20MHz: OP.17 FDD		
		4, 5, 6	5MHz: OP.9 TDD 10MHz: OP.1 TDD 20MHz: OP.7 TDD		
PBCH_RA	dB	1, 2, 3, 4, 5, 6	0		
PBCH_RB					
PSS_RA					
SSS_RA					
PCFICH_RB					
PHICH_RA					

Parameter	Unit	Configuration	Cell 2		
			T1	T2	T3
PHICH_RB					
PDCCH_RA					
PDCCH_RB					
PDSCH_RA					
PDSCH_RB					
OCNG_RA Note4					
OCNG_RB Note4					
N_{oc} Note5	dBm/15kHz	1, 2, 3, 4, 5, 6	-98		
$\hat{E}_s/N_{oc}$	dB	1, 2, 3, 4, 5, 6	-Infinity	9.55	9.55
$\hat{E}_s/I_{ot}$ Note6	dB	1, 2, 3, 4, 5, 6	-Infinity	9.55	9.55
RSRP Note6	dBm/15kHz	1, 2, 3, 4, 5, 6	-Infinity	-88.45	-88.45
SCH_RP Note6	dBm/15kHz	1, 2, 3, 4, 5, 6	-Infinity	-88.45	-88.45
Io Note6	dBm/Ch BW	1, 2, 3, 4, 5, 6	-67.21 +10log ($N_{RB,c}$ /100)	-57.20 +10log ($N_{RB,c}$ /100)	-57.20 +10log ($N_{RB,c}$ /100)
Propagation Condition		1, 2, 3, 4, 5, 6	AWGN		
Antenna Configuration and Correlation Matrix Note7		1, 2, 3, 4, 5, 6	1x2 Low		

Note 1: Special subframe and uplink-downlink configurations are specified in table 4.2-1 in TS 36.211.
Note 2: PRACH configurations are specified in table 5.7.1-2 and table 5.7.1-3 in TS 36.211.
Note 3: DL RMCs and OCNG patterns are specified in sections A 3.1 and A 3.2 of TS 36.133 respectively.
Note 4: OCNG shall be used such that all cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.
Note 5: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for N_{oc} to be fulfilled.
Note 6: $\hat{E}_s/I_{ot}$, RSRP, SCH_RP and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.
Note 7: Propagation condition and correlation matrix are defined in section B.2 in TS 36.101 [27].

The UE shall start to transmit the PRACH to Cell 2 less than 85 ms from the beginning of time period T3.

The rate of correct handovers observed during repeated tests shall be at least 90%.

NOTE: The handover delay can be expressed as: RRC procedure delay + $T_{interrupt}$, where:

RRC procedure delay = 50 ms and is specified in section 6.1.2.1 of TS 38.133 [6].

$T_{interrupt}$ = 35 ms in the test; $T_{interrupt}$ is defined in section 6.1.2.1 of TS 38.133 [6].

This gives a total of 85 ms.

6.3.1.5 NR SA FR1 – E-UTRA handover with unknown target cell

6.3.1.5.1 Test purpose

To verify that the UE can make correct inter-RAT E-UTRAN handover when operating in standalone (SA) operation with PCell in FR1. This test shall verify the NR to E-UTRAN handover requirements for the case when the target E-UTRAN cell is unknown as specified in section 6.1.2.1 of TS 38.133 [6].

6.3.1.5.2 Test applicability

This test applies to all types of NR UE from Release 15 onwards.

6.3.1.5.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 6.3.1.0.1.

The normative reference for this requirement is TS 38.133 [6] clause A.6.3.1.2.

6.3.1.5.4 Test description

6.3.1.5.4.1 Initial conditions

The Test shall be tested using any of the test configuration in Table 6.3.1.5.4.1-1.

Table 6.3.1.5.4.1-1: Supported test configurations for SA inter-RAT E-UTRAN handover tests

Configuration	Description
6.3.1.5-1	NR 15 kHz SSB SCS, 10MHz bandwidth, FDD duplex mode, LTE FDD
6.3.1.5-2	NR 15 kHz SSB SCS, 10MHz bandwidth, TDD duplex mode, LTE FDD
6.3.1.5-3	NR 30 kHz SSB SCS, 40MHz bandwidth, TDD duplex mode, LTE FDD
6.3.1.5-4	NR 15 kHz SSB SCS, 10MHz bandwidth, FDD duplex mode, LTE TDD
6.3.1.5-5	NR 15 kHz SSB SCS, 10MHz bandwidth, TDD duplex mode, LTE TDD
6.3.1.5-6	NR 30kHz SSB SCS, 40MHz bandwidth, TDD duplex mode, LTE TDD
Note: The UE is only required to be tested in one of the supported test configurations.	

Configure the test requirement and the DUT according to the parameters in Table 6.3.1.5.4.1-2.

Table 6.3.1.5.4.1-2: Initial conditions for NR SA FR1 – E-UTRA handover with unknown target cell

Parameter	Value		Comment
Test environment	NC		As specified in TS 38.508-1 [14] clause 4.1.
Test frequencies	As specified in Annex E, Table E.4-1 and TS 38.508-1 [14] clause 4.3.1.		
Channel bandwidth	As specified by the test configuration selected from Table 6.3.1.5.4.1-1.		
Propagation conditions	AWGN		As specified in Annex C.2.2.
Connection Diagram	TE Part	A.3.1.6.1	As specified in TS 38.508-1 [14] Annex A.
	DUT Part	A.3.2.3.2	
Exceptions to connection diagram	N/A		

1. The general test parameter settings are set up according to Table 6.3.1.5.4.1-3.

2. Message contents are defined in clause 6.3.1.5.4.3.

3. The test comprises of one NR carrier and one E-UTRA carrier. There are two cells and one cell on each carrier. Cell 1 is the NR PCell and Cell 2 is the E-UTRAN neighbour cell. Cell 1 is configured according to Annex C.1.1 and C.1.2. Cell 2 is configured according to TS 36.521-3 [26] Annex C.1.0 and C.1.1.

Table 6.3.1.5.4.1-3: General test parameters for SA inter-RAT E-UTRAN handover

Parameter		Unit	Value	Comment
NR RF Channel Number			1	1 NR carrier frequency is used in the test
LTE RF Channel Number			2	1 E-UTRAN carrier frequency is used in the test
Initial conditions	Active cell		Cell 1	NR cell
	Neighbouring cell		Cell 2	E-UTRAN cell
Final condition	Active cell		Cell 2	
NR measurement quantity			SS-RSRP	
E-UTRAN measurement quantity			RSRP	
DRX			OFF	Non-DRX test
Access Barring Information		-	Not sent	No additional delays in random access procedure
Time offset between cells			3 ms	Asynchronous cells
T1		s	≤5	
T2		s	1	

6.3.1.5.4.2 Test procedure

The test comprises of one NR carrier and one E-UTRA carrier. There are two cells and one cell on each carrier. Cell 1 is the NR PCell and Cell 2 is an inter-RAT E-UTRAN neighbour cell. The test consists of two successive time periods, with time durations of T1 and T2. At the start of time duration T1, the UE does not have any timing information of Cell 2. Starting T2, Cell 2 becomes detectable. No Gap pattern shall be configured.

An RRC message implying handover shall be sent to the UE during period T1. The start of T2 is the instant when the last subframe containing the RRC message implying handover is sent to the UE. Starting T2, Cell 2 becomes detectable and the UE is expected to detect and start to transmit the PRACH to Cell 2.

1. Ensure the UE is in State RRC_CONNECTED with generic procedure parameters Connectivity *NR*, Connected without release *On* and Test Mode *On* according to TS 38.508-1 [14] clause 4.5. Establish SRB2 and DRB in the RRC Reconfiguration message. Cell 1 is the active cell.
2. Set the parameters according to T1 in Table 6.3.1.5.5-1 and 6.3.1.5.5-2. T1 starts.
3. SS shall transmit an RRCReconfiguration message implying handover to Cell 2.
4. The start of T2 is the instant when the last subframe containing the RRC Reconfiguration message implying handover is sent to the UE, at that instant the SS shall switch the power settings from T1 to T2 as specified in Table 6.3.1.5.5-1 and 6.3.1.5.5-2. T2 starts.
5. The UE shall transmit RRCConnectionReconfigurationComplete message on Cell 2.
6. If the UE transmits the uplink PRACH channel to Cell 2 less than 165 ms from the beginning of time period T2 then the number of successful tests is increased by one. Otherwise, the number of failure tests is increased by one.
7. After T2 expires, cause UE handover back to Cell 1 (if the handover fails, switch off the UE) or switch off the UE. Then ensure the UE is in State RRC_CONNECTED with generic procedure parameters Connectivity *NR*, Connected without release *On* according to TS 38.508-1 [14] clause 4.5. Cell 1 is the active cell.
8. Set Cell 2 physical cell identity = ((current cell 2 physical cell identity + 1) mod 14 + 2) for next iteration of the test procedure loop.
9. Repeat step 2-8 until the confidence level according to Tables G.2.3-1 in Annex G clause G.2 is achieved.

6.3.1.5.4.3 Message contents

Message contents are according to TS 38.508-1 [14] clause 4.6 with the following exceptions:

Table 6.3.1.5.4.3-1: Common Exception messages

Default Message Contents	
Common contents of system information blocks exceptions	
Default RRC messages and information elements contents exceptions	Table H.3.3-1

Table 6.3.1.5.4.3-2: *PRACH-Config-DEFAULT*: Inter-RAT handover to E-UTRAN unknown cell

Derivation Path: TS 36.508 [25], Table 4.6.3-7			
Information Element	**Value/remark**	**Comment**	**Condition**
PRACH-Config-DEFAULT ::= SEQUENCE {			
prach-ConfigInfo SEQUENCE {			
prach-ConfigIndex	4		Config 1, 2, 3
	53		Config 4, 5, 6
}			
}			

6.3.1.5.5 Test requirement

Tables 6.3.1.5.4.1-3, 6.3.1.5.5-1 and 6.3.1.5.5-2 define the primary level settings including test tolerances for inter-RAT E-UTRAN handover: unknown target cell test.

Table 6.3.1.5.5-1: Cell specific test parameters for SA inter-RAT E-UTRA handover (Cell 1)

Parameter	Unit	Configuration	Cell 1	
			T1	T2
RF channel number		1, 2, 3, 4, 5, 6	1	
Duplex mode		1, 4	FDD	
		2, 3, 5, 6	TDD	
TDD Configuration		2, 5	TDDConf.1.1	
		3, 6	TDDConf. 2.1	
$BW_{channel}$	MHz	1, 4	10: $N_{RB,c}$ = 52 (FDD)	

			2, 5	10: $N_{RB,c}$ = 52 (TDD)	
			3, 6	40: $N_{RB,c}$ = 106 (TDD)	
PDSCH reference measurement channel			1, 4	SR.1.1 FDD	
			2, 5	SR.1.1 TDD	
			3, 6	SR.2.1 TDD	
CORSET reference channel			1, 4	CR.1.1 FDD	
			2, 5	CR.1.1 TDD	
			3, 6	CR.2.1 TDD	
OCNG pattern[Note1]			1, 2, 3, 4, 5, 6	OP.1	
BWP	Initial DL BWP		1, 2, 3, 4, 5, 6	DLBWP.0.1	
	Dedicated DL BWP			DLBWP.1.1	
	Initial UL BWP			ULBWP.0.1	
	Dedicated UL BWP			ULBWP.1.1	
SMTC configuration			1, 2, 3, 4, 5, 6	SMTC.1	
SSB configuration			1, 2, 4, 5	SSB.1 FR1	
			3, 6	SSB.2 FR1	
EPRE ratio of PSS to SSS		dB	1, 2, 3, 4, 5, 6	0	
EPRE ratio of PBCH_DMRS to SSS					
EPRE ratio of PBCH to PBCH_DMRS					
EPRE ratio of PDCCH_DMRS to SSS					
EPRE ratio of PDCCH to PDCCH_DMRS					
EPRE ratio of PDSCH_DMRS to SSS					
EPRE ratio of PDSCH to PDSCH_DMRS					
EPRE ratio of OCNG DMRS to SSS					
EPRE ratio of OCNG to OCNG DMRS					
N_{oc}[Note2]		dBm/15 KHz	1, 2, 3, 4, 5, 6	-98	
N_{oc}[Note2]		dBm/SCS	1, 2, 4, 5	-98	
			3, 6	-95	
$\hat{E}_s/N_{oc}$		dB	1, 2, 3, 4, 5, 6	0	0
$\hat{E}_s/I_{ot}$[Note3]		dB	1, 2, 3, 4, 5, 6	0	0
SS-RSRP[Note3]		dBm/SCS	1, 2, 4, 5	-98	-98
			3, 6	-95	-95
Io[Note3]		dBm/9.36 MHz	1, 2, 4, 5	-67.04	-67.04
		dBm/38.16 MHz	3, 6	-60.94	-60.94
Propagation condition			1, 2, 3, 4, 5, 6	AWGN	
Antenna Configuration and Correlation Matrix			1, 2, 3, 4, 5, 6	1x2 Low	

Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.
Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for N_{oc} to be fulfilled.
Note 3: $\hat{E}_s/I_{ot}$, SS-RSRP, and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.

Table 6.3.1.5.5-2: Cell specific test parameters for SA inter-RAT E-UTRA handover (Cell 2)

Parameter	Unit	Configuration	Cell 2	
			T1	T2
RF channel number		1, 2, 3, 4, 5, 6	2	
Duplex mode		1, 2, 3	FDD	
		4, 5, 6	TDD	
TDD special subframe configuration[Note1]		4, 5, 6	6	
TDD uplink-downlink configuration[Note1]		4, 5, 6	1	
$BW_{channel}$	MHz	1, 2, 3, 4, 5, 6	5MHz: $N_{RB,c}$ = 25	

			10MHz: $N_{RB,c}$ = 50 20MHz: $N_{RB,c}$ = 100	
PRACH Configuration[Note2]		1, 2, 3	4	
		4, 5, 6	53	
PDSCH parameters: DL Reference Measurement Channel[Note3]		1, 2, 3	5MHz: R.7 FDD 10MHz: R.3 FDD 20MHz: R.6 FDD	
		4, 5, 6	5MHz: R.4 TDD 10MHz: R.0 TDD 20MHz: R.3 TDD	
PCFICH/PDCCH/PHICH parameters: DL Reference Measurement Channel[Note3]		1, 2, 3	5MHz: R.11 FDD 10MHz: R.6 FDD 20MHz: R.10 FDD	
		4, 5, 6	5MHz: R.11 TDD 10MHz: R.6 TDD 20MHz: R.10 TDD	
OCNG Patterns[Note3]		1, 2, 3	5MHz: OP.20 FDD 10MHz: OP.10 FDD 20MHz: OP.17 FDD	
		4, 5, 6	5MHz: OP.9 TDD 10MHz: OP.1 TDD 20MHz: OP.7 TDD	
PBCH_RA	dB	1, 2, 3, 4, 5, 6	0	
PBCH_RB				
PSS_RA				
SSS_RA				
PCFICH_RB				
PHICH_RA				
PHICH_RB				
PDCCH_RA				
PDCCH_RB				
PDSCH_RA				
PDSCH_RB				
OCNG_RA[Note4]				
OCNG_RB[Note4]				
N_{oc}[Note5]	dBm/15kHz	1, 2, 3, 4, 5, 6	-98	
$\hat{E}_s/N_{oc}$	dB	1, 2, 3, 4, 5, 6	-Infinity	7
$\hat{E}_s/I_{ot}$[Note6]	dB	1, 2, 3, 4, 5, 6	-Infinity	7
RSRP[Note6]	dBm/15kHz	1, 2, 3, 4, 5, 6	-Infinity	-91
SCH_RP[Note6]	dBm/15kHz	1, 2, 3, 4, 5, 6	-Infinity	-91
Io[Note6]	dBm/9MHz	1, 2, 3, 4, 5, 6	-70.22	-62.43
Propagation Condition		1, 2, 3, 4, 5, 6	AWGN	
Antenna Configuration and Correlation Matrix [Note7]		1, 2, 3, 4, 5, 6	1x2 Low	

Note 1: Special subframe and uplink-downlink configurations are specified in table 4.2-1 in TS 36.211.
Note 2: PRACH configurations are specified in table 5.7.1-2 and table 5.7.1-3 in TS 36.211.
Note 3: DL RMCs and OCNG patterns are specified in sections A 3.1 and A 3.2 of TS 36.133 respectively.
Note 4: OCNG shall be used such that all cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.
Note 5: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for N_{oc} to be fulfilled.
Note 6: $\hat{E}_s/I_{ot}$, RSRP, SCH_RP and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.
Note 7: Propagation condition and correlation matrix are defined in section B.2 in TS 36.101 [27].

The UE shall start to transmit the PRACH to Cell 2 less than 165 ms from the beginning of time period T2.

The rate of correct handovers observed during repeated tests shall be at least 90%.

NOTE: The handover delay can be expressed as: RRC procedure delay + $T_{interrupt}$, where:

RRC procedure delay = 50 ms and is specified in section 6.1.2.1 of TS 38.133 [6].

$T_{interrupt}$ = 115 ms in the test; $T_{interrupt}$ is defined in section 6.1.2.1 of TS 38.133 [6].

This gives a total of 165 ms.

6.3.1.6 NR SA FR1 – UTRAN FDD handover with known target cell

6.3.1.6.1 Test purpose

To verify that the UE can make correct inter-RAT UTRAN handover when operating in standalone (SA) operation with PCell in FR1.

6.3.1.6.2 Test applicability

This test applies to all types of NR UE from Release 16 onwards and support UTRA FDD.

6.3.1.6.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 6.3.1.0.3.

The normative reference for this requirement is TS 38.133 [6] clause A.6.3.1.6.

6.3.1.6.4 Test description

6.3.1.6.4.1 Initial conditions

The Test shall be tested using any of the test configuration in Table 6.3.1.6.4.1-1.

Table 6.3.1.6.4.1-1: Supported test configurations

Configuration	Description
6.3.1.6-1	NR 15 kHz SSB SCS, 10MHz bandwidth, FDD duplex mode, UTRAN FDD
6.3.1.6-2	NR 15 kHz SSB SCS, 10MHz bandwidth, TDD duplex mode, UTRAN FDD
6.3.1.6-3	NR 30 kHz SSB SCS, 40MHz bandwidth, TDD duplex mode, UTRAN FDD
Note: The UE is only required to be tested in one of the supported test configurations.	

Configure the test requirement and the DUT according to the parameters in Table 6.3.1.6.4.1-2.

Table 6.3.1.6.4.1-2: Initial conditions for NR SA FR1 – UTRAN handover with known target cell

Parameter	Value		Comment
Test environment	NC		As specified in TS 38.508-1 [14] clause 4.1.
Test frequencies	As specified in Annex E, Table E.4-3 and TS 38.508-1 [14] clause 4.3.1.		
Channel bandwidth	As specified by the test configuration selected from Table 6.3.1.6.4.1-1.		
Propagation conditions	AWGN		As specified in Annex C.2.2.
Connection Diagram	TE Part	A.3.1.8.2	As specified in TS 38.508-1 [14] Annex A.
	UE Part	A.3.2.3.2	
Exceptions to connection diagram	SS LTE in Figure A.3.1.8.2 is replaced by SS UTRA Faders in Figure A.3.1.8.2 are removed. LTE TX/RX in Figure A.3.2.3.2 is replaced by UTRA TX/RX		

1. The general test parameter settings are set up according to Table 6.3.1.6.4.1-3.

2. Message contents are defined in clause 6.3.1.6.4.3.

3. The test comprises of one NR carrier and one UTRAN carrier. There are two cells and one cell on each carrier. Cell 1 is the NR PCell and Cell 2 is an inter-RAT UTRAN neighbour cell. Cell 1 is configured according to Annex C.1.1 and C.1.2, Cell 2 is configured according to TS 36.521-3 Annex C.0 and C.1.

Table 6.3.1.6.4.1-3: General test parameters for SA inter-RAT UTRAN handover

Parameter		Unit	Value	Comment
NR RF Channel Number			1	1 NR carrier frequency is used in the test
UTRA RF Channel Number			2	1 UTRAN carrier frequency is used in the test
Initial conditions	Active cell		Cell 1	NR cell

	Neighbouring cell		Cell 2	UTRAN cell
Final condition	Active cell		Cell 2	
NR measurement quantity			SS-RSRP	
Inter-RAT (UTRAN FDD) measurement quantity			CPICH Ec/N0	
b2-Threshold1		dBm	As specified in Table 6.3.1.6.5-1	Absolute NR SS-RSRP threshold for event B2
b2-Threshold2UTRA-FDD		dB	-18	Absolute UTRAN CPICH Ec/Io threshold for event B2
Hysteresis		dB	0	
TimeToTrigger		s	0	
Filter coefficient			0	L3 filtering is not used
DRX			OFF	Non-DRX test
Access Barring Information		-	Not sent	No additional delays in random access procedure
Time offset between cells			3 ms	Asynchronous cells
Gap pattern configuration Id			0	As specified in TS 38.133 [6] Table 9.1.2-1 started before T2 starts
T1		s	5	
T2		s	≤5	
T3		s	1	

6.3.1.6.4.2 Test procedure

The test comprises of one NR carrier and one UTRAN carrier. There are two cells and one cell on each carrier. Cell 1 is the NR PCell and Cell 2 is an inter-RAT UTRAN neighbour cell. The test consists of three successive time periods, with time durations of T1, T2 and T3 respectively. At the start of time duration T1, the UE does not have any timing information of Cell 2. Starting T2, Cell 2 becomes detectable and the UE is expected to detect and send a measurement report. Gap pattern configuration with id #0 as specified in Table 9.1.2-1 of TS 38.133 [6] is configured before T2 begins to enable inter-RAT frequency monitoring.

A RRC message implying handover shall be sent to the UE during period T2 after the UE has reported Event B2. The start of T3 is the instant when the last TTI containing the RRC message implying handover is sent to the UE. The handover message shall contain Cell 2 as the target cell.

1. Ensure the UE is in State RRC_CONNECTED with generic procedure parameters Connectivity *NR*, Connected without release *On* and Test Mode *On* according to TS 38.508-1 [14] clause 4.5. Cell 1 is the active cell.
2. Set the parameters according to T1 in Table 6.3.1.6.5-1 and 6.3.1.6.5-2. T1 starts.
3. The SS shall transmit an *RRCReconfiguration* message to configure Event B2 measurement reporting.
4. The UE shall transmit an *RRCReconfigurationComplete* message.
5. When T1 expires, the SS shall switch the power setting from T1 to T2 as specified in Table 6.3.1.6.5-1 and 6.3.1.6.5-2.
6. UE shall transmit a *MeasurementReport* message triggered by Event B2.
7. SS shall transmit a *MobilityFromNRCommand* message implying handover to Cell 2.
8. T3 starts when the last TTI containing the *MobilityFromNRCommand* message implying handover is sent to the UE, at that instant the SS shall switch the power setting from T2 to T3 as specified in Table 6.3.1.6.5-1 and 6.3.1.6.5-2.
9. If the UE transmits the uplink PRACH channel to Cell 2 less than 85 ms from the beginning of time period T3 then the number of successful tests is increased by one. Otherwise, the number of failure tests is increased by one.
10. The UE shall transmit HANDOVER TO UTRAN COMPLETE message on Cell 2.
11. After T3 expires, cause UE handover back to Cell 1 (if the handover fails, switch off the UE) or switch off the UE. Then ensure the UE is in State RRC_CONNECTED with generic procedure parameters Connectivity *NR*, Connected without release *On* according to TS 38.508-1 [14] clause 4.5. Cell 1 is the active cell.

12. The SS shall set Cell 2 primary scrambling code = ((current cell 2 primary scrambling code - 50) mod 200 + 100) for next iteration of the test procedure loop.

13. Repeat step 2-12 until the confidence level according to Tables G.2.3-1 in Annex G clause G.2 is achieved.

6.3.1.6.4.3 Message contents

Table 6.3.1.6.4.3-1: RRCReconfiguration (Step 3)

Derivation Path: TS 38.508-1 [14] Table 4.6.1-13 with condition NR_MEAS			
Information Element	**Value/remark**	**Comment**	**Condition**
RRCReconfiguration ::= SEQUENCE {			
criticalExtensions CHOICE {			
rrcReconfiguration SEQUENCE {			
measConfig	MeasConfig	Table 6.3.1.6.4.3-2	
}			
}			
}			

Table 6.3.1.6.4.3-2: MeasConfig (Table 6.3.1.6.4.3-1)

Derivation Path: Table H.3.1-2 with condition INTER-RAT and GAP NEEDED			
Information Element	**Value/remark**	**Comment**	**Condition**
MeasConfig ::= SEQUENCE {			
measObjectToAddModList SEQUENCE (SIZE (1..maxNrofMeasId)) OF MeasObjectToAddMod {	2 entries		
MeasObjectToAddMod[1] SEQUENCE {		entry 1	
measObjectId	1		
measObject CHOICE {			
measObjectNR	MeasObjectNR-DEFAULT specified in Table H.3.1-3 with condition INTRA-FREQ MO		
}			
}			
MeasObjectToAddMod[2] SEQUENCE {		entry 2	
measObjectId	2		
measObject CHOICE {			
measObjectUTRA-FDD-r16	MeasObjectUTRA-FDD	Table 6.3.1.6.4.3-3	
}			
}			
}			
reportConfigToAddModList SEQUENCE (SIZE (1..maxReportConfigId)) OF ReportConfigToAddMod {	1 entry		
ReportConfigToAddMod[1] SEQUENCE {		entry 1	
reportConfigId	1		
reportConfig CHOICE {			
reportConfigInterRAT	ReportConfigInterRAT(*13*, *60*) specified in 38.508-1 [14] Table 4.6.3-141 with condition EVENT_B2_UTRA	Actual value of thresholds are: UTRA threshold = (13-49)/2 = -18dB NR threshold = 60-156 = -96dBm	6.6.1.6-1, 6.6.1.6-2
	ReportConfigInterRAT(*13*, *63*) specified in 38.508-1 [14] Table 4.6.3-141 with condition EVENT_B2_UTRA	Actual value of thresholds are: UTRA threshold = (13-49)/2 = -18dB NR threshold = 63-156 = -93dBm	6.6.1.6-3
}			

}			
}			
measGapConfig	MeasGapConfig specified in Table H.3.1-6 with condition gapUE and Pattern #0		
}			

Table 6.3.1.6.4.3-3: MeasObjectUTRA-FDD (Table 6.3.1.6.4.3-2)

Derivation Path: TS 38.508-1 [14], Table 4.6.3-77A			
Information Element	**Value/remark**	**Comment**	**Condition**
MeasObjectUTRA-FDD-r16 ::= SEQUENCE {			
carrierFreq-r16	ARFCN-ValueUTRA-FDD-r16 for UTRA Cell 2		
}			

Table 6.3.1.6.4.3-4: MeasurementReport (Step 6)

Derivation Path: TS 38.508-1 [14], Table 4.6.1-5A			
Information Element	**Value/remark**	**Comment**	**Condition**
MeasurementReport ::= SEQUENCE {			
criticalExtensions CHOICE {			
measurementReport SEQUENCE {			
measResults	MeasResults	Table 6.3.1.6.4.3-5	
}			
}			
}			

Table 6.3.1.6.4.3-5: MeasResults (Table 6.3.1.6.4.3-4)

Derivation Path: TS 38.508-1 [14] Table 4.6.3-79 with condition B2_UTRA			
Information Element	**Value/remark**	**Comment**	**Condition**
MeasResults ::= SEQUENCE {			
measResultNeighCells CHOICE {			
measResultListUTRA-FDD-r16 SEQUENCE (SIZE (1..maxCellReport)) OF MeasResultUTRA-FDD-r16 {	1 entry		
MeasResultUTRA-FDD-r16[1] SEQUENCE {		entry 1	
physCellId-r16	PhysCellIdUTRA-FDD-r16 of UTRA Cell 2		
measResult-r16 SEQUENCE {			
utra-FDD-EcN0-r16	INTEGER (0..49)		
}			
}			
}			
}			
}			

Table 6.3.1.6.4.3-6: MobilityFromNRCommand (Step 7)

Derivation Path: TS 38.508-1 [14] Table 4.6.1-8 with condition HO-TO-UTRA_FDD

6.3.1.6.5 Test requirement

Tables 6.3.1.6.5-1 and 6.3.1.6.5-2 define the primary level settings including test tolerances for intra frequency NR cell re-selection test case.

Table 6.3.1.6.5-1: Cell specific test parameters for SA inter-RAT UTRAN FDD handover (Cell 1)

Parameter		Unit	Configuration	Cell 1		
				T1	T2	T3
RF channel number			1, 2, 3	1		
Duplex mode			1	FDD		
			2, 3	TDD		
TDD Configuration			2	TDDConf.1.1		
			3	TDDConf.2.1		
$BW_{channel}$		MHz	1	10: $N_{RB,c}$ = 52 (FDD)		
			2	10: $N_{RB,c}$ = 52 (TDD)		
			3	40: $N_{RB,c}$ = 106 (TDD)		
PDSCH reference measurement channel			1	SR.1.1 FDD		
			2	SR.1.1 TDD		
			3	SR.2.1 TDD		
CORSET reference channel			1	CR.1.1 FDD		
			2	CR.1.1 TDD		
			3	CR.2.1 TDD		
TRS configuration			1	TRS.1.1 FDD		
			2	TRS.1.1 TDD		
			3	TRS.1.2 TDD		
OCNG pattern[Note1]			1, 2, 3	OP.1		
BWP	Initial DL BWP		1, 2, 3	DLBWP.0.1		
	Dedicated DL BWP			DLBWP.1.1		
	Initial UL BWP			ULBWP.0.1		
	Dedicated UL BWP			ULBWP.1.1		
SMTC configuration			1, 2, 3	SMTC.1		
SSB configuration			1, 2	SSB.1 FR1		
			3	SSB.2 FR1		
b2-Threshold1		dBm	1, 2	-96		
			3	-93		
EPRE ratio of PSS to SSS		dB	1, 2, 3	0		
EPRE ratio of PBCH_DMRS to SSS						
EPRE ratio of PBCH to PBCH_DMRS						
EPRE ratio of PDCCH_DMRS to SSS						
EPRE ratio of PDCCH to PDCCH_DMRS						
EPRE ratio of PDSCH_DMRS to SSS						
EPRE ratio of PDSCH to PDSCH_DMRS						
EPRE ratio of OCNG DMRS to SSS						
EPRE ratio of OCNG to OCNG DMRS						
N_{oc}[Note2]		dBm/15 KHz	1, 2, 3	-101.54		
N_{oc}[Note2]		dBm/SCS	1, 2,	-101.54		
			3	-98.54		
$\hat{E}_s/N_{oc}$		dB	1, 2, 3	12	-4	-4
$\hat{E}_s/I_{ot}$[Note3]		dB	1, 2, 3	12	-4	-4
SS-RSRP[Note3]		dBm/SCS	1, 2	-89.54	-105.54	-105.54
			3	-86.54	-102.54	-102.54
Io[Note3]		dBm/9.36 MHz	1, 2	-61.32	-72.13	-72.13
		dBm/38.16 MHz	3	-55.22	-66.03	-66.03
Propagation condition			1, 2, 3	AWGN		
Antenna Configuration and Correlation Matrix			1, 2, 3	1x2 Low		

Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.

Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for N_{oc} to be fulfilled.

Parameter	Unit	Configuration	Cell 1		
			T1	T2	T3
Note 3: $\hat{E}_s/I_{ot}$, SS-RSRP, and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.					

Table 6.3.1.6.5-2: Cell specific test parameters for SA inter-RAT UTRAN FDD handover (Cell 2)

Parameter	Unit	Cell 2 (UTRA)		
		T1	T2	T3
UTRA RF Channel Number		2		
CPICH_Ec/Ior	dB	-10		
PCCPCH_Ec/Ior	dB	-12		
SCH_Ec/Ior	dB	-12		
PICH_Ec/Ior	dB	-15		
DCH_Ec/Ior	dB	N/A	N/A	Note 1
OCNS_Ec/Ior	dB	-0.941	0.941	Note 2
$\hat{I}_{or}/I_{oc}$	dB	-infinity	-1.8	-1.8
I_{oc}	dBm/3,84 MHz	-70	-70	-70
CPICH_Ec/Io	dB	-infinity	-14	-14
Propagation Condition		AWGN		
Note 1: The DPCH level is controlled by the power control loop Note 2: The power of the OCNS channel that is added shall make the total power from the cell to be equal to I_{or}.				

The UE shall start to transmit the UL DPCCH to Cell 2 less than 190 ms from the beginning of time period T3.

The rate of correct handovers observed during repeated tests shall be at least 90%.

NOTE: The handover delay can be expressed as: RRC procedure delay + $T_{interrupt}$, where:

RRC procedure delay = 50 ms, which is specified in clause 5.3.1.1.1.

$T_{interrupt}$ = 140 ms in the test; $T_{interrupt}$ is defined in clause 5.3.1.1.2. This gives a total of 190 ms.

6.3.1.7 NR SA FR1 synchronous DAPS handover

6.3.1.7.1 Test purpose

To verify the requirement for the NR FR1-NR FR1 intra frequency DAPS handover requirements in synchronous scenario specified in clause 38.133 [6] clause 6.1.3.2.

6.3.1.7.2 Test applicability

This test applies to all types of NR UE from Release 16 onwards and support intra-frequency DAPS handover.

6.3.1.7.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 6.3.1.0.4.

The normative reference for this requirement is TS 38.133 [6] clause A.6.3.1.7.

6.3.1.7.4 Test description

6.3.1.7.4.1 Initial conditions

Initial conditions are a set of test configurations the UE needs to be tested in and the steps for the SS to take with the UE to reach the correct measurement state.

This test shall be tested using any of the test configurations in Table 6.3.1.7.4.1-1.

Table 6.3.1.7.4.1-1: NR SA FR1 synchronous DAPS handover test configurations

Config	Description

6.3.1.7-1	Source cell: NR 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode Target cell: NR 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode
6.3.1.7-2	Source cell: NR 15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode Target cell: NR 15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode
6.3.1.7-3	Source cell: NR 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode Target cell: NR 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode
Note: The UE is only required to be tested in one of the supported test configurations	

Configure the test equipment and the DUT according to the parameters in Table 6.3.1.7.4.1-2

Table 6.3.1.7.4.1-2: Initial conditions for NR SA FR1 synchronous DAPS handover

Parameter	Value		Comment
Test environment	NC		As specified in TS 38.508-1 [14] clause 4.1.
Test frequencies	As specified in Annex E, Table E.4-1 and TS 38.508-1 [14] clause 4.3.1.		
Channel bandwidth	As specified by the test configuration selected from Table 6.3.1.7.4.1-1		
Propagation conditions	AWGN		As specified in Annex C.2.2.
Connection Diagram	TE Part	A.3.1.8.2	As specified in TS 38.508-1 [14] Annex A.
	DUT Part	A.3.2.3.4	
Exceptions to connection diagram	N/A		

1. Message contents are defined in clause 6.3.1.7.4.3.
2. The power levels and settings for NR Cell 1 are set according to Annex C.1.2 and C.1.3. Cell 2 is NR FR1 target Cell, and its power levels and settings are also set according to Annex C.1.2 and C.1.3.
3. The test parameters are given in Table 6.3.1.7.4.1-3 below, with A3-Offset modified by Test Tolerance.

Table 6.3.1.7.4.1-3: General test parameters for NR SA FR1 synchronous DAPS handover

Parameter		Unit	Value	Comment
Initial conditions	Active cell		Cell 1	
	Neighbouring cell		Cell 2	
Final condition	Active cell		Cell 2	
A3-Offset		dB	-1	
Hysteresis		dB	0	
Time To Trigger		s	0	
Filter coefficient			0	L3 filtering is not used
Access Barring Information		-	Not Sent	No additional delays in random access procedure.
Time offset between cells			3 μs	Synchronous cells
T1		s	5	
T2		s	≤5	
T3		s	1	
T4		ms	$D_{handover2}$	$D_{Handover2}$ is defined in TS 38.133 [6] clause 6.1.3.2.1
T5		ms	100	

6.3.1.7.4.2 Test procedure

The test scenario comprises of 1 NR carrier and two cells, Cell 1 and Cell 2, on this carrier. General parameters and Cell-specific parameters for Cell 1 and Cell 2 are given in Table 6.3.1.7.4.1-3 and 6.3.1.7.5-1 respectively. No measurement gap is configured in the test case. Both Cell 1 and Cell 2 belong to the same TAG.

The test consists of five successive time periods, with time durations of T1, T2, T3, T4 and T5 respectively.

Before the start of T1, the UE is connected to the Cell 1 and not aware of the Cell 2. During T1, the UE does not have any timing information of the Cell 2.

From start of T2, the Cell 2 becomes detectable. During T2, the UE performs cell detection and measurements on the Cell 2 and shall send event report to the network. After receiving the event report A3, the network sends a RRC message implying DAPS handover command for target cell addition to the UE.

T3 starts from the instant when the last TTI containing DAPS handover command for target cell addition sent to the UE. During T3, UE shall be able to perform random access, DL reception or UL transmission in the Cell 2 while the DL scheduling and UL feedback in the Cell 1 shall be avoided. After successful RACH procedure on the Cell 2, UE is scheduled with PDSCH from Cell 1 and Cell 2 in alternative TTIs. In the end of T3 the network sends a RRC message implying DAPS handover command for source cell release to the UE. During T3, the handover delay $D_{handover1}$ for target cell addition need to be verified.

T4 starts from the instant when the last TTI containing DAPS handover command for source cell release sent to the UE. During T4, the UE shall accomplish the release actions within $D_{handover2}$

From start of T5, the UE shall stop sending periodical CSI report on Cell 1.

1. Ensure the UE is in State RRC_CONNECTED with generic procedure parameters Connectivity *NR*, Connected without release *On* according to TS 38.508-1 [14] clause 4.5. Establish SRB2 and DRB in the *RRCReconfiguration message*. Cell 1 is the active cell. Set Cell 2 physical cell identity to the initial physical cell identity.

2. Set the parameters according to T1 in Table 6.3.1.7.5-1. Propagation conditions are set according to Annex C clause C.2.2. T1 starts and the SS starts continuously scheduling the UE to perform DL reception in every DL slot on Cell 1 and monitoring corresponding ACK/NACK feedbacks sent by the UE.

3. Set Cell 2 physical cell identity = ((current cell 2 physical cell identity + 1) mod 14 + 2).

4. The SS shall transmit an *RRCReconfiguration* message to configure event A3 triggered measurement reporting on the intra-frequency carrier and periodical CSI reporting on Cell 1.

5. The UE shall transmit an *RRCReconfigurationComplete* message.

6. When T1 expires, the SS shall switch the power setting from T1 to T2 as specified in Table 6.3.1.7.5-1.

7. UE shall transmit a *MeasurementReport* message triggered by Event A3.

8. SS shall transmit an *RRCReconfiguration* with *reconfigurationWithSync* message which reconfiguring DRB as a DAPS radio bearer to the UE, at that instant the SS shall switch the power settings from T2 to T3 as specified in Table 6.3.1.7.5-1. T3 starts and the SS stops scheduling the UE to perform DL reception on Cell 1.

9. If the UE transmits PRACH preamble to Cell 2 within $D_{handover1}$ from the beginning of time period T3 then the number of successful tests is increased by one, continue to step 10. Otherwise, the number of failure tests is increased by one, go to step 17. where:

   - $D_{handover1}$ = 72 ms.

10. The UE transmits an *RRCReconfigurationComplete* message on Cell 2.

11. Upon receiving *RRCReconfigurationComplete* message sent by UE, the SS immediately starts scheduling UE to perform DL reception in Cell 1 and Cell 2 in an alternative manner, and monitoring corresponding ACK/NACK feedbacks sent by the UE.

12. Upon T3 expiring, the SS immediately transmit an *RRCReconfiguration* with *daps-SourceRelease-r16 = true* on Cell 2 to the UE. T4 starts.

13. When T4 expires, T5 starts.

15. If

    a) The UE can report ACK/NACK from the first DL reception scheduled on Cell 2 after the beginning of time period T5,

    and

    b) The UE doesn't send periodical CSI report on Cell 1 during entire time period T5.

then the number of successful tests is increased by one. Otherwise, the number of failure tests is increased by one.

16. After T5 expires, the SS sends an *RRCReconfiguration* with *reconfigurationWithSync* to cause UE handover back to Cell 1.

17. If UE is not in state RRC_CONNECTED with generic procedure parameters Connectivity *NR*, Connected without release *On* according to TS 38.508-1 [14] clause 4.5 on Cell 1, switch off and on the UE. Then ensure the UE is in State RRC_CONNECTED with generic procedure parameters Connectivity *NR*, Connected without release *On* according to TS 38.508-1 [14] clause 4.5 on Cell 1.

18. Repeat steps 2-17 until the confidence level according to Tables G.2.3-1 in Annex G clause G.2 is achieved.

6.3.1.7.4.3 Message contents

Message contents are according to TS 38.508-1 [14] clause 7.3 with the following exceptions:

Table 6.3.1.7.4.3-1: RRCReconfiguration (Step 4)

Derivation Path: TS 38.508-1 [14], 4.6.1-13 with condition NR_MEAS			
Information Element	**Value/remark**	**Comment**	**Condition**
RRCReconfiguration ::= SEQUENCE {			
criticalExtensions CHOICE {			
rrcReconfiguration SEQUENCE {			
measConfig	MeasConfig	Table 6.3.1.7.4.3-3	
nonCriticalExtension SEQUENCE {			
masterCellGroup SEQUENCE {			
spCellConfigDedicated	ServingCellConfig	Table 6.3.1.7.4.3-2	
}			
}			
}			
}			
}			

Table 6.3.1.7.4.3-2: ServingCellConfig (Table 6.3.1.7.4.3-1)

Derivation Path: TS 38.508-1 [14], Table 4.6.3-167 with condition MEAS			
Information Element	**Value/remark**	**Comment**	**Condition**
ServingCellConfig ::= SEQUENCE {			
csi-MeasConfig	CSI-MeasConfig for RRM Specified in TS 38.508-1 [14] Table 7.3.1-6		
}			

Table 6.3.1.7.4.3-3: MeasConfig (Table 6.3.1.7.4.3-1)

Derivation path: Table H.3.1-2			
Information Element	**Value/Remark**	**Comment**	**Condition**
measConfig ::= SEQUENCE {			
reportConfigToAddModList SEQUENCE(SIZE (1..maxReportConfigId)) OF SEQUENCE {	1 entry		
reportConfig[1] CHOICE {			
reportConfigNR	ReportConfigNR(-1) specified in Table H.3.1-4	Acutal value of A3-offset is -1dB	
}			
}			
}			

Table 6.3.1.7.4.3-4: MeasurementReport (Step 7)

Derivation Path: TS 38.508-1 [14], Table 4.6.1-5A

Information Element	Value/remark	Comment	Condition
MeasurementReport ::= SEQUENCE {			
criticalExtensions CHOICE {			
measurementReport SEQUENCE {			
measResults	MeasResults specified in Table H.3.1-7 with condition INTRA-FREQ		
}			
}			
}			

Table 6.3.1.7.4.3-5: RRCReconfiguration (Step 8)

Derivation Path: TS 38.508-1 [4], Table 4.8.1-1A with Condition RBConfig_NoKeyChange			
Information Element	**Value/remark**	**Comment**	**Condition**
RRCReconfiguration ::= SEQUENCE {			
criticalExtensions CHOICE {			
rrcReconfiguration SEQUENCE {			
radioBearerConfig	RadioBearerConfig	Table 6.3.1.7.4.3-6	
nonCriticalExtension SEQUENCE{			
masterCellGroup	CellGroupConfig	Table 6.3.1.7.4.3-7	
}			
}			
}			
}			

Table 6.3.1.7.4.3-6: RadioBearerConfig (Table 6.3.1.7.4.3-5)

Derivation Path: TS 38.508-1 [14], Table 4.6.3-132 with condition DRB1			
Information Element	**Value/remark**	**Comment**	**Condition**
RadioBearerConfig ::= SEQUENCE {			
drb-ToAddModList SEQUENCE (SIZE (1..maxDRB)) OF DRB-ToAddMod {	1 entry		
DRB-ToAddMod[1] SEQUENCE {		entry 1	
drb-Identity	DRB-Identity using condition DRBn	DRB #n is a DRB established before DAPS HO. Actual value of n is left to TE implementation	
daps-Config-r16	true		
}			
}			
securityConfig	Not present		
}			

Table 6.3.1.7.4.3-7: CellGroupConfig (Table 6.3.1.7.4.3-6)

Derivation Path: TS 38.508-1 [14], Table 4.6.3-19 with condition PCell_change			
Information Element	**Value/remark**	**Comment**	**Condition**
CellGroupConfig ::= SEQUENCE {			
rlc-BearerToAddModList	Not present		
spCellConfig SEQUENCE {			
reconfigurationWithSync SEQUENCE {			
spCellConfigCommon SEQUENCE {			
physCellId	PhysCellId for Cell 2		
}			
}			
}			
}			

Table 6.3.1.7.4.3-8: RRCReconfiguration (Step 12)

Derivation Path: TS 38.508-1 [14], Table 4.6.1-13 with condition DAPS_HO_ReleaseSource

6.3.1.7.5 Test requirements

Table 6.3.1.7.5-1 defines the primary level settings including test tolerances for all tests.

Table 6.3.1.7.5-1: Cell specific test parameters for NR SA FR1 synchronous DAPS handover

Parameter		Unit	Cell 1		Cell 2	
			T1	T2 – T5	T1	T2 – T5
NR RF Channel Number			1			
Duplex mode	Config 1		FDD			
	Config 2,3		TDD			
TDD configuration	Config 1		Not Applicable			
	Config 2		TDDConf.1.1			
	Config 3		TDDConf.2.1			
$BW_{channel}$	Config 1	MHz	10: $N_{RB,c}$ = 52			
	Config 2		10: $N_{RB,c}$ = 52			
	Config 3		40: $N_{RB,c}$ = 106			
BWP BW	Config 1	MHz	10: $N_{RB,c}$ = 52			
	Config 2		10: $N_{RB,c}$ = 52			
	Config 3		40: $N_{RB,c}$ = 106			
DRX Cycle		ms	Not Applicable			
PDSCH Reference measurement channel	Config 1		SR.1.1 FDD			
	Config 2		SR.1.1 TDD			
	Config 3		SR.2.1 TDD			
CORESET Reference Channel	Config 1		CR.1.1 FDD			
	Config 2		CR.1.1 TDD			
	Config 3		CR.2.1 TDD			
TRS configuration	Config 1		TRS.1.1 FDD			
	Config 2		TRS.1.1 TDD			
	Config 3		TRS.1.2 TDD			
OCNG Patterns			OP.1			
CSI-RS configuration for CSI reporting	Config 1		CSI-RS.1.1 FDD			
	Config 2		CSI-RS.1.1 TDD			
	Config 3		CSI-RS.2.1 TDD			
reportConfigType			periodic		N/A	
reportQuantity			cri-RI-PMI-CQI		N/A	
CSI reporting periodicity	Config 1,2	slot	5		N/A	
	Config 3		10		N/A	
CSI reporting offset	Config 1,2	slot	3		N/A	
	Config 3		5		N/A	
SMTC Configuration			SMTC.1			
SSB Configuration	Config 1,2		SSB.1 FR1			
	Config 3		SSB.2 FR1			
PDSCH/PDCCH subcarrier spacing	Config 1,2	kHz	15 kHz			
	Config 3		30 kHz			
PUCCH/PUSCH subcarrier spacing	Config 1,2	kHz	15 kHz			
	Config 3		30 kHz			
PRACH configuration			FR1 PRACH configuration 1			
BWP configuration	Initial DL BWP		DLBWP.0.1			
	Dedicated DL BWP		DLBWP.1.1			
	Initial UL BWP		ULBWP.0.1			
	Dedicated UL BWP		ULBWP.1.1			
EPRE ratio of PSS to SSS		dB	0			
EPRE ratio of PBCH DMRS to SSS						

EPRE ratio of PBCH to PBCH DMRS						
EPRE ratio of PDCCH DMRS to SSS						
EPRE ratio of PDCCH to PDCCH DMRS						
EPRE ratio of PDSCH DMRS to SSS						
EPRE ratio of PDSCH to PDSCH						
EPRE ratio of OCNG DMRS to SSS(Note 1)						
EPRE ratio of OCNG to OCNG DMRS (Note 1)						
N_{oc} Note2		dBm/15kHz	-98			
N_{oc} Note2	Config 1,2	dBm/SCS	-98			
	Config 3		-95			
$\hat{E}_s / I_{ot}$		dB	8	-2.41	-Infinity	1.36
$\hat{E}_s / N_{oc}$		dB	8	8	-Infinity	10
SSB_RP	Config 1,2	dBm/SCS	-90	-90	-Infinity	-88
	Config 3	dBm/SCS	-87	-87	-Infinity	-85
Io Note3	Config 1,2	dBm/ 9.36MHz	-61.41	-57.67	-61.41	-57.67
	Config 3	dBm/ 38.16MHz	-55.31	-51.56	-55.31	-51.56
Propagation condition			AWGN			

Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.
Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for Noc to be fulfilled.
Note 3: Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.

The UE shall start to transmit the PRACH to Cell 2 less than $D_{handover1}$ from the beginning of time period T3. The rate of correct handovers observed during repeated tests shall be at least 90%, where:

$D_{handover1} = T_{RRC_procedure} + T_{search} + T_{IU} + T_{processing} + T_{\Delta} + T_{margin}$

- $T_{RRC_procedure}$= 10 ms, is the RRC procedure delay specified in 38.331 [13] clause 12;

- T_{search} = 0 ms for known target cell, is the time required to search the target cell specified in 38.133 [6] clause 6.1.1.2.2;

- T_{IU} = 20 ms, is the interruption uncertainty in acquiring the first available PRACH occasion in the new cell specified in 38.133 [6] clause 6.1.1.2.2.

- $T_{processing}$ = 20 ms, is the time for UE processing specified in 38.133 [6] clause 6.1.1.2.2.

- T_{Δ} = 20 ms, is the time for fine time tracking and acquiring full timing information of the target cell specified in 38.133 [6] clause 6.1.1.2.2.

- T_{margin} = 2 ms, is the time for SSB post-processing specified in 38.133 [6] clause 6.1.1.2.2.

This gives a total of 72 ms.

After successful RACH to cell 2 and until the start of time period T4, UE shall be able to receive PDSCH alternatively from cell 1 and cell 2. UE is not expected to transmit UL to both cell 1 and cell 2 in the same TTI.

The UE shall release Cell 1 less than $D_{handover2}$ from the beginning of time period T4, where:

$D_{handover2} = T_{RRC_procedure} + T_{interrupt2}$

- $T_{RRC_procedure}$= 10 ms, is the RRC procedure delay specified in 38.331 [13] clause 12;

- $T_{interrupt2}$ = 1 ms for sync intra-frequency DAPS handover, is the allowed interruption length during $D_{handover2}$ as in 38.133 [13] clause 6.1.3.2.2;

This gives a total of 11 ms.

UE shall not report CSI to Cell 1 during T5.

6.3.1.8 NR SA FR1 asynchronous DAPS handover

6.3.1.8.1 Test purpose

To verify the requirement for the NR FR1-NR FR1 intra-frequency DAPS handover requirements in asynchronous scenario specified in clause 38.133 [6] clause 6.1.3.2.

6.3.1.8.2 Test applicability

This test applies to all types of NR UE from Release 16 onwards and support intra-frequency asynchronous DAPS handover.

6.3.1.8.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 6.3.1.0.4.

The normative reference for this requirement is TS 38.133 [6] clause A.6.3.1.8.

6.3.1.8.4 Test description

6.3.1.8.4.1 Initial conditions

Initial conditions are a set of test configurations the UE needs to be tested in and the steps for the SS to take with the UE to reach the correct measurement state.

This test shall be tested using any of the test configurations in Table 6.3.1.8.4.1-1.

Table 6.3.1.8.4.1-1: NR SA FR1 asynchronous DAPS handover test configurations

Config	Description
6.3.1.8-1	Source cell: NR 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode Target cell: NR 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode
6.3.1.8-2	Source cell: NR 15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode Target cell: NR 15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode
6.3.1.8-3	Source cell: NR 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode Target cell: NR 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode
Note: The UE is only required to be tested in one of the supported test configurations	

Configure the test equipment and the DUT according to the parameters in Table 6.3.1.8.4.1-2

Table 6.3.1.8.4.1-2: Initial conditions for NR SA FR1 asynchronous DAPS handover

Parameter	Value		Comment
Test environment	NC		As specified in TS 38.508-1 [14] clause 4.1.
Test frequencies	As specified in Annex E, Table E.4-1 and TS 38.508-1 [14] clause 4.3.1.		
Channel bandwidth	As specified by the test configuration selected from Table 6.3.1.8.4.1-1		
Propagation conditions	AWGN		As specified in Annex C.2.2.
Connection Diagram	TE Part	A.3.1.8.2	As specified in TS 38.508-1 [14] Annex A.
	DUT Part	A.3.2.3.4	
Exceptions to connection diagram	N/A		

1. Message contents are defined in clause 6.3.1.8.4.3.
2. The power levels and settings for NR Cell 1 are set according to Annex C.1.2 and C.1.3. Cell 2 is NR FR1 target Cell, and its power levels and settings are also set according to Annex C.1.2 and C.1.3.
3. The test parameters are given in Table 6.3.1.8.4.1-3 below, with A3-Offset modified by Test Tolerance.

Table 6.3.1.8.4.1-3: General test parameters for NR SA FR1 asynchronous DAPS handover

Parameter		Unit	Value	Comment
Initial conditions	Active cell		Cell 1	
	Neighbouring cell		Cell 2	
Final condition	Active cell		Cell 2	
A3-Offset		dB	-1	
Hysteresis		dB	0	
Time To Trigger		s	0	
Filter coefficient			0	L3 filtering is not used
Access Barring Information		-	Not Sent	No additional delays in random access procedure.
Time offset between cells			7 μs	Asynchronous cells
T1		s	5	
T2		s	≤5	
T3		s	1	
T4		ms	$D_{handover2}$	$D_{Handover2}$ is defined in TS 38.133 [6] clause 6.1.3.2.1
T5		ms	100	

6.3.1.8.4.2 Test procedure

Same test procedure as described in section 6.3.1.7.4.2.

6.3.1.8.4.3 Message contents

Same message contents as described in section 6.3.1.7.4.3.

6.3.1.8.5 Test requirements

Table 6.3.1.8.5-1 defines the primary level settings including test tolerances for all tests.

Table 6.3.1.8.5-1: Cell specific test parameters for NR SA FR1 asynchronous DAPS handover

Parameter		Unit	Cell 1		Cell 2	
			T1	T2 – T5	T1	T2 – T5
NR RF Channel Number			1			
Duplex mode	Config 1		FDD			
	Config 2,3		TDD			
TDD configuration	Config 1		Not Applicable			
	Config 2		TDDConf.1.1			
	Config 3		TDDConf.2.1			
$BW_{channel}$	Config 1,2	MHz	10: $N_{RB,c}$ = 52			
	Config 3		40: $N_{RB,c}$ = 106			
BWP BW	Config 1	MHz	10: $N_{RB,c}$ = 52			
	Config 3		40: $N_{RB,c}$ = 106			
DRX Cycle		ms	Not Applicable			
PDSCH Reference measurement channel	Config 1		SR.1.1 FDD			
	Config 2		SR.1.1 TDD			
	Config 3		SR.2.1 TDD			
CORESET Reference Channel	Config 1		CR.1.1 FDD			
	Config 2		CR.1.1 TDD			
	Config 3		CR.2.1 TDD			
TRS configuration	Config 1		TRS.1.1 FDD			
	Config 2		TRS.1.1 TDD			
	Config 3		TRS.1.2 TDD			
OCNG Patterns			OP.1			
CSI-RS CSI configuration for reporting	Config 1		CSI-RS.1.1 FDD			
	Config 2		CSI-RS.1.1 TDD			
	Config 3		CSI-RS.2.1 TDD			
reportConfigType			periodic		N/A	
reportQuantity			cri-RI-PMI-CQI		N/A	
CSI reporting periodicity	Config 1,2	slot	5		N/A	
	Config 3		10		N/A	
CSI reporting offset	Config 1,2	slot	3		N/A	
	Config 3		5		N/A	

SMTC Configuration			SMTC.1			
SSB Configuration	Config 1,2		SSB.1 FR1			
	Config 3		SSB.2 FR1			
PDSCH/PDCCH subcarrier spacing	Config 1,2	kHz	15			
	Config 3		30			
PUCCH/PUSCH subcarrier spacing	Config 1,2	kHz	15			
	Config 3		30			
PRACH configuration			FR1 PRACH configuration 1			
BWP configuration	Initial DL BWP		DLBWP.0.1			
	Dedicated DL BWP		DLBWP.1.1			
	Initial UL BWP		ULBWP.0.1			
	Dedicated UL BWP		ULBWP.1.1			
EPRE ratio of PSS to SSS		dB	0			
EPRE ratio of PBCH DMRS to SSS						
EPRE ratio of PBCH to PBCH DMRS						
EPRE ratio of PDCCH DMRS to SSS						
EPRE ratio of PDCCH to PDCCH DMRS						
EPRE ratio of PDSCH DMRS to SSS						
EPRE ratio of PDSCH to PDSCH						
EPRE ratio of OCNG DMRS to SSS(Note 1)						
EPRE ratio of OCNG to OCNG DMRS (Note 1)						
N_{oc} Note2		dBm/15kHz	-98			
N_{oc} Note2	Config 1,2	dBm/SCS	-98			
	Config 3		-95			
$\hat{E}_s / I_{ot}$		dB	8	-2.41	-Infinity	1.36
$\hat{E}_s / N_{oc}$		dB	8	8	-Infinity	10
SSB_RP	Config 1,2	dBm/SCS	-90	-90	-Infinity	-88
	Config 3		-87	-87	-Infinity	-85
Io Note3	Config 1,2	dBm/ 9.36MHz	-61.41	-57.67	-61.41	-57.67
	Config 3	dBm/ 38.16MHz	-55.31	-51.56	-55.31	-51.56
Propagation condition			AWGN			

Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.
Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for Noc to be fulfilled.
Note 3: Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.

Same test requirements as described in section 6.3.1.7.5 except:

The UE shall release Cell 1 less than $D_{handover2}$ from the beginning of time period T4, where:

$D_{handover2} = T_{RRC_procedure} + T_{interrupt2}$

- $T_{RRC_procedure}$= 10 ms, is the RRC procedure delay specified in 38.331 [13] clause 12;
- $T_{interrupt2}$ = 2 slots for test configuration 6.3.1.8-1/2 and $T_{interrupt2}$ = 3 slots for test configuration 6.3.1.8-3, is the allowed interruption length during $D_{handover2}$ as in 38.133 [13] clause 6.1.3.2.2;

This gives a total of 10 ms + 2 slots for test configuration 6.3.1.8-1/2 and 10 ms + 3 slots for test configuration 6.3.1.8-3.

6.3.1.9 NR SA FR1 Intra-band inter-frequency synchronous DAPS handover

6.3.1.9.1 Test purpose

To verify the requirement for the NR FR1-NR FR1 intra-band inter-frequency DAPS handover requirements in synchronous scenario specified in clause 38.133 [6] clause 6.1.3.2.

6.3.1.9.2 Test applicability

This test applies to all types of NR UE from Release 16 onwards and support intra-band inter-frequency DAPS handover.

6.3.1.9.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 6.3.1.0.4.

The normative reference for this requirement is TS 38.133 [6] clause A.6.3.1.9.

6.3.1.9.4 Test description

6.3.1.9.4.1 Initial conditions

Initial conditions are a set of test configurations the UE needs to be tested in and the steps for the SS to take with the UE to reach the correct measurement state.

This test shall be tested using any of the test configurations in Table 6.3.1.9.4.1-1.

Table 6.3.1.9.4.1-1: NR SA FR1 Intra-band inter-frequency synchronous DAPS handover test configurations

Config	Description
6.3.1.9-1	Source cell: NR 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode Target cell: NR 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode
6.3.1.9-2	Source cell: NR 15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode Target cell: NR 15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode
6.3.1.9-3	Source cell: NR 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode Target cell: NR 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode
Note: The UE is only required to be tested in one of the supported test configurations	

Configure the test equipment and the DUT according to the parameters in Table 6.3.1.9.4.1-2

Table 6.3.1.9.4.1-2: Initial conditions for NR SA FR1 Intra-band inter-frequency synchronous DAPS handover

Parameter	Value		Comment
Test environment	NC		As specified in TS 38.508-1 [14] clause 4.1.
Test frequencies	As specified in Annex E, Table E.4-1 and TS 38.508-1 [14] clause 4.3.1. Note 1		
Channel bandwidth	As specified by the test configuration selected from Table 6.3.1.9.4.1-1		
Propagation conditions	AWGN		As specified in Annex C.2.2.
Connection Diagram	TE Part	A.3.1.8.2	As specified in TS 38.508-1 [14] Annex A.
	DUT Part	A.3.2.3.4	
Exceptions to connection diagram	N/A		
Note 1: For UE supporting DAPS HO on intra-band contiguous BC, the test frequencies are selected according to E.1.4.2. For UE supporting DAPS HO on intra-band non-contiguous BC, the test frequencies are selected according to E.1.4.3			

1. Message contents are defined in clause 6.3.1.9.4.3.
2. The power levels and settings for NR Cell 1 are set according to Annex C.1.2 and C.1.3. Cell 2 is NR FR1 target Cell, and its power levels and settings are also set according to Annex C.1.2 and C.1.3.
3. The test parameters are given in Table 6.3.1.9.4.1-3 below, with A3-Offset modified by Test Tolerance.

Table 6.3.1.9.4.1-3: General test parameters for NR SA FR1 Intra-band inter-frequency synchronous DAPS handover

Parameter		Unit	Value	Comment
Initial conditions	Active cell		Cell 1	
	Neighbouring cell		Cell 2	
Final condition	Active cell		Cell 2	
A3-Offset		dB	-3	
Hysteresis		dB	0	
Time To Trigger		s	0	
Filter coefficient			0	L3 filtering is not used
Access Barring Information		-	Not Sent	No additional delays in random access procedure.
Time offset between cells			0 μs	Synchronous cells
T1		s	5	
T2		s	≤5	
T3		s	1	
T4		ms	10 + $T_{interrupt2}$	$T_{interrupt2}$ is defined in TS 38.133 [6] 6.1.3.2.2 Table 6.1.3.2.2-6
T5		ms	100	

6.3.1.9.4.2 Test procedure

The test scenario comprises of two NR carriers and one cell on each carrier, Cell 1 and Cell 2. General parameters and Cell-specific parameters for Cell 1 and Cell 2 are given in Table 6.3.1.9.4.1-3 and 6.3.1.9.5-1 respectively.

The test consists of five successive time periods, with time durations of T1, T2, T3, T4 and T5 respectively.

Before the start of T1, the UE is connected to the Cell 1 and not aware of the Cell 2. During T1, the UE may not have any timing information of the Cell 2. Gap pattern ID gp0 is configured as specified in 38.133 [6] Table 9.1.2-1 before T2 in the test case.

From start of T2, the Cell 2 becomes detectable. During T2, the UE performs cell detection and measurements on the Cell 2 and shall send event report to the network. After receiving the event report A3, the network sends a RRC message implying DAPS handover command for target cell addition to the UE.

T3 starts from the instant when the last TTI containing DAPS handover command for target cell addition sent to the UE. During T3, UE shall be able to perform random access, DL reception or UL transmission in the Cell 2 while the DL scheduling and UL feedback in the Cell 1 shall be avoided. After successful RACH procedure on the Cell 2, UE is scheduled with PDSCH from Cell 1 and Cell 2 in alternative TTIs. In the end of T3 the network sends a RRC message implying DAPS handover command for source cell release to the UE. During T3, the handover delay $D_{handover1}$ for target cell addition need to be verified.

T4 starts from the instant when the last TTI containing DAPS handover command for source cell release sent to the UE. Cell 2 is continuously scheduled in DL during T4.During T4, the UE shall accomplish the release actions within $D_{handover2}$

From start of T5, the UE shall stop sending periodical CSI report on Cell 1. And the test system shall observe the periodic reporting of CSI for Cell 1 during T5.

1. Ensure the UE is in State RRC_CONNECTED with generic procedure parameters Connectivity *NR*, Connected without release *On* according to TS 38.508-1 [14] clause 4.5. Establish SRB2 and DRB in the RRC Reconfiguration message. Cell 1 is the active cell. Set Cell 2 physical cell identity to the initial physical cell identity.

2. Set the parameters according to T1 in Table 6.3.1.9.5-1. Propagation conditions are set according to Annex C clause C.2.2. T1 starts and the SS starts continuously scheduling the UE to perform DL reception in every DL slot on Cell 1 and monitoring corresponding ACK/NACK feedbacks sent by the UE.

3. Set Cell 2 physical cell identity = ((current cell 2 physical cell identity + 1) mod 14 + 2).

4. The SS shall transmit an *RRCReconfiguration* message to configure event A3 triggered measurement reporting on the intra-band inter-frequency carrier and periodical CSI reporting on Cell 1.

5. The UE shall transmit an *RRCReconfigurationComplete* message.

6. When T1 expires, the SS shall switch the power setting from T1 to T2 as specified in Table 6.3.1.9.5-1.

7. UE shall transmit a *MeasurementReport* message triggered by Event A3.

8. SS shall transmit an *RRCReconfiguration* with *reconfigurationWithSync* message which reconfiguring DRB as a DAPS radio bearer to the UE, at that instant the SS shall switch the power settings from T2 to T3 as specified in Table 6.3.1.9.5-1. T3 starts and the SS stops scheduling the UE to perform DL reception on Cell 1.

9. If the UE transmits PRACH preamble to Cell 2 within $D_{handover1}$ from the beginning of time period T3 then the number of successful tests is increased by one, continue to step 10. Otherwise, the number of failure tests is increased by one, go to step 17. where:

   - $D_{handover1}$ = 72 ms.

10. The UE transmits an *RRCReconfigurationComplete* message on Cell 2.

11. Upon receiving *RRCReconfigurationComplete* message sent by UE, the SS immediately starts scheduling UE to perform DL reception in Cell 1 and Cell 2 in an alternative manner, and monitoring corresponding ACK/NACK feedbacks sent by the UE.

12. Upon T3 expiring, the SS immediately transmit an *RRCReconfiguration* with *daps-SourceRelease-r16 = true* on Cell 2 to the UE. T4 starts.

13. When T4 expires, T5 starts.

15. If

    c) The UE can report ACK/NACK from the first DL reception scheduled on Cell 2 after the beginning of time period T5,

    and

    d) The UE doesn't send periodical CSI report during entire time period T5.

    then the number of successful tests is increased by one. Otherwise, the number of failure tests is increased by one.

16. After T5 expires, the SS sends an *RRCReconfiguration* with *reconfigurationWithSync* to cause UE handover back to Cell 1.

17. If UE is not in state RRC_CONNECTED with generic procedure parameters Connectivity *NR*, Connected without release *On* according to TS 38.508-1 [14] clause 4.5 on Cell 1, switch off and on the UE. Then ensure the UE is in State RRC_CONNECTED with generic procedure parameters Connectivity *NR*, Connected without release *On* according to TS 38.508-1 [14] clause 4.5 on Cell 1. Cell 1 is the active cell.

18. Repeat steps 2-17 until the confidence level according to Tables G.2.3-1 in Annex G clause G.2 is achieved.

6.3.1.9.4.3 Message contents

Message contents are according to TS 38.508-1 [14] clause 7.3 with the following exceptions:

Table 6.3.1.9.4.3-1: RRCReconfiguration (Step 4)

Derivation Path: TS 38.508-1 [14], 4.6.1-13 with condition NR_MEAS			
Information Element	**Value/remark**	**Comment**	**Condition**
RRCReconfiguration ::= SEQUENCE {			
criticalExtensions CHOICE {			
rrcReconfiguration SEQUENCE {			
measConfig	MeasConfig	Table 6.3.1.9.4.3-3	
nonCriticalExtension SEQUENCE {			
masterCellGroup SEQUENCE {			
spCellConfigDedicated	ServingCellConfig	Table 6.3.1.9.4.3-2	
}			
}			
}			

}			
}			

Table 6.3.1.9.4.3-2: ServingCellConfig (Table 6.3.1.9.4.3-1)

Derivation Path: TS 38.508-1 [14], Table 4.6.3-167 with condition MEAS			
Information Element	**Value/remark**	**Comment**	**Condition**
ServingCellConfig ::= SEQUENCE {			
csi-MeasConfig	CSI-MeasConfig for RRM Specified in TS 38.508-1 [14] Table 7.3.1-6		
}			

Table 6.3.1.9.4.3-3: MeasConfig (Table 6.3.1.9.4.3-1)

Derivation path: Table H.3.1-2 with condition INTER-FREQ			
Information Element	**Value/Remark**	**Comment**	**Condition**
measConfig ::= SEQUENCE {			
reportConfigToAddModList SEQUENCE(SIZE (1..maxReportConfigId)) OF SEQUENCE {	1 entry		
reportConfig[1] CHOICE {			
reportConfigNR	ReportConfigNR(-3) specified in Table H.3.1-4	Acutal value of A3-threshold is -3 dBm	
}			
}			
}			

Table 6.3.1.9.4.3-4: MeasurementReport (Step 7)

Derivation Path: TS 38.508-1 [14], Table 4.6.1-5A			
Information Element	**Value/remark**	**Comment**	**Condition**
MeasurementReport ::= SEQUENCE {			
criticalExtensions CHOICE {			
measurementReport SEQUENCE {			
measResults	MeasResults specified in Table H.3.1-7 with condition INTER-FREQ		
}			
}			
}			

Table 6.3.1.9.4.3-5: RRCReconfiguration (Step 8)

Derivation Path: TS 38.508-1 [4], Table 4.8.1-1A with Condition RBConfig_NoKeyChange			
Information Element	**Value/remark**	**Comment**	**Condition**
RRCReconfiguration ::= SEQUENCE {			
criticalExtensions CHOICE {			
rrcReconfiguration SEQUENCE {			
radioBearerConfig	RadioBearerConfig	Table 6.3.1.9.4.3-6	
nonCriticalExtension SEQUENCE{			
masterCellGroup	CellGroupConfig	Table 6.3.1.9.4.3-7	
}			
}			
}			
}			

Table 6.3.1.9.4.3-6: RadioBearerConfig (Table 6.3.1.9.4.3-5)

Derivation Path: TS 38.508-1 [14], Table 4.6.3-132 with condition DRB1

Information Element	Value/remark	Comment	Condition
RadioBearerConfig ::= SEQUENCE {			
drb-ToAddModList SEQUENCE (SIZE (1..maxDRB)) OF DRB-ToAddMod {	1 entry		
DRB-ToAddMod[1] SEQUENCE {		entry 1	
drb-Identity	DRB-Identity using condition DRBn	DRB #n is a DRB established before DAPS HO. Actual value of n is left to TE implementation	
daps-Config-r16	true		
}			
}			
securityConfig	Not present		
}			

Table 6.3.1.9.4.3-7: CellGroupConfig (Table 6.3.1.9.4.3-5)

Derivation Path: TS 38.508-1 [14], Table 4.6.3-19 with condition PCell_change			
Information Element	**Value/remark**	**Comment**	**Condition**
CellGroupConfig ::= SEQUENCE {			
rlc-BearerToAddModList	Not present		
spCellConfig SEQUENCE {			
reconfigurationWithSync SEQUENCE {			
spCellConfigCommon SEQUENCE {			
physCellId	PhysCellId for Cell 2		
}			
}			
}			
}			

Table 6.3.1.9.4.3-8: RRCReconfiguration (Step 12)

Derivation Path: TS 38.508-1 [14], Table 4.6.1-13 with condition DAPS_HO_ReleaseSource

6.3.1.9.5 Test requirements

Table 6.3.1.9.5-1 defines the primary level settings including test tolerances for all tests.

Table 6.3.1.9.5-1: Cell specific test parameters for NR SA FR1 Intra-band inter-frequency synchronous DAPS handover

Parameter		Unit	Cell 1		Cell 2	
			T1	T2-T5	T1	T2-T5
NR RF Channel Number			1		2	
Duplex mode	Config 1		FDD			
	Config 2,3		TDD			
TDD configuration	Config 1		Not Applicable			
	Config 2		TDDConf.1.1			
	Config 3		TDDConf.2.1			
$BW_{channel}$	Config 1	MHz	10: $N_{RB,c}$ = 52			
	Config 2		10: $N_{RB,c}$ = 52			
	Config 3		40: $N_{RB,c}$ = 106			
BWP BW	Config 1	MHz	10: $N_{RB,c}$ = 52			
	Config 2		10: $N_{RB,c}$ = 52			
	Config 3		40: $N_{RB,c}$ = 106			
DRX Cycle		ms	Not Applicable			
PDSCH Reference	Config 1		SR.1.1 FDD			

measurement channel				
	Config 2		SR.1.1 TDD	
	Config 3		SR.2.1 TDD	
CORESET Reference Channel	Config 1		CR.1.1 FDD	
	Config 2		CR.1.1 TDD	
	Config 3		CR.2.1 TDD	
TRS configuration	Config 1		TRS.1.1 FDD	
	Config 2		TRS.1.1 TDD	
	Config 3		TRS.1.2 TDD	
OCNG Patterns			OP.1	
CSI-RS configuration for CSI reporting	Config 1		CSI-RS.1.1 FDD	
	Config 2		CSI-RS.1.1 TDD	
	Config 3		CSI-RS.2.1 TDD	
reportConfigType				periodic
reportQuantity				cri-RI-PMI-CQI
CSI reporting periodicity	Config 1,2	slot	5	5
	Config 3		10	10
CSI reporting offset	Config 1,2	slot	3	3
	Config 3		5	5
SMTC Configuration			SMTC.1	
SSB Configuration	Config 1,2		SSB.1 FR1	
	Config 3		SSB.2 FR1	
PDSCH/PDCCH subcarrier spacing	Config 1,2	kHz	15 kHz	
	Config 3		30 kHz	
PUCCH/PUSCH subcarrier spacing	Config 1,2	kHz	15 kHz	
	Config 3		30 kHz	
PRACH configuration			FR1 PRACH configuration 1	
BWP configuration	Initial DL BWP		DLBWP.0.1	
	Dedicated DL BWP		DLBWP.1.1	
	Initial UL BWP		ULBWP.0.1	
	Dedicated UL BWP		ULBWP.1.1	
EPRE ratio of PSS to SSS		dB	0	
EPRE ratio of PBCH DMRS to SSS				
EPRE ratio of PBCH to PBCH DMRS				
EPRE ratio of PDCCH DMRS to SSS				
EPRE ratio of PDCCH to PDCCH DMRS				
EPRE ratio of PDSCH DMRS to SSS				
EPRE ratio of PDSCH to PDSCH				
EPRE ratio of OCNG DMRS to SSS(Note 1)				
EPRE ratio of OCNG to OCNG DMRS (Note 1)				
N_{oc} Note2		dBm/15kHz	-98	
N_{oc} Note2	Config 1,2	dBm/SCS	-98	
	Config 3		-95	

$\hat{E}_s/I_{ot}$		dB	8	8	-Infinity	11.7
$\hat{E}_s/N_{oc}$		dB	8	8	-Infinity	11.7
SSB_RP	Config 1,2	dBm/SCS	-90	-90	-Infinity	-86.3
	Config 3	dBm/SCS	-86.99	-86.99	-Infinity	-83.29
Io[Note3]	Config 1,2	dBm/ 9.36MHz	-61.41	-61.41	-70.05	-58.06
	Config 3	dBm/ 38.16MHz	-55.31	-55.31	-63.94	-51.96
Propagation condition			AWGN			

Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.

Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for N_{oc} to be fulfilled.

Note 3: Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.

The UE shall start to transmit the PRACH to Cell 2 less than $D_{handover1}$ from the beginning of time period T3. The rate of correct handovers observed during repeated tests shall be at least 90%, where:

$D_{handover1} = T_{RRC_procedure} + T_{search} + T_{IU} + T_{processing} + T_{\Delta} + T_{margin}$

- $T_{RRC_procedure}$= 10 ms, is the RRC procedure delay specified in 38.331 [13] clause 12;
- T_{search} = 0 ms for known target cell, is the time required to search the target cell specified in 38.133 [6] clause 6.1.1.2.2;
- T_{IU} = 20 ms, is the interruption uncertainty in acquiring the first available PRACH occasion in the new cell specified in 38.133 [6] clause 6.1.1.2.2.
- $T_{processing}$ = 20 ms, is the time for UE processing specified in 38.133 [6] clause 6.1.1.2.2.
- T_{Δ} = 20 ms, is the time for fine time tracking and acquiring full timing information of the target cell specified in 38.133 [6] clause 6.1.1.2.2.
- T_{margin} = 2 ms, is the time for SSB post-processing specified in 38.133 [6] clause 6.1.1.2.2.

This gives a total of 72 ms.

During T3 UE is allowed to cause $T_{interrupt1}$ interruption to cell 1. $T_{interrupt1}$ is defined in 38.133 [6] clause 6.1.3.2.2 Table 6.1.3.2.2-2. When UE is transmitting PRACH preamble to cell 2, interruption to cell 1 is allowed.

During T4 UE is allowed to cause $T_{interrupt2}$ interruption to cell 1. $T_{interrupt2}$ is defined in 38.133 [6] clause 6.1.3.2.2 Table 6.1.3.2.2-6.

UE shall finish cell 1 release in T4 and shall not send any CSI reports to cell 1 during T5.

6.3.1.10 NR SA FR1 Intra-band inter-frequency asynchronous DAPS handover

6.3.1.10.1 Test purpose

To verify the requirement for the NR FR1-NR FR1 intra-band inter-frequency DAPS handover requirements in asynchronous scenario specified in clause 38.133 [6] clause 6.1.3.2.

6.3.1.10.2 Test applicability

This test applies to all types of NR UE from Release 16 onwards and support intra-band inter-frequency DAPS handover.

6.3.1.10.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 6.3.1.0.4.

The normative reference for this requirement is TS 38.133 [6] clause A.6.3.1.10.

6.3.1.10.4 Test description

6.3.1.10.4.1 Initial conditions

Initial conditions are a set of test configurations the UE needs to be tested in and the steps for the SS to take with the UE to reach the correct measurement state.

This test shall be tested using any of the test configurations in Table 6.3.1.10.4.1-1.

Table 6.3.1.10.4.1-1: NR SA FR1 Intra-band inter-frequency asynchronous DAPS handover test configurations

Config	Description
6.3.1.10-1	Source cell: NR 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode Target cell: NR 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode
Note: The UE is only required to be tested in one of the supported test configurations	

Configure the test equipment and the DUT according to the parameters in Table 6.3.1.10.4.1-2

Table 6.3.1.10.4.1-2: Initial conditions for NR SA FR1 Intra-band inter-frequency asynchronous DAPS handover

Parameter	Value		Comment
Test environment	NC		As specified in TS 38.508-1 [14] clause 4.1.
Test frequencies	As specified in Annex E, Table E.4-1 and TS 38.508-1 [14] clause 4.3.1. Note 1		
Channel bandwidth	As specified by the test configuration selected from Table 6.3.1.10.4.1-1		
Propagation conditions	AWGN		As specified in Annex C.2.2.
Connection Diagram	TE Part	A.3.1.8.2	As specified in TS 38.508-1 [14] Annex A.
	DUT Part	A.3.2.3.4	
Exceptions to connection diagram	N/A		
Note 1: For UE supporting DAPS HO on intra-band contiguous BC, the test frequencies are selected according to E.1.4.2. For UE supporting DAPS HO on intra-band non-contiguous BC, the test frequencies are selected according to E.1.4.3.			

1. Message contents are defined in clause 6.3.1.10.4.3.
2. The power levels and settings for NR Cell 1 are set according to Annex C.1.2 and C.1.3. Cell 2 is NR FR1 target Cell, and its power levels and settings are also set according to Annex C.1.2 and C.1.3.
3. The test parameters are given in Table 6.3.1.10.4.1-3 below, with A3-Offset modified by Test Tolerance.

Table 6.3.1.10.4.1-3: General test parameters for NR SA FR1 Intra-band inter-frequency asynchronous DAPS handover

Parameter		Unit	Value	Comment
Initial conditions	Active cell		Cell 1	
	Neighbouring cell		Cell 2	
Final condition	Active cell		Cell 2	
A3-Offset		dB	-3	
Hysteresis		dB	0	
Time To Trigger		s	0	
Filter coefficient			0	L3 filtering is not used
Access Barring Information		-	Not Sent	No additional delays in random access procedure.
Time offset between cells			10 μs	Asynchronous cells
T1		s	5	
T2		s	≤5	
T3		s	1	
T4		ms	10 + $T_{interrupt2}$	$T_{interrupt2}$ is defined in TS 38.133 [6] 6.1.3.2.2 Table 6.1.3.2.2-6

T5	ms	100	

6.3.1.10.4.2 Test procedure

The test scenario comprises of two NR carriers and one cell on each carrier, Cell 1 and Cell 2. General parameters and Cell-specific parameters for Cell 1 and Cell 2 are given in Table 6.3.1.10.4.1-3 and 6.3.1.10.5-1 respectively.

The test consists of five successive time periods, with time durations of T1, T2, T3, T4 and T5 respectively.

Before the start of T1, the UE is connected to the Cell 1 and not aware of the Cell 2. During T1, the UE may not have any timing information of the Cell 2. Gap pattern ID gp0 is configured as specified in 38.133 [6] Table 9.1.2-1 before T2 in the test case.

From start of T2, the Cell 2 becomes detectable. During T2, the UE performs cell detection and measurements on the Cell 2 and shall send event report to the network. After receiving the event report A3, the network sends a RRC message implying DAPS handover command for target cell addition to the UE.

T3 starts from the instant when the last TTI containing DAPS handover command for target cell addition sent to the UE. During T3, UE shall be able to perform random access, DL reception or UL transmission in the Cell 2 while the DL scheduling and UL feedback in the Cell 1 shall be avoided. After successful RACH procedure on the Cell 2, UE is scheduled with PDSCH from Cell 1 and Cell 2 in alternative TTIs. In the end of T3 the network sends a RRC message implying DAPS handover command for source cell release to the UE. During T3, the handover delay $D_{handover1}$ for target cell addition need to be verified.

T4 starts from the instant when the last TTI containing DAPS handover command for source cell release sent to the UE. During T4, the UE shall accomplish the release actions within $D_{handover2}$

From start of T5, the UE shall stop sending periodical CSI report on Cell 1. And the test system shall observe the periodic reporting of CSI for cell 1 during T5.

1. Ensure the UE is in State RRC_CONNECTED with generic procedure parameters Connectivity *NR*, Connected without release *On* according to TS 38.508-1 [14] clause 4.5. Establish SRB2 and DRB in the RRC Reconfiguration message. Cell 1 is the active cell. Set Cell 2 physical cell identity to the initial physical cell identity.

2. Set the parameters according to T1 in Table 6.3.1.10.5-1. Propagation conditions are set according to Annex C clause C.2.2. T1 starts and the SS starts continuously scheduling the UE to perform DL reception in every DL slot on Cell 1 and monitoring corresponding ACK/NACK feedbacks sent by the UE.

3. Set Cell 2 physical cell identity = ((current cell 2 physical cell identity + 1) mod 14 + 2).

4. The SS shall transmit an *RRCReconfiguration* message to configure event A3 triggered measurement reporting on the intra-band inter-frequency carrier and periodical CSI reporting on Cell 1.

5. The UE shall transmit an *RRCReconfigurationComplete* message.

6. When T1 expires, the SS shall switch the power setting from T1 to T2 as specified in Table 6.3.1.10.5-1.

7. UE shall transmit a *MeasurementReport* message triggered by Event A3.

8. SS shall transmit an *RRCReconfiguration* with *reconfigurationWithSync* message which reconfiguring DRB as a DAPS radio bearer to the UE, at that instant the SS shall switch the power settings from T2 to T3 as specified in Table 6.3.1.10.5-1. T3 starts and the SS stops scheduling the UE to perform DL reception on Cell 1.

9. If the UE transmits PRACH preamble to Cell 2 within $D_{handover1}$ from the beginning of time period T3 then the number of successful tests is increased by one, continue to step 10. Otherwise, the number of failure tests is increased by one, go to step 17. where:

   - $D_{handover1}$ = 72 ms.

10. The UE transmits an *RRCReconfigurationComplete* message on Cell 2.

11. Upon receiving *RRCReconfigurationComplete* message sent by UE, the SS immediately starts scheduling UE to perform DL reception in Cell 1 and Cell 2 in an alternative manner, and monitoring corresponding ACK/NACK feedbacks sent by the UE.

12. Upon T3 expiring, the SS immediately transmit an *RRCReconfiguration* with *daps-SourceRelease-r16* = *true* on Cell 2 to the UE. T4 starts.

13. The UE transmits an *RRCReconfigurationComplete* message on Cell 2.

13. When T4 expires, T5 starts.

15. If

    e) The UE can report ACK/NACK from the first DL reception scheduled on Cell 2 after the beginning of time period T5,

    and

    f) The UE doesn't send periodical CSI report on Cell 1during entire time period T5.

    then the number of successful tests is increased by one. Otherwise, the number of failure tests is increased by one.

16. After T5 expires, the SS sends an *RRCReconfiguration* with *reconfigurationWithSync* to cause UE handover back to Cell 1.

17. If UE is not in state RRC_CONNECTED with generic procedure parameters Connectivity *NR*, Connected without release *On* according to TS 38.508-1 [14] clause 4.5 on Cell 1, switch off and on the UE. Then ensure the UE is in State RRC_CONNECTED with generic procedure parameters Connectivity *NR*, Connected without release *On* according to TS 38.508-1 [14] clause 4.5 on Cell 1. Cell 1 is the active cell.

18. Repeat steps 2-17 until the confidence level according to Tables G.2.3-1 in Annex G clause G.2 is achieved.

6.3.1.10.4.3 Message contents

Message contents are according to TS 38.508-1 [14] clause 7.3 with the following exceptions:

Table 6.3.1.10.4.3-1: RRCReconfiguration (Step 4)

Derivation Path: TS 38.508-1 [14], 4.6.1-13 with condition NR_MEAS			
Information Element	**Value/remark**	**Comment**	**Condition**
RRCReconfiguration ::= SEQUENCE {			
criticalExtensions CHOICE {			
rrcReconfiguration SEQUENCE {			
measConfig	MeasConfig	Table 6.3.1.10.4.3-3	
nonCriticalExtension SEQUENCE {			
masterCellGroup SEQUENCE {			
spCellConfigDedicated	ServingCellConfig	Table 6.3.1.10.4.3-2	
}			
}			
}			
}			
}			

Table 6.3.1.10.4.3-2: ServingCellConfig (Table 6.3.1.10.4.3-1)

Derivation Path: TS 38.508-1 [14], Table 4.6.3-167 with condition MEAS			
Information Element	**Value/remark**	**Comment**	**Condition**
ServingCellConfig ::= SEQUENCE {			
csi-MeasConfig	CSI-MeasConfig for RRM Specified in TS 38.508-1 [14] Table 7.3.1-6		
}			

Table 6.3.1.10.4.3-3: MeasConfig (Table 6.3.1.10.4.3-1)

Derivation path: Table H.3.1-2 with condition INTER-FREQ

Information Element	Value/Remark	Comment	Condition
measConfig ::= SEQUENCE {			
reportConfigToAddModList SEQUENCE(SIZE (1..maxReportConfigId)) OF SEQUENCE {	1 entry		
reportConfig[1] CHOICE {			
reportConfigNR	ReportConfigNR(-3) specified in Table H.3.1-4	Acutal value of A3-threshold is -3 dBm	
}			
}			
}			

Table 6.3.1.10.4.3-4: MeasurementReport (Step 7)

Derivation Path: TS 38.508-1 [14], Table 4.6.1-5A			
Information Element	**Value/remark**	**Comment**	**Condition**
MeasurementReport ::= SEQUENCE {			
criticalExtensions CHOICE {			
measurementReport SEQUENCE {			
measResults	MeasResults specified in Table H.3.1-7 with condition INTER-FREQ		
}			
}			
}			

Table 6.3.1.10.4.3-5: RRCReconfiguration (Step 8)

Derivation Path: TS 38.508-1 [4], Table 4.8.1-1A with Condition RBConfig_NoKeyChange			
Information Element	**Value/remark**	**Comment**	**Condition**
RRCReconfiguration ::= SEQUENCE {			
criticalExtensions CHOICE {			
rrcReconfiguration SEQUENCE {			
radioBearerConfig	RadioBearerConfig	Table 6.3.1.10.4.3-6	
nonCriticalExtension SEQUENCE{			
masterCellGroup	CellGroupConfig	Table 6.3.1.10.4.3-7	
}			
}			
}			
}			

Table 6.3.1.10.4.3-6: RadioBearerConfig (Table 6.3.1.10.4.3-5)

Derivation Path: TS 38.508-1 [14], Table 4.6.3-132 with condition DRB1			
Information Element	**Value/remark**	**Comment**	**Condition**
RadioBearerConfig ::= SEQUENCE {			
drb-ToAddModList SEQUENCE (SIZE (1..maxDRB)) OF DRB-ToAddMod {	1 entry		
DRB-ToAddMod[1] SEQUENCE {		entry 1	
drb-Identity	DRB-Identity using condition DRBn	DRB #n is a DRB established before DAPS HO. Actual value of n is left to TE implementation	
daps-Config-r16	true		
}			
}			
securityConfig	Not present		
}			

Table 6.3.1.10.4.3-7: CellGroupConfig (Table 6.3.1.10.4.3-5)

Derivation Path: TS 38.508-1 [14], Table 4.6.3-19 with condition PCell_change			
Information Element	**Value/remark**	**Comment**	**Condition**
CellGroupConfig ::= SEQUENCE {			
rlc-BearerToAddModList	Not present		
spCellConfig SEQUENCE {			
reconfigurationWithSync SEQUENCE {			
spCellConfigCommon SEQUENCE {			
physCellId	PhysCellId for Cell 2		
}			
}			
}			
}			

Table 6.3.1.10.4.3-8: RRCReconfiguration (Step 12)

Derivation Path: TS 38.508-1 [14], Table 4.6.1-13 with condition DAPS_HO_ReleaseSource

6.3.1.10.5 Test requirements

Table 6.3.1.10.5-1 defines the primary level settings including test tolerances for all tests.

Table 6.3.1.10.5-1: Cell specific test parameters for NR SA FR1 Intra-band inter-frequency asynchronous DAPS handover

Parameter		**Unit**	**Cell 1**	**Cell 2**
			T1	**T2 -T5**
NR RF Channel Number			1	2
Duplex mode	Config 1		FDD	
TDD configuration	Config 1		Not Applicable	
$BW_{channel}$	Config 1	MHz	10: $N_{RB,c}$ = 52	
BWP BW	Config 1	MHz	10: $N_{RB,c}$ = 52	
DRX Cycle		ms	Not Applicable	
PDSCH Reference measurement channel	Config 1		SR.1.1 FDD	
CORESET Reference Channel	Config 1		CR.1.1 FDD	
	Config 2		CR.1.1 TDD	
	Config 3		CR.2.1 TDD	
TRS configuration	Config 1		TRS.1.1 FDD	
OCNG Patterns			OP.1	
SMTC Configuration			SMTC.1	
SSB Configuration	Config 1		SSB.1 FR1	
PDSCH/PDCCH subcarrier spacing	Config 1	kHz	15 kHz	
PUCCH/PUSCH subcarrier spacing	Config 1	kHz	15 kHz	
PRACH configuration			FR1 PRACH configuration 1	
BWP configuration	Initial DL BWP		DLBWP.0.1	
	Dedicated DL BWP		DLBWP.1.1	
	Initial UL BWP		ULBWP.0.1	

	Dedicated UL BWP		ULBWP.1.1			
EPRE ratio of PSS to SSS		dB	0			
EPRE ratio of PBCH DMRS to SSS						
EPRE ratio of PBCH to PBCH DMRS						
EPRE ratio of PDCCH DMRS to SSS						
EPRE ratio of PDCCH to PDCCH DMRS						
EPRE ratio of PDSCH DMRS to SSS						
EPRE ratio of PDSCH to PDSCH						
EPRE ratio of OCNG DMRS to SSS(Note 1)						
EPRE ratio of OCNG to OCNG DMRS (Note 1)						
N_{oc} Note2		dBm/15kHz	-98			
N_{oc} Note2	Config 1	dBm/SCS	-98			
$\hat{E}_s / I_{ot}$		dB	8	8	- Infinity	11.7
$\hat{E}_s / N_{oc}$		dB	8	8	- Infinity	11.7
SSB_RP	Config 1,2	dBm/SCS	-90	-90	- Infinity	-86.3
Io Note3	Config 1,2	dBm/ 9.36MHz	-61.41	-61.41	-70.05	-58.06
Propagation condition			AWGN			

Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.

Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for N_{oc} to be fulfilled.

Note 3: Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.

The UE shall start to transmit the PRACH to Cell 2 less than $D_{handover1}$ from the beginning of time period T3. The rate of correct handovers observed during repeated tests shall be at least 90%, where:

$D_{handover1} = T_{RRC_procedure} + T_{search} + T_{IU} + T_{processing} + T_{\Delta} + T_{margin}$

- $T_{RRC_procedure}$= 10 ms, is the RRC procedure delay specified in 38.331 [13] clause 12;
- T_{search} = 0 ms for known target cell, is the time required to search the target cell specified in 38.133 [6] clause 6.1.1.2.2;
- T_{IU} = 20 ms, is the interruption uncertainty in acquiring the first available PRACH occasion in the new cell specified in 38.133 [6] clause 6.1.1.2.2.
- $T_{processing}$ = 20 ms, is the time for UE processing specified in 38.133 [6] clause 6.1.1.2.2.
- T_{Δ} = 20 ms, is the time for fine time tracking and acquiring full timing information of the target cell specified in 38.133 [6] clause 6.1.1.2.2.
- T_{margin} = 2 ms, is the time for SSB post-processing specified in 38.133 [6] clause 6.1.1.2.2.

This gives a total of 72 ms.

During T3 UE is allowed to cause $T_{interrupt1}$ interruption to cell 1. $T_{interrupt1}$is defined in 38.133 [6] clause 6.1.3.2.2 Table 6.1.3.2.2-2. When UE is transmitting PRACH preamble to cell 2, interruption to cell 1 is allowed.

During T4 UE is allowed to cause $T_{interrupt2}$ interruption to cell 1. $T_{interrupt2}$ is defined in 38.133 [6] clause 6.1.3.2.2 Table 6.1.3.2.2-6.

UE shall finish cell 1 release in T4 and shall not send any CSI reports to cell 1 during T5.

6.3.1.11 NR SA FR1 Inter-band inter-frequency synchronous DAPS handover

6.3.1.11.1 Test purpose

To verify the requirement for the NR FR1-NR FR1 inter-band inter-frequency DAPS handover requirements in synchronous scenario specified in clause 38.133 [6] clause 6.1.3.2.

6.3.1.11.2 Test applicability

This test applies to all types of NR UE from Release 16 onwards and support inter-band inter-frequency DAPS handover.

6.3.1.11.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 6.3.1.0.4.

The normative reference for this requirement is TS 38.133 [6] clause A.6.3.1.11.

6.3.1.11.4 Test description

6.3.1.11.4.1 Initial conditions

Initial conditions are a set of test configurations the UE needs to be tested in and the steps for the SS to take with the UE to reach the correct measurement state.

This test shall be tested using any of the test configurations in Table 6.3.1.11.4.1-1.

Table 6.3.1.11.4.1-1: NR SA FR1 Inter-band inter-frequency synchronous DAPS handover test configurations

Config	Description
6.3.1.11-1	Source cell: NR 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode Target cell: NR 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode
6.3.1.11-2	Source cell: NR 15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode Target cell: NR 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode
6.3.1.11-3	Source cell: NR 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode Target cell: NR 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode
6.3.1.11-4	Source cell: NR 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode Target cell: NR 15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode
6.3.1.11-5	Source cell: NR 15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode Target cell: NR 15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode
6.3.1.11-6	Source cell: NR 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode Target cell: NR 15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode
6.3.1.11-7	Source cell: NR 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode Target cell: NR 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode
6.3.1.11-8	Source cell: NR 15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode Target cell: NR 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode
6.3.1.11-9	Source cell: NR 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode Target cell: NR 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode
Note: The UE is only required to be tested in one of the supported test configurations	

Configure the test equipment and the DUT according to the parameters in Table 6.3.1.11.4.1-2

Table 6.3.1.11.4.1-2: Initial conditions for NR SA FR1 Inter-band inter-frequency synchronous DAPS handover

Parameter	Value		Comment
Test environment	NC		As specified in TS 38.508-1 [14] clause 4.1.
Test frequencies	As specified in Annex E, Table E.4-1 and TS 38.508-1 [14] clause 4.3.1.		
Channel bandwidth	As specified by the test configuration selected from Table 6.3.1.11.4.1-1		
Propagation conditions	AWGN		As specified in Annex C.2.2.
Connection Diagram	TE Part	A.3.1.8.2	As specified in TS 38.508-1 [14] Annex A.
	DUT Part	A.3.2.3.4	

Exceptions to connection diagram	N/A	

1. Message contents are defined in clause 6.3.1.11.4.3.
2. The power levels and settings for NR Cell 1 are set according to Annex C.1.2 and C.1.3. Cell 2 is NR FR1 target Cell, and its power levels and settings are also set according to Annex C.1.2 and C.1.3.
3. The test parameters are given in Table 6.3.1.11.4.1-3 below, with A3-Offset modified by Test Tolerance.

Table 6.3.1.11.4.1-3: General test parameters for NR SA FR1 Inter-band inter-frequency synchronous DAPS handover

Parameter		Unit	Value	Comment
Initial conditions	Active cell		Cell 1	PCell on RF channel number 1
	Neighbouring cell		Cell 2	Neighbour cell on RF channel number 2
Final condition	Active cell		Cell 2	PCell on RF channel number 2
	Neighbouring cell		Cell 1	Neighbour cell on RF channel number 1
A3-Offset	Config 1,2,4,5,9	dB	-7 (Note 1)	
	Config 3,6	dB	-10 (Note 1)	
	Config 7,8	dB	-4	
Hysteresis		dB	0	
Time To Trigger		s	0	
Filter coefficient			0	L3 filtering is not used
Access Barring Information		-	Not Sent	No additional delays in random access procedure.
Time offset between cells		µs	33	Synchronous cells
DRX			OFF	
Measurement gap pattern Id			#0	Gaps are configured before T2.
T1		s	5	
T2		s	<5	
T3		s	<0.5	
T4		ms	$10+T_{interrupt2}$	$T_{interrupt2}$ as defined in TS 38.133 [6] Table 6.1.3.2.2-7 for synchronous DAPS HO
T5		ms	100	
Note 1: Including test tolerance given in Annex F.1.3.2				

6.3.1.11.4.2 Test procedure

The test scenario comprises of two NR bands and one cell on each band, Cell 1 and Cell 2. General parameters and Cell-specific parameters for Cell 1 and Cell 2 are given in Table 6.3.1.11.4.1-3, 6.3.1.11.5-1 and 6.3.1.11.5-2 respectively.

The test consists of five successive time periods, with time durations of T1, T2, T3, T4 and T5 respectively.

Before the start of T1, the UE is connected to the Cell 1 and not aware of the Cell 2. During T1, the UE does not have any timing information of the Cell 2. Gap pattern ID gp0 is configured as specified in 38.133 [6] Table 9.1.2-1 before T2 in the test case.

From start of T2, the Cell 2 becomes detectable. During T2, the UE performs cell detection and measurements on the Cell 2 and shall send event report to the network. After receiving the event report A3, the network sends a RRC message implying DAPS handover command for target cell addition to the UE.

T3 starts from the instant when the last TTI containing DAPS handover command for target cell addition sent to the UE. During T3, UE shall be able to perform random access, DL reception or UL transmission in the Cell 2 while the DL scheduling and UL feedback in the Cell 1 shall be avoided. After successful RACH procedure on the Cell 2, UE is scheduled with PDSCH from Cell 1 and Cell 2 in alternative TTIs. In the end of T3 the network sends a RRC message implying DAPS handover command for source cell release to the UE. During T3, the handover delay $D_{handover1}$ for target cell addition need to be verified.

T4 starts from the instant when the last TTI containing DAPS handover command for source cell release sent to the UE. During T4, the UE shall accomplish the release actions within $D_{handover2}$

From start of T5, the UE shall stop sending periodical CSI report on Cell 1. And the test system shall observe the periodic reporting of CSI for cell 1 during T5.

1. Ensure the UE is in State RRC_CONNECTED with generic procedure parameters Connectivity *NR*, Connected without release *On* according to TS 38.508-1 [14] clause 4.5. Establish SRB2 and DRB in the RRC Reconfiguration message. Cell 1 is the active cell. Set Cell 2 physical cell identity to the initial physical cell identity.

2. Set the parameters according to T1 in Table 6.3.1.11.5-1 and Table 6.3.1.11.5-2. Propagation conditions are set according to Annex C clause C.2.2. T1 starts and the SS starts continuously scheduling the UE to perform DL reception in every DL slot on Cell 1 and monitoring corresponding ACK/NACK feedbacks sent by the UE.

3. Set Cell 2 physical cell identity = ((current cell 2 physical cell identity + 1) mod 14 + 2).

4. The SS shall transmit an *RRCReconfiguration* message to configure event A3 triggered measurement reporting on the inter-band inter-frequency carrier and periodical CSI reporting on Cell 1.

5. The UE shall transmit an *RRCReconfigurationComplete* message.

6. When T1 expires, the SS shall switch the power setting from T1 to T2 as specified in Table 6.3.1.11.5-1 and Table 6.3.1.11.5-2.

7. UE shall transmit a *MeasurementReport* message triggered by Event A3.

8. SS shall transmit an *RRCReconfiguration* with *reconfigurationWithSync* message which reconfiguring DRB as a DAPS radio bearer to the UE, at that instant the SS shall switch the power settings from T2 to T3 as specified in Table 6.3.1.11.5-1 and Table 6.3.1.11.5-2. T3 starts and the SS stops scheduling the UE to perform DL reception on Cell 1.

9. If the UE transmits PRACH preamble to Cell 2 within $D_{handover1}$ from the beginning of time period T3 then the number of successful tests is increased by one, continue to step 10. Otherwise, the number of failure tests is increased by one, go to step 17. where:

   - $D_{handover1}$ = 72 ms.

10. The UE transmits an *RRCReconfigurationComplete* message on Cell 2.

11. Upon receiving *RRCReconfigurationComplete* message sent by UE, the SS immediately starts scheduling UE to perform DL reception in Cell 1 and Cell 2 in an alternative manner, and monitoring corresponding ACK/NACK feedbacks sent by the UE.

12. Upon T3 expiring, the SS immediately transmit an *RRCReconfiguration* with *daps-SourceRelease-r16 = true* on Cell 2 to the UE. T4 starts.

13. When T4 expires, T5 starts.

15. If

    g) The UE can report ACK/NACK from the first DL reception scheduled on Cell 2 after the beginning of time period T5,

    and

    h) The UE doesn't send periodical CSI report on Cell 1during entire time period T5.

    then the number of successful tests is increased by one. Otherwise, the number of failure tests is increased by one.

16. After T5 expires, the SS sends an *RRCReconfiguration* with *reconfigurationWithSync* to cause UE handover back to Cell 1.

17. If UE is not in state RRC_CONNECTED with generic procedure parameters Connectivity *NR*, Connected without release *On* according to TS 38.508-1 [14] clause 4.5 on Cell 1, switch off and on the UE. Then ensure

the UE is in State RRC_CONNECTED with generic procedure parameters Connectivity *NR*, Connected without release *On* according to TS 38.508-1 [14] clause 4.5 on Cell 1. Cell 1 is the active cell.

18. Repeat steps 2-17 until the confidence level according to Tables G.2.3-1 in Annex G clause G.2 is achieved.

6.3.1.11.4.3 Message contents

Message contents are according to TS 38.508-1 [14] clause 7.3 with the following exceptions:

Table 6.3.1.11.4.3-1: RRCReconfiguration (Step 4)

Derivation Path: TS 38.508-1 [14], 4.6.1-13 with condition NR_MEAS			
Information Element	**Value/remark**	**Comment**	**Condition**
RRCReconfiguration ::= SEQUENCE {			
criticalExtensions CHOICE {			
rrcReconfiguration SEQUENCE {			
measConfig	MeasConfig	Table 6.3.1.11.4.3-3	
nonCriticalExtension SEQUENCE {			
masterCellGroup SEQUENCE {			
spCellConfigDedicated	ServingCellConfig	Table 6.3.1.11.4.3-2	
}			
}			
}			
}			
}			

Table 6.3.1.11.4.3-2: ServingCellConfig (Table 6.3.1.11.4.3-1)

Derivation Path: TS 38.508-1 [14], Table 4.6.3-167 with condition MEAS			
Information Element	**Value/remark**	**Comment**	**Condition**
ServingCellConfig ::= SEQUENCE {			
csi-MeasConfig	CSI-MeasConfig for RRM Specified in TS 38.508-1 [14] Table 7.3.1-6		
}			

Table 6.3.1.11.4.3-3: MeasConfig (Table 6.3.1.11.4.3-1)

Derivation path: Table H.3.1-2 with condition INTER-FREQ			
Information Element	**Value/Remark**	**Comment**	**Condition**
measConfig ::= SEQUENCE {			
reportConfigToAddModList SEQUENCE(SIZE (1..maxReportConfigId)) OF SEQUENCE {	1 entry		
reportConfig[1] CHOICE {			
reportConfigNR	ReportConfigNR(-7) specified in Table H.3.1-4	Acutal value of a3-Offset is -7 dB	6.3.1.11-1, 6.3.1.11-2, 6.3.1.11-4, 6.3.1.11-5, 6.3.1.11-9.
	ReportConfigNR(-10) specified in Table H.3.1-4	Acutal value of a3-Offset is -10 dB	6.3.1.11-3, 6.3.1.11-6
	ReportConfigNR(-4) specified in Table H.3.1-4	Acutal value of a3-Offset is -4 dB	6.3.1.11-7, 6.3.1.11-8
}			
}			
}			

Table 6.3.1.11.4.3-4: MeasurementReport (Step 7)

Derivation Path: TS 38.508-1 [14], Table 4.6.1-5A

Information Element	Value/remark	Comment	Condition
MeasurementReport ::= SEQUENCE {			
criticalExtensions CHOICE {			
measurementReport SEQUENCE {			
measResults	MeasResults specified in Table H.3.1-7 with condition INTER-FREQ		
}			
}			
}			

Table 6.3.1.11.4.3-5: RRCReconfiguration (Step 8)

Derivation Path: TS 38.508-1 [4], Table 4.8.1-1A with Condition RBConfig_NoKeyChange			
Information Element	**Value/remark**	**Comment**	**Condition**
RRCReconfiguration ::= SEQUENCE {			
criticalExtensions CHOICE {			
rrcReconfiguration SEQUENCE {			
radioBearerConfig	RadioBearerConfig	Table 6.3.1.11.4.3-6	
nonCriticalExtension SEQUENCE{			
masterCellGroup	CellGroupConfig	Table 6.3.1.11.4.3-7	
}			
}			
}			
}			

Table 6.3.1.11.4.3-6: RadioBearerConfig (Table 6.3.1.11.4.3-5)

Derivation Path: TS 38.508-1 [14], Table 4.6.3-132 with condition DRB1			
Information Element	**Value/remark**	**Comment**	**Condition**
RadioBearerConfig ::= SEQUENCE {			
drb-ToAddModList SEQUENCE (SIZE (1..maxDRB)) OF DRB-ToAddMod {	1 entry		
DRB-ToAddMod[1] SEQUENCE {		entry 1	
drb-Identity	DRB-Identity using condition DRBn	DRB #n is a DRB established before DAPS HO. Actual value of n is left to TE implementation	
daps-Config-r16	true		
}			
}			
securityConfig	Not present		
}			

Table 6.3.1.11.4.3-7: CellGroupConfig (Table 6.3.1.11.4.3-5)

Derivation Path: TS 38.508-1 [14], Table 4.6.3-19 with condition PCell_change			
Information Element	**Value/remark**	**Comment**	**Condition**
CellGroupConfig ::= SEQUENCE {			
rlc-BearerToAddModList	Not present		
spCellConfig SEQUENCE {			
reconfigurationWithSync SEQUENCE {			
spCellConfigCommon SEQUENCE {			
physCellId	PhysCellId for Cell 2		
}			
}			
}			
}			

Table 6.3.1.11.4.3-8: RRCReconfiguration (Step 12)

Derivation Path: TS 38.508-1 [14], Table 4.6.1-13 with condition DAPS_HO_ReleaseSource

6.3.1.11.5 Test requirements

Table 6.3.1.11.5-1, Table 6.3.1.11.5-2 defines the primary level settings including test tolerances for all tests.

Table 6.3.1.11.5-1: Cell specific test parameters for NR SA FR1 Inter-band inter-frequency synchronous DAPS handover (Cell 1)

Parameter		Unit	Cell 1	
			T1	T2 – T5
NR RF Channel Number			1	
Duplex mode	Config 1,4,7		FDD	
	Config 2,3,5,6,8,9		TDD	
TDD configuration	Config 1,4,7		Not Applicable	
	Config 2,5,8		TDDConf.1.1	
	Config 3,6,9		TDDConf.2.1	
$BW_{channel}$	Config 1,4,7	MHz	10: $N_{RB,c}$ = 52	
	Config 2,5,8		10: $N_{RB,c}$ = 52	
	Config 3,6,9		40: $N_{RB,c}$ = 106	
BWP BW	Config 1,4,7	MHz	10: $N_{RB,c}$ = 52	
	Config 2,5,8		10: $N_{RB,c}$ = 52	
	Config 3,6,9		40: $N_{RB,c}$ = 106	
TRS configuration	Config 1,4,7		TRS.1.1 FDD	
	Config 2,5,8		TRS.1.1 TDD	
	Config 3,6,9		TRS.1.2 TDD	
DRX Cycle		ms	Not Applicable	
PDSCH Reference measurement channel	Config 1,4,7		SR.1.1 FDD	
	Config 2,5,8		SR.1.1 TDD	
	Config 3,6,9		SR.2.1 TDD	
CORESET Reference Channel	Config 1,4,7		CR.1.1 FDD	
	Config 2,5,8		CR.1.1 TDD	
	Config 3,6,9		CR.2.1 TDD	
OCNG Patterns			OP.1	
CSI-RS configuration for CSI reporting	Config 1,4,7		CSI-RS.1.1 FDD	
	Config 2,5,8		CSI-RS.1.1 TDD	
	Config 3,6,9		CSI-RS.2.1 TDD	
reportConfigType			periodic	
reportQuantity			cri-RI-PMI-CQI	
CSI reporting periodicity	Config 1,2,4,5,7,8	slot	5	
	Config 3,6,9		10	
CSI reporting offset	Config 1,2,4,5,7,8	slot	3	
	Config 3,6,9		5	
SMTC Configuration			SMTC.1	
SSB Configuration	Config 1,2,4,5,7,8		SSB.1 FR1	
	Config 3,6,9		SSB.2 FR1	
PDSCH/PDCCH subcarrier spacing	Config 1,2,4,5,7,8	kHz	15 kHz	
	Config 3,6,9		30 kHz	
PUCCH/PUSCH subcarrier spacing	Config 1,2,4,5,7,8	kHz	15 kHz	
	Config 3,6,9		30 kHz	
PRACH configuration			FR1 PRACH configuration 2	
BWP	Initial DL BWP		DLBWP.0.1	
	Dedicated DL BWP		DLBWP.1.3	
	Initial UL BWP		ULBWP.0.1	
	Dedicated UL BWP		ULBWP.1.3	
EPRE ratio of PSS to SSS		dB	0	
EPRE ratio of PBCH DMRS to SSS				
EPRE ratio of PBCH to PBCH DMRS				
EPRE ratio of PDCCH DMRS to SSS				
EPRE ratio of PDCCH to PDCCH DMRS				

Parameter		Unit	Cell 1	
			T1	T2 – T5
EPRE ratio of PDSCH DMRS to SSS				
EPRE ratio of PDSCH to PDSCH				
EPRE ratio of OCNG DMRS to SSS Note 1				
EPRE ratio of OCNG to OCNG DMRS Note 1				
N_{oc} Note2		dBm/15kHz	-98	-98
N_{oc} Note2	Config 1,2,4,5,7,8	dBm/SCS	-98	-98
	Config 3,6,9		-95	-95
$\hat{E}_s / I_{ot}$		dB	4	4
$\hat{E}_s / N_{oc}$		dB	4	4
SSB_RP	Config 1,2,4,5,7,8	dBm/SCS	-94	-94
	Config 3,6,9	dBm/SCS	-91	-91
Io Note3	Config 1,2,4,5,7,8	dBm/ 9.36MHz	-64.59	-64.59
	Config 3,6,9	dBm/ 38.16MHz	-58.49	-58.49
Propagation condition		-	AWGN	

Note 1: OCNG shall be used such that the cell is fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.

Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for N_{oc} to be fulfilled.

Note 3: Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.

Table 6.3.1.11.5-2: Cell specific test parameters for NR SA FR1 Inter-band inter-frequency synchronous DAPS handover (Cell 2)

Parameter		Unit	Cell 2	
			T1	T2 - T5
NR RF Channel Number			2	
Duplex mode	Config 1,2,3		FDD	
	Config 4,5,6,7,8,9		TDD	
TDD configuration	Config 1,2,3		Not Applicable	
	Config 4,5,6		TDDConf.1.1	
	Config 7,8,9		TDDConf.2.1	
$BW_{channel}$	Config 1,2,3	MHz	10: $N_{RB,c}$ = 52	
	Config 4,5,6		10: $N_{RB,c}$ = 52	
	Config 7,8,9		40: $N_{RB,c}$ = 106	
BWP BW	Config 1,2,3	MHz	10: $N_{RB,c}$ = 52	
	Config 4,5,6		10: $N_{RB,c}$ = 52	
	Config 7,8,9		40: $N_{RB,c}$ = 106	
TRS configuration	Config 1,2,3		TRS.1.1 FDD	
	Config 4,5,6		TRS.1.1 TDD	
	Config 7,8,9		TRS.1.2 TDD	
DRx Cycle		ms	Not Applicable	
PDSCH Reference measurement channel	Config 1,2,3		SR.1.1 FDD	
	Config 4,5,6		SR.1.1 TDD	
	Config 7,8,9		SR2.1 TDD	
CORESET Reference Channel	Config 1,2,3		CR.1.1 FDD	
	Config 4,5,6		CR.1.1 TDD	
	Config 7,8,9		CR2.1 TDD	
OCNG Patterns			OCNG pattern 1	
CSI-RS configuration for CSI reporting	Config 1,4,7		CSI-RS.1.1 FDD	
	Config 2,5,8		CSI-RS.1.1 TDD	
	Config 3,6,9		CSI-RS.2.1 TDD	
SMTC Configuration			SMTC pattern 1	
SSB Configuration	Config 1,2,3,4,5,6		SSB.1 FR1	
	Config 7,8,9		SSB.2 FR1	
PDSCH/PDCCH subcarrier spacing	Config 1,2,3,4,5,6	kHz	15 kHz	
	Config 7,8,9		30 kHz	

Parameter		Unit	Cell 2	
			T1	T2 - T5
PUCCH/PUSCH subcarrier spacing	Config 1,2,3,4,5,6	kHz	15 kHz	
	Config 7,8,9		30 kHz	
PRACH configuration			FR1 PRACH configuration 2	
BWP	Initial DL BWP		DLBWP.0.1	
	Dedicated DL BWP		DLBWP.1.3	
	Initial UL BWP		ULBWP.0.1	
	Dedicated UL BWP		ULBWP.1.3	
EPRE ratio of PSS to SSS		dB	0	
EPRE ratio of PBCH DMRS to SSS				
EPRE ratio of PBCH to PBCH DMRS				
EPRE ratio of PDCCH DMRS to SSS				
EPRE ratio of PDCCH to PDCCH DMRS				
EPRE ratio of PDSCH DMRS to SSS				
EPRE ratio of PDSCH to PDSCH				
EPRE ratio of OCNG DMRS to SSS Note 1				
EPRE ratio of OCNG to OCNG DMRS Note 1				
N_{oc} Note2		dBm/15kHz	-98	-98
N_{oc} Note2	Config 1,2,3,4,5,6	dBm/SCS	-98	-98
	Config 7,8,9		-95	-95
$\hat{E}_s / I_{ot}$		dB	-Infinity	4
$\hat{E}_s / N_{oc}$		dB	-Infinity	4
SSB_RP	Config 1,2,3,4,5,6	dBm/SCS	-Infinity	-94
	Config 7,8,9	dBm/SCS	-Infinity	-91
Io Note3	Config 1,2,3,4,5,6	dBm/ 9.36MHz	-70.05	-64.59
	Config 7,8,9	dBm/ 38.16MHz	-63.94	-58.49
Propagation condition		-	AWGN	

Note 1: OCNG shall be used such that the cell is fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.

Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for N_{oc} to be fulfilled.

Note 3: Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.

The UE shall start to transmit the PRACH to Cell 2 less than $D_{handover1}$ from the beginning of time period T3. The rate of correct handovers observed during repeated tests shall be at least 90%, where:

$D_{handover1} = T_{RRC_procedure} + T_{search} + T_{IU} + T_{processing} + T_{\Delta} + T_{margin}$

- $T_{RRC_procedure}$= 10 ms, is the RRC procedure delay specified in 38.331 [13] clause 12;
- T_{search} = 0 ms for known target cell, is the time required to search the target cell specified in 38.133 [6] clause 6.1.1.2.2;
- T_{IU} = 20 ms, is the interruption uncertainty in acquiring the first available PRACH occasion in the new cell specified in 38.133 [6] clause 6.1.1.2.2.
- $T_{processing}$ = 20 ms, is the time for UE processing specified in 38.133 [6] clause 6.1.1.2.2.
- T_{Δ} = 20 ms, is the time for fine time tracking and acquiring full timing information of the target cell specified in 38.133 [6] clause 6.1.1.2.2.
- T_{margin} = 2 ms, is the time for SSB post-processing specified in 38.133 [6] clause 6.1.1.2.2.

This gives a total of 72 ms.

The UE shall complete to release Cell 1 less than $D_{handover2}$ from the beginning of time period T4. During $D_{handover2}$, the interruption on Cell 2 shall not exceed $T_{interrupt2}$ as defined in TS 38.133 [6] Table 6.1.3.2.2-7 for synchronous DAPS HO.

The handover delay $D_{handover2}$ can be expressed as: $T_{RRC_procedure} + T_{interrupt2}$, where:

$T_{RRC_procedure}$ = 10 ms and is specified in clause 12 in TS 38.331 [13].

6.3.1.12 NR SA FR1 Inter-band inter-frequency asynchronous DAPS handover

6.3.1.12.1 Test purpose

To verify the requirement for the NR FR1-NR FR1 inter-band inter-frequency DAPS handover requirements in asynchronous scenario specified in clause 38.133 [6] clause 6.1.3.2.

6.3.1.12.2 Test applicability

This test applies to all types of NR UE from Release 16 onwards and support inter-band inter-frequency DAPS handover.

6.3.1.12.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 6.3.1.0.4.

The normative reference for this requirement is TS 38.133 [6] clause A.6.3.1.12.

6.3.1.12.4 Test description

6.3.1.12.4.1 Initial conditions

Initial conditions are a set of test configurations the UE needs to be tested in and the steps for the SS to take with the UE to reach the correct measurement state.

This test shall be tested using any of the test configurations in Table 6.3.1.12.4.1-1.

Table 6.3.1.12.4.1-1: NR SA FR1 Inter-band inter-frequency asynchronous DAPS handover test configurations

Config	Description
6.3.1.12-1	Source cell: NR 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode Target cell: NR 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode
6.3.1.12-2	Source cell: NR 15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode Target cell: NR 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode
6.3.1.12-3	Source cell: NR 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode Target cell: NR 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode
6.3.1.12-4	Source cell: NR 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode Target cell: NR 15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode
6.3.1.12-5	Source cell: NR 15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode Target cell: NR 15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode
6.3.1.12-6	Source cell: NR 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode Target cell: NR 15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode
6.3.1.12-7	Source cell: NR 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode Target cell: NR 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode
6.3.1.12-8	Source cell: NR 15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode Target cell: NR 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode
6.3.1.12-9	Source cell: NR 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode Target cell: NR 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode
Note: The UE is only required to be tested in one of the supported test configurations	

Configure the test equipment and the DUT according to the parameters in Table 6.3.1.12.4.1-2

Table 6.3.1.12.4.1-2: Initial conditions for NR SA FR1 Inter-band inter-frequency asynchronous DAPS handover

Parameter	Value		Comment
Test environment	NC		As specified in TS 38.508-1 [14] clause 4.1.
Test frequencies	As specified in Annex E, Table E.4-1 and TS 38.508-1 [14] clause 4.3.1.		
Channel bandwidth	As specified by the test configuration selected from Table 6.3.1.12.4.1-1		
Propagation conditions	AWGN		As specified in Annex C.2.2.
Connection Diagram	TE Part	A.3.1.8.2	As specified in TS 38.508-1 [14] Annex A.
	DUT Part	A.3.2.3.4	

Exceptions to connection diagram	N/A	

1. Message contents are defined in clause 6.3.1.12.4.3.
2. The power levels and settings for NR Cell 1 are set according to Annex C.1.2 and C.1.3. Cell 2 is NR FR1 target Cell, and its power levels and settings are also set according to Annex C.1.2 and C.1.3.
3. The test parameters are given in Table 6.3.1.12.4.1-3 below, with A3-Offset modified by Test Tolerance.

Table 6.3.1.12.4.1-3: General test parameters for NR SA FR1 Inter-band inter-frequency asynchronous DAPS handover

Parameter		Unit	Value	Comment
Initial conditions	Active cell		Cell 1	
	Neighbouring cell		Cell 2	
Final condition	Active cell		Cell 2	
A3-Offset	Config 1,2,4,5,9	dB	-7(Note 1)	
	Config 3,6	dB	-10(Note 1)	
	Config 7,8	dB	-4	
Hysteresis		dB	0	
Time To Trigger		s	0	
Filter coefficient			0	L3 filtering is not used
Access Barring Information		-	Not Sent	No additional delays in random access procedure.
Time offset between cells	Config 1,2,4,5	ms	0.5	Asynchronous cells
	Config3,6,7,8,9	ms	0.25	
DRX			OFF	
Measurement gap pattern Id			#0	Gaps are configured before T2.
T1		s	5	
T2		s	<5	
T3		s	<0.5	
T4		ms	$10+T_{interrupt2}$	$T_{interrupt2}$ as defined in TS 38.133 [6] Table 6.1.3.2.2-7 for asynchronous DAPS HO.
T5		ms	100	
Note 1: Including test tolerance given in Annex F.1.3.2				

6.3.1.12.4.2 Test procedure

The test scenario comprises of two NR bands and one cell on each band, Cell 1 and Cell 2. General parameters and Cell-specific parameters for Cell 1 and Cell 2 are given in Table 6.3.1.12.4.1-3, 6.3.1.12.5-1 and 6.3.1.12.5-2 respectively.

The test consists of five successive time periods, with time durations of T1, T2, T3, T4 and T5 respectively.

Before the start of T1, the UE is connected to the Cell 1 and not aware of the Cell 2. During T1, the UE does not have any timing information of the Cell 2. Gap pattern ID gp0 is configured as specified in 38.133 [6] Table 9.1.2-1 before T2 in the test case.

From start of T2, the Cell 2 becomes detectable. During T2, the UE performs cell detection and measurements on the Cell 2 and shall send event report to the network. After receiving the event report A3, the network sends a RRC message implying DAPS handover command for target cell addition to the UE.

T3 starts from the instant when the last TTI containing DAPS handover command for target cell addition sent to the UE. During T3, UE shall be able to perform random access, DL reception or UL transmission in the Cell 2 while the DL scheduling and UL feedback in the Cell 1 shall be avoided. After successful RACH procedure on the Cell 2, UE is scheduled with PDSCH from Cell 1 and Cell 2 in alternative TTIs. In the end of T3 the network sends a RRC message implying DAPS handover command for source cell release to the UE. During T3, the handover delay $D_{handover1}$ for target cell addition need to be verified.

T4 starts from the instant when the last TTI containing DAPS handover command for source cell release sent to the UE. During T4, the UE shall accomplish the release actions within $D_{handover2}$

From start of T5, the UE shall stop sending periodical CSI report on Cell 1. And the test system shall observe the periodic reporting of CSI for cell 1 during T5.

1. Ensure the UE is in State RRC_CONNECTED with generic procedure parameters Connectivity *NR*, Connected without release *On* according to TS 38.508-1 [14] clause 4.5. Establish SRB2 and DRB in the RRC Reconfiguration message. Cell 1 is the active cell. Set Cell 2 physical cell identity to the initial physical cell identity.

2. Set the parameters according to T1 in Table 6.3.1.12.5-1 and Table 6.3.1.12.5-2. Propagation conditions are set according to Annex C clause C.2.2. T1 starts and the SS starts continuously scheduling the UE to perform DL reception in every DL slot on Cell 1 and monitoring corresponding ACK/NACK feedbacks sent by the UE.

3. Set Cell 2 physical cell identity = ((current cell 2 physical cell identity + 1) mod 14 + 2).

4. The SS shall transmit an *RRCReconfiguration* message to configure event A3 triggered measurement reporting on the inter-band inter-frequency carrier and periodical CSI reporting on Cell 1.

5. The UE shall transmit an *RRCReconfigurationComplete* message.

6. When T1 expires, the SS shall switch the power setting from T1 to T2 as specified in Table 6.3.1.12.5-1 and Table 6.3.1.12.5-2.

7. UE shall transmit a *MeasurementReport* message triggered by Event A3.

8. SS shall transmit an *RRCReconfiguration* with *reconfigurationWithSync* message which reconfiguring DRB as a DAPS radio bearer to the UE, at that instant the SS shall switch the power settings from T2 to T3 as specified in Table 6.3.1.12.5-1 and Table 6.3.1.12.5-2. T3 starts and the SS stops scheduling the UE to perform DL reception on Cell 1.

9. If the UE transmits PRACH preamble to Cell 2 within $D_{handover1}$ from the beginning of time period T3 then the number of successful tests is increased by one, continue to step 10. Otherwise, the number of failure tests is increased by one, go to step 17. where:

   - $D_{handover1}$ = 72 ms.

10. The UE transmits an *RRCReconfigurationComplete* message on Cell 2.

11. Upon receiving *RRCReconfigurationComplete* message sent by UE, the SS immediately starts scheduling UE to perform DL reception in Cell 1 and Cell 2 in an alternative manner, and monitoring corresponding ACK/NACK feedbacks sent by the UE.

12. Upon T3 expiring, the SS immediately transmit an *RRCReconfiguration* with *daps-SourceRelease-r16 = true* on Cell 2 to the UE. T4 starts.

13. When T4 expires, T5 starts.

15. If

    i) The UE can report ACK/NACK from the first DL reception scheduled on Cell 2 after the beginning of time period T5,

    and

    j) The UE doesn't send periodical CSI report on Cell 1during entire time period T5.

    then the number of successful tests is increased by one. Otherwise, the number of failure tests is increased by one.

16. After T5 expires, the SS sends an *RRCReconfiguration* with *reconfigurationWithSync* to cause UE handover back to Cell 1.

17. If UE is not in state RRC_CONNECTED with generic procedure parameters Connectivity *NR*, Connected without release *On* according to TS 38.508-1 [14] clause 4.5 on Cell 1, switch off and on the UE. Then ensure

the UE is in State RRC_CONNECTED with generic procedure parameters Connectivity *NR*, Connected without release *On* according to TS 38.508-1 [14] clause 4.5 on Cell 1. Cell 1 is the active cell.

18. Repeat steps 2-17 until the confidence level according to Tables G.2.3-1 in Annex G clause G.2 is achieved.

6.3.1.12.4.3 Message contents

Message contents are according to TS 38.508-1 [14] clause 7.3 with the following exceptions:

Table 6.3.1.12.4.3-1: RRCReconfiguration (Step 4)

Derivation Path: TS 38.508-1 [14], 4.6.1-13 with condition NR_MEAS			
Information Element	**Value/remark**	**Comment**	**Condition**
RRCReconfiguration ::= SEQUENCE {			
criticalExtensions CHOICE {			
rrcReconfiguration SEQUENCE {			
measConfig	MeasConfig	Table 6.3.1.12.4.3-3	
nonCriticalExtension SEQUENCE {			
masterCellGroup SEQUENCE {			
spCellConfigDedicated	ServingCellConfig	Table 6.3.1.12.4.3-2	
}			
}			
}			
}			
}			

Table 6.3.1.12.4.3-2: ServingCellConfig (Table 6.3.1.12.4.3-1)

Derivation Path: TS 38.508-1 [14], Table 4.6.3-167 with condition MEAS			
Information Element	**Value/remark**	**Comment**	**Condition**
ServingCellConfig ::= SEQUENCE {			
csi-MeasConfig	CSI-MeasConfig for RRM Specified in TS 38.508-1 [14] Table 7.3.1-6		
}			

Table 6.3.1.12.4.3-3: MeasConfig (Table 6.3.1.12.4.3-1)

Derivation path: Table H.3.1-2 with condition INTER-FREQ			
Information Element	**Value/Remark**	**Comment**	**Condition**
measConfig ::= SEQUENCE {			
reportConfigToAddModList SEQUENCE(SIZE (1..maxReportConfigId)) OF SEQUENCE {	1 entry		
reportConfig[1] CHOICE {			
reportConfigNR	ReportConfigNR(-7) specified in Table H.3.1-4	Acutal value of a3-Offset is -7 dB	6.3.1.11-1, 6.3.1.11-2, 6.3.1.11-4, 6.3.1.11-5, 6.3.1.11-9.
	ReportConfigNR(-10) specified in Table H.3.1-4	Acutal value of a3-Offset is -10 dB	6.3.1.11-3, 6.3.1.11-6
	ReportConfigNR(-4) specified in Table H.3.1-4	Acutal value of a3-Offset is -4 dB	6.3.1.11-7, 6.3.1.11-8
}			
}			
}			

Table 6.3.1.12.4.3-4: MeasurementReport (Step 7)

Derivation Path: TS 38.508-1 [14], Table 4.6.1-5A

Information Element	Value/remark	Comment	Condition
MeasurementReport ::= SEQUENCE {			
criticalExtensions CHOICE {			
measurementReport SEQUENCE {			
measResults	MeasResults specified in Table H.3.1-7 with condition INTER-FREQ		
}			
}			
}			

Table 6.3.1.12.4.3-5: RRCReconfiguration (Step 8)

Derivation Path: TS 38.508-1 [4], Table 4.8.1-1A with Condition RBConfig_NoKeyChange			
Information Element	**Value/remark**	**Comment**	**Condition**
RRCReconfiguration ::= SEQUENCE {			
criticalExtensions CHOICE {			
rrcReconfiguration SEQUENCE {			
radioBearerConfig	RadioBearerConfig	Table 6.3.1.12.4.3-6	
nonCriticalExtension SEQUENCE{			
masterCellGroup	CellGroupConfig	Table 6.3.1.12.4.3-7	
}			
}			
}			
}			

Table 6.3.1.12.4.3-6: RadioBearerConfig (Table 6.3.1.12.4.3-5)

Derivation Path: TS 38.508-1 [14], Table 4.6.3-132 with condition DRB1			
Information Element	**Value/remark**	**Comment**	**Condition**
RadioBearerConfig ::= SEQUENCE {			
drb-ToAddModList SEQUENCE (SIZE (1..maxDRB)) OF DRB-ToAddMod {	1 entry		
DRB-ToAddMod[1] SEQUENCE {		entry 1	
drb-Identity	DRB-Identity using condition DRBn	DRB #n is a DRB established before DAPS HO. Actual value of n is left to TE implementation	
daps-Config-r16	true		
}			
}			
securityConfig	Not present		
}			

Table 6.3.1.12.4.3-7: CellGroupConfig (Table 6.3.1.12.4.3-5)

Derivation Path: TS 38.508-1 [14], Table 4.6.3-19 with condition PCell_change			
Information Element	**Value/remark**	**Comment**	**Condition**
CellGroupConfig ::= SEQUENCE {			
rlc-BearerToAddModList	Not present		
spCellConfig SEQUENCE {			
reconfigurationWithSync SEQUENCE {			
spCellConfigCommon SEQUENCE {			
physCellId	PhysCellId for Cell 2		
}			
}			
}			
}			

Table 6.3.1.12.4.3-8: RRCReconfiguration (Step 12)

Derivation Path: TS 38.508-1 [14], Table 4.6.1-13 with condition DAPS_HO_ReleaseSource

6.3.1.12.5 Test requirements

Table 6.3.1.12.5-1, Table 6.3.1.12.5-2 defines the primary level settings including test tolerances for all tests.

Table 6.3.1.12.5-1: Cell specific test parameters for NR SA FR1 Inter-band inter-frequency asynchronous DAPS handover (Cell 1)

Parameter		Unit	Cell 1	
			T1	T2 – T5
NR RF Channel Number			1	
Duplex mode	Config 1,4,7		FDD	
	Config 2,3,5,6,8,9		TDD	
TDD configuration	Config 1,4,7		Not Applicable	
	Config 2,5,8		TDDConf.1.1	
	Config 3,6,9		TDDConf.2.1	
$BW_{channel}$	Config 1,4,7	MHz	10: $N_{RB,c}$ = 52	
	Config 2,5,8		10: $N_{RB,c}$ = 52	
	Config 3,6,9		40: $N_{RB,c}$ = 106	
BWP BW	Config 1,4,7	MHz	10: $N_{RB,c}$ = 52	
	Config 2,5,8		10: $N_{RB,c}$ = 52	
	Config 3,6,9		40: $N_{RB,c}$ = 106	
TRS configuration	Config 1,4,7		TRS.1.1 FDD	
	Config 2,5,8		TRS.1.1 TDD	
	Config 3,6,9		TRS.1.2 TDD	
DRX Cycle		ms	Not Applicable	
PDSCH Reference measurement channel	Config 1,4,7		SR.1.1 FDD	
	Config 2,5,8		SR.1.1 TDD	
	Config 3,6,9		SR.2.1 TDD	
CORESET Reference Channel	Config 1,4,7		CR.1.1 FDD	
	Config 2,5,8		CR.1.1 TDD	
	Config 3,6,9		CR.2.1 TDD	
OCNG Patterns			OP.1	
CSI-RS configuration for CSI reporting	Config 1,4,7		CSI-RS.1.1 FDD	
	Config 2,5,8		CSI-RS.1.1 TDD	
	Config 3,6,9		CSI-RS.2.1 TDD	
reportConfigType			periodic	
reportQuantity			cri-RI-PMI-CQI	
CSI reporting periodicity	Config 1,2,4,5,7,8	slot	5	
	Config 3,6,9		10	
CSI reporting offset	Config 1,2,4,5,7,8	slot	3	
	Config 3,6,9		5	
SMTC Configuration			SMTC.1	
SSB Configuration	Config 1,2,4,5,7,8		SSB.1 FR1	
	Config 3,6,9		SSB.2 FR1	
PDSCH/PDCCH subcarrier spacing	Config 1,2,4,5,7,8	kHz	15 kHz	
	Config 3,6,9		30 kHz	
PUCCH/PUSCH subcarrier spacing	Config 1,2,4,5,7,8	kHz	15 kHz	
	Config 3,6,9		30 kHz	
PRACH configuration			FR1 PRACH configuration 2	
BWP	Initial DL BWP		DLBWP.0.1	
	Dedicated DL BWP		DLBWP.1.3	
	Initial UL BWP		ULBWP.0.1	
	Dedicated UL BWP		ULBWP.1.3	
EPRE ratio of PSS to SSS		dB	0	
EPRE ratio of PBCH DMRS to SSS				
EPRE ratio of PBCH to PBCH DMRS				
EPRE ratio of PDCCH DMRS to SSS				
EPRE ratio of PDCCH to PDCCH DMRS				

Parameter		Unit	Cell 1	
			T1	T2 – T5
EPRE ratio of PDSCH DMRS to SSS				
EPRE ratio of PDSCH to PDSCH				
EPRE ratio of OCNG DMRS to SSS Note 1				
EPRE ratio of OCNG to OCNG DMRS Note 1				
N_{oc} Note2		dBm/15kHz	-98	-98
N_{oc} Note2	Config 1,2,4,5,7,8	dBm/SCS	-98	-98
	Config 3,6,9		-95	-95
$\hat{E}_s / I_{ot}$		dB	4	4
$\hat{E}_s / N_{oc}$		dB	4	4
SSB_RP	Config 1,2,4,5,7,8	dBm/SCS	-94	-94
	Config 3,6,9	dBm/SCS	-91	-91
Io Note3	Config 1,2,4,5,7,8	dBm/ 9.36MHz	-64.59	-64.59
	Config 3,6,9	dBm/ 38.16MHz	-58.49	-58.49
Propagation condition		-	AWGN	

Note 1: OCNG shall be used such that the cell is fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.

Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for N_{oc} to be fulfilled.

Note 3: Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.

Table 6.3.1.12.5-2: Cell specific test parameters for NR SA FR1 Inter-band inter-frequency asynchronous DAPS handover (Cell 2)

Parameter		Unit	Cell 2	
			T1	T2 - T5
NR RF Channel Number			2	
Duplex mode	Config 1,2,3		FDD	
	Config 4,5,6,7,8,9		TDD	
TDD configuration	Config 1,2,3		Not Applicable	
	Config 4,5,6		TDDConf.1.1	
	Config 7,8,9		TDDConf.2.1	
$BW_{channel}$	Config 1,2,3	MHz	10: $N_{RB,c}$ = 52	
	Config 4,5,6		10: $N_{RB,c}$ = 52	
	Config 7,8,9		40: $N_{RB,c}$ = 106	
BWP BW	Config 1,2,3	MHz	10: $N_{RB,c}$ = 52	
	Config 4,5,6		10: $N_{RB,c}$ = 52	
	Config 7,8,9		40: $N_{RB,c}$ = 106	
TRS configuration	Config 1,2,3		TRS.1.1 FDD	
	Config 4,5,6		TRS.1.1 TDD	
	Config 7,8,9		TRS.1.2 TDD	
DRx Cycle		ms	Not Applicable	
PDSCH Reference measurement channel	Config 1,2,3		SR.1.1 FDD	
	Config 4,5,6		SR.1.1 TDD	
	Config 7,8,9		SR2.1 TDD	
CORESET Reference Channel	Config 1,2,3		CR.1.1 FDD	
	Config 4,5,6		CR.1.1 TDD	
	Config 7,8,9		CR2.1 TDD	
OCNG Patterns			OCNG pattern 1	
CSI-RS configuration for CSI reporting	Config 1,4,7		CSI-RS.1.1 FDD	
	Config 2,5,8		CSI-RS.1.1 TDD	
	Config 3,6,9		CSI-RS.2.1 TDD	
SMTC Configuration			SMTC pattern 1	
SSB Configuration	Config 1,2,3,4,5,6		SSB.1 FR1	
	Config 7,8,9		SSB.2 FR1	
PDSCH/PDCCH subcarrier spacing	Config 1,2,3,4,5,6	kHz	15 kHz	
	Config 7,8,9		30 kHz	
PUCCH/PUSCH subcarrier spacing	Config 1,2,3,4,5,6	kHz	15 kHz	
	Config 7,8,9		30 kHz	

Parameter		Unit	Cell 2	
			T1	T2 - T5
PRACH configuration			FR1 PRACH configuration 2	
BWP	Initial DL BWP		DLBWP.0.1	
	Dedicated DL BWP		DLBWP.1.3	
	Initial UL BWP		ULBWP.0.1	
	Dedicated UL BWP		ULBWP.1.3	
EPRE ratio of PSS to SSS		dB	0	
EPRE ratio of PBCH DMRS to SSS				
EPRE ratio of PBCH to PBCH DMRS				
EPRE ratio of PDCCH DMRS to SSS				
EPRE ratio of PDCCH to PDCCH DMRS				
EPRE ratio of PDSCH DMRS to SSS				
EPRE ratio of PDSCH to PDSCH				
EPRE ratio of OCNG DMRS to SSS Note 1				
EPRE ratio of OCNG to OCNG DMRS Note 1				
N_{oc} Note2		dBm/15kHz	-98	-98
N_{oc} Note2	Config 1,2,3,4,5,6	dBm/SCS	-98	-98
	Config 7,8,9		-95	-95
$\hat{E}_s / I_{ot}$		dB	-Infinity	4
$\hat{E}_s / N_{oc}$		dB	-Infinity	4
SSB_RP	Config 1,2,3,4,5,6	dBm/SCS	-Infinity	-94
	Config 7,8,9	dBm/SCS	-Infinity	-91
Io Note3	Config 1,2,3,4,5,6	dBm/ 9.36MHz	-70.05	-64.59
	Config 7,8,9	dBm/ 38.16MHz	-63.94	-58.49
Propagation condition		-	AWGN	

Note 1: OCNG shall be used such that the cell is fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.

Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for N_{oc} to be fulfilled.

Note 3: Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.

The UE shall start to transmit the PRACH to Cell 2 less than $D_{handover1}$ from the beginning of time period T3. The rate of correct handovers observed during repeated tests shall be at least 90%, where:

$D_{handover1} = T_{RRC_procedure} + T_{search} + T_{IU} + T_{processing} + T_{\Delta} + T_{margin}$

- $T_{RRC_procedure}$= 10 ms, is the RRC procedure delay specified in 38.331 [13] clause 12;
- T_{search} = 0 ms for known target cell, is the time required to search the target cell specified in 38.133 [6] clause 6.1.1.2.2.
- T_{IU} = 20 ms, is the interruption uncertainty in acquiring the first available PRACH occasion in the new cell specified in 38.133 [6] clause 6.1.1.2.2.
- $T_{processing}$ = 20 ms, is the time for UE processing specified in 38.133 [6] clause 6.1.1.2.2.
- T_{Δ} = 20 ms, is the time for fine time tracking and acquiring full timing information of the target cell specified in 38.133 [6] clause 6.1.1.2.2.
- T_{margin} = 2 ms, is the time for SSB post-processing specified in 38.133 [6] clause 6.1.1.2.2.

This gives a total of 72 ms.

The UE shall complete to release Cell 1 less than $D_{handover2}$ from the beginning of time period T4. During $D_{handover2}$, the interruption on Cell 2 shall not exceed $T_{interrupt2}$ as defined in TS 38.133 [6] Table 6.1.3.2.2-6 for asynchronous DAPS HO.

The handover delay $D_{handover2}$ can be expressed as: $T_{RRC_procedure} + T_{interrupt2}$, where:

$T_{RRC_procedure}$ = 10 ms and is specified in clause 12 in TS 38.331 [13].

6.3.2 RRC connection mobility control

6.3.2.1 RRC re-establishment

6.3.2.1.0 Minimum conformance requirements

6.3.2.1.0.1 Minimum conformance requirements for FR1 RRC re-establishment

In RRC_CONNECTED state the UE shall be capable of sending *RRCReestablishmentRequest* message within $T_{re\text{-}establish_delay}$ seconds from the moment it detects a loss in RRC connection. The total RRC connection delay ($T_{re\text{-}establish_delay}$) shall be less than:

$$T_{re-establish_delay} = T_{UE_re-establish_delay} + T_{UL_grant}$$

T_{UL_grant}: It is the time required to acquire and process uplink grant from the target PCell. The uplink grant is required to transmit *RRCReestablishmentRequest* message.

The UE re-establishment delay ($T_{UE_re\text{-}establish_delay}$) is the time between the moments when any of the conditions requiring RRC re-establishment as defined in clause 5.3.7 in TS 38.331 [2] is detected by the UE and when the UE sends PRACH to the target PCell. The UE re-establishment delay ($T_{UE_re\text{-}establish_delay}$) requirement shall be less than:

$$T_{UE_re-establish_delay} = 50 + T_{identify_intra_NR} + \sum_{i=1}^{Nfreq-1} T_{identify_inter_NR,i} + T_{SI-NR} + T_{PRACH}$$

The intra-frequency target NR cell shall be considered detectable when for each relevant SSB can satisfy that:

- SS-RSRP related side conditions given in Section 10.1.2 and 10.1.3 are fulfilled for a corresponding NR Band for FR1 and FR2, respectively,
- the conditions of SSB_RP and SSB Ês/Iot according to Annex B.2.2 for a corresponding NR Band are fullfilled.

The inter-frequency target NR cell shall be considered detectable when for each relevant SSB:

- SS-RSRP related side conditions given in Section 10.1.4 and 10.1.5 are fulfilled for a corresponding NR Band for FR1 and FR2, respectively,
- the conditions of SSB_RP and SSB Ês/Iot according to Annex B.2.2 for a corresponding NR Band are fullfilled.

$T_{identify_intra_NR}$: It is the time to identify the target intra-frequency NR cell and it depends on whether the target NR cell is known cell or unknown cell and on the frequency range (FR) of the target NR cell. If the UE is not configured with intra-frequency NR carrier for RRC re-establishment then $T_{identify_intra_NR}$=0; otherwise $T_{identify_intra_NR}$ shall not exceed the values defined in table 6.3.2.1.0.1-1.

$T_{identify_inter_NR,i}$: It is the time to identify the target inter-frequency NR cell on inter-frequency carrier *i* configured for RRC re-establishment and it depends on whether the target NR cell is known cell or unknown cell and on the frequency range (FR) of the target NR cell. $T_{identify_inter_NR,i}$ shall not exceed the values defined in table 6.3.2.1.0.1-2.

T_{SMTC}: It is the periodicity of the SMTC occasion configured for the intra-frequency carrier. If the UE has been provided with higher layer in TS 38.331 [2] signalling of *smtc2*, T_{smtc} follows *smtc1* or *smtc2* according to the physical cell ID of the target cell.

$T_{SMTC,i}$: It is the periodicity of the SMTC occasion configured for the inter-frequency carrier *i*. If it is not configured, the UE may assume that the target SSB periodicity is no larger than 20 ms.

$T_{SI\text{-}NR}$ = It is the time required for receiving all the relevant system information according to the reception procedure and the RRC procedure delay of system information blocks defined in TS 38.331 [2] for the target NR cell.

$T_{PRACH:}$ It is the delay uncertainty in acquiring the first available PRACH occasion in the target NR cell. T_{PRACH} can be up to the summation of SSB to PRACH occasion association period and 10 ms. SSB to PRACH occasion associated period is defined in the table 8.1-1 of TS 38.213 [3].

N_{freq}: It is the total number of NR frequencies to be monitored for RRC re-establishment; N_{freq} = 1 if the target intra-frequency NR cell is known, else N_{freq} = 2 and $T_{identify_intra_NR}$ = 0 if the target inter-frequency NR cell is known.

There is no requirement if the target cell does not contain the UE context.

In the requirement defined in the below tables, the target FR1 cell is known if it has been meeting the relevant cell identification requirement during the last 5 seconds otherwise it is unknown.

Table 6.3.2.1.0.1-1: Time to identify target NR cell for RRC connection re-establishment to NR intra-frequency cell

Serving cell SSB Ês/Iot (dB)	Frequency range (FR) of target NR cell	$T_{identify_intra_NR}$ (ms)	
		Known NR cell	Unknown NR cell
≥ -8	FR1	MAX (200 ms, 5 x T_{SMTC})	MAX (800 ms, 10 x T_{SMTC})
≥ -8	FR2	N/A	MAX (1000 ms, 80 x T_{SMTC}))
< -8	FR1	N/A	800[Note1]
< -8	FR2	N/A	3520[Note1]
Note 1: The UE is not required to successfully identify a cell on any NR frequency layer when T_{SMTC} > 20 ms and serving cell SSB Ês/Iot < -8 dB.			

Table 6.3.2.1.0.1-2: Time to identify target NR cell for RRC connection re-establishment to NR inter-frequency cell

Serving cell SSB Ês/Iot (dB)	Frequency range (FR) of target NR cell	$T_{identify_inter_NR,\ i}$ (ms)	
		Known NR cell	Unknown NR cell
≥ -8	FR1	MAX (200 ms, 6 x $T_{SMTC,\ i}$)	MAX (800 ms, 13 x $T_{SMTC,\ i}$)
≥ -8	FR2	N/A	MAX (1000 ms, 104 x $T_{SMTC,\ i}$))
< -8	FR1	N/A	800[Note1]
< -8	FR2	N/A	4000[Note1]
Note 1: The UE is not required to successfully identify a cell on any NR frequency layer when $T_{SMTC,i}$ > 20 ms and serving cell SSB Ês/Iot < -8 dB.			

The normative reference for this requirement is TS 38.133 [6] clauses 6.2.1.2.1.

6.3.2.1.1 NR SA FR1 RRC re-establishment

6.3.2.1.1.1 Test purpose

The purpose is to verify that the NR intra-frequency RRC re-establishment delay in FR1 with known target cell is within the specified limits.

6.3.2.1.1.2 Test applicability

This test applies to all types of NR UE from Release 15 onwards.

6.3.2.1.1.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 6.3.2.1.0.1.

The normative reference for this requirement is TS 38.133 [6] clause A.6.3.2.1.1.

6.3.2.1.1.4 Test description

6.3.2.1.1.4.1 Initial conditions

The Test shall be tested using any of the test configuration in Table 6.3.2.1.1.4.1-1

Table 6.3.2.1.1.4.1-1: Supported test configurations

Configuration	Description
6.3.2.1.1-1	15 kHz SSB SCS, 10MHz bandwidth, FDD duplex mode
6.3.2.1.1-2	15 kHz SSB SCS, 10MHz bandwidth, TDD duplex mode
6.3.2.1.1-3	30 kHz SSB SCS, 40MHz bandwidth, TDD duplex mode
Note: The UE is only required to be tested in one of the supported test configurations.	

Configure the test requirement and the DUT according to the parameters in Table 6.3.2.1.1.4.1-2

Table 6.3.2.1.1.4.1-2: Initial conditions for NR Intra-frequency RRC Re-establishment in FR1

Parameter	Value		Comment
Test environment	NC		As specified in TS 38.508-1 [14] clause 4.1.
Test frequencies	As specified in Annex E, Table E.4-1 and TS 38.508-1 [14] clause 4.3.1.		
Channel bandwidth	As specified by the test configuration selected from Table 6.3.2.1.1.4.1-1.		
Propagation conditions	AWGN		As specified in Annex C.2.2.
Connection Diagram	TE Part	A.3.1.8.2	As specified in TS 38.508-1 [14] Annex A.
	DUT Part	A.3.2.3.4	
Exceptions to connection diagram	- Without LTE link - For 4Rx capable UEs without any 2 Rx RF bands use A.3.2.5.2 for DUT part and A.3.1.8.4 for TE Part		

1. The general test parameter settings are set up according to Table 6.3.2.1.1.4.1-3.

2. Message contents are defined in clause 6.3.2.1.1.4.3.

There is one NR carrier and two cells specified in the test. Cell 1 is the cell used for registration with the power level set according to Annex C.1.1 and C.1.2 for this test.

Table 6.3.2.1.1.4.1-3: General test parameters for NR intra-frequency RRC Re-establishment test case in FR1

Parameter		Unit	Test configuration	Value	Comment
Initial condition	Active cell		1, 2, 3	Cell1	
	Neighbour cells		1, 2, 3	Cell2	
Final condition	Active cell		1, 2, 3	Cell2	
RF Channel Number			1, 2, 3	1	
Time offset between cells			1	3 ms	Asynchronous cells
			2	3 μs	Synchronous cells
			3	3 μs	Synchronous cells
N310		-	1, 2, 3	1	Maximum consecutive out-of-sync indications from lower layers
N311		-	1, 2, 3	1	Minimum consecutive in-sync indications from lower layers
T310		ms	1, 2, 3	0	Radio link failure timer
T311		ms	1, 2, 3	3000	RRC re-establishment timer
Access Barring Information		-	1, 2, 3	Not Sent	No additional delays in random access procedure.
SSB configuration			1	SSB.1 FR1	
			2	SSB.1 FR1	
			3	SSB.2 FR1	
SMTC configuration			1	SMTC.2	
			2	SMTC.1	
			3	SMTC.1	
DRX cycle length		s	1, 2, 3	OFF	
PRACH configuration			1, 2, 3	PRACH.1 FR1	Table A.7.1-1
T1		s	1, 2, 3	5	
T2		ms	1, 2, 3	240	Time for the UE to detect RLF (Summation of $T_{Evaluate_out_SSB}$ defined in clause 8.1 in TS 38.133, T310 and the period for UE turns off transmitter defined in clause 8.1.5 in TS 38.133)
T3		s	1, 2, 3	2	

6.3.2.1.1.4.2 Test procedure

The test consists of 3 successive time periods, with time duration of T1, T2 and T3 respectively. At the start of time period T2, cell 1, which is the active cell, is deactivated. The time period T3 starts after the occurrence of the radio link failure.

1. Ensure the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity *NR*, Connected without release *On* and Test Mode *On* according to TS 38.508-1 [14] clause 4.5. Establish SRB2 and DRB in the RRC Reconfiguration message.
2. Set the parameters according to T1 in Table 6.3.2.1.1.5-1. T1 starts.
3. SS shall transmit an RRCReconfiguration message.
4. The UE shall transmit RRCReconfigurationComplete message.
5. When T1 expires, the SS shall switch the power setting from T1 to T2 as specified in Table 6.3.2.1.1.5-1. T2 starts
6. When T2 expires, the SS shall switch the power setting from T2 to T3 as specified in Table 6.3.2.1.1.5-1. T3 starts
7. If the UE starts to send PRACH preambles to cell 2 for sending the *RRCReestablishmentRequest* message to cell 2 within 1.6 s from the beginning of time period T3, then the number of successful tests is increased by one. Otherwise, the number of failure tests is increased by one.
8. After T3 expires, cause UE handover back to Cell 1 (if the handover fails, switch off the UE) or switch off the UE. Then ensure the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity *NR*, Connected without release *On* according to TS 38.508-1 [14] clause 4.5. Cell 1 is the active cell.
9. Repeat step 2-8 until the confidence level according to Table G.2.3-1 in Annex G clause G.2 is achieved.

6.3.2.1.1.4.3 Message contents

Message contents are according to TS 38.508-1 [14] clause 7.3with the following exceptions:

Table 6.3.2.1.1.4.3-1: Common Exception messages intra-frequency RRC re-establishment

Default Message Contents	
Common contents of system information blocks exceptions	
Default RRC messages and information elements contents exceptions	
Specific message contents exceptions for Test Configuration 6.3.2.1.1-1	Table H.3.1-3 with Condition INTRA-FREQ MO, SSB.1 FR1 Table 7.3.1-3 in TS 38.508-1 [14] with condition SMTC.2
Specific message contents exceptions for Test Configuration 6.3.2.1.1-2	Table H.3.1-3 with Condition INTRA-FREQ MO, SSB.1 FR1 and synchronous cells Table 7.3.1-3 in TS 38.508-1 [14] with condition SMTC.1
Specific message contents exceptions for Test Configuration 6.3.2.1.1-3	Table H.3.1-3 with Condition INTRA-FREQ MO, SSB.2 FR1 and synchronous cells Table 7.3.1-3 in TS 38.508-1 [14] with condition SMTC.1

Table 6.3.2.1.1.4.3-2: *RLF-TimersAndConstants* for intra-frequency RRC re-establishment

Derivation Path: TS 38.508-1 [14], Table 4.6.3-150			
Information Element	**Value/remark**	**Comment**	**Condition**
RLF-TimersAndConstants ::= SEQUENCE {			
t310	ms0		
t311	ms3000		
}			

Table 6.3.2.1.1.4.3-3: *MeasConfig* for intra-frequency RRC re-establishment

Derivation Path: TS 38.508-1 [14], Table 4.6.3-69			
Information Element	**Value/remark**	**Comment**	**Condition**
MeasConfig::= SEQUENCE {			
reportConfigToAddModList	Not present		

measIdToAddModList	Not present		
quantityConfig	Not present		
}			

6.3.2.1.1.5 Test requirement

Table 6.3.2.1.1.5-1 defines the primary level settings including test tolerances for NR Intra-frequency RRC Re-establishment in FR1 test case.

Table 6.3.2.1.1.5-1: Cell specific test parameters for NR intra-frequency RRC Re-establishment test case in FR1

Parameter	Unit	Test configuration	Cell 1			Cell 2		
			T1	T2	T3	T1	T2	T3
TDD configuration		1	N/A			N/A		
		2	TDDConf.1.1			TDDConf.1.1		
		3	TDDConf.2.1			TDDConf.2.1		
PDSCH RMC configuration		1	SR.1.1 FDD			SR.1.1 FDD		
		2	SR.1.1 TDD			SR.1.1 FDD		
		3	SR.2.1 TDD			SR.2.1 FDD		
RMSI CORESET RMC configuration		1	CR.1.1 FDD			CR.1.1 FDD		
		2	CR.1.1 TDD			CR.1.1 TDD		
		3	CR.2.1 TDD			CR.2.1 TDD		
Dedicated CORESET RMC configuration		1	CCR.1.1 FDD			CCR.1.1 FDD		
		2	CCR.1.1 TDD			CCR.1.1 TDD		
		3	CCR.2.1 TDD			CCR.2.1 TDD		
OCNG Pattern		1, 2, 3	OP.1 defined in A.3.2.1			OP.1 defined in A.3.2.1		
TRS configuration		1	TRS.1.1 FDD			TRS.1.1 FDD		
		2	TRS.1.1 TDD			TRS.1.1 TDD		
		3	TRS.1.2 TDD			TRS.1.2 TDD		
Initial DL BWP configuration		1, 2, 3	DLBWP.0.1			DLBWP.0.1		
Initial UL BWP configuration		1, 2, 3	ULBWP.0.1			ULBWP.0.1		
Active DL BWP configuration		1, 2, 3	DLBWP.1.1	N/A	N/A	N/A	N/A	DLBWP.1.1
Active UL BWP configuration		1, 2, 3	ULBWP.1.1	N/A	N/A	N/A	N/A	ULBWP.1.1
RLM-RS		1, 2, 3	SSB			SSB		
$\hat{E}_s/I_{ot}$	dB	1	1.54	-infinity	-infinity	-3.79	4	4
		2						
		3						
N_{oc} Note2	dBm/SCS	1	-98					
		2	-98					
		3	-95					
N_{oc} Note2	dBm/15 kHz	1	-98					
		2						
		3						
$\hat{E}_s/N_{oc}$	dB	1	7	-infinity	-infinity	4	4	4
		2						
		3						
SS-RSRP Note3	dBm/SCS	1	-91	-infinity	-infinity	-94	-94	-94
		2	-91	-infinity	-infinity	-94	-94	-94
		3	-88	-infinity	-infinity	-91	-91	-91
Io	dBm/9.36 MHz	1	-60.74	-64.59	-64.59	-60.74	-64.59	-64.59
	dBm/9.36 MHz	2	-60.74	-64.59	-64.59	-60.74	-64.59	-64.59
	dBm/38.16 MHz	3	-54.65	-58.50	-58.50	-54.65	-58.50	-58.50
Propagation Condition		1, 2, 3	AWGN					

Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.
Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for N_{oc} to be fulfilled.
Note 3: SS-RSRP levels have been derived from other parameters for information purposes. They are not settable parameters themselves.

The RRC re-establishment delay is defined as the time from the start of time period T3, to the moment when the UE starts to send PRACH preambles to cell 2 for sending the *RRCReestablishmentRequest* message to cell 2.

The RRC re-establishment delay to a known NR intra frequency cell shall be less than 1.6 s.

The rate of correct RRC re-establishments observed during repeated tests shall be at least 90%.

NOTE: The RRC re-establishment delay in the test is derived from the following expression:

$$T_{re\text{-}establish_delay} = T_{UL_grant} + T_{UE_re\text{-}establish_delay}.$$

Where:

T_{UL_grant} = It is the time required to acquire and process uplink grant from the target cell. The PRACH reception at the system simulator is used as a trigger for the completion of the test; hence T_{UL_grant} is not used.

$$T_{UE_re-establish_delay} = 50 + T_{identify_intra_NR} + \sum_{i=1}^{Nfreq-1} T_{identify_inter_NR,i} + T_{SI-NR} + T_{PRACH}$$

$N_{freq} = 1$

$T_{identify_intra_NR}$ = 200 ms

T_{SI} = 1280 ms; it is the time required for receiving all the relevant system information as defined in TS 38.331 for the target intra-frequency NR cell.

T_{PRACH} = 15 ms; it is the additional delay caused by the random access procedure.

This gives a total of 1545 ms, allow 1.6 s in the test case.

6.3.2.1.2 NR SA FR1 - FR1 RRC re-establishment

6.3.2.1.2.1 Test purpose

The purpose is to verify that the NR inter-frequency RRC re-establishment delay in FR1 without known target cell is within the specified limits.

6.3.2.1.2.2 Test applicability

This test applies to all types of NR UE from Release 15 onwards.

6.3.2.1.2.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 6.3.2.1.0.1.

The normative reference for this requirement is TS 38.133 [6] A.6.3.2.1.2.

6.3.2.1.2.4 Test description

6.3.2.1.2.4.1 Initial conditions

The Test shall be tested using any of the test configuration in Table 6.3.2.1.2.4.1-1

Table 6.3.2.1.2.4.1-1: Supported test configurations

Configuration	Description of serving cell	Description of target cell
6.3.2.1.2-1	15 kHz SSB SCS, 10MHz bandwidth, FDD duplex mode	15 kHz SSB SCS, 10MHz bandwidth, FDD duplex mode
6.3.2.1.2-2	15 kHz SSB SCS, 10MHz bandwidth, TDD duplex mode	15 kHz SSB SCS, 10MHz bandwidth, TDD duplex mode
6.3.2.1.2-3	30 kHz SSB SCS, 40MHz bandwidth, TDD duplex mode	30 kHz SSB SCS, 40MHz bandwidth, TDD duplex mode
Note: The UE is only required to be tested in one of the supported test configurations.		

Configure the test requirement and the DUT according to the parameters in Table 6.3.2.1.2.4.1-2

Table 6.3.2.1.2.4.1-2: Initial conditions for NR Inter-frequency RRC Re-establishment in FR1

Parameter	Value		Comment
Test environment	NC		As specified in TS 38.508-1 [14] clause 4.1.
Test frequencies	As specified in Annex E, Table E.4-1 and TS 38.508-1 [14] clause 4.3.1.		
Channel bandwidth	As specified by the test configuration selected from Table 6.3.2.1.2.4.1-1.		
Propagation conditions	AWGN		As specified in Annex C.2.2.
Connection Diagram	TE Part	A.3.1.8.2	As specified in TS 38.508-1 [14] Annex A.
	DUT Part	A.3.2.3.4	
Exceptions to connection diagram	Without LTE link - For 4Rx capable UEs without any 2 Rx RF bands use A.3.2.5.2 for DUT part and A.3.1.8.4 for TE Part		

1. The general test parameter settings are set up according to Table 6.3.2.1.2.4.1-3.

2. Message contents are defined in clause 6.3.2.1.2.4.3.

There are two NR carriers and two cells specified in the test. Cell 1 is the cell used for registration with the power level set according to Annex C.1.1 and C.1.2 for this test.

Table 6.3.2.1.2.4.1-3: General test parameters for NR inter-frequency RRC Re-establishment test case in FR1

Parameter		Unit	Test configuration	Value	Comment
Initial condition	Active cell		1, 2, 3	Cell1	
	Neighbour cells		1, 2, 3	Cell2	
Final condition	Active cell		1, 2, 3	Cell2	
RF Channel Number			1, 2, 3	1, 2	
Time offset between cells			1	3 ms	Asynchronous cells
			2	3 μs	Synchronous cells
			3	3 μs	Synchronous cells
N310		-	1, 2, 3	1	Maximum consecutive out-of-sync indications from lower layers
N311		-	1, 2, 3	1	Minimum consecutive in-sync indications from lower layers
T310		ms	1, 2, 3	0	Radio link failure timer
T311		ms	1, 2, 3	5000	RRC re-establishment timer
Access Barring Information		-	1, 2, 3	Not Sent	No additional delays in random access procedure.
SSB configuration			1	SSB.1 FR1	
			2	SSB.1 FR1	
			3	SSB.2 FR1	
SMTC configuration			1	SMTC.2	
			2	SMTC.1	
			3	SMTC.1	
DRX cycle length		s	1, 2, 3	OFF	
PRACH configuration			1, 2, 3	PRACH.1 FR1	Table A.7.1-1
T1		s	1, 2, 3	5	
T2		ms	1, 2, 3	240	Time for the UE to detect RLF (Summation of $T_{Evaluate_out_SSB}$ defined in clause 8.1 in TS 38.133, T310 and the period for UE turns off transmitter defined in clause 8.1.5 in TS 38.133)
T3		s	1, 2, 3	5	

6.3.2.1.2.4.2 Test procedure

The test consists of 3 successive time periods, with time duration of T1, T2 and T3 respectively. At the start of time period T2, cell 1, which is the active cell, becomes inactive. The time period T3 starts after the occurrence of the radio

link failure. During T1, the UE shall be configured with the carrier frequency of cell 2 (with RF Channel Number #2) to ensure that the UE has the context of the carrier frequency of cell 2 by the end of T1.

1. Ensure the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity *NR*, Connected without release *On* and Test Mode *On* according to TS 38.508-1 [14] clause 4.5. Establish SRB2 and DRB in the RRC Reconfiguration message.
2. Set the parameters according to T1 in Table 6.3.2.1.2.5-1. T1 starts.
3. SS shall transmit an RRCReconfiguration message.
4. The UE shall transmit RRCReconfigurationComplete message.
5. When T1 expires, the SS shall switch the power setting from T1 to T2 as specified in Table 6.3.2.1.2.5-1. T2 starts
6. When T2 expires, the SS shall switch the power setting from T2 to T3 as specified in Table 6.3.2.1.2.5-1. T3 starts
7. If the UE starts to send PRACH preambles to cell 2 for sending the *RRCReestablishmentRequest* message to cell 2 within 3 s from the beginning of time period T3, then the number of successful tests is increased by one. Otherwise, the number of failure tests is increased by one.
8. After T3 expires, cause UE handover back to Cell 1 (if the handover fails, switch off the UE) or switch off the UE. Then ensure the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity *NR*, Connected without release *On* according to TS 38.508-1 [14] clause 4.5. Cell 1 is the active cell.
9. Set cell 2 physical cell identity = ((current cell 2 physical cell identity + 1) mod 14 + 2) for next iteration of the test procedure loop.
10. Repeat step 2-9 until the confidence level according to Table G.2.3-1 in Annex G clause G.2 is achieved.

6.3.2.1.2.4.3 Message contents

Message contents are according to TS 38.508-1 [14] clause 7.3with the following exceptions:

Table 6.3.2.1.2.4.3-1: Common Exception messages inter-frequency RRC re-establishment

Default Message Contents	
Common contents of system information blocks exceptions	
Default RRC messages and information elements contents exceptions	
Specific message contents exceptions for Test Configuration 6.3.2.1.2-1	Table H.3.1-3 with Condition INTER-FREQ MO, SSB.1 FR1 Table 7.3.1-3 in TS 38.508-1 [14] with condition SMTC.2
Specific message contents exceptions for Test Configuration 6.3.2.1.2-2	Table H.3.1-3 with Condition INTER-FREQ MO, SSB.1 FR1 and Synchronous cells Table 7.3.1-3 in TS 38.508-1 [14] with condition SMTC.1
Specific message contents exceptions for Test Configuration 6.3.2.1.2-3	Table H.3.1-3 with Condition INTER-FREQ MO, SSB.2 FR1 and Synchronous cells Table 7.3.1-3 in TS 38.508-1 [14] with condition SMTC.1

Table 6.3.2.1.2.4.3-2: *RLF-TimersAndConstants* for inter-frequency RRC re-establishment

Derivation Path: TS 38.508-1 [14], Table 4.6.3-150			
Information Element	**Value/remark**	**Comment**	**Condition**
RLF-TimersAndConstants ::= SEQUENCE {			
t310	ms0		
t311	ms5000		
}			

Table 6.3.2.1.2.4.3-3: *MeasConfig* for inter-frequency RRC re-establishment

Derivation Path: TS 38.508-1 [14], Table 4.6.3-69			
Information Element	**Value/remark**	**Comment**	**Condition**

MeasConfig::= SEQUENCE {			
reportConfigToAddModList	Not present		
measIdToAddModList	Not present		
quantityConfig	Not present		
}			

6.3.2.1.2.5 Test requirement

Table 6.3.2.1.2.5-1 defines the primary level settings including test tolerances for NR Inter-frequency RRC Re-establishment in FR1 test case.

Table 6.3.2.1.2.5-1: Cell specific test parameters for NR inter-frequency RRC Re-establishment test case in FR1

Parameter	Unit	Test configuration	Cell 1			Cell 2		
			T1	T2	T3	T1	T2	T3
RF Channel Number		1, 2, 3	1			2		
TDD configuration		1	N/A			N/A		
		2	TDDConf.1.1			TDDConf.1.1		
		3	TDDConf.2.1			TDDConf.2.1		
PDSCH RMC configuration		1	SR.1.1 FDD			SR.1.1 FDD		
		2	SR.1.1 TDD			SR.1.1 TDD		
		3	SR.2.1 TDD			SR.2.1 TDD		
RMSI CORESET RMC configuration		1	CR.1.1 FDD			CR.1.1 FDD		
		2	CR.1.1 TDD			CR.1.1 TDD		
		3	CR.2.1 TDD			CR.2.1 TDD		
Dedicated CORESET RMC configuration		1	CCR.1.1 FDD			CCR.1.1 FDD		
		2	CCR.1.1 TDD			CCR.1.1 TDD		
		3	CCR.2.1 TDD			CCR.2.1 TDD		
OCNG Pattern		1, 2, 3	OP.1 defined in A.3.2.1			OP.1 defined in A.3.2.1		
TRS configuration		1	TRS.1.1 FDD			TRS.1.1 FDD		
		2	TRS.1.1 TDD			TRS.1.1 TDD		
		3	TRS.1.2 TDD			TRS.1.2 TDD		
Initial DL BWP configuration		1, 2, 3	DLBWP.0.1			DLBWP.0.1		
Initial UL BWP configuration		1, 2, 3	ULBWP.0.1			ULBWP.0.1		
Active DL BWP configuration		1, 2, 3	DLBWP.1.1	N/A	N/A	N/A	N/A	DLBWP.1.1
Active UL BWP configuration		1, 2, 3	ULBWP.1.1	N/A	N/A	N/A	N/A	ULBWP.1.1
RLM-RS		1, 2, 3	SSB			SSB		
$\hat{E}_s / I_{ot}$	dB	1	4	-infinity	-infinity	-infinity	-infinity	7
		2						
		3						
N_{oc} Note2	dBm/SCS	1	-98					
		2	-98					
		3	-95					
N_{oc} Note2	dBm/15 kHz	1	-98					
		2						
		3						
$\hat{E}_s / N_{oc}$	dB	1	4	-infinity	-infinity	-infinity	-infinity	7
		2						
		3						
SS-RSRP Note3	dBm/SCS	1	-94	-infinity	-infinity	-infinity	-infinity	-91
		2	-94	-infinity	-infinity	-infinity	-infinity	-91
		3	-91	-infinity	-infinity	-infinity	-infinity	-88
Io	dBm/9.36 MHz	1	-64.59	-70.05	-70.05	-70.05	-70.05	-62.26
	dBm/9.36 MHz	2	-64.59	-70.05	-70.05	-70.05	-70.05	-62.26
	dBm/38.16 MHz	3	-58.50	-63.94	-63.94	-63.94	-63.94	-56.15
Propagation Condition		1, 2, 3	AWGN					

Parameter	Unit	Test configuration	Cell 1			Cell 2		
			T1	T2	T3	T1	T2	T3
Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.								
Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for N_{oc} to be fulfilled.								
Note 3: SS-RSRP levels have been derived from other parameters for information purposes. They are not settable parameters themselves.								

The RRC re-establishment delay is defined as the time from the start of time period T3, to the moment when the UE starts to send PRACH preambles to cell 2 for sending the *RRCReestablishmentRequest* message to cell 2.

The RRC re-establishment delay to an unknown NR inter frequency cell shall be less than 3 s.

The rate of correct RRC re-establishments observed during repeated tests shall be at least 90%.

NOTE: The RRC re-establishment delay in the test is derived from the following expression:

$$T_{re\text{-}establish_delay} = T_{UL_grant} + T_{UE_re\text{-}establish_delay}.$$

Where:

T_{UL_grant} = It is the time required to acquire and process uplink grant from the target cell. The PRACH reception at the system simulator is used as a trigger for the completion of the test; hence T_{UL_grant} is not used.

$$T_{UE_re-establish_delay} = 50 + T_{identify_intra_NR} + \sum_{i=1}^{Nfreq-1} T_{identify_inter_NR,i} + T_{SI-NR} + T_{PRACH}$$

$N_{freq} = 2$

$T_{identify_intra_NR}$ = 800 ms

$T_{identify_inter_NR}$ = 800 ms

T_{SI} = 1280 ms; it is the time required for receiving all the relevant system information as defined in TS 38.331 for the target inter-frequency NR cell.

T_{PRACH} = 15 ms; it is the additional delay caused by the random access procedure.

This gives a total of 2945 ms, allow 3 s in the test case.

6.3.2.1.3 NR SA FR1 RRC re-establishment without serving cell timing

6.3.2.1.3.1 Test purpose

The purpose is to verify that the NR intra-frequency RRC re-establishment delay in FR1 without serving cell timing is within the specified limits and to verify the requirements in TS 38.133 [6] clause 6.2.1

6.3.2.1.3.2 Test applicability

This test applies to all types of NR UE from Release 15 onwards.

6.3.2.1.3.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 6.3.2.1.0.1.

The normative reference for this requirement is TS 38.133 [6] clause A.6.3.2.1.3.

6.3.2.1.3.4 Test description

6.3.2.1.3.4.1 Initial conditions

The test shall be tested using any of the test configuration in Table 6.3.2.1.3.4.1-1

Table 6.3.2.1.3.4.1-1: Supported test configurations

Configuration	Description
6.3.2.1.3-1	15 kHz SSB SCS, 10MHz bandwidth, FDD duplex mode
6.3.2.1.3-2	15 kHz SSB SCS, 10MHz bandwidth, TDD duplex mode
6.3.2.1.3-3	30 kHz SSB SCS, 40MHz bandwidth, TDD duplex mode
Note: The UE is only required to be tested in one of the supported test configurations.	

Configure the test requirement and the DUT according to the parameters in Table 6.3.2.1.3.4.1-2

Table 6.3.2.1.3.4.1-2: Initial conditions for NR SA FR1 RRC re-establishment without serving cell timing

Parameter	Value		Comment
Test environment	NC		As specified in TS 38.508-1 [14] clause 4.1.
Test frequencies	As specified in Annex E, Table E.4-1 and TS 38.508-1 [14] clause 4.3.1.		
Channel bandwidth	As specified by the test configuration selected from Table 6.3.2.1.3.4.1-1.		
Propagation conditions	AWGN		As specified in Annex C.2.2.
Connection Diagram	TE Part	A.3.1.8.2	As specified in TS 38.508-1 [14] Annex A.
	DUT Part	A.3.2.3.4	
Exceptions to connection diagram	- Without LTE link - For 4Rx capable UEs without any 2 Rx RF bands use A.3.2.5.2 for DUT part and A.3.1.8.4 for TE Part		

1. The general test parameter settings are set up according to Table 6.3.2.1.3.4.1-3.
2. Message contents are defined in clause 6.3.2.1.3.4.3.
3. There is one NR carrier and two cells specified in the test. Cell 1 is the cell used for connection setup with the power level set according to Annex C.1.2 and C.1.3 for this test.

Table 6.3.2.1.3.4.1-3: General test parameters for NR SA FR1 RRC re-establishment without serving cell timing

Parameter		Unit	Test configuration	Value	Comment
Initial condition	Active cell		1, 2, 3	Cell1	
	Neighbour cells		1, 2, 3	Cell2	
Final condition	Active cell		1, 2, 3	Cell2	
RF Channel Number			1, 2, 3	1	
Time offset between cells			1	3 ms	Asynchronous cells
			2	3 µs	Synchronous cells
			3	3 µs	Synchronous cells
N310		-	1, 2, 3	1	Maximum consecutive out-of-sync indications from lower layers
N311		-	1, 2, 3	1	Minimum consecutive in-sync indications from lower layers
T310		ms	1, 2, 3	6000	Radio link failure timer configured by *RLF-TimersAndConstants*
T311		ms	1, 2, 3	3000	RRC re-establishment timer
Access Barring Information		-	1, 2, 3	Not Sent	No additional delays in random access procedure.
SSB configuration			1	SSB.1 FR1	
			2	SSB.1 FR1	
			3	SSB.2 FR1	
SMTC configuration			1	SMTC.2	
			2	SMTC.1	
			3	SMTC.1	
DRX cycle length		s	1, 2, 3	OFF	
PRACH configuration			1, 2, 3	PRACH.1 FR1	

T1	s	1, 2, 3	5	
T2	s	1, 2, 3	6.24	Time for the UE to detect RLF (Summation of TEvaluate_out_SSB defined in clause 8.1 in TS 38.133 [6], T310 and the period for UE turns off transmitter defined in clause 8.1.5 in TS 38.133 [6])
T3	s	1, 2, 3	3	

6.3.2.1.3.4.2 Test procedure

The test consists of 3 successive time periods, with time duration of T1, T2 and T3 respectively. At the start of time period T2, cell 1, which is the active cell, is deactivated. The time period T3 starts after the occurrence of the radio link failure.

1. Ensure the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity *NR*, Connected without release *On* and Test Mode *On* according to TS 38.508-1 [14] clause 4.5. Establish SRB2 and DRB in the RRC Reconfiguration message.
2. Set the parameters according to T1 in Table 6.3.2.1.3.5-1. T1 starts.
3. SS shall transmit an RRCReconfiguration message.
4. The UE shall transmit RRCReconfigurationComplete message.
5. When T1 expires, the SS shall switch the power setting from T1 to T2 as specified in Table 6.3.2.1.3.5-1. T2 starts
6. When T2 expires, the SS shall switch the power setting from T2 to T3 as specified in Table 6.3.2.1.3.5-1. T3 starts
7. If the UE starts to send PRACH preambles to cell 2 for sending the *RRCReestablishmentRequest* message to cell 2 within 2.2 s from the beginning of time period T3, then the number of successful tests is increased by one. Otherwise, the number of failure tests is increased by one.
8. After T3 expires, switch off the UE. Then ensure the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity *NR*, Connected without release *On* and Test Mode *On* according to TS 38.508-1 [14] clause 4.5. Cell 1 is the active cell.
9. Set cell 2 physical cell identity = ((current cell 2 physical cell identity + 1) mod 14 + 2) for next iteration of the test procedure loop.
10. Repeat step 2-9 until the confidence level according to Table G.2.3-1 in Annex G clause G.2 is achieved.

6.3.2.1.3.4.3 Message contents

Message contents are according to TS 38.508-1 [14] clause 7.3 with the following exceptions:

Table 6.3.2.1.3.4.3-1: Common Exception messages for NR SA FR1 RRC re-establishment without serving cell timing

Default Message Contents	
Common contents of system information blocks exceptions	
Default RRC messages and information elements contents exceptions	
Specific message contents exceptions for Test Configuration 6.3.2.1.3-1	Table H.3.1-3 with Condition INTRA-FREQ MO, SSB.1 FR1 Table 7.3.1-3 in TS 38.508-1 [14] with condition SMTC.2
Specific message contents exceptions for Test Configuration 6.3.2.1.3-2	Table H.3.1-3 with Condition INTRA-FREQ MO, SSB.1 FR1 and synchronous cells Table 7.3.1-3 in TS 38.508-1 [14] with condition SMTC.1
Specific message contents exceptions for Test Configuration 6.3.2.1.3-3	Table H.3.1-3 with Condition INTRA-FREQ MO, SSB.2 FR1 and synchronous cells Table 7.3.1-3 in TS 38.508-1 [14] with condition SMTC.1

Table 6.3.2.1.3.4.3-2: *RLF-TimersAndConstants for intra-frequency RRC re-establishment*

Derivation Path: TS 38.508-1 [14], Table 4.6.3-150			
Information Element	**Value/remark**	**Comment**	**Condition**
RLF-TimersAndConstants ::= SEQUENCE {			
t310	ms6000		
t311	ms3000		
}			

Table 6.3.2.1.3.4.3-3: *MeasConfig* for intra-frequency RRC re-establishment

Derivation Path: TS 38.508-1 [14], Table 4.6.3-69			
Information Element	**Value/remark**	**Comment**	**Condition**
MeasConfig::= SEQUENCE {			
reportConfigToAddModList	Not present		
measIdToAddModList	Not present		
quantityConfig	Not present		
}			

6.3.2.1.3.5 Test requirement

Table 6.3.2.1.3.5-1 defines the primary level settings including test tolerances for NR SA FR1 RRC re-establishment without serving cell timing test case.

Table 6.3.2.1.3.5-1: Cell specific test parameters for NR SA FR1 RRC re-establishment without serving cell timing

Parameter	Unit	Test configuration	Cell 1			Cell 2		
			T1	T2	T3	T1	T2	T3
TDD configuration		1	N/A			N/A		
		2	TDDConf.1.1			TDDConf.1.1		
		3	TDDConf.2.1			TDDConf.2.1		
PDSCH RMC configuration		1	SR.1.1 FDD			SR.1.1 FDD		
		2	SR.1.1 TDD			SR.1.1 TDD		
		3	SR.2.1 TDD			SR.2.1 TDD		
RMSI CORESET RMC configuration		1	CR.1.1 FDD			CR.1.1 FDD		
		2	CR.1.1 TDD			CR.1.1 TDD		
		3	CR.2.1 TDD			CR.2.1 TDD		
Dedicated CORESET RMC configuration		1	CCR.1.1 FDD			CCR.1.1 FDD		
		2	CCR.1.1 TDD			CCR.1.1 TDD		
		3	CCR.2.1 TDD			CCR.2.1 TDD		
OCNG Pattern		1, 2, 3	OP.1			OP.1		
TRS Configuration		1	TRS.1.1.FDD			TRS.1.1.FDD		
		2	TRS.1.1.TDD			TRS.1.1.TDD		
		3	TRS.1.2.FDD			TRS.1.2.TDD		
Initial DL BWP configuration		1, 2, 3	DLBWP.0.1			DLBWP.0.1		
Initial UL BWP configuration		1, 2, 3	ULBWP.0.1			ULBWP.0.1		
RLM-RS		1, 2, 3	SSB			SSB		
$\hat{E}_s/I_{ot}$	dB	1	4	-infinity	-infinity	-infinity	-infinity	4
		2						
		3						
N_{oc} Note2	dBm/SCS	1	-98					
		2	-98					
		3	-95					
N_{oc} Note2	dBm/15 kHz	1	-98					
		2						
		3						
$\hat{E}_s/N_{oc}$	dB	1	4	-infinity	-infinity	-infinity	-infinity	4
		2						
		3						
SS-RSRP Note3	dBm/SCS	1	-94	-infinity	-infinity	-infinity	-infinity	-94

Parameter	Unit	Test configuration	Cell 1			Cell 2		
			T1	T2	T3	T1	T2	T3
		2	-94	-infinity	-infinity	-infinity	-infinity	-94
		3	-91	-infinity	-infinity	-infinity	-infinity	-91
Io	dBm/9.36 MHz	1	-64.59	-70.05	-70.05	-70.05	-70.05	-64.59
	dBm/9.36 MHz	2	-64.59	-70.05	-70.05	-70.05	-70.05	-64.59
	dBm/38.16 MHz	3	-58.50	-63.94	-63.94	-63.94	-63.94	-58.50
Propagation Condition		1, 2, 3	AWGN					
Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols. Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for N_{oc} to be fulfilled. Note 3: SS-RSRP levels have been derived from other parameters for information purposes. They are not settable parameters themselves.								

The RRC re-establishment delay is defined as the time from the start of time period T3, to the moment when the UE starts to send PRACH preambles to cell 2 for sending the *RRCReestablishmentRequest* message to cell 2.

The RRC re-establishment delay to an unknown NR intra frequency cell without serving cell timing shall be less than 2.2 s.

The rate of correct RRC re-establishments observed during repeated tests shall be at least 90%.

NOTE: The RRC re-establishment delay in the test is derived from the following expression:

$$T_{re\text{-}establish_delay} = T_{UL_grant} + T_{UE_re\text{-}establish_delay}.$$

Where:

T_{UL_grant} = It is the time required to acquire and process uplink grant from the target cell. The PRACH reception at the system simulator is used as a trigger for the completion of the test; hence T_{UL_grant} is not used.

$$T_{UE_re-establish_delay} = 50 + T_{identify_intra_NR} + \sum_{i=1}^{Nfreq-1} T_{identify_inter_NR,i} + T_{SI-NR} + T_{PRACH}$$

$N_{freq} = 1$

$T_{identify_intra_NR}$ = 800 ms

T_{SI} = 1280 ms; it is the time required for receiving all the relevant system information as defined in TS 38.331 [13] for the target intra-frequency NR cell.

T_{PRACH} = 15 ms; it is the additional delay caused by the random access procedure.

This gives a total of 2145 ms, allow 2.2 s in the test case.

6.3.2.2 Random access

6.3.2.2.0 Minimum conformance requirements

6.3.2.2.0.1 Minimum conformance requirements for Contention based random access

The random access procedure is used when establishing the layer 1 communication between the UE and NG-RAN. The random access is as defined in TS 38.213 [8] clause 7.4 and the control of the RACH transmission is as defined in TS 38.321 [12] clause 5.1.

The UE shall have capability to calculate PRACH transmission power according to the PRACH power formula as defined in TS 38.213 [8] clause 7.4 and apply this power level at the first preamble or additional preambles. The absolute power applied to the first preamble shall have an accuracy as defined in TS 38.101-1 [2] Table 6.3.4.2-1. The relative power applied to additional preambles shall have an accuracy as specified in TS 38.101-1 [2] Table 6.3.4.3-1.

The UE shall indicate a Random Access problem to upper layers if the maximum number of preamble transmission counter has been reached for the random access procedure on PCell or PSCell as specified in TS 38.321 [12] clause 5.1.4.

With the UE selected SSB with SS-RSRP above *rsrp-ThresholdSSB*, UE shall have the capability to select a Random Access Preamble randomly with equal probability from the Random Access Preambles associated with the selected SSB if the association between Random Access Preambles and SS blocks is configured, as specified in clause 5.1.2 in TS 38.321 [12].

With the UE selected SSB with SS-RSRP above *rsrp-ThresholdSSB*, UE shall have the capability to transmit Random Access Preamble on the next available PRACH occasion from the PRACH occasions corresponding to the selected SSB permitted by the restrictions given by the *ra-ssb-OccasionMaskIndex* if configured, if the association between PRACH occasions and SSBs is configured, and PRACH occasion shall be randomly selected with equal probability amongst the selected SSB associated PRACH occasions occurring simultaneously but on different subcarriers, as specified in clause 5.1.2 in TS 38.321 [12].

The UE may stop monitoring for Random Access Response(s) and shall transmit the msg3 if the Random Access Response contains a Random Access Preamble identifier corresponding to the transmitted Random Access Preamble.

The UE shall again perform the Random Access Resource selection procedure defined in clause 5.1.2 in TS 38.321 [12], and transmit with the calculated PRACH transmission power when the backoff time expires if all received Random Access Responses contain Random Access Preamble identifiers that do not match the transmitted Random Access Preamble.

The UE shall again perform the Random Access Resource selection procedure defined in clause 5.1.2 in TS 38.321 [12], and transmit with the calculated PRACH transmission power when the backoff time expires if no Random Access Response is received within the RA Response window defined in clause 5.1.4 in TS 38.321 [12].

The UE shall re-transmit the msg3 upon the reception of an UL grant for msg3 retransmission.

The UE shall send ACK if the Contention Resolution is successful.

The UE shall again perform the Random Access Resource selection procedure defined in clause 5.1.2 in TS 38.321 [12], and transmit with the calculated PRACH transmission power when the backoff time expires unless the received message includes a UE Contention Resolution Identity MAC control element and the UE Contention Resolution Identity included in the MAC control element matches the CCCH SDU transmitted in the uplink message.

The UE shall re-select a preamble and transmit with the calculated PRACH transmission power when the backoff time expires if the Contention Resolution Timer expires.

The normative reference for this requirement is TS 38.133 [6] clauses 6.2.2.

6.3.2.2.0.2 Minimum conformance requirements for Non-Contention based random access

The random access procedure is used when establishing the layer 1 communication between the UE and NG-RAN. The random access is as defined in TS 38.213 [8] clause 7.4 and the control of the RACH transmission is as defined in TS 38.321 [12] clause 5.1.

The UE shall have capability to calculate PRACH transmission power according to the PRACH power formula as defined in TS 38.213 [8] clause 7.4 and apply this power level at the first preamble or additional preambles. The absolute power applied to the first preamble shall have an accuracy as defined in TS 38.101-1 [2] Table 6.3.4.2-1. The relative power applied to additional preambles shall have an accuracy as specified in TS 38.101-1 [2] Table 6.3.4.3-1.

The UE shall indicate a Random Access problem to upper layers if the maximum number of preamble transmission counter has been reached for the random access procedure on PCell or PSCell as specified in TS 38.321 [12] clause 5.1.4.

If the contention-free Random Access Resources and the contention-free PRACH occasions associated with SSBs is configured, with the UE selected SSB with SS-RSRP above *rsrp-ThresholdSSB* amongst the associated SSBs, UE shall have the capability to select the Random Access Preamble corresponding to the selected SSB, and to transmit Random Access Preamble on the next available PRACH occasion from the PRACH occasions corresponding to the selected SSB permitted by the restrictions given by the *ra-ssb-OccasionMaskIndex* if configured, and PRACH occasion shall be randomly selected with equal probability amongst the selected SSB associated PRACH occasions occurring simultaneously but on different subcarriers, as specified in clause 5.1.2 in TS 38.321 [12].

If the contention-free Random Access Resources and the contention-free PRACH occasions associated with CSI-RSs is configured, with the UE selected CSI-RS with CSI-RSRP above *cfra-csirs-DedicatedRACH-Threshold* amongst the associated CSI-RSs, UE shall have the capability to select the Random Access Preamble corresponding to the selected CSI-RS, and to transmit Random Access Preamble on the next available PRACH occasion from the PRACH occasions in *ra-OccasionList* corresponding to the selected CSI-RS, and PRACH occasion shall be randomly selected with equal probability amongst the selected CSI-RS associated PRACH occasions occurring simultaneously but on different subcarriers, as specified in clause 5.1.2 in TS 38.321 [12].

The UE may stop monitoring for Random Access Response(s), if the Random Access Response contains a Random Access Preamble identifier corresponding to the transmitted Random Access Preamble, unless the random access procedure is initialized for Other SI request from UE.

The UE shall again perform the Random Access Resource selection procedure defined in clause 5.1.2 in TS 38.321 [12] for the next available PRACH occasion, and transmit the preamble with the calculated PRACH transmission power if all received Random Access Responses contain Random Access Preamble identifiers that do not match the transmitted Random Access Preamble.

The UE shall again perform the Random Access Resource selection procedure defined in clause 5.1.2 in TS 38.321 [12] for the next available PRACH occasion, and transmit the preamble with the calculated PRACH transmission power, if no Random Access Response is received within the RA Response window configured in *RACH-ConfigCommon* or if no PDCCH addressed to UE's C-RNTI is received within the RA Response window configured in *BeamFailureRecoveryConfig*, as defined in clause 5.1.4 in TS 38.321 [12].

The normative reference for this requirement is TS 38.133 [6] clauses 6.2.2.

Non-contention based random access procedure is not initialized for Other SI requested from UE or for beam failure recovery, so the requirements related to those features are omitted.

6.3.2.2.1 NR SA FR1 contention based random access

6.3.2.2.1.1 Test purpose

The purpose of this test is to verify that the behaviour of the random access procedure is according to the requirements and that the PRACH power settings and timing are within specified limits.

6.3.2.2.1.2 Test applicability

This test applies to all types of NR UE from Release 15 onwards.

6.3.2.2.1.3 Minimum conformance requirement

The minimum conformance requirements are specified in clause 6.3.2.2.0.1.

The normative reference for this requirement is TS 38.133 [6] clauses A.6.3.2.2.1.

6.3.2.2.1.4 Test description

6.3.2.2.1.4.1 Initial conditions

This test can be run in the configurations defined in Table 6.3.2.2.1.4.1-1.

Table 6.3.2.2.1.4.1-1: Contention based random access test in FR1 for NR standalone supported test configurations

Test Case ID	Test Config Index	Description
6.3.2.2.1-1	1	NR: 15 kHz SSB SCS, 10MHz bandwidth, FDD
6.3.2.2.1-2	2	NR: 30 kHz SSB SCS, 40MHz bandwidth, TDD
Note: The UE is only required to be tested in one of the supported test configurations		

Configure the test equipment and the DUT according to the parameters in Table 6.3.2.2.1.4.1-2.

Table 6.3.2.2.1.4.1-2: Initial conditions for Contention based random access test in FR1 for NR standalone

Parameter	Value	Comment

Test environment	NC		As specified in TS 38.508-1 [14] clause 4.1.
Test frequencies	As specified in Annex E, Table E.4-1 and TS 38.508-1 [14] clause 4.3.1.		
Channel bandwidth	As specified by the test configuration selected from Table 6.3.2.2.1.4.1-1.		
Propagation conditions	AWGN		As specified in Annex C.2.2.
Connection Diagram	TE Part	A.3.1.7.1	As specified in TS 38.508-1 [14] Annex A.
	DUT Part	A.3.2.3.4	
Exceptions to connection diagram	N/A		

1. Message contents are defined in clause 6.3.2.2.1.4.3.

2. Cell 1 is the NR FR1 serving cell (PCell). The connection setup is done according to the settings in Annex C.1.1 and C.1.2.

6.3.2.2.1.4.2 Test procedure

The test consists of a single cell, configured as PCell in FR1. The System Simulator shall not explicitly assign a random access preamble via dedicated signalling in the downlink.

1. Ensure the UE is in state RRC_IDLE with generic procedure parameters Connectivity *NR* and Test Mode *On* according to TS 38.508-1 [14] clause 4.5.

2. Set the parameters according to Table 6.3.2.2.1.5-1.

3. The UE shall establish a connection setup with SS, the random access procedure within the connection setup is used in the test.

4. Test 1: Correct behaviour when transmitting Random Access Preamble

   4.1. The UE shall send a preamble to the System Simulator. The System Simulator shall check that the Random Access Preamble belongs to one of the Random Access Preambles associated with the SSB with index 0, which has SS-RSRP above the configured rsrp-ThresholdSSB.

5. Test 2: Correct behaviour when receiving Random Access Response

   5.1. Repeat steps 1-3.

   5.2. The UE shall send preambles to the System Simulator. In response to the first 4 preambles, the System Simulator shall transmit a Random Access Response containing Random Access Preamble identifiers that do not match the transmitted Random Access Preamble.

   5.3. As the received Random Access Responses contain Random Access Preamble identifiers that do not match the transmitted Random Access Preamble, the UE shall perform the Random Access Resource selection procedure specified in clause 5.1.2 in TS 38.321 [12], and transmit with the calculated PRACH transmission power when the backoff time expires.

   5.4. The System Simulator shall transmit a Random Access Response containing a Random Access Preamble identifier matching the transmitted Random Access Preamble after 5 preambles have been received by the System Simulator.

   5.5. As the received Random Access Response contains a Random Access Preamble identifier that matches the transmitted Random Access Preamble, the UE shall transmit the msg3.

   5.6. Measure the power and timing of the first preamble and it shall not exceed the values specified in 6.3.2.2.1.5. Measure the relative power and timing applied to additional preambles (last 4 preambles) and it shall not exceed the values specified in 6.3.2.2.1.5.

6. Test 3: Correct behaviour when not receiving Random Access Response

   6.1. Repeat steps 1-3.

   6.2. The UE shall send preambles to the System Simulator. The System Simulator shall not respond to the first 4 preambles.

6.3. As no Random Access Response was received within the RA Response window, the UE shall perform the Random Access Resource selection procedure specified in clause 5.1.2 in TS 38.321 [12], and transmit with the calculated PRACH transmission power when the backoff time expires.

6.4. The System Simulator shall transmit a Random Access Response containing a Random Access Preamble identifier matching the transmitted Random Access Preamble after 5 preambles have been received by the System Simulator.

6.5. As the received Random Access Response contains a Random Access Preamble identifier that matches the transmitted Random Access Preamble, the UE shall transmit the msg3.

6.6. Measure the power and timing of the first preamble and it shall not exceed the values specified in 6.3.2.2.1.5. Measure the relative power and timing applied to additional preambles (last 4 preambles) and it shall not exceed the values specified in 6.3.2.2.1.5.

7. Test 4: Correct behaviour when receiving an UL grant for msg3 retransmission

7.1. Repeat steps 1-3.

7.2. The UE shall send a preamble to the System Simulator. The System Simulator shall transmit a Random Access Response containing a Random Access Preamble identifier matching the transmitted Random Access Preamble.

7.3. As the received Random Access Response contains a Random Access Preamble identifier that matches the transmitted Random Access Preamble, the UE shall transmit the msg3.

7.4. The System Simulator shall send PDCCH addressed to the Temporary C-RNTI after receiving the msg3.

7.5. The UE shall re-transmit the msg3.

7.6. The System Simulator shall check if UE re-transmit the msg3.

8. Test 5: Correct behaviour when receiving an unsuccessful UE Contention Resolution

8.1. Repeat steps 1-3.

8.2. The UE shall send a preamble to the System Simulator. The System Simulator shall transmit a Random Access Response containing a Random Access Preamble identifier matching the transmitted Random Access Preamble.

8.3. As the received Random Access Response contains a Random Access Preamble identifier that matches the transmitted Random Access Preamble, the UE shall transmit the msg3.

8.4. The System Simulator shall send a message addressed to the temporary C-RNTI with a UE Contention Resolution Identity included in the MAC control element not matching the CCCH SDU transmitted in msg3 uplink message.

8.5. As the UE Contention Resolution Identity included in the MAC control element did not match the CCCH SDU transmitted in the uplink message, the UE shall perform the Random Access Resource selection procedure specified in clause 5.1.2 in TS 38.321 [12], and transmit with the calculated PRACH transmission power when the backoff time expires.

8.6. Measure the power and timing of the first preamble and it shall not exceed the values specified in 6.3.2.2.1.5.

9. Test 6: Correct behaviour when receiving a successful UE Contention Resolution

9.1. Repeat steps 1-3.

9.2. The UE shall send a preamble to the System Simulator. The System Simulator shall transmit a Random Access Response containing a Random Access Preamble identifier matching the transmitted Random Access Preamble.

9.3. As the received Random Access Response contains a Random Access Preamble identifier that matches the transmitted Random Access Preamble, the UE shall transmit the msg3.

9.4. The System Simulator shall send a message addressed to the temporary C-RNTI with a UE Contention Resolution Identity included in the MAC control element matching the CCCH SDU transmitted in msg3 uplink message.

9.5. As the UE Contention Resolution Identity included in the MAC control element matches the CCCH SDU, the Contention Resolution is successful and the UE shall send ACK.

10. Test 7: Correct behaviour when contention Resolution timer expires

10.1. Repeat steps 1-3.

10.2. The UE shall send a preamble to the System Simulator. The System Simulator shall transmit a Random Access Response containing a Random Access Preamble identifier matching the transmitted Random Access Preamble.

10.3. As the received Random Access Response contains a Random Access Preamble identifier that matches the transmitted Random Access Preamble, the UE shall transmit the msg3.

10.4. The System Simulator shall not send a response.

10.5. As there was no response, the UE shall perform the Random Access Resource selection procedure specified in clause 5.1.2 in TS 38.321 [12], and transmit with the calculated PRACH transmission power when the Contention Resolution Timer expires and then after the backoff timer expires.

10.6. Measure the power and timing of the first preamble and it shall not exceed the values specified in 6.3.2.2.1.5.

6.3.2.2.1.4.3 Message contents

Message contents are according to TS 38.508-1 [14] clause 4.6 with the following exceptions:

Table 6.3.2.2.1.4.3-0: Common Exception messages

Default Message Contents	
Common contents of system information blocks exceptions	
Default RRC messages and information elements contents exceptions	
Common exceptions to the contents of TS 38.508-1 [14]	Table 4.6.3-115 with SSB-Index 0 Table 4.6.3-120 with SSB-Index 0

Table 6.3.2.2.1.4.3-1: *FrequencyInfoUL-SIB* for Contention Based Random Access

Derivation Path: TS 38.508-1 [14], table 4.6.3-62			
Information Element	**Value/remark**	**Comment**	**Condition**
FrequencyInfoUL-SIB SEQUENCE {			
p-Max	23	23 dBm	
}			

Table 6.3.2.2.1.4.3-2: RACH-ConfigCommon for Contention Based Random Access

Derivation Path: TS 38.508-1 [14], table 4.6.3-128			
Information Element	**Value/remark**	**Comment**	**Condition**
RACH-ConfigCommon::= SEQUENCE {			
rach-ConfigGeneric	RACH-ConfigGeneric		
totalNumberOfRA-Preambles	48		
ssb-perRACH-OccasionAndCB-PreamblesPerSSB CHOICE {			
oneFourth	n48		FR1
}			
groupBconfigured SEQUENCE {			
numberOfRA-PreamblesGroupA	48		
}			
ra-ContentionResolutionTimer	sf48		
rsrp-ThresholdSSB	RSRP_51		

prach-RootSequenceIndex CHOICE {			
0			
}			
msg1-SubcarrierSpacing	kHz 15		
	kHz 30		
}			

Table 6.3.2.2.1.4.3-3: RACH-ConfigGeneric for Contention Based Random Access

Derivation Path: TS 38.508-1 [14], table 4.6.3-130			
Information Element	**Value/remark**	**Comment**	**Condition**
RACH-ConfigGeneric ::= SEQUENCE {			
prach-ConfigurationIndex	102		FR1
msg1-FDM	one		FR1
zeroCorrelationZoneConfig	11		
preambleReceivedTargetPower	-120		
preambleTransMax	n6		
powerRampingStep	dB2		
ra-ResponseWindow	sl10		
}			

Table 6.3.2.2.1.4.3-4: *ServingCellConfigCommonSIB* for Contention Based Random Access

Derivation Path: TS 38.508-1 [14], table 4.6.3-169			
Information Element	**Value/remark**	**Comment**	**Condition**
ServingCellConfigCommonSIB ::= SEQUENCE {			
ssb-PositionsInBurst SEQUENCE {			
inOneGroup	'1100 0000'B		
}			
ss-PBCH-BlockPower	-5		
}			

6.3.2.2.1.5 Test requirement

Table 6.3.2.2.1.5-1 defines the primary level settings for contention based random access test in FR1 for NR Standalone. Tables 6.3.2.2.1.5-2, 6.3.2.2.1.5-3 and 6.3.2.2.1.5-4 define the Absolute power limits, Relative power limits and uplink timing error limits respectively, and all include test tolerances.

Table 6.3.2.2.1.5-1: General test parameters for contention based random access test in FR1 for NR Standalone

Parameter		**Unit**	**Test-1**	**Comments**
SSB Configuration	Config 1		SSB.1 FR1	As defined in A.3.1, except for number of SSBs per SS-burst and SS/PBCH block index as below
	Config 2		SSB.2 FR1	
Number of SSBs per SS-burst			2	Different from the definition in A.3.1
SS/PBCH block index			0,1	Different from the definition in A.3.1
Duplex Mode for Cell 1	Config 1		FDD	
	Config 2		TDD	
TDD Configuration	Config 2		TDDConf.2.1	
CSI-RS for tracking	Config 1		TRS.1.1 FDD	
	Config 2		TRS.1.2 TDD	
OCNG Pattern Note 1			OP.1	As defined in A.2.1
PDSCH parameters Note 4	Config 1		SR.1.1 FDD	As defined in A.1.1
	Config 2		SR.2.1 TDD	
RMSI CORESET Reference Channel	Config 1		CR.1.1 FDD	
	Config 2		CR.2.1 TDD	
Dedicated CORESET Reference Channel	Config 1		CCR.1.1 FDD	
	Config 2		CCR.2.1 TDD	

Parameter			Unit	Test-1	Comments
NR RF Channel Number				1	
EPRE ratio of PSS to SSS			dB	0	
EPRE ratio of PBCH_DMRS to SSS			dB		
EPRE ratio of PBCH to PBCH_DMRS			dB		
EPRE ratio of PDCCH_DMRS to SSS			dB		
EPRE ratio of PDCCH to PDCCH_DMRS			dB		
EPRE ratio of PDSCH_DMRS to SSS			dB		
EPRE ratio of PDSCH to PDSCH_DMRS			dB		
SSB with index 0	$\hat{E}_s/I_{ot}$		dB	3	Power of SSB with index 0 is set to be above configured *rsrp-ThresholdSSB*
	N_{oc}	Config 1	dBm/15kHz	-98	
		Config 2		-101	
	$\hat{E}_s/N_{oc}$		dB	3	
	SS-RSRP	Config 1	dBm/15kHz	-95	
		Config 2		-98	
	SS-RSRP		dBm/ SCS	-95	
SSB with index 1	$\hat{E}_s/I_{ot}$		dB	-17	Power of SSB with index 1 is set to be below configured *rsrp-ThresholdSSB*
	N_{oc}	Config 1	dBm/15kHz	-98	
		Config 2		-101	
	$\hat{E}_s/N_{oc}$		dB	-17	
	SS-RSRP	Config 1	dBm/15kHz	-115	
		Config 2		-118	
	SS-RSRP		dBm/ SCS	-115	
Io Note 2		Config 1	dBm	-65.3/9.36MHz	For symbols without SSB index 1
		Config 2		-62.2/38.16MHz	
ss-PBCH-BlockPower			dBm/ SCS	-5	As defined in clause 6.3.2 in TS 38.331 [13].
Configured UE transmitted power ($P_{\mathrm{CMAX,f,c}}$)			dBm	23	As defined in clause 6.2.4 in TS 38.101-1 [2].
PRACH Configuration				FR1 PRACH configuration 1	As defined in A. 7.1.
Propagation Condition			-	AWGN	
Note 1: OCNG shall be used such that the cell is fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols. The OCNG pattern is chosen during the test according to the presence of a DL reference measurement channel. Note 2: Es/Iot, SS-RSRP and Io level have been derived from other parameters for information purpose. They are not settable parameters. Note 3: Void. Note 4: The DL PDSCH reference measurement channel is used in the test only when a downlink transmission dedicated to the UE under test is required.					

Test 1: Correct behaviour when transmitting Random Access Preamble

- The Random Access Preamble shall be one of the Random Access Preambles associated with SSB index 0.

Test 2: Correct behaviour when receiving Random Access Response

- The power of the first preamble shall be -22 dBm within the accuracy specified in Table 6.3.2.2.1.5-2.
- The relative power for preamble ramping step shall be 2 dB within the accuracy specified in Table 6.3.2.2.1.5-3.
- The transmit timing of all PRACH transmissions shall be within the accuracy specified in Table 6.3.2.2.1.5-4.

Test 3: Correct behaviour when not receiving Random Access Response

- The power of the first preamble shall be -22 dBm within the accuracy specified in Table 6.3.2.2.1.5-2.
- The relative power for preamble ramping step shall be 2 dB within the accuracy specified in Table 6.3.2.2.1.5-3.
- The transmit timing of all PRACH transmissions shall be within the accuracy specified in Table 6.3.2.2.1.5-4.

Test 4: Correct behaviour when receiving an UL grant for msg3 retransmission

- The UE shall re-transmit the msg3 upon the reception of an UL grant for msg3 retransmission.

Test 5: Correct behaviour when receiving an incorrect message over Temporary C-RNTI

- The UE shall re-select a preamble and transmit with the calculated PRACH transmission power when the back off time expires.
- The power of the first preamble shall be -22 dBm within the accuracy specified in Table 6.3.2.2.1.5-2.
- The transmit timing of the PRACH transmission shall be within the accuracy specified in Table 6.3.2.2.1.5-4.

Test 6: Correct behaviour when receiving a correct message over Temporary C-RNTI

- The UE shall send ACK if the contention resolution is successful.

Test 7: Correct behaviour when contention resolution timer expires

- The UE shall re-select a preamble and transmit with the calculated PRACH transmission power when the back off time expires if the contention resolution timer expires.
- The power of the first preamble shall be -22 dBm within the accuracy specified in Table 6.3.2.2.1.5-2.
- The transmit timing of the PRACH transmission shall be within the accuracy specified in Table 6.3.2.2.1.5-4.

Table 6.3.2.2.1.5-2 Absolute power tolerance Test requirements

Conditions	Tolerance
Normal	± 11.1 dB

Table 6.3.2.2.1.5-3 Relative power tolerance Test requirements

Power step ΔP (Up or down) (dB)	PRACH (dB)
2 ≤ ΔP < 3	± 3.2

Table 6.3.2.2.1.5-4: T_e Timing error Test requirements

Frequency Range	SCS of SSB signals (kHz)	SCS of uplink signals s(KHz)	T_e
1	15	15	$880*T_c$
	30	30	$624*T_c$
Note 1: T_c is the basic timing unit defined in TS 38.211 [7]			

6.3.2.2.2 NR SA FR1 non-contention based random access

6.3.2.2.2.1 Test purpose

The purpose of this test is to verify that the behaviour of the random access procedure is according to the requirements and that the PRACH power settings and timing are within specified limits.

6.3.2.2.2.2 Test applicability

This test applies to all types of NR UE from Release 15 onwards. Additionally Test 2 is applicable to UE that supports CSI-RS based Random Access Preamble which requires UE to support csi-RSRP-AndRSRQ-MeasWithSSB or csi-RSRP-AndRSRQ-MeasWithoutSSB.

6.3.2.2.2.3 Minimum conformance requirement

The minimum conformance requirements are specified in clause 6.3.2.2.0.2.

The normative reference for this requirement is TS 38.133 [6] clauses A.6.3.2.2.2.

6.3.2.2.2.4 Test description

6.3.2.2.2.4.1 Initial conditions

This test can be run in the configurations defined in Table 6.3.2.2.2.4.1-1.

Table 6.3.2.2.2.4.1-1: Non-Contention based random access test in FR1 for NR standalone supported test configurations

Test Case ID	Test Config Index	Description
6.3.2.2.2-1	1	NR: 15 kHz SSB SCS, 10MHz bandwidth, FDD
6.3.2.2.2-2	2	NR: 30 kHz SSB SCS, 40MHz bandwidth, TDD
Note: The UE is only required to be tested in one of the supported test configurations		

Configure the test equipment and the DUT according to the parameters in Table 6.3.2.2.2.4.1-2.

Table 6.3.2.2.2.4.1-2: Initial conditions for Non-Contention based random access test in FR1 for NR standalone

Parameter	Value		Comment
Test environment	NC		As specified in TS 38.508-1 [14] clause 4.1.
Test frequencies	As specified in Annex E, Table E.4-1 and TS 38.508-1 [14] subclause 4.3.1.		
Channel bandwidth	As specified by the test configuration selected from Table 6.3.2.2.2.4.1-1.		
Propagation conditions	AWGN		As specified in Annex C.2.2.
Connection Diagram	TE Part	A.3.1.7.1	As specified in TS 38.508-1 [14] Annex A.
	DUT Part	A.3.2.3.4	
Exceptions to connection diagram	N/A		

1. Message contents are defined in clause 6.3.2.2.2.4.3.

2. Cell 1 is the NR FR1 serving cell (PCell). The connection setup is done according to the settings in Annex C.1.1 and C.1.2.

6.3.2.2.2.4.2 Test procedure

The test consists of a single cell, configured as PCell in FR1. The System Simulator shall explicitly assign a random access preamble via dedicated signalling in the downlink. There are two subtests, to test both SSB-based non-contention based random access (subtest 1) and CSI-RS-based non-contention based random access (subtest 2).

1. Ensure the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity *NR*, Connected without release *On* and Test Mode *On* according to TS 38.508-1 [14] clause 4.5. Establish SRB2 and DRB in the RRC Reconfiguration message.

2. Set the parameters according to Table 6.3.2.2.2.5-1 Subtest 1.

3. The SS shall signal a Random Access Preamble ID via a RRCReconfiguration message to the UE and initiate a Non-contention based Random Access procedure according to Table 6.3.2.2.2.4.3-3 and Table 6.3.2.2.2.4.3-4.

4. Test 1: Correct behaviour when transmitting SSB-based Random Access Preamble

   4.1. The UE shall send a preamble to the System Simulator. The System Simulator shall check that the Random Access Preamble has the Preamble Index associated with the SSB with index 0, that it arrives on a PRACH occasion which belongs to the PRACH occasions corresponding to the SSB with index 0, and that the selected PRACH occasion belongs to the PRACH occasions permitted by the restrictions given by the *ra-ssb-OccasionMaskIndex*.

5. Test 2: Correct behaviour when transmitting CSI-RS-based Random Access Preamble

   5.1. Set the parameters according to Table 6.3.2.2.2.5-1 Subtest 2.

   5.2. Repeat steps 1-3.

   5.3. The UE shall send a preamble to the System Simulator. The System Simulator shall check that the Random Access Preamble has the Preamble Index associated with the CSI-RS configured, that it arrives on a PRACH

occasion which belongs to the PRACH occasions corresponding to the CSI-RS configured, and that the selected PRACH occasion belongs to the PRACH occasions permitted by the restrictions given by the *ra-OccasionList*.

6. Test 3: Correct behaviour when receiving Random Access Response

   6.1. Repeat steps 1-3.

   6.2. The UE shall send preambles to the System Simulator. In response to the first 4 preambles, the System Simulator shall transmit a Random Access Response containing Random Access Preamble identifiers that do not match the transmitted Random Access Preamble.

   6.3. As the received Random Access Responses contain Random Access Preamble identifiers that do not match the transmitted Random Access Preamble, the UE shall perform the Random Access Resource selection procedure specified in clause 5.1.2 in TS 38.321 [12], and transmit with the calculated PRACH transmission power.

   6.4. The System Simulator shall transmit a Random Access Response containing a Random Access Preamble identifier matching the transmitted Random Access Preamble after 5 preambles have been received by the System Simulator.

   6.5. As the received Random Access Response contains a Random Access Preamble identifier that matches the transmitted Random Access Preamble, the UE may stop monitoring for Random Access Response(s).

   6.6. Measure the power and timing of the first preamble and it shall not exceed the values specified in 6.3.2.2.2.5. Measure the relative power and timing applied to additional preambles (last 4 preambles) and it shall not exceed the values specified in 6.3.2.2.2.5.

7. Test 4: Correct behaviour when not receiving Random Access Response

   7.1. Repeat steps 1-3.

   7.2. The UE shall send preambles to the System Simulator. The System Simulator shall not respond to the first 4 preambles.

   7.3. As no Random Access Response was received within the RA Response window configured in *RACH-ConfigCommon*, the UE shall perform the Random Access Resource selection procedure specified in clause 5.1.2 in TS 38.321 [12], and transmit with the calculated PRACH transmission power.

   7.4. The System Simulator shall transmit a Random Access Response containing a Random Access Preamble identifier matching the transmitted Random Access Preamble after 5 preambles have been received by the System Simulator.

   7.5. As the received Random Access Response contains a Random Access Preamble identifier that matches the transmitted Random Access Preamble, the UE may stop monitoring for Random Access Response(s).

   7.6. Measure the power and timing of the first preamble and it shall not exceed the values specified in 6.3.2.2.2.5. Measure the relative power and timing applied to additional preambles (last 4 preambles) and it shall not exceed the values specified in 6.3.2.2.2.5.

6.3.2.2.2.4.3 Message contents

Message contents are according to TS 38.508-1 [14] clause 4.6 with the following exceptions:

Table 6.3.2.2.2.4.3-0: Common Exception messages

Default Message Contents	
Common contents of system information blocks exceptions	
Default RRC messages and information elements contents exceptions	
Common exceptions to the contents of TS 38.508-1 [14]	Table 4.6.3-115 with SSB-Index 0 Table 4.6.3-120 with SSB-Index 0

Table 6.3.2.2.2.4.3-1: *FrequencyInfoUL-SIB* for Non-Contention Based Random Access

Derivation Path: TS 38.508-1 [14], table 4.6.3-62			
Information Element	**Value/remark**	**Comment**	**Condition**
FrequencyInfoUL-SIB SEQUENCE {			
p-Max	23	23 dBm	
}			

Table 6.3.2.2.2.4.3-2: RACH-ConfigCommon for Non-Contention Based Random Access

Derivation Path: TS 38.508-1 [14], table 4.6.3-128			
Information Element	**Value/remark**	**Comment**	**Condition**
RACH-ConfigCommon::= SEQUENCE {			
rach-ConfigGeneric	RACH-ConfigGeneric		
totalNumberOfRA-Preambles	48		
groupBconfigured SEQUENCE {			
numberOfRA-PreamblesGroupA	48		
}			
rsrp-ThresholdSSB	RSRP_51		Subtest 1
prach-RootSequenceIndex CHOICE {			
0			
}			
msg1-SubcarrierSpacing	kHz 15		
	kHz 30		
}			

Table 6.3.2.2.2.4.3-3: CellGroupConfig for Non-Contention Based Random Access

Derivation Path: TS 38.508-1 [14], table 4.6.3-19			
Information Element	**Value/remark**	**Comment**	**Condition**
CellGroupConfig ::= SEQUENCE {			
spCellConfig SEQUENCE {			
servCellIndex	ServCellIndex		
reconfigurationWithSync SEQUENCE {			
newUE-Identity	1		
t304	ms1000		
rach-ConfigDedicted			
uplink	RACH-ConfigDedicated		
}			
spCellConfigDedicated SEQUENCE {			
uplinkConfig SEQUENCE {			
initialUplinkBWP SEQUENCE {			
srs-Config	SRS-Config		
}			
firstActiveUplinkBWP-Id	BWP-Id		
}			
}			
}			
}			

Table 6.3.2.2.2.4.3-4: RACH-ConfigDedicated for Non-Contention Based Random Access

Derivation Path: TS 38.508-1 [14], table 4.6.3-129			
Information Element	**Value/remark**	**Comment**	**Condition**
RACH-ConfigDedicated::= SEQUENCE {			
cfra SEQUENCE {			
occasions SEQUENCE {			
ssb-perRACH-Occasion	oneFourth		
}			
resources CHOICE {			
ssb SEQUENCE {			
ssb-ResourceList SEQUENCE (SIZE(1..maxRA-SSB-Resources)) OF {	1 entry		

ssb[1]	0		
ra-PreambleIndex[1]	50		Subtest 1
}			
ra-ssb-OccasionMaskIndex	1		Subtest 1
}			
csirs SEQUENCE {			
csirs-ResourceList SEQUENCE (SIZE(1..maxRA-CSIRS -Resources)) OF {			
ra-OccasionList	1		Subtest 2
ra-PreambleIndex[1]	50		Subtest 2
}			
rsrp-ThresholdCSI-RS	RSRP_51		Subtest 2
}			
}			
}			
}			

Table 6.3.2.2.2.4.3-5: RACH-ConfigGeneric for Non-Contention Based Random Access

Derivation Path: TS 38.508-1 [14], table 4.6.3-130			
Information Element	**Value/remark**	**Comment**	**Condition**
RACH-ConfigGeneric ::= SEQUENCE {			
prach-ConfigurationIndex	102		
msg1-FDM	one		
zeroCorrelationZoneConfig	11		
preambleReceivedTargetPower	-120		
preambleTransMax	n6		
powerRampingStep	dB2		
ra-ResponseWindow	sl10		
}			

Table 6.3.2.2.2.4.3-6: *ServingCellConfigCommonSIB* for Non-Contention Based Random Access

Derivation Path: TS 38.508-1 [14], table 4.6.3-169			
Information Element	**Value/remark**	**Comment**	**Condition**
ServingCellConfigCommonSIB ::= SEQUENCE {			
ssb-PositionsInBurst SEQUENCE {			
inOneGroup	'1100 0000'B		
}			
ss-PBCH-BlockPower	-5		
}			

6.3.2.2.2.5 Test requirement

Table 6.3.2.2.2.5-1 defines the primary level settings for non-contention based random access test in FR1 for NR Standalone. Tables 6.3.2.2.2.5-2, 6.3.2.2.2.5-3 and 6.3.2.2.2.5-4 define the Absolute power limits, Relative power limits and uplink timing error limits respectively, and all include test tolerances.

Table 6.3.2.2.2.5-1: General test parameters for non-contention based random access test in FR1 for NR Standalone

Parameter		Unit	Subtest 1	Subtest 2	Comments
SSB Configuration	Config 1		SSB.1 FR1	SSB.1 FR1	As defined in A.3.10, except for number of SSBs per SS-burst and SS/PBCH block index as below
	Config 2		SSB.2 FR1	SSB.2 FR1	
Number of SSBs per SS-burst			2	2	Different from the definition in A.3.10
SS/PBCH block index			0,1	0,1	Different from the definition in A.3.10
CSI-RS Configuration	Config 1		N/A	CSI-RS.1.1 FDD	As defined in A.3.1.4
	Config 2			CSI-RS.2.1 TDD	

Duplex Mode for Cell 1		Config 1		FDD	FDD	
		Config 2		TDD	TDD	
TDD Configuration		Config 2		TDDConf.2.1	TDDConf.2.1	
CSI-RS for tracking		Config 1		TRS.1.1 FDD	TRS.1.1 FDD	
		Config 2		TRS.1.2 TDD	TRS.1.2 TDD	
OCNG Pattern Note 1				OCNG pattern 1	OCNG pattern 1	As defined in A. 2.1.
PDSCH parameters Note 4		Config 1		SR.1.1 FDD	SR.1.1 FDD	As defined in A.1.1.
		Config 2		SR.2.1 TDD	SR.2.1 TDD	
RMSI CORESET Reference Channel		Config 1		CR.1.1 TDD	CR.1.1 TDD	
		Config 2		CR.2.1 TDD	CR.2.1 TDD	
Dedicated CORESET Reference Channel		Config 1		CCR.1.1 TDD	CCR.1.1 TDD	
		Config 2		CCR.2.1 TDD	CCR.2.1 TDD	
NR RF Channel Number				1	1	
EPRE ratio of PSS to SSS			dB	0	0	
EPRE ratio of PBCH_DMRS to SSS			dB			
EPRE ratio of PBCH to PBCH_DMRS			dB			
EPRE ratio of PDCCH_DMRS to SSS			dB			
EPRE ratio of PDCCH to PDCCH_DMRS			dB			
EPRE ratio of PDSCH_DMRS to SSS			dB			
EPRE ratio of PDSCH to PDSCH_DMRS			dB			
SSB with index 0	$\hat{E}_s / I_{ot}$		dB	3	3	Power of SSB with index 0 is set to be above configured *rsrp-ThresholdSSB*
	N_{oc}	Config 1	dBm/15kHz	-98	-98	
		Config 2		-101	-101	
	$\hat{E}_s / N_{oc}$		dB	3	3	
	SS-RSRP Note 3	Config 1	dBm/15kHz	-95	-95	
		Config 2		-98	-98	
	SS-RSRP Note 3		dBm/ SCS	-95	-95	
SSB with index 1	$\hat{E}_s / I_{ot}$		dB	-17	-17	Power of SSB with index 1 is set to be below configured *rsrp-ThresholdSSB*
	N_{oc}	Config 1	dBm/15kHz	-98	-98	
		Config 2		-101	-101	
	$\hat{E}_s / N_{oc}$		dB	-17	-17	
	SS-RSRP Note 3	Config 1	dBm/15kHz	-115	-115	
		Config 2		-118	-118	
	SS-RSRP Note 3		dBm/ SCS	-115	-115	
Io Note 2		Config 1	dBm	-65.3/9.36MHz	-65.3/9.36MHz	For symbols without SSB index 1
		Config 2		-62.2/38.16MHz	-62.2/38.16MHz	
ss-PBCH-BlockPower			dBm/ SCS	-5	-5	As defined in clause 6.3.2 in TS 38.331 [13].
Configured UE transmitted power ($P_{\mathrm{CMAX},\ f,c}$)			dBm	23	23	As defined in clause 6.2.4 in TS 38.101-1 [2].
PRACH Configuration				FR1 PRACH configuration 2	FR1 PRACH configuration 3	As defined in A. 7.1.
Propagation Condition			-	AWGN	AWGN	

Note 1: OCNG shall be used such that the cell is fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols. The OCNG pattern is chosen during the test according to the presence of a DL reference measurement channel.
Note 2: Es/Iot, SS-RSRP and Io level have been derived from other parameters for information purpose. They are not settable parameters.
Note 3: Void.
Note 4: The DL PDSCH reference measurement channel is used in the test only when a downlink transmission dedicated to the UE under test is required.

Test 1: Correct behaviour when transmitting SSB-based Random Access Preamble

- The Random Access Preamble shall be one of the Random Access Preambles associated with SSB index 0.
- The Random Access Preamble shall arrive on a PRACH occasion which belongs to the PRACH occasions corresponding to the SSB with index 0.

- The selected PRACH occasion shall belong to the PRACH occasions permitted by the restrictions given by the *ra-ssb-OccasionMaskIndex*.

Test 2: Correct behaviour when transmitting CSI-RS-based Random Access Preamble

- The Random Access Preamble shall have the Preamble Index associated with the CSI-RS configured.
- The Random Access Preamble shall arrive on a PRACH occasion which belongs to the PRACH occasions corresponding to the CSI-RS configured.
- The selected PRACH occasion belongs to the PRACH occasions permitted by the restrictions given by the *ra-OccasionList*.

Test 3: Correct behaviour when receiving Random Access Response

- The power of the first preamble shall be -22 dBm within the accuracy specified in Table 6.3.2.2.2.5-2.
- The relative power for preamble ramping step shall be 2 dB within the accuracy specified in Table 6.3.2.2.2.5-3.
- The transmit timing of all PRACH transmissions shall be within the accuracy specified in Table 6.3.2.2.2.5-4.

Test 4: Correct behaviour when not receiving Random Access Response

- The power of the first preamble shall be -22 dBm within the accuracy specified in Table 6.3.2.2.2.5-2.
- The relative power for preamble ramping step shall be 2 dB within the accuracy specified in Table 6.3.2.2.2.5-3.
- The transmit timing of all PRACH transmissions shall be within the accuracy specified in Table 6.3.2.2.2.5-4.

Table 6.3.2.2.2.5-2 Absolute power tolerance Test requirements

Conditions	Tolerance
Normal	± 11.1 dB

Table 6.3.2.2.2.5-3 Relative power tolerance Test requirements

Power step ΔP (Up or down) (dB)	PRACH (dB)
2 ≤ ΔP < 3	± 3.2

Table 6.3.2.2.2.5-4: T_e Timing error Test requirements

Frequency Range	SCS of SSB signals (kHz)	SCS of uplink signals s(KHz)	T_e
1	15	15	$880*T_c$
	30	30	$624*T_c$
Note 1: T_c is the basic timing unit defined in TS 38.211 [7]			

6.3.2.2.3 NR SA FR1 2-step contention based random access

6.3.2.2.3.1 Test purpose

The purpose of this test is to verify that the behaviour of the random access procedure is according to the requirements and that the MsgA PRACH and MsgA PUSCH power settings and timing are within specified limits.

6.3.2.2.3.2 Test applicability

This test applies to all types of NR FR1 UE from Release 16 onwards.

6.3.2.2.3.3 Minimum conformance requirement

Same as in clause 4.3.2.2.3.3.

The normative reference for this requirement is TS 38.133 [6] clause 6.2.2 and A.6.3.2.2.3.

6.3.2.2.3.4 Test description

6.3.2.2.3.4.1 Initial conditions

This test can be run in the configurations defined in Table 6.3.2.2.3.4.1-1.

Table 6.3.2.2.3.4.1-1: Supported test configurations

Test Case ID	Test Config Index	Description
6.3.2.2.3-1	1	NR: 15 kHz SSB SCS, 10MHz bandwidth, FDD
6.3.2.2.3-2	2	NR: 30 kHz SSB SCS, 40MHz bandwidth, TDD
Note: The UE is only required to be tested in one of the supported test configurations		

Before the test procedure, Downlink and Uplink calibrations are carried out to derive signalled parameter values. This is necessary to ensure that the test case operates within the specified ranges. The detail of the calibration process is implementation dependent, but shall derive the values of Δ_{DL} and Δ_{UL} according to the following principles:

With the UE configured to report SS-RSRP, the Δ_{DL} value is calculated as (RSRP_$_{REP}$ – RSRP_76), where RSRP_$_{REP}$ is the SS-RSRP Reported value according to TS 38.133 [6] Table 10.1.6.1-1 with -80.6dBm/SCS applied at the Reference point. For a Reported value RSRP_x, x is treated as a positive integer value.

With the UE configured to send a first PRACH preamble, Δ_{UL} value is calculated as -ROUND(PPRACH0 -1), where PPRACH0 is the measured first PRACH power with -80.6dBm/SCS applied at the Reference point, and with signalled values *preambleReceivedTargetPower* = -100dBm and *ss-PBCH-BlockPower* = 20dBm.

Configure the test equipment and the DUT according to the parameters in Table 6.3.2.2.3.4.1-2.

Table 6.3.2.2.3.4.1-2: Initial conditions

Parameter	Value		Comment
Test environment	NC		As specified in TS 38.508-1 [14] clause 4.1.
Test frequencies	As specified in Annex E, E.1.1, E.1.3.1 and Table E.3-1 and TS 38.508-1 [14] clause 4.3.1.		
Channel bandwidth	As specified by the test configuration selected from Table 4.3.2.2.1.4.1-1.		
Propagation conditions	AWGN		As specified in Annex C.2.2.
Connection Diagram	TE Part	A.3.1.7.1	As specified in TS 38.508-1 [14] Annex A.
	DUT Part	A.3.2.3.4	
Exceptions to connection diagram	N/A		

1. Message contents are defined in clause 6.3.2.2.3.4.3.

2. Cell 1 is the NR FR1 serving cell (PCell). The connection setup is done according to the settings in Annex C.1.1 and C.1.2.

6.3.2.2.3.4.2 Test procedure

The test consists of a single cell, configured as PCell in FR1. The System Simulator shall not explicitly assign a random access preamble via dedicated signalling in the downlink.

1. Ensure the UE is in state RRC_IDLE with generic procedure parameters Connectivity *NR* and Test Mode *On* according to TS 38.508-1 [14] clause 4.5.

2. Set the parameters according to Table 6.3.2.2.1.5-1.

3. The UE shall establish a connection setup with SS, the random access procedure within the connection setup is used in the test.

4. Test 1: Correct behaviour when transmitting MsgA:

   4.1. The UE shall send a MsgA to the System Simulator. The System Simulator shall check that the MsgA preamble belongs to one of the Random Access Preambles associated with the SSB with index 0, which has SSB_RP above the configured rsrp-ThresholdSSB.

4.2 Measure the power and timing of the first preamble and it shall not exceed the values specified in clause 6.3.2.2.3.5. Measure the power of the first MsgA PUSCH transmission and it shall not exceed the values specified in clause 6.3.2.2.3.5.

5. Test 2: Correct behaviour when receiving MsgB:

5.1. Repeat steps 1-3.

5.2. The UE shall send preambles to the System Simulator. In response to the first 4 preambles, the System Simulator shall transmit a MsgB containing identifiers that do not match the transmitted Random Access Preamble.

5.3. As the received MsgB contain Random Access Preamble identifiers that do not match the transmitted Random Access Preamble, the UE shall perform the Random Access Resource selection procedure specified in clause 5.1.2a in TS 38.321 [12], and transmit with the calculated MsgA PRACH transmission power when the backoff time expires.

5.4. The System Simulator shall transmit a MsgB containing a Random Access Preamble identifier matching the transmitted Random Access Preamble after 5 preambles have been received by the System Simulator.

5.5. As the received MsgB contains a Random Access Preamble identifier that matches the transmitted Random Access Preamble, the UE shall transmit an ACK and stop monitoring for MsgB.

5.6. Measure the power and timing of the first preamble and it shall not exceed the values specified in clause 6.3.2.2.3.5. Measure the relative power and timing applied to additional preambles (last 4 preambles) and it shall not exceed the values specified in clause 6.3.2.2.3.5. Measure the power of the first MsgA PUSCH transmission and it shall not exceed the values specified in clause 6.3.2.2.3.5.

6. Test 3: Correct behaviour when not receiving MsgB:

6.1. Repeat steps 1-3.

6.2. The UE shall send preambles to the System Simulator. The System Simulator shall not respond to the first 4 preambles.

6.3. As no MsgB was received within the RA Response window, the UE shall perform the Random Access Resource selection procedure specified in clause 5.1.2a in TS 38.321 [12], and transmit with the calculated MsgA PRACH transmission power when the backoff time expires.

6.4. The System Simulator shall transmit a MsgB containing a Random Access Preamble identifier matching the transmitted Random Access Preamble after 5 preambles have been received by the System Simulator.

6.5. As the received MsgB contains a Random Access Preamble identifier that matches the transmitted Random Access Preamble, the UE shall transmit an ACK and stop monitoring for MsgB.

6.6 Measure the power and timing of the first preamble and it shall not exceed the values specified in clause 6.3.2.2.3.5. Measure the relative power and timing applied to additional preambles (last 4 preambles) and it shall not exceed the values specified in clause 6.3.2.2.3.5. Measure the power of the first MsgA PUSCH transmission and it shall not exceed the values specified in clause 6.3.2.2.3.5.

6.3.2.2.3.4.3 Message contents

Message contents are according to TS 38.508-1 [14] clause 7.3.1 with the following exceptions:

Table 6.3.2.2.3.4.3-0: Common Exception messages

Default Message Contents	
Common contents of system information blocks exceptions	
Default RRC messages and information elements contents exceptions	
Common exceptions to the contents of TS 38.508-1 [14]	Table 4.6.3-115 with SSB-Index 0 Table 4.6.3-120 with SSB-Index 0

6.3.2.2.3.5 Test requirement

Table 6.3.2.2.3.5-2 defines the primary level settings for contention based random access test in FR1 for NR Standalone.

Table 6.3.2.2.1.5-1: General test parameters

Parameter			Unit	Test-1	Comments
SSB Configuration		Config 1		SSB.1 FR1	As defined in A.3.1, except for number of SSBs per SS-burst and SS/PBCH block index as below
		Config 2		SSB.2 FR1	
Number of SSBs per SS-burst				2	Different from the definition in A.3.1
SS/PBCH block index				0,1	Different from the definition in A.3.1
Duplex Mode for Cell 2		Config 1		FDD	
		Config 2		TDD	
TDD Configuration		Config 2		TDDConf.2.1	
CSI-RS for tracking		Config 1		TRS.1.1 FDD	
		Config 2		TRS.1.2 TDD	
OCNG Pattern Note 1				OP.1	As defined in A.2.1
PDSCH parameters Note 4		Config 1		SR.1.1 FDD	As defined in A.1.1
		Config 2		SR.2.1 TDD	
NR RF Channel Number				1	
EPRE ratio of PSS to SSS			dB	0	
EPRE ratio of PBCH_DMRS to SSS			dB		
EPRE ratio of PBCH to PBCH_DMRS			dB		
EPRE ratio of PDCCH_DMRS to SSS			dB		
EPRE ratio of PDCCH to PDCCH_DMRS			dB		
EPRE ratio of PDSCH_DMRS to SSS			dB		
EPRE ratio of PDSCH to PDSCH_DMRS			dB		
SSB with index 0	$\hat{E}_s/I_{ot}$		dB	3	Power of SSB with index 0 is set to be above configured *rsrp-ThresholdSSB*
	N_{oc}	Config 1	dBm/15kHz	-98	
		Config 2		-101	
	$\hat{E}_s/N_{oc}$		dB	3	
	SS-RSRP	Config 1	dBm/15kHz	-95	
		Config 2		-98	
	SS-RSRP		dBm/ SCS	-95	
SSB with index 1	$\hat{E}_s/I_{ot}$		dB	-17	Power of SSB with index 1 is set to be below configured *rsrp-ThresholdSSB*
	N_{oc}	Config 1	dBm/15kHz	-98	
		Config 2		-101	
	$\hat{E}_s/N_{oc}$		dB	-17	
	SS-RSRP	Config 1	dBm/15kHz	-115	
		Config 2		-118	
	SS-RSRP		dBm/ SCS	-115	
Io Note 2		Config 1	dBm	-65.3/9.36MHz	For symbols without SSB index 1
		Config 2		-62.2/38.16MHz	
ss-PBCH-BlockPower			dBm/ SCS	-5	As defined in clause 6.3.2 in TS 38.331 [13].
Configured UE transmitted power ($P_{\mathrm{CMAX,f,c}}$)			dBm	23	As defined in clause 6.2.4 in TS 38.101-1 [2].
MsgA Configuration				FR1 MsgA configuration 1	As defined in FFS.
msgA-RSRP-ThresholdSSB			dBm	RSRP_51	The actual value of the threshold is -105dBm, as defined in TS 38.331 [13].
Propagation Condition			-	AWGN	

Note 1: OCNG shall be used such that the cell is fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols. The OCNG pattern is chosen during the test according to the presence of a DL reference measurement channel.

Note 2: SS-RSRP, Es/Iot and Io levels have been derived from other parameters for information purpose. They are not settable parameters.

Parameter	Unit	Test-1	Comments
Note 3: The DL PDSCH reference measurement channel is used in the test only when a downlink transmission dedicated to the UE under test is required.			

Test 1: Correct behaviour when transmitting MsgA:

- The MsgA shall be one of the Random Access Preambles associated with SSB index 0.
- The power of the first preamble shall be -22 dBm within the accuracy specified in Table 6.3.2.2.3.5-2.
- The power of the first MsgA PUSCH transmission shall be 6.6 dBm for test configuration 1 and 9.6 dBm for test configuration 2 within the accuracy specified in Table 6.3.2.2.3.5-2A.

Test 2: Correct behaviour when receiving MsgB:

- The power of the first preamble shall be -22 dBm within the accuracy specified in Table 6.3.2.2.3.5-2.
- The relative power for preamble ramping step shall be 2 dB within the accuracy specified in Table 6.3.2.2.3.5-3.
- The transmit timing of all MsgA PRACH transmissions shall be within the accuracy specified in Table 6.3.2.2.3.5-4.
- The power of the first MsgA PUSCH transmission shall be 6.6 dBm for test configuration 1 and 9.6 dBm for test configuration 2 within the accuracy specified in Table 6.3.2.2.3.5-2A.

Test 3: Correct behaviour when not receiving MsgB:

- The power of the first preamble shall be -22 dBm within the accuracy specified in Table 6.3.2.2.3.5-2.
- The relative power for preamble ramping step shall be 2 dB within the accuracy specified in Table 6.3.2.2.3.5-3.
- The transmit timing of all MsgA PRACH transmissions shall be within the accuracy specified in Table 6.3.2.2.3.5-4.
- The power of the first MsgA PUSCH transmission shall be 6.6 dBm for test configuration 1 and 9.6 dBm for test configuration 2 within the accuracy specified in Table 6.3.2.2.3.5-2A.

Table 6.3.2.2.3.5-2: MsgA PRACH Absolute power tolerance Test requirements

Conditions	Tolerance
Normal	± 11.1 dB

Table 6.3.2.2.3.5-2A: MsgA PUSCH Absolute power tolerance Test requirements

Conditions	Tolerance
Normal	± 11.1 dB

Table 6.3.2.2.3.5-3: Relative power tolerance Test requirements

Power step ΔP (Up or down) (dB)	MsgA PRACH (dB)
$2 \leq \Delta P < 3$	± 3.2 dB

Table 6.3.2.2.3.5-4: T_e Timing error Test requirements

Frequency Range	SCS of SSB signals (kHz)	SCS of uplink signals s(KHz)	T_e
1	15	15	$880*T_c$
	30	30	$624*T_c$
NOTE: T_c is the basic timing unit defined in TS 38.211 [7]			

6.3.2.2.4 NR SA FR1 2-step non-contention based random access

6.3.2.2.4.1 Test purpose

The purpose of this test is to verify that the behaviour of the random access procedure is according to the requirements and that the MsgA PRACH and MsgA PUSCH power settings and timing are within specified limits.

6.3.2.2.4.2 Test applicability

This test applies to all types of NR FR1 UE from Release 16 onwards.

6.3.2.2.4.3 Minimum conformance requirement

Same as in clause 4.3.2.2.4.3.

The normative reference for this requirement is TS 38.133 [6] clause 6.2.2 and A.6.3.2.2.4.

6.3.2.2.4.4 Test description

6.3.2.2.4.4.1 Initial conditions

This test can be run in the configurations defined in Table 6.3.2.2.4.4.1-1.

Table 6.3.2.2.4.4.1-1: Supported test configurations

Test Case ID	Test Config Index	Description
6.3.2.2.4-1	1	NR: 15 kHz SSB SCS, 10MHz bandwidth, FDD
6.3.2.2.4-2	2	NR: 30 kHz SSB SCS, 40MHz bandwidth, TDD
Note: The UE is only required to be tested in one of the supported test configurations		

Before the test procedure, Downlink and Uplink calibrations are carried out to derive signalled parameter values. This is necessary to ensure that the test case operates within the specified ranges. The detail of the calibration process is implementation dependent, but shall derive the values of Δ_{DL} and Δ_{UL} according to the following principles:

With the UE configured to report SS-RSRP, the Δ_{DL} value is calculated as (RSRP_$_{REP}$ – RSRP_76), where RSRP_$_{REP}$ is the SS-RSRP Reported value according to TS 38.133 [6] Table 10.1.6.1-1 with -80.6dBm/SCS applied at the Reference point. For a Reported value RSRP_x, x is treated as a positive integer value.

With the UE configured to send a first PRACH preamble, Δ_{UL} value is calculated as -ROUND(PPRACH0 -1), where PPRACH0 is the measured first PRACH power with -80.6dBm/SCS applied at the Reference point, and with signalled values *preambleReceivedTargetPower* = -100dBm and *ss-PBCH-BlockPower* = 20dBm.

Configure the test equipment and the DUT according to the parameters in Table 6.3.2.2.4.4.1-2.

Table 6.3.2.2.4.4.1-2: Initial conditions

Parameter	Value		Comment
Test environment	NC		As specified in TS 38.508-1 [14] clause 4.1.
Test frequencies	As specified in Annex E, E.1.1, E.1.3.1 and Table E.3-1 and TS 38.508-1 [14] clause 4.3.1.		
Channel bandwidth	As specified by the test configuration selected from Table 4.3.2.2.1.4.1-1.		
Propagation conditions	AWGN		As specified in Annex C.2.2.
Connection Diagram	TE Part	A.3.1.7.1	As specified in TS 38.508-1 [14] Annex A.
	DUT Part	A.3.2.3.4	
Exceptions to connection diagram	N/A		

1. Message contents are defined in clause 6.3.2.2.4.4.3.
2. Cell 1 is the NR FR1 serving cell (PCell). The connection setup is done according to the settings in Annex C.1.1 and C.1.2.

6.3.2.2.4.4.2 Test procedure

The test consists of a single cell, configured as PCell in FR1. The System Simulator shall explicitly assign a random access preamble via dedicated signalling in the downlink.

1. Ensure the UE is in state RRC_IDLE with generic procedure parameters Connectivity *NR* and Test Mode *On* according to TS 38.508-1 [14] clause 4.5.

2. Set the parameters according to Table 6.3.2.2.1.5-1.

3. The UE shall establish a connection setup with SS, the random access procedure within the connection setup is used in the test.

4. Test 1: Correct behaviour when transmitting MsgA:

   4.1. The UE shall send a MsgA to the System Simulator. The System Simulator shall check that the MsgA preamble belongs to one of the Random Access Preambles associated with the SSB with index 0, that it arrives on a PRACH occasion which belongs to the PRACH occasions corresponding to the SSB with index 0, and that the selected PRACH occasion belongs to the PRACH occasions permitted by the restrictions given by the *msgA-SSB-SharedRO-MaskIndex*.

   4.2 Measure the power and timing of the first preamble and it shall not exceed the values specified in clause 6.3.2.2.4.5. Measure the power of the first MsgA PUSCH transmission and it shall not exceed the values specified in clause 6.3.2.2.4.5.

5. Test 2: Correct behaviour when receiving MsgB:

   5.1. Repeat steps 1-3.

   5.2. The UE shall send preambles to the System Simulator. In response to the first 4 preambles, the System Simulator shall transmit a MsgB containing identifiers that do not match the transmitted Random Access Preamble.

   5.3. As the received MsgB contain Random Access Preamble identifiers that do not match the transmitted Random Access Preamble, the UE shall perform the Random Access Resource selection procedure specified in clause 5.1.2a in TS 38.321 [12], and transmit with the calculated MsgA PRACH transmission power when the backoff time expires.

   5.4. The System Simulator shall transmit a MsgB containing a Random Access Preamble identifier matching the transmitted Random Access Preamble after 5 preambles have been received by the System Simulator.

   5.5. As the received MsgB contains a Random Access Preamble identifier that matches the transmitted Random Access Preamble, the UE shall transmit an ACK and stop monitoring for MsgB.

   5.6. Measure the power and timing of the first preamble and it shall not exceed the values specified in clause 6.3.2.2.4.5. Measure the relative power and timing applied to additional preambles (last 4 preambles) and it shall not exceed the values specified in clause 6.3.2.2.4.5. Measure the power of the first MsgA PUSCH transmission and it shall not exceed the values specified in clause 6.3.2.2.4.5.

6. Test 3: Correct behaviour when not receiving MsgB:

   6.1. Repeat steps 1-3.

   6.2. The UE shall send preambles to the System Simulator. The System Simulator shall not respond to the first 4 preambles.

   6.3. As no MsgB was received within the MsgB Response window configured in *RACH-ConfigGenericTwoStepRA*, the UE shall perform the Random Access Resource selection procedure specified in clause 5.1.2a in TS 38.321 [12], and transmit with the calculated MsgA PRACH transmission power when the backoff time expires.

   6.4. The System Simulator shall transmit a MsgB containing a Random Access Preamble identifier matching the transmitted Random Access Preamble after 5 preambles have been received by the System Simulator.

   6.5. As the received MsgB contains a Random Access Preamble identifier that matches the transmitted Random Access Preamble, the UE shall transmit an ACK and stop monitoring for MsgB.

6.6. Measure the power and timing of the first preamble and it shall not exceed the values specified in clause 6.3.2.2.3.5. Measure the relative power and timing applied to additional preambles (last 4 preambles) and it shall not exceed the values specified in clause 6.3.2.2.3.5. Measure the power of the first MsgA PUSCH transmission and it shall not exceed the values specified in clause 6.3.2.2.4.5.

6.3.2.2.4.4.3 Message contents

Message contents are according to TS 38.508-1 [14] clause 7.3.1 with the following exceptions:

Table 6.3.2.2.4.4.3-0: Common Exception messages

Default Message Contents	
Common contents of system information blocks exceptions	
Default RRC messages and information elements contents exceptions	
Common exceptions to the contents of TS 38.508-1 [14]	Table 4.6.3-115 with SSB-Index 0 Table 4.6.3-120 with SSB-Index 0

6.3.2.2.4.5 Test requirement

Table 6.3.2.2.4.5-2 defines the primary level settings for non-contention based random access test in FR1 for NR Standalone.

Table 6.3.2.2.1.5-1: General test parameters

Parameter			Unit	Test-1	Comments
SSB Configuration		Config 1		SSB.1 FR1	As defined in A.3.1, except for number of SSBs per SS-burst and SS/PBCH block index as below
		Config 2		SSB.2 FR1	
Number of SSBs per SS-burst				2	Different from the definition in A.3.1
SS/PBCH block index				0,1	Different from the definition in A.3.1
Duplex Mode for Cell 2		Config 1		FDD	
		Config 2		TDD	
TDD Configuration		Config 2		TDDConf.2.1	
CSI-RS for tracking		Config 1		TRS.1.1 FDD	
		Config 2		TRS.1.2 TDD	
OCNG Pattern Note 1				OP.1	As defined in A.2.1
PDSCH parameters Note 4		Config 1		SR.1.1 FDD	As defined in A.1.1
		Config 2		SR.2.1 TDD	
NR RF Channel Number				1	
EPRE ratio of PSS to SSS			dB	0	
EPRE ratio of PBCH_DMRS to SSS			dB		
EPRE ratio of PBCH to PBCH_DMRS			dB		
EPRE ratio of PDCCH_DMRS to SSS			dB		
EPRE ratio of PDCCH to PDCCH_DMRS			dB		
EPRE ratio of PDSCH_DMRS to SSS			dB		
EPRE ratio of PDSCH to PDSCH_DMRS			dB		
SSB with index 0	$\hat{E}_s/I_{ot}$		dB	3	Power of SSB with index 0 is set to be above configured *rsrp-ThresholdSSB*
	N_{oc}	Config 1	dBm/15kHz	-98	
		Config 2		-101	
	$\hat{E}_s/N_{oc}$		dB	3	
	SS-RSRP	Config 1	dBm/15kHz	-95	
		Config 2		-98	
	SS-RSRP		dBm/ SCS	-95	
SSB with index 1	$\hat{E}_s/I_{ot}$		dB	-17	Power of SSB with index 1 is set to be below
	N_{oc}	Config 1	dBm/15kHz	-98	
		Config 2		-101	

Parameter			Unit	Test-1	Comments
	$\hat{E}_s/N_{oc}$		dB	-17	configured *rsrp-ThresholdSSB*
	SS-RSRP	Config 1	dBm/15kHz	-115	
		Config 2		-118	
	SS-RSRP		dBm/ SCS	-115	
Io Note 2		Config 1	dBm	-65.3/9.36MHz	For symbols without SSB index 1
		Config 2		-62.2/38.16MHz	
ss-PBCH-BlockPower			dBm/ SCS	-5	As defined in clause 6.3.2 in TS 38.331 [13].
Configured UE transmitted power ($P_{\mathrm{CMAX,f,c}}$)			dBm	23	As defined in clause 6.2.4 in TS 38.101-1 [2].
MsgA Configuration				FR1 MsgA configuration 2	As defined in FFS.
msgA-RSRP-ThresholdSSB			dBm	RSRP_51	The actual value of the threshold is -105dBm, as defined in TS 38.331 [13].
Propagation Condition			-	AWGN	
Note 1: OCNG shall be used such that the cell is fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols. The OCNG pattern is chosen during the test according to the presence of a DL reference measurement channel. Note 2: SS-RSRP, Es/Iot and Io levels have been derived from other parameters for information purpose. They are not settable parameters. Note 3: The DL PDSCH reference measurement channel is used in the test only when a downlink transmission dedicated to the UE under test is required.					

Test 1: Correct behaviour when transmitting MsgA:

- The MsgA shall be one of the Random Access Preambles associated with SSB index 0.
- The MsgA shall arrive on a PRACH occasion which belongs to the PRACH occasions corresponding to the SSB with index 0.
- The selected PRACH occasion shall belong to the PRACH occasions permitted by the restrictions given by the *msgA-SSB-SharedRO-MaskIndex*.
- The power of the first preamble shall be -22 dBm within the accuracy specified in Table 6.3.2.2.4.5-2.
- The power of the first MsgA PUSCH transmission shall be 6.6 dBm for test configuration 1 and 9.6 dBm for test configuration 2 within the accuracy specified in Table 6.3.2.2.4.5-2A.

Test 2: Correct behaviour when receiving MsgB:

- The power of the first preamble shall be -22 dBm within the accuracy specified in Table 6.3.2.2.4.5-2.
- The relative power for preamble ramping step shall be 2 dB within the accuracy specified in Table 6.3.2.2.4.5-3.
- The transmit timing of all PRACH transmissions shall be within the accuracy specified in Table 6.3.2.2.4.5-4.
- The power of the first MsgA PUSCH transmission shall be 6.6 dBm for test configuration 1 and 9.6 dBm for test configuration 2 within the accuracy specified in Table 6.3.2.2.4.5-2A.

Test 3: Correct behaviour when not receiving MsgB:

- The power of the first preamble shall be -22 dBm within the accuracy specified in Table 6.3.2.2.4.5-2.
- The relative power for preamble ramping step shall be 2 dB within the accuracy specified in Table 6.3.2.2.4.5-3.
- The transmit timing of all PRACH transmissions shall be within the accuracy specified in Table 6.3.2.2.4.5-4.
- The power of the first MsgA PUSCH transmission shall be 6.6 dBm for test configuration 1 and 9.6 dBm for test configuration 2 within the accuracy specified in Table 6.3.2.2.4.5-2A.

Table 6.3.2.2.4.5-2: MsgA PRACH Absolute power tolerance Test requirements

Conditions	Tolerance
Normal	± 11.1 dB

Table 6.3.2.2.4.5-2A: MsgA PUSCH Absolute power tolerance Test requirements

Conditions	Tolerance
Normal	± 11.1 dB

Table 6.3.2.2.4.5-3: Relative power tolerance Test requirements

Power step ΔP (Up or down) (dB)	MsgA PRACH (dB)
2 ≤ ΔP < 3	± 3.2 dB

Table 6.3.2.2.4.5-4: T_e Timing error Test requirements

Frequency Range	SCS of SSB signals (kHz)	SCS of uplink signals s(KHz)	T_e
1	15	15	$880*T_c$
	30	30	$624*T_c$
NOTE: T_c is the basic timing unit defined in TS 38.211 [7]			

6.3.2.3 RRC connection release with redirection

6.3.2.3.0 Minimum conformance requirements

6.3.2.3.0.1 Minimum conformance requirements for FR1 RRC connection release with redirection

The UE shall be capable of performing the RRC connection release with redirection to the target NR cell within $T_{connection_release_redirect_NR}$.

The time delay ($T_{connection_release_redirect_NR}$) is the time between the end of the last slot containing the RRC command, "*RRCRelease*" (TS 38.331 [2]) on the NR PDSCH and the time the UE starts to send random access to the target NR cell. The time delay ($T_{connection_release_redirect_NR}$) shall be less than:

$$T_{connection_release_redirect_NR} = T_{RRC_procedure_delay} + T_{identify\text{-}NR} + T_{SI\text{-}NR} + T_{RACH}$$

The target NR cell shall be considered detectable when for each relevant SSB, the side conditions should be met that,

- SSB_RP and SSB Ês/Iot according to Annex B.2.5 for a corresponding NR Band.

$T_{RRC_procedure_delay}$: It is the RRC procedure delay for processing the received message "*RRCRelease*" as defined in clause 6.2.2 of TS 38.331 [2].

$T_{identify\text{-}NR}$: It is the time to identify the target NR cell and depend on the frequency range (FR) of the target NR cell. It is defined in table 6.3.2.3.0.1-1. Note that $T_{identify\text{-}NR} = T_{PSS/SSS\text{-}sync} + T_{meas}$, in which $T_{PSS/SSS\text{-}sync}$ is the cell search time and T_{meas} is the measurement time due to cell selection criteria evaluation.

$T_{SI\text{-}NR}$: It is the time required for acquiring all the relevant system information of the target NR cell. This time depends upon whether the UE is provided with the relevant system information of the target NR cell or not by the old NR cell before the RRC connection is released. $T_{SI\text{-}NR} = 0$ provided the UE is provided with the SI (including MIB and all relevant SIBs) of the target NR cell before the RRC connection is released by the old NR cell.

T_{RACH}: It is the delay caused due to the random access procedure when sending random access to the target NR cell. This delay depends on the PRACH configuration defined in Table 6.3.3.2-2 [6] or Table 6.3.3.2-3 [6] for FR1 and in Table 6.3.3.2-4 [6] for FR2.

T_{rs} is the SMTC periodicity of the target NR cell if the UE has been provided with an SMTC configuration for the target cell in the redirection command, otherwise T_{rs} is the SMTC configured in the measObjectNR having the same SSB frequency and subcarrier spacing configured for the RRC connection release with redirection. If the UE is not provided with SMTC configuration or measurement object for the frequency which is also configured for the RRC connection release with redirection then:

- the requirement in this section is applied with T_{rs} = 20 ms assuming the SSB transmission periodicity is not larger than 20 ms,

- there is no requirement if the SSB transmission periodicity is larger than 20ms.

Table 6.3.2.3.0.1-1: Time to identify target NR cell for RRC connection release with redirection to NR

Frequency range (FR) of target NR cell	$T_{identify-NR}$
FR1	MAX (680 ms, [11] x T_{rs})
FR2	MAX (880 ms, 8x[11] x T_{rs})
Note : If the UE has been provided with higher layer in TS 38.331 [2] signalling of *smtc2* prior to the redirection command, SMTC follows *smtc1* or *smtc2* according to the physical cell ID of the target cell.	

The normative reference for this requirement is TS 38.133 [6] clauses 6.2.3.2.1.

6.3.2.3.0.2 Minimum conformance requirements for FR1 – E-UTRAN RRC connection release with redirection

The UE shall be capable of performing the RRC connection release with redirection to the target E-UTRAN cell within $T_{connection_release_redirect_E-UTRA}$.

The time delay ($T_{connection_release_redirect_E-UTRA}$) is the time between the end of the last slot containing the RRC command, "*RRCRelease*" (TS 38.331 [2]) on the PDSCH and the time the UE starts to send random access to the target E-UTRA cell. The time delay ($T_{connection_release_redirect_E-UTRA}$) shall be less than:

$$T_{connection_release_redirect_E-UTRA} = T_{RRC_procedure_delay} + T_{identify-E-UTRA} + T_{SI-E-UTRA} + T_{RACH}$$

The target E-UTRA FDD or TDD cell shall be considered detectable when for each relevant SSB:

- RSRP related conditions in the accuracy requirements in Section 10.2.2 are fulfilled for a corresponding Band, together with the corresponding side conditions in Annex B.2 and Annex B.3 of TS 36.133 [15],

- RSRQ related conditions in the accuracy requirements in Section 10.2.3 are fulfilled for a corresponding Band, together with the corresponding side conditions in Annex B.2 and Annex B.3 of TS 36.133 [15],

- RS-SINR related conditions in the accuracy requirements in Section 10.2.5 are fulfilled for a corresponding Band, together with the corresponding side conditions in Annex B.2 and Annex B.3 of TS 36.133 [15].

$T_{RRC_procedure_delay}$: It is the RRC procedure delay for processing the received message "*RRCRelease*" as defined in clause 6.2.2 of TS 38.331 [2].

$T_{identify-E-UTRA}$: It is the time to identify the target E-UTRA cell. It shall be less than 320 ms.

$T_{SI-E-UTRA}$: It is the time required for acquiring all the relevant system information of the target E-UTRA cell. This time depends upon whether the UE is provided with the relevant system information (SI) of the target E-UTRA cell or not by the old NR cell before the RRC connection is released. $T_{SI-E-UTRA}$ = 0 provided the UE is provided with the SI (including MIB and all relevant SIBs) of the target E-UTRA cell before the RRC connection is released by the old NR cell.

T_{RACH}: It is the delay caused due to the random access procedure when sending random access to the target E-UTRA cell.

The normative reference for this requirement is TS 38.133 [6] clauses 6.2.3.2.2.

6.3.2.3.1 NR SA FR1 RRC connection release with redirection

6.3.2.3.1.1 Test purpose

This test is to verify RRC connection release with redirection from NR to NR.

6.3.2.3.1.2 Test applicability

This test applies to all types of NR UE from Release 15 onwards.

6.3.2.3.1.3 Minimum conformance requirement

The minimum conformance requirements are specified in clause 6.3.2.3.0.1.

The normative reference for this requirement is TS 38.133 [6] A.6.3.2.3.1.

6.3.2.3.1.4 Test description

6.3.2.3.1.4.1 Initial conditions

This test can be run in the configurations defined in Table 6.3.2.3.1.4.1-1.

Table 6.3.2.3.1.4.1-1: Redirection from NR to NR test configurations

Configuration	Description
6.3.2.3.1-1	Source cell: NR 15 kHz SSB SCS, 10MHz bandwidth, FDD duplex mode Target cell: NR 15 kHz SSB SCS, 10MHz bandwidth, FDD duplex mode
6.3.2.3.1-2	Source cell: NR 15 kHz SSB SCS, 10MHz bandwidth, TDD duplex mode Target cell: NR 15 kHz SSB SCS, 10MHz bandwidth, TDD duplex mode
6.3.2.3.1-3	Source cell: NR 30 kHz SSB SCS, 40MHz bandwidth, TDD duplex mode Target cell: NR 30 kHz SSB SCS, 40MHz bandwidth, TDD duplex mode
Note: The UE is only required to be tested in one of the supported test configurations.	

Configure the test equipment and the DUT according to the parameters in Table 6.3.2.3.1.4.1-2.

Table 6.3.2.3.1.4.1-2: Initial conditions for Redirection from NR to NR test case

Parameter	Value		Comment
Test environment	NC		As specified in TS 38.508-1 [14] clause 4.1.
Test frequencies	As specified in Annex E, Table E.4-1 and TS 38.508-1 [14] clause 4.3.1.		
Channel bandwidth	As specified by the test configuration selected from Table 6.3.2.3.1.4.1-1.		
Propagation conditions	AWGN		As specified in Annex C.2.2.
Connection Diagram	TE Part	A.3.1.8.2	As specified in TS 38.508-1 [14] Annex A.
	DUT Part	A.3.2.3.4	
Exceptions to connection diagram	N/A		

1. The general test parameters for PCell and neighbour cell are given in Table 6.3.2.3.1.4.1-3 below.

2. Message contents are defined in clause 6.3.2.3.1.4.3.

3. There are two carriers and two NR cells specified in the test. Cell 1 and Cell 2 are configured according to Annex C.1.1 and C.1.2.

Table 6.3.2.3.1.4.1-3: General test parameters for Redirection from NR to NR test case

Parameter		Unit	Value	Comment
Initial conditions	Active cell		Cell 1	
	Neighbouring cell		Cell 2	
Final condition	Active cell		Cell 2	
Filter coefficient			0	L3 filtering is not used
Access Barring Information		-	Not Sent	No additional delays in random access procedure.
Time offset between cells			3 μs	Synchronous cells
T1		s	5	
T2		s	2.3	

6.3.2.3.1.4.2 Test procedure

The test consists of two successive time periods, with time duration of T1, and T2 respectively. The "*RRCRelease*" message shall be sent to the UE during period T1 and the start of T2 is the instant when the last TTI containing the RRC message is sent to the UE. Prior to time duration T2, the UE shall not have any timing information of Cell 2. Cell 2 is powered up at the beginning of the T2. Cell 1 and Cell 2 belong to different tracking areas.

1. Ensure the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity NR, Connected without release On and Test Mode *On* according to TS 38.508-1 [14] clause 4.5. Cell 1 is the active cell.

2. Set the parameters according to T1 in Table 6.3.2.3.1.5-1. T1 starts.
3. SS shall transmit an *RRCRelease* during period T1.
4. The SS shall switch the power setting from T1 to T2 as specified in Table 6.3.2.3.1.5-1. When the last TTI containing the *RRCRelease* message is sent to UE, T2 starts.
5. If the UE transmits the PRACH to Cell 2 less than 2240 ms from the beginning of time period T2 then the number of successful tests is increased by one. Otherwise, the number of failure tests is increased by one.
6. After T2 expires, the UE shall be switched off. Then ensure the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity NR, Connected without release On and Test Mode *On* according to TS 38.508-1 [14] clause 4.5. Cell 1 is the active cell and Cell 2 shall be powered OFF.
7. The SS shall set Cell 2 physical cell identity = ((current cell 2 physical cell identity + 1) mod 1008) for next iteration of the test procedure loop.
8. Repeat step 2-7 until the confidence level according to Table G.2.3-1 in Annex G clause G.2 is achieved.

6.3.2.3.1.4.3 Message contents

Message contents are according to TS 38.508-1 [14] clause 7.3 with the following exceptions:

Table 6.3.2.3.1.4.3-1: RRCRelease for NR RRC redirection

Derivation Path: TS 38.508-1 [14], Table 4.6.1-16			
Information Element	**Value/remark**	**Comment**	**Condition**
RRCRelease ::= SEQUENCE {			
criticalExtensions CHOICE {			
rrcRelease SEQUENCE {			
redirectedCarrierInfo CHOICE {			
nr SEQUENCE {			
carrierFreq	ARFCN-ValueNR	Frequency of Cell 2	
ssbSubcarrierSpacing	kHz15		Config 1,2
	kHz30		Config 3
smtc SEQUENCE {			
duration	sf1		SMTC.1
	sf5		SMTC.2
}			
}			
}			
}			
}			
}			

Table 6.3.2.3.1.4.3-2: SIB2

Derivation Path: TS 38.508-1 [14], Table 4.6.2-1			
Information Element	**Value/remark**	**Comment**	**Condition**
SIB2 ::= SEQUENCE {			
cellReselectionInfoCommon SEQUENCE {			
rangeToBestCell	Not present		
}			

6.3.2.3.1.5 Test requirement

Table 6.3.2.3.1.5-1 defines the primary level settings for Redirection from NR to NR test case.

Table 6.3.2.3.1.5-1: Cell specific test parameters for Redirection from NR to NR test case

Parameter		Unit	Cell 1		Cell 2	
			T1	T2	T1	T2
NR RF Channel Number			1		2	
Duplex mode	Config 1		FDD			
	Config 2,3		TDD			

SSB Configuration	Config 1		SSB.1 FR1			
	Config 2		SSB.1 FR1			
	Config 3		SSB.2 FR1			
CSI-RS for tracking	Config 1		TRS.1.1 FDD			
	Config 2		TRS.1.1 TDD			
	Config 3		TRS.1.2 TDD			
TDD configuration	Config 1		Not Applicable			
	Config 2		TDDConf.1.1			
	Config 3		TDDConf.2.1			
$BW_{channel}$	Config 1	MHz	10: $N_{RB,c}$ = 52			
	Config 2		10: $N_{RB,c}$ = 52			
	Config 3		40: $N_{RB,c}$ = 106			
BWP BW	Config 1	MHz	10: $N_{RB,c}$ = 52			
	Config 2		10: $N_{RB,c}$ = 52			
	Config 3		40: $N_{RB,c}$ = 106			
DRx Cycle		ms	Not Applicable			
PDSCH Reference measurement channel	Config 1		SR.1.1 FDD			
	Config 2		SR.1.1 TDD			
	Config 3		SR 2.1 TDD			
CORESET Reference Channel	Config 1		CR.1.1 FDD			
	Config 2		CR.1.1 TDD			
	Config 3		CR 2.1 TDD			
OCNG Patterns			OP.1			
SMTC configuration	Config 1,2		SMTC.1			
	Config 3		SMTC.2			
PDSCH/PDCCH subcarrier spacing	Config 1,2	kHz	15 kHz			
	Config 3		30 kHz			
PUCCH/PUSCH subcarrier spacing	Config 1,2	kHz	15 kHz			
	Config 3		30 kHz			
PRACH configuration			FR1 PRACH configuration 1			
BWP configuration	Initial DL BWP		DLBWP.0.1			
	Dedicated DL BWP		DLBWP.1.1			
	Initial UL BWP		ULBWP.0.1			
	Dedicated UL BWP		ULBWP.1.1			
EPRE ratio of PSS to SSS		dB	0			
EPRE ratio of PBCH DMRS to SSS						
EPRE ratio of PBCH to PBCH DMRS						
EPRE ratio of PDCCH DMRS to SSS						
EPRE ratio of PDCCH to PDCCH DMRS						
EPRE ratio of PDSCH DMRS to SSS						
EPRE ratio of PDSCH to PDSCH						
EPRE ratio of OCNG DMRS to SSS(Note 1)						
EPRE ratio of OCNG to OCNG DMRS (Note 1)						
N_{oc} Note2		dBm/15kHz	-98			
N_{oc} Note2	Config 1,2	dBm/SCS	-98			
	Config 3		-95			
$\hat{E}_s / I_{ot}$		dB	4	4	-infinity	4
$\hat{E}_s / N_{oc}$		dB	4	4	-infinity	4
Io Note3	Config 1,2	dBm/ 9.36MHz	-64.59	-64.59	-70.05	-64.59
	Config 3	dBm/ 38.16MHz	-58.49	-58.49	-63.94	-58.49
Propagation condition		-	AWGN			

Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.

Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for N_{oc} to be fulfilled.

Note 3: Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.

The UE shall start to transmit the PRACH to Cell 2 less than 2240 ms from the beginning of time period T2.

The rate of correct RRC connection release redirection to NR observed during repeated tests shall be at least 90%.

NOTE: The redirection delay can be expressed as:

$$T_{connection_release_redirect_NR} = T_{RRC_procedure_delay} + T_{identify\text{-}NR} + T_{SI\text{-}NR} + T_{RACH},$$

where:

$T_{RRC_procedure_delay}$ = 110 ms and is specified in clause 12 in TS 38.331 [13].

$T_{identify\text{-}NR}$ = 680 ms in the test.

$T_{SI\text{-}NR}$ = 1280 ms is assumed, it is the time required for receiving all the relevant system information as defined in TS 38.331 for the target NR cell.

T_{RACH} = 170 ms in the test.

This gives a total of 2240 ms.

6.3.2.3.2 NR SA FR1 – E-UTRA RRC connection release with redirection

6.3.2.3.2.1 Test purpose

This test is to verify RRC connection release with redirection from NR to E-UTRAN.

6.3.2.3.2.2 Test applicability

This test applies to all types of NR UE from Release 15 onwards.

6.3.2.3.2.3 Minimum conformance requirement

The minimum conformance requirements are specified in clause 6.3.2.3.0.2.

The normative reference for this requirement is TS 38.133 [6] A.6.3.2.3.2.

6.3.2.3.2.4 Test description

6.3.2.3.2.4.1 Initial conditions

This test can be run in the configurations defined in Table 6.3.2.3.2.4.1-1.

Table 6.3.2.3.2.4.1-1: Redirection from NR to E-UTRAN test configurations

Configuration	Description
6.3.2.3.2-1	NR 15 kHz SSB SCS, 10MHz bandwidth, FDD duplex mode, LTE FDD
6.3.2.3.2-2	NR 15 kHz SSB SCS, 10MHz bandwidth, TDD duplex mode, LTE FDD
6.3.2.3.2-3	NR 30 kHz SSB SCS, 40MHz bandwidth, TDD duplex mode, LTE FDD
6.3.2.3.2-4	NR 15 kHz SSB SCS, 10MHz bandwidth, FDD duplex mode, LTE TDD
6.3.2.3.2-5	NR 15 kHz SSB SCS, 10MHz bandwidth, TDD duplex mode, LTE TDD
6.3.2.3.2-6	NR 30 kHz SSB SCS, 40MHz bandwidth, TDD duplex mode, LTE TDD
Note: The UE is only required to be tested in one of the supported test configurations	

Configure the test equipment and the DUT according to the parameters in Table 6.3.2.3.2.4.1-2.

Table 6.3.2.3.2.4.1-2: Initial conditions for Redirection from NR to E-UTRAN test case

Parameter	Value		Comment
Test environment	NC		As specified in TS 38.508-1 [14] clause 4.1.
Test frequencies	As specified in Annex E, Table E.4-1 and TS 38.508-1 [14] clause 4.3.1.		
Channel bandwidth	As specified by the test configuration selected from Table 6.3.2.3.2.4.1-1.		
Propagation conditions	AWGN		As specified in Annex C.2.2.
Connection Diagram	TE Part	A.3.1.6.1	As specified in TS 38.508-1 [14] Annex A.
	DUT Part	A.3.2.3.2	

Exceptions to connection diagram	N/A	

1. The general test parameters settings are given in Table 6.3.2.3.2.4.1-3 below.

2. Message contents are defined in clause 6.3.2.3.2.4.3.

3. There are two cells specified in the test. Cell 1 is the NR PCell and Cell 2 is the E-UTRAN neighbour cell. Cell 1 is configured according to Annex C.1.1 and C.1.2, Cell 2 is configured according to TS 36.521-3 [26] Annex C.1.0 and C.1.1.

Table 6.3.2.3.2.4.1-3: General test parameters for Redirection from NR to E-UTRAN test case

Parameter		Unit	Value	Comment
Initial conditions	Active cell		Cell 1	
	Neighbouring cell		Cell 2	
Final condition	Active cell		Cell 2	
Filter coefficient			0	L3 filtering is not used
Access Barring Information		-	Not Sent	No additional delays in random access procedure.
Time offset between cells			3 μs	Synchronous cells
T1		s	5	
T2		s	2.3	

6.3.2.3.2.4.2 Test procedure

The test consists of two successive time periods, with time duration of T1, and T2 respectively. The "*RRCRelease*" message shall be sent to the UE during period T1 and the start of T2 is the instant when the last TTI containing the RRC message is sent to the UE. Prior to time duration T2, the UE shall not have any timing information of Cell 2. Cell 2 is powered up at the beginning of the T2.

1. Ensure the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity NR, Connected without release On and Test Mode *On* according to TS 38.508-1 [14] clause 4.5. Cell 1 is the active cell.

2. Set the parameters according to T1 in Table 6.3.2.3.2.5-1 and 6.3.2.3.2.5-2. T1 starts.

3. SS shall transmit an *RRCRelease* during period T1.

4. The SS shall start T2 timer when the last TTI containing the *RRCRelease* message is sent to UE.

5. When T2 starts, the SS shall switch the power setting from T1 to T2 as specified in Table 6.3.2.3.2.5-1 for Cell 1 and Table 6.3.2.3.2.5-2 for Cell 2.

6. The UE shall transmit RRCConnectionRequest message.

7. If the UE transmits the PRACH to Cell 2 less than 2205 ms from the beginning of time period T2 then the number of successful tests is increased by one. Otherwise, the number of failure tests is increased by one.

8. After T2 expires, the UE shall be switched off. Then ensure the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity NR, Connected without release On according to TS 38.508-1 [14] clause 4.5. Cell 1 is the active cell and Cell 2 shall be powered OFF.

9. The SS shall set Cell 2 physical cell identity = ((current cell 2 physical cell identity + 1) mod 14+2) for next iteration of the test procedure loop.

10. Repeat step 2-9 until the confidence level according to Table G.2.3-1 in Annex G clause G.2 is achieved.

6.3.2.3.2.4.3 Message contents

Message contents are according to TS 38.508-1 [14] clause 4.6 with the following exceptions:

Table 6.3.2.3.2.4.3-1: RRCRelease for Inter-RAT RRC redirection

Derivation Path: TS 38.508-1 [14], Table 4.6.1-16

Information Element	Value/remark	Comment	Condition
RRCRelease ::= SEQUENCE {			
criticalExtensions CHOICE {			
rrcRelease SEQUENCE {			
redirectedCarrierInfo CHOICE {			
eutra SEQUENCE {			
eutraFrequency	ARFCN-ValueEUTRA	Frequency of Cell 2	
cnType	epc		
}			
}			
}			
}			
}			

6.3.2.3.2.5 Test requirement

Table 6.3.2.3.2.5-1 and 6.3.2.3.2.5-2 define the primary level settings for Redirection from NR to E-UTRAN test case.

Table 6.3.2.3.2.5-1: Cell specific test parameters for Redirection from NR to E-UTRAN test case(Cell 1)

Parameter		Unit	Cell 1	
			T1	T2
RF Channel Number			1	
Duplex mode	Config 1,4		FDD	
	Config 2,3,5,6		TDD	
SSB Configuration	Config 1,4		SSB.1 FR1	
	Config 2,5		SSB.1 FR1	
	Config 3,6		SSB.2 FR1	
CSI-RS for tracking	Config 1,4		TRS.1.1 FDD	
	Config 2,5		TRS.1.1 TDD	
	Config 3,6		TRS.1.2 TDD	
TDD configuration	Config 1,4		Not Applicable	
	Config 2,5		TDDConf.1.1	
	Config 3,6		TDDConf.2.1	
$BW_{channel}$	Config 1,4	MHz	10: $N_{RB,c}$ = 52	
	Config 2,5		10: $N_{RB,c}$ = 52	
	Config 3,6		40: $N_{RB,c}$ = 106	
BWP BW	Config 1,4	MHz	10: $N_{RB,c}$ = 52	
	Config 2,5		10: $N_{RB,c}$ = 52	
	Config 3,6		40: $N_{RB,c}$ = 106	
DRx Cycle		ms	Not Applicable	
PDSCH Reference measurement channel	Config 1,4		SR.1.1 FDD	
	Config 2,5		SR.1.1 TDD	
	Config 3,6		SR2.1 TDD	
CORESET Reference Channel	Config 1,4		CR.1.1 FDD	
	Config 2,5		CR.1.1 TDD	
	Config 3,6		CR2.1 TDD	
OCNG Patterns			OCNG pattern 1	
SMTC configuration	Config 1,2,4,5		SMTC.1 FR1	
	Config 3,6		SMTC.2 FR1	
PDSCH/PDCCH subcarrier spacing	Config 1,2,4,5	kHz	15 kHz	
	Config 3,6		30 kHz	
PUCCH/PUSCH subcarrier spacing	Config 1,2,4,5	kHz	15 kHz	
	Config 3,6		30 kHz	
PRACH configuration			FR1 PRACH configuration 1	
BWP configuration	Initial DL BWP		DLBWP.0.1	
	Dedicated DL BWP		DLBWP.1.1	
	Initial UL BWP		ULBWP.0.1	
	Dedicated UL BWP		ULBWP.1.1	
EPRE ratio of PSS to SSS		dB	0	
EPRE ratio of PBCH DMRS to SSS				
EPRE ratio of PBCH to PBCH DMRS				
EPRE ratio of PDCCH DMRS to SSS				
EPRE ratio of PDCCH to PDCCH DMRS				
EPRE ratio of PDSCH DMRS to SSS				

Parameter		Unit	Cell 1	
			T1	T2
EPRE ratio of PDSCH to PDSCH				
EPRE ratio of OCNG DMRS to SSS(Note 1)				
EPRE ratio of OCNG to OCNG DMRS (Note 1)				
N_{oc} Note2		dBm/15kHz	-98	
N_{oc} Note2	Config 1,2,4,5	dBm/SCS	-98	
	Config 3,6		-95	
$\hat{E}_s/I_{ot}$		dB	4	4
$\hat{E}_s/N_{oc}$		dB	4	4
Io Note3	Config 1,2,4,5	dBm/ 9.36MHz	-64.59	-64.59
	Config 3,6	dBm/ 38.16MHz	-58.49	-58.49
Propagation condition		-	AWGN	

Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.

Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for N_{oc} to be fulfilled.

Note 3: Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.

Table 6.3.2.3.2.5-1: Cell specific test parameters for Redirection from NR to E-UTRAN test case(Cell 2)

Parameter	Unit	Configuration	Cell 2	
			T1	T2
RF channel number		1, 2, 3, 4, 5, 6	2	
Duplex mode		1, 2, 3	FDD	
		4, 5, 6	TDD	
TDD special subframe configuration Note1		4, 5, 6	6	
TDD uplink-downlink configuration Note1		4, 5, 6	1	
$BW_{channel}$	MHz	1, 2, 3, 4, 5, 6	5MHz: $N_{RB,c}$ = 25 10MHz: $N_{RB,c}$ = 50 20MHz: $N_{RB,c}$ = 100	
PRACH Configuration Note2		1, 2, 3	4	
		4, 5, 6	53	
PDSCH parameters: DL Reference Measurement Channel Note3		1, 2, 3	5MHz: R.7 FDD 10MHz: R.3 FDD 20MHz: R.6 FDD	
		4, 5, 6	5MHz: R.4 TDD 10MHz: R.0 TDD 20MHz: R.3 TDD	
PCFICH/PDCCH/PHICH parameters: DL Reference Measurement Channel Note3		1, 2, 3	5MHz: R.11 FDD 10MHz: R.6 FDD 20MHz: R.10 FDD	
		4, 5, 6	5MHz: R.11 TDD 10MHz: R.6 TDD 20MHz: R.10 TDD	
OCNG Patterns Note3		1, 2, 3	5MHz: OP.20 FDD 10MHz: OP.10 FDD 20MHz: OP.17 FDD	
		4, 5, 6	5MHz: OP.9 TDD 10MHz: OP.1 TDD 20MHz: OP.7 TDD	
PBCH_RA	dB	1, 2, 3, 4, 5, 6	0	
PBCH_RB				
PSS_RA				
SSS_RA				
PCFICH_RB				

Parameter	Unit	Configuration	Cell 2	
			T1	T2
PHICH_RA				
PHICH_RB				
PDCCH_RA				
PDCCH_RB				
PDSCH_RA				
PDSCH_RB				
OCNG_RA Note4				
OCNG_RB Note4				
N_{oc} Note5	dBm/15kHz	1, 2, 3, 4, 5, 6	-98	
$\hat{E}_s/N_{oc}$	dB	1, 2, 3, 4, 5, 6	-Infinity	4
$\hat{E}_s/I_{ot}$ Note6	dB	1, 2, 3, 4, 5, 6	-Infinity	4
RSRP Note6	dBm/15kHz	1, 2, 3, 4, 5, 6	-Infinity	-94
SCH_RP Note6	dBm/15kHz	1, 2, 3, 4, 5, 6	-Infinity	-94
Io Note6	dBm/9MHz	1, 2, 3, 4, 5, 6	-70.22	-64.76
Propagation Condition		1, 2, 3, 4, 5, 6	AWGN	

Note 1: Special subframe and uplink-downlink configurations are specified in table 4.2-1 in TS 36.211.
Note 2: PRACH configurations are specified in table 5.7.1-2 and table 5.7.1-3 in TS 36.211.
Note 3: DL RMCs and OCNG patterns are specified in sections A 3.1 and A 3.2 of TS 36.133 respectively.
Note 4: OCNG shall be used such that all cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.
Note 5: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for N_{oc} to be fulfilled.
Note 6: $\hat{E}_s/I_{ot}$, RSRP, SCH_RP and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.
Note 7: Propagation condition and correlation matrix are defined in section B.2 in TS 36.101 [27].

The UE shall start to transmit the PRACH to Cell 2 less than 2205 ms from the beginning of time period T2.

The rate of correct RRC connection release redirection to E-UTRAN observed during repeated tests shall be at least 90%.

NOTE: The redirection delay can be expressed as:

$$T_{connection_release_redirect_E\text{-}UTRA} = T_{RRC_procedure_delay} + T_{identify\text{-}E\text{-}UTRA} + T_{SI\text{-}E\text{-}UTRA} + T_{RACH},$$

where:

$T_{RRC_procedure_delay}$ = 110 ms and is specified in clause 12 in TS 38.331 [2].

$T_{identify\text{-}E\text{-}UTRA}$ = 800 ms in the test.

$T_{SI\text{-}E\text{-}UTRA}$ = 1280 ms is assumed, it is the time required for receiving all the relevant system information as defined in TS 38.331 for the target E-UTRAN cell.

T_{RACH} = 15 ms in the test.

This gives a total of 2205 ms.

6.3.3 Conditional handover

6.3.3.0 Minimum conformance requirements

6.3.3.0.1 Minimum conformance requirements for NR FR1 intra-frequency conditional handover

[TS 38.133, clause 6.1.4.2.1]

Procedure delays for all procedures that can command a conditional handover are specified in TS 38.331 [13].

When the UE receives a RRC message implying conditional handover the UE shall be ready to start the transmission of the new uplink PRACH channel within $D_{handover}$ seconds from the end of the last TTI containing the RRC command.

$$D_{CHO} = T_{RRC} + T_{Event_DU} + T_{measure} + T_{interrupt} + T_{CHO_execution}$$

Where:

T_{RRC} is the RRC procedure delay defined in clause 12 in TS 38.331 [13].

T_{Event_DU} is the delay uncertainty which is the time from when the UE successfully decodes a conditional handover command until a condition exists at the measurement reference point which will trigger the conditional handover.

$T_{measure}$ is the measurements time stated in TS 38.133 [6] clause 6.1.4.2.2.

$T_{CHO_execution}$ is the conditional execution preparation time in TS 38.133 [6] clause 6.1.4.2.3.

$T_{interrupt}$ is the interruption time stated in TS 38.133 [6] clause 6.1.4.2.4.

[TS 38.133, clause 6.1.4.2.2]

The measurement time delay is defined from the end of T_{Event_DU} until UE executes a handover to a target cell and interruption time starts.

For intra-frequency handover, the measurement time delay measured without Time To Trigger (TTT) and L3 filtering shall be less than $T_{identify\ intra\ with\ index}$ or $T_{identify_intra_without_index}$ defined in clause 9.2.5.1 or clause 9.2.6.2.

When TTT or L3 filtering is used an additional delay can be expected.

A cell is detectable only if at least one SSB measured from the cell being configured remains detectable during the time period $T_{identify_intra_without_index}$ or $T_{identify_intra_with_index}$ for intra-frequency handover or $T_{identify_inter_without_index}$ for inter-frequency handover. If a cell which has been detectable at least for the time period $T_{identify_intra_without_index}$ or $T_{identify_intra_with_index}$ for intra-frequency handover or $T_{identify_inter_without_index}$ for inter-frequency handover becomes undetectable for a period and then the cell becomes detectable again and triggers a handover, the measurement time delay shall be less than $T_{SSB_measurement_period_intra}$ or $T_{SSB_measurement_period_inter}$ provided the timing to that cell has not changed more than ± 3200 Tc while the measurement gap has not been available and the L3 filter has not been used. When L3 filtering is used, an additional delay can be expected.

[TS 38.133, clause 6.1.4.2.3]

$T_{CHO_execution}$ is the UE execution preparation time for conditional handover, and starts after UE realizes the condition of CHO is met and identity of the target cell is determined. $T_{CHO_execution}$ can be up to 10ms.

[TS 38.133, clause 6.1.4.2.4]

The interruption time is the time between when the UE starts to execute the conditional handover to the target cell and the time the UE starts transmission of the new PRACH.

For intra-frequency or inter-frequency conditional conditional handover, the measurment time shall be less than

$$T_{interrupt} = T_{processing} + T_{IU} + T_{\Delta} + T_{margin}\ ms$$

Where:

$T_{processing}$ is time for UE processing. $T_{processing}$ can be up to 20ms.

T_{IU} is the interruption uncertainty in acquiring the first available PRACH occasion in the new cell. T_{IU} can be up to the summation of SSB to PRACH occasion association period and 10 ms. SSB to PRACH occasion associated period is defined in the table 8.1-1 of TS 38.213 [8]

T_{Δ} is time for fine time tracking and acquiring full timing information of the target cell. $T_{\Delta} = T_{rs}$.

T_{margin} is time for SSB post-processing. T_{margin} can be up to 2ms.

T_{rs} is the SMTC periodicity of the target NR cell if the UE has been provided with an SMTC configuration for the target cellin the handover command, otherwise Trs is the SMTC configured in the measObjectNR having the same SSB frequency and subcarrier spacing. If the UE is not provided SMTC configuration or measurement object on this frequency, the requirement in this clause is applied with T_{rs}=5ms assuming the SSB transmission periodicity is 5ms. There is no requirement if the SSB transmission periodicity is not 5ms. If the UE has been provided with higher layer in TS 38.331 [13] signaling of *smtc2* prior to the handover command, T_{rs} follows *smtc1* or *smtc2* according to the physical cell ID of the target cell.

NOTE 1: The actual value of T_{IU} shall depend upon the PRACH configuration used in the target cell.[TS 38.133, clause 9.2.2]

The requirements in TS 38.133 [6] clause 9.2 apply, provided:

- The cell being identified or measured is detectable.

An intra-frequency cell shall be considered detectable when for each relevant SSB:

- SS-RSRP related side conditions given in TS 38.133 [6] clauses 10.1.2 for FR1, for a corresponding Band,
- SSB_RP and SSB Ês/Iot according to TS 38.133 [6] Annex B.2.2 for a corresponding Band.

[TS 38.133, clause 9.2.5.1]

The UE shall be able to identify a new detectable intra-frequency cell within $T_{identify_intra_without_index}$ if the UE is not indicated to report SSB based RRM measurement result with the associated SSB index(*reportQuantityRsIndexes* or *maxNrofRSIndexesToReport* is not configured), or the UE is indicated that the neighbour cell is synchronous with the serving cell (*deriveSSB-IndexFromCell* is enabled). Otherwise UE shall be able to identify a new detectable intra frequency cell within $T_{identify_intra_with_index}$. The UE shall be able to identify a new detectable intra frequency SS block of an already detected cell within $T_{identify_intra_without_index}$. It is assumed that *deriveSSB-IndexFromCell* is always enabled for FR1 TDD and FR2.

$$T_{identify_intra_without_index} = (T_{PSS/SSS_sync_intra} + T_{SSB_measurement_period_intra})\ ms$$

$$T_{identify_intra_with_index} = (T_{PSS/SSS_sync_intra} + T_{SSB_measurement_period_intra} + T_{SSB_time_index_intra})\ ms$$

Where:

T_{PSS/SSS_sync_intra}: it is the time period used in PSS/SSS detection given in TS 38.133 [6] Table 9.2.5.1-1.

$T_{SSB_time_index_intra}$: it is the time period used to acquire the index of the SSB being measured given in TS 38.133 [6] Table 9.2.5.1-3.

$T_{SSB_measurement_period_intra}$: equal to a measurement period of SSB based measurement given in TS 38.133[6] Table 9.2.5.2-1.

$CSSF_{intra}$: it is a carrier specific scaling factor and is determined

according to $CSSF_{outside_gap,i}$ in TS 38.133 [6] clause 9.1.5.1 for measurement conducted outside measurement gaps, i.e. when intra-frequency SMTC is fully non overlapping or partially overlapping with measurement gaps.

When intra-frequency SMTC is fully non overlapping with measurement gaps or intra-frequency SMTC is fully overlapping with MGs, Kp=1

Table 9.2.5.1-1: Time period for PSS/SSS detection, (Frequency range FR1)

DRX cycle	T_{PSS/SSS_sync_intra}
No DRX	max(600ms, ceil(5 x K_p) x SMTC period)[Note 1] x $CSSF_{intra}$
DRX cycle≤ 320ms	max(600ms, ceil(M2 [Note 2]x 5 x K_p) x max(SMTC period,DRX cycle)) x $CSSF_{intra}$
DRX cycle>320ms	ceil(5 x K_p) x DRX cycle x $CSSF_{intra}$
NOTE 1: If different SMTC periodicities are configured for different cells, the SMTC period in the requirement is the one used by the cell being identified NOTE 2: When *highSpeedMeasFlag-r16* is not configured, M2 = 1.5; When *highSpeedMeasFlag-r16* is configured, M2 = 1.5 if SMTC periodicity > 40 ms;,otherwise M2=1.	

NOTE 3: When *highSpeedMeasFlag-r16* is configured, the requirements apply only to UE supporting either *measurementEnhancement-r16* or *[intraRAT-MeasurementEnhancement-r16]* on measurements of the primary component carrier and do not apply to measurements of a secondary component carrier with active SCell.

Table 9.2.5.1-3: Time period for time index detection (FR1)

DRX cycle	$T_{SSB_time_index_intra}$
No DRX	max(120ms, ceil(3 x K_p) x SMTC period)[Note 1] x $CSSF_{intra}$
DRX cycle≤ 320ms	max(120ms, ceil (M2[Note 2] x 3 x K_p) x max(SMTC period,DRX cycle)) x $CSSF_{intra}$
DRX cycle>320ms	Ceil(3 x K_p) x DRX cycle x $CSSF_{intra}$
NOTE 1: If different SMTC periodicities are configured for different cells, the SMTC period in the requirement is the one used by the cell being identified NOTE 2: When *highSpeedMeasFlag-r16* is not configured, M2 = 1.5; When *highSpeedMeasFlag-r16* is configured, M2 = 1.5 if SMTC periodicity > 40 ms;,otherwise M2=1 NOTE 3: When *highSpeedMeasFlag-r16* is configured, the requirements apply only to UE supporting either *measurementEnhancement-r16* or *[intraRAT-MeasurementEnhancement-r16]* on measurements of the primary component carrier and do not apply to measurements of a secondary component carrier with active SCell.	

[TS 38.133, clause 9.2.5.2]

The measurement period for intra-frequency measurements without gaps is as shown in TS 38.133 [6] Table 9.2.5.2-1.

Table 9.2.5.2-1: Measurement period for intra-frequency measurements without gaps(FR1)

DRX cycle	$T_{SSB_measurement_period_intra}$
No DRX	max(200ms, ceil(5 x K_p) x SMTC period)[Note 1] x $CSSF_{intra}$
DRX cycle≤ 320ms	max(200ms, ceil(1.5x 5 x K_p) x max(SMTC period,DRX cycle)) x $CSSF_{intra}$
DRX cycle>320ms	ceil(5 x K_p) x DRX cycle x $CSSF_{intra}$
NOTE 1: If different SMTC periodicities are configured for different cells, the SMTC period in the requirement is the one used by the cell being identified	

[TS 38.133, clause 10.1.2.1.1]

Unless otherwise specified, the requirements for absolute accuracy of SS-RSRP in this clause apply to a cell on the same frequency as that of the serving cell in FR1. The accuracy requirements in this clause are also applicable when *highSpeedMeasFlag-r16* is configured.

The accuracy requirements in TS 38.133 [6] Table 10.1.2.1.1-1 are valid under the following conditions:

- Conditions defined in clause 7.3 of TS 38.101-1 [2] for reference sensitivity are fulfilled.
- Conditions for intra-frequency measurements are fulfilled according to 38.133 [6] Annex B.2.2 for a corresponding Band for each relevant SSB.

Table 10.1.2.1.1-1: SS-RSRP Intra frequency absolute accuracy in FR1

Accuracy		Conditions					
Normal condition	Extreme condition	SSB $\hat{E}s/Iot$	Io[Note 1] range				
			NR operating band groups Note 2	Minimum Io			Maximum Io
dB	dB	dB		dBm / SCS_{SSB}		$dBm/BW_{Channel}$	$dBm/BW_{Channel}$
				SCS_{SSB} = 15 kHz	SCS_{SSB} = 30 kHz		
±4.5	±9	≥-6	Depending on band group	-121+ Δ_{BG_offset}	-118+ Δ_{BG_offset}	N/A	-70
±8	±11	≥-6	Depending on band group	N/A	N/A	-70	-50
NOTE 1: Io is assumed to have constant EPRE across the bandwidth.							

NOTE 2: NR operating band groups in FR1 are as defined in clause 3.5.2.
NOTE 3: For NR operating band groups, Δ_{BG_offset} is defined in clause 3A.4, Table 3A.4.1-2.

[TS 38.133, annex B.2.2]

This clause defines the following conditions for NR intra-frequency measurements and corresponding procedures performed based on SSBs: SSB_RP and SSB Ês/Iot, applicable for a corresponding operating band.

The conditions are defined in Table B.2.2-1 for FR1 NR cells.

Table B.2.2-1: Conditions for intra-frequency measurements in FR1

Parameter	NR operating band groups Note1	Minimum SSB_RP		SSB Ês/Iot
		dBm / SCS_{SSB}		dB
		SCS_{SSB} = 15 kHz	SCS_{SSB} = 30 kHz	
Conditions	Depending on band group	-127+ Δ_{BG_offset}	-124+ Δ_{BG_offset}	≥ -6
NOTE 1: NR operating band groups are defined in clause 3.5.2. NOTE 2: For NR operating band groups, Δ_{BG_offset} is defined in clause 3A.4, Table 3A.4.1-2.				

6.3.3.0.2 Minimum conformance requirements for NR FR1 inter-frequency conditional handover

[TS 38.133, clause 6.1.4.2.1]

Procedure delays for all procedures that can command a conditional handover are specified in TS 38.331 [13].

When the UE receives a RRC message implying conditional handover the UE shall be ready to start the transmission of the new uplink PRACH channel within $D_{handover}$ seconds from the end of the last TTI containing the RRC command.

$$D_{CHO} = T_{RRC} + T_{Event_DU} + T_{measure} + T_{interrupt} + T_{CHO_execution}$$

Where:

T_{RRC} is the RRC procedure delay defined in clause 12 in TS 38.331 [13].

T_{Event_DU} is the delay uncertainty which is the time from when the UE successfully decodes a conditional handover command until a condition exists at the measurement reference point which will trigger the conditional handover.

$T_{measure}$ is the measurements time stated in TS 38.133 [6] clause 6.1.4.2.2.

$T_{CHO_execution}$ is the conditional execution preparation time in TS 38.133 [6] clause 6.1.4.2.3.

$T_{interrupt}$ is the interruption time stated in TS 38.133 [6] clause 6.1.4.2.4.

[TS 38.133, clause 6.1.4.2.2]

The measurement time delay is defined from the end of T_{Event_DU} until UE executes a handover to a target cell and interruption time starts.

For intra-frequency handover, the measurement time delay measured without Time To Trigger (TTT) and L3 filtering shall be less than $T_{identify\ intra\ with\ index}$ or $T_{identify_intra_without_index}$ defined in clause 9.2.5.1 or clause 9.2.6.2.

For inter-frequency handover, the measurement time delay measured without Time To Trigger (TTT) and L3 filtering shall be less than $T_{identify_inter_with_index}$ or $T_{identify_inter_without_index}$ defined in clause 9.3.4.

When TTT or L3 filtering is used an additional delay can be expected.

A cell is detectable only if at least one SSB measured from the cell being configured remains detectable during the time period $T_{identify_intra_without_index}$ or $T_{identify_intra_with_index}$ for intra-frequency handover or $T_{identify_inter_without_index}$ for inter-frequency handover. If a cell which has been detectable at least for the time period $T_{identify_intra_without_index}$ or $T_{identify_intra_with_index}$ for intra-frequency handover or $T_{identify_inter_without_index}$ for inter-frequency handover becomes undetectable for a period and then the cell becomes detectable again and triggers a handover, the measurement time delay shall be less than $T_{SSB_measurement_period_intra}$ or $T_{SSB_measurement_period_inter}$ provided the timing to that cell has not changed

more than ± 3200 Tc while the measurement gap has not been available and the L3 filter has not been used. When L3 filtering is used, an additional delay can be expected.

[TS 38.133, clause 6.1.4.2.3]

$T_{CHO_execution}$ is the UE execution preparation time for conditional handover, and starts after UE realizes the condition of CHO is met and identity of the target cell is determined. $T_{CHO_execution}$ can be up to 10ms.

[TS 38.133, clause 6.1.4.2.4]

The interruption time is the time between when the UE starts to execute the conditional handover to the target cell and the time the UE starts transmission of the new PRACH.

For intra-frequency or inter-frequency conditional conditional handover, the measurment time shall be less than

$$T_{interrupt} = T_{processing} + T_{IU} + T_{\Delta} + T_{margin} \text{ ms}$$

Where:

$T_{processing}$ is time for UE processing. $T_{processing}$ can be up to 20ms.

T_{IU} is the interruption uncertainty in acquiring the first available PRACH occasion in the new cell. T_{IU} can be up to the summation of SSB to PRACH occasion association period and 10 ms. SSB to PRACH occasion associated period is defined in the table 8.1-1 of TS 38.213 [8]

T_{Δ} is time for fine time tracking and acquiring full timing information of the target cell. $T_{\Delta} = T_{rs}$.

T_{margin} is time for SSB post-processing. T_{margin} can be up to 2ms.

T_{rs} is the SMTC periodicity of the target NR cell if the UE has been provided with an SMTC configuration for the target cellin the handover command, otherwise Trs is the SMTC configured in the measObjectNR having the same SSB frequency and subcarrier spacing. If the UE is not provided SMTC configuration or measurement object on this frequency, the requirement in this clause is applied with T_{rs}=5ms assuming the SSB transmission periodicity is 5ms. There is no requirement if the SSB transmission periodicity is not 5ms. If the UE has been provided with higher layer in TS 38.331 [13] signaling of *smtc2* prior to the handover command, T_{rs} follows *smtc1* or *smtc2* according to the physical cell ID of the target cell.

NOTE 1: The actual value of T_{IU} shall depend upon the PRACH configuration used in the target cell.

[TS 38.133, clause 9.3.2]

The requirements in clause 9.3 apply, provided:

- The cell being identified or measured is detectable.

An inter-frequency cell shall be considered detectable when for each relevant SSB:

- SS-RSRP related side conditions given in TS 38.133 [6] clauses 10.1.4 for FR1, for a corresponding Band,
- SSB_RP and SSB Ês/Iot according to TS 38.133 [6] Annex B.2.3 for a corresponding Band.

[TS 38.133, clause 9.3.4]

When measurement gaps are provided, or the UE supports capability of conducting such measurements without gaps, the UE shall be able to identify a new detectable inter frequency cell within $T_{identify_inter_without_index}$ if UE is not indicated to report SSB based RRM measurement result with the associated SSB index (*reportQuantityRsIndexes* or *maxNrofRSIndexesToReport* is not configured). Otherwise UE shall be able to identify a new detectable inter frequency cell within $T_{identify_inter_with_index}$. The UE shall be able to identify a new detectable inter frequency SS block of an already detected cell within $T_{identify_inter_without_index.}$

$$T_{identify_inter_without_index} = (T_{PSS/SSS_sync_inter} + T_{SSB_measurement_period_inter}) \text{ ms}$$

$$T_{identify_inter_with_index} = (T_{PSS/SSS_sync_inter} + T_{SSB_measurement_period_inter} + T_{SSB_time_index_inter}) \text{ ms}$$

Where:

T_{PSS/SSS_sync_inter}: it is the time period used in PSS/SSS detection given in 38.133 [6] Table 9.3.4-1.

$T_{SSB_time_index_inter}$: it is the time period used to acquire the index of the SSB being measured given in 38.133 [6] Table 9.3.4-3.

$T_{SSB_measurement_period_inter}$: equal to a measurement period of SSB based measurement given in 38.133 [6] Table 9.3.5-1.

$CSSF_{inter}$: it is a carrier specific scaling factor and is determined according to $CSSF_{within_gap,i}$ in 38.133 [6] clause 9.1.5.2 for measurement conducted within measurement gaps.

Table 9.3.4-1: Time period for PSS/SSS detection (Frequency range FR1)

Condition NOTE1,2	T_{PSS/SSS_sync_inter}
No DRX	$Max(600ms, 8 \times Max(MGRP, SMTC\ period)) \times CSSF_{inter}$
DRX cycle ≤ 320ms	$Max(600ms, Ceil(8*1.5) \times Max(MGRP, SMTC\ period, DRX\ cycle)) \times CSSF_{inter}$
DRX cycle > 320ms	$8 \times DRX\ cycle \times CSSF_{inter}$
NOTE 1: DRX or non DRX requirements apply according to the conditions described in clause 3.6.1 NOTE 2: In EN-DC operation, the parameters, timers and scheduling requests referred to in clause 3.6.1 are for the secondary cell group. The DRX cycle is the DRX cycle of the secondary cell group.	

Table 9.3.4-3: Time period for time index detection (Frequency range FR1)

Condition NOTE1,2	$T_{SSB_time_index_inter}$
No DRX	$Max(120ms, 3 \times Max(MGRP, SMTC\ period)) \times CSSF_{inter}$
DRX cycle ≤ 320ms	$Max(120ms, Ceil(3 \times 1.5) \times Max(MGRP, SMTC\ period, DRX\ cycle)) \times CSSF_{inter}$
DRX cycle > 320ms	$3 \times DRX\ cycle \times CSSF_{inter}$
NOTE 1: DRX or non DRX requirements apply according to the conditions described in clause 3.6.1 NOTE 2: In EN-DC operation, the parameters, timers and scheduling requests referred to in clause 3.6.1 are for the secondary cell group. The DRX cycle is the DRX cycle of the secondary cell group.	

[TS 38.133, clause 9.3.5]

When measurement gaps are provided for inter frequency measurements, or the UE supports capability of conducting such measurements without gaps, the UE physical layer shall be capable of reporting SS-RSRP, SS-RSRQ and SS-SINR measurements to higher layers with measurement accuracy as specified in TS 38.133 [6] clauses 10.1.4, 10.1.5, 10.1.9, 10.1.10, 10.1.14 and 10.1.15, respectively, as shown in table 9.3.5-1 and 9.3.5-2:

Table 9.3.5-1: Measurement period for inter-frequency measurements with gaps (Frequency FR1)

Condition NOTE1,2	$T_{SSB_measurement_period_inter}$
No DRX	$Max(200ms, 8 \times Max(MGRP, SMTC\ period)) \times CSSF_{inter}$
DRX cycle ≤ 320ms	$Max(200ms, Ceil(8 \times 1.5) \times Max(MGRP, SMTC\ period, DRX\ cycle)) \times CSSF_{inter}$
DRX cycle > 320ms	$8 \times DRX\ cycle \times CSSF_{inter}$
NOTE 1: DRX or non DRX requirements apply according to the conditions described in clause 3.6.1 NOTE 2: In EN-DC operation, the parameters, timers and scheduling requests referred to in clause 3.6.1 are for the secondary cell group. The DRX cycle is the DRX cycle of the secondary cell group.	

[TS 38.133, clause 10.1.4.1.1]

The requirements for absolute accuracy of SS-RSRP in this clause apply to a cell on a frequency in FR1 that has different carrier frequency from the serving cell.

The accuracy requirements in Table 10.1.4.1.1-1 are valid under the following conditions:

- Conditions defined in clause 7.3 of TS 38.101-1 [2] for reference sensitivity are fulfilled.
- Conditions for inter-frequency measurements are fulfilled according to TS 38.133 [6] Annex B.2.3 for a corresponding Band for each relevant SSB.

Table 10.1.4.1.1-1: SS-RSRP Inter frequency Absolute accuracy in FR1

Accuracy	Conditions

Normal condition	Extreme condition	SSB Ês/Iot Note 2	Io Note 1 range				
			NR operating band groups Note 3	Minimum Io			Maximum Io
dB	dB	dB		dBm / SCS_{SSB}		$dBm/BW_{Channel}$	$dBm/BW_{Channel}$
				SCS_{SSB} = 15 kHz	SCS_{SSB} = 30 kHz		
±4.5	±9	≥-6	Depending on band group	-121+ Δ_{BG_offset}	-118+ Δ_{BG_offset}	N/A	-70
±8	±11	≥-6	Depending on band group	N/A	N/A	-70	-50
NOTE 1: Io is assumed to have constant EPRE across the bandwidth. NOTE 2: Void NOTE 3: NR operating band groups in FR1 are as defined in clause 3.5.2. NOTE 4: For NR operating band groups, Δ_{BG_offset} is defined in clause 3A.4, Table 3A.4.1-2.							

[TS 38.133, annex B.2.3]

This clause defines the following conditions for NR inter-frequency measurements and corresponding procedures performed based on SSBs: SSB_RP and SSB Ês/Iot, applicable for a corresponding operating band.

The conditions are defined in Table B.2.3-1 for FR1 NR cells.

Table B.2.3-1: Conditions for inter-frequency measurements in FR1

Parameter	NR operating band groups Note1	Minimum SSB_RP		SSB Ês/Iot
		dBm / SCS_{SSB}		dB
		SCS_{SSB} = 15 kHz	SCS_{SSB} = 30 kHz	
Conditions	Depending on band group	-125+ Δ_{BG_offset}	-122+ Δ_{BG_offset}	≥ -4
NOTE 1: NR operating band groups are defined in clause 3.5.2. NOTE 2: For NR operating band groups, Δ_{BG_offset} is defined in clause 3A.4, Table 3A.4.1-2.				

6.3.3.1 NR SA FR1 conditional handover

6.3.3.1.1 Test purpose

To verify the requirement for the NR FR1 intra-frequency conditional handover requirements specified in 38.133 [6] clause 6.1.4.2

6.3.3.1.2 Test applicability

This test applies to all types of NR UE from Release 16 onwards and supporting conditional handover.

6.3.3.1.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 6.3.3.0.1.

The normative reference for this requirement is TS 38.133 [6] clause A.6.3.3.1.

6.3.3.1.4 Test description

6.3.3.1.4.1 Initial conditions

Initial conditions are a set of test configurations the UE needs to be tested in and the steps for the SS to take with the UE to reach the correct measurement state.

This test shall be tested using any of the test configurations in Table 6.3.3.1.4.1-1.

Table 6.3.3.1.4.1-1: NR SA FR1 conditional handover test configurations

Config	Description
6.3.3.1-1	Source cell: NR 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode Target cell: NR 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode
6.3.3.1-2	Source cell: NR 15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode Target cell: NR 15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode

6.3.3.1-3	Source cell: NR 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode Target cell: NR 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode
Note: The UE is only required to be tested in one of the supported test configurations	

Configure the test equipment and the DUT according to the parameters in Table 6.3.3.1.4.1-2

Table 6.3.3.1.4.1-2: Initial conditions for NR SA FR1 conditional handover

Parameter	Value		Comment
Test environment	NC		As specified in TS 38.508-1 [14] clause 4.1.
Test frequencies	As specified in Annex E.1.1, Table E.4-1 and TS 38.508-1 [14] clause 4.3.1.		
Channel bandwidth	As specified by the test configuration selected from Table 6.3.3.1.4.1-1		
Propagation conditions	AWGN		As specified in Annex C.2.2.
Connection Diagram	TE Part	A.3.1.8.2	As specified in TS 38.508-1 [14] Annex A.
	DUT Part	A.3.2.3.4	
Exceptions to connection diagram	N/A		

1. Message contents are defined in clause 6.3.3.1.4.3.

2. The power levels and settings for NR Cell 1 are set according to Annex C.1.2 and C.1.3. Cell 2 is NR FR1 target Cell, and its power levels and settings are also set according to Annex C.1.2 and C.1.3.

3. The test parameters are given in Table 6.3.3.1.4.1-3 below, with A3-Offset modified by Test Tolerance.

Table 6.3.3.1.4.1-3: General test parameters NR SA FR1 conditional handover

Parameter		Unit	Value	Comment
Initial conditions	Active cell		Cell 1	
	Neighbouring cell		Cell 2	
Final condition	Active cell		Cell 2	
A3-Offset in condition		dB	-1	
Hysteresis		dB	0	
Time To Trigger		s	0	
Filter coefficient			0	L3 filtering is not used
Access Barring Information		-	Not Sent	No additional delays in random access procedure.
PRACH configuration index			FR1 PRACH configuration 1	As specified in table Table 6.3.3.2-3 in TS 38.211 [7]
Time offset between cells			3 μs	Synchronous cells
T1		s	5	
T2		s	≤2	

6.3.3.1.4.2 Test procedure

The test scenario comprises of 1 NR carrier and two cells, Cell 1 and Cell 2, on this carrier. General parameters and Cell-specific parameters for Cell 1 and Cell 2 are given in Table 6.3.3.1.4.1-3 and 6.3.3.1.5-1 respectively. No measurement gap is configured in the test case.

The test consists of two successive time periods, with time durations of T1 and T2 respectively.

At the start of time duration T1, the UE may not have any timing information of cell 2. The UE is configured with a condition implying handover to Cell 2 at a time earlier than T_{RRC} ms before the beginning of T2. No interruption shall be observed in time period T1, where

- T_{RRC} = 10ms, is the RRC procedure delay defined in clause 12 in TS 38.331 [13].

From start of T2, the Cell 2 becomes detectable and handover condition is satisfied. During T2, the UE performs measurement on Cell 2 and evaluates the execution condition, and starts handover procedure when execution condition is satisifed. The UE shall sent PRACH to Cell 2 less than $T_{measure} + T_{CHO_execution} + T_{interrupt}$ ms from the start of T2. The Interruption length $T_{interrupt}$ shall also be verified in T2.

1. Ensure the UE is in State RRC_CONNECTED with generic procedure parameters Connectivity *NR*, Connected without release *On* according to TS 38.508-1 [14] clause 4.5. Establish SRB2 and DRB in the *RRCReconfiguration* message. Cell 1 is the active cell. Set Cell 2 physical cell identity to the initial physical cell identity.

2. Set the parameters according to T1 in Table 6.3.3.1.5-1. Propagation conditions are set according to Annex C clause C.2.2. T1 starts. The SS starts continuously scheduling the UE to perform DL reception in every DL slot on Cell 1 and monitoring corresponding ACK/NACK feedbacks sent by the UE.

3. Set Cell 2 physical cell identity = ((current cell 2 physical cell identity + 1) mod 14 + 2).

4. The SS shall transmit an *RRCReconfiguration* message with *conditionalReconfiguration* on Cell 1 to configure CHO execution condition for the UE.

5. The UE shall transmit an *RRCReconfigurationComplete* message.

6. When T1 expires, the SS shall switch the power setting from T1 to T2 as specified in Table 6.3.3.1.5-1. T2 starts.

7. If

   a) the UE transmits the PRACH preambles to Cell 2 less than $T_{measure} + T_{CHO_execution} + T_{interrupt}$ ms from the beginning of time period T2,

   and

   b) no longer than X consecutive ACK/NACK DTXs are observed by the SS from the start of T2 to the instant the UE transmits the first PRACH preamble, where

   - $X = T_{interrupt} + k_1$ for test configuration 6.3.3.1-1
   - $X = T_{interrupt}$ for test configuration 6.3.3.1-2
   - $X = 2 \cdot T_{interrupt}$ for test configuration 6.3.3.1-3.

   then the number of successful tests is increased by one. Otherwise, the number of failure tests is increased by one.

8. After T2 expires, the SS sends an *RRCReconfiguration* with *reconfigurationWithSync* to cause UE handover back to Cell 1.

9. If UE is not in state RRC_CONNECTED with generic procedure parameters Connectivity *NR*, Connected without release *On* according to TS 38.508-1 [14] clause 4.5 on Cell 1, switch off and on the UE. Then ensure the UE is in State RRC_CONNECTED with generic procedure parameters Connectivity *NR*, Connected without release *On* according to TS 38.508-1 [14] clause 4.5 on Cell 1.

10. Repeat steps 2-9 until the confidence level according to Tables G.2.3-1 in Annex G clause G.2 is achieved.

6.3.3.1.4.3 Message contents

Message contents are according to TS 38.508-1 [14] clause 7.3 with the following exceptions:Table 6.3.3.1.4.3-1: RRCReconfiguration (Step 4)

Derivation Path: TS 38.508-1 [14], Table 4.6.1-13 with condition NR_MEAS and CHO			
Information Element	**Value/remark**	**Comment**	**Condition**
RRCReconfiguration ::= SEQUENCE {			
criticalExtensions CHOICE {			
rrcReconfiguration SEQUENCE {			
measConfig	MeasConfig	Table 6.3.3.1.4.3-2	
nonCriticalExtension SEQUENCE {			
nonCriticalExtension SEQUENCE {			
nonCriticalExtension SEQUENCE {			
nonCriticalExtension SEQUENCE {			
conditionalReconfiguration-r16	ConditionalReconfiguration	Table 6.3.3.1.4.3-5	
}			
}			

}			
}			
}			
}			
}			

Table 6.3.3.1.4.3-2: MeasConfig (Table 6.3.3.1.4.3-1)

Derivation Path: Table H.3.1-2			
Information Element	**Value/remark**	**Comment**	**Condition**
MeasConfig ::= SEQUENCE {			
measObjectToAddModList SEQUENCE (SIZE (1..maxNrofObjectId)) OF MeasObjectToAddMod {	1 entry		
MeasObjectToAddMod[1] SEQUENCE {		entry 1	
measObjectId	1		
measObject CHOICE {			
measObjectNR	MeasObjectNR	Table 6.3.3.1.4.3-3	
}			
}			
}			
reportConfigToAddModList SEQUENCE (SIZE (1..maxReportConfigId)) OF ReportConfigToAddMod {	1 entry		
ReportConfigToAddMod[1] SEQUENCE {		entry 1	
reportConfigId	1		
reportConfig CHOICE {			
reportConfigNR	ReportConfigNR	Table 6.3.3.1.4.3-4	
}			
}			
}			
measIdToAddModList SEQUENCE (SIZE (1..maxNrofMeasId)) OF MeasIdToAddMod {	1 entry		
MeasIdToAddMod[1] SEQUENCE {			
measId	1		
measObjectId	1		
reportConfigId	1		
}			
}			
quantityConfig	QuantityConfig specified in Table H.3.1-5		
}			

Table 6.3.3.1.4.3-3: MeasObjectNR (Table 6.3.3.1.4.3-2)

Derivation Path: TS 38.508-1[14], Table 4.6.3-76			
Information Element	**Value/remark**	**Comment**	**Condition**
MeasObjectNR ::= SEQUENCE {			
ssbFrequency	ARFCN-ValueNR for PCell		
smtc1	SSB-MTC specified in TS 38.508-1[14] Table 7.3.1-3 with condition SMTC.1		
referenceSignalConfig SEQUENCE {			
ssb-ConfigMobility SEQUENCE {			
ssb-ToMeasure	Not present		
}			
}			
absThreshSS-BlocksConsolidation	Not present		
}			

Table 6.3.3.1.4.3-4: ReportConfigNR (Table 6.3.3.1.4.3-2)

Derivation Path: TS 38.508-1[14], Table 4.6.3-142 with condition CHO			
Information Element	**Value/remark**	**Comment**	**Condition**
ReportConfigNR ::= SEQUENCE {			
reportType CHOICE {			
condTriggerConfig SEQUENCE {			
condEventId CHOICE {			
condEventA3 SEQUENCE {			
a3-Offset CHOICE {			
rsrp	-2	actuall value = -2*0.5 = -1dB	
}			
hysteresis	0	actuall value = 0*0.5 = 0dB	
timeToTrigger	ms0		
}			
}			
}			
}			
}			

Table 6.3.3.1.4.3-5: ConditionalReconfiguration (Table 6.3.3.1.4.3-1)

Derivation Path: TS 38.508-1[14], Table 4.6.3-25D			
Information Element	**Value/remark**	**Comment**	**Condition**
ConditionalReconfiguration-r16::= SEQUENCE {			
condReconfigToAddModList-r16 SEQUENCE (SIZE (1.. maxNrofCondCells-r16)) OF CondReconfigToAddMod-r16 {	1 entry		
CondReconfigToAddMod-r16 [1] SEQUENCE {		entry 1	
condReconfigId-r16	1		
condExecutionCond-r16 SEQUENCE (SIZE (1..2)) OF MeasId {	1 entry		
MeasId[1]	1	The MeasId configured in Table 6.3.3.1.4.3-2	
}			
condRRCReconfig-r16	OCTET STRING (CONTAINING RRCReconfiguration Specified in Table 4.8.1-1A with condition RBConfig_NoKeyChange)		
}			
}			
}			

6.3.3.1.5 Test requirements

Table 6.3.3.1.5-1 defines the primary level settings including test tolerances for all tests.

Table 6.3.3.1.5-1: Cell specific test parameters for NR SA FR1 conditional handover

Parameter		**Unit**	**Cell 1**		**Cell 2**	
			T1	**T2**	**T1**	**T2**
NR RF Channel Number			1		1	
Duplex mode	Config 1		FDD			
	Config 2,3		TDD			
TDD configuration	Config 1		Not Applicable			
	Config 2		TDDConf.1.1			
	Config 3		TDDConf.2.1			
$BW_{channel}$	Config 1	MHz	10: $N_{RB,c}$ = 52			
	Config 2		10: $N_{RB,c}$ = 52			

Parameter		Unit	Cell 1		Cell 2	
			T1	T2	T1	T2
	Config 3		40: $N_{RB,c}$ = 106			
BWP BW	Config 1	MHz	10: $N_{RB,c}$ = 52			
	Config 2		10: $N_{RB,c}$ = 52			
	Config 3		40: $N_{RB,c}$ = 106			
DRx Cycle		ms	Not Applicable			
PDSCH Reference measurement channel	Config 1		SR.1.1 FDD			
	Config 2		SR.1.1 TDD			
	Config 3		SR2.1 TDD			
CORESET Reference Channel	Config 1		CR.1.1 FDD			
	Config 2		CR.1.1 TDD			
	Config 3		CR2.1 TDD			
TRS configuration	Config 1		TRS.1.1 FDD			
	Config 2		TRS.1.1 TDD			
	Config 3		TRS.1.2 TDD			
OCNG Patterns			OCNG pattern 1			
SMTC Configuration			SMTC pattern 1			
SSB Configuration	Config 1,2		SSB.1 FR1			
	Config 3		SSB.2 FR1			
PDSCH/PDCCH subcarrier spacing	Config 1,2	kHz	15 kHz			
	Config 3		30 kHz			
PUCCH/PUSCH subcarrier spacing	Config 1,2	kHz	15 kHz			
	Config 3		30 kHz			
PRACH configuration			FR1 PRACH configuration 1			
BWP configuration	Initial DL BWP		DLBWP.0.1			
	Dedicated DL BWP		DLBWP.1.1			
	Initial UL BWP		ULBWP.0.1			
	Dedicated UL BWP		ULBWP.1.1			
EPRE ratio of PSS to SSS		dB	0			
EPRE ratio of PBCH DMRS to SSS						
EPRE ratio of PBCH to PBCH DMRS						
EPRE ratio of PDCCH DMRS to SSS						
EPRE ratio of PDCCH to PDCCH DMRS						
EPRE ratio of PDSCH DMRS to SSS						
EPRE ratio of PDSCH to PDSCH						
EPRE ratio of OCNG DMRS to SSS(Note 1)						
EPRE ratio of OCNG to OCNG DMRS (Note 1)						
N_{oc} Note2		dBm/15kHz	-98			
N_{oc} Note2	Config 1,2	dBm/SCS	-98			
	Config 3		-95			
$\hat{E}_s / I_{ot}$		dB	8	-2.41	-Infinity	1.36
$\hat{E}_s / N_{oc}$		dB	8	8	-Infinity	10
SSB_RP	Config 1,2	dBm/SCS	-90	-90	-Infinity	-88
	Config 3	dBm/SCS	-87	-87	-Infinity	-85
Io Note3	Config 1,2	dBm/ 9.36MHz	-61.41	-57.67	-61.41	-57.67
	Config 3	dBm/ 38.16MHz	-55.31	-50.56	-55.31	-50.56
Propagation condition			AWGN			

Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.

Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for N_{oc} to be fulfilled.

Note 3: Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.

The rate of correct handovers observed during repeated tests shall be at least 90%.

The test shall verify that there are no interruptions during T1.

The UE shall start to transmit the PRACH to Cell 2 less than $T_{measure} + T_{CHO_execution} + T_{interrupt}$ from the start of T2.
where:

- $T_{measure}$ = 800 ms, is the measurements time specified in 38.133 [6] clause 6.1.4.2.2.
- $T_{CHO_execution}$ = 10 ms, is the conditional execution preparation time specified in 38.133 [6] clause 6.1.4.2.2.
- $T_{interrupt} = T_{processing} + T_{IU} + T_{\Delta} + T_{margin}$ ms, is the interruption time specified in 38.133 [6] 6.1.4.2.4.
  - $T_{processing}$ = 20 ms, is time for UE processing;
  - T_{IU} = 20 ms, is the interruption uncertainty in acquiring the first available PRACH occasion in the new cell;
  - T_{Δ} = 20 ms, is time for fine time tracking and acquiring full timing information of the target cell;
  - T_{margin} = 2 ms, is time for SSB post-processing.

This gives a total of 872 ms

The interruption during T2 shall not exceeed $T_{interrupt}$ = 62ms.

6.3.3.2 NR SA FR1-FR1 conditional handover

6.3.3.2.1 Test purpose

To verify the requirement for the NR conditional FR1-NR FR1 inter-frequency conditional handover requirements specified in clause 6.1.4.2.

6.3.3.2.2 Test applicability

This test applies to all types of NR UE from Release 16 onwards and supporting conditional handover.

6.3.3.2.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 6.3.3.0.2.

The normative reference for this requirement is TS 38.133 [6] clause A.6.3.3.2.

6.3.3.2.4 Test description

6.3.3.2.4.1 Initial conditions

Initial conditions are a set of test configurations the UE needs to be tested in and the steps for the SS to take with the UE to reach the correct measurement state.

This test shall be tested using any of the test configurations in Table 6.3.3.2.4.1-1.

Table 6.3.3.2.4.1-1: NR SA FR1-FR1 conditional handover test configurations

Config	Description
6.3.3.2-1	Source cell: NR 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode Target cell: NR 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode
6.3.3.2-2	Source cell: NR 15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode Target cell: NR 15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode
6.3.3.2-3	Source cell: NR 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode Target cell: NR 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode
Note: The UE is only required to be tested in one of the supported test configurations	

Configure the test equipment and the DUT according to the parameters in Table 6.3.3.2.4.1-2

Table 6.3.3.2.4.1-2: Initial conditions for NR SA FR1-FR1 conditional handover

Parameter	Value	Comment
Test environment	NC	As specified in TS 38.508-1 [14] clause 4.1.
Test frequencies	As specified in Annex E.1.1, Table E.4-1 and TS 38.508-1 [14] clause 4.3.1.	
Channel bandwidth	As specified by the test configuration selected from Table 6.3.3.2.4.1-1	

Propagation conditions	AWGN		As specified in Annex C.2.2.
Connection Diagram	TE Part	A.3.1.8.2	As specified in TS 38.508-1 [14] Annex A.
	DUT Part	A.3.2.3.4	
Exceptions to connection diagram	N/A		

1. Message contents are defined in clause 6.3.3.2.4.3.

2. The power levels and settings for NR Cell 1 are set according to Annex C.1.2 and C.1.3. Cell 2 is NR FR1 target Cell, and its power levels and settings are also set according to Annex C.1.2 and C.1.3.

3. The test parameters are given in Table 6.3.3.2.4.1-3 below, with A3-Offset modified by Test Tolerance.

Table 6.3.3.2.4.1-3: General test parameters NR SA FR1-FR1 conditional handover

Parameter		Unit	Value	Comment
Initial conditions	Active cell		Cell 1	
	Neighbouring cell		Cell 2	
Final condition	Active cell		Cell 2	
A3-Offset in handover condition		dB	-4	
Hysteresis		dB	0	
Time To Trigger		s	0	
Filter coefficient			0	L3 filtering is not used
Access Barring Information		-	Not Sent	No additional delays in random access procedure.
T1		s	5	
T2		s	≤2	

6.3.3.2.4.2 Test procedure

The test scenario comprises of 2 NR carrier and two cells, Cell 1 and Cell 2, on each carrier respectively. General parameters and Cell-specific parameters for Cell 1 and Cell 2 are given in Table 6.3.3.2.4.1-3 and 6.3.3.2.5-1 respectively. Measurement gap (gap pattern #0) is configured in the test case.

The test consists of two successive time periods, with time durations of T1 and T2 respectively.

At the start of time duration T1, the UE may not have any timing information of cell 2. The UE is configured with a condition implying handover to Cell 2 at a time earlier than T_{RRC} ms before the beginning of T2. No interruption shall be observed in time period T1, where

- T_{RRC} = 10ms, is the RRC procedure delay defined in clause 12 in TS 38.331 [13].

From start of T2, the Cell 2 becomes detectable and handover condition is satisfied. During T2, the UE performs measurement on Cell 2 and evaluates the execution condition, and starts handover procedure when execution condition is satisifed. The UE shall sent PRACH to Cell 2 less than $T_{measure} + T_{CHO_execution} + T_{interrupt}$ ms from the start of T2. The Interruption length $T_{interrupt}$ shall also be verified in T2.

1. Ensure the UE is in State RRC_CONNECTED with generic procedure parameters Connectivity *NR*, Connected without release *On* according to TS 38.508-1 [14] clause 4.5. Establish SRB2 and DRB in the *RRCReconfiguration* message. Cell 1 is the active cell. Set Cell 2 physical cell identity to the initial physical cell identity.

2. Set the parameters according to T1 in Table 6.3.3.2.5-1. Propagation conditions are set according to Annex C clause C.2.2. T1 starts. The SS starts continuously scheduling the UE to perform DL reception in every DL slot on Cell 1 and monitoring corresponding ACK/NACK feedbacks sent by the UE.

3. Set Cell 2 physical cell identity = ((current cell 2 physical cell identity + 1) mod 14 + 2).

4. The SS shall transmit an *RRCReconfiguration* message with *conditionalReconfiguration* on Cell 1 to configure CHO execution condition and measurement gap pattern #0 for the UE.

5. The UE shall transmit an *RRCReconfigurationComplete* message.

6. When T1 expires, the SS shall switch the power setting from T1 to T2 as specified in Table 6.3.3.2.5-1. T2 starts.

7. If

   c) the UE transmits the PRACH preambles to Cell 2 less than $T_{measure} + T_{CHO_execution} + T_{interrupt}$ ms from the beginning of time period T2,

   and

   d) no longer than X consecutive ACK/NACK DTXs are observed by the SS from the start of T2 to the instant the UE transmits the first PRACH preamble, where

   - $X = T_{interrupt} + k_1$ for test configuration 6.3.3.2-1
   - $X = T_{interrupt}$ for test configuration 6.3.3.2-2
   - $X = 2 \cdot T_{interrupt}$ for test configuration 6.3.3.2-3.

   then the number of successful tests is increased by one. Otherwise, the number of failure tests is increased by one.

8. After T2 expires, the SS sends an *RRCReconfiguration* with *reconfigurationWithSync* to cause UE handover back to Cell 1.

9. If UE is not in state RRC_CONNECTED with generic procedure parameters Connectivity *NR*, Connected without release *On* according to TS 38.508-1 [14] clause 4.5 on Cell 1, switch off and on the UE. Then ensure the UE is in State RRC_CONNECTED with generic procedure parameters Connectivity *NR*, Connected without release *On* according to TS 38.508-1 [14] clause 4.5 on Cell 1.

10. Repeat steps 2-9 until the confidence level according to Tables G.2.3-1 in Annex G clause G.2 is achieved.

6.3.3.2.4.3 Message contents

Message contents are according to TS 38.508-1 [14] clause 7.3 with the following exceptions:

Table 6.3.3.2.4.3-1: RRCReconfiguration (Step 4)

Derivation Path: TS 38.508-1 [14], Table 4.6.1-13 with condition NR_MEAS and CHO			
Information Element	**Value/remark**	**Comment**	**Condition**
RRCReconfiguration ::= SEQUENCE {			
criticalExtensions CHOICE {			
rrcReconfiguration SEQUENCE {			
measConfig	MeasConfig	Table 6.3.3.2.4.3-2	
nonCriticalExtension SEQUENCE {			
nonCriticalExtension SEQUENCE {			
nonCriticalExtension SEQUENCE {			
nonCriticalExtension SEQUENCE {			
conditionalReconfiguration-r16	ConditionalReconfiguration	Table 6.3.3.2.4.3-6	
}			
}			
}			
}			
}			
}			
}			

Table 6.3.3.2.4.3-2: MeasConfig (Table 6.3.3.2.4.3-1)

Derivation Path: Table H.3.1-2			
Information Element	**Value/remark**	**Comment**	**Condition**
MeasConfig ::= SEQUENCE {			
measObjectToAddModList SEQUENCE (SIZE (1..maxNrofObjectId)) OF MeasObjectToAddMod {	2 entry		
MeasObjectToAddMod[1] SEQUENCE {		entry 1	
measObjectId	1		

measObject CHOICE {			
measObjectNR	MeasObjectNR-f1	Table 6.3.3.2.4.3-3	
}			
}			
MeasObjectToAddMod[2] SEQUENCE {		entry 2	
measObjectId	2		
measObject CHOICE {			
measObjectNR	MeasObjectNR-f2	Table 6.3.3.2.4.3-4	
}			
}			
}			
reportConfigToAddModList SEQUENCE (SIZE (1..maxReportConfigId)) OF ReportConfigToAddMod {	1 entry		
ReportConfigToAddMod[1] SEQUENCE {		entry 1	
reportConfigId	1		
reportConfig CHOICE {			
reportConfigNR	ReportConfigNR	Table 6.3.3.2.4.3-5	
}			
}			
}			
measIdToAddModList SEQUENCE (SIZE (1..maxNrofMeasId)) OF MeasIdToAddMod {	1 entry		
MeasIdToAddMod[1] SEQUENCE {			
measId	1		
measObjectId	2		
reportConfigId	1		
}			
}			
measGapConfig	MeasGapConfig specified in Table H.3.1-6 with condition gapUE and Pattern #0		
quantityConfig	QuantityConfig specified in Table H.3.1-5		
}			

Table 6.3.3.2.4.3-3: MeasObjectNR-f1 (Table 6.3.3.2.4.3-2)

Derivation Path: TS 38.508-1[14], Table 4.6.3-76			
Information Element	**Value/remark**	**Comment**	**Condition**
MeasObjectNR ::= SEQUENCE {			
ssbFrequency	ARFCN-ValueNR for Cell 1		
smtc1	SSB-MTC specified in TS 38.508-1[14] Table 7.3.1-3 with condition SMTC.1		
referenceSignalConfig SEQUENCE {			
ssb-ConfigMobility SEQUENCE {			
ssb-ToMeasure	Not present		
}			
}			
absThreshSS-BlocksConsolidation	Not present		
}			

Table 6.3.3.2.4.3-4: MeasObjectNR-f2 (Table 6.3.3.2.4.3-2)

Derivation Path: TS 38.508-1[14], Table 4.6.3-76			
Information Element	**Value/remark**	**Comment**	**Condition**
MeasObjectNR ::= SEQUENCE {			

ssbFrequency	ARFCN-ValueNR for Cell 2		
smtc1	SSB-MTC specified in TS 38.508-1[14] Table 7.3.1-3 with condition SMTC.1		
referenceSignalConfig SEQUENCE {			
ssb-ConfigMobility SEQUENCE {			
ssb-ToMeasure	Not present		
}			
}			
absThreshSS-BlocksConsolidation	Not present		
}			

Table 6.3.3.2.4.3-5: ReportConfigNR (Table 6.3.3.2.4.3-2)

Derivation Path: TS 38.508-1[14], Table 4.6.3-142 with condition CHO			
Information Element	**Value/remark**	**Comment**	**Condition**
ReportConfigNR ::= SEQUENCE {			
reportType CHOICE {			
condTriggerConfig SEQUENCE {			
condEventId CHOICE {			
condEventA3 SEQUENCE {			
a3-Offset CHOICE {			
rsrp	-8	actuall value = -8*0.5 = -4dB	
}			
hysteresis	0	actuall value = 0*0.5 = 0dB	
timeToTrigger	ms0		
}			
}			
}			
}			
}			

Table 6.3.3.2.4.3-6: ConditionalReconfiguration (Table 6.3.3.2.4.3-1)

Derivation Path: TS 38.508-1[14], Table 4.6.3-25D			
Information Element	**Value/remark**	**Comment**	**Condition**
ConditionalReconfiguration-r16::= SEQUENCE {			
condReconfigToAddModList-r16 SEQUENCE (SIZE (1.. maxNrofCondCells-r16)) OF CondReconfigToAddMod-r16 {	1 entry		
CondReconfigToAddMod-r16 [1] SEQUENCE {		entry 1	
condReconfigId-r16	1		
condExecutionCond-r16 SEQUENCE (SIZE (1..2)) OF MeasId {	1 entry		
MeasId[1]	1	The MeasId configured in Table 6.3.3.2.4.3-2	
}			
condRRCReconfig-r16	OCTET STRING (CONTAINING RRCReconfiguration Specified in Table 4.8.1-1A with condition RBConfig_NoKeyChange)		
}			
}			
}			

6.3.3.2.5 Test requirements

Table 6.3.3.2.5-1 defines the primary level settings including test tolerances for all tests.

Table 6.3.3.2.5-1: Cell specific test parameters for NR SA FR1-FR1 conditional handover

Parameter		Unit	Cell 1		Cell 2	
			T1	T2	T1	T2
NR RF Channel Number			1		2	
Duplex mode	Config 1		FDD			
	Config 2,3		TDD			
TDD configuration	Config 1		Not Applicable			
	Config 2		TDDConf.1.1			
	Config 3		TDDConf.2.1			
$BW_{channel}$	Config 1	MHz	10: $N_{RB,c}$ = 52			
	Config 2		10: $N_{RB,c}$ = 52			
	Config 3		40: $N_{RB,c}$ = 106			
BWP BW	Config 1	MHz	10: $N_{RB,c}$ = 52			
	Config 2		10: $N_{RB,c}$ = 52			
	Config 3		40: $N_{RB,c}$ = 106			
TRS configuration	Config 1		TRS.1.1 FDD			
	Config 2		TRS.1.1 TDD			
	Config 3		TRS.1.2 TDD			
DRx Cycle		ms	Not Applicable			
Gap pattern ID			gp0			
PDSCH Reference measurement channel	Config 1		SR.1.1 FDD			
	Config 2		SR.1.1 TDD			
	Config 3		SR2.1 TDD			
CORESET Reference Channel	Config 1		CR.1.1 FDD			
	Config 2		CR.1.1 TDD			
	Config 3		CR2.1 TDD			
OCNG Patterns			OCNG pattern 1			
SMTC Configuration			SMTC pattern 1			
SSB Configuration	Config 1,2		SSB.1 FR1			
	Config 3		SSB.2 FR1			
PDSCH/PDCCH subcarrier spacing	Config 1,2	kHz	15 kHz			
	Config 3		30 kHz			
PUCCH/PUSCH subcarrier spacing	Config 1,2	kHz	15 kHz			
	Config 3		30 kHz			
PRACH configuration			FR1 PRACH configuration 1			
BWP	Initial DL BWP		DLBWP.0.1			
	Dedicated DL BWP		DLBWP.1.1			
	Initial UL BWP		ULBWP.0.1			
	Dedicated UL BWP		ULBWP.1.1			
EPRE ratio of PSS to SSS		dB	0			
EPRE ratio of PBCH DMRS to SSS						
EPRE ratio of PBCH to PBCH DMRS						
EPRE ratio of PDCCH DMRS to SSS						
EPRE ratio of PDCCH to PDCCH DMRS						
EPRE ratio of PDSCH DMRS to SSS						
EPRE ratio of PDSCH to PDSCH						
EPRE ratio of OCNG DMRS to SSS(Note 1)						
EPRE ratio of OCNG to OCNG DMRS (Note 1)						
N_{oc} Note2		dBm/15kHz	-98		-98	
N_{oc} Note2	Config 1,2	dBm/SCS	-98		-98	
	Config 3		-95		-95	
$\hat{E}_s / I_{ot}$		dB	4	4	-Infinity	6.70
$\hat{E}_s / N_{oc}$		dB	4	4	-Infinity	6.70
SSB_RP	Config 1,2	dBm/SCS	-94	-94	-Infinity	-91.30
	Config 3	dBm/SCS	-91	-91	-Infinity	-88.30
Io Note3	Config 1,2	dBm/	-64.59	-64.59	-70.05	-62.51

Parameter		Unit	Cell 1		Cell 2	
			T1	T2	T1	T2
		9.36MHz				
	Config 3	dBm/ 38.16MHz	-58.49	-58.49	-63.94	-56.40
Propagation condition		-	AWGN		AWGN	
Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.						
Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for N_{oc} to be fulfilled.						
Note 3: Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.						

The rate of correct handovers observed during repeated tests shall be at least 90%.

The test shall verify that there are no interruptions during T1.

The UE shall start to transmit the PRACH to Cell 2 less than $T_{measure} + T_{CHO_execution} + T_{interrupt}$ from the start of T2. where:

- $T_{measure}$ = 920 ms, is the measurements time specified in 38.133 [6] clause 6.1.4.2.2.
- $T_{CHO_execution}$ = 10 ms, is the conditional execution preparation time specified in 38.133 [6] clause 6.1.4.2.2.
- $T_{interrupt} = T_{processing} + T_{IU} + T_{\Delta} + T_{margin}$ ms, is the interruption time specified in 38.133 [6] 6.1.4.2.4.
  - $T_{processing}$ = 20 ms, is time for UE processing;
  - T_{IU} = 20 ms, is the interruption uncertainty in acquiring the first available PRACH occasion in the new cell;
  - T_{Δ} = 20 ms, is time for fine time tracking and acquiring full timing information of the target cell;
  - T_{margin} = 2 ms, is time for SSB post-processing.

This gives a total of 992 ms

The interruption during T2 shall not exceeed $T_{interrupt}$ = 62ms.

6.4 Timing

6.4.1 UE transmit timing

6.4.1.0 Minimum conformance requirements

6.4.1.0.1 Minimum conformance requirements for UE transmit timing accuracy

The UE initial transmission timing error shall be less than or equal to $\pm T_e$ where the timing error limit value T_e is specified in Table 6.4.1.0.1-1. This requirement applies:

- when it is the first transmission in a DRX cycle for PUCCH, PUSCH and SRS or it is the PRACH transmission.

The UE shall meet the Te requirement for an initial transmission provided that at least one SSB is available at the UE during the last 160 ms. The reference point for the UE initial transmit timing control requirement shall be the downlink timing of the reference cell minus $(N_{\mathrm{TA}} + N_{\mathrm{TA\,offset}})\times T_{\mathrm{c}}$. The downlink timing is defined as the time when the first detected path (in time) of the corresponding downlink frame is received from the reference cell. N_{TA} for PRACH is defined as 0.

$(N_{\mathrm{TA}} + N_{\mathrm{TA\,offset}})\times T_{\mathrm{c}}$ (in T_c units) for other channels is the difference between UE transmission timing and the downlink timing immediately after when the last timing advance in clause 7.3 was applied. N_{TA} for other channels is not changed until next timing advance is received. The value of $N_{\mathrm{TA\,offset}}$ depends on the duplex mode of the cell in which the uplink transmission takes place and the frequency range (FR). $N_{\mathrm{TA\,offset}}$ is defined in Table 6.4.1.0.1-2.

Table 6.4.1.0.1-1: T_e Timing Error Limit

Frequency Range	SCS of SSB signals (KHz)	SCS of uplink signals s(KHz)	T_e
1	15	15	12*64*T_c
		30	10*64*T_c
		60	10*64*T_c
	30	15	8*64*T_c
		30	8*64*T_c
		60	7*64*T_c
2	120	60	3.5*64*T_c
		120	3.5*64*T_c
	240	60	3*64*T_c
		120	3*64*T_c
Note 1: T_c is the basic timing unit defined in TS 38.211 [6]			

Table 6.4.1.0.1-2: The Value of $N_{\mathrm{TA\,offset}}$

Frequency range and band of cell used for uplink transmission	$N_{\mathrm{TA\,offset}}$ (Unit: T_C)
FR1 FDD band without LTE-NR coexistence case or FR1 TDD band without LTE-NR coexistence case	25600 (Note 1)
FR1 FDD band with LTE-NR coexistence case	0 (Note 1)
FR1 TDD band with LTE-NR coexistence case	39936 (Note 1)
FR2	13792
Note 1: The UE identifies $N_{\mathrm{TA\,offset}}$ based on the information n-TimingAdvanceOffset according to [2]. If UE is not provided with the information n-TimingAdvanceOffset, the default value of $N_{\mathrm{TA\,offset}}$ is set as 25600 for FR1 band. In case of multiple UL carriers in the same TAG, UE expects that the same value of n-TimingAdvanceOffset is provided for all the UL carriers according to section 4.2 in [3] and the value 39936 of $N_{\mathrm{TA\,offset}}$ can also be provided for a FDD serving cell.	

When it is not the first transmission in a DRX cycle or there is no DRX cycle, and when it is the transmission for PUCCH, PUSCH and SRS transmission, the UE shall be capable of changing the transmission timing according to the received downlink frame of the reference cell except when the timing advance in clause 7.3 is applied.

When the transmission timing error between the UE and the reference timing exceeds $\pm T_e$, the UE is required to adjust its timing to within $\pm T_e$. The reference timing shall be $(N_{TA} + N_{TA\ offset}) \times T_c$ before the downlink timing of the reference cell. All adjustments made to the UE uplink timing shall follow these rules:

1) The maximum amount of the magnitude of the timing change in one adjustment shall be T_q.

2) The minimum aggregate adjustment rate shall be T_p per second.

3) The maximum aggregate adjustment rate shall be T_q per [200]ms.

where the maximum autonomous time adjustment step T_q and the aggregate adjustment rate T_p are specified in Table 6.4.1.0.1-3.

Table 6.4.1.0.1-3: T_q Maximum Autonomous Time Adjustment Step and T_p Minimum Aggregate Adjustment rate

Frequency Range	SCS of uplink signals (KHz)	T_q	T_p
1	15	$5.5*64*T_c$	$5.5*64*T_c$
	30	$5.5*64*T_c$	$5.5*64*T_c$
	60	$5.5*64*T_c$	$5.5*64*T_c$
2	60	$2.5*64*T_c$	$2.5*64*T_c$
	120	$2.5*64*T_c$	$2.5*64*T_c$
NOTE 1: T_c is the basic timing unit defined in TS 38.211 [6]			

The normative reference for this requirement is TS.38.133 [6] clause 7.1.2.

6.4.1.1 NR SA FR1 UE transmit timing accuracy

6.4.1.1.1 Test purpose

The purpose of this test is to verify that the UE can follow frame timing change of the connected gNodeb and that the UE initial transmit timing accuracy, maximum amount of timing change in one adjustment, minimum and maximum adjustment rate are within the specified limits. This test will verify the requirements in TS 38.133 [6] clause 7.1.2.

6.4.1.1.2 Test applicability

This test applies to all types of NR UE from Release 15 onwards.

6.4.1.1.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 6.4.1.0.1.

The normative reference for this requirement is TS.38.133 [6] clause A.6.4.1.1

6.4.1.1.4 Test Description

6.4.1.1.4.1 Initial Conditions

Initial conditions are a set of test configurations the UE needs to be tested in and the steps for the SS to take with the UE to reach the correct measurement state.

The initial test configurations consist of environmental conditions, test frequencies, test channel bandwidths and sub-carrier spacing based on NR operating bands specified in Table 5.3.5-1 of 38.521-1 [17].

This test can be run in one of the configurations defined in Table 6.4.1.1.4.1-1.

Table 6.4.1.1.4.1-1: Supported test configurations for FR1 PCell

Configuration	Description
6.4.1.1-1	NR FDD, SSB SCS 15 kHz, data SCS 15 kHz, BW 10 MHz

6.4.1.1-2	NR TDD, SSB SCS 15 kHz, data SCS 15 kHz, BW 10 MHz
6.4.1.1-3	NR TDD, SSB SCS 30 kHz, data SCS 30 kHz, BW 40 MHz
Note: The UE is only required to be tested in one of the supported test configurations in FR1 depending on UE capability.	

Configure the test equipment and the DUT according to the parameters in Table 6.4.1.1.4.1-2

Table 6.4.1.1.4.1-2: Initial conditions for NR SA FR1 transmit timing accuracy

Parameter	Value		Comment
Test environment	NC		As specified in TS 38.508-1 [14] clause 4.1.
Test frequencies	As specified in Annex E.1.2, Table E.4-1 and TS 38.508-1 [14] clause 4.3.1.		
Channel bandwidth	As specified by the test configuration selected from Table 6.4.1.1.4.1-1		
Propagation conditions	AWGN		As specified in Annex C.2.2.
Connection Diagram	TE Part	A.3.1.7.1	As specified in TS 38.508-1 [14] Annex A.
	DUT Part	A.3.2.3.4	
Exceptions to connection diagram	Without LTE link		

1. Message contents are defined in clause 6 6.4.1.1.4.3.

2. A single NR cell is used. The connection setup is done according to the settings in Annex C.1.3, and the downlink signal levels as per Annex C.1. The general test parameters are given in Table 6.4.1.1.5-1 below.

6.4.1.1.4.2 Test procedure

The test consists of a single NR cell (PCell). The downlink timing of the NR Cell is changed and the changes in UE transmit timing are observed. The transmit timing is verified by the UE transmitting SRS used as a measurement reference facilitating the SS timing estimation.

The test sequence shall be carried out in RRC_CONNECTED for every test case.

Following will be the test sequence for this test

1. Ensure the UE is in state RRC_CONNECTED with generic procedure parameters *Connectivity* NR, Connected without release *On* according to TS 38.508-1 [6] clause 4.5.

2. Set up NR Cell according to parameters given in Table 6.4.1.1.4.1-1.

3. The SS shall transmit an RRCReconfiguration message configuring the UE with the message content defined in clause 6.4.1.1.4.3.

4. The UE shall transmit RRCReconfigurationComplete message.

5. After connection set up with the cell and during 2 seconds before DL timing adjustment, the test equipment shall monitor all SRS transmissions and verify that, for each received SRS, the timing of the NR cell is within $(N_{TA} + N_{TA_offset}) \times T_c \pm T_e$ of the first detected path of DL SSB.

   a. The N_{TA} offset value (in T_c units) is 25600 for FR1

   b. The T_e values depend on the DL and UL SCS for which the test is being run and are given in Table 6.4.1.1.5-4

6. The test system shall adjust the timing of the DL path by values given in Table 6.4.1.1.4.2-1. For Test 2, the DL timing change shall be applied within the first half of the DRX cycle upon expiration of the preceding DRX ON duration.

Table 6.4.1.1.4.2-1: Adjustment Value for DL Timing

SCS of SSB signals (KHz)	Adjustment Value	
	Test1	Test2

15	+64*64Tc	+32*64Tc
30	+32*64Tc	+16*64Tc

7. The test system shall verify that the adjustment step size and the adjustment rate shall be according to requirements specified in Table 6.4.1.1.5-5. This will only be done for Test1. The test system samples the UE Transmit Timing once per SRS transmission (as per configured SRS periodicity). To check Rule 1, the SS shall check that the maximum time adjustment step size T_q between one SRS transmission to next consecutive SRS transmission of a valid UL slot is within Rule 1 as specified in clause 6.4.1.0.1 and Table 6.4.1.0.1-3. To check that the minimum adjustment rate is within Rule 2 as specified in clause 6.4.1.0.1 and Table 6.4.1.0.1-3, the SS shall measure the change in SRS transmission timing over a 1 + offset seconds sliding window (offset in ms to the next consecutive SRS transmission), with step size p (where p is the periodicity of SRS) , as long as the resulting slot is a valid UL slot. To check that the maximum adjustment rate is within Rule 3 as specified in clause 6.4.1.0.1 and Table 6.4.1.0.1-3, the SS shall measure the change in SRS transmission timing over a 200ms – offset sliding window of previous SRS transmission, with step size p (where p is the periodicity of SRS) , as long as the resulting slot is a valid UL slot. The three rules apply until the UE transmit timing offset is within the limits specified in 6.4.1.0.1 and Table 6.4.1.0.1-3 with respect to the first detected path (in time) of the corresponding downlink frame of Cell 1. The test system will wait till evaluation interval of T seconds is met to ensure UE transmit timing is stable at the end of the step, where T=.DL_timing_change[Ts]/5.5Ts and DL_timing_change is specified in Table 6.4.1.1.4.2-1.

8. After the UE transmit timing is within the limits specified in step 7, and during 2 seconds, the test system shall monitor all SRS transmissions and verify that, for each received SRS, the UE transmit timing offset stays within $(N_{TA} + N_{TA_offset}) \times T_c \pm T_e$ of the first detected path of DL SSB. For Test 2 the UE transmit timing offset shall be verified for the first transmission in the DRX cycle immediately after DL timing adjustment.

6.4.1.1.4.3 Message contents

Message contents are according to TS 38.508-1 [14] clause 7.3 with the following exceptions:

Table 6.4.1.1.4.3-0: Common Exception messages

Default Message Contents	
Common contents of system information blocks exceptions	
Default RRC messages and information elements contents exceptions	Table H.3.9-1

Table 6.4.1.1.4.3-1: *SRS-Config* : Additional test requirement for UE transmit timing accuracy for NR SA FR1 UE

Derivation Path: TS 38.508-1 [14], Table 4.6.3-182			
Information Element	**Value/remark**	**Comment**	**Condition**
SRS-Config ::= SEQUENCE {			
srs-ResourceSetToAddModList SEQUENCE (SIZE(0..maxNrofSRS-ResourceSets)) OF SEQUENCE {			
SRS-ResourceSet[1] SEQUENCE {		entry 1	
resourceType CHOICE {			
periodic SEQUENCE {			
}			
}			
}			
}			
srs-ResourceToAddModList SEQUENCE (SIZE(1..maxNrofSRS-Resources)) OF SEQUENCE {			
SRS-Resource[1] SEQUENCE {		entry 1	
freqHopping SEQUENCE {			
c-SRS	14		SCS15
	25		SCS30
}			
groupOrSequenceHopping	neither		
resourceType CHOICE {			

periodic SEQUENCE {			
periodicityAndOffset-p CHOICE {			
sl1	0		Test 1
sl320	3		Test 2 and SCS15
sl640	5		Test 2 and SCS30
}			
}			
}			
}			
}			
}			

Table 6.4.1.1.4.3-2: *DRX-Config* : Additional test requirement for UE transmit timing accuracy Test 2 for NR SA FR1

Derivation Path: TS 38.508-1 [14], Table 4.6.3-56			
Information Element	**Value/remark**	**Comment**	**Condition**
DRX-Config ::= CHOICE {			
drx-InactivityTimer	ms1		
drx-RetransmissionTimerDL	sl1		
drx-RetransmissionTimerUL	sl1		
drx-LongCycleStartOffset CHOICE {			
ms320	0		
}			
}			

6.4.1.1.5 Test Requirements

Table 6.4.1.1.5-1: Cell Specific Test Parameters for UL Transmit Timing test

Parameter	Unit	Config	Test1	Test2
SSB ARFCN		1,2,3	Freq1	Freq1
NR Channel Number		1,2,3	2	2
TDD configuration		1	Not Applicable	
		2	TDDConf.1.1	
		3	TDDConf.2.1	
$BW_{channel}$	MHz	1	10: $N_{RB,c}$ = 52	
		2	10: $N_{RB,c}$ = 52	
		3	40: $N_{RB,c}$ = 106	
Initial BWP Configuration		1,2,3	DLBWP.0.1 ULBWP.0.1	
Dedicated BWP Configuration		1,2,3	DLBWP.1.1 ULBWP.1.1	
DRx Cycle	ms	1,2,3	N/A	DRX.8[Note5]
PDSCH Reference measurement channel		1	SR.1.1 FDD	
		2	SR.1.1 TDD	
		3	SR.2.1 TDD	
RMSI CORESET Reference Channel		1	CR.1.1 FDD	
		2	CR.1.1 TDD	
		3	CR.2.1 TDD	
Dedicated CORESET Reference Channel		1	CCR.1.1 FDD	
		2	CCR.1.1 TDD	
		3	CCR.2.1 TDD	
OCNG Patterns		1,2,3	OP.1	
SSB configuration		1,2	SSB.1 FR1	
		3	SSB.2 FR1	
SMTC		1	SMTC.1	
		3	SMTC.2	

TRS configuration		1	TRS.1.1 FDD	
		2	TRS.1.1 TDD	
		3	TRS.1.2 TDD	
EPRE ratio of PSS to SSS	dB	1,2,3	0	0
EPRE ratio of PBCH DMRS to SSS				
EPRE ratio of PBCH to PBCH DMRS				
EPRE ratio of PDCCH DMRS to SSS				
EPRE ratio of PDCCH to PDCCH DMRS				
EPRE ratio of PDSCH DMRS to SSS				
EPRE ratio of PDSCH to PDSCH				
EPRE ratio of OCNG DMRS to SSS(Note 1)				
EPRE ratio of OCNG to OCNG DMRS (Note 1)				
N_{oc} Note2	dBm/15 kHz	1,2,3	-98	-98
N_{oc} Note2	dBm/SCS	1,2	-98	-98
		3	-95	-95
$\hat{E}_s/I_{ot}$		1,2,3	3.3	3.3
$\hat{E}_s/N_{oc}$		1,2,3	3.3	3.3
SS-RSRP Note3	dBm/SCS	1,2	-95	-95
		3	-92	-92
Io Note3	dBm/9.36MHz	1,2	-65.08	-65.08
	dBm/38.1MHz	3	-61.99	-61.99
Propagation condition		1,2,3	AWGN	
SRS Config		1	SRSConf.1 Note6	SRSConf.3 Note6
		2,3	SRSConf.1 Note6	SRSConf.2 Note6

Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.
Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for N_{oc} to be fulfilled.
Note 3: SS-RSRP and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.
Note 4: SS-RSRP minimum requirements are specified assuming independent interference and noise at each receiver antenna port.
Note 5: DRx related parameters are given in Table 6.4.1.1.5-3 or Table A.5.-1
Note 6: SRS configs are given in Table 6.4.1.1.5-2

Table 6.4.1.1.5-2: SRS Configuration for Timing Accuracy Test

	Field	SRSConf.1	SRSConf.2	SRSConf.3	Comments
SRS-ResourceSet	srs-ResourceSetId	0	0	0	
	srs-ResourceIdList	0	0	0	
	resourceType	Periodic	Periodic	Periodic	
	Usage	Codebook	Codebook	Codebook	
	SRS-ResourceSetId	0	0	0	
SRS-Resource	nrofSRS-Ports	Port1	Port1	Port1	
	transmissionComb	n2	n2	n2	
	combOffset-n2	0	0	0	
	cyclicShift-n2	0	0	0	
	resourceMapping startPosition	0	0	0	
	resourceMapping nrofSymbols	n1	n1	n1	
	resourceMapping repetitionFactor	n1	n1	n1	

	freqDomainPosition	0	0	0	
	freqDomainShift	0	0	0	
	freqHopping c-SRS	14 for test configuration 1,2 25 for test configuration 3	25	14	Matches $N_{RB,c}$
	freqHopping b-SRS	0	0	0	
	freqHopping b-hop	0	0	0	
	groupOrSequenceHopping	Neither	Neither	Neither	
	resourceType	Periodic	Periodic	Periodic	
	periodicityAndOffset-p	sl1	sl640,5	sl320,3	Offset to align with DRx periodicity
	sequenceId	0	0	0	Any 10 bit number

Table 6.4.1.1.5-3: DRX-Configuration for UL Timing Tests

Field	Test 2
	Value
drx-onDurationTimer	6 ms
drx-InactivityTimer	1 ms
drx-RetransmissionTimerDL	1 slot
drx-RetransmissionTimerUL	1 slot
longDRX-CycleStartOffset	320 ms
shortDRX	disable
TimeAlignmentTimer	Infinity
Note: The DRX cycle and time alignment timer parameters are specified in clause 6.3.2 in TS 38.331 [13]	

Table 6.4.1.1.5-4: T_e Timing Error Limit

Frequency Range	SCS of SSB signals (KHz)	SCS of uplink signals (KHz)	T_e
1	15	15	$13.75*64*T_c$
		30	$11.75*64*T_c$
		60	$11.75*64*T_c$
	30	15	$9.75*64*T_c$
		30	$9.75*64*T_c$
		60	$8.75*64*T_c$
Note 1: T_c is the basic timing unit defined in TS 38.211 [6]			

Table 6.4.1.1.5-5: T_q Maximum Autonomous Time Adjustment Step and T_p Minimum Aggregate Adjustment rate

Frequency Range	SCS of uplink signals (KHz)	T_q	T_p	Maximum Adjustement Rate
1	15	$6.0*64*T_c$	$1.9*64*T_c$	$6.6*64*T_c$
	30	$6.0*64*T_c$	$1.9*64*T_c$	$6.6*64*T_c$
	60	$6.0*64*T_c$	$1.9*64*T_c$	$6.6*64*T_c$
NOTE 1: T_c is the basic timing unit defined in TS 38.211 [6]				

6.4.2 UE timer accuracy

6.4.3 Timing advance

6.4.3.0 Minimum conformance requirement

6.4.3.0.1 Minimum conformance requirement for timing advance adjustment

The UE shall adjust the timing of its transmissions with a relative accuracy better than or equal to the UE Timing Advance adjustment accuracy requirement in Table 6.4.3.1.3-1, to the signalled timing advance value compared to the timing of preceding uplink transmission. The timing advance command step is defined in TS38.213 [8].

Table 6.4.3.1.3-1: UE Timing Advance adjustment accuracy

Sub Carrier Spacing, SCS kHz	15	30	60	120
UE Timing Advance adjustment accuracy	±256 T_c	±256 T_c	±128 T_c	±32 T_c

6.4.3.1 NR SA FR1 timing advance adjustment accuracy

6.4.3.1.1 Test purpose

The purpose of the test is to verify UE timing advance adjustment delay and accuracy requirement defined in clause 7.3 of TS 38.133 [6].

6.4.3.1.2 Test applicability

This test applies to all types of NR UE from Release 15 onwards.

6.4.3.1.3 Minimum conformance requirement

The minimum conformance requirements are specified in clause 6.4.3.0.1.

The normative reference for this requirement is TS 38.133 [6] clause A.6.4.3.1.

6.4.3.1.4 Test description

6.4.3.1.4.1 Initial conditions

This test shall be tested using any of the test configurations in Table 6.4.3.1.4.1-1.

Table 6.4.3.1.4.1-1: NR SA FR1 timing advance adjustment accuracy supported test configurations

Config	Description
1	NR 15 kHz SSB SCS, 10MHz bandwidth, FDD duplex mode
2	NR 15 kHz SSB SCS, 10MHz bandwidth, TDD duplex mode
3	NR 30 kHz SSB SCS, 40MHz bandwidth, TDD duplex mode
Note: The UE is only required to be tested in one of the supported test configurations	

Configure the test equipment and the DUT according to the parameters in Table 6.4.3.1.4.1-2

Table 6.4.3.1.4.1-2: Initial conditions for NR SA FR1 timing advance adjustment accuracy

Parameter	Value		Comment
Test environment	NC		As specified in TS 38.508-1 [14] clause 4.1.
Test frequencies	As specified in Annex E.1.2, Table E.4-1 and TS 38.508-1 [14] clause 4.3.1.		
Channel bandwidth	As specified by the test configuration selected from Table 6.4.3.1.4.1-1		
Propagation conditions	AWGN		As specified in Annex C.2.2.
Connection Diagram	TE Part	A.3.1.7.1	As specified in TS 38.508-1 [14] Annex A.
	DUT Part	A.3.2.3.4	

Exceptions to connection diagram	Without LTE Link	

Table 6.4.3.1.4.1-3: General test parameters for timing advance

Parameter	Unit	Value	Comment
RF channel number		1	
Initial DL BWP		DLBWP.0.1	As specified in Table A.8.1-1
Dedicated DL BWP		DLBWP.1.1	As specified in Table A.8.1-2
Initial UL BWP		ULBWP.0.1	As specified in Table A.8.2-1
Dedicated UL BWP		ULBWP.1.1	As specified in Table A.8.2-2
Timing Advance Command (T_A) value during T1		31	$N_{TA_new} = N_{TA_old}$ for the purpose of establishing a reference value from which the timing advance adjustment accuracy can be measured during T2
Timing Advance Command (T_A) value during T2		39	For SCS = 15kHz : $N_{TA_new} = N_{TA_old} + 8192*T_c$ (based on equation in TS38.213 section 4.2) For SCS = 30kHz : $N_{TA_new} = N_{TA_old} + 4096*T_c$ (based on equation in TS38.213 section 4.2)
T1	s	5	
T2	s	5	

1. Message contents are defined in clause 6.4.3.1.4.3.

2. Single Cell is used, which is NR FR1 PCell. The connection setup is done according to the settings in Annex C.1.2 and C.1.3.

3. The test parameters are given in Table 6.4.3.1.4.1-3 above.

4. Downlink signals for NR cell are initially set up according to Annex C.1.2 and C.1.3.

5. Ensure the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity *NR*, Connected without release *On* and Test Mode *On* according to TS 38.508-1 [10] clause 4.5.

6.4.3.1.4.2 Test Procedure

The test consists of single cell. The test consists of two successive time periods, with time durations of T1 and T2 respectively. In each time period, timing advance commands are sent to the UE and Sounding Reference Signals (SRS), as specified in table 6.4.3.1.5-1 and table 6.4.3.1.4.1-3, are sent from the UE and received by the test equipment. By measuring the reception of the SRS, the transmit timing, and hence the timing advance adjustment accuracy, can be measured. The UE Time Alignment Timer, described in Clause 5.2 in TS 38.321, shall be configured so that it does not expire in the duration of the test.

1. Set the parameters according to values in Tables 6.4.3.1.4.1-3.

2. SS shall transmit an RRCReconfiguration message.

3. The UE shall transmit RRCReconfigurationComplete message.

4. During time period T1, the test equipment shall send one message with a Timing Advance Command MAC Control Element, as specified in Clause 6.1.3.4 in TS 38.321. The Timing Advance Command value shall be set to 31, which according to Clause 4.2 in TS 38.213 results in zero adjustment of the Timing Advance. In this way, a reference value for the timing advance used by the UE is established.

5. During time period T2, the test equipment shall send a sequence of messages with Timing Advance Command MAC Control Elements, with Timing Advance Command value 39 as specified in table 6.4.3.1.4.1-3. This value shall result in changes of the timing advance used by the UE, and the accuracy of the change shall then be measured, using the SRS sent from the UE.

6. As specified in Clause 7.3.2.1 of TS 38.133 [6], the UE adjusts its uplink timing at slot n+k+1 for a timing advance command received in slot n. This delay must be taken into account when measuring the timing advance adjustment accuracy, via the SRS sent from the UE.

7. The UE Time Alignment Timer, described in Clause 5.2 in TS 38.321, shall be configured so that it does not expire in the duration of the test.

8. The result from the SRS and adjustment of the timing advance in step 7) is used to measure that the UE adjusts the timing of its transmission with a relative accuracy better than or equal to value specified in Table 6.4.3.1.3-1 to the signalled timing advance value compared to the timing of preceding uplink transmission.

9. If the UE adjust the timing of its transmission within a relative accuracy greater than or equal to value specified in Table 6.4.3.1.3-1 to the signalled timing advance value compared to the timing of preceding uplink transmission then the number of successful tests is increased by one. Otherwise, the number of failure tests is increased by one.

10. The SS shall transmit RRCRelease message to release the RRC connection which includes the release of the established radio bearers as well as all radio resources.

11. After the RRC connection release, the SS transmits in Cell a Paging message (including PagingRecord with ue-Identity) for the UE and ensures the UE is in State RRC_CONNECTED according to TS 38.508-1 [14] clause 4.5.4 or if the paging fails, switch off and on the UE and ensure the UE is in RRC_CONNECTED according to TS 38.508-1 [14] clause 4.5.4.

12. Repeat step 2-11 until the confidence level according to Tables G.2.3-1 in Annex G clause G.2 is achieved.

6.4.3.1.4.3 Message Contents

Message contents are according to TS 38.508-1 [14] clause 7.3, with the following exceptions:

Table 6.4.3.1.4.3-0: Common Exception messages

Default Message Contents	
Common contents of system information blocks exceptions	
Default RRC messages and information elements contents exceptions	Table H.3.9-1

Table 6.4.3.1.4.3-1: srs-Config setup

Derivation Path: TS 38.508-1, Table 4.6.3-182			
Information Element	**Value/remark**	**Comment**	**Condition**
SRS-Config ::= SEQUENCE {			
srs-ResourceSetToAddModList SEQUENCE (SIZE(0..maxNrofSRS-ResourceSets)) OF SEQUENCE {	1 entry		
SRS-ResourceSet[1] SEQUENCE {		entry 1	
resourceType CHOICE {			
periodic SEQUENCE {			
}			
}			
}			
}			
srs-ResourceToAddModList SEQUENCE (SIZE(1..maxNrofSRS-Resources)) OF SEQUENCE {	1 entry		
SRS-Resource[1] SEQUENCE {		entry 1	
freqHopping SEQUENCE {			
c-SRS	12	Config 1,2	
	24	Config 3	
}			
groupOrSequenceHopping	neither		
resourceType CHOICE {			
periodic SEQUENCE {	periodic		

periodicityAndOffset-p CHOICE {			
sl5	2	Once every 5 Slots	SCS15
sl5	4	Once every 5 Slots	SCS30
}			
}			
}			
}			
}			
}			

6.4.3.1.5 Test Requirement

The UE shall apply the signalled Timing Advance value to the transmission timing at the designated activation time i.e. *k* slots after the reception of the timing advance command, where:

k = 5 for Config 1, 2, and 3

The Timing Advance adjustment accuracy shall be within the limits specified in Table 6.4.3.1.5-3.

The rate of correct Timing Advance adjustments observed during repeated tests shall be at least 90%.

Table 6.4.3.1.5-1 and Table 6.4.3.1.5-2 define the primary level settings.

Table 6.4.3.1.5-1: Cell specific test parameters for timing advance

Parameter		Unit	Test1	
			T1	T2
Duplex mode	Config 1		FDD	
	Config 2,3		TDD	
TDD configuration	Config 1		Not Applicable	
	Config 2		TDDConf.1.1	
	Config 3		TDDConf.2.1	
$BW_{channel}$	Config 1	MHz	10: $N_{RB,c}$ = 52	
	Config 2		10: $N_{RB,c}$ = 52	
	Config 3		40: $N_{RB,c}$ = 106	
BWP BW	Config 1	MHz	10: $N_{RB,c}$ = 52	
	Config 2		10: $N_{RB,c}$ = 52	
	Config 3		40: $N_{RB,c}$ = 106	
DRx Cycle		ms	Not Applicable	
PDSCH Reference measurement channel	Config 1		SR.1.1 FDD	
	Config 2		SR.1.1 TDD	
	Config 3		SR2.1 TDD	
RMSI CORESET Reference Channel	Config 1		CR.1.1 FDD	
	Config 2		CR.1.1 TDD	
	Config 3		CR2.1 TDD	
Dedicated CORESET Reference Channel	Config 1		CCR.1.1 FDD	
	Config 2		CCR.1.1 TDD	
	Config 3		CCR.2.1 TDD	
TRS Configuration	Config 1		TRS.1.1 FDD	
	Config 2		TRS.1.1 TDD	
	Config 3		TRS.1.2 TDD	
OCNG Patterns			OCNG pattern 1	
SMTC configuration	Config 1,2		SMTC.1 FR1	
	Config 3		SMTC.2 FR1	
PDSCH/PDCCH subcarrier spacing	Config 1,2	kHz	15 kHz	
	Config 3		30 kHz	
PUCCH/PUSCH subcarrier spacing	Config 1,2	kHz	15 kHz	
	Config 3		30 kHz	
EPRE ratio of PSS to SSS		dB	0	
EPRE ratio of PBCH DMRS to SSS				
EPRE ratio of PBCH to PBCH DMRS				
EPRE ratio of PDCCH DMRS to SSS				
EPRE ratio of PDCCH to PDCCH DMRS				

EPRE ratio of PDSCH DMRS to SSS EPRE ratio of PDSCH to PDSCH EPRE ratio of OCNG DMRS to SSS(Note 1) EPRE ratio of OCNG to OCNG DMRS (Note 1)			
N_{oc} Note2		dBm/15kHz	-98
N_{oc} Note2	Config 1,2	dBm/SCS	-98
	Config 3		-95
$\hat{E}_s / I_{ot}$		dB	3
$\hat{E}_s / N_{oc}$		dB	3
Io Note3	Config 1,2	dBm/ 9.36MHz	-67.57
	Config 3	dBm/ 38.16MHz	-62.58
Propagation condition		-	AWGN
Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols. Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for N_{oc} to be fulfilled. Note 3: Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.			

Table 6.4.3.1.5-2: Sounding Reference Symbol Configuration for timing advance

Field		Value	Comment
c-SRS	Config 1,2	12	Frequency hopping is disabled
	Config 3	24	
b-SRS		0	
b-hop		0	
freqDomainPosition		0	Frequency domain position of SRS
freqDomainShift		0	
groupOrSequenceHopping		neither	No group or sequence hopping
SRS-PeriodicityAndOffset		sl5@2 for SCS 15kHz sl5@4 for SCS 30kHz	Once every 5 slots
pathlossReferenceRS		ssb-Index=0	SSB #0 is used for SRS path loss estimation
usage		Codebook	Codebook based UL transmission
startPosition		0	resourceMapping setting. SRS on last symbol of slot, and 1symbols for SRS without repetition.
nrofSymbols		n1	
repetitionFactor		n1	
combOffset-n2		0	transmissionComb setting
cyclicShift-n2		0	
nrofSRS-Ports		port1	Number of antenna ports used for SRS transmission
Note: For further information see clause 6.3.2 in TS 38.331.			

Table 6.4.3.1.5-3: UE Timing Advance adjustment accuracy

Sub Carrier Spacing, SCS kHz	15	30	60
UE Timing Advance adjustment accuracy	±344 T_c	±344 T_c	±216 T_c

For the test to pass, the total number of successful tests shall be more than 90% of the cases with a confidence level of 95%.

6.5 Signaling characteristics

6.5.1 Radio link monitoring

6.5.1.00 General

The UE shall monitor the downlink link quality based on the reference signal in the configured RLM-RS resource(s) in order to detect the downlink radio link quality of the PCell and PCell as specified in [3]. The configured RLM-RS resources can be all SSBs, or all CSI-RSs, or a mix of SSBs and CSI-RSs. UE is not required to perform RLM outside the active DL BWP.

On each RLM-RS resource, the UE shall estimate the downlink radio link quality and compare it to the thresholds Q_{out} and Q_{in} for the purpose of monitoring downlink radio link quality of the cell.

The threshold Q_{out} is defined as the level at which the downlink radio link cannot be reliably received and shall correspond to the out-of-sync block error rate ($BLER_{out}$) as defined in Table 6.5.1-1.

The threshold Q_{in} is defined as the level at which the downlink radio link quality can be significantly more reliably received than at Q_{out} and shall correspond to the in-sync block error rate ($BLER_{in}$) as defined in Table 6.5.1-1.

The out-of-sync block error rate ($BLER_{out}$) and in-sync block error rate ($BLER_{in}$) are determined from the network configuration via parameter *rlmInSyncOutOfSyncThreshold* signalled by higher layers. When UE is not configured with *RLM-IS-OOS-thresholdConfig* from the network, UE determines out-of-sync and in-sync block error rates from Configuration #0 in Table 6.5.1-1 as default. All requirements here are applicable for BLER Configuration #0 in Table 6.5.1-1.

Table 6.5.1-1: Out-of-sync and in-sync block error rates

Configuration	$BLER_{out}$	$BLER_{in}$
0	10%	2%

UE shall be able to monitor up to X_{RLM-RS} RLM-RS resources of the same or different types in each corresponding carrier frequency range, where X_{RLM-RS} is specified in Table 6.5.1-2, and meet the requirements as specified in this section.

Table 6.5.1-2: Maximum number of RLM-RS resources X_{RLM-RS}

Maximum number of RLM-RS resources, X_{RLM-RS}	Carrier frequency range of PCell/Pcell
2	FR1, ≤ 3 GHz
4	FR1, > 3 GHz
8	FR2

If different SCS is used for CSI-RS based RLM-RS and SSB, then CSI-RS based RLM-RS and SSB shall be TDMed. If same SCS is used for CSI-RS based RLM-RS and SSB, then CSI-RS based RLM-RS and SSB can be FDMed or TDMed.

Any uplink signal transmitted by the UE is used for detecting the In-/Out-of-Sync state of the UE. In terms of measurement, the uplink signal is verified on the basis of the UE output power:

For intra-band contiguous carrier aggregation, transmit OFF power is measured as the mean power per component carrier.

For UE with multiple transmit antennas, transmit OFF power is measured as the mean power at each transmit connector.

- UE output power higher than Transmit OFF power -50 dBm (as defined in TS 38.101-3 [4]) means uplink signal
- UE output power equal to or less than Transmit OFF power -50 dBm (as defined in TS 38.101-3 [4]) means no uplink signal.

6.5.1.0 Minimum conformance requirements

6.5.1.0.1 Minimum conformance requirements for out-of-sync SSB-based RLM

UE shall be able to evaluate whether the downlink radio link quality on the configured RLM-RS resource estimated over the last $T_{Evaluate_out_SSB}$ [ms] period becomes worse than the threshold Q_{out_SSB} within $T_{Evaluate_out_SSB}$ [ms] evaluation period. The requirements in this section apply for each SSB based RLM-RS resource configured for PSCell, provided that the SSB configured for RLM is transmitted within UE active DL BWP during the entire evaluation period defined in Table 6.5.1.0.1-1.

$T_{Evaluate_out_SSB}$ is defined in Table 6.5.1.0.1-1 for FR1.

Table 6.5.1.0.1-1: Evaluation period $T_{Evaluate_out}$ for FR1

Configuration	$T_{Evaluate_out_SSB}$ (ms)
no DRX	max(200,ceil(10*P)*T_{SSB})
DRX cycle≤320	max(200,ceil(15*P)*max(T_{DRX},T_{SSB}))
DRX cycle>320	ceil(10*P)*T_{DRX}
NOTE: T_{SSB} is the periodicity of SSB configured for RLM.	

For FR1,

- P=1/(1 – T_{SSB}/MGRP), when in the monitored cell there are measurement gaps configured for intra-frequency, inter-frequency or inter-RAT measurements, which are overlapping with some but not all occasions of the SSB; and

- P=1 when in the monitored cell there are no measurement gaps overlapping with any occasion of the SSB.

If the high layer in TS 38.331 [13] signaling of *smtc2* is present, $T_{SMTCperiod}$ follows *smtc2*; otherwise $T_{SMTCperiod}$ follows *smtc1*.

Longer evaluation period would be expected if the combination of RLM-RS, SMTC occasion and measurement gap configurations does not meet pervious conditions.

When the downlink radio link quality on all the configured RLM-RS resources is worse than Q_{out}, Layer 1 of the UE shall send an out-of-sync indication for the cell to the higher layers. A Layer 3 filter shall be applied to the out-of-sync indications as specified in TS 38.331 [13].

The out-of-sync and in-sync evaluations for the configured RLM-RS resources shall be performed as specified in clause 5 in TS 38.213 [8]. Two successive indications from Layer 1 shall be separated by at least $T_{Indication_interval}$.

If DRX is used, when the UE transitions between DRX and no DRX or when DRX cycle periodicity changes, for each RLM-RS resource, for a duration of time equal to the evaluation period corresponding to the second mode after the transition occurs, the UE shall use an evaluation period that is no less than the minimum of evaluation period corresponding to the first mode and the second mode. Subsequent to this duration, the UE shall use an evaluation period corresponding to the second mode for each RLM-RS resource. This requirement shall be applied to both out-of-sync evaluation and in-sync evaluation of the monitored cell.

When

- the UE transitions from a first configuration of RLM-RS resources to a second configuration of RLM-RS resources that is different from the first configuration,

or

- the UE transitions between DRX and no DRX or DRX cycle periodicity changes,

for each RLM-RS resource, for a duration of time equal to the evaluation period corresponding to the second configuration after the transition occurs, the UE shall use an evaluation period that is no less than the minimum of evaluation periods corresponding to the first configuration and the second configuration. Subsequent to this duration, the UE shall use an evaluation period corresponding to the second configuration for each RLM-RS resource present in the second configuration. This requirement shall be applied to both out-of-sync evaluation and in-sync evaluation of the monitored cell.

When DRX is not used $T_{Indication_interval}$ is max(10ms, $T_{RLM\text{-}RS,M}$), where $T_{RLM,M}$ is the shortest periodicity of all configured RLM-RS resources for the monitored cell, which corresponds to T_{SSB} specified in section 8.1.2 if the RLM-RS resource is SSB.

When DRX is used, TIndication_interval is max(10ms, 1.5*DRX_cycle_length, 1.5*TRLM-RS,M) if DRX cycle_length is less than or equal to 320ms, and TIndication_interval is DRX_cycle_length if DRX cycle_length is greater than 320ms. Upon start of T310 timer as specified in TS 38.331 [13], the UE shall monitor the configured RLM-RS resources for recovery using the evaluation period and Layer 1 indication interval corresponding to the no DRX mode until the expiry or stop of T310 timer.

The transmitter power of the UE in the monitored cell shall be turned off within 40ms after expiry of T310 timer as specified in TS 38.331 [13].

There are no scheduling restrictions due to radio link monitoring performed with a same subcarrier spacing as PDSCH/PDCCH on FR1.

For UE which support *simultaneousRxDataSSB-DiffNumerology* [14] there are no restrictions on scheduling availability due to radio link monitoring based on SSB as RLM-RS. For UE which do not support *simultaneousRxDataSSB-DiffNumerology* [11] the following restrictions apply due to radio link monitoring based on SSB as RLM-RS.

- The UE is not expected to transmit PUCCH/PUSCH or receive PDCCH/PDSCH on SSB symbols to be measured for radio link monitoring.

The normative reference for this requirement is TS 38.133 [6] clauses 8.1.2, 8.1.4, 8.1.5, 8.1.6 and 8.1.7.

6.5.1.0.2 Minimum conformance requirements for in-sync SSB-based RLM

UE shall be able to evaluate whether the downlink radio link quality on the configured RLM-RS resource estimated over the last $T_{Evaluate_in_SSB}$ [ms] period becomes better than the threshold Q_{in_SSB} within $T_{Evaluate_in_SSB}$ [ms] evaluation period.

$T_{Evaluate_out_SSB}$ and $T_{Evaluate_in_SSB}$ are defined in Table 6.5.1.0.2-1 for FR1.

For FR1,

- $P=1/(1 - T_{SSB}/MGRP)$, when in the monitored cell there are measurement gaps configured for intra-frequency, inter-frequency or inter-RAT measurements, which are overlapping with some but not all occasions of the SSB; and

- P=1 when in the monitored cell there are no measurement gaps overlapping with any occasion of the SSB.

If the high layer in TS 38.331 [2] signaling of *smtc2* is present, $T_{SMTCperiod}$ follows *smtc2*; Otherwise $T_{SMTCperiod}$ follows *smtc1*.

Note: The overlap between CSI-RS RLM and SMTC means that CSI-RS based RLM is within the SMTC window duration.Longer evaluation period would be expected if the combination of RLM-RS, SMTC occasion and measurement gap configurations does not meet pervious conditions.

The values of M_{out} and M_{in} used in Table 6.5.1.2.3-1 are defined as:

- M_{out} = 20 and M_{in} = 10, if the CSI-RS resource configured for RLM is transmitted with Density =3.

Table 6.5.1.0.2-1: Evaluation period $T_{Evaluate_out}$ and $T_{Evaluate_in}$ for FR1

Configuration	$T_{Evaluate_out}$ (ms)	$T_{Evaluate_in}$ (ms)
no DRX	max(200, ceil(M_{out}×P)×$T_{CSI\text{-}RS}$)	max(100, ceil(M_{in}×P) × $T_{CSI\text{-}RS}$)
DRX ≤ 320ms	max(200, ceil(1.5×M_{out}×P)× max(T_{DRX}, $T_{CSI\text{-}RS}$))	max(100, ceil(1.5×M_{in}×P)× max(T_{DRX}, $T_{CSI\text{-}RS}$))
DRX > 320ms	ceil(M_{out}×P) × T_{DRX}	ceil(M_{in}×P) × T_{DRX}
NOTE: $T_{CSI\text{-}RS}$ is the periodicity of CSI-RS resource configured for RLM. T_{DRX} is the DRX cycle length.		

If the high layer in TS 38.331 [2] signaling of *smtc2* is present, $T_{SMTCperiod}$ follows *smtc2*; Otherwise $T_{SMTCperiod}$ follows *smtc1*.

When the downlink radio link quality on at least one of the configured RLM-RS resources is better than Q_{in}, Layer 1 of the UE shall send an in-sync indication for the cell to the higher layers. A Layer 3 filter shall be applied to the in-sync indications as specified in TS 38.331 [2].

The in-sync evaluations for the configured RLM-RS resources shall be performed as specified in clause 5 in TS 38.213 [3]. Two successive indications from Layer 1 shall be separated by at least $T_{Indication_interval}$.

When DRX is not used $T_{Indication_interval}$ is max(10ms, $T_{RLM\text{-}RS,M}$), where $T_{RLM,M}$ is the shortest periodicity of all configured RLM-RS resources for the monitored cell, which corresponds to T_{SSB} specified in section 8.1.2 of TS 38.133 [6] if the RLM-RS resource is SSB, or $T_{CSI\text{-}RS}$ specified later in this if the RLM-RS resource is CSI-RS.

When DRX is used, TIndication_interval is max(10ms, 1.5*DRX_cycle_length, 1.5*TRLM-RS,M) if DRX cycle_length is less than or equal to 320ms, and TIndication_interval is DRX_cycle_length if DRX cycle_length is greater than 320ms. Upon start of T310 timer as specified in TS 38.331 [2], the UE shall monitor the configured RLM-RS resources for recovery using the evaluation period and Layer 1 indication interval corresponding to the no DRX mode until the expiry or stop of T310 timer.

When the UE transitions between DRX and no DRX or when DRX cycle periodicity changes, for each RLM-RS resource, for a duration of time equal to the evaluation period corresponding to the second mode after the transition occurs, the UE shall use an evaluation period that is no less than the minimum of evaluation period corresponding to the first mode and the second mode. Subsequent to this duration, the UE shall use an evaluation period corresponding to the second mode for each RLM-RS resource. This requirement shall be applied to both out-of-sync evaluation and in-sync evaluation of the monitored cell.

When the UE transitions from a first configuration of RLM-RS resources to a second configuration of RLM-RS resources that is different from the first configuration, for each RLM-RS resource present in the second configuration, for a duration of time equal to the evaluation period corresponding to the second configuration after the transition occurs, the UE shall use an evaluation period that is no less than the minimum of evaluation periods corresponding to the first configuration and the second configuration. Subsequent to this duration, the UE shall use an evaluation period corresponding to the second configuration for each RLM-RS resource present in the second configuration. This requirement shall be applied to both out-of-sync evaluation and in-sync evaluation of the monitored cell.

The transmitter power of the UE in the monitored cell shall be turned off within 40ms after expiry of T310 timer as specified in TS 38.331 [13].

There are no scheduling restrictions due to radio link monitoring performed with a same subcarrier spacing as PDSCH/PDCCH on FR1.

For UE which support *simultaneousRxDataSSB-DiffNumerology* [14] there are no restrictions on scheduling availability due to radio link monitoring based on SSB as RLM-RS. For UE which do not support *simultaneousRxDataSSB-DiffNumerology* [11] the following restrictions apply due to radio link monitoring based on SSB as RLM-RS.

- The UE is not expected to transmit PUCCH/PUSCH or receive PDCCH/PDSCH on SSB symbols to be measured for radio link monitoring.

The normative reference for this requirement is TS 38.133 [6] clauses 8.1.2, 8.1.4, 8.1.5, 8.1.6, 8.1.7 and A.7.5.1.

6.5.1.0.3 Minimum conformance requirements for out-of-sync and in-sync CSI-RS based RLM

[TS 38.133 clause 8.1.3.2]

UE shall be able to evaluate whether the downlink radio link quality on the configured RLM-RS resource estimated over the last $T_{Evaluate_out_CSI\text{-}RS}$ [ms] period becomes worse than the threshold $Q_{out_CSI\text{-}RS}$ within $T_{Evaluate_out_CSI\text{-}RS}$ [ms] evaluation period.

UE shall be able to evaluate whether the downlink radio link quality on the configured RLM-RS resource estimated over the last $T_{Evaluate_in_CSI\text{-}RS}$ [ms] period becomes better than the threshold $Q_{in_CSI\text{-}RS}$ within $T_{Evaluate_in_CSI\text{-}RS}$ [ms] evaluation period.

- $T_{Evaluate_out_CSI\text{-}RS}$ and $T_{Evaluate_in_CSI\text{-}RS}$ are defined in Table 8.1.3.2-1 for FR1.

For FR1,

- P=1/(1 – T_{CSI-RS}/MGRP), when in the monitored cell there are measurement gaps configured for intra-frequency, inter-frequency or inter-RAT measurements, which are overlapping with some but not all occasions of the CSI-RS; and

- P=1 when in the monitored cell there are no measurement gaps overlapping with any occasion of the CSI-RS.

If the high layer in TS 38.331 [2] signaling of *smtc2* is present, $T_{SMTCperiod}$ follows *smtc2*; Otherwise $T_{SMTCperiod}$ follows *smtc1*.

Note: The overlap between CSI-RS RLM and SMTC means that CSI-RS based RLM is within the SMTC window duration. Longer evaluation period would be expected if the combination of RLM-RS, SMTC occasion and measurement gap configurations does not meet pervious conditions.

The values of M_{out} and M_{in} used in Table 8.1.3.2-1 are defined as:

- M_{out} = 20 and M_{in} = 10, if the CSI-RS resource configured for RLM is transmitted with Density =3.

Table 6.5.1.0.3-1: Evaluation period $T_{Evaluate_out}$ and $T_{Evaluate_in}$ for FR1

Configuration	$T_{Evaluate_out}$ (ms)	$T_{Evaluate_in}$ (ms)
no DRX	max(200, ceil(M_{out}×P)×T_{CSI-RS})	max(100, ceil(M_{in}×P) × T_{CSI-RS})
DRX ≤ 320ms	max(200, ceil(1.5×M_{out}×P)× max(T_{DRX}, T_{CSI-RS}))	max(100, ceil(1.5×M_{in}×P)× max(T_{DRX}, T_{CSI-RS}))
DRX > 320ms	ceil(M_{out}×P) × T_{DRX}	ceil(M_{in}×P) × T_{DRX}
NOTE: T_{CSI-RS} is the periodicity of CSI-RS resource configured for RLM. T_{DRX} is the DRX cycle length.		

[TS 38.133 clause 8.1.6]

When the downlink radio link quality on all the configured RLM-RS resources is worse than Q_{out}, Layer 1 of the UE shall send an out-of-sync indication for the cell to the higher layers. A Layer 3 filter shall be applied to the out-of-sync indications as specified in TS 38.331 [2].

When the downlink radio link quality on at least one of the configured RLM-RS resources is better than Q_{in}, Layer 1 of the UE shall send an in-sync indication for the cell to the higher layers. A Layer 3 filter shall be applied to the in-sync indications as specified in TS 38.331 [2].

The out-of-sync and in-sync evaluations for the configured RLM-RS resources shall be performed as specified in clause 5 in TS 38.213 [3]. Two successive indications from Layer 1 shall be separated by at least $T_{Indication_interval}$.

When DRX is not used $T_{Indication_interval}$ is max(10ms, $T_{RLM-RS,M}$), where $T_{RLM,M}$ is the shortest periodicity of all configured RLM-RS resources for the monitored cell, which corresponds to T_{SSB} specified in section 8.1.2 if the RLM-RS resource is SSB, or T_{CSI-RS} specified in section 8.1.3 if the RLM-RS resource is CSI-RS.

In case DRX is used, $T_{Indication_interval}$ is max(10ms, 1.5*DRX_cycle_length, 1.5*$T_{RLM-RS,M}$) if DRX cycle_length is less than or equal to 320ms, and $T_{Indication_interval}$ is DRX_cycle_length if DRX cycle_length is greater than 320ms. Upon start of T310 timer as specified in TS 38.331 [2], the UE shall monitor the configured RLM-RS resources for recovery using the evaluation period and Layer 1 indication interval corresponding to the no DRX mode until the expiry or stop of T310 timer.

[TS 38.133 clause 8.1.5]

The transmitter power of the UE in the monitored cell shall be turned off within 40ms after expiry of T310 timer as specified in TS 38.331 [2].

The normative reference for this requirement is TS 38.133 [6] clause 8.1.3.2, 8.1.6 and 8.1.5.

6.5.1.1 NR SA FR1 radio link monitoring out-of-sync test for PCell configured with SSB-based RLM RS in non-DRX mode

6.5.1.1.1 Test purpose

The purpose of this test is to verify that the UE properly detects the out of sync for the purpose of monitoring downlink radio link quality of the PCell configured with SSB-based RLM RS in non-DRX mode. This test will partly verify the NR cell radio link monitoring requirements in TS 38.133 [6] section 8.1.2.

6.5.1.1.2 Test applicability

This test applies to all types of NR UE from Release 15 onwards.

6.5.1.1.3 Minimum conformance requirement

The minimum conformance requirements are specified in clause 6.5.1.0.1.

The normative reference for this requirement is TS 38.133 [6] clause A.6.5.1.1.

6.5.1.1.4 Test description

There is one cell (Cell 1), which is the active NR cell, in the test. The test consists of three successive time periods, with time duration of T1, T2 and T3 respectively. Figure 6.5.1.1.4-1 shows the variation of the downlink SNR in the active cell to emulate out-of-sync and in-sync states. Prior to the start of the time duration T1, the UE shall be fully synchronized to Cell 1. The UE shall be configured for periodic CSI reporting with a reporting periodicity of 5 ms. The UE is configured to perform inter-frequency measurements using Gap Pattern ID #0 (40ms) in test 1.

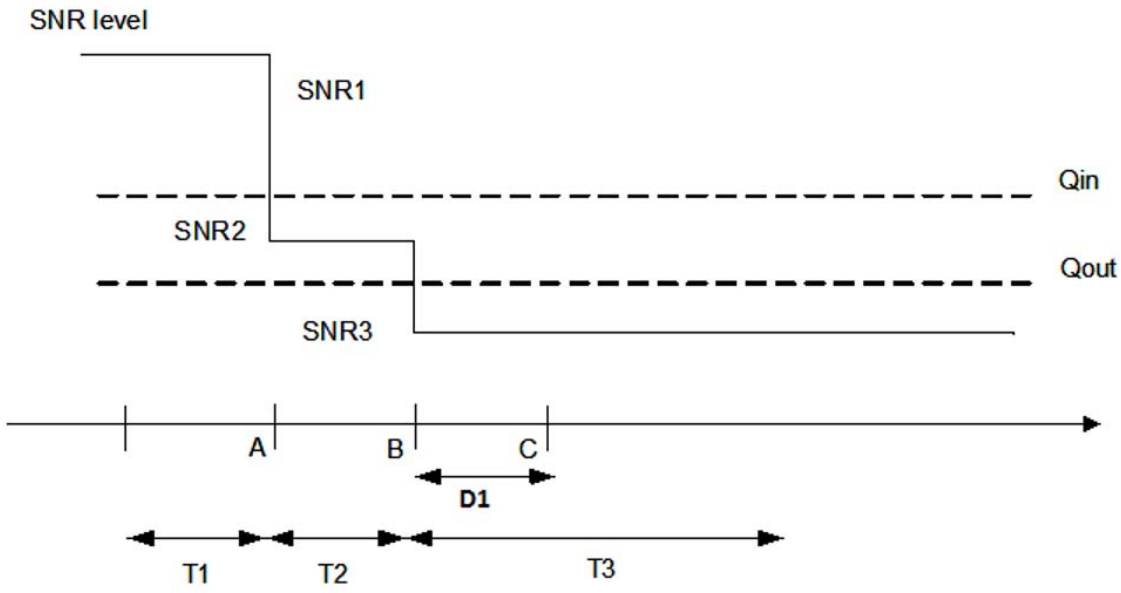


Figure 6.5.1.1.4-1: SNR variation for out-of-sync testing

6.5.1.1.4.1 Initial conditions

This test shall be tested using any of the test configurations in Table 6.5.1.1.4.1-1.

Table 6.5.1.1.4.1-1: NA SA FR1 radio link monitoring out-of-sync test for PCell configured with SSB-based RLM RS in non-DRX mode supported test configurations

Configuration	Description
6.5.1.1-1	FDD, SSB SCS 15 KHz, data SCS 15KHz, BW 10MHz
6.5.1.1-2	TDD, SSB SCS 15 KHz, data SCS 15KHz, BW 10MHz
6.5.1.1-3	TDD, SSB SCS 30 KHz, data SCS 30KHz, BW 40MHz
Note: The UE is only required to pass in one of the supported test configurations in FR1.	

Configure the test equipment and the DUT according to the parameters in Table 6.5.1.1.4.1-2.

Table 6.5.1.1.4.1-2: Initial conditions for NR SA FR1 radio link monitoring out-of-sync test for PCell configured with SSB-based RLM RS in non-DRX mode

Parameter	Value		Comment
Test environment	NC		As specified in TS 38.508-1 [14] clause 4.1.
Test frequencies	As specified in Annex E.1.2, Table E.4-1 and TS 38.508-1 [14] clause 4.3.1.		
Channel bandwidth	As specified by the test configuration selected from Table 6.5.1.1.4.1-1		
Propagation conditions	AWGN		As specified in Annex C.2.2.
Connection Diagram	TE Part	A.3.1.7.1	As specified in TS 38.508-1 [14] Annex A.
	DUT Part	A.3.2.3.4	
Exceptions to connection diagram	For 4Rx capable UEs without any 2 Rx RF bands use A.3.2.5.2 for DUT part and A.3.1.7.4 for TE Part		

Table 6.5.1.1.4.1-3: Void

1. Message contents are defined in clause 6.5.1.1.4.3.
2. Single Cell is used, which is NR FR1 Pcell. The connection setup is done according to the settings in Annex C.1.2 and C.1.3.
3. The test parameters are given in Table 6.5.1.1.4.1-4 below.
4. Downlink signals for NR cell are initially set up according to Annex C.1.2 and C.1.3.

Table 6.5.1.1.4.1-4: General test parameters for FR1 out-of-sync testing in non-DRX mode

Parameter		Unit	Value
			Test 1
Active PCell			Cell 1
RF Channel Number			1
Duplex mode	Config 1		FDD
	Config 2, 3		TDD
$BW_{channel}$	Config 1	MHz	10: $N_{RB,c}$ = 52
	Config 2		10: $N_{RB,c}$ = 52
	Config 3		40: $N_{RB,c}$ = 106
DL initial BWP configuration	Config 1, 2, 3		DLBWP.0.1
DL dedicated BWP configuration	Config 1, 2, 3		DLBWP.1.1
UL initial BWP configuration	Config 1, 2, 3		ULBWP.0.1
UL dedicated BWP configuration	Config 1, 2, 3		ULBWP.1.1
TDD Configuration	Config 1		Not Applicable
	Config 2		TDDConf.1.1
	Config 3		TDDConf.2.1
RMSI CORESET Reference Channel	Config 1		CR.1.1 FDD
	Config 2		CR.1.1 TDD
	Config 3		CR.2.1 TDD
Dedicated CORESET Reference Channel	Config 1		CCR.1.3 FDD
	Config 2		CCR.1.3 TDD
	Config 3		CCR.2.2 TDD
SSB Configuration	Config 1		SSB.1 FR1
	Config 2		SSB.1 FR1
	Config 3		SSB.2 FR1
SMTC Configuration	Config 1, 2		SMTC.1
	Config 3		SMTC.1
PDSCH/PDCCH subcarrier spacing	Config 1, 2		15 KHz
	Config 3		30 KHz
PRACH Configuration	Config 1, 2		Table A.7.1-1, PRACH.1 FR1
	Config 3		Table A.7.1-1, PRACH.1 FR1

SSB index assigned as RLM RS			0
OCNG parameters			OP.1
CP length			Normal
Correlation Matrix and Antenna Configuration			2x2 Low
Out of sync transmission parameters	DCI format		1-0
	Number of Control OFDM symbols		2
	Aggregation level	CCE	8
	Ratio of hypothetical PDCCH RE energy to average SSS RE energy	dB	4
	Ratio of hypothetical PDCCH DMRS energy to average SSS RE energy	dB	4
	DMRS precoder granularity		REG bundle size
	REG bundle size		6
DRX			*OFF*
Gap pattern ID			*gp0*
Layer 3 filtering			*Enabled*
T310 timer		ms	*0*
T311 timer		ms	1000
N310			1
N311			1
CSI-RS configuration for CSI reporting	Config 1, 4		CSI-RS.1.1 FDD
	Config 2, 5		CSI-RS.1.1 TDD
	Config 3, 6		CSI-RS.2.1 TDD
CSI-RS for tracking	Config 1, 4		TRS.1.1 FDD
	Config 2, 5		TRS.1.1 TDD
	Config 3, 6		TRS.1.2 TDD
T1		s	0.2
T2		s	0.48
T3		s	0.48
D1		s	0.44
Note 1: All configurations are assigned to the UE prior to the start of time period T1. Note 2: UE-specific PDCCH is not transmitted after T1 starts.			

6.5.1.1.4.2 Test Procedure

There is one cell (Cell 1), which is the active NR cell, in the test. Prior to the start of the time duration T1, the UE shall be fully synchronized to PCell. The UE shall be configured for periodic CQI reporting in PUCCH [format 2] with a reporting periodicity as mentioned in the above table 6.5.1.1.4.1-4.

1. Ensure the UE is in state RRC_CONNECTED with generic procedure parameters *Connectivity* NR, Connected without release *On* and Test Mode *On* according to TS 38.508-1 [6] clause 4.5.

2. The SS shall transmit an RRCReconfiguration message configuring the UE for inter-frequency measurements.

3. The UE shall transmit RRCReconfigurationComplete message.

4. Set the parameters according to T1 in Table 6.5.1.1.5-1. Propagation conditions are set according to Annex C.2.3. T1 starts.

5. When T1 expires the SS shall change the SNR value to T2 as specified in Table 6.5.1.1.5-1. T2 starts.

6. When T2 expires the SS shall change the SNR value to T3 as specified in Table 6.5.1.1.5-1. T3 starts.

7. If the SS:
   a) detects uplink power equal to or higher than minimum output power defined in TS 38.521-1 [17] clause 6.3.1.5 in each subframe configured for CQI transmission (according to configured CQI periodicity on PUCCH [format 2]) during the period from time point A to time point B

and

b) does not detect any uplink power higher than OFF power defined in TS 38.521-1 [17] clause 6.3.2.5 from time point C (D1 after the start of T3) until T3 expires,
the number of successful tests is increased by one.

8. Otherwise the number of failed tests is increased by one.

9. When T3 expires the SS shall change the SNR value to T1 as specified in Table 6.5.1.1.5-1.

10. If the UE has not re-established the connection in at least 1s, the UE is switched off and then on. Ensure the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity *NR*, Connected without release *On* according to TS 38.508-1 [10] clause 4.5.

11. Repeat steps 4-10 until the confidence level according to Tables G.2.3-1 in Annex G clause G.2 is achieved.

6.5.1.1.4.3 Message Contents

Message contents are according to TS 38.508-1 [14] clause 4.6.1 and 7.3.1 with condition "Short_DCI" and with the following exceptions:

Table 6.5.1.1.4.3-0: Common Exception messages for NR SA FR1 radio link monitoring out-of-sync test for PCell configured with SSB-based RLM RS in non-DRX mode test requirement

Default Message Contents	
Common contents of system information blocks exceptions	
Default RRC messages and information elements contents exceptions	Table H.3.1-1 Table H.3.1-2 with Condition INTER-FREQ, L3 FILTERING NEEDED, GAP_NEEDED Table H.3.1-3 with Condition INTER-FREQ MO (where ssbFrequency is set to the ARFCN value of carrier center of High range) Table H.3.1-4 with A3-offset = 0 Table H.3.1-1 Table H.3.1-6 with conditions gapUE and RLM Table H.3.5-4 Table H.3.5-9

Table 6.5.1.1.4.3-1: Void

Table 6.5.1.1.4.3-2: *RLF-TimersAndConstants*

Derivation Path: TS 38.508-1 [14], Table 4.6.3-150			
Information Element	**Value/remark**	**Comment**	**Condition**
RLF-TimersAndConstants ::= SEQUENCE {			
t310	ms0		
n310	n1		
t311	ms1000		
n311	n1		
}			

Table 6.5.1.1.4.3-3: Void

Table 6.5.1.1.4.3-4 *SIB1*

Derivation Path: TS 38.508-1 [14], Table 4.6.1-28			
Information Element	**Value/remark**	**Comment**	**Condition**
SIB1 ::= SEQUENCE {			
cellSelectionInfo SEQUENCE {			
q-RxLevMin	-53	-106 is actual value in dBm (-53	dBm/15kHz

		* 2 dBm)	
	-51	-102 is actual value in dBm (-51 * 2 dBm)	dBm/30kHz
}			
}			

6.5.1.1.5 Test Requirement

Table 6.5.1.1.5-1 defines the cell specific primary level settings.

The UE behavior in each test during time durations T1, T2 and T3 shall be as follows:

During the period from time point A to time point B the UE shall transmit uplink signal at least in all uplink slots configured for CSI transmission according to the configured periodic CSI reporting.

The UE shall stop transmitting uplink signal no later than time point C (D1 second after the start of the time duration T3).

The rate of correct events observed during repeated tests shall be at least 90%.

Table 6.5.1.1.5-1: Cell specific test parameters for FR1 (Cell 1) for out-of-sync radio link monitoring tests in non-DRX mode

Parameter		Unit	Test 1		
			T1	T2	T3
EPRE ratio of PDCCH DMRS to SSS		dB	4		
EPRE ratio of PDCCH to PDCCH DMRS		dB	0		
EPRE ratio of PBCH DMRS to SSS		dB	0		
EPRE ratio of PBCH to PBCH DMRS		dB			
EPRE ratio of PSS to SSS		dB			
EPRE ratio of PDSCH DMRS to SSS		dB			
EPRE ratio of PDSCH to PDSCH DMRS		dB			
EPRE ratio of OCNG DMRS to SSS		dB			
EPRE ratio of OCNG to OCNG DMRS		dB			
SNR on RLM-RS	Config 1	dB	1.9	-6.1	-15.9
	Config 2		1.9	-6.1	-15.9
	Config 3		1.9	-6.1	-15.9
N_{oc}	Config 1	dBm/ 15kHz	-98		
	Config 2		-98		
	Config 3		-98		
N_{oc}	Config 1	dBm/ SCS	-98		
	Config 2		-98		
	Config 3		-95		
Propagation condition			TDL-C 300ns 100Hz		

Note 1: OCNG shall be used such that the resources in Cell 1 are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.
Note 2: The signal contains PDCCH for UEs other than the device under test as part of OCNG.
Note 3: SNR levels correspond to the signal to noise ratio over the SSS REs.
Note 4: The SNR in time periods T1, T2 and T3 is denoted as SNR1, SNR2 and SNR3 respectively in Figure 6.5.1.1.4-1.
Note 5: The SNR values are specified for a UE with 2RX antennas connected under test. For a UE with 4RX antennas connected under test, the SNR during T3 from D.4.1.1, is -18dB-TT = -18.9dB (including test tolerances).

Table 6.5.1.1.5-2: Measurement gap configuration for out-of-sync tests in non-DRX mode

Field	Test 1
	Value
gapOffset	0
Note Ensure that RLM RS is partially overlapped with measurement gap	

For the test to pass, the total number of successful tests shall be more than 90% of the cases with a confidence level of 95%.

6.5.1.2 NR SA FR1 radio link monitoring in-sync test for PCell configured with SSB-based RLM RS in non-DRX mode

6.5.1.2.1 Test purpose

The purpose of this test is to verify that the UE properly detects in sync for the purpose of monitoring downlink radio link quality of the PCell, when DRX is not used. This test will partly verify the FR1 radio link monitoring requirements in clause 8.1.2.

6.5.1.2.2 Test applicability

This test applies to all types of NR UEs supporting Release 15 and forwared

6.5.1.2.3 Minimum conformance requirements

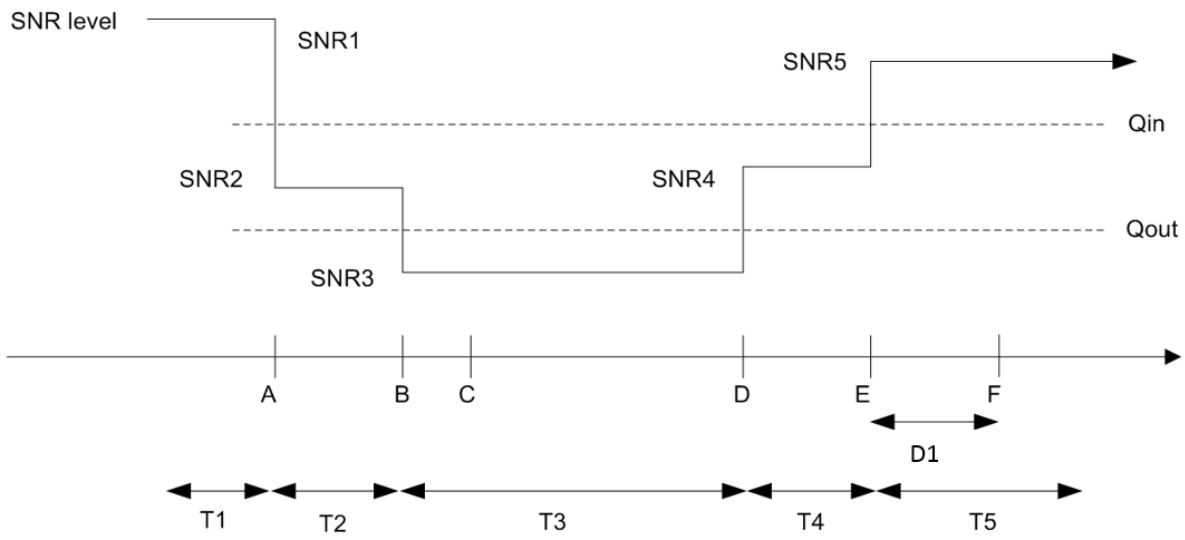
The minimum conformance requirements are specified in clause 6.5.1.0.2.

The normative reference for this requirement is TS 38.133 [6] clause A.6.5.1.2.

6.5.1.2.4 Test Description

There is one cell (Cell 1), which is the active NR cell, in the test. The test consists of three successive time periods, with time duration of T1, T2, T3, T4 and T5 respectively. Figure 6.5.1.2.4-1 shows the variation of the downlink SNR in the active cell to emulate out-of-sync and in-sync states. Prior to the start of the time duration T1, the UE shall be fully synchronized to Cell 1. The UE shall be configured for periodic CSI reporting with a reporting periodicity of 5 ms.

Figure 6.5.1.2.4-1 - SNR variation for in-sync testing



6.5.1.2.4 Test Requirements

6.5.1.2.4.1 Initial Conditions

This test shall be tested using any of the test configurations in Table 6.5.1.2.4.1-1.

Table 6.5.1.2.4.1-1: Supported test configurations for FR1 PSCell

Configuration	Description
6.5.1.2-1	FDD, SSB SCS 15 KHz, data SCS 15KHz, BW 10MHz
6.5.1.2-2	TDD, SSB SCS 15 KHz, data SCS 15KHz, BW 10MHz
6.5.1.2-3	TDD, SSB SCS 30 KHz, data SCS 30KHz, BW 40MHz
Note: The UE is only required to pass in one of the supported test	

configurations in FR1

Configure the test equipment and the DUT according to the parameters in Table 6.5.1.2.4.1-2.

Table 6.5.1.2.4.1-2: Initial conditions for SA FR1 radio link monitoring in-sync test for PSCell configured with SSB-based RLM RS in non-DRX mode

Parameter	Value		Comment
Test environment	NC		As specified in TS 38.508-1 [14] clause 4.1.
Test frequencies	As specified in Annex E.1.1, Table E.2-1 and TS 38.508-1 [14] clause 4.3.1.		
Channel bandwidth	As specified by the test configuration selected from Table 6.5.1.2.4.1-1		
Propagation conditions	AWGN		As specified in Annex C.2.2.
Connection Diagram	TE Part	A.3.1.7.1	As specified in TS 38.508-1 [14] Annex A.
	DUT Part	A.3.2.3.4	
Exceptions to connection diagram	For 4Rx capable UEs without any 2 Rx RF bands use A.3.2.5.2 for DUT part and A.3.1.7.4 for TE Part		

Table 6.5.1.2.4.1-3: Void

1. Message contents are defined in clause 6.5.1.2.4.3.
2. The power levels and settings for Cell 1 are set according to Annex A.6, Table A.6.1.1-1. The connection setup is done according to the settings in Annex C.1.3, and the downlink signal levels as per Annex C.1.2
3. The general test parameters are given in Table 6.5.1.2.4.1-4 below.
4. Downlink signals for NR cell are initially set up according to Annex C.1.

Table 6.5.1.2.4.1-4: General test parameters for FR1 in-sync testing in non-DRX mode

Parameter		Unit	Value
			Test 1
Active PCell			Cell 1
RF Channel Number			1
Duplex mode	Config 1		FDD
	Config 2, 3		TDD
$BW_{channel}$	Config 1	MHz	10: $N_{RB,c}$ = 52
	Config 2		10: $N_{RB,c}$ = 52
	Config 3		40: $N_{RB,c}$ = 106
DL initial BWP configuration	Config 1, 2, 3		DLBWP.0.1
DL dedicated BWP configuration	Config 1, 2, 3		DLBWP.1.1
UL initial BWP configuration	Config 1, 2, 3		ULBWP.0.1
UL dedicated BWP configuration	Config 1, 2, 3		ULBWP.1.1
TDD Configuration	Config 1		Not Applicable
	Config 2		TDDConf.1.1
	Config 3		TDDConf.2.1
RMSI CORESET Reference Channel	Config 1		CR.1.1 FDD
	Config 2		CR.1.1 TDD
	Config 3		CR.2.1 TDD
Dedicated CORESET Reference Channel	Config 1		CCR.1.1 FDD
	Config 2		CCR.1.1 TDD
	Config 3		CCR.2.1 TDD
SSB Configuration	Config 1		SSB.1 FR1
	Config 2		SSB.1 FR1
	Config 3		SSB.2 FR1
SMTC Configuration	Config 1, 2		SMTC.1

	Config 3		SMTC.1
PDSCH/PDCCH subcarrier spacing	Config 1, 2		15 KHz
	Config 3		30 KHz
PRACH Configuration	Config 1, 2		Table A.7.1-1, PRACH.1 FR1
	Config 3		Table A.7.1-1, PRACH.1 FR1
SSB index assigned as RLM RS			0
OCNG parameters			OP.1
CP length			Normal
Correlation Matrix and Antenna Configuration			2x2 Low
In sync transmission parameters	DCI format		1-0
	Number of Control OFDM symbols		2
	Aggregation level	CCE	4
	Ratio of hypothetical PDCCH RE energy to average SSS RE energy	dB	0
	Ratio of hypothetical PDCCH DMRS energy to average SSS RE energy	dB	0
	DMRS precoder granularity		REG bundle size
	REG bundle size		6
Out of sync transmission parameters	DCI format		1-0
	Number of Control OFDM symbols		2
	Aggregation level	CCE	8
	Ratio of hypothetical PDCCH RE energy to average SSS RE energy	dB	4
	Ratio of hypothetical PDCCH DMRS energy to average SSS RE energy	dB	4
	DMRS precoder granularity		REG bundle size
	REG bundle size		6
DRX			*OFF*
Gap pattern ID			N.A.
Layer 3 filtering			*Enabled*
T310 timer		ms	1000
T311 timer		ms	1000
N310			1
N311			1
CSI-RS configuration for CSI reporting	Config 1		CSI-RS.1.1 FDD
	Config 2		CSI-RS.1.1 TDD
	Config 3		CSI-RS.2.1 TDD
CSI-RS for tracking	Config 1, 4		TRS.1.1 FDD
	Config 2, 5		TRS.1.1 TDD
	Config 3, 6		TRS.1.2 TDD
T1		s	0.2
T2		s	0.2
T3		s	0.24
T4		s	0.2
T5		s	0.88
D1		s	0.84

Note 1: All configurations are assigned to the UE prior to the start of time period T1.
Note 2: UE-specific PDCCH is not transmitted after T1 starts.

6.5.1.2.4.2 Test Procedure

There is one cell (Cell 1), which is the active NR cell, in the test. The test consists of five successive time periods, with time duration of T1, T2, T3, T4 and T5 respectively. Figure 6.5.1.2.4-1 shows the variation of the downlink SNR in the active cell to emulate out-of-sync and in-sync states.. Prior to the start of the time duration T1, the UE shall be fully synchronized to PCell. The UE shall be configured for periodic CQI reporting in PUCCH [format 2] with a reporting periodicity as mentioned in the above table 6.5.1.2.4.1-4.

1. Ensure the UE is in state RRC_CONNECTED with generic procedure parameters *Connectivity* NR, Connected without release *On* and Test Mode *On* according to TS 38.508-1 [6] clause 4.5.

2. Set the parameters according to T1 in Table 6.5.1.2.5-1 for subtest 1 and 2. Propagation conditions are set according to Annex C.2.3. T1 starts.

3. When T1 expires the SS shall change the SNR value to T2 as specified in Table 6.5.1.2.5-1. T2 starts.

4. When T2 expires the SS shall change the SNR value to T3 as specified in Table 6.5.1.2.5-1. T3 starts.

5. When T3 expires the SS shall change the SNR value to T4 as specified in Table 6.5.1.2.5-1. T4 starts.

6. When T4 expires the SS shall change the SNR value to T5 as specified in Table 6.5.1.2.5-1. T5 starts.

7. If the SS detects uplink power equal to or higher than the minimum output power defined in TS 38.521-1 [17] clause 6.3.1.5 in the subframe according the configured CQI reporting mode (PUCCH 2-0) during the period from time point A to time point F (D1 after the start of time duration T5) the number of successful tests is increased by one.

   Otherwise the number of failed tests is increased by one.

8. Ensure the UE is in state RRC_CONNECTED with generic procedure parameters *Connectivity* NR, Connected without release *On* and Test Mode *On* according to TS 38.508-1 [6] clause 4.5.

9. Repeat steps 2-7 for all subtests until the confidence level according to Tables G.2.3-1 in Annex G clause G.2 is achieved.

6.5.1.2.4.3 Message Contents

Message contents are according to TS 38.508-1 [14] clause 4.6.1 and 7.3.1 with condition “Short_DCI” and with the following exceptions:

Table 6.5.1.2.4.3-0: Common Exception messages for NR SA FR1 radio link monitoring in-sync test for PCell configured with SSB-based RLM RS in non-DRX mode test requirement

Default Message Contents	
Common contents of system information blocks exceptions	
Default RRC messages and information elements contents exceptions	Table H.3.5-4 Table H.3.5-9

Table 6.5.1.2.4.3-1: Void

Table 6.5.1.2.4.3-2: *RLF-TimersAndConstants*

Derivation Path: TS 38.508-1 [14], Table 4.6.3-150			
Information Element	**Value/remark**	**Comment**	**Condition**
RLF-TimersAndConstants ::= SEQUENCE {			
t310	ms1000		
n310	n1		
t311	ms1000		
n311	n1		
}			

Table 6.5.1.2.4.3-3: Void

6.5.1.2.5 Test Requirement

The requirements in this section apply for each SSB based RLM-RS resource configured for the PCell, provided that the SSB configured for RLM are actually transmitted within UE active DL BWP during the entire evaluation period specified in section 6.5.1.2.3.

Table 6.5.1.2.5-1 defines the cell specific primary level settings.

The UE behaviour in each test during time durations T1, T2, T3, T4 and T5 shall be as follows:

During the period from time point A to time point F (D1 second after the start of time duration T5) the UE shall transmit uplink signal at least in all uplink slots configured for CSI transmission according to the configured periodic CSI reporting.

The rate of correct events observed during repeated tests shall be at least 90% with a confidence interval of 95%.

Table 6.5.1.2.5-1: Cell specific test parameters for FR1 for in-sync radio link monitoring tests in non-DRX mode

Parameter		Unit	Test 1				
			T1	T2	T3	T4	T5
EPRE ratio of PDCCH DMRS to SSS		dB	0				
EPRE ratio of PDCCH to PDCCH DMRS		dB	0				
EPRE ratio of PBCH DMRS to SSS		dB	0				
EPRE ratio of PBCH to PBCH DMRS		dB					
EPRE ratio of PSS to SSS		dB					
EPRE ratio of PDSCH DMRS to SSS		dB					
EPRE ratio of PDSCH to PDSCH DMRS		dB					
EPRE ratio of OCNG DMRS to SSS		dB					
EPRE ratio of OCNG to OCNG DMRS		dB					
SNR on RLM-RS	Config 1	dB	1.8	-6.2	-15.8	-5.3	1.8
	Config 2		1.8	-6.2	-15.8	-5.3	1.8
	Config 3		1.8	-6.2	-15.8	-5.3	1.8
N_{oc}	Config 1	dBm/15 kHz	-98				
	Config 2		-98				
	Config 3		-98				
N_{oc}	Config 1	dBm/SCS	-98				
	Config 2		-98				
	Config 3		-95				
Propagation condition			TDL-C 300ns 100Hz				

Note 1: OCNG shall be used such that the resources in Cell 1 are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.
Note 2: The signal contains PDCCH for UEs other than the device under test as part of OCNG.
Note 3: SNR levels correspond to the signal to noise ratio over the SSS REs.
Note 4: The SNR in time periods T1, T2, T3, T4 and T5 is denoted as SNR1, SNR2, SNR3, SNR4 and SNR5 respectively in Figure 6.5.1.2.4-1.
Note 5: The SNR values are specified for a UE with 2RX antennas connected under test. For a UE wiht 4RX antennas connected under test, the SNR during T3 and T4 from D.4.1.1 are -18.0-TT and -8.0-TT, which are -18.8dB and -8.8dB(including test tolerances)

6.5.1.3 NR SA FR1 radio link monitoring out-of-sync test for PCell configured with SSB-based RLM RS in DRX mode

6.5.1.3.1 Test purpose

The purpose of this test is to verify that the UE properly detects the out of sync for the purpose of monitoring downlink radio link quality of the PCell configured with SSB-based RLM RS when DRX is used. This test will partly verify the NR cell radio link monitoring requirements in TS 38.133 [6] section 8.1.2.

6.5.1.3.2 Test applicability

This test applies to all types of NR UE Release 15 and forward supporting 5GS NR SA FR1 and long DRX cycle.

6.5.1.3.3 Minimum conformance requirement

The minimum conformance requirements are specified in clause 6.5.1.0.1.

The normative reference for this requirement is TS 38.133 [6] clause A.6.5.1.3.

6.5.1.3.4 Test description

There is one cell (Cell 1), which is the active NR cell, in the test. The test consists of three successive time periods, with time duration of T1, T2 and T3 respectively. Figure 6.5.1.3.4-1 shows the variation of the downlink SNR in the active cell to emulate out-of-sync and in-sync states. Prior to the start of the time duration T1, the UE shall be fully synchronized to Cell 1. The UE shall be configured for periodic CSI reporting with a reporting periodicity of 5 ms. In the test, DRX configuration is enabled and DRX inactivity timer has already been expired, i.e. UE tries to decode PDCCH and to send periodic CSI during the period when On-duration timer is running. Time alignment timers shall be set to “infinity” so that UL timing alignment is maintained during the test.

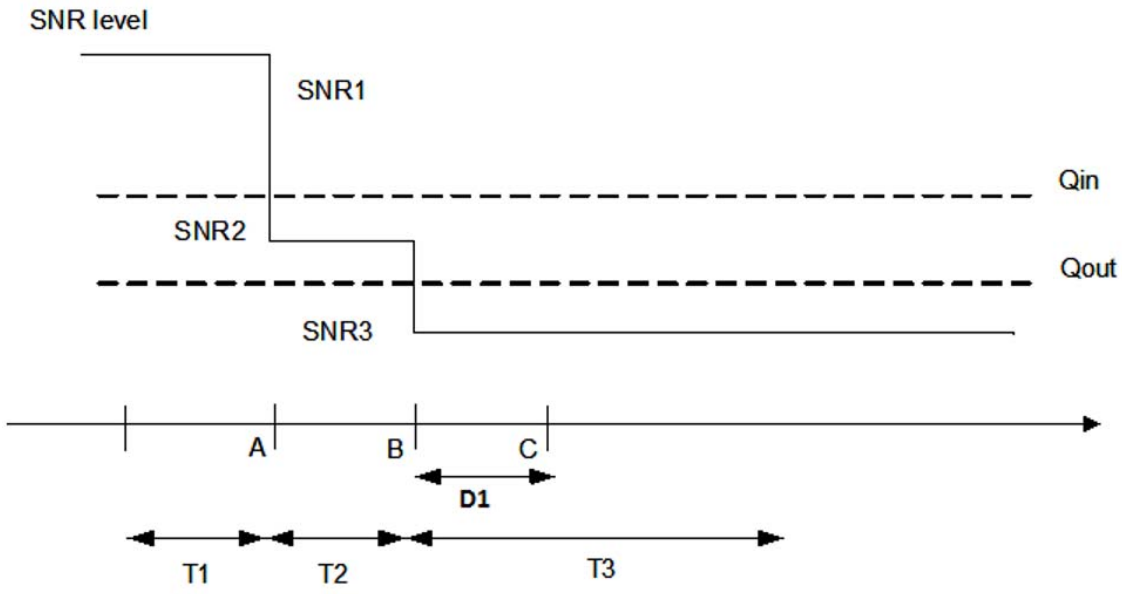


Figure 6.5.1.3.4-1: SNR variation for out-of-sync testing

6.5.1.3.4.1 Initial conditions

This test shall be tested using any of the test configurations in Table 6.5.1.3.4.1-1.

Table 6.5.1.3.4.1-1: NA SA FR1 radio link monitoring out-of-sync test for PCell configured with SSB-based RLM RS in DRX mode supported test configurations

Configuration	Description

6.5.1.3-1	FDD, SSB SCS 15 KHz, data SCS 15KHz, BW 10MHz
6.5.1.3-2	TDD, SSB SCS 15 KHz, data SCS 15KHz, BW 10MHz
6.5.1.3-3	TDD, SSB SCS 30 KHz, data SCS 30KHz, BW 40MHz
Note: The UE is only required to pass in one of the supported test configurations in FR1.	

Configure the test equipment and the DUT according to the parameters in Table 6.5.1.3.4.1-2.

Table 6.5.1.3.4.1-2: Initial conditions for NR SA FR1 radio link monitoring out-of-sync test for PCell configured with SSB-based RLM RS in DRX mode

Parameter	Value		Comment
Test environment	NC		As specified in TS 38.508-1 [14] clause 4.1.
Test frequencies	As specified in Annex E.1.2, Table E.4-1 and TS 38.508-1 [14] clause 4.3.1.		
Channel bandwidth	As specified by the test configuration selected from Table 6.5.1.3.4.1-1		
Propagation conditions	AWGN		As specified in Annex C.2.2.
Connection Diagram	TE Part	A.3.1.7.1	As specified in TS 38.508-1 [14] Annex A.
	DUT Part	A.3.2.3.4	
Exceptions to connection diagram	For 4Rx capable UEs without any 2 Rx RF bands use A.3.2.5.2 for DUT part and A.3.1.7.4 for TE Part		

Table 6.5.1.3.4.1-3: Void

1. Message contents are defined in clause 6.5.1.3.4.3.

2. Single Cell is used, which is NR FR1 PCell. The connection setup is done according to the settings in Annex C.1.2 and C.1.3.

3. The test parameters are given in Table 6.5.1.3.4.1-4 below.

4. Downlink signals for NR cell are initially set up according to Annex C.1.2 and C.1.3.

Table 6.5.1.3.4.1-4: General test parameters for FR1 out-of-sync testing in DRX mode

Parameter		Unit	Value
			Test 1
Active PCell			Cell 1
RF Channel Number			1
Duplex mode	Config 1		FDD
	Config 2, 3		TDD
$BW_{channel}$	Config 1	MHz	10: $N_{RB,c}$ = 52
	Config 2		10: $N_{RB,c}$ = 52
	Config 3		40: $N_{RB,c}$ = 106
DL initial BWP configuration	Config 1, 2, 3		DLBWP.0.1
DL dedicated BWP configuration	Config 1, 2, 3		DLBWP.1.1
UL initial BWP configuration	Config 1, 2, 3		ULBWP.0.1
UL dedicated BWP configuration	Config 1, 2, 3		ULBWP.1.1
TDD Configuration	Config 1		Not Applicable
	Config 2		TDDConf.1.1
	Config 3		TDDConf.2.1
RMSI CORESET Reference Channel	Config 1		CR.1.1 FDD
	Config 2		CR.1.1 TDD
	Config 3		CR.2.1 TDD
Dedicated CORESET	Config 1		CCR.1.3 FDD

Reference Channel	Config 2		CCR.1.3 TDD
	Config 3		CCR.2.2 TDD
SSB Configuration	Config 1		SSB.1 FR1
	Config 2		SSB.1 FR1
	Config 3		SSB.2 FR1
SMTC Configuration	Config 1, 2		SMTC.1
	Config 3		SMTC.1
PDSCH/PDCCH subcarrier spacing	Config 1, 2		15 KHz
	Config 3		30 KHz
PRACH Configuration	Config 1, 2		Table A.7.1-1, PRACH.1 FR1
	Config 3		Table A.7.1-1, PRACH.1 FR1
SSB index assigned as RLM RS			0
OCNG parameters			OP.1
CP length			Normal
Correlation Matrix and Antenna Configuration			2x2 Low
Out of sync transmission parameters	DCI format		1-0
	Number of Control OFDM symbols		2
	Aggregation level	CCE	8
	Ratio of hypothetical PDCCH RE energy to average SSS RE energy	dB	4
	Ratio of hypothetical PDCCH DMRS energy to average SSS RE energy	dB	4
	DMRS precoder granularity		REG bundle size
	REG bundle size		6
DRX Configuration			DRX.3
Gap pattern ID			N.A.
Layer 3 filtering			*Enabled*
T310 timer		ms	*0*
T311 timer		ms	1000
N310			1
N311			1
CSI-RS configuration	Config 1		CSI-RS.1.1 FDD
	Config 2		CSI-RS.1.1 TDD
	Config 3		CSI-RS.2.1 TDD
CSI-RS for tracking	Config 1		TRS.1.1 FDD
	Config 2		TRS.1.1 TDD
	Config 3		TRS.1.2 TDD
T1		s	0.2
T2		s	0.68
T3		s	0.68
D1		s	0.64
Note 1: All configurations are assigned to the UE prior to the start of time period T1. Note 2: UE-specific PDCCH is not transmitted after T1 starts.			

6.5.1.3.4.2 Test Procedure

There is one cell (Cell 1), which is the active NR cell, in the test. Prior to the start of the time duration T1, the UE shall be fully synchronized to PCell. The UE shall be configured for periodic CQI reporting in PUCCH [format 2] with a reporting periodicity as mentioned in the above table 6.5.1.3.4.1-4.

1. Ensure the UE is in state RRC_CONNECTED with generic procedure parameters *Connectivity* NR, Connected without release *On* and Test Mode *On* according to TS 38.508-1 [6] clause 4.5.

2. Set the parameters according to T1 in Table 6.5.1.3.5-1. Propagation conditions are set according to Annex C.2.3. T1 starts.

3. When T1 expires the SS shall change the SNR value to T2 as specified in Table 6.5.1.3.5-1. T2 starts.

4. When T2 expires the SS shall change the SNR value to T3 as specified in Table 6.5.1.3.5-1. T3 starts.

5. If the SS:
   a) detects uplink power equal to or higher than minimum output power defined in TS 38.521-1 [17] clause 6.3.1.5 in each subframe configured for CQI transmission (according to configured CQI periodicity on PUCCH [format 2]) during the period from time point A to time point B

and

   b) does not detect any uplink power higher than OFF power defined in TS 38.521-1 [17] clause 6.3.2.5 from time point C (D1 after the start of T3) until T3 expires,
   the number of successful tests is increased by one.

Otherwise the number of failed tests is increased by one.

6. When T3 expires the SS shall change the SNR value to T1 as specified in Table 6.5.1.3.5-1.

7. If the UE has not re-established the connection in at least 1s, the UE is switched off and then on. Ensure the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity *NR*, Connected without release *On* according to TS 38.508-1 [10] clause 4.5.

8. Repeat steps 2-8 until the confidence level according to Tables G.2.3-1 in Annex G clause G.2 is achieved.

6.5.1.3.4.3 Message Contents

Message contents are according to TS 38.508-1 [14] clause 4.6.1 and 7.3.1 with condition “Short_DCI” and with the following exceptions:

Table 6.5.1.3.4.3-0: Common Exception messages for NR SA FR1 radio link monitoring out-of-sync test for PCell configured with SSB-based RLM RS in DRX mode test requirement

Default Message Contents	
Common contents of system information blocks exceptions	
Default RRC messages and information elements contents exceptions	Table H.3.5-4 Table H.3.5-9 Table H.3.7-1 with condition DRX.3

Table 6.5.1.3.4.3-1: Void

Table 6.5.1.3.4.3-2: RLF-TimersAndConstant

Derivation Path: TS 38.508-1 [14], Table 4.6.3-150			
Information Element	**Value/remark**	**Comment**	**Condition**
RLF-TimersAndConstants ::= SEQUENCE {			
t310	ms0		
n310	n1		
n311	n1		
t311	ms1000		
}			

Table 6.5.1.3.4.3-3: Void

Table 6.5.1.3.4.3-4 *SIB1*

Derivation Path: TS 38.508-1 [14], Table 4.6.1-28

Information Element	Value/remark	Comment	Condition
SIB1 ::= SEQUENCE {			
cellSelectionInfoSEQUENCE {			
q-RxLevMin	-53	-106 is actual value in dBm (-53 * 2 dBm)	dBm/15kHz
	-51	-102 is actual value in dBm (-51 * 2 dBm)	dBm/30kHz
}			
}			

6.5.1.3.5 Test Requirement

Table 6.5.1.3.5-1 defines the cell specific primary level settings.

The UE behavior in each test during time durations T1, T2 and T3 shall be as follows:

During the period from time point A to time point B the UE shall transmit uplink signal at least in all uplink slots configured for CSI transmission according to the configured periodic CSI reporting.

The UE shall stop transmitting uplink signal no later than time point C (D1 second after the start of the time duration T3).

The rate of correct events observed during repeated tests shall be at least 90%.

Table 6.5.1.3.5-1: Cell specific test parameters for FR1 (Cell 1) for out-of-sync radio link monitoring tests in DRX mode

Parameter		Unit	Test 1		
			T1	T2	T3
EPRE ratio of PDCCH DMRS to SSS		dB	4		
EPRE ratio of PDCCH to PDCCH DMRS		dB	0		
EPRE ratio of PBCH DMRS to SSS		dB	0		
EPRE ratio of PBCH to PBCH DMRS		dB			
EPRE ratio of PSS to SSS		dB			
EPRE ratio of PDSCH DMRS to SSS		dB			
EPRE ratio of PDSCH to PDSCH DMRS		dB			
EPRE ratio of OCNG DMRS to SSS		dB			
EPRE ratio of OCNG to OCNG DMRS		dB			
SNR on RLM-RS	Config 1	dB	1.8	-6.2	-15.8
	Config 2		1.8	-6.2	-15.8
	Config 3		1.8	-6.2	-15.8
N_{oc}	Config 1	dBm/15 kHz	-98		
	Config 2		-98		
	Config 3		-98		
N_{oc}	Config 1	dBm/SCS	-98		
	Config 2		-98		
	Config 3		-95		
Propagation condition			TDL-C 300ns 100Hz		

Note 1: OCNG shall be used such that the resources in Cell 1 are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.
Note 2: The signal contains PDCCH for UEs other than the device under test as part of OCNG.
Note 3: SNR levels correspond to the signal to noise ratio over the SSS REs.
Note 4: The SNR in time periods T1, T2 and T3 is denoted as SNR1, SNR2 and SNR3 respectively in Figure 6.5.1.3.4-1.
Note 5: The SNR values are specified for a UE with 2RX antennas connected under test. For a UE with 4RX antennas connected under test, the SNR during T3 from D.4.1.1, is -18dB-TT = -18.9dB (including test tolerances)..

For the test to pass, the total number of successful tests shall be more than 90% of the cases with a confidence level of 95%.

6.5.1.4 NR SA FR1 radio link monitoring in-sync test for PCell configured with SSB-based RLM RS in DRX mode

6.5.1.4.1 Test purpose

The purpose of this test is to verify that the UE properly detects in sync for the purpose of monitoring downlink radio link quality of the Pcell when DRX is used. This test will partly verify the FR1 radio link monitoring requirements in clause 8.1.2.

6.5.1.4.2 Test applicability

This test applies to all types of NR UE Release 15 and forward supporting 5GS NR SA FR1 and long DRX cycle.

6.5.1.4.3 Minimum conformance requirements

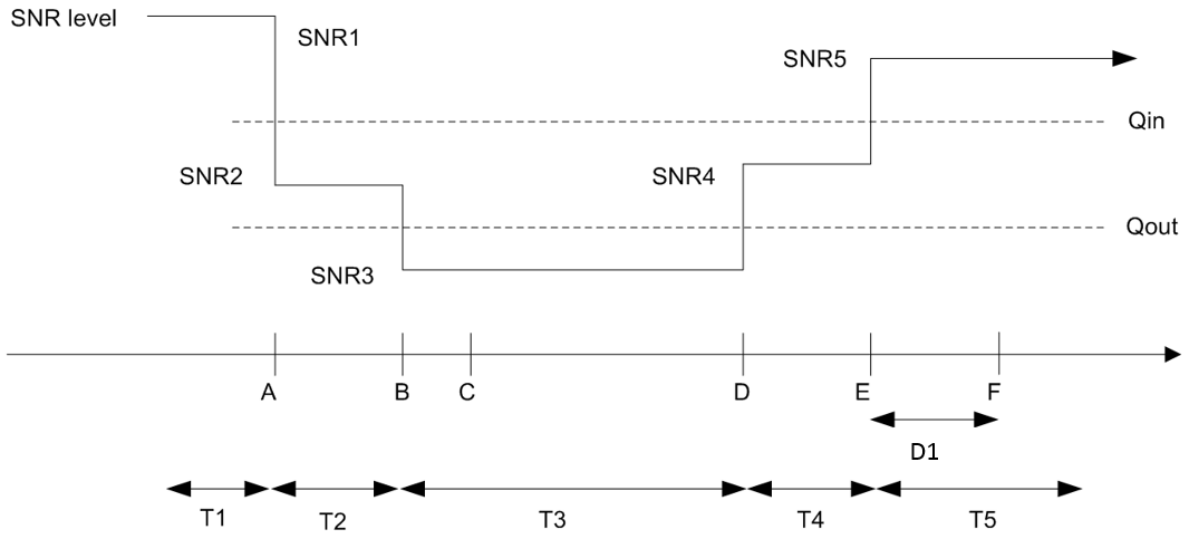
The minimum conformance requirements are specified in clause 6.5.1.0.2.

The normative reference for this requirement is TS 38.133 [6] clause A.6.5.1.4.

6.5.1.4.4 Test Description

There is one cell (Cell 1), which is the active NR cell, in the test. The test consists of five successive time periods, with time duration of T1, T2, T3, T4 and T5 respectively. Figure 6.5.1.4.4-1 shows the variation of the downlink SNR in the active cell to emulate out-of-sync and in-sync states. Prior to the start of the time duration T1, the UE shall be fully synchronized to Cell 1. The UE shall be configured for periodic CSI reporting with a reporting periodicity of 5 ms. In the test, DRX configuration is enabled and DRX inactivity timer has already been expired, i.e. UE tries to decode PDCCH and to send periodic CSI during the period when On-duration timer is running. Time alignment timers shall be set to “infinity” so that UL timing alignment is maintained during the test.Editor note: whether to revise power level to be gradually changed

Figure 6.5.1.4.4-1 - SNR variation for in-sync testing



6.5.1.4.4.1 Initial Conditions

This test shall be tested using any of the test configurations in Table 6.5.1.4.4.1-1.

Table 6.5.1.4.4.1-1: Supported test configurations for NR FR1 PCell

Configuration	Description
6.5.1.4-1	FDD, SSB SCS 15 KHz, data SCS 15KHz, BW 10MHz
6.5.1.4-2	TDD, SSB SCS 15 KHz, data SCS 15KHz, BW 10MHz

6.5.1.4-3	TDD, SSB SCS 30 KHz, data SCS 30KHz, BW 40MHz
Note:	The UE is only required to pass in one of the supported test configurations in FR1.

Configure the test equipment and the DUT according to the parameters in Table 6.5.1.4.4.1-2.

Table 6.5.1.4.4.1-2: Initial conditions for SA FR1 radio link monitoring in-sync test for NR PCell configured with SSB-based RLM RS in DRX mode

Parameter	Value		Comment
Test environment	NC		As specified in TS 38.508-1 [14] clause 4.1.
Test frequencies	As specified in Annex E.1.2, Table E.4-1 and TS 38.508-1 [14] clause 4.3.1.		
Channel bandwidth	As specified by the test configuration selected from Table 6.5.1.4.4.1-1		
Propagation conditions	AWGN		As specified in Annex C.2.2.
Connection Diagram	TE Part	A.3.1.7.1	As specified in TS 38.508-1 [14] Annex A.
	DUT Part	A.3.2.3.4	
Exceptions to connection diagram	For 4Rx capable UEs without any 2 Rx RF bands use A.3.2.5.2 for DUT part and A.3.1.7.4 for TE Part		

Table 6.5.1.4.4.1-3: Void

1. Message contents are defined in clause 6.5.1.4.4.3.

2. There is one cell (Cell 1), which is the active NR cell, in the test. The power levels and settings are set according to Annex A.6, Table A.6.1.1-1. The connection setup is done according to the settings in Annex C.1.3, and the downlink signal levels as per Annex C.1.2.

3. The general test parameters are given in Table 6.5.1.4.4.1-4 below.

4. Downlink signals for NR cell are initially set up according to Annex C.1.

Table 6.5.1.4.4.1-4: General test parameters for FR1 in-sync testing in DRX mode

Parameter		Unit	Value
			Test 1
Active PCell			Cell 1
RF Channel Number			1
Duplex mode	Config 1		FDD
	Config 2, 3		TDD
$BW_{channel}$	Config 1	MHz	10: $N_{RB,c}$ = 52
	Config 2		10: $N_{RB,c}$ = 52
	Config 3		40: $N_{RB,c}$ = 106
DL initial BWP configuration	Config 1, 2, 3		DLBWP.0.1
DL dedicated BWP configuration	Config 1, 2, 3		DLBWP.1.1
UL initial BWP configuration	Config 1, 2, 3		ULBWP.0.1
UL dedicated BWP configuration	Config 1, 2, 3		ULBWP.1.1
TDD Configuration	Config 1		Not Applicable
	Config 2		TDDConf.1.1
	Config 3		TDDConf.2.1
RMSI CORESET Reference Channel	Config 1		CR.1.1 FDD
	Config 2		CR.1.1 TDD
	Config 3		CR.2.1 TDD
Dedicated CORESET Reference Channel	Config 1		CCR.1.1 FDD
	Config 2		CCR.1.1 TDD
	Config 3		CCR.2.1 TDD
SSB Configuration	Config 1		SSB.1 FR1

	Config 2		SSB.1 FR1
	Config 3		SSB.2 FR1
SMTC Configuration	Config 1, 2		SMTC.1
	Config 3		SMTC.1
PDSCH/PDCCH subcarrier spacing	Config 1, 2		15 KHz
	Config 3		30 KHz
PRACH Configuration	Config 1, 2		Table A.7.1-1, PRACH.1 FR1
	Config 3		Table A.7.1-1, PRACH.1 FR1
SSB index assigned as RLM RS			0
OCNG parameters			OP.1
CP length			Normal
Correlation Matrix and Antenna Configuration			2x2 Low
In sync transmission parameters	DCI format		1-0
	Number of Control OFDM symbols		2
	Aggregation level	CCE	4
	Ratio of hypothetical PDCCH RE energy to average SSS RE energy	dB	0
	Ratio of hypothetical PDCCH DMRS energy to average SSS RE energy	dB	0
	DMRS precoder granularity		REG bundle size
	REG bundle size		6
Out of sync transmission parameters	DCI format		1-0
	Number of Control OFDM symbols		2
	Aggregation level	CCE	8
	Ratio of hypothetical PDCCH RE energy to average SSS RE energy	dB	4
	Ratio of hypothetical PDCCH DMRS energy to average SSS RE energy	dB	4
	DMRS precoder granularity		REG bundle size
	REG bundle size		6
DRX Configuration			DRX.3
Gap pattern ID			N.A.
Layer 3 filtering			*Enabled*
T310 timer		ms	2000
T311 timer		ms	1000
N310			1
N311			1
CSI-RS configuration for CSI reporting	Config 1		CSI-RS.1.1 FDD
	Config 2		CSI-RS.1.1 TDD
	Config 3		CSI-RS.2.1 TDD
CSI-RS for tracking	Config 1		TRS.1.1 FDD
	Config 2		TRS.1.1 TDD
	Config 3		TRS.1.2 TDD
T1		s	0.2
T2		s	0.2
T3		s	0.64
T4		s	0.2
T5		s	0.88
D1		s	0.84

Note 1: All configurations are assigned to the UE prior to the start of time period T1.
Note 2: UE-specific PDCCH is not transmitted after T1 starts.

6.5.1.4.4.2 Test Procedure

There is one cell (Cell 1), which is the active NR cell, in the test. The test consists of five successive time periods, with time duration of T1, T2, T3, T4 and T5 respectively. Figure 6.5.1.4.4-1 shows the variation of the downlink SNR in the active cell to emulate out-of-sync and in-sync states. Prior to the start of the time duration T1, the UE shall be fully synchronized to PCell. The UE shall be configured for periodic CQI reporting in PUCCH [format 2] with a reporting periodicity as mentioned in the above table 6.5.1.4.4.1-4.

1. Ensure the UE is in state RRC_CONNECTED with generic procedure parameters *Connectivity* NR, Connected without release *On* and Test Mode *On* according to TS 38.508-1 [6] clause 4.5.

2. Set the parameters according to T1 in Table 6.5.1.4.5-1 for subtest 1 and 2. Propagation conditions are set according to Annex C.2.3. T1 starts.

3. When T1 expires the SS shall change the SNR value to T2 as specified in Table 6.5.1.4.5-1. T2 starts.

4. When T2 expires the SS shall change the SNR value to T3 as specified in Table 6.5.1.4.5-1. T3 starts.

5. When T3 expires the SS shall change the SNR value to T4 as specified in Table 6.5.1.4.5-1. T4 starts.

6. When T4 expires the SS shall change the SNR value to T5 as specified in Table 6.5.1.4.5-1. T5 starts.

7. If the SS detects uplink power equal to or higher than the minimum output power defined in TS 38.521-1 [17] clause 6.3.1.5 in the On-duration part of every DRX cycle in the subframe according the configured CQI reporting mode (PUCCH 2-0) during the period from time point A to time point F (D1 second after the start of time duration T5) the number of successful tests is increased by one.

   Otherwise the number of failed tests is increased by one.

8. Ensure the UE is in state RRC_CONNECTED with generic procedure parameters *Connectivity* NR, Connected without release *On* and Test Mode *On* according to TS 38.508-1 [6] clause 4.5.

9. Repeat steps 2-7 for all subtests until the confidence level according to Tables G.2.3-1 in Annex G clause G.2 is achieved.

6.5.1.4.4.3 Message Contents

Message contents are according to TS 38.508-1 [14] clause 4.6.1 and 7.3.1 with condition “Short_DCI” and with the following exceptions:

Table 6.5.1.4.4.3-0: Common Exception messages for NR SA FR1 radio link monitoring in-sync test for PCell configured with SSB-based RLM RS in DRX mode test requirement

Default Message Contents	
Common contents of system information blocks exceptions	
Default RRC messages and information elements contents exceptions	Table H.3.5-4 Table H.3.5-9 Table H.3.7-1 with condition DRX.3

Table 6.5.1.4.4.3-1: Void

Table 6.5.1.4.4.3-2: RLF-TimersAndConstant

Derivation Path: TS 38.508-1 [14], Table 4.6.3-150			
Information Element	**Value/remark**	**Comment**	**Condition**
RLF-TimersAndConstants ::= SEQUENCE {			
t310	ms2000		
n310	n1		
n311	n1		
t311-v1530	ms1000		
}			

Table 6.5.1.4.4.3-3: Void

6.5.1.4.5 Test Requirement

The requirements in this section apply for each SSB based RLM-RS resource configured for the PCell, provided that the SSB configured for RLM are actually transmitted within UE active DL BWP during the entire evaluation period specified in section 6.5.1.4.3.

Table 6.5.1.4.5-1 defines the cell specific primary level settings.

The UE behaviour in each test during time durations T1, T2, T3, T4 and T5 shall be as follows:

During the period from time point A to time point F (D1 second after the start of time duration T5) the UE shall transmit uplink signal at least in all uplink slots configured for CSI transmission according to the configured periodic CSI reporting.

The rate of correct events observed during repeated tests shall be at least 90% with a confidence interval of 95%.

Table 6.5.1.4.5-1: Cell specific test parameters for FR1 for in-sync radio link monitoring tests in DRX mode

Parameter		Unit	Test 1				
			T1	T2	T3	T4	T5
EPRE ratio of PDCCH DMRS to SSS		dB	0				
EPRE ratio of PDCCH to PDCCH DMRS		dB	0				
EPRE ratio of PBCH DMRS to SSS		dB	0				
EPRE ratio of PBCH to PBCH DMRS		dB					
EPRE ratio of PSS to SSS		dB					
EPRE ratio of PDSCH DMRS to SSS		dB					
EPRE ratio of PDSCH to PDSCH DMRS		dB					
EPRE ratio of OCNG DMRS to SSS		dB					
EPRE ratio of OCNG to OCNG DMRS		dB					
SNR on RLM-RS	Config 1	dB	1.8	-6.2	-15.8	-5.3	1.8
	Config 2		1.8	-6.2	-15.8	-5.3	1.8
	Config 3		1.8	-6.2	-15.8	-5.3	1.8
N_{oc}	Config 1	dBm/15 kHz	-98				
	Config 2		-98				
	Config 3		-98				
N_{oc}	Config 1	dBm/SCS	-98				
	Config 2		-98				
	Config 3		-95				
Propagation condition			TDL-C 300ns 100Hz				

Note 1: OCNG shall be used such that the resources in Cell 1 are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.
Note 2: The signal contains PDCCH for UEs other than the device under test as part of OCNG.
Note 3: SNR levels correspond to the signal to noise ratio over the SSS REs.
Note 4: The SNR in time periods T1, T2, T3, T4 and T5 is denoted as SNR1, SNR2, SNR3, SNR4 and SNR5 respectively in Figure 6.5.1.4.4-1.
Note 5: The SNR values are specified for a UE with 2RX antennas connected under test. For a UE with 4RX antennas connected under test, the SNR during T3 and T4 from D.4.1.1 are -18.0-TT and -8.0-TT, which are -18.8dB and -8.8dB(including test tolerances).

6.5.1.5 NR SA FR1 radio link monitoring out-of-sync test for PCell configured with CSI-RS-based RLM RS in non-DRX mode

6.5.1.5.1 Test purpose

The purpose of this test is to verify that the UE properly detects the out of sync for the purpose of monitoring downlink CSI-RS based radio link quality of the PCell when no DRX is used. This test will partly verify the FR1 PCell CSI-RS Out-of-sync radio link monitoring requirements in TS 38.133 [6] clause 8.1.

6.5.1.5.2 Test applicability

This test applies to all types of NR UE release 15 and forward supporting CSI-RS based RLM.

6.5.1.5.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 6.5.1.0.3.

The normative reference for this requirement is TS 38.133 [6] clause A.6.5.1.5.

6.5.1.5.4 Test description

The test consists of three successive time periods, with time duration of T1, T2 and T3 respectively. Figure 6.5.1.5.4-1 shows the three different time durations and the corresponding variation of the downlink SNR in the active cell to emulate out-of-sync states.

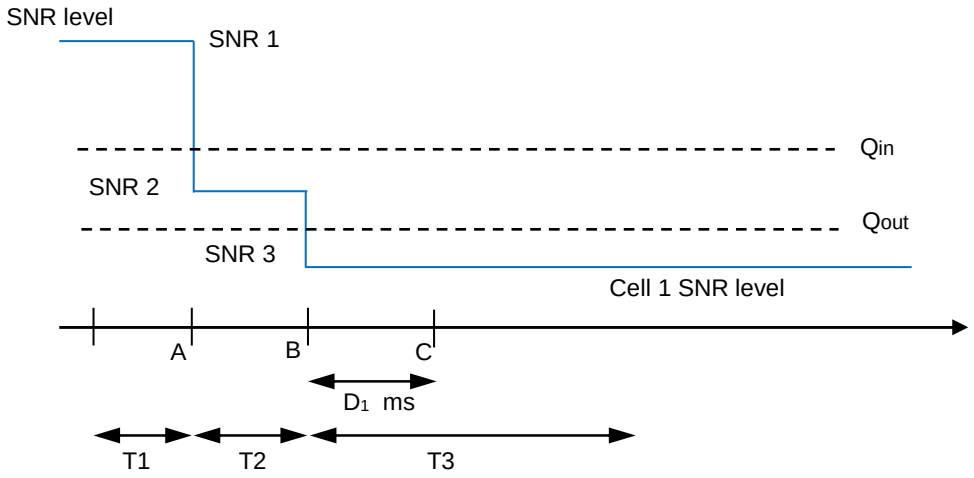


Figure 6.5.1.5.4-1: SNR variation for out-of-sync testing

6.5.1.5.4.1 Initial conditions

This test shall be tested using any of the test configurations in Table 6.5.1.5.4.1-1.

Table 6.5.1.5.4.1-1: Supported test configurations for NR SA FR1 radio link monitoring out-of-sync test for PCell configured with CSI-RS-based RLM RS in non-DRX

Configuration	Description
6.5.1.5-1	FDD duplex mode, 15 kHz SSB SCS, 10MHz bandwidth
6.5.1.5-2	TDD duplex mode, 15 kHz SSB SCS, 10MHz bandwidth
6.5.1.5-3	TDD duplex mode, 30 kHz SSB SCS, 40MHz bandwidth
Note: The UE is only required to pass in one of the supported test configurations in FR1	

Configure the test equipment and the DUT according to the parameters in Table 6.5.1.5.4.1-2.

Table 6.5.1.5.4.1-2: Initial conditions for NR SA radio link monitoring NR SA FR1 radio link monitoring out-of-sync test for PCell configured with CSI-RS-based RLM RS in non-DRX

Parameter	Value		Comment
Test environment	NC		As specified in TS 38.508-1 [14] clause 4.1.
Test frequencies	As specified in Annex E, Table E.4-1 and TS 38.508-1 [14] clause 4.3.1.		
Channel bandwidth	As specified by the test configuration selected from Table 6.5.1.5.4.1-1.		
Propagation conditions	AWGN		As specified in Annex C.2.2
Connection Diagram	TE Part	A.3.1.7.1	As specified in TS 38.508-1 [14] Annex A.
	DUT Part	A.3.2.3.4	
Exceptions to connection	For 4Rx capable UEs without any 2 Rx RF bands use A.3.2.5.2 for DUT part and		

diagram	A.3.1.7.4 for TE Part	

1. The general test parameter settings are set up according to Table 6.5.1.5.4.1-3. The measurement gap configuration is according to Table 6.5.1.5.4.1-4.

2. Message contents are defined in clause 6.5.1.5.4.3.

3. There are one cell in the test, where Cell 1 is the NR PCell on the NR carrier. Cell 1 is the cell used for connection setup with the power level set according to Table 6.5.1.5.5-1 for this test. Cell 1 is configured according to Annex C.1.2 and C.1.3.

Table 6.5.1.5.4.1-3: General test parameters for NR SA FR1 radio link monitoring out-of-sync test for PCell configured with CSI-RS-based RLM RS in non-DRX

Parameter		Unit	Value
			Test 1
Active PCell			Cell 1
RF Channel Number			1
Duplex mode	Config 1		FDD
	Config 2, 3		TDD
TDD Configuration	Config 1		Not Applicable
	Config 2		TDDConf.1.1
	Config 3		TDDConf.2.1
DL initial BWP configuration	Config 1, 2, 3		DLBWP.0.1
DL dedicated BWP configuration	Config 1, 2, 3		DLBWP.1.1
UL initial BWP configuration	Config 1, 2, 3		ULBWP.0.1
UL dedicated BWP configuration	Config 1, 2, 3		ULBWP.1.1
RMSI CORESET Reference Channel	Config 1		CR.1.1 FDD
	Config 2		CR.1.1 TDD
	Config 3		CR.2.1 TDD
Dedicated CORESET Reference Channel	Config 1		CCR.1.3 FDD
	Config 2		CCR.1.3 TDD
	Config 3		CCR.2.2 TDD
SSB Configuration	Config 1		SSB.1 FR1
	Config 2		SSB.1 FR1
	Config 3		SSB.2 FR1
SMTC Configuration	Config 1, 2		SMTC.1
	Config 3		SMTC.1
PDSCH/PDCCH subcarrier spacing	Config 1, 2		15 kHz
	Config 3		30 kHz
TRS configuration	Config 1		TRS.1.1 FDD
	Config 2		TRS.1.1 TDD
	Config 3		TRS.1.2 TDD
CSI-RS for RLM	Config 1		Resource #4 in TRS.1.1 FDD
	Config 2		Resource #4 in TRS.1.1 TDD
	Config 3		Resource #4 in TRS.1.2 TDD
TCI configuration for PDCCH/PDSCH			TCI.State.2
OCNG parameters			OP.1
CP length			Normal
Correlation Matrix and Antenna Configuration			2x2 Low
Out of sync transmission parameters	DCI format		1-0
	Number of Control OFDM symbols		2
	Aggregation level	CCE	8
	Ratio of hypothetical PDCCH RE energy to average CSI-RS RE energy	dB	4
	Ratio of hypothetical PDCCH DMRS energy to average CSI-RS RE energy	dB	4
	DMRS precoder granularity		REG bundle size

	REG bundle size		6
DRX			*OFF*
Gap pattern ID			*gp0*
Layer 3 filtering			*Enabled*
T310 timer		ms	*0*
T311 timer		ms	1000
N310			1
N311			1
CSI-RS configuration	Config 1		CSI-RS.1.1 FDD
	Config 2		CSI-RS.1.1 TDD
	Config 3		CSI-RS.2.1 TDD
T1		s	0.2
T2		s	0.48
T3		s	0.48
D1		s	0.44
Note 1: UE-specific PDCCH is not transmitted after T1 starts.			

Table 6.5.1.5.4.1-4: Measurement gap configuration for NR SA FR1 radio link monitoring out-of-sync test for PCell configured with CSI-RS-based RLM RS in non-DRX

Field	Test 1
	Value
gapOffset	0

6.5.1.5.4.2 Test procedure

Prior to the start of the time duration T1, the UE shall be fully synchronized to Cell 1. The UE shall be configured for periodic CSI reporting with a reporting periodicity of 5ms. In the test, DRX configuration is not enabled. The UE is configured to perform inter-frequency measurements using GP ID #0 (40ms) in test.

1. Ensure the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity NR, Connected without release *On* and Test Mode *On* according to TS 38.508-1 [14] clause 4.5.

2. The SS shall transmit an RRCReconfiguration message configuring the UE for inter-frequency measurements.

3. The UE shall transmit RRCReconfigurationComplete message.

4. Set the parameters of Cell 1 according to T1 in Table 6.5.1.5.5-1. Propagation conditions are set according to Annex C.2.3. T1 starts.

5. When T1 expires the SS shall change the SNR value to T2 as specified in Table 6.5.1.5.5-1. T2 starts.

6. When T2 expires the SS shall change the SNR value to T3 as specified in Table 6.5.1.5.5-1. T3 starts.

7. If the SS:

   a) detects uplink power equal to or higher than minimum output power defined in TS 38.521-1 [17] clause 6.3.1.5 in each slot configured for CSI transmission (according CSI reporting on PUCCH) during the period from time point A to time point B

   and

   b) does not detect any uplink power higher than OFF power defined in TS 38.521-1 [17] clause 6.3.2.5 from time point C (D1 after the start of T3) until T3 expires,

   the number of successful tests is increased by one.

   Otherwise the number of failed tests is increased by one.

8. When T3 expires the SS shall change the SNR value to T1 as specified in Table 6.5.1.5.5-1.

9. If the UE has not re-established the connection in at least 1s, the UE is switched off and then on. Ensure the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity NR, Connected without release *On* according to TS 38.508-1 [14] clause 4.5.

10. Repeat steps 4-9 until the confidence level according to Tables G.2.3-1 in Annex G clause G.2 is achieved.

6.5.1.5.4.3 Message contents

Message contents are according to TS 38.508-1 [14] clause 4.6 and 7.3.1 with condition "Short_DCI" and with the following exceptions:

Table 6.5.1.5.4.3-1: Common Exception messages for NR SA FR1 radio link monitoring out-of-sync test for PCell configured with CSI-RS-based RLM RS in non-DRX mode

Default Message Contents	
Common contents of system information blocks exceptions	
Default RRC messages and information elements contents exceptions	Table H.3.1-1 Table H.3.1-2 with Condition INTER-FREQ, L3 FILTERING NEEDED, GAP_NEEDED Table H.3.1-3 with Condition INTER-FREQ MO (where ssbFrequency is set to the ARFCN value of carrier center of High range) Table H.3.1-4 with A3-offset = 0 Table H.3.1-6 with conditions gapUE and RLM Table H.3.5-4 Table H.3.5-9 with Condition CSI-RS RLM

Table 6.5.1.5.4.3-2 *SIB1*

Derivation Path: TS 38.508-1 [14], Table 4.6.1-28			
Information Element	**Value/remark**	**Comment**	**Condition**
SIB1 ::= SEQUENCE {			
cellSelectionInfoSEQUENCE {			
q-RxLevMin	-46	-92 is actual value in dBm (-46 * 2 dBm)	dBm/15kHz or dBm/30kHz
}			
}			

Table 6.5.1.5.4.3-2: *RLF-TimersAndConstants*

Derivation Path: TS 38.508-1 [14], Table 4.6.3-150			
Information Element	**Value/remark**	**Comment**	**Condition**
RLF-TimersAndConstants ::= SEQUENCE {			
t310	ms0		
n310	n1		
t311	ms1000		
n311	n1		
}			

6.5.1.5.5 Test requirement

Tables 6.5.1.5.4.1-3 and 6.5.1.5.5-1 define the primary level settings including test tolerances for Radio Link Monitoring Out-of-sync Test for FR1 PCell configured with CSI-RS-based RLM in non-DRX mode.

Table 6.5.1.5.5-1: Cell specific test parameters for NR SA FR1 radio link monitoring out-of-sync test for PCell configured with CSI-RS-based RLM RS in non-DRX mode

Parameter	Unit	Test 1		
		T1	T2	T3
EPRE ratio of PDCCH DMRS to SSS	dB	4		
EPRE ratio of PDCCH to PDCCH DMRS	dB	0		
EPRE ratio of PBCH DMRS to SSS	dB			

EPRE ratio of PBCH to PBCH DMRS		dB			
EPRE ratio of PBCH to PBCH DMRS		dB			
EPRE ratio of PDSCH DMRS to SSS		dB			
EPRE ratio of PDSCH to PDSCH DMRS		dB			
EPRE ratio of OCNG DMRS to SSS		dB			
EPRE ratio of OCNG to OCNG DMRS		dB			
SNR on RLM-RS	Config 1	dB	1.8	-6.2	-15.8
	Config 2		1.8	-6.2	-15.8
	Config 3		1.8	-6.2	-15.8
N_{oc}	Config 1	dBm/15KHz	-98		
	Config 2		-98		
	Config 3		-98		
Propagation condition			TDL-C 300ns 100Hz		

Note 1: OCNG shall be used such that the resources in Cell 1 are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.
Note 2: The uplink resources for CSI reporting are assigned to the UE prior to the start of time period T1.
Note 3: NZP CSI-RS resource set configuration for CSI reporting are assigned to the UE prior to the start of time period T1.
Note 4: Measurement gap configuration is assigned to the UE prior to the start of time period T1.
Note 5: The timers and layer 3 filtering related parameters are configured prior to the start of time period T1.
Note 6: The signal contains PDCCH for UEs other than the device under test as part of OCNG.
Note 7: SNR levels correspond to the signal to noise ratio over the SSS REs.
Note 8: The SNR in time periods T1, T2 and T3 is denoted as SNR1, SNR2 and SNR3 respectively in figure 6.5.1.5.4-1.
Note 9: The SNR values are specified for testing a UE which supports 2RX on at least one band. For testing of a UE which supports 4RX on all bands, the SNR during T3 from D.4.1.1 is -18 -TT, which is -18.8dB (including test tolerances).

The UE behaviour during time durations T1, T2 and T3 shall be as follows:

During time durations T1, T2 and T3, the UE shall transmit uplink signal at least in all subframes configured for CSI transmission on Cell 1.

During the period from time point A to time point B the UE shall transmit uplink signal in Cell 1 at least in all uplink slots configured for CSI transmission according to the configured periodic CSI reporting for Cell 1.

The UE shall stop transmitting uplink signal in Cell 1 no later than time point C (D_1 ms after the start of the time duration T3) on the PCell.

The rate of correct events observed during repeated tests shall be at least 90% with a confidence level of 95%.

6.5.1.6 NR SA FR1 radio link monitoring in-sync test for PCell configured with CSI-RS-based RLM RS in non-DRX mode

6.5.1.6.1 Test purpose

The purpose of this test is to verify that the UE properly detects the in sync for the purpose of monitoring downlink CSI-RS based radio link quality of the PCell when no DRX is used. This test will partly verify the FR1 PCell CSI-RS in-sync radio link monitoring requirements in TS 38.133 [6] clause 8.1.

6.5.1.6.2 Test applicability

This test applies to all types of NR UE release 15 and forward supporting CSI-RS based RLM.

6.5.1.6.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 6.5.1.0.3.

The normative reference for this requirement is TS 38.133 [6] clause A.6.5.1.6.

6.5.1.6.4 Test description

The test consists of five successive time periods, with time duration of T1, T2, T3, T4 and T5 respectively. Figure 6.5.1.6.4-1 shows the five different time durations and the corresponding variation of the downlink SNR in the Pcell to emulate out-of-sync and in-sync states.

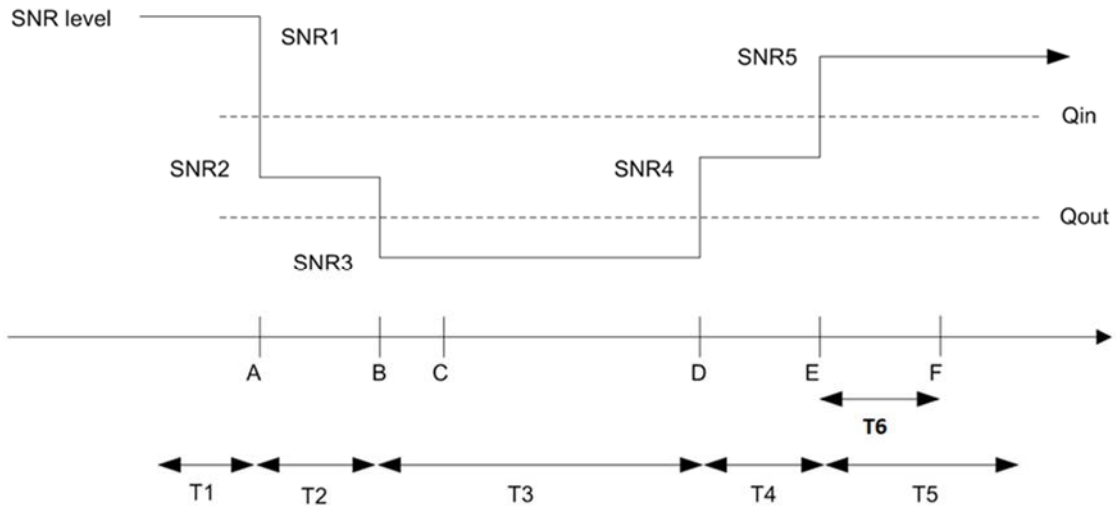


Figure 6.5.1.6.4-1: SNR variation for In-sync testing

6.5.1.6.4.1 Initial conditions

This test shall be tested using any of the test configurations in Table 6.5.1.6.4.1-1.

Table 6.5.1.6.4.1-1: Supported test configurations for NR SA FR1 radio link monitoring in-sync test for PCell configured with CSI-RS-based RLM RS in non-DRX mode

Configuration	Description
6.5.1.6-1	FDD duplex mode, 15 kHz SSB SCS, 10MHz bandwidth
6.5.1.6-2	TDD duplex mode, 15 kHz SSB SCS, 10MHz bandwidth
6.5.1.6-3	TDD duplex mode, 30 kHz SSB SCS, 40MHz bandwidth
Note: The UE is only required to pass in one of the supported test configurations in FR1	

Configure the test equipment and the DUT according to the parameters in Table 6.5.1.6.4.1-2.

Table 6.5.1.6.4.1-2: Initial conditions for for NR SA FR1 radio link monitoring in-sync test for PCell configured with CSI-RS-based RLM RS in non-DRX mode

Parameter	Value		Comment
Test environment	NC		As specified in TS 38.508-1 [14] clause 4.1.
Test frequencies	As specified in Annex E, Table E.4-1 and TS 38.508-1 [14] clause 4.3.1.		
Channel bandwidth	As specified by the test configuration selected from Table 6.5.1.6.4.1-1.		
Propagation conditions	AWGN		As specified in Annex C.2.2
Connection Diagram	TE Part	A.3.1.7.1	As specified in TS 38.508-1 [14] Annex A.
	DUT Part	A.3.2.3.4	
Exceptions to connection diagram	For 4Rx capable UEs without any 2 Rx RF bands use A.3.2.5.2 for DUT part and A.3.1.7.4 for TE Part		

1. The general test parameter settings are set up according to Table 6.5.1.6.4.1-3.

2. Message contents are defined in clause 6.5.1.6.4.3.

3. There is one cell in the test, where Cell 1 is the NR PCell on the NR carrier. Cell 1 is the cell used for connection setup with the power level set according to Table 6.5.1.6.5-1 for this test. Cell 1 is configured according to Annex C.1.2 and C.1.3.

Table 6.5.1.6.4.1-3: General test parameters for NR SA FR1 radio link monitoring in-sync test for PCell configured with CSI-RS-based RLM RS in non-DRX mode

Parameter		Unit	Value
			Test 1
Active PCell			Cell 1
RF Channel Number			1
Duplex mode	Config 1		FDD
	Config 2, 3		TDD
TDD Configuration	Config 1		Not Applicable
	Config 2		TDDConf.1.1
	Config 3		TDDConf.2.1
DL initial BWP configuration	Config 1, 2, 3		DLBWP.0.1
DL dedicated BWP configuration	Config 1, 2, 3		DLBWP.1.1
UL initial BWP configuration	Config 1, 2, 3		ULBWP.0.1
UL dedicated BWP configuration	Config 1, 2, 3		ULBWP.1.1
RMSI CORESET Reference Channel	Config 1		CR.1.1 FDD
	Config 2		CR.1.1 TDD
	Config 3		CR.2.1 TDD
Dedicated CORESET Reference Channel	Config 1		CCR.1.1 FDD
	Config 2		CCR.1.1 TDD
	Config 3		CCR.2.1 TDD
SSB Configuration	Config 1		SSB.1 FR1
	Config 2		SSB.1 FR1
	Config 3		SSB.2 FR1
SMTC Configuration	Config 1, 2		SMTC.1
	Config 3		SMTC.1
PDSCH/PDCCH subcarrier spacing	Config 1, 2		15 kHz
	Config 3		30 kHz
TRS configuration	Config 1		TRS.1.1 FDD
	Config 2		TRS.1.1 TDD
	Config 3		TRS.1.2 TDD
CSI-RS for RLM	Config 1		Resource #4 in TRS.1.1 FDD
	Config 2		Resource #4 in TRS.1.1 TDD
	Config 3		Resource #4 in TRS.1.2 TDD
TCI configuration for PDCCH/PDSCH			TCI.State.2
OCNG parameters			OP.1
CP length			Normal
Correlation Matrix and Antenna Configuration			2x2 Low
Out of sync transmission parameters	DCI format		1-0
	Number of Control OFDM symbols		2
	Aggregation level	CCE	8
	Ratio of hypothetical PDCCH RE energy to average CSI-RS RE energy	dB	4
	Ratio of hypothetical PDCCH DMRS energy to average CSI-RS RE energy	dB	4
	DMRS precoder granularity		REG bundle size
	REG bundle size		6

In sync transmission parameters	DCI format		1-0
	Number of Control OFDM symbols		2
	Aggregation level	CCE	4
	Ratio of hypothetical PDCCH RE energy to average CSI-RS RE energy	dB	0
	Ratio of hypothetical PDCCH DMRS energy to average CSI-RS RE energy	dB	0
	DMRS precoder granularity		REG bundle size
	REG bundle size		6
DRX			*OFF*
Gap pattern ID			N.A.
Layer 3 filtering			*Enabled*
T310 timer		ms	1000
T311 timer		ms	1000
N310			1
N311			1
CSI-RS configuration	Config 1		CSI-RS.1.1 FDD
	Config 2		CSI-RS.1.1 TDD
	Config 3		CSI-RS.2.1 TDD
T1		s	0.2
T2		s	0.2
T3		s	0.44
T4		s	0.2
T5		s	0.88
D1		s	0.84
Note 1: UE-specific PDCCH is not transmitted after T1 starts.			

6.5.1.6.4.2 Test procedure

Prior to the start of the time duration T1, the UE shall be fully synchronized to Cell 1. The UE shall be configured for periodic CSI reporting with a reporting periodicity of 5ms. In the test, DRX configuration is not enabled.

1. Ensure the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity NR, Connected without release *On* and Test Mode *On* according to TS 38.508-1 [14] clause 4.5.

2. Set the parameters of Cell 1 according to T1 in Table 6.5.1.6.5-1. Propagation conditions are set according to Annex C.2.3. T1 starts.

3. When T1 expires the SS shall change the SNR value to T2 as specified in Table 6.5.1.6.5-1. T2 starts.

4. When T2 expires the SS shall change the SNR value to T3 as specified in Table 6.5.1.6.5-1. T3 starts.

5. When T3 expires the SS shall change the SNR value to T4 as specified in Table 6.5.1.6.5-1. T4 starts.

6. When T4 expires the SS shall change the SNR value to T5 as specified in Table 6.5.1.6.5-1. T5 starts.

7. If the SS detects uplink power equal to or higher than minimum output power defined in TS 38.521-1 [17] clause 6.3.1.5 in each slot configured for CSI transmission (according CSI reporting on PUCCH) during the period from time point A to time point F (T6 after the start of time duration T5) the number of successful tests is increased by one.

   Otherwise the number of failed tests is increased by one.

8. If the UE has not re-established the connection in at least 1s, the UE is switched off and then on. Ensure the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity NR, Connected without release *On* according to TS 38.508-1 [14] clause 4.5.

9. After T5 expires, repeat steps 2-7 for both subtests until the confidence level according to Tables G.2.3-1 in Annex G clause G.2 is achieved.

6.5.1.6.4.3 Message contents

Message contents are according to TS 38.508-1 [14] clause 4.6 and 7.3.1 with the following exceptions:

Table 6.5.1.6.4.3-1: Common Exception messages for NR SA FR1 radio link monitoring in-sync test for PCell configured with CSI-RS-based RLM RS in non-DRX mode

Default Message Contents	
Common contents of system information blocks exceptions	
Default RRC messages and information elements contents exceptions	Table H.3.5-4 Table H.3.5-9 with Condition CSI-RS RLM

6.5.1.6.5 Test requirement

Tables 6.5.1.6.4.1-3 and 6.5.1.6.5-1 define the primary level settings including test tolerances for Radio Link Monitoring In-sync Test for FR1 PCell configured with CSI-RS-based RLM in non-DRX mode.

Table 6.5.1.6.5-1: Cell specific test parameters for NR SA FR1 radio link monitoring in-sync test for PCell configured with CSI-RS-based RLM RS in non-DRX mode

Parameter		Unit	Test 1				
			T1	T2	T3	T4	T5
EPRE ratio of PDCCH DMRS to SSS		dB	0				
EPRE ratio of PDCCH to PDCCH DMRS		dB	0				
EPRE ratio of PBCH DMRS to SSS		dB					
EPRE ratio of PBCH to PBCH DMRS		dB					
EPRE ratio of PBCH to PBCH DMRS		dB					
EPRE ratio of PDSCH DMRS to SSS		dB					
EPRE ratio of PDSCH to PDSCH DMRS		dB					
EPRE ratio of OCNG DMRS to SSS		dB					
EPRE ratio of OCNG to OCNG DMRS		dB					
SNR on RLM-RS	Config 1	dB	1.8	-6.2	-15.8	-5.3	1.8
	Config 2		1.8	-6.2	-15.8	-5.3	1.8
	Config 3		1.8	-6.2	-15.8	-5.3	1.8
N_{oc}	Config 1	dBm/15kHz	-98				
	Config 2		-98				
	Config 3		-98				
Propagation condition			TDL-C 300ns 100Hz				

Note 1: OCNG shall be used such that the resources in Cell 1 are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.
Note 2: The uplink resources for CSI reporting are assigned to the UE prior to the start of time period T1.
Note 3: NZP CSI-RS resource set configuration for CSI reporting are assigned to the UE prior to the start of time period T1.
Note 4: Measurement gap configuration is assigned to the UE prior to the start of time period T1.
Note 5: The timers and layer 3 filtering related parameters are configured prior to the start of time period T1.
Note 6: The signal contains PDCCH for UEs other than the device under test as part of OCNG.
Note 7: SNR levels correspond to the signal to noise ratio over the SSS REs.
Note 8: The SNR in time periods T1, T2, T3, T4 and T5 is denoted as SNR1, SNR2, SNR3, SNR4 and SNR5 respectively in figure 6.5.1.6.4-1.
Note 9: The SNR values are specified for testing a UE which supports 2RX on at least one band. For testing of a UE which supports 4RX on all bands, the SNR during T3 and T4 from D.4.1.1 are -18.0-TT and -8.0-TT, which are -18.8dB and -8.8dB(including test tolerances).

The UE behaviour in each test during time durations T1, T2, T3, T4 and T5 shall be as follows:

During the period from time point A to time point F (T6 second after the start of time duration T5) the UE shall transmit uplink signal at least in all uplink slots configured for CSI transmission according to the configured periodic CSI reporting on the PCell.

The rate of correct events observed during repeated tests shall be at least 90% with a confidence level of 95%.

6.5.1.7 NR SA FR1 radio link monitoring out-of-sync test for PCell configured with CSI-RS-based RLM RS in DRX mode

6.5.1.7.1 Test purpose

The purpose of this test is to verify that the UE properly detects the out of sync for the purpose of monitoring downlink CSI-RS based radio link quality of the PCell when DRX is used. This test will partly verify the FR1 PCell CSI-RS Out-of-sync radio link monitoring requirements in TS 38.133 [6] clause 8.1.

6.5.1.7.2 Test applicability

This test applies to all types of NR UE release 15 and forward supporting 5GS NR SA FR1, CSI-RS based RLM and long DRX cycle.

6.5.1.7.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 6.5.1.0.3.

The normative reference for this requirement is TS 38.133 [6] clause A.6.5.1.7.

6.5.1.7.4 Test description

The test consists three successive time periods, with time duration of T1, T2 and T3 respectively. Figure 6.5.1.7.4-1 shows the three different time durations and the corresponding variation of the downlink SNR in the active cell to emulate out-of-sync states.

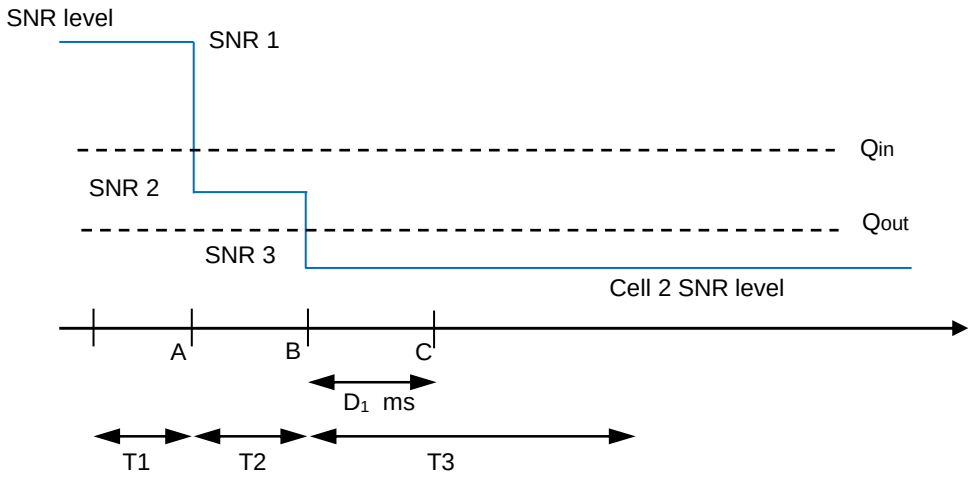


Figure 6.5.1.7.4-1: SNR variation for out-of-sync testing

6.5.1.7.4.1 Initial conditions

This test shall be run in one of the configurations defined in Table 6.5.1.7.4.1-1.

Table 6.5.1.7.4.1-1: Supported test configurations for NR SA FR1 radio link monitoring out-of-sync test for PCell configured with CSI-RS-based RLM RS in DRX mode

Configuration	Description
6.5.1.7-1	FDD duplex mode, 15 kHz SSB SCS, 10MHz bandwidth
6.5.1.7-2	TDD duplex mode, 15 kHz SSB SCS, 10MHz bandwidth
6.5.1.7-3	TDD duplex mode, 30 kHz SSB SCS, 40MHz bandwidth
Note: The UE is only required to pass in one of the supported test configurations in FR1	

Configure the test equipment and the DUT according to the parameters in Table 6.5.1.7.4.1-2.

Table 6.5.1.7.4.1-2: Initial conditions for NR SA radio link monitoring for NR SA FR1 radio link monitoring out-of-sync test for PCell configured with CSI-RS-based RLM RS in DRX mode

Parameter	Value		Comment
Test environment	NC		As specified in TS 38.508-1 [14] clause 4.1.
Test frequencies	As specified in Annex E, Table E.4-1 and TS 38.508-1 [14] clause 4.3.1.		
Channel bandwidth	As specified by the test configuration selected from Table 6.5.1.7.4.1-1.		
Propagation conditions	AWGN		As specified in Annex C.2.2
Connection Diagram	TE Part	A.3.1.7.1	As specified in TS 38.508-1 [14] Annex A.
	DUT Part	A.3.2.3.4	
Exceptions to connection diagram	For 4Rx capable UEs without any 2 Rx RF bands use A.3.2.5.2 for DUT part and A.3.1.7.4 for TE Part		

1. The general test parameter settings are set up according to Table 6.5.1.7.4.1-3.

2. Message contents are defined in clause 6.5.1.7.4.3.

3. There is one cell in the test, where Cell 1 is the NR PCell on the NR carrier. Cell 1 is the cell used for connection setup with the power level set according to Table 6.5.1.7.5-1 for this test. Cell 1 is configured according to Annex C.1.2 and C.1.3.

Table 6.5.1.7.4.1-3: General test parameters for NR SA FR1 radio link monitoring out-of-sync test for PCell configured with CSI-RS-based RLM RS in DRX mode

Parameter		Unit	Value
			Test 1
Active PCell			Cell 1
RF Channel Number			1
Duplex mode	Config 1		FDD
	Config 2, 3		TDD
TDD Configuration	Config 1		Not Applicable
	Config 2		TDDConf.1.1
	Config 3		TDDConf.2.1
DL initial BWP configuration	Config 1, 2, 3		DLBWP.0.1
DL dedicated BWP configuration	Config 1, 2, 3		DLBWP.1.1
UL initial BWP configuration	Config 1, 2, 3		ULBWP.0.1
UL dedicated BWP configuration	Config 1, 2, 3		ULBWP.1.1
RMSI CORESET Reference Channel	Config 1		CR.1.1 FDD
	Config 2		CR.1.1 TDD
	Config 3		CR.2.1 TDD
Dedicated CORESET Reference Channel	Config 1		CCR.1.3 FDD
	Config 2		CCR.1.3 TDD
	Config 3		CCR.2.2 TDD
SSB Configuration	Config 1		SSB.1 FR1
	Config 2		SSB.1 FR1
	Config 3		SSB.2 FR1
SMTC Configuration	Config 1, 2		SMTC.1
	Config 3		SMTC.1
PDSCH/PDCCH subcarrier spacing	Config 1, 2		15 kHz
	Config 3		30 kHz
TRS configuration	Config 1		TRS.1.1 FDD
	Config 2		TRS.1.1 TDD
	Config 3		TRS.1.2 TDD
CSI-RS for RLM	Config 1		Resource #4 in TRS.1.1 FDD
	Config 2		Resource #4 in TRS.1.1 TDD

	Config 3		Resource #4 in TRS.1.2 TDD
TCI configuration for PDCCH/PDSCH			TCI.State.2
OCNG parameters			OP.1
CP length			Normal
Correlation Matrix and Antenna Configuration			2x2 Low
Out of sync transmission parameters	DCI format		1-0
	Number of Control OFDM symbols		2
	Aggregation level	CCE	8
	Ratio of hypothetical PDCCH RE energy to average CSI-RS RE energy	dB	4
	Ratio of hypothetical PDCCH DMRS energy to average CSI-RS RE energy	dB	4
	DMRS precoder granularity		REG bundle size
	REG bundle size		6
DRX			DRX.3
Gap pattern ID			N.A.
Layer 3 filtering			*Enabled*
T310 timer		ms	*0*
T311 timer		ms	1000
N310			1
N311			1
CSI-RS configuration for CSI reporting	Config 1		CSI-RS.1.1 FDD
	Config 2		CSI-RS.1.1 TDD
	Config 3		CSI-RS.2.1 TDD
T1		s	0.2
T2		s	1.28
T3		s	1.28
D1		s	1.24
Note 1: UE-specific PDCCH is not transmitted after T1 starts.			

6.5.1.7.4.2 Test procedure

Prior to the start of the time duration T1, the UE shall be fully synchronized to Cell 1. The UE shall be configured for periodic CSI reporting with a reporting periodicity of 5ms. In the test, DRX configuration is enabled in PCell and DRX inactivity timer has already been expired, i.e. UE tries to decode PDCCH and to send periodic CQI during the period when On-duration timer is running. Time alignment timers shall be set to “infinity” so that UL timing alignment is maintained during the test.

1. Ensure the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity NR, Connected without release *On* and Test Mode *On* according to TS 38.508-1 [14] clause 4.5. Establish SRB2 and DRB in the RRC Reconfiguration message.

2. Set the parameters of Cell 1 according to T1 in Table 6.5.1.7.5-1. Propagation conditions are set according to Annex C.2.3. T1 starts.

3. When T1 expires the SS shall change the SNR value to T2 as specified in Table 6.5.1.7.5-1. T2 starts.

4. When T2 expires the SS shall change the SNR value to T3 as specified in Table 6.5.1.7.5-1. T3 starts.

5. If the SS:

   a) detects uplink power equal to or higher than minimum output power defined in TS 38.521-1 [17] clause 6.3.1.5 in the On-duration part of every DRX cycle in the slots configured for CSI transmission (according CSI reporting on PUCCH) during the period from time point A to time point B

   and

   b) does not detect any uplink power higher than OFF power defined in TS 38.521-1 [17] clause 6.3.2.5 from time point C (D1 after the start of T3) until T3 expires,

   the number of successful tests is increased by one.

   Otherwise the number of failed tests is increased by one.

6. When T3 expires the SS shall change the SNR value to T1 as specified in Table 6.5.1.7.5-1.

7. If the UE has not re-established the connection in at least 1s, the UE is switched off and then on. Ensure the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity NR, Connected without release *On* according to TS 38.508-1 [14] clause 4.5.

8. Repeat steps 2-7 until the confidence level according to Tables G.2.3-1 in Annex G clause G.2 is achieved.

6.5.1.7.4.3 Message contents

Message contents are according to TS 38.508-1 [14] clause 4.6 and 7.3.1 with the following exceptions:

Table 6.5.1.7.4.3-1: Common Exception messages for NR SA FR1 radio link monitoring out-of-sync test for PCell configured with CSI-RS-based RLM RS in DRX mode

Default Message Contents	
Common contents of system information blocks exceptions	
Default RRC messages and information elements contents exceptions	Table H.3.1-9 Table H.3.5-4 Table H.3.5-9 with Condition CSI-RS RLM Table H.3.7-1 with condition DRX.3

Table 6.5.1.7.4.3-2 *SIB1*

Derivation Path: TS 38.508-1 [14], Table 4.6.1-28			
Information Element	**Value/remark**	**Comment**	**Condition**
SIB1 ::= SEQUENCE {			
cellSelectionInfoSEQUENCE {			
q-RxLevMin	-46	-92 is actual value in dBm (-46 * 2 dBm)	dBm/15kHz or dBm/30kHz
}			
}			

Table 6.5.1.7.4.3-3: RLF-TimersAndConstant

Derivation Path: TS 38.508-1 [14], Table 4.6.3-150			
Information Element	**Value/remark**	**Comment**	**Condition**
RLF-TimersAndConstants ::= SEQUENCE {			
t310	ms0		
}			

6.5.1.7.5 Test requirement

Tables 6.5.1.7.4.1-3 and 6.5.1.7.5-1 define the primary level settings including test tolerances for Radio Link Monitoring Out-of-sync Test for FR1 PCell configured with CSI-RS-based RLM in DRX mode.

Table 6.5.1.7.5-1: Cell specific test parameters for FR1 for NR SA FR1 radio link monitoring out-of-sync test for PCell configured with CSI-RS-based RLM RS in DRX mode

Parameter	Unit	Test 1		
		T1	T2	T3
EPRE ratio of PDCCH DMRS to SSS	dB	4		
EPRE ratio of PDCCH to PDCCH DMRS	dB	0		
EPRE ratio of PBCH DMRS to SSS	dB			
EPRE ratio of PBCH to PBCH DMRS	dB			
EPRE ratio of PBCH to PBCH DMRS	dB			

EPRE ratio of PDSCH DMRS to SSS		dB			
EPRE ratio of PDSCH to PDSCH DMRS		dB			
EPRE ratio of OCNG DMRS to SSS		dB			
EPRE ratio of OCNG to OCNG DMRS		dB			
SNR on RLM-RS	Config 1	dB	1.8	-6.2	-15.8
	Config 2		1.8	-6.2	-15.8
	Config 3		1.8	-6.2	-15.8
N_{oc}	Config 1	dBm/15kHz	-98		
	Config 2		-98		
	Config 3		-98		
Propagation condition			TDL-C 300ns 100Hz		

Note 1: OCNG shall be used such that the resources in Cell 1 are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.
Note 2: The uplink resources for CSI reporting are assigned to the UE prior to the start of time period T1.
Note 3: NZP CSI-RS resource set configuration for CSI reporting are assigned to the UE prior to the start of time period T1.
Note 4: Measurement gap configuration is assigned to the UE prior to the start of time period T1.
Note 5: The timers and layer 3 filtering related parameters are configured prior to the start of time period T1.
Note 6: The signal contains PDCCH for UEs other than the device under test as part of OCNG.
Note 7: SNR levels correspond to the signal to noise ratio over the SSS REs.
Note 8: The SNR in time periods T1, T2 and T3 is denoted as SNR1, SNR2 and SNR3 respectively in figure A.6.5.1.7.1-1.
Note 9: The SNR values are specified for testing a UE which supports 2RX on at least one band. For testing of a UE which supports 4RX on all bands, the SNR during T3 from D.4.1.1 is -18 -TT, which is -18.8dB (including test tolerances).

The UE behaviour in each test during time durations T1, T2 and T3 shall be as follows:

During time durations T1, T2 and T3, the UE shall transmit uplink signal at least in all subframes configured for CSI transmission on PCell.

During the period from time point A to time point B the UE shall transmit uplink signal in Cell 1 (PCell) at least in all uplink slots configured for CSI transmission according to the configured periodic CSI reporting for Cell 1.

The UE shall stop transmitting uplink signal in Cell 1 (PCell) no later than time point C (D_1 ms after the start of the time duration T3) on the PCell.

The rate of correct events observed during repeated tests shall be at least 90% with a confidence level of 95%.

6.5.1.8 NR SA FR1 radio link monitoring in-sync test for PCell configured with CSI-RS-based RLM RS in DRX mode

6.5.1.8.1 Test purpose

The purpose of this test is to verify that the UE properly detects the in sync for the purpose of monitoring downlink CSI-RS based radio link quality of the PCell when DRX is used. This test will partly verify the FR1 PCell CSI-RS in-sync radio link monitoring requirements in TS 38.133 [6] clause 8.1.

6.5.1.8.2 Test applicability

This test applies to all types of NR UE release 15 and forward supporting 5GS NR SA FR1, CSI-RS based RLM and long DRX cycle.

6.5.1.8.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 6.5.1.0.3.

The normative reference for this requirement is TS 38.133 [6] clause A.6.5.1.8.

6.5.1.8.4 Test description

The test consists of five successive time periods, with time duration of T1, T2, T3, T4 and T5 respectively. Figure 6.5.1.8.4-1 shows the five different time durations and the corresponding variation of the downlink SNR in the active cell to emulate in-sync states.

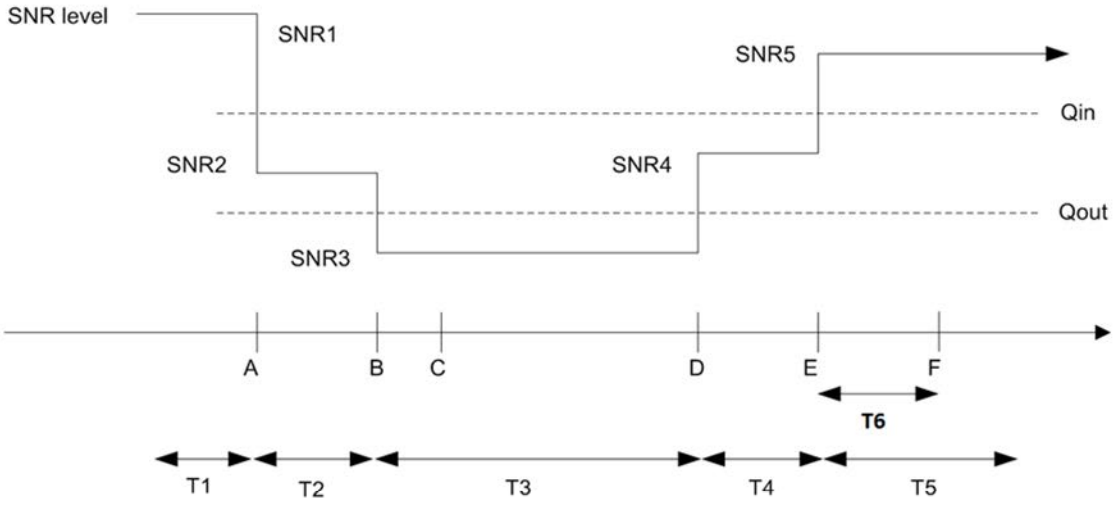


Figure 6.5.1.8.4-1: SNR variation for In-sync testing

6.5.1.8.4.1 Initial conditions

This test shall be run in one of the configurations defined in Table 6.5.1.8.4.1-1.

Table 6.5.1.8.4.1-1: Supported test configurations for NR SA FR1 radio link monitoring in-sync test for PCell configured with CSI-RS-based RLM RS in DRX mode

Configuration	Description
6.5.1.8-1	FDD duplex mode, 15 kHz SSB SCS, 10MHz bandwidth
6.5.1.8-2	TDD duplex mode, 15 kHz SSB SCS, 10MHz bandwidth
6.5.1.8-3	TDD duplex mode, 30 kHz SSB SCS, 40MHz bandwidth
Note: The UE is only required to pass in one of the supported test configurations in FR1	

Configure the test equipment and the DUT according to the parameters in Table 6.5.1.8.4.1-2.

Table 6.5.1.8.4.1-2: Initial conditions for NR SA FR1 radio link monitoring in-sync test for PCell configured with CSI-RS-based RLM RS in DRX mode

Parameter	Value		Comment
Test environment	NC		As specified in TS 38.508-1 [14] clause 4.1.
Test frequencies	As specified in Annex E, Table E.4-1 and TS 38.508-1 [14] clause 4.3.1.		
Channel bandwidth	As specified by the test configuration selected from Table 6.5.1.8.4.1-1.		
Propagation conditions	AWGN		As specified in Annex C.2.2
Connection Diagram	TE Part	A.3.1.7.1	As specified in TS 38.508-1 [14] Annex A.
	DUT Part	A.3.2.3.4	
Exceptions to connection diagram	For 4Rx capable UEs without any 2 Rx RF bands use A.3.2.5.2 for DUT part and A.3.1.7.4 for TE Part		

1. The general test parameter settings are set up according to Table 6.5.1.8.4.1-3. The measurement gap configuration for subtest 2 is according to Table 6.5.1.8.4.1-4.

2. Message contents are defined in clause 6.5.1.8.4.3.

3. There are one cell in the test, where Cell 1 is the NR PCell on the NR carrier. Cell 1 is the cell used for connection setup with the power level set according to Table A.6.1.1-1 for this test. Cell 1 is configured according to Annex C.1.2 and C.1.3.

Table 6.5.1.8.4.1-3: General test parameters for NR SA FR1 radio link monitoring in-sync test for PCell configured with CSI-RS-based RLM RS in DRX mode

Parameter		Unit	Value
			Test 1
Active PCell			Cell 1
RF Channel Number			1
Duplex mode	Config 1		FDD
	Config 2, 3		TDD
TDD Configuration	Config 1		Not Applicable
	Config 2		TDDConf.1.1
	Config 3		TDDConf.2.1
DL initial BWP configuration	Config 1, 2, 3		DLBWP.0.1
DL dedicated BWP configuration	Config 1, 2, 3		DLBWP.1.1
UL initial BWP configuration	Config 1, 2, 3		ULBWP.0.1
UL dedicated BWP configuration	Config 1, 2, 3		ULBWP.1.1
RMSI CORESET Reference Channel	Config 1		CR.1.1 FDD
	Config 2		CR.1.1 TDD
	Config 3		CR.2.1 TDD
Dedicated CORESET Reference Channel	Config 1		CCR.1.1 FDD
	Config 2		CCR.1.1 TDD
	Config 3		CCR.2.1 TDD
SSB Configuration	Config 1		SSB.1 FR1
	Config 2		SSB.1 FR1
	Config 3		SSB.2 FR1
SMTC Configuration	Config 1, 2		SMTC.1
	Config 3		SMTC.1
PDSCH/PDCCH subcarrier spacing	Config 1, 2		15 kHz
	Config 3		30 kHz
TRS configuration	Config 1		TRS.1.1 FDD
	Config 2		TRS.1.1 TDD
	Config 3		TRS.1.2 TDD
CSI-RS for RLM	Config 1		Resource #4 in TRS.1.1 FDD
	Config 2		Resource #4 in TRS.1.1 TDD
	Config 3		Resource #4 in TRS.1.2 TDD
TCI configuration for PDCCH/PDSCH			TCI.State.2
OCNG parameters			OP.1
CP length			Normal
Correlation Matrix and Antenna Configuration			2x2 Low
Out of sync transmission parameters	DCI format		1-0
	Number of Control OFDM symbols		2
	Aggregation level	CCE	8
	Ratio of hypothetical PDCCH RE energy to average CSI-RS RE energy	dB	4
	Ratio of hypothetical PDCCH DMRS energy to average CSI-RS RE energy	dB	4
	DMRS precoder granularity		REG bundle size

	REG bundle size		6
In sync transmission parameters	DCI format		1-0
	Number of Control OFDM symbols		2
	Aggregation level	CCE	4
	Ratio of hypothetical PDCCH RE energy to average CSI-RS RE energy	dB	0
	Ratio of hypothetical PDCCH DMRS energy to average CSI-RS RE energy	dB	0
	DMRS precoder granularity		REG bundle size
	REG bundle size		6
DRX			DRX.3
Gap pattern ID			*gp0*
Layer 3 filtering			*Enabled*
T310 timer		ms	2000
T311 timer		ms	1000
N310			1
N311			1
CSI-RS configuration for CSI reporting	Config 1		CSI-RS.1.1 FDD
	Config 2		CSI-RS.1.1 TDD
	Config 3		CSI-RS.2.1 TDD
T1		s	0.2
T2		s	0.2
T3		s	1.24
T4			0.2
T5			1.88
T6		s	1.84
Note 1: UE-specific PDCCH is not transmitted after T1 starts.			

Table 6.5.1.8.4.1-4: Measurement gap configuration for NR SA FR1 radio link monitoring in-sync test for PCell configured with CSI-RS-based RLM RS in DRX mode

Field	Test 1
	Value
gapOffset	0
Note 1: Void	

6.5.1.8.4.2 Test procedure

Prior to the start of the time duration T1, the UE shall be fully synchronized to Cell 1. The UE shall be configured for periodic CSI reporting with a reporting periodicity of 5ms. In the test, DRX configuration is enabled in PCell and DRX inactivity timer has already been expired, i.e. UE tries to decode PDCCH and to send periodic CQI during the period when On-duration timer is running. Time alignment timers shall be set to “infinity” so that UL timing alignment is maintained during the test. The UE is configured to perform inter-frequency measurements using GP ID #0 (40ms).

1. Ensure the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity NR, Connected without release *On* and Test Mode *On* according to TS 38.508-1 [14] clause 4.5.
2. The SS shall transmit an RRCReconfiguration message configuring the UE for inter-frequency measurements.
3. The UE shall transmit RRCReconfigurationComplete message.
4. Set the parameters of Cell 1 according to T1 in Table 6.5.1.8.5-1. Propagation conditions are set according to Annex C.2.3. T1 starts.
5. When T1 expires the SS shall change the SNR value to T2 as specified in Table 6.5.1.8.5-1. T2 starts.
6. When T2 expires the SS shall change the SNR value to T3 as specified in Table 6.5.1.8.5-1. T3 starts.
7. When T3 expires the SS shall change the SNR value to T4 as specified in Table 6.5.1.8.5-1. T4 starts.
8. When T4 expires the SS shall change the SNR value to T5 as specified in Table 6.5.1.8.5-1. T5 starts.

9. If the SS detects uplink power equal to or higher than minimum output power defined in TS 38.521-1 [17] clause 6.3.1.5 in the On-duration part of every DRX cycle in the configured slots for CSI transmission (according CSI reporting on PUCCH) during the period from time point A to time point F (T6 after the start of time duration T5) the number of successful tests is increased by one.

   Otherwise the number of failed tests is increased by one.

10. If the UE has not re-established the connection in at least 1s, the UE is switched off and then on. Ensure the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity NR, Connected without release *On* according to TS 38.508-1 [14] clause 4.5.

11. Repeat steps 4-10 for both subtests until the confidence level according to Tables G.2.3-1 in Annex G clause G.2 is achieved.

6.5.1.8.4.3 Message contents

Message contents are according to TS 38.508-1 [14] clause 4.6 and 7.3.1 with the following exceptions:

Table 6.5.1.8.4.3-1: Common Exception messages for NR SA FR1 radio link monitoring in-sync test for PCell configured with CSI-RS-based RLM RS in DRX mode

Default Message Contents	
Common contents of system information blocks exceptions	
Default RRC messages and information elements contents exceptions	Table H.3.1-1 Table H.3.1-2 with Condition INTER-FREQ, L3 FILTERING NEEDED, GAP_NEEDED Table H.3.1-3 with Condition INTER-FREQ MO (where ssbFrequency is set to the ARFCN value of carrier center of High range) Table H.3.1-4 with A3-offset = 0 Table H.3.5-4 Table H.3.5-9 with Condition CSI-RS RLM Table H.3.7-1 with condition DRX.3 and Gap

Table 6.5.1.8.4.3-2: RLF-TimersAndConstant

Derivation Path: TS 38.508-1 [14], Table 4.6.3-150			
Information Element	**Value/remark**	**Comment**	**Condition**
RLF-TimersAndConstants ::= SEQUENCE {			
t310	ms2000		
}			

6.5.1.8.5 Test requirement

Tables 6.5.1.8.4.1-3 and 6.5.1.8.5-1 define the primary level settings including test tolerances for Radio Link Monitoring In-sync Test for FR1 PCell configured with CSI-RS-based RLM in DRX mode.

Table 6.5.1.8.5-1: Cell specific test parameters for NR SA FR1 radio link monitoring in-sync test for PCell configured with CSI-RS-based RLM RS in DRX mode

Parameter	Unit	Test 1				
		T1	T2	T3	T4	T5
EPRE ratio of PDCCH DMRS to SSS	dB	4				
EPRE ratio of PDCCH to PDCCH DMRS	dB	0				
EPRE ratio of PBCH DMRS to SSS	dB					
EPRE ratio of PBCH to PBCH DMRS	dB					
EPRE ratio of PBCH to PBCH DMRS	dB					

EPRE ratio of PDSCH DMRS to SSS		dB					
EPRE ratio of PDSCH to PDSCH DMRS		dB					
EPRE ratio of OCNG DMRS to SSS		dB					
EPRE ratio of OCNG to OCNG DMRS		dB					
SNR on RLM-RS	Config 1	dB	1.8	-6.2	-15.8	-5.3	1.8
	Config 2		1.8	-6.2	-15.8	-5.3	1.8
	Config 3		1.8	-6.2	-15.8	-5.3	1.8
N_{oc}	Config 1	dBm/15kHz	-98				
	Config 2		-98				
	Config 3		-98				
Propagation condition			TDL-C 300ns 100Hz				

Note 1: OCNG shall be used such that the resources in Cell 1 are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.
Note 2: The uplink resources for CSI reporting are assigned to the UE prior to the start of time period T1.
Note 3: NZP CSI-RS resource set configuration for CSI reporting are assigned to the UE prior to the start of time period T1.
Note 4: Measurement gap configuration is assigned to the UE prior to the start of time period T1.
Note 5: The timers and layer 3 filtering related parameters are configured prior to the start of time period T1..
Note 6: The signal contains PDCCH for UEs other than the device under test as part of OCNG.
Note 7: SNR levels correspond to the signal to noise ratio over the SSS REs.
Note 8: The SNR in time periods T1, T2, T3, T4 and T5 is denoted as SNR1, SNR2, SNR3, SNR4 and SNR5 respectively in figure 6.5.1.8.4-1.
Note 9: The SNR values are specified for testing a UE which supports 2RX on at least one band. For testing of a UE which supports 4RX on all bands, the SNR during T3 and T4 from D.4.1.1 are -18.0-TT and -8.0-TT, which are -18.8dB and -8.8dB(including test tolerances)

The UE behaviour in each test during time durations T1, T2, T3, T4 and T5 shall be as follows:

During the period from time point A to time point F (T6 second after the start of time duration T5) the UE shall transmit uplink signal at least in all uplink slots configured for CSI transmission according to the configured periodic CSI reporting on the PCell.

The rate of correct events observed during repeated tests shall be at least 90% with a confidence level of 95%.

6.5.2 Interruption

6.5.2.0 Minimum conformance requirements

6.5.2.0.1 Minimum conformance requirements for interruptions during measurements on deactivated NR SCC

Interruptions on PCell due to measurements when an SCell is deactivated are allowed with up to 0.5% probability of missed ACK/NACK when the configured *measCycleSCell* [13] is 640 ms or longer.

If the PCell is not in the same band as the deactivated SCell, the UE is only allowed to cause interruptions on PCell immediately before and immediately after an SMTC. Each interruption shall not exceed requirement in Table 6.5.2.0.1-1

If the PCell is in the same band as the deactivated SCell, the UE is only allowed to cause an interruption on PCell no earlier than X slots before $T_{SMTC_duration}$ and no later than X slots after $T_{SMTC_duration}$, provided the cell specific reference signals from the active serving cells and the deactivated SCell are available in the same slot, where X and $T_{SMTC_duration}$ are given by Table 6.5.2.0.1-2. The interruption shall not exceed requirements in Table 6.5.2.0.1-2.

Interruptions on active SCells due to measurements when an SCell is deactivated are allowed with up to 0.5% probability of missed ACK/NACK when the configured *measCycleSCell* [13] is 640 ms or longer.

If the activated SCell is not in the same band as the deactivated SCell, the UE is only allowed to cause interruptions on an activated SCell immediately before and immediately after an SMTC. Each interruption shall not exceed requirement in Table 6.5.2.0.1-1

If the activated SCell is in the same band as the deactivated SCell, the UE is only allowed to cause an interruption on the activated SCell no earlier than X slots before $T_{SMTC_duration}$ and no later than X slots after $T_{SMTC_duration}$, provided the cell specific reference signals from the active serving cells and the deactivated SCell are available in the same slot, where X and $T_{SMTC_duration}$ are given by Table 6.5.2.0.1-2. The interruption shall not exceed requirements in Table 6.5.2.0.1-2.

Table 6.5.2.0.1-1: Interruption duration for SCell activation/deactivation for inter-band CA

μ	NR Slot length (ms) of victim cell	Interruption length (slot)	
0	1		1
1	0.5		1
2	0.25	Both aggressor cell and victim cell are on FR2	2
		Either aggressor cell or victim cell is on FR1	3
3	0.125	Aggressor cell is on FR2	4
		Aggressor cell is on FR1	5

Table 6.5.2.0.1-2: Interruption duration for SCell activation/deactivation for intra-band CA

μ	NR Slot length (ms)	Interruption length (slots)
0	1	$1 + T_{SMTC_duration} * N_{slot}^{subframe,\mu}$
1	0.5	$1 + T_{SMTC_duration} * N_{slot}^{subframe,\mu}$
2	0.25	$2 + T_{SMTC_duration} * N_{slot}^{subframe,\mu}$
3	0.125	$4 + T_{SMTC_duration} * N_{slot}^{subframe,\mu}$
NOTE 1: $T_{SMTC_duration}$ measured in subframes is - the longest SMTC duration among all above active serving cells and the SCell being activated when one SCell is activated. If SSB configuration (*absoluteFrequencySSB*) but no SMTC configuration is provided for the SCell being activated, the SSB transmission periodicity is assumed to be 5ms and $T_{SMTC\ duration}$ for the SCell being activated is [x]ms. If no SSB configuration (*absoluteFrequencySSB*) nor SMTC configuration is provided for the SCell being activated, $T_{SMTC\ duration}$ for the SCell being activated is 0ms; - the longest SMTC duration among all active serving cells in the same band when one SCell is deactivated. NOTE 2: $N_{slot}^{subframe,\mu}$ is as defined in TS 38.211 [7].		

The normative reference for this requirement is TS 38.133 [6] clause 8.2.2.2.

6.5.2.0.2 Interruptions at NR SRS carrier based switching

SRS transmission can be configured on a carrier not configured for PUCCH/PUSCH transmission. When a UE needs to transmit periodic, semi-persistent or aperiodic SRS on a carrier of a serving cell not configured for PUCCH/PUSCH transmission, the UE can perform carrier based switching to one or more carriers not configured for PUCCH/PUSCH transmission from a carrier with PUCCH/PUSCH transmission or from a carrier not configured for PUCCH/PUSCH transmission prior to transmitting SRS, provided that:

- switching is from a configured carrier to another activated carrier;
- the carrier of SCells not configured for PUCCH/PUSCH transmission to which SRS carrier based switching is performed is indicated by DCI SRS request field for aperiodic SRS transmission, or indicated by MAC-CE for semi-persistent SRS transmission, or configured via RRC for periodic SRS transmission;
- the serving cell, from which SRS carrier based switching is performed and whose UL transmission may therefore be interrupted, is indicated by srs-SwitchFromServCellIndex and srs-SwitchFromCarrier in TS38.331 [2];

- the SRS switching is not colliding with any other transmission with higher priority defined in TS 38.214 [26].
- the SRS switching is not colliding with any SSB/CSI-RS based L3 measurements and the measurements for RLM/BFD.
- for UE, which does not support simultaneous reception and transmission for inter-band TDD CA specified in TS 38.331 [2], and is compliant to the requirements for inter-band CA with uplink in one NR band and without simultaneous Rx/Tx specified in TS 38.101 [5], the SRS transmission are not simultaneously scheduled with DL SSB/CSI-RS for L3 or L1 measurements transmission on other carriers.

The UE shall not perform SRS carrier based switching if the above conditions cannot be met.

When SRS carrier based switching is performed between carriers, the UE is allowed interruptions on any active serving cell if UE is not capable of Per-FR gap, or on active serving cell(s) in FR1 if UE is capable of Per-FR gap, during the switching to the carrier of a serving cell in FR1 not configured for PUCCH/PUSCH transmission,

- with up to X1 slot as specified in Table 6.5.2.0.1-1.

When SRS carrier based switching is performed between carriers, the UE is allowed interruptions on any active serving cell if UE is not capable of Per-FR gap, or on active serving cell(s) in FR2 if UE is capable of Per-FR gap, during the switching to the carrier of a serving cell in FR2 not configured for PUCCH/PUSCH transmission,

- with up to X2 slot as specified in Table 6.5.2.0.1-2.

When SRS carrier based switching is performed between carriers, the UE is allowed interruptions on any active serving cell if UE is not capable of Per-FR gap, or on active serving cell(s) in FR1 if UE is capable of Per-FR gap, during the switching from the carrier of a serving cell in FR1 not configured for PUCCH/PUSCH transmission,

- with up to X1 slot as specified in Table 6.5.2.0.1-1.

When SRS carrier based switching is performed between carriers, the UE is allowed interruptions on any active serving cell if UE is not capable of Per-FR gap, or on active serving cell(s) in FR2 if UE is capable of Per-FR gap, during the switching from the carrier of a serving cell in FR2 not configured for PUCCH/PUSCH transmission,

- with up to X2 slot as specified in Table 6.5.2.0.1-2.

Table 6.5.2.0.1-1: Interruption length X1 (slot)

μ	NR Slot length (ms) of victim cell	SRS carrier switching time (us)[Note 1]	Interruption length X1 (slots)	
			Sub carrier spacing for aggressor cell (kHz)	
			15	30
0	1	≤ 200	2	2
		300, 500	2	2
		900	2	2
1	0.5	≤ 200	3	2
		300, 500	3	3
		900	4	4
2	0.25	≤ 200	4	3
		300, 500	5	4
		900	7	6
3	0.125	≤ 200	7	5
		300, 500	9	7
		900	12	10
Note1: NR SRS carrier switching time is UE capability indicated by higher layer parameter *SRS-SwitchingTimeNR*.				

Table 6.5.2.0.1-2: Interruption length X2 (slot)

μ	NR Slot length (ms) of victim cell	SRS carrier switching time (us) [Note 1]	Interruption length X2 (slots)	
			Sub carrier spacing for aggressor cell (kHz)	
			60	120
0	1	≤ 200	2	2
1	0.5	≤ 200	2	2

2	0.25	≤ 200	3	3
3	0.125	≤ 200	4	4
Note1: NR SRS carrier switching time is UE capability indicated by higher layer parameter *SRS-SwitchingTimeNR*.				

For intra-band SRS carrier switching in FR1 or FR2, interruptions in Table 6.5.2.0.1-1 and in Table 6.5.2.0.1-2 based on SRS carrier switching time ≤ 200us shall apply. For inter-band SRS carrier switching in FR1, interruptions in Table 6.5.2.0.1-1 and in Table 6.5.2.0.1-2 shall apply.

The normative reference for this requirement is TS 38.133 [6] clause 8.2.2.9.

6.5.2.1 NR SA FR1 interruptions during measurements on deactivated NR SCC

6.5.2.1.1 Test purpose

To verify UE's ability to complete NR PCell interruptions during the measurement on the deactivated NR SCC within the missed ACK/NACK rate in standalone NR requirements.

6.5.2.1.2 Test applicability

This test applies to all types of NR UE release 15 and forward supporting 2DL CA.

6.5.2.1.3 Minimum conformance requirements

The minimum conformance requirements are defined in clause 6.5.2.0.1.

The normative reference for this requirement is TS 38.133 [6] clause A.6.5.2.1.

6.5.2.1.4 Test description

6.5.2.1.4.1 Initial conditions

Test 6.5.2.1 can be run in one of the configurations defined in this clause. Supported test configurations for NR PCell are shown in Table 6.5.2.1.4.1-1. Supported test configurations for NR SCell are shown in Table 6.5.2.1.4.1-1A. Test configuration for NR PCell and test configuration for NR SCell are chosen independently.

Table 6.5.2.1.4.1-1: Supported test configurations for NR PCell

Config	Description
6.5.2.1-1	NR 15 kHz SSB SCS, ≥10 MHz bandwidth, FDD duplex mode
6.5.2.1-2	NR 15 kHz SSB SCS, ≥10 MHz bandwidth, TDD duplex mode
6.5.2.1-3	NR 30 kHz SSB SCS, ≥40 MHz bandwidth, TDD duplex mode
Note 1: The UE is only required to be tested in one of the supported test configurations Note 2: The UE is only required to be tested in one with smallest aggregated channel bandwidth from supported band combinations which is composed of CCs ≥ the bandwidth ($BW_{channel}$) defined in each test configuration,	

Table 6.5.2.1.4.1-1A: Supported test configurations for NR SCell

$Config_{SCell}$	Description
6.5.2.1-1	NR 15 kHz SSB SCS, ≥10 MHz bandwidth, FDD duplex mode
6.5.2.1-2	NR 15 kHz SSB SCS, ≥10 MHz bandwidth, TDD duplex mode
6.5.2.1-3	NR 30 kHz SSB SCS, ≥40 MHz bandwidth, TDD duplex mode
Note 1: The UE is only required to be tested in one of the supported test configurations Note 2: The UE is only required to be tested in one with smallest aggregated channel bandwidth from supported band combinations which is composed of CCs ≥ the bandwidth ($BW_{channel}$) defined in each test configuration,	

Configure the test equipment and the DUT according to the parameters in Table 6.5.2.1.4.1-2.

Table 6.5.2.1.4.1-2: Initial conditions for NR SA FR1 interruptions during measurements on deactivated NR SCC

Parameter	Value	Comment

Test environment	NC		As specified in TS 38.508-1 [14] clause 4.1.
Test frequencies	As specified in Annex E, table E.4-1 and TS 38.508-1 [14] clause 4.3.1 and 4.4.2.		
Channel bandwidth	As specified by the test configuration selected from Table 6.5.2.1.4.1-1.		
Propagation conditions	AWGN		As specified in Annex C.2.2.
Connection Diagram	TE Part	A.3.1.8.1	As specified in TS 38.508-1 [14] Annex A.
	DUT Part	A.3.2.3.4	
Exceptions to connection diagram	N/A		

1. The general test parameter settings are set up according to Table 6.5.2.1.4.1-3

2. Message contents are defined in clause 6.5.2.1.4.3.

3. There are two NR carriers and two cells specified in the test. Cell 1 is the PCell on one NR carrier, Cell 2 is the SCell on the other NR carrier. Cell 1 and Cell 2 shall be configured according to Annex C.1.1 and C.1.2.

Table 6.5.2.1.4.1-3: General test parameters for NR SA FR1 interruptions during measurements on deactivated NR SCC

Parameter	Unit	Value	Comment
RF Channel Number		1, 2	Two NR RF channels
Active PCell		Cell1	PCell on NR RF channel number 1.
Configured deactivated SCell		Cell2	Deactivated SCell on NR RF channel number 2.
CP length		Normal	Applicable to Cell1 and Cell 2
DRX		OFF	
Measurement gap pattern Id		OFF	
SCell measurement cycle (measCycleSCell)	ms	640	
T1	s	10	

6.5.2.1.4.2 Test procedure

The test consists of two cells: Cell1 and Cell2. Cell1 is PCell and Cell2 is deactivated SCell. The test consists of one time period, with duration of T1. Prior to the start of the time duration T1, the UE shall be connected to Cell1 and Cell2 and the RRC message including *measCycleSCell* or *allowInterruptions* for the deactivated NR SCells is received at the UE antenna connector. Cell1 shall be configured as PCell and Cell2 shall be configured as SCell.. During T1, PCell is continuously scheduled in DL.

1. Ensure the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity *NR*, Connected without release *On* and Test Mode *On* according to TS 38.508-1 [14] clause 4.5.

2. The SS shall transmit an RRCReconfiguration message including measCycleSCell or allowInterruptions for the deactivated NR SCell.

3. The UE shall transmit RRCReconfigurationComplete message.

4. Set the parameters according to Table 6.5.2.1.5-1. Propagation conditions are set according to Annex C.2.1. T1 starts.

5. SS schedules on PCell continuously and UE shall start sending ACK/NACK reports. The SS shall monitor ACK/NACK/DTX on PCell.

6. If more than 99.5% of uplink transmissions are received by SS then count a success for the event “ACK/NACK”. Otherwise count a fail for the event “ACK/NACK”.

7. If no longer than X consecutive DTX is observed by the SS, then count a success for the event “DTX”. Otherwise count a fail for the event “DTX”. Where

   - For PCell test configuration 6.5.2.1-1,

- X = interruption length+k_1 if $k_1 \leq$ interruption length
- X = interruption length if k_1 > interruption length

Note: UE expects that the SS won't use k_1 = 3 for PCell test configuration 4.5.2.3-1 and 4.5.2.3-4.

- For PCell test configuration 6.5.2.1-2 and 6.5.2.1-3,
  - X = interruption length.
- interruption length is given in table 6.5.2.1.5-2 for inter-band case and in 6.5.2.1.5-3 for intra-band case.

8. After the RRC connection release, the SS:

- transmits in Cell 1 a Paging message (including PagingRecord with UE-Identity) for the UE and ensures the UE is in state RRC_CONNECTED TS 38.508-1 [14] clause 4.5. (if the paging fails, switches off and on the UE and ensures the UE is in state RRC_CONNECTED TS 38.508-1 [14] clause 4.5),

or

- switches off and on the UE and ensures the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity *NR*, Connected without release *On* according to TS 38.508-1 [14] clause 4.5.

9. Repeat step 2-8 until a test verdict has been achieved.

Each of the events "ACK/NACK" and "DTX" is evaluated independently for the statistic, resulting in an event verdict: pass or fail. Each event is evaluated only until the confidence level according to Table G.2.3-1 in Annex G.2 is achieved. Different events may require different times for a verdict.

If all events pass, the test passes. If one event fails, the test fails.

6.5.2.1.4.3 Message contents

Message contents are according to TS 38.508-1 [14] clause 7.3 with the following exceptions:

Table 6.5.2.1.4.3-1: Common Exception messages

Default Message Contents	
Common contents of system information blocks exceptions	
Default RRC messages and information elements contents exceptions	Table H.3.1-2 with Condition Deactivated SCell; Table H.3.1-4 with A3-offset = 15
Specific message contents exceptions for SCell Test Configuration 6.5.2.1-1, 6.5.2.1-2	Table H.3.1-3 with Condition Deactivated SCell and SSB.1 FR1 Table 7.3.1-3 in TS 38.508-1 [14] with condition SMTC.1
Specific message contents exceptions for SCell Test Configuration 6.5.2.1-3	Table H.3.1-3 with Condition Deactivated SCell and SSB.2 FR1 Table 7.3.1-3 in TS 38.508-1 [14] with condition SMTC.1

Table 6.5.2.1.4.3-2: ServingCellConfig (Cell 2)

Derivation Path: TS 38.508-1 [14], Table 4.6.3-167 with condition MEAS			
Information Element	**Value/remark**	**Comment**	**Condition**
ServingCellConfig ::= SEQUENCE {			
servingCellMO	2	MeasObjectId for SCell in Table H.3.1-2	
}			

6.5.2.1.5 Test requirement

Table 6.5.2.1.5-1 and Table 6.5.2.1.5-1A defines the primary level settings including test tolerances for NR SA FR1 interruptions during measurements on deactivated NR SCC.

Table 6.5.2.1.5-1: NR cell specific test parameters for NR PCell for NR SA FR1 interruptions during measurements on deactivated NR SCC

Parameter		Unit	Cell1
Frequency Range			FR1
Duplex mode	Config 1		FDD
	Config 2,3		TDD
TDD configuration	Config 1		Not Applicable
	Config 2		TDDConf.1.1
	Config 3		TDDConf.2.1
$BW_{channel}$			Note 9
$BW_{occupied}$	Config 1,2	RB	52 Note 7
	Config 3		106 Note 8
Initial DL BWP Configuration			DLBWP.0.1
Dedicated DL BWP Configuration			DLBWP.1.1
Initial UL BWP Configuration			ULBWP.0.1
Dedicated UL BWP Configuration			ULBWP.1.1
PDSCH Reference measurement channel	Config 1		SR.1.1 FDD
	Config 2		SR.1.2 TDD
	Config 3		SR.2.1 TDD
CSI-RS for tracking	Config 1		TRS.1.1 FDD
	Config 2		TRS.1.1 TDD
	Config 3		TRS.1.2 TDD
RMSI CORESET parameters	Config 1		CR.1.1 FDD
	Config 2		CR.1.1 TDD
	Config 3		CR.2.1 TDD
Dedicated CORESET parameters	Config 1		CCR.1.1 FDD
	Config 2		CCR.1.1 TDD
	Config 3		CCR.2.1 TDD
OCNG Patterns	Config 1,2		OP.1 Note 7
	Config 3		OP.1 Note 8
SMTC Configuration			SMTC.1
SSB Configuration	Config 1,2		SSB.1 FR1
	Config 3		SSB.2 FR1
Correlation Matrix and Antenna Configuration			1x2 Low
EPRE ratio of PSS to SSS		dB	0
EPRE ratio of PBCH DMRS to SSS			
EPRE ratio of PBCH to PBCH DMRS			
EPRE ratio of PDCCH DMRS to SSS			
EPRE ratio of PDCCH to PDCCH DMRS			
EPRE ratio of PDSCH DMRS to SSS			
EPRE ratio of PDSCH to PDSCH			
EPRE ratio of OCNG DMRS to SSS Note 1			
EPRE ratio of OCNG to OCNG DMRS Note 1			
N_{oc} Note 2		dBm/15 kHz	-104
SS-RSRP Note 3		dBm/15 kHz	-87
$\hat{E}_s/I_{ot}$		dB	17
$\hat{E}_s/N_{oc}$		dB	17
N_{oc} Note 2	Config 1,2	dBm/SCS	-104
	Config 3		-101
Io Note3	Config 1,2	dBm/9.36MHz	-58.96
	Config 3	dBm/38.16MHz	-52.86
Time offset to Cell1 Note 5		µs	-
Propagation Condition			AWGN

Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.
Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modeled as AWGN of appropriate power for N_{oc} to be fulfilled within $BW_{occupied}$.
Note 3: SS-RSRP and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselvess.
Note 4: Void
Note 5: Receive time difference between slot boundaries of signals received from the two cells at the UE antenna connector including time alignment error between the two cells.
Note 6: For unpaired spectrum, a DL BWP is linked with an UL BWP. DLBWP.0.2 is linked with ULBWP.0.2 defined in clause 12 of TS 38.213 [3].
Note 7: All UL/DL transmission shall be confined within $BW_{occupied}$ (i.e. 10 MHz, 52 RBs) from $F_{C,low}$, and Io is independent of the $BW_{channel}$ configured.
Note 8: All UL/DL transmission shall be confined within $BW_{occupied}$ (i.e. 40 MHz, 106 RBs) from $F_{C,low}$, and Io is independent of the $BW_{channel}$ configured.
Note 9: $N_{RB,c}$. is derived from Table 5.3.2-1 in TS38.101-1[2] with configured $BW_{channel}$.

Table 6.5.2.1.5-1A: NR cell specific test parameters for NR SCell for NR SA FR1 interruptions during measurements on deactivated NR SCC

Parameter		Unit	Cell2
Frequency Range			FR1
Duplex mode	$Config_{SCell}$ 1		FDD
	$Config_{SCell}$ 2,3		TDD
TDD configuration	$Config_{SCell}$ 1		Not Applicable
	$Config_{SCell}$ 2		TDDConf.1.1
	$Config_{SCell}$ 3		TDDConf.2.1
$BW_{channel}$			Note 9
$BW_{occupied}$	$Config_{SCell}$ 1,2	RB	52 Note 7
	$Config_{SCell}$ 3		106 Note 8
Initial DL BWP Configuration			DLBWP.0.1
Dedicated DL BWP Configuration			DLBWP.1.1
Initial UL BWP Configuration			N/A
Dedicated UL BWP Configuration			N/A
PDSCH Reference measurement channel	$Config_{SCell}$ 1		SR.1.1 FDD
	$Config_{SCell}$ 2		SR.1.2 TDD
	$Config_{SCell}$ 3		SR.2.1 TDD
CSI-RS for tracking	$Config_{SCell}$ 1		TRS.1.1 FDD
	$Config_{SCell}$ 2		TRS.1.1 TDD
	$Config_{SCell}$ 3		TRS.1.2 TDD
RMSI CORESET parameters	$Config_{SCell}$ 1		CR.1.1 FDD
	$Config_{SCell}$ 2		CR.1.1 TDD
	$Config_{SCell}$ 3		CR.2.1 TDD
Dedicated CORESET parameters	$Config_{SCell}$ 1		CCR.1.1 FDD
	$Config_{SCell}$ 2		CCR.1.1 TDD
	$Config_{SCell}$ 3		CCR.2.1 TDD
OCNG Patterns	$Config_{SCell}$ 1,2		OP.1 Note 7
	$Config_{SCell}$ 3		OP.1 Note 8
SMTC Configuration			SMTC.4
SSB Configuration	$Config_{SCell}$ 1,2		SSB.5 FR1
	$Config_{SCell}$ 3		SSB.6 FR1
Correlation Matrix and Antenna Configuration			1x2 Low
EPRE ratio of PSS to SSS		dB	0
EPRE ratio of PBCH DMRS to SSS			
EPRE ratio of PBCH to PBCH DMRS			
EPRE ratio of PDCCH DMRS to SSS			
EPRE ratio of PDCCH to PDCCH DMRS			
EPRE ratio of PDSCH DMRS to SSS			
EPRE ratio of PDSCH to PDSCH			
EPRE ratio of OCNG DMRS to SSS Note 1			
EPRE ratio of OCNG to OCNG DMRS Note 1			
N_{oc} Note 2		dBm/15 kHz	-104

SS-RSRP Note 3		dBm/15 kHz	-87
$\hat{E}_s/I_{ot}$		dB	17
$\hat{E}_s/N_{oc}$		dB	17
N_{oc} Note 2	$Config_{SCell}$ 1,2	dBm/SCS	-104
	$Config_{SCell}$ 3		-101
Io Note3	$Config_{SCell}$ 1,2	dBm/9.36MHz	-58.96
	$Config_{SCell}$ 3	dBm/38.16MHz	-52.86
Time offset to Cell1 Note 5		µs	3
Propagation Condition			AWGN

Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.
Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modeled as AWGN of appropriate power for N_{oc} to be fulfilled within $BW_{occupied}$.
Note 3: SS-RSRP and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselvess.
Note 4: Void
Note 5: Receive time difference between slot boundaries of signals received from the two cells at the UE antenna connector including time alignment error between the two cells.
Note 6: For unpaired spectrum, a DL BWP is linked with an UL BWP. DLBWP.0.2 is linked with ULBWP.0.2 defined in clause 12 of TS 38.213 [3].
Note 7: All UL/DL transmission shall be confined within $BW_{occupied}$ (i.e. 10 MHz, 52 RBs) from $F_{C,low}$, and Io is independent of the $BW_{channel}$ configured.
Note 8: All UL/DL transmission shall be confined within $BW_{occupied}$ (i.e. 40 MHz, 106 RBs) from $F_{C,low}$, and Io is independent of the $BW_{channel}$ configured.
Note 9: $N_{RB,c}$. is derived from Table 5.3.2-1 in TS38.101-1[2] with configured $BW_{channel}$.

The UE shall be continuously scheduled on PCell during the entire length of T1. During the time duration T1 the UE shall transmit at least 99.5% of ACK/NACK on PCell.

If the NR PCell is not in the same band as the deactivated SCell, the UE is only allowed to cause interruptions on NR PCell immediately before and immediately after an SMTC. Each interruption on NR PCell shall not exceed the value defined in Table 6.5.2.1.5-2.

If the NR PCell is in the same band as the deactivated SCell, the UE is only allowed to cause an interruption on PCell no earlier than 1 slot before an SMTC and no later than 1 slot after the SMTC. the interruption on NR PCell shall not exceed the value defined in Table 6.5.2.1.5-3.

Table 6.5.2.1.5-2: Interruption duration if the PCell is not in the same band as the deactivated SCell

μ	NR Slot length (ms)	Interruption length
0	1	1
1	0.5	1

Table 6.5.2.1.5-3: Interruption duration if the PCell is in the same band as the deactivated SCell

μ	NR Slot length (ms)	Interruption length
0	1	2 + SMTC duration
1	0.5	2 + SMTC duration

The rate of correct events observed during repeated tests shall be at least 90%.

6.5.2.2 SA FR1 interruptions at NR SRS carrier based switching

Editor's Note: This test case is incomplete in following aspects:

- Message contents are missing.
- TT analysis is missing.

- Test Procedure is FFS.
- Test applicability needs to be updated
- Cell mapping is missing in Annex E

6.5.2.2.1 Test purpose

The purpose of this test is to verify PCell interruptions during carrier-based switching to one carrier not configured for PUCCH/PUSCH transmission from a CC with PUCCH/PUSCH transmission, when a UE needs to transmit aperiodic SRS.

6.5.2.2.2 Test applicability

This test applies to all types of NR UE release 16 and forward supporting 2 DL CA.

6.5.2.2.3 Minimum conformance requirements

The minimum conformance requirements are defined in clause 5.5.2.0.2.

The normative reference for this requirement is TS 38.133 [6] clause A.6.5.2.2.

6.5.2.2.4 Test description

6.5.2.2.4.1 Initial conditions

This test shall be tested using any of the test configurations in Table 6.5.2.2.4.1-1.

Table 6.5.2.2.4.1-1: Supported test configurations for SA interruptions at NR SRS carrier based switching

Configuration	Description
6.5.2.2-1	15 kHz SSB SCS, 10 MHz bandwidth, FDD – TDD duplex mode
6.5.2.2-2	15 kHz SSB SCS, 10 MHz bandwidth, TDD – TDD duplex mode
6.5.2.2-3	30 kHz SSB SCS, 40 MHz bandwidth, TDD – TDD duplex mode
NOTE.1: The UE is only required to be tested in one of the supported test configurations.	

Configure the test equipment and the DUT according to the parameters in Table 6.5.2.2.4.1-2.

Table 6.5.2.2.4.1-2: Initial conditions for SA interruptions at NR SRS carrier based switching

Parameter	Value		Comment
Test environment	NC		As specified in TS 38.508-1 [14] clause 4.1.
Test frequencies	As specified in Annex E, table E.4-1 and TS 38.508-1 [14] clause 4.3.1 and 4.4.2..		
Channel bandwidth	As specified by the test configuration selected from Table 6.5.2.2.4.1-1.		
Propagation conditions	AWGN		As specified in clause C.2.2.
Connection Diagram	TE Part	A.3.1.8.1	As specified in TS 38.508-1 [14] Annex A.
	DUT Part	A.3.2.3.4	
Exceptions to connection diagram	N/A		

1. The general test parameter settings are set up according to Table 6.5.2.2.4.1-3.
2. Message contents are defined in clause 6.5.2.2.4.3.
3. There are two NR carriers and one E-UTRA carrier, and three cells specified in the test. Each cell is on a different carrier. Cell1 Is E-UTRAN PCell, Cell2 is NR FR1 PSCell and Cell 3 is NR activated Scell. Cell 1 is the cell used for connection setup with the power level set according to Table A.6.1.1-1. Cell 2 and Cell 3 shall be configured according to clauses C.1.1 and C.1.2.

Table 6.5.2.2.4.1-3: General test parameters for SA interruptions at NR SRS carrier based switching

Parameter	Unit	Value	Comment

RF Channel Number		1,2	Two NR radio channel (1, 2) are used for this test
Active PCell		Cell 1	Primary cell on NR RF channel number 1
Configured SCell		Cell 2	Activated secondary cell on NR RF channel number 2
CP length		Normal	
DRX		OFF	Continuous monitoring of primary cell
Cell2 timing offset to cell1	µs	0	
Time alignment error between cell2 and cell1	µs	≤ Time alignment error as specified in TS 38.104 [13] clause 6.5.3.1.	The value of time alignment error depends upon the type of carrier aggregation.
T1	s	5	
T2	ms	40	UE shall perform SRS switching during T2

6.5.2.2.4.2 Test procedure

TBD

6.5.2.2.4.3 Message contents

TBD

6.5.2.2.5 Test requirement

Table 6.5.2.2.5-1 defines the primary level settings including test tolerances for SA FR1 interruptions at NR SRS carrier based switching.

Table 6.5.2.2.5-1: Cell specific test parameters for SA interruptions at NR SRS carrier based switching

Parameter		Unit	T1		T2	
			Cell 1	Cell 2	Cell 1	Cell 2
Duplex mode	Config 1		FDD	TDD	FDD	TDD
	Config 2,3		TDD			
TDD configuration	Config 1		N/A	[TDDConf.1.2]	N/A	[TDDConf.1.2]
	Config 2		[TDDConf.1.2]			
	Config 3		[TDDConf.2.3]			
$BW_{channel}$	Config 1,2	MHz	10: $N_{RB,c}$ = 52			
	Config 3		40: $N_{RB,c}$ = 106			
Downlink initial BWP Configuration			DLBWP.0.1			
Downlink dedicated BWP Configuration			DLBWP.1.1			
Uplink initial BWP configuration			ULBWP.0.1			
Uplink dedicated BWP configuration			ULBWP.1.1			
TCI state			TCI.State.0			
TRS Configuration			TRS.1.1 TDD			
PDSCH Reference measurement channel	Config 1		SR.1.1 FDD	SR.1.1 TDD	SR.1.1 FDD	SR.1.1 TDD
	Config 2		SR.1.1 TDD	SR.1.1 TDD	SR.1.1 TDD	SR.1.1 TDD
	Config 3		SR2.1 TDD	SR2.1 TDD	SR2.1 TDD	SR2.1 TDD
Dedicated CORESET parameters	Config 1		CCR.1.1 FDD	CCR.1.1 TDD	CCR.1.1 FDD	CCR.1.1 TDD
	Config 2		CCR.1.1 TDD	CCR.1.1 TDD	CCR.1.1 TDD	CCR.1.1 TDD

	Config 3		CCR.2.1 TDD	CCR.2.1 TDD	CCR.2.1 TDD	CCR.2.1 TDD
RMSI CORESET parameters	Config 1		CR.1.1 FDD	CR.1.1 TDD	CR.1.1 FDD	CR.1.1 TDD
	Config 2		CR.1.1 TDD	CR.1.1 TDD	CR.1.1 TDD	CR.1.1 TDD
	Config 3		CR2.1 TDD	CR2.1 TDD	CR2.1 TDD	CR2.1 TDD
OCNG Patterns			OP.1			
SRS Configuration	Config 1,2		SRS.1 TDD			
	Config 3		SRS.2 TDD			
SSB Configuration	Config 1,2		SSB.1 FR1			
	Config 3		SSB.2 FR1			
SMTC configuration			SMTC.1			
EPRE ratio of PSS to SSS		dB	0			
EPRE ratio of PBCH DMRS to SSS						
EPRE ratio of PBCH to PBCH DMRS						
EPRE ratio of PDCCH DMRS to SSS						
EPRE ratio of PDCCH to PDCCH DMRS						
EPRE ratio of PDSCH DMRS to SSS						
EPRE ratio of PDSCH to PDSCH						
EPRE ratio of OCNG DMRS to SSS(Note 1)						
EPRE ratio of OCNG to OCNG DMRS (Note 1)						
N_{oc} Note2	Config 1,2,4,5	dBm/15kHz	-104			
	Config 3,6		-101			
$\hat{E}_s / I_{ot}$		dB	17			
$\hat{E}_s / N_{oc}$		dB	17			
SS-RSRP Note3	Config 1,2,4,5	dBm/SCS	-87			
	Config 3,6		-84			
SCH_RP Note 3		dBm/15 kHz	-87			
Propagation condition		-	AWGN			

Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.
Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for N_{oc} to be fulfilled.
Note 3: SS-RSRP and SCH_RP levels have been derived from other parameters for information purposes. They are not settable parameters themselves.
Note 4: The uplink resources for CSI reporting are assigned to the UE prior to the start of time period T2.

The UE shall be scheduled on PCell continuously throughout the test. During the time duration T2, the interruption on PCell shall not be more than the values specified for SA in TS 38.133 [6] clause 8.2.2.2.9.

The rate of correct events observed during repeated tests shall be at least 90% with the confidence level of 95%.

6.5.3 SCell activation and deactivation delay

6.5.3.0 Minimum conformance requirements

6.5.3.0.1 Minimum conformance requirements for SCell activation and deactivation delay

Same as in clause 4.5.3.0.1.

6.5.3.1 NR SA FR1 SCell activation and deactivation of known SCell in non-DRX for 160ms SCell measurement cycle

6.5.3.1.1 Test purpose

This test is to verify that the SCell activation and deactivation times are within the requirements in TS 38.133 [6] clause 8.3, when the SCell in FR1 is known by the UE at the time of activation.

6.5.3.1.2 Test applicability

This test applies to all types of NR UE from Release 15 onwards and supporting 2DL CA.

6.5.3.1.3 Minimum conformance requirements

The minimum conformance requirements are defined in clause 6.5.3.0.1.

The normative reference for this requirement is TS 38.133 [6] clause A.6.5.3.1.

6.5.3.1.4 Test description

6.5.3.1.4.1 Initial conditions

This test shall be tested using any of the test configurations in this clause. The supported test configurations for NR PCell are shown in Table 6.5.3.1.4.1-1. Supported test configurations for NR SCell are shown in Table 6.5.3.1.4.1-1A. Test configuration for NR PCell and test configuration for NR SCell are chosen independently.

Table 6.5.3.1.4.1-1: supported test configurations for NR PCell

Config	Description
6.5.3.1-1	NR 15 kHz SSB SCS, ≥10 MHz bandwidth, FDD duplex mode
6.5.3.1-2	NR 15 kHz SSB SCS, ≥10 MHz bandwidth, TDD duplex mode
6.5.3.1-3	NR 30 kHz SSB SCS, ≥40 MHz bandwidth, TDD duplex mode
Note 1: The UE is only required to be tested in one of the supported test configurations. Note 2: The UE is only required to be tested in one with smallest aggregated channel bandwidth from supported band combinations which is composed of CCs ≥ the bandwidth ($BW_{channel}$) defined in each test configuration.	

Table 6.5.3.1.4.1-1A: Supported test configurations for NR PCell

$Config_{SCell}$	Description
6.5.3.1-1	NR 15 kHz SSB SCS, ≥10 MHz bandwidth, FDD duplex mode
6.5.3.1-2	NR 15 kHz SSB SCS, ≥10 MHz bandwidth, TDD duplex mode
6.5.3.1-3	NR 30 kHz SSB SCS, ≥40 MHz bandwidth, TDD duplex mode
Note 1: The UE is only required to be tested in one of the supported test configurations Note 2: The UE is only required to be tested in one with smallest aggregated channel bandwidth from supported band combinations which is composed of CCs ≥ the bandwidth ($BW_{channel}$) defined in each test configuration,	

Configure the test equipment and the DUT according to the parameters in Table 6.5.3.1.4.1-2 and Table 6.5.3.1.4.1-3.

Table 6.5.3.1.4.1-2: Initial conditions for known FR1 SCell activation case

Parameter	Value		Comment
Test environment	NC		As specified in TS 38.508-1 [14] clause 4.1.
Test frequencies	As specified in Annex E, Table E.4-1 and TS 38.508-1 [14] clause 4.3.1.		
Channel bandwidth	As specified by the test configuration selected from Table 6.5.3.1.5-1		
Propagation conditions	AWGN		As specified in Annex C.2.2.
Connection Diagram	TE Part	A.3.1.7.1	As specified in TS 38.508-1 [14] Annex A.
	DUT Part	A.3.2.3.1	
Exceptions to connection diagram	- Without LTE link - For 4Rx capable UEs without any 2Rx RF bands use A.3.2.5.2 for DUT part and A.3.1.8.4 for TE part.		

Table 6.5.3.1.4.1-3: General test parameters for known FR1 SCell activation case, 160ms SCell measurement cycle

Parameter	Unit	Value	Comment
RF Channel Number		1,2	Two NR radio channel (1, 2) are used for this test
Active PCell		Cell 1	Primary cell on NR RF channel number 1.
Configured deactivated SCell		Cell 2	Configured deactivated secondary cell on NR RF channel number 2
CP length		Normal	
DRX		OFF	Continuous monitoring of primary cell
Cell-individual offset for cells on NR channel number	dB	0	Individual offset for cells on primary component carrier.
SCell measurement cycle (measCycleSCell)	ms	160	
Cell2 timing offset to cell1	µs	0	
Time alignment error between cell2 and cell1	µs	≤ Time alignment error as specified in TS 38.104 [13] clause 6.5.3.1.	The value of time alignment error depends upon the type of carrier aggregation.
T1	s	7	During this time the PCell shall be known and the SCell configured and detected.
T2	s	1	During this time the UE shall activate the SCell.
T3	s	1	During this time the UE shall deactivate the SCell.
T_{HARQ}	ms	PCell Config 1: 2 PCell Config 2: 3 PCell Config 3: 2.5	k_1×NR slot length k_1 is a number of slots and is indicated by the PDSCH-to-HARQ-timing-indicator field in the DCI format, if present, or provided by *dl-DataToUL-ACK*, the value of k should be the minimum value defined in TS 38.213 [8] that will meet the timing constraints of this test case.
$T_{CSI_Reporting}$	ms	15	the delay (in ms) including uncertainty in acquiring the first available downlink CSI reference resource, UE processing time for CSI reporting (clause 5.2.2.5 in TS 38.214) and uncertainty in acquiring the first available CSI reporting resources as specified in TS 38.331 [13].

1. Message contents are defined in clause 6.5.3.1.4.3.
2. There are two NR carriers, each with one cell. Cell 1 is NR FR1 PCell and Cell 2 is the deactivated SCell. Cell 1 and Cell 2 are configured according to Annex C.1.2 and C.1.3.

6.5.3.1.4.2 Test procedure

The test consists of three successive time periods, with duration of T1, T2 and T3, respectively. Before the test starts the UE is connected to Cell 1, but is not aware of Cell2. The UE is only monitoring the PCC. The UE shall be continuously scheduled in the PCell throughout the whole test.

The point in time at which the MAC message is received at the UE antenna connector, in slot # denoted n, defines the start of time period T2. The UE shall be able to report valid CSI in PCell for the activated SCell at latest in slot n + $\frac{T_{\mathrm{HARQ}}+T_{\mathrm{activation_time}}+T_{\mathrm{CSI_Reporting}}}{\mathrm{NR\ slot\ length}}$, as defined in TS 38.133 [6] clause 8.3. The UE shall start reporting CSI in PCell after at least one CSI-RS transmission occasion for channel measurement and reporting after slot $n + \frac{T_{\mathrm{HARQ}}+3\mathrm{ms}}{\mathrm{NR\ slot\ length}}$ and shall report CQI index 0 (out-of-range) until the SCell activation has been completed. Any PCell interruption due to activation of SCell shall occur in the slot $n + 1 + \frac{T_{\mathrm{HARQ}}}{\mathrm{NR\ slot\ length}}$ to $n + 1 + \frac{T_{\mathrm{HARQ}}+3\mathrm{ms}+T_{\mathrm{X}}}{\mathrm{NR\ slot\ length}} + N_{\mathrm{interruption}}$, as defined in TS 38.133 [6] clause 8.3, where $N_{\mathrm{interruption}}$ is the interruption length given in TS 38.133 [6] clause 8.2.

Time period T3 starts when a MAC message for deactivation of SCell, sent from the test equipment to the UE in a slot # denoted m, is received at the UE antenna connector. The UE shall carry out deactivation of the SCell in a slot m + $\frac{\mathrm{T_{HARQ}}+3ms}{NR\ slot\ length}$, as defined in TS 38.133 [6] clause 8.3, and The starting point of any PCell interruption due to the deactivation shall occur in the slot m + 1 + $\frac{\mathrm{T_{HARQ}}}{NR\ slot\ length}$ to m + 1 + $\frac{\mathrm{T_{HARQ}}+3\mathrm{ms}}{NR\ slot\ length}$, as defined in TS 38.133 [6] clause 8.3.

1. Ensure the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity *NR*, Connected without release *On* and Test Mode *On* according to TS 38.508-1 [14] clause 4.5.

2. Set the parameters according to T1 in Tables 6.5.3.1.4.1-3 and 6.5.3.1.5**-**1. Propagation conditions are set according to Annex C clauses C.2.2..

3. T1 starts. Immediately after, the SS shall configure SCell (Cell 2) on the SCC as per TS 38.508-1 [14] clause 7.5.1 and provide measurement configurations.

3a. The UE sends a *MeasurementReport* message.

4. The SS shall configure transmission of PDSCH with a maximum number of 1 HARQ transmission.

5. The SS activates SCC by sending the activation MAC-CE (Refer TS 38.321 [12], clauses 5.9, 6.1.3.10) in a slot # denoted n and T2 starts in slot n. If the SS receives ACK for MAC-CE sent by the UE, the test proceeds to step 6, otherwise go to step 9.

6. After at least one CSI-RS transmission occasion for channel measurement, the UE shall start sending CSI reports for SCell and the SS shall monitor CSI reports for SCell sent from the UE and ACK/NACK sent in PCell according to the following criteria:

   - If the first CSI report for SCell is received by the SS no later than slot *s* = n + 1 + $\frac{\mathrm{T_{HARQ}}+3\mathrm{ms}+T_{\mathrm{CSI_Reporting}}}{NR\ slot\ length}$,

     - or slot $n + 1 + \frac{T_{HARQ}+3ms+T_{CSI_Reporting}+T_X}{NR\ slot\ length} + N_{interruption} + 1$ if the slot *s* was subject to interruption,

     - or the next CSI report occasion if there is no CSI report occasion in slots *s* or *s'*,

   - and CSI report with non-zero CQI index is received by the SS earlier than or equal to slot n + $\frac{T_{\mathrm{HARQ}}+T_{\mathrm{activation_time}}+T_{\mathrm{CSI_Reporting}}}{\mathrm{NR\ slot\ length}}$,

     - or the next available uplink resource if there are no uplink resources for reporting the valid CSI in a slot n + $\frac{T_{\mathrm{HARQ}}+T_{\mathrm{activation_time}}+T_{\mathrm{CSI_Reporting}}}{\mathrm{NR\ slot\ length}}$

   - and DTX is not observed by the SS outside the slot $n + 1 + \frac{T_{\mathrm{HARQ}}}{\mathrm{NR\ slot\ length}}$ to $n + 1 + \frac{T_{HARQ}+3ms+T_X}{NR\ slot\ length} + N_{interruption} + \frac{T_{HARQ}}{NR\ slot\ length}$ up to the end of T2

   - Then the number of successes for the event “Activation” is increased by one. Otherwise, count a fail for the event “Activation” and go to step 9.

7. When T2 expires, the SS deactivate SCC by sending the deactivation MAC-CE (Refer TS 38.321 [12], clauses 5.9, 6.1.3.10) in a slot # denoted m and T3 starts in slot m. If the SS receives ACK for MAC-CE sent by the UE, the test proceeds to step 8, otherwise go to step 9.

8. The UE shall stop sending CSI reports for SCell and the SS shall monitor CSI reports for SCell sent from the UE and ACK/NACK sent in PCell during SCell deactivation.

   - If the last CSI report is received by the SS earlier than or equal to slot m + $\frac{\mathrm{T_{HARQ}}+3ms}{NR\ slot\ length}$

   - and DTX is not observed by the SS outside the slot m + 1 + $\frac{\mathrm{T_{HARQ}}}{NR\ slot\ length}$ to $m + 1 + \frac{T_{HARQ}+3ms}{NR\ slot\ length} + N_{interruption} + \frac{T_{HARQ}}{NR\ slot\ length}$ up to the end of T3,

- Then the number of successes for the event “Deactivation” is increased by one. Otherwise, count a fail for the event “Deactivation”.

9. When T3 expires, or Activation in step 5 was not acknowledged, or a fail was counted for the event “Activation” in step 6, or Deactivation in step 7 was not acknowledged, the SS shall transmit a RRCRelease message to release the RRC connection which includes the release of the established radio bearers as well as all radio resources.

10. Set Cell 2 physical cell identity = ((current cell 2 physical cell identity + 1) mod 1008) for next iteration of the test procedure loop.

11. After the RRC connection release, the SS:
    - transmits in Cell 1 a Paging message (including PagingRecord with UE-Identity) for the UE and ensures the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity NR, Connected without release *On* and Test Mode *On* according to TS 38.508-1 [14] clause 4.5 (if the paging fails, switches off and on the UE and ensures the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity NR, Connected without release *On* and Test Mode *On* according to TS 38.508-1 [14] clause 4.5),
    or
    - switches off and on the UE and ensures the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity NR, Connected without release *On* and Test Mode *On* according to TS 38.508-1 [14] clause 4.5.

12. Repeat steps 2-11 until a test verdict has been achieved.

Each of the events “Activation” and “Deactivation” is evaluated independently for the statistic, resulting in an event verdict: pass or fail. Each event is evaluated only until the confidence level according to Table G.2.3-1 in Annex G.2 is achieved. Different events may require different times for a verdict.
If all events pass, the test passes. If one event fails, the test fails.

6.5.3.1.4.3 Message contents

Message contents are according to TS 38.508-1 [14] clause 7.3 with condition SCELL_CSI_ON_SPCELL with the following exceptions:

Table 6.5.3.1.4.3-1: Common Exception messages

Default Message Contents	
Common contents of system information blocks exceptions	
Default RRC messages and information elements contents exceptions	Table H.3.1-7 with Condition Deactivated SCell;

Table 6.5.3.1.4.3-2: *RRCReconfiguration*: SCell addition

Derivation Path: TS 38.508-1 [14], Table 4.6.1-13 with condition NR_MEAS and SCell_add			
Information Element	**Value/remark**	**Comment**	**Condition**
RRCReconfiguration ::= SEQUENCE {			
criticalExtensions CHOICE {			
rrcReconfiguration ::= SEQUENCE {			
measConfig	MeasConfig	Table 6.5.3.1.4.3-2A	
nonCriticalExtension SEQUENCE {			
masterCellGroup	CellGroupConfig-SCell	Table 6.5.3.1.4.3-5	
}			
}			
}			
}			

Table 6.5.3.1.4.3-2A: MeasConfig (Table 6.5.3.1.4.3-2)

Derivation path: Table H.3.1-2 with condition Deactivated SCell			
Information Element	**Value/Remark**	**Comment**	**Condition**
measConfig ::= SEQUENCE {			

measObjectToAddModList SEQUENCE (SIZE (1..maxNrofMeasId)) OF SEQUENCE {	2 entries		
measObject[2] CHOICE {			
measObjectNR	MeasObjectNR for SCell	entry 2 Table 6.5.3.1.4.3-3	
}			
}			
reportConfigToAddModList SEQUENCE (SIZE (1..maxReportConfigId)) OF ReportConfigToAddMod {	1 entry		
ReportConfigToAddMod[1] SEQUENCE {		entry 1	
reportConfigId	ReportConfigId		
reportConfig CHOICE {			
reportConfigNR	ReportConfigNR	Table 6.5.3.1.4.3-4	
}			
}			
}			
}			

Table 6.5.3.1.4.3-3: MeasObjectNR for SCell

Derivation Path: Table H.3.1-3 with condition Deactivated SCell and Synchronous cells			
Information Element	**Value/remark**	**Comment**	**Condition**
MeasObjectNR::= SEQUENCE {			
smtc1	SSB-MTC specified in TS 38.508-1 [14] Table 7.3.1-3 with condition SMTC.1		
measCycleSCell-v1530	sf160		
}			

Table 6.5.3.1.4.3-4: ReportConfigNR

Derivation Path: Table H.3.1-4			
Information Element	**Value/remark**	**Comment**	**Condition**
ReportConfigNR::= SEQUENCE {			
reportType CHOICE {			
eventTriggered SEQUENCE {			
eventId CHOICE {			
eventA3 SEQUENCE {			
a3-Offset CHOICE {			
rsrp	-30	To ensure reporting can always be triggered	
}			
}			
}			
}			
}			
}			

Table 6.5.3.1.4.3-5: CellGroupConfig-SCell (Table 6.5.3.1.4.3-2)

Derivation Path: TS 38.508-1 [14], Table 4.6.3-19 with condition MEAS and SCell_add			
Information Element	**Value/remark**	**Comment**	**Condition**
CellGroupConfig ::= SEQUENCE {			
spCellConfig SEQUENCE {			
servCellIndex	Not present	PCell always uses servCellIndex=0	
reconfigurationWithSync	Not present		
rlf-TimersAndConstants	Not present		
rlmInSyncOutOfSyncThreshold	Not present		
spCellConfigDedicated	ServingCellConfig-SpCell	Table 6.5.3.1.4.3-	

		6	
}			
sCellToAddModList SEQUENCE (SIZE (1..maxNrofSCells)) OF SCellConfig {	1 entry		
SCellConfig[1] SEQUENCE {		entry 1	
sCellConfigDedicated	ServingCellConfig-SCell	Table 6.5.3.1.4.3-7	
smtc	SSB-MTC specified in TS 38.508-1 [14] Table 7.3.1-3 with condition SMTC.1		
}			
}			
}			

Table 6.5.3.1.4.3-6: ServingCellConfig-SpCell (Table 6.5.3.1.4.3-5)

Derivation Path: TS 38.508-1 [14], Table 4.6.3-167 with condition MEAS			
Information Element	**Value/remark**	**Comment**	**Condition**
ServingCellConfig ::= SEQUENCE {			
csi-MeasConfig	CSI-MeasConfig for RRM specified in TS 38.508-1 [14] Table 7.3.1-6		
servingCellMO	1		
}			

Table 6.5.3.1.4.3-7: ServingCellConfig-SCell (Table 6.5.3.1.4.3-5)

Derivation Path: TS 38.508-1 [14], Table 4.6.3-167 with condition No_UL			
Information Element	**Value/remark**	**Comment**	**Condition**
ServingCellConfig ::= SEQUENCE {			
csi-MeasConfig	CSI-MeasConfig for RRM specified in TS 38.508-1 [14] Table 7.3.1-6		
servingCellMO	2		
}			

6.5.3.1.5 Test requirement

Table 6.5.3.1.5-1 and Table 6.5.3.1.5-2 defines the primary level settings including test tolerances for all tests.

Table 6.5.3.1.5-1: Cell specific test parameters for NR PCell for known FR1 SCell activation case, 160ms SCell measurement cycle

Parameter		Unit	Cell 1		
			T1	T2	T3
Duplex mode	Config 1		FDD		
	Config 2,3		TDD		
TDD configuration	Config 1		Not applicable		
	Config 2		TDDConf.1.1		
	Config 3		TDDConf.2.1		
$BW_{channel}$		MHz	Note 7		
$BW_{occupied}$	Config 1,2	RB	52 Note 5		
	Config 3		106 Note 6		
Initial BWP configuration			DLBWP.0.1		
TCI state			TCI.State.0		
TRS Configuration	Config 1		TRS.1.1 FDD		
	Config 2		TRS.1.1 TDD		
	Config 3		TRS.1.2 TDD		
PDSCH Reference measurement channel	Config 1		SR.1.1 FDD		
	Config 2		SR.1.1 TDD		
	Config 3		SR.2.1 TDD		
Dedicated CORESET	Config 1		CCR.1.1 FDD		

parameters	Config 2		CCR.1.1 TDD
	Config 3		CCR.2.1 TDD
RMSI CORESET parameters	Config 1		CR.1.1 FDD
	Config 2		CR.1.1 TDD
	Config 3		CR.2.1 TDD
OCNG Patterns	Config 1,2		OP.1 Note 5
	Config 3,		OP.1 Note 6
SSB Configuration	Config 1,2		SSB.1 FR1
	Config 3		SSB.2 FR1
CSI-RS configuration for CSI reporting Note 8	Config 1		CSI-RS.1.1 FDD
	Config 2		CSI-RS.1.1 TDD
	Config 3		CSI-RS.2.1 TDD
SMTC configuration			SMTC.1
reportConfigType			periodic
reportQuantity			cri-RI-PMI-CQI
CSI reporting periodicity	Config 1,2	slot	5
	Config 3		10
CSI reporting offset	Config 1,2	slot	3
	Config 3		5
EPRE ratio of PSS to SSS		dB	0
EPRE ratio of PBCH DMRS to SSS			
EPRE ratio of PBCH to PBCH DMRS			
EPRE ratio of PDCCH DMRS to SSS			
EPRE ratio of PDCCH to PDCCH DMRS			
EPRE ratio of PDSCH DMRS to SSS			
EPRE ratio of PDSCH to PDSCH			
EPRE ratio of OCNG DMRS to SSS Note 1			
EPRE ratio of OCNG to OCNG DMRS Note 1			
N_{oc} Note2	Config 1,2	dBm/SCS	-104
	Config 3		-101
$\hat{E}_s/I_{ot}$		dB	17
$\hat{E}_s/N_{oc}$		dB	17
SS-RSRP Note3	Config 1,2	dBm/SCS	-87
	Config 3		-84
SCH_RP Note 3		dBm/15 kHz	-87
Io Note3	Config 1,2	dBm/ 9.36MHz	-58.96
	Config 3	dBm/ 38.16MHz	-52.87
Propagation condition		-	AWGN

Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.

Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for N_{oc} to be fulfilled within $BW_{occupied}$.

Note 3: SS-RSRP and SCH_RP levels have been derived from other parameters for information purposes. They are not settable parameters themselves.

Note 4: The uplink resources for CSI reporting are assigned to the UE prior to the start of time period T2.

Note 5: All UL/DL transmission shall be confined within $BW_{occupied}$ (i.e. 10 MHz, 52 RBs) from $F_{C,low}$, and Io is independent of the $BW_{channel}$ configured.

Note 6: All UL/DL transmission shall be confined within $BW_{occupied}$ (i.e. 40 MHz, 106 RBs) from $F_{C,low}$, and Io is independent of the $BW_{channel}$ configured.

Note 7: $N_{RB,c}$. is derived from Table 5.3.2-1 in TS38.101-1[2] with configured $BW_{channel}$.

Note 8: On top of the reference configurations, CSI-RS offset should be set to meet the CSI reference resource timing definition in TS 38.214 cl. 5.2.2.5.

Table 6.5.3.1.5-2: Cell specific test parameters for NR SCell for known FR1 SCell activation case, 160ms SCell measurement cycle

Parameter		Unit	Cell 2		
			T1	T2	T3
Duplex mode	$Config_{SCell}$ 1		FDD		
	$Config_{SCell}$ 2,3		TDD		

TDD configuration	Config$_{SCell}$ 1		Not applicable
	Config$_{SCell}$ 2		TDDConf.1.1
	Config$_{SCell}$ 3		TDDConf.2.1
$BW_{channel}$		MHz	Note 7
$BW_{occupied}$	Config$_{SCell}$ 1,2	RB	52 Note 5
	Config$_{SCell}$ 3		106 Note 6
Initial BWP configuration			DLBWP.0.1
TCI state			TCI.State.0
TRS Configuration	Config$_{SCell}$ 1		TRS.1.1 FDD
	Config$_{SCell}$ 2		TRS.1.1 TDD
	Config$_{SCell}$ 3		TRS.1.2 TDD
PDSCH Reference measurement channel	Config$_{SCell}$ 1		N/A
	Config$_{SCell}$ 2		N/A
	Config$_{SCell}$ 3		N/A
Dedicated CORESET parameters	Config$_{SCell}$ 1		N/A
	Config$_{SCell}$ 2		N/A
	Config$_{SCell}$ 3		N/A
RMSI CORESET parameters	Config$_{SCell}$ 1		N/A
	Config$_{SCell}$ 2		N/A
	Config$_{SCell}$ 3		N/A
OCNG Patterns	Config$_{SCell}$ 1,2		OP.1 Note 5
	Config$_{SCell}$ 3,		OP.1 Note 6
SSB Configuration	Config$_{SCell}$ 1,2		SSB.1 FR1
	Config$_{SCell}$ 3		SSB.2 FR1
CSI-RS configuration for CSI reporting Note 8	Config$_{SCell}$ 1		CSI-RS.1.1 FDD
	Config$_{SCell}$ 2		CSI-RS.1.1 TDD
	Config$_{SCell}$ 3		CSI-RS.2.1 TDD
SMTC configuration			SMTC.1
reportConfigType			N/A
reportQuantity			N/A
CSI reporting periodicity	Config$_{SCell}$ 1,2	slot	N/A
	Config$_{SCell}$ 3		N/A
CSI reporting offset	Config$_{SCell}$ 1,2	slot	N/A
	Config$_{SCell}$ 3		N/A
EPRE ratio of PSS to SSS		dB	0
EPRE ratio of PBCH DMRS to SSS			
EPRE ratio of PBCH to PBCH DMRS			
EPRE ratio of PDCCH DMRS to SSS			
EPRE ratio of PDCCH to PDCCH DMRS			
EPRE ratio of PDSCH DMRS to SSS			
EPRE ratio of PDSCH to PDSCH			
EPRE ratio of OCNG DMRS to SSS Note 1			
EPRE ratio of OCNG to OCNG DMRS Note 1			
N_{oc} Note2	Config$_{SCell}$ 1,2	dBm/SCS	-104
	Config$_{SCell}$ 3		-101
$\hat{E}_s/I_{ot}$		dB	17
$\hat{E}_s/N_{oc}$		dB	17
SS-RSRP Note3	Config$_{SCell}$ 1,2	dBm/SCS	-87
	Config$_{SCell}$ 3		-84
SCH_RP Note 3		dBm/15 kHz	-87
Io Note3	Config$_{SCell}$ 1,2	dBm/ 9.36MHz	-58.96
	Config$_{SCell}$ 3	dBm/ 38.16MHz	-52.87
Propagation condition		-	AWGN

Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.

Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for N_{oc} to be fulfilled within $BW_{occupied}$.

Note 3: SS-RSRP and SCH_RP levels have been derived from other parameters for information purposes. They are not settable parameters themselves.

Note 4: The uplink resources for CSI reporting are assigned to the UE prior to the start

	of time period T2.
Note 5:	All UL/DL transmission shall be confined within $BW_{occupied}$ (i.e. 10 MHz, 52 RBs) from $F_{C,low}$, and Io is independent of the $BW_{channel}$ configured.
Note 6:	All UL/DL transmission shall be confined within $BW_{occupied}$ (i.e. 40 MHz, 106 RBs) from $F_{C,low}$, and Io is independent of the $BW_{channel}$ configured.
Note 7:	$N_{RB,c}$. is derived from Table 5.3.2-1 in TS38.101-1[2] with configured $BW_{channel}$.
Note 8:	On top of the reference configurations, CSI-RS offset should be set to meet the CSI reference resource timing definition in TS 38.214 cl. 5.2.2.5.

During T2 the UE shall send the first CSI report for SCell no later than the first available uplink resource after at least one CSI-RS transmission occasion for channel measurement and reporting after slot $n + 1 + \frac{T_{HARQ}+3ms}{NR\ slot\ length}$ UE is allowed to postpone CSI report to next available uplink resource if an available uplink resource is subject to interruption. Whether CSI report in slot $n + 1 + \frac{T_{HARQ}+3ms+T_{CSI_Reporting}}{NR\ slot\ length}$ was interrupted or not is checked by monitoring ACK/NACK sent in PCell in slot $n + 1 + \frac{T_{HARQ}+3ms+T_{CSI_Reporting}}{NR\ slot\ length}$.

During T2 the UE shall start sending CSI reports for SCell with non-zero CQI index at latest in a slot $n + \frac{T_{HARQ}+T_{activtion_time}+T_{CSI_Reporting}}{NR\ slot\ length}$, $T_{activation_time} = T_{FirstSSB} + 5ms$, as defined in TS 38.133 [6] section 8.3.

During T2 interruption of PCell/PSCell during SCell activation shall not happen outside the slot $n + 1 + \frac{T_{HARQ}}{\text{NR slot length}}$ to $n + 1 + \frac{T_{HARQ}+3ms+T_X}{\text{NR slot length}} + N_{interruption}$, as defined in TS 38.133 [6] section 8.3.

Figures 6.5.3.1.5-1 shows the derivation of the Test procedure requirement for DTX during T2, based on the core requirements for interruption.

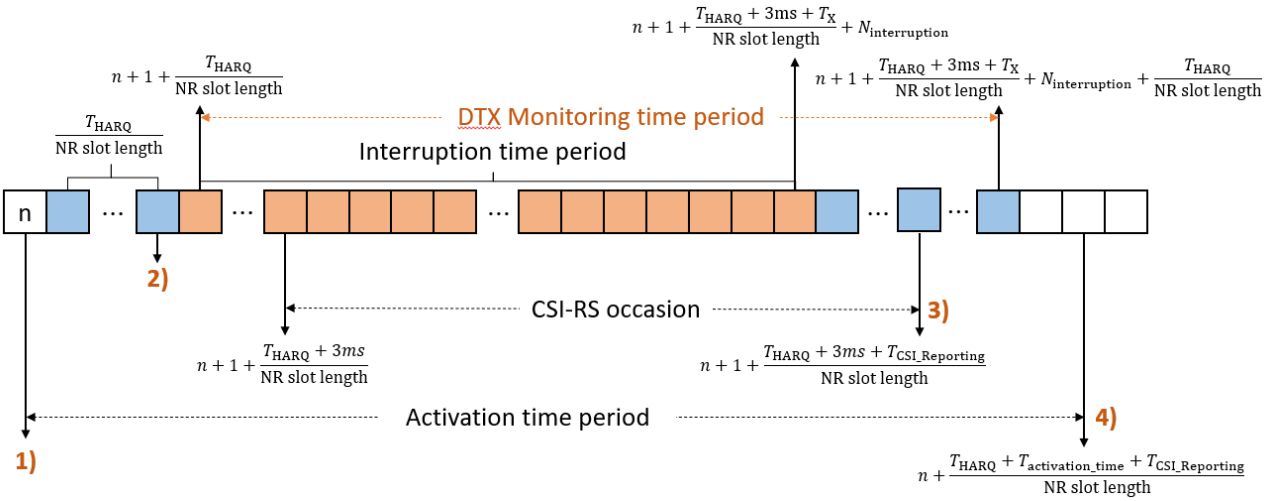


Figure 6.5.3.1.5-1: Procedure derivation for Activation

1) Activation command for SCell
2) ACK for MAC-CE for SCell1 activation
3) First CSI report timing (could be invalid CQI)
4) First non-zero CSI report transmission

During T3 the UE shall stop sending CSI reports for SCell at latest in a slot $m + \frac{T_{HARQ}+3ms}{NR\ slot\ length}$, as defined in TS 38.133 [6] section 8.3.

During T3 interruption of PCell during SCell deactivation shall not happen outside the slot $m + 1 + \frac{T_{HARQ}}{NR\ slot\ length}$ to $m + 1 + \frac{T_{HARQ}+3ms}{NR\ slot\ length}$, as defined in TS 38.133 [6] section 8.3.

Figures 6.5.3.1.5-2 shows the derivation of the Test procedure requirement for NR PSCell DTX during T3, based on the core requirements for interruption.

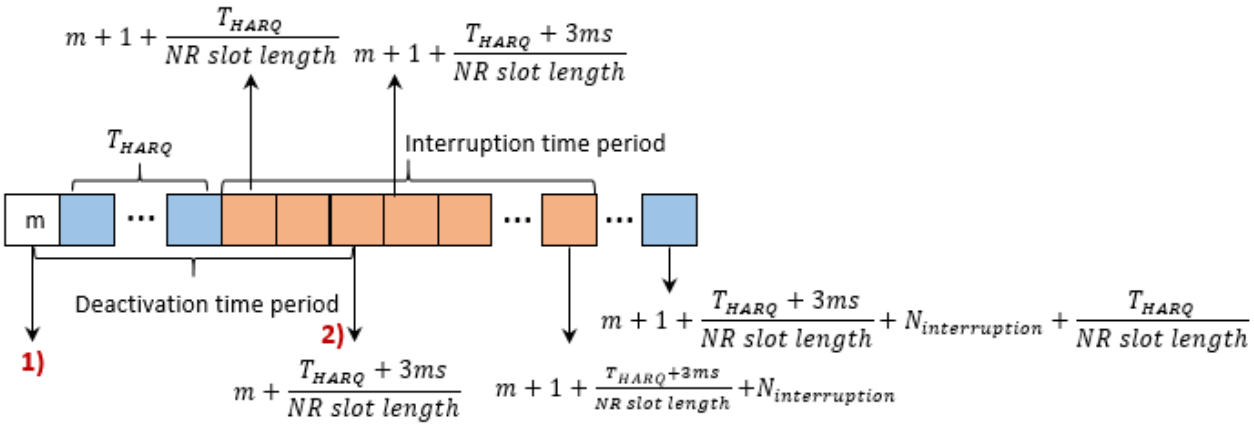


Figure 6.5.3.1.5-2: Procedure derivation for Deactivation

1) Deactivation command for SCell

2) Latest slot stop sending CSI reports for SCell

The interruption on any activated serving cell shall not be more than the values specified for SA in TS 38.133 [6] clause 8.2.2.2.2.

All of the above test requirements shall be fulfilled in order for the observed SCell activation delay and SCell deactivation delay to be counted as correct. The rate of correct observed SCell activation delay and SCell deactivation delay during repeated tests shall be at least 90%.

NOTE: During T2 if there are no uplink resources for reporting the valid CSI in a slot n + $\frac{T_{HARQ}+T_{activtion_time}+T_{CSI_Reporting}}{NR\ slot\ length}$ as defined in TS 38.133 [6] section 8.3 then the UE shall use the next available uplink resource for reporting the corresponding valid CSI.

6.5.3.2 NR SA FR1 SCell activation and deactivation of known SCell in non-DRX for 640ms SCell measurement cycle

6.5.3.2.1 Test purpose

This test is to verify that the SCell activation and deactivation times are within the requirements in TS 38.133 [6] clause 8.3, when the SCell in FR1 is known by the UE at the time of activation.

6.5.3.2.2 Test applicability

This test applies to all types of NR UE from Release 15 onwards and supporting 2DL CA.

6.5.3.2.3 Minimum conformance requirements

The minimum conformance requirements are defined in clause 6.5.3.0.1.

The normative reference for this requirement is TS 38.133 [6] clause A.6.5.3.2.

6.5.3.2.4 Test description

6.5.3.2.4.1 Initial conditions

Same initial conditions as described in section 6.5.3.1.4.1 with following exception:

- The listed parameter values in Tables 6.5.3.2.4.1-2 will replace the values of corresponding parameters in Tables 6.5.3.1.4.1-3.

Table 6.5.3.2.4.1-1: Void

Table 6.5.3.2.4.1-2: General test parameters for known FR1 SCell activation case, 640ms SCell measurement cycle

Parameter	Unit	Value	Comment
SCell measurement cycle (measCycleSCell)	ms	640	

6.5.3.2.4.2 Test procedure

Same test procedure as described in section 6.5.3.1.4.2.

6.5.3.2.4.3 Message contents

Same message contents as described in section 6.5.3.1.4.3 with following exception:

- Table 6.5.3.1.4.3-3 is replaced by Table 6.5.3.2.4.3-1.

Table 6.5.3.2.4.3-1: MeasObjectNR for SCell

Derivation Path: Table H.3.1-3 with condition Deactivated SCell and Synchronous cells			
Information Element	**Value/remark**	**Comment**	**Condition**
MeasObjectNR::= SEQUENCE {			
smtc1	SSB-MTC specified in TS 38.508-1 [14] Table 7.3.1-3 with condition SMTC.1		

6.5.3.2.5 Test requirement

Same test requirement as described in section 6.5.3.1.5, except $T_{activation_time}$ will be replaced with the value $T_{FirstSSB_MAX} + T_{rs} + 5ms$.

6.5.3.3 NR SA FR1 SCell activation and deactivation of unknown SCell in non-DRX

6.5.3.3.1 Test purpose

This test is to verify that the SCell activation and deactivation times are within the requirements stated in TS 38.133 [6] clause 8.3, when the SCell in FR1 is unknown by the UE at the time of activation.

6.5.3.3.2 Test applicability

This test applies to all types of NR UE from Release 15 onwards and supporting 2DL CA.

6.5.3.3.3 Minimum conformance requirements

The minimum conformance requirements are defined in clause 6.5.3.0.1.

The normative reference for this requirement is TS 38.133 [6] clause A.6.5.3.3.

6.5.3.3.4 Test description

6.5.3.3.4.1 Initial conditions

Same initial conditions as described in section 6.5.3.1.4.1 with following exception:

- The listed parameter values in Tables 6.5.3.3.4.1-2 will replace the values of corresponding parameters in Tables 6.5.3.1.4.1-3.

Table 6.5.3.3.4.1-1: Void

Table 6.5.3.3.4.1-2: General test parameters for unknown FR1 SCell activation case, 160ms SCell measurement cycle

Parameter	Unit	Value	Comment
T1	ms	100	During this time the PSCell shall be known and the SCell configured, but not detected.

6.5.3.3.4.2 Test procedure

Same test procedure as described in section 6.5.3.1.4.2, except step3 and step 5 are replaced by following steps:

3. T1 starts. Immediately after, the SS shall configure SCell (Cell 2) on the SCC as per TS 38.508-1 [14] clause 7.5.1. The SCell (Cell 2) shall be powered OFF till T2 starts.

5. The SS activates SCC by sending the activation MAC-CE (Refer TS 38.321 [12], clauses 5.9, 6.1.3.10) in a slot # denoted n, power ON the SCell (Cell2), T2 starts in slot n. If the SS receives ACK for MAC-CE sent by the UE, the test proceeds to step 6, otherwise go to step 9.

and,

- step 3a is removed.

6.5.3.3.4.3 Message contents

Message contents are according to TS 38.508-1 [14] clause 7.3 with condition SCELL_CSI_ON_SPCELL with the following exceptions:

Table 6.5.3.3.4.3-1: *RRCReconfiguration* in step 3: SCell addition

Derivation Path: TS 38.508-1 [14], Table 4.6.1-13 with condition SCell_add			
Information Element	**Value/remark**	**Comment**	**Condition**
RRCReconfiguration ::= SEQUENCE {			
criticalExtensions CHOICE {			
rrcReconfiguration ::= SEQUENCE {			
nonCriticalExtension SEQUENCE {			
masterCellGroup	CellGroupConfig	Table 6.5.3.3.4.3-2	
}			
}			
}			
}			

Table 6.5.3.3.4.3-2: CellGroupConfig (Table 6.5.3.3.4.3-1)

Derivation Path: TS 38.508-1 [14], Table 4.6.3-19 with condition SCell_add			
Information Element	**Value/remark**	**Comment**	**Condition**
CellGroupConfig ::= SEQUENCE {			
spCellConfig SEQUENCE {			
spCellConfigDedicated	ServingCellConfig-SpCell	Table 6.5.3.3.4.3-3	
}			
sCellToAddModList SEQUENCE (SIZE (1..maxNrofSCells)) OF SCellConfig {	1 entry		
SCellConfig[1] SEQUENCE {		entry 1	
sCellConfigDedicated	ServingCellConfig-SCell	Table 6.5.3.3.4.3-4	
smtc	SSB-MTC specified in TS 38.508-1 [14] Table 7.3.1-3 with condition SMTC.1		
}			
}			
}			

Table 6.5.3.3.4.3-3: ServingCellConfig-SpCell (Table 6.5.3.3.4.3-2)

Derivation Path: TS 38.508-1 [14], Table 4.6.3-167			
Information Element	**Value/remark**	**Comment**	**Condition**
ServingCellConfig ::= SEQUENCE {			
csi-MeasConfig	CSI-MeasConfig for RRM specified in TS 38.508-1 [14] Table 7.3.1-6		
}			

Table 6.5.3.3.4.3-4: ServingCellConfig-SCell (Table 6.5.3.3.4.3-2)

Derivation Path: TS 38.508-1 [14], Table 4.6.3-167 with condition No_UL			
Information Element	**Value/remark**	**Comment**	**Condition**
ServingCellConfig ::= SEQUENCE {			
csi-MeasConfig	CSI-MeasConfig for RRM specified in TS 38.508-1 [14] Table 7.3.1-6		
}			

6.5.3.3.5 Test requirement

Same test requirement as described in section 6.5.3.1.5, except $T_{activation_time}$ will be replaced with the value $T_{FirstSSB_MAX}$ + T_{SMTC_MAX} + 2*T_{rs} + 5ms

6.5.3.4 Direct SCell activation at SCell addition of known SCell in FR1

Editor's note: This test case is incomplete. The following aspects are missing

- Test Tolerances and measurement uncertainty are missing

- CSI-RS config is missing

6.5.3.4.1 Test purpose

The purpose of this test is to verify that the direct SCell activation delay and interruption is within the requirements, when the SCell in FR1 is known by the UE at the time of activation.

6.5.3.4.2 Test applicability

This test applies to all types of NR UE from Release 15 onwards and supporting 2DL CA.

6.5.3.4.3 Minimum conformance requirements

The minimum conformance requirements are defined in clause 6.5.3.0.1.

The normative reference for this requirement is TS 38.133 [6] clause A.6.5.3.4.

6.5.3.4.4 Test description

6.5.3.4.4.1 Initial conditions

This test shall be tested using any of the test configurations in this clause. The supported test configurations for NR PCell are shown in Table 6.5.3.4.4.1-1. Supported test configurations for NR SCell are shown in Table 6.5.3.4.4.1-1A. Test configuration for NR PCell and test configuration for NR SCell are chosen independently.

Table 6.5.3.4.4.1-1: supported test configurations for NR PCell

Config	Description
6.5.3.1-1	NR 15 kHz SSB SCS, ≥10 MHz bandwidth, FDD duplex mode
6.5.3.1-2	NR 15 kHz SSB SCS, ≥10 MHz bandwidth, TDD duplex mode
6.5.3.1-3	NR 30 kHz SSB SCS, ≥40 MHz bandwidth, TDD duplex mode
Note 1: The UE is only required to be tested in one of the supported test configurations. Note 2: The UE is only required to be tested in one with smallest aggregated channel bandwidth from supported band combinations which is composed of CCs ≥ the bandwidth ($BW_{channel}$) defined in	

each test configuration.

Table 6.5.3.4.4.1-1A: Supported test configurations for NR PSCell

$Config_{SCell}$	Description
1	NR 15 kHz SSB SCS, ≥10 MHz bandwidth, FDD duplex mode
2	NR 15 kHz SSB SCS, ≥10 MHz bandwidth, TDD duplex mode
3	NR 30 kHz SSB SCS, ≥40 MHz bandwidth, TDD duplex mode
Note 1: The UE is only required to be tested in one of the supported test configurations Note 2: The UE is only required to be tested in one with smallest aggregated channel bandwidth from supported band combinations which is composed of CCs ≥ the bandwidth ($BW_{channel}$) defined in each test configuration,	

Configure the test equipment and the DUT according to the parameters in Table 6.5.3.4.4.1-2 and Table 6.5.3.4.4.1-3.

Table 6.5.3.4.4.1-2: Initial conditions for known FR1 SCell activation case

Parameter	Value		Comment
Test environment	NC		As specified in TS 38.508-1 [14] clause 4.1.
Test frequencies	As specified in Annex E, Table E.4-1 and TS 38.508-1 [14] clause 4.3.1.		
Channel bandwidth	As specified by the test configuration selected from Table 6.5.3.4.5-1		
Propagation conditions	AWGN		As specified in Annex C.2.2.
Connection Diagram	TE Part	A.3.1.7.1	As specified in TS 38.508-1 [14] Annex A.
	DUT Part	A.3.2.3.1	
Exceptions to connection diagram	- Without LTE link - For 4Rx capable UEs without any 2Rx RF bands use A.3.2.5.2 for DUT part and A.3.1.8.4 for TE part.		

Table 6.5.3.4.4.1-3: General test parameters for known FR1 SCell activation case

Parameter	Unit	Value	Comment
NR RF Channel Number		1, 2	Two NR radio channels are used for this test
Active PCell		Cell 1	Primary cell on NR RF channel number 1.
Inter-frequency neighbour cell (SCell to-be)		Cell 2	Inter-frequency neighbour cell on NR RF channel number 2
CP length		Normal	
DRX		OFF	Continuous monitoring of primary cell
Measurement gap pattern		gp0	Measurement gap is used during parts of time period T1 for detection of Cell 2.
CSI reporting periodicity	ms	2	CSI reporting periodicity for periodic reporting of CQI for PCell and, when added, SCell.
SCell measurement cycle (measCycleSCell)	ms	160	Measurement cycle for SCell does not come into effect in direct activation at SCell addition.
Timing offset between Cell 1 and Cell 2	µs	≤ MRTD	The value of maximum timing offset depends upon the carrier aggregation scenario.
T1	s	7	During this time period the PCell shall be known and Cell 2 shall be detected as an inter-frequency neighbour cell.
T2	s	1	During this time period Cell 2 shall be configured and directly activated as SCell.

1. Message contents are defined in clause 6.5.3.4.4.3.

2.There are two NR carriers, each with one cell. Cell 1 is NR FR1 PCell and Cell 2 is the SCell. Cell 1 and Cell 2 are configured according to Annex C.1.2 and C.1.3.

6.5.3.4.4.2 Test procedure

The test consists of two successive time periods with duration T1 and T2, respectively. There are two carriers, each with one cell. Cell 1 (PCell) is on RF channel 1 (PCC), and Cell 2 (SCell) is on RF channel 2 (SCC). Cell 1 and Cell 2 both operate according to one of the configurations in Table 6.5.3.4.4.1-1. Before the test starts the UE is connected to Cell 1 on RF channel 1. The UE is only monitoring RF channel 1 and is not aware of Cell 2 on RF channel 2. The UE is continuously scheduled in PCell throughout the test.

At the beginning of T1 the UE is configured to measure RF channel 2 in measurement gaps. During T1, the UE detects and measures Cell 2 on RF channel 2 and sends a measurement report containing Cell 2 to the test equipment. After having received a measurement report containing Cell 2, the test equipment deconfigures the measurement gaps and thereafter sends a RRCReconfiguration message to the UE by which it configures the SCell (Cell 2) in activated state (*sCellState* is set to *activated*). The time between reception of the last measurement report carrying SCell and transmission of the RRCReconfiguration message directly activating SCell is kept short enough to allow the SCell to remain known to the UE.

Time period T2 starts when the UE receives the RRC connection reconfiguration message at the UE antenna connector. The corresponding slot at which the message is received at the UE antenna connector is denoted *m*. The UE shall complete activation of the SCell no later than in slot $m + \frac{N_{direct}}{\text{NR slot length}}$, where N_{direct} is defined as the time taken for direct SCell activation as specified in clause 8.3.4, TS 38.133 [6]. From slot $m+ \frac{N_{direct}}{\text{NR slot length}}$ and onwards the UE shall report valid CSI both for PCell and SCell. The test equipment verifies the activation time by counting the slots between the RRC connection reconfiguration message is sent and until CSI report with non-zero CQI for both PCell and SCell is received. The test equipment verifies that interruptions on other serving cells are within the requirements by counting ACK/NACKs transmitted in PCell.

1. Ensure the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity *NR*, Connected without release *On* and Test Mode *On* according to TS 38.508-1 [14] clause 4.5.

2. Set the parameters according to T1 in Tables 6.5.3.4.4.1-3 and 6.5.3.4.5-1. Propagation conditions are set according to Annex C clauses C.2.2.

3. T1 starts. Immediately after, the SS shall configure SCell (Cell 2) on the SCC as per TS 38.508-1 [14] clause 7.5.1 and provide measurement configurations.

3a. The UE sends a *MeasurementReport* message.

4. The SS shall configure transmission of PDSCH with a maximum number of 1 HARQ transmission.

5. After having received a measurement report containing Cell 2, the SS activates SCC by sending a RRCReconfiguration message to the UE by which it configures the SCell (Cell 2) in activated state as defined in message contents table 6.5.3.4.4.3-5.

6. The UE shall start reporting CSI in PSCell in slot ($m+k+T_{RRC_process}$), where $T_{RRC_process}$ is the RRC procedure delay defined in clause 12 of TS 38.331 [13], and Tx is the time to the end of the first complete the SSB burst as specified in TS 38.133 [6] clause 8.3.4. UE shall report CQI index 0 (out-of-range) until the SCell activation has been completed, and the SS shall monitor CSI reports for SCell sent from the UE according to the following criteria:

   - If the first CSI report for SCell is received by the SS no later than slot $m + 1 + \frac{T_{HARQ}+T_1+ \text{TRRC_process} +T_(\text{CSI_Reporting})}{NR\ slot\ length}$,

   - or slot $m + 1 + \frac{T_{HARQ}+\text{TRRC_process}+T_(CSI_Reporting)+T_1+T_X}{NR\ slot\ length} + N_{interruption} + 1$ if the slot $m + 1 + \frac{T_{HARQ}+T_1+\text{TRRC_process}+T_(\text{CSI_Reporting})}{NR\ slot\ length}$ was subject to interruption,

   - and CSI report with non-zero CQI index is received by the SS earlier than or equal to slot $m + \frac{N_{direct}}{\text{NR slot length}}$,

- or the next available uplink resource if there are no uplink resources for reporting the valid CSI in a slot m + $\frac{N_{\text{direct}}}{\text{NR slot length}}$

- and DTX is not observed by the SS outside the slot $m + 1 + \frac{T_{\text{HARQ}}}{\text{NR slot length}}$ to $m + 1 + \frac{T_{HARQ}+\text{TRRC_process}+T_1+T_X}{NR\ slot\ length} + N_{interruption} + \frac{T_{HARQ}}{NR\ slot\ length}$ up to the end of T2

- Then the number of successes for the event "Activation" is increased by one. Otherwise, count a fail for the event "Activation" and go to step 7.

7. When T2 expires, or Activation in step 5 was not acknowledged, or a failure was counted for the event "Activation" in step 6, the SS shall transmit a RRCRelease message to release the RRC connection which includes the release of the established radio bearers as well as all radio resources.

8. Set Cell 2 physical cell identity = ((current cell 2 physical cell identity + 1) mod 1008) for next iteration of the test procedure loop.

9. After the RRC connection release, the SS:
- transmits in Cell 1 a Paging message (including PagingRecord with UE-Identity) for the UE and ensures the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity NR, Connected without release *On* and Test Mode *On* according to TS 38.508-1 [14] clause 4.5 (if the paging fails, switches off and on the UE and ensures the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity NR, Connected without release *On* and Test Mode *On* according to TS 38.508-1 [14] clause 4.5),
or
- switches off and on the UE and ensures the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity NR, Connected without release *On* and Test Mode *On* according to TS 38.508-1 [14] clause 4.5.

10. Repeat steps 2-9 until a test verdict has been achieved.

Each of the event “Activation” is evaluated independently for the statistic, resulting in an event verdict: pass or fail. Each event is evaluated only until the confidence level according to Table G.2.3-1 in Annex G.2 is achieved.

6.5.3.4.4.3 Message contents

Message contents are according to TS 38.508-1 [14] clause 7.3 with the following exceptions:

Table 6.5.3.4.4.3-1: Common Exception messages

Default Message Contents	
Common contents of system information blocks exceptions	
Default RRC messages and information elements contents exceptions	Table H.3.1-7 with Condition Deactivated SCell;

Table 6.5.3.4.4.3-2: *RRCReconfiguration*: SCell addition

Derivation Path: TS 38.508-1 [14], Table 4.6.1-13 with condition NR_MEAS and SCell_add			
Information Element	**Value/remark**	**Comment**	**Condition**
RRCReconfiguration ::= SEQUENCE {			
criticalExtensions CHOICE {			
rrcReconfiguration ::= SEQUENCE {			
measConfig	MeasConfig	Table 6.5.3.4.4.3-2A	
nonCriticalExtension SEQUENCE {			
masterCellGroup	CellGroupConfig-SCell	Table 6.5.3.4.4.3-5	
}			
}			
}			
}			

Table 6.5.3.4.4.3-2A: MeasConfig (Table 6.5.3.4.4.3-2)

Derivation path: Table H.3.1-2 with condition Deactivated SCell			
Information Element	**Value/Remark**	**Comment**	**Condition**
measConfig ::= SEQUENCE {			
measObjectToAddModList SEQUENCE (SIZE (1..maxNrofMeasId)) OF SEQUENCE {	2 entries		
measObject[2] CHOICE {			
measObjectNR	MeasObjectNR for SCell	entry 2 Table 6.5.3.4.4.3-3	
}			
}			
reportConfigToAddModList SEQUENCE (SIZE (1..maxReportConfigId)) OF ReportConfigToAddMod {	1 entry		
ReportConfigToAddMod[1] SEQUENCE {		entry 1	
reportConfigId	ReportConfigId		
reportConfig CHOICE {			
reportConfigNR	ReportConfigNR	Table 6.5.3.4.4.3-4	
}			
}			
}			
}			

Table 6.5.3.4.4.3-3: MeasObjectNR for SCell

Derivation Path: Table H.3.1-3 with condition Deactivated SCell and Synchronous cells			
Information Element	**Value/remark**	**Comment**	**Condition**
MeasObjectNR::= SEQUENCE {			
smtc1	SSB-MTC specified in TS 38.508-1 [14] Table 7.3.1-3 with condition SMTC.1		
measCycleSCell-v1530	sf160		
}			

Table 6.5.3.4.4.3-4: ReportConfigNR

Derivation Path: Table H.3.1-4			
Information Element	**Value/remark**	**Comment**	**Condition**
ReportConfigNR::= SEQUENCE {			
reportType CHOICE {			
eventTriggered SEQUENCE {			
eventId CHOICE {			
eventA3 SEQUENCE {			
a3-Offset CHOICE {			
rsrp	-30	To ensure reporting can always be triggered	
}			
}			
}			
}			
}			
}			

Table 6.5.3.4.4.3-5: CellGroupConfig-SCell (Table 6.5.3.4.4.3-2)

Derivation Path: TS 38.508-1 [14], Table 4.6.3-19 with condition MEAS and SCell_add			
Information Element	**Value/remark**	**Comment**	**Condition**
CellGroupConfig ::= SEQUENCE {			

spCellConfig SEQUENCE {			
servCellIndex	Not present	PCell always uses servCellIndex=0	
reconfigurationWithSync	Not present		
rlf-TimersAndConstants	Not present		
rlmInSyncOutOfSyncThreshold	Not present		
spCellConfigDedicated	ServingCellConfig-SpCell	Table 6.5.3.4.4.3-6	
}			
sCellToAddModList SEQUENCE (SIZE (1..maxNrofSCells)) OF SCellConfig {	1 entry		
SCellConfig[1] SEQUENCE {		entry 1	
sCellConfigDedicated	ServingCellConfig-SCell	Table 6.5.3.4.4.3-7	
smtc	SSB-MTC specified in TS 38.508-1 [14] Table 7.3.1-3 with condition SMTC.1		
sCellState-r16	activated		
…			
}			
}			
}			

Table 6.5.3.4.4.3-6: ServingCellConfig-SpCell (Table 6.5.3.4.4.3-5)

Derivation Path: TS 38.508-1 [14], Table 4.6.3-167 with condition MEAS			
Information Element	**Value/remark**	**Comment**	**Condition**
ServingCellConfig ::= SEQUENCE {			
csi-MeasConfig	CSI-MeasConfig for RRM specified in TS 38.508-1 [14] Table 7.3.1-6		
servingCellMO	1		
}			

Table 6.5.3.4.4.3-7: ServingCellConfig-SCell (Table 6.5.3.4.4.3-5)

Derivation Path: TS 38.508-1 [14], Table 4.6.3-167 with condition No_UL			
Information Element	**Value/remark**	**Comment**	**Condition**
ServingCellConfig ::= SEQUENCE {			
csi-MeasConfig	CSI-MeasConfig for RRM specified in TS 38.508-1 [14] Table 7.3.1-6		
servingCellMO	2		
}			

6.5.3.4.5 Test requirement

Table 6.5.3.4.5-1 defines the primary level settings including test tolerances for all tests.

Table 6.5.3.4.5-1: NR Cell specific test parameters

Parameter		Unit	Cell 1		Cell 2	
			T1	T2	T1	T2
Duplex mode	Config 1		FDD			
	Config 2,3		TDD			
TDD configuration	Config 2		TDDConf.1.1			
	Config 3		TDDConf.2.1			
$BW_{channel}$	Config 1,2	MHz	10: $N_{RB,c}$ = 52			
	Config 3		40: $N_{RB,c}$ = 106			
BWP configuration	Initial DL		DLBWP.0.1		---	DLBWP.0.1

	Initial UL		ULBWP.0.1		---
	Dedicated DL		DLBWP.1.1		DLBWP.1.1
	Dedicated UL		ULBWP.1.1		---
TCI state			TCI.State.0	---	TCI.State.0
CSI-RS configuration for CSI reporting	Config 1		CSI-RS.1.1 FDD		CSI-RS.1.1 FDD
	Config 2		CSI-RS.1.1 TDD	---	CSI-RS.1.1 TDD
	Config 3		CSI-RS.2.1 TDD		CSI-RS.2.1 TDD
TRS Configuration	Config 1		TRS.1.1 FDD		TRS.1.1 FDD
	Config 2		TRS.1.1 TDD	---	TRS.1.1 TDD
	Config 3		TRS.1.2 TDD		TRS.1.2 TDD
PDSCH Reference measurement channel	Config 1		SR.1.1 FDD		SR.1.1 FDD
	Config 2		SR.1.1 TDD	---	SR.1.1 TDD
	Config 3		SR.2.1 TDD		SR.2.1 TDD
Dedicated CORESET parameters	Config 1		CCR.1.1 FDD		CCR.1.1 FDD
	Config 2		CCR.1.1 TDD	---	CCR.1.1 TDD
	Config 3		CCR.2.1 TDD		CCR.2.1 TDD
RMSI CORESET parameters	Config 1		CR.1.1 FDD	---	
	Config 2		CR.1.1 TDD		
	Config 3		CR.2.1 TDD		
OCNG Pattern			OP.1	OP.1	
SSB Configuration	Config 1,2		SSB.1 FR1	SSB.1 FR1	
	Config 3		SSB.2 FR1	SSB.2 FR1	
SMTC configuration			SMTC.1	SMTC.1	
EPRE ratio of PSS to SSS		dB	0		
EPRE ratio of PBCH DMRS to SSS					
EPRE ratio of PBCH to PBCH DMRS					
EPRE ratio of PDCCH DMRS to SSS					
EPRE ratio of PDCCH to PDCCH DMRS					
EPRE ratio of PDSCH DMRS to SSS					
EPRE ratio of PDSCH to PDSCH					
EPRE ratio of OCNG DMRS to SSS Note1					
EPRE ratio of OCNG to OCNG DMRS Note1					
N_{oc} Note2	Config 1,2	dBm/15kHz	-104	-104	
	Config 3		-101	-101	
$\hat{E}_s/I_{ot}$		dB	17	17	
$\hat{E}_s/N_{oc}$		dB	17	17	
SS-RSRP Note3	Config 1,2	dBm/SCS	-87	-87	
	Config 3		-84	-84	
Io Note3	Config 1,2	dBm/9.36 MHz	-59.0	-59.0	
	Config 3	dBm/38.16 MHz	-52.9	-52.9	
Propagation condition			AWGN	AWGN	
Correlation Matrix and Antenna Configuration			1x2 Low	1x2 Low	

Note 1: OCNG shall be used such that both cells are fully allocated, and a constant total transmitted power spectral density is achieved for all OFDM symbols.
Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for N_{oc} to be fulfilled.
Note 3: SS-RSRP, SCH_RP, and Io levels have been derived from other parameters for information purpose. They are not settable parameters themselves.

The UE shall complete the direct activation of the SCell no later than at slot $n + \frac{N_{direct}}{\text{NR slot length}}$.

The UE shall report non-zero CQI for SCell from slot $n + \frac{N_{direct}}{\text{NR slot length}}$ and onwards throughout time period T2.

The interruption on PCell during direct activation of the SCell shall occur within the interruption window specified in TS 38.133 [6] clause 8.3.4 and shall not exceed the length specified in TS 38.133 [6] clause 8.2.2.2.11.

The rate of correct events observed during repeated tests shall be at least 90%.

6.5.3.5 Direct SCell activation at handover with known SCell in FR1

Editor's note: This test case is incomplete. The following aspects are missing

- Test procedure
- Message contents are not complete.
- TT analysis is missing
- measurement uncertainty are missing
- Cell configuration mapping in Annex E
- CSI-RS config is missing

6.5.3.5.1 Test purpose

The purpose of this test is to verify the requirement for the FDD-FDD and TDD-TDD intra frequency handover with direct SCell activation requirements specified in is TS 38.133 [6] subclause 8.3.5.

6.5.3.5.2 Test applicability

This test applies to all types of NR UE from Release 15 onwards and supporting 2DL CA.

6.5.3.5.3 Minimum conformance requirements

The minimum conformance requirements are defined in clause 6.5.3.0.1.

The normative reference for this requirement is TS 38.133 [6] clause A.6.5.3.5.

6.5.3.5.4 Test description

6.5.3.5.4.1 Initial conditions

This test shall be tested using any of the test configurations in this clause. The supported test configurations for NR PCell are shown in Table 6.5.3.5.4.1-1. Supported test configurations for NR SCell are shown in Table 6.5.3.5.4.1-1A. Test configuration for NR PCell and test configuration for NR SCell are chosen independently.

Table 6.5.3.5.4.1-1: Intra-frequency handover with direct SCell activation from FR1-to-FR1 test configurations for NR PCell

Config	Description
1	Source PCell: NR 15 kHz SSB SCS, ≥10 MHz bandwidth, FDD duplex mode Target PCell: NR 15 kHz SSB SCS, ≥10 MHz bandwidth, FDD duplex mode
2	Source PCell: NR 15 kHz SSB SCS, ≥10 MHz bandwidth, TDD duplex mode Target PCell: NR 15 kHz SSB SCS, ≥10 MHz bandwidth, TDD duplex mode
3	Source PCell: NR 30 kHz SSB SCS, ≥40 MHz bandwidth, TDD duplex mode Target PCell: NR 30 kHz SSB SCS, ≥40 MHz bandwidth, TDD duplex mode
Note 1: The UE is only required to be tested in one of the supported test configurations Note 2: The UE is only required to be tested in one with smallest aggregated channel bandwidth from supported band combinations which is composed of CCs ≥ the bandwidth ($BW_{channel}$) defined in each test configuration,	

Table 6.5.3.5.4.1-1A: Intra-frequency handover with direct SCell activation from FR1-to-FR1 test configurations for NR SCell

$Config_{SCell}$	Description
1	NR 15 kHz SSB SCS, ≥10 MHz bandwidth, FDD duplex mode
2	NR 15 kHz SSB SCS, ≥10 MHz bandwidth, TDD duplex mode
3	NR 30 kHz SSB SCS, ≥40 MHz bandwidth, TDD duplex mode
Note 1: The UE is only required to be tested in one of the supported test configurations Note 2: The UE is only required to be tested in one with smallest aggregated channel bandwidth from supported band combinations which is composed of CCs ≥ the bandwidth ($BW_{channel}$) defined in each test configuration.	

Configure the test equipment and the DUT according to the parameters in Table 6.5.3.5.4.1-2 and Table 6.5.3.5.4.1-3.

Table 6.5.3.5.4.1-2: Initial conditions for known FR1 SCell activation case

Parameter	Value		Comment
Test environment	NC		As specified in TS 38.508-1 [14] clause 4.1.
Test frequencies	As specified in Annex E, Table E.4-1 and TS 38.508-1 [14] clause 4.3.1.		
Channel bandwidth	As specified by the test configuration selected from Table 6.5.3.5.4.1-1		
Propagation conditions	AWGN		As specified in Annex C.2.2.
Connection Diagram	TE Part	A.3.1.7.1	As specified in TS 38.508-1 [14] Annex A.
	DUT Part	A.3.2.3.1	
Exceptions to connection diagram	- Without LTE link - For 4Rx capable UEs without any 2Rx RF bands use A.3.2.5.2 for DUT part and A.3.1.8.4 for TE part.		

Table 6.5.3.5.4.1-3: General test parameters Intra-frequency handover with direct SCell activation from FR1 to FR1

Parameter		Unit	Value	Comment
Initial conditions	PCell		Cell 1	
	SCell		Cell 2	
	Target cell		Cell 3	
Final condition	PCell		Cell 3	
	SCell		Cell 2	
	neighbour cell		Cell 1	
Access Barring Information		-	Not Sent	No additional delays in random access procedure.
PRACH configuration index			FR1 PRACH configuration 1	As specified in Table 6.3.3.2-3 in TS 38.211 [6]
Time offset between cells			3 μs	Synchronous cells
T1		s	5	UE is in connected mode with PCell and SCell1 (cell 2) is in activated state. UE receives a handover command
T2		s	N_{direct}	UE shall accomplish the activation of the SCell
T3		s	1	
T_{HARQ}		slot	k	k is a number of slots indicated by the PDSCH-to-HARQ_feedback timing indicator field in a corresponding DCI format or provided by *dl-DataToUL-ACK* if the PDSCH-to-HARQ feedback timing field is not present in the DCI format, the value is defined in 38.213 [3]
$T_{CSI_Reporting}$		ms	2	the delay uncertainty in acquiring the first available CSI reporting resources as specified in TS 38.331 [2]
k		ms	$k_1 + 3 \cdot N_{slot}^{subframe,\ \mu} + 1$	As specified in clause 4.3 of TS 38.213 [3]

6.5.3.5.4.2 Test Procedure

TBD

6.5.3.5.4.3 Message contents

Message contents are according to TS 38.508-1 [14] clause 7.3 with the following exceptions:

Table 6.5.3.5.4.3-1: Common Exception messages

Default Message Contents

Common contents of system information blocks exceptions	
Default RRC messages and information elements contents exceptions	FFS

6.5.3.5.5 Test requirements

Table 6.5.3.5.5-1 and 6.5.3.5.5-2 defines the primary level settings including test tolerances for all tests.

Table 6.5.3.5.5-1: Cell specific test parameters for NR PCell for NR FR1-FR1 Intra frequency handover with direct SCell activation test case

Parameter		Unit	Cell 1			Cell 3		
			T1	T2	T3	T1	T2	T3
NR RF Channel Number			1			1		
Duplex mode	Config 1		FDD					
	Config 2,3		TDD					
TDD configuration	Config 1		Not Applicable					
	Config 2		TDDConf.1.1					
	Config 3		TDDConf.2.1					
$BW_{channel}$	Config 1	MHz	10: $N_{RB,c}$ = 52					
	Config 2		10: $N_{RB,c}$ = 52					
	Config 3		40: $N_{RB,c}$ = 106					
BWP BW	Config 1	MHz	10: $N_{RB,c}$ = 52					
	Config 2		10: $N_{RB,c}$ = 52					
	Config 3		40: $N_{RB,c}$ = 106					
DRx Cycle		ms	Not Applicable					
PDSCH Reference measurement channel	Config 1		SR.1.1 FDD					
	Config 2		SR.1.1 TDD					
	Config 3		SR.2.1 TDD					
CORESET Reference Channel	Config 1		CR.1.1 FDD					
	Config 2		CR.1.1 TDD					
	Config 3		CR.2.1 TDD					
TRS configuration	Config 1		TRS.1.1 FDD					
	Config 2		TRS.1.1 TDD					
	Config 3		TRS.1.2 TDD					
OCNG Patterns			OCNG pattern 1					
SMTC Configuration			SMTC pattern 1					
SSB Configuration	Config 1,2		SSB.1 FR1					
	Config 3		SSB.2 FR1					
PDSCH/PDCCH subcarrier spacing	Config 1,2	kHz	15 kHz					
	Config 3		30 kHz					
PUCCH/PUSCH subcarrier spacing	Config 1,2	kHz	15 kHz					
	Config 3		30 kHz					
PRACH configuration			FR1 PRACH configuration 1					
BWP configuration	Initial DL BWP		DLBWP.0.1					
	Dedicated DL BWP		DLBWP.1.1					
	Initial UL BWP		ULBWP.0.1					
	Dedicated UL BWP		ULBWP.1.1					
EPRE ratio of PSS to SSS		dB	0					
EPRE ratio of PBCH DMRS to SSS								
EPRE ratio of PBCH to PBCH DMRS								
EPRE ratio of PDCCH DMRS to SSS								
EPRE ratio of PDCCH to PDCCH DMRS								
EPRE ratio of PDSCH DMRS to SSS								

EPRE ratio of PDSCH to PDSCH EPRE ratio of OCNG DMRS to SSS(Note 1) EPRE ratio of OCNG to OCNG DMRS (Note 1)								
N_{oc} Note2		dBm/15kHz	-98					
N_{oc} Note2	Config 1,2	dBm/SCS	-98					
	Config 3		-95					
$\hat{E}_s/I_{ot}$		dB	8	8	8	8	8	8
$\hat{E}_s/N_{oc}$		dB	8	8	8	8	8	8
SSB_RP	Config 1,2	dBm/SCS	-90	-90	-90	-90	-90	-90
	Config 3	dBm/SCS	-87	-87	-87	-87	-87	-87
Io Note3	Config 1,2	dBm/ 9.36MHz	-61.41	-57.06	-57.06	-57.06	-57.06	-61.41
	Config 3	dBm/ 38.16MHz	-55.31	-50.96	-50.96	-50.96	-50.96	-55.31
Propagation condition		-	AWGN			AWGN		

Note 1: OCNG shall be used such that both cells are fully allocated, and a constant total transmitted power spectral density is achieved for all OFDM symbols.

Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for N_{oc} to be fulfilled.

Note 3: Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.

Table 6.5.3.5.5-2: Cell specific test parameters for NR SCell for NR FR1-FR1 Intra frequency handover with direct SCell activation test case

Parameter		Unit	Cell 2		
			T1	T2	T3
NR RF Channel Number			2		
Duplex mode	$Config_{SCell}$ 1		FDD		
	$Config_{SCell}$ 2,3		TDD		
TDD configuration	$Config_{SCell}$ 1		Not Applicable		
	$Config_{SCell}$ 2		TDDConf.1.1		
	$Config_{SCell}$ 3		TDDConf.2.1		
$BW_{channel}$	$Config_{SCell}$ 1	MHz	10: $N_{RB,c}$ = 52		
	$Config_{SCell}$ 2		10: $N_{RB,c}$ = 52		
	$Config_{SCell}$ 3		40: $N_{RB,c}$ = 106		
BWP BW	$Config_{SCell}$ 1	MHz	10: $N_{RB,c}$ = 52		
	$Config_{SCell}$ 2		10: $N_{RB,c}$ = 52		
	$Config_{SCell}$ 3		40: $N_{RB,c}$ = 106		
DRx Cycle		ms	Not Applicable		
PDSCH Reference measurement channel	$Config_{SCell}$ 1		SR.1.1 FDD		
	$Config_{SCell}$ 2		SR.1.1 TDD		
	$Config_{SCell}$ 3		SR.2.1 TDD		
CORESET Reference Channel	$Config_{SCell}$ 1		CR.1.1 FDD		
	$Config_{SCell}$ 2		CR.1.1 TDD		
	$Config_{SCell}$ 3		CR.2.1 TDD		
TRS configuration	$Config_{SCell}$ 1		TRS.1.1 FDD		
	$Config_{SCell}$ 2		TRS.1.1 TDD		
	$Config_{SCell}$ 3		TRS.1.2 TDD		
OCNG Patterns			OCNG pattern 1		
SMTC Configuration			SMTC pattern 1		
SSB Configuration	$Config_{SCell}$ 1,2		SSB.1 FR1		
	$Config_{SCell}$ 3		SSB.2 FR1		
PDSCH/PDCCH subcarrier spacing	$Config_{SCell}$ 1,2	kHz	15 kHz		
	$Config_{SCell}$ 3		30 kHz		
PUCCH/PUSCH subcarrier spacing	$Config_{SCell}$ 1,2	kHz	15 kHz		
	$Config_{SCell}$ 3		30 kHz		
PRACH configuration			FR1 PRACH configuration 1		
BWP configuration	Initial DL BWP		DLBWP.0.1		

	Dedicated DL BWP		DLBWP.1.1		
	Initial UL BWP		ULBWP.0.1		
	Dedicated UL BWP		ULBWP.1.1		
EPRE ratio of PSS to SSS		dB	0		
EPRE ratio of PBCH DMRS to SSS					
EPRE ratio of PBCH to PBCH DMRS					
EPRE ratio of PDCCH DMRS to SSS					
EPRE ratio of PDCCH to PDCCH DMRS					
EPRE ratio of PDSCH DMRS to SSS					
EPRE ratio of PDSCH to PDSCH					
EPRE ratio of OCNG DMRS to SSS(Note 1)					
EPRE ratio of OCNG to OCNG DMRS (Note 1)					
N_{oc} Note2		dBm/15kHz	-98		
N_{oc} Note2	$Config_{SCell}$ 1,2	dBm/SCS	-98		
	$Config_{SCell}$ 3		-95		
$\hat{E}_s/I_{ot}$		dB	8	8	8
$\hat{E}_s/N_{oc}$		dB	8	8	8
SSB_RP	$Config_{SCell}$ 1,2	dBm/SCS	-90	-90	-90
	$Config_{SCell}$ 3	dBm/SCS	-87	-87	-87
Io Note3	$Config_{SCell}$ 1,2	dBm/ 9.36MHz	-61.41	-57.06	-61.41
	$Config_{SCell}$ 3	dBm/ 38.16MHz	-55.31	-50.96	-55.31
Propagation condition		-	AWGN		

Note 1: OCNG shall be used such that both cells are fully allocated, and a constant total transmitted power spectral density is achieved for all OFDM symbols.

Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for N_{oc} to be fulfilled.

Note 3: Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.

The UE shall be capable to transmit valid CSI report for the directly activated SCell1 no later than in subframe $n+N_{direct}$.

The rate of correct observed SCell1 direct activation delay during repeated tests shall be at least 90%.

6.5.4 UE UL carrier RRC reconfiguration delay

6.5.4.0 Minimum conformance requirements

6.5.4.0.1 Minimum conformance requirements for UL carrier RRC reconfiguration delay

[TS 38.133, clause 8.4.2]

When the UE receives a RRC message implying NR UL or Supplementary UL carrier configuration, the UE shall be ready to start transmission on the newly configured carrier within $T_{UL_carrier_config}$ from the end of the last slot containing the RRC command.

$T_{UL_carrier_config}$ equals the maximum RRC procedure delay defined in clause x.y in TS 38.331 [2] plus the interruption time specified in TS 38.133 [6] section 8.2.1.2.6.

[TS 38.133, clause 8.4.3]

When the UE receives a RRC message implying NR UL or Supplementary UL carrier deconfiguration RRC signalling, the UE shall stop UL signalling on the deconfigured UL carrier within $T_{UL_carrier_deconfig}$ from the end of the last slot containing the RRC command.

$T_{UL_carrier_deconfig}$ equals the maximum RRC procedure delay defined in clause x.y in TS 38.331 [2].

The normative reference for this requirement is TS 38.133 [6] clause 8.4.

6.5.4.1 NR SA FR1 UE UL carrier RRC reconfiguration delay

6.5.4.1.1 Test purpose

To verify that when the UE receives a RRC message implying NR UL or Supplementary UL carrier configuration, the UE shall be ready to start transmission on the newly configured carrier within the time limits specified in TS 38.133 [6] section 8.4.2 and 8.4.3 for configuring and deconfiguring, respectively.

6.5.4.1.2 Test applicability

This test applies to all types of NR UE release 15 and forward supporting SUL.

6.5.4.1.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 6.5.4.0.1.

The normative reference for this requirement is TS 38.133 [6] clause A.6.5.4.1.

6.5.4.1.4 Test description

6.5.4.1.4.1 Initial conditions

The Test shall be tested using any of the test configuration in Table 6.5.4.1.4.1-1.

Table 6.5.4.1.4.1-1: Supported test configurations

Configuration	PSCell (Cell 1)	SCell (Cell 2)
6.5.4.1-1	15 kHz SSB SCS, ≥10MHz bandwidth, FDD duplex mode	DL and UL: 15kHz SSB SCS, ≥10MHz bandwidth, FDD duplex mode; SUL: 15kHz SCS, ≥10MHz bandwidth, SUL duplex mode
6.5.4.1-2	15 kHz SSB SCS, ≥10MHz bandwidth, FDD duplex mode	DL and UL: 15kHz SSB SCS, ≥10MHz bandwidth, TDD duplex mode; SUL: 15kHz SCS, ≥10MHz bandwidth, SUL duplex mode
6.5.4.1-3	15 kHz SSB SCS, ≥10MHz bandwidth, FDD duplex mode	DL and UL: 30kHz SSB SCS, ≥40MHz bandwidth, TDD duplex mode; SUL: 30kHz SCS, ≥40MHz bandwidth, SUL duplex mode
6.5.4.1-4	15 kHz SSB SCS, ≥10MHz bandwidth, TDD duplex mode	DL and UL: 15kHz SSB SCS, ≥10MHz bandwidth, FDD duplex mode; SUL: 15kHz SCS, ≥10MHz bandwidth, SUL duplex mode
6.5.4.1-5	15 kHz SSB SCS, ≥10MHz bandwidth, TDD duplex mode	DL and UL: 15kHz SSB SCS, ≥10MHz bandwidth, TDD duplex mode; SUL: 15kHz SCS, ≥10MHz bandwidth, SUL duplex mode
6.5.4.1-6	15 kHz SSB SCS, ≥10MHz bandwidth, TDD duplex mode	DL and UL: 30kHz SSB SCS, ≥40MHz bandwidth, TDD duplex mode; SUL: 30kHz SCS, ≥40MHz bandwidth, SUL duplex mode
6.5.4.1-7	30 kHz SSB SCS, ≥40MHz bandwidth, TDD duplex mode	DL and UL: 15kHz SSB SCS, ≥10MHz bandwidth, FDD duplex mode; SUL: 15kHz SCS, ≥10MHz bandwidth, SUL duplex mode
6.5.4.1-8	30 kHz SSB SCS, ≥40MHz bandwidth, TDD duplex mode	DL and UL: 15kHz SSB SCS, ≥10MHz bandwidth, TDD duplex mode; SUL: 15kHz SCS, ≥10MHz bandwidth, SUL duplex mode
6.5.4.1-9	30 kHz SSB SCS, ≥40MHz bandwidth, TDD duplex mode	DL and UL: 30kHz SSB SCS, ≥40MHz bandwidth, TDD duplex mode; SUL: 30kHz SCS, ≥40MHz bandwidth, SUL duplex mode
Note 1: The UE is only required to be tested in one of the supported test configurations. Note 2: The UE is only required to be tested in one with smallest aggregated channel bandwidth from supported band combinations which is composed of CCs ≥ the bandwidth ($BW_{channel}$) defined in each test configuration.		

Configure the test requirement and the DUT according to the parameters in Table 6.5.4.1.4.1-2.

Table 6.5.4.1.4.1-2: Initial conditions for NR SA FR1 UE UL carrier RRC reconfiguration delay

Parameter	Value		Comment
Test environment	NC		As specified in TS 38.508-1 [14] clause 4.1.
Test frequencies	As specified in Annex E, Table E.4-1 and TS 38.508-1 [14] clause 4.3.1.		
Channel bandwidth	As specified by the test configuration selected from Table 6.5.4.1.4.1-1.		
Propagation conditions	AWGN		As specified in Annex C.2.1.
Connection Diagram	TE Part	A.3.1.8.2	As specified in TS 38.508-1 [14] Annex A.
	DUT Part	A.3.2.3.4	
Exceptions to connection diagram	N/A		

1. The general test parameter settings are set up according to Table 6.5.4.1.4.1-3.
2. Message contents are defined in clause 6.5.4.1.4.3.
3. There are two NR FR1 carriers and two cells in the test. Cell 1 is PCell on the primary component carrier, Cell 2 is SCell on the secondary component carrier. Cell 1 is the cell used for connection setup with the power levels set according to Table A.6.5.4.1.5-1 for this test. Cell 2 is configured according to Annex C.1.1 and C.1.2.

Table 6.5.4.1.4.1-3: General test parameters for NR standalone UE UL carrier RRC reconfiguration Delay on Pcell

Parameter	Unit	Test configuration	Value	Comment
RF Channel Number		Config 1,2,3, 4, 5, 6, 7, 8, 9	1, 2	Two radio channels are used for these two tests.
Active cell		Config 1,2,3, 4, 5, 6, 7, 8, 9	Cell 1: FR1 PCell Cell 2: FR1 SCell	FR1 PCell on RF channel number 1 FR1 SCell on RF channel number 2
CP length		Config 1,2,3, 4, 5, 6, 7, 8, 9	Normal	
DRX		Config 1,2,3, 4, 5, 6, 7, 8, 9	OFF	
Measurement gap pattern Id		Config 1,2,3, 4, 5, 6, 7, 8, 9	OFF	
Filter coefficient		Config 1,2,3, 4, 5, 6, 7, 8, 9	0	L3 filtering is not used
T1	s	Config 1,2,3, 4, 5, 6, 7, 8, 9	5	
T2	s	Config 1,2,3, 4, 5, 6, 7, 8, 9	5	
T3	s	Config 1,2,3, 4, 5, 6, 7, 8, 9	5	

6.5.4.1.4.2 Test procedure

There are two cells: FR1 PCell (cell 1) and FR1 SCell (cell 2). Both NR uplink and supplementary uplink are broadcast by *ServingCellConfigCommonSIB.* In test 1, the test consists of three time periods, with duration of T1, T2 and T3 respectively. During time duration T1, NR uplink of cell 2 is configured to UE. At the start of T2, a supplementary uplink of cell 2 is configured to UE through *RRCReconfiguration*, then UE shall start transmission both on the NR uplink and supplementary uplink. At the start of T3, the supplementary uplink is released through *RRCReconfiguration*.

In test 2, the test consists of three time periods, with duration of T1, T2 and T3 respectively. During time duration T1, supplementary uplink on cell 2 is configured to UE. At the start of T2, a NR uplink is configured to UE through *RRCReconfiguration*, then UE shall start transmission both on the NR uplink and supplementary uplink. At the start of T3, the NR uplink is released through *RRCReconfiguration*.

1. Ensure the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity *NR*, Connected without release *On* and Test Mode *On* according to TS 38.508-1 [14] clause 4.5.

2. Setup PCell (Cell 1) according to parameters given in Table 6.5.4.1.5-1. Propagation conditions are set according to Annex C clause C.2.2.

3. For SCell (Cell 2), both NR uplink and supplementary uplink are broadcast by *ServingCellConfigCommonSIB*.

4. For Test 1: NR uplink of SCell is configured to UE during T1

   4.1 During time duration T1, NR uplink of SCell is configured to UE. Setup SCell (Cell 2) according to parameters given in Table 6.5.4.1.5-2

   4.2 At the start of T2, a supplementary uplink of SCell (Cell 2) is configured to UE through RRCReconfiguration, then UE shall start transmission on both the NR uplink and supplementary uplink on SCell (Cell 2) within 20ms. If UE transmits data on both the NR uplink and supplementary uplink on SCell (Cell 2) within 20ms from the start of T2, then count a success for the event “reconfiguration” otherwise count a failure for event “reconfiguration”

   4.3 At the start of T3, the supplementary uplink is released through RRCReconfiguration, then UE shall transmit data only on the NR uplink carrier on SCell (Cell 2) within 20ms. If UE stop transmitting data on supplementary uplink carrier on SCell (Cell 2) within 20ms from the start of T3, then count a success for the event “deconfiguration” otherwise count a failure for event “deconfiguration”.

5. For Test 2: Supplementary uplink of SCell is configured to UE during T1

   5.1 During time duration T1, Supplementary uplink of SCell is configured to UE. Setup SCell (Cell 2) according to parameters given in Table 6.5.4.1.5-2

   5.2 At the start of T2, a NR uplink of SCell (Cell 2) is configured to UE through RRCReconfiguration, then UE shall start transmission on both the NR uplink and supplementary uplink on SCell (Cell 2) within 20ms. If UE transmits data on both the NR uplink and supplementary uplink on SCell (Cell 2) within 20ms from the start of T2, then count a success for the event “reconfiguration” otherwise count a failure for event “reconfiguration”

   5.3 At the start of T3, the NR uplink is released through RRCReconfiguration, then UE shall transmit data only on the Supplementary uplink carrier on SCell (Cell 2) within 20ms. If UE stop transmitting data on NR uplink carrier on SCell (Cell 2) within 20ms from the start of T3, then count a success for the event “deconfiguration” otherwise count a failure for event “deconfiguration”.

6. Repeat steps 1-5 until a test verdict has been achieved.

Each of the events “reconfiguration” and “deconfiguration” is evaluated independently for the statistic, resulting in an event verdict: pass or fail. Each event is evaluated only until the confidence level according to Table G.2.3-1in Annex G.2 is achieved. Different events may require different times for a verdict.

If all events pass, the test passes. If one event fails, the test fails.

6.5.4.1.4.3 Message contents

Message contents are according to TS 38.508-1 [14] clause 4.6 with the following exceptions:

Table 6.5.4.1.4.3-1: Common Exception messages

Default Message Contents	
Common contents of system information blocks exceptions	
Default RRC messages and information elements contents exceptions	Table H.3.8-1 Table H.3.8-2

6.5.4.1.5 Test requirement

Table 6.5.4.1.5.1-1 and 6.5.4.1.5-2 define the primary level settings including test tolerances for UE UL carrier RRC reconfiguration delay test.

Table 6.5.4.1.5-1: NR Cell specific test parameters for NR standalone UE UL carrier RRC reconfiguration Delay on PCell (Cell 1)

Parameter	Unit	Test Configuration	Test 1			Test 2		
			T1	T2	T3	T1	T2	T3
Channel number		Conf 1, 2, 3, 4, 5, 6, 7, 8, 9	1			1		
TDD configuration		Conf 1, 2, 3	N/A			N/A		
		Conf 4, 5, 6	TDD Conf.1.1			TDD Conf.1.1		
		Conf 7, 8, 9	TDD Conf.2.1			TDD Conf.2.1		
$BW_{channel}$	MHz	Conf 1, 2, 3	Note 6			Note 6		
		Conf 4, 5, 6	Note 6			Note 6		
		Conf 7, 8, 9	Note 6			Note 6		
$BW_{occupied}$	RB	Conf 1, 2, 3	52 Note 4			52 Note 4		
		Conf 4, 5, 6	52 Note 4			52 Note 4		
		Conf 7, 8, 9	106 Note 5			106 Note 5		
PDSCH reference measurement channel as defined in A.3.1.1		Conf 1, 2, 3	SR.1.1 FDD			SR.1.1 FDD		
		Conf 4, 5, 6	SR.1.1 TDD			SR.1.1 TDD		
		Conf 7, 8, 9	SR 2.1 TDD			SR 2.1 TDD		
RMSI CORESET reference measurement channel as defined in A.3.1.2		Conf 1, 2, 3	CR.1.1 FDD			CR.1.1 FDD		
		Conf 4, 5, 6	CR.1.1 TDD			CR.1.1 TDD		
		Conf 7, 8, 9	CR.2.1 TDD			CR.2.1 TDD		
RMC CORESET reference measurement channel as defined in A.3.1.3		Conf 1, 2, 3	CCR.1.1 FDD			CCR.1.1 FDD		
		Conf 4, 5, 6	CCR.1.1 TDD			CCR.1.1 TDD		
		Conf 7, 8, 9	CCR.2.1 TDD			CCR.2.1 TDD		
OCNG Pattern Note 1		Conf 1, 2, 3, 4, 5, 6, 7, 8, 9	OP.1			OP.1		
SSB configuration		Conf 1, 2, 3, 4, 5, 6	SSB.1 FR1			SSB.1 FR1		
		Conf 7, 8, 9	SSB.2 FR1			SSB.2 FR1		
SMTC configuration		Conf 1, 2, 3, 4, 5, 6, 7, 8, 9	SMTC.1			SMTC.1		
CSI-RS for tracking		Conf 1	TRS.1.1 FDD			TRS.1.1 FDD		
		Conf 2	TRS.1.1 FDD			TRS.1.1 FDD		
		Conf 3	TRS.1.1 FDD			TRS.1.1 FDD		
		Conf 4	TRS.1.1 TDD			TRS.1.1 TDD		
		Conf 5	TRS.1.1 TDD			TRS.1.1 TDD		
		Conf 6	TRS.1.1 TDD			TRS.1.1 TDD		
		Conf 7	TRS.1.2 TDD			TRS.1.2 TDD		
		Conf 8	TRS.1.2 TDD			TRS.1.2 TDD		
		Conf 9	TRS.1.2 TDD			TRS.1.2 TDD		
DL initial BWP configuration		Conf 1, 2, 3, 4, 5, 6, 7, 8, 9	DLBWP.0.1			DLBWP.0.1		
DL dedicated BWP configuration		Conf 1, 2, 3, 4, 5, 6, 7, 8, 9	DLBWP.1.1			DLBWP.1.1		
UL dedicated BWP configuration		Conf 1, 2, 3, 4, 5, 6, 7, 8, 9	ULBWP.1.1			ULBWP.1.1		
EPRE ratio of PSS to SSS	dB	Conf 1, 2, 3, 4, 5, 6, 7, 8, 9	0			0		
EPRE ratio of PBCH_DMRS to SSS								
EPRE ratio of PBCH to PBCH_DMRS								
EPRE ratio of PDCCH_DMRS to SSS								
EPRE ratio of PDCCH to PDCCH_DMRS								

EPRE ratio of PDSCH_DMRS to SSS								
EPRE ratio of PDSCH to PDSCH_DMRS								
EPRE ratio of OCNG DMRS to SSS								
EPRE ratio of OCNG to OCNG DMRS								
N_{oc} Note 2	dBm / 15kHz	Conf 1, 2, 3, 4, 5, 6, 7, 8, 9	-102			-102		
	dBm/ SCS	Conf 1,2,3,4,5,6	-102			-102		
		Conf 7,8,9	-99			-99		
$\hat{E}_s / N_{oc}$	dB	Conf 1, 2, 3, 4, 5, 6, 7, 8, 9	16	16	16	16	16	16
$\hat{E}_s / I_{ot}$ Note 3	dB	Conf 1, 2, 3, 4, 5, 6, 7, 8, 9	16	16	16	16	16	16
SS-RSRP Note 3	dBm/ SCS	Conf 1,2,3,4,5,6	-86	-86	-86	-86	-86	-86
		Conf 7,8,9	-83	-83	-83	-83	-83	-83
Io Note 3	dBm/ 9.36 MHz	Conf 1,2,3,4,5,6	-57.9	-57.9	-57.9	-57.9	-57.9	-57.9
	dBm/ 38.16 MHz	Conf 7,8,9	-51.8	-51.8	-51.8	-51.8	-51.8	-51.8
Propagation Condition		Conf 1, 2, 3, 4, 5, 6, 7, 8, 9	AWGN			AWGN		
Antenna configuration		Conf 1, 2, 3, 4, 5, 6, 7, 8, 9	1 x 2			1 x 2		

NOTE 1: OCNG shall be used such that both cells are fully allocated, and a constant total transmitted power spectral density is achieved for all OFDM symbols.

NOTE 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for N_{oc} to be fulfilled within $BW_{occupied}$.

NOTE 3: $\hat{E}_s / I_{ot}$, Io, and SS-RSRP levels have been derived from other parameters for information purposes. They are not settable parameters themselves.

NOTE 4: All UL/DL transmission shall be confined within $BW_{occupied}$ (i.e. 10 MHz, 52 RBs) from $F_{C,low}$, and Io is independent of the $BW_{channel}$ configured.

NOTE 5: All UL/DL transmission shall be confined within $BW_{occupied}$ (i.e. 40 MHz, 106 RBs) from $F_{C,low}$, and Io is independent of the $BW_{channel}$ configured.

NOTE 6: $N_{RB,c}$. is derived from Table 5.3.2-1 in TS38.101-1[2] with configured $BW_{channel}$.

Table 6.5.4.1.5-2 : NR Cell specific test parameters for NR standalone UE UL carrier RRC reconfiguration Delay on SCell (Cell 2)

Parameter	Unit	Test Configuration	Test 1			Test 2		
			T1	T2	T3	T1	T2	T3
Channel number		Conf 1, 2, 3, 4, 5, 6, 7, 8, 9	2			2		
TDD configuration		Conf 1, 4, 7	N/A			N/A		
		Conf 2, 5, 8	TDDConf.1.1			TDDConf.1.1		
		Conf 3, 6, 9	TDDConf.2.1			TDDConf.2.1		
$BW_{channel}$	MHz	Conf 1, 4, 7	Note 6			Note 6		
		Conf 2, 5, 8	Note 6			Note 6		
		Conf 3, 6, 9	Note 6			Note 6		
$BW_{occupied}$	RB	Conf 1, 4, 7	52 Note 4			52 Note 4		
		Conf 2, 5, 8	52 Note 4			52 Note 4		
		Conf 3, 6, 9	106 Note 5			106 Note 5		

PUSCH parameters for NR UL carrier		Conf 1, 4, 7	G-FR1-A3-10 in [28]	G-FR1-A3-10 in [28]	G-FR1-A3-10 in [28]	N/A	G-FR1-A3-10 in [28]	N/A
		Conf 2, 5, 8	G-FR1-A3-10 in [28]	G-FR1-A3-10 in [28]	G-FR1-A3-10 in [28]	N/A	G-FR1-A3-10 in [28]	N/A
		Conf 3, 6, 9	G-FR1-A3-14 in [28]	G-FR1-A3-14 in [28]	G-FR1-A3-14 in [28]	N/A	G-FR1-A3-14 in [28]	N/A
PUCCH parameters For NR UL carrier		Conf 1, 4, 7	Table 8.3.3.1.2-1 in [28]	Table 8.3.3.1.2-1 in [28]	Table 8.3.3.1.2-1 in [28]	N/A	N/A	N/A
		Conf 2, 5, 8	Table 8.3.3.1.2-1 in [28]	Table 8.3.3.1.2-1 in [28]	Table 8.3.3.1.2-1 in [28]	N/A	N/A	N/A
		Conf 3, 6, 9	Table 8.3.3.1.2-2 in [28]	Table 8.3.3.1.2-2 in [28]	Table 8.3.3.1.2-2 in [28]	N/A	N/A	N/A
PUSCH parameters for supplementary UL		Conf 1, 4, 7	N/A	G-FR1-A3-10 in [28]	N/A	G-FR1-A3-10 in [28]	G-FR1-A3-10 in [28]	G-FR1-A3-10 in [28]
		Conf 2, 5, 8	N/A	G-FR1-A3-10 in [28]	N/A	G-FR1-A3-10 in [28]	G-FR1-A3-10 in [28]	G-FR1-A3-10 in [28]
		Conf 3, 6, 9	N/A	G-FR1-A3-14 in [28]	N/A	G-FR1-A3-14 in [28]	G-FR1-A3-14 in [28]	G-FR1-A3-14 in [28]
PUCCH parameters for supplementary UL		Conf 1, 4, 7	N/A	N/A	N/A	Table 8.3.3.1.2-1 in [28]	Table 8.3.3.1.2-1 in [28]	Table 8.3.3.1.2-1 in [28]
		Conf 2, 5, 8	N/A	N/A	N/A	Table 8.3.3.1.2-1 in [28]	Table 8.3.3.1.2-1 in [28]	Table 8.3.3.1.2-1 in [28]
		Conf 3, 6, 9	N/A	N/A	N/A	Table 8.3.3.1.2-2 in [28]	Table 8.3.3.1.2-2 in [28]	Table 8.3.3.1.2-2 in [28]
PDSCH reference measurement channel as defined in A.3.1.1		Conf 1, 4, 7	SR.1.1 FDD			SR.1.1 FDD		
		Conf 2, 5, 8	SR.1.1 TDD			SR.1.1 TDD		
		Conf 3, 6, 9	SR 2.1 TDD			SR 2.1 TDD		
RMSI CORESET reference measurement channel as defined in A.3.1.2		Conf 1, 4, 7	CR.1.1 FDD			CR.1.1 FDD		
		Conf 2, 5, 8	CR.1.1 TDD			CR.1.1 TDD		
		Conf 3, 6, 9	CR.2.1 TDD			CR.2.1 TDD		
RMC CORESET reference measurement channel as defined in A.3.1.3		Conf 1, 4, 7	CCR.1.1 FDD			CCR.1.1 FDD		
		Conf 2, 5, 8	CCR.1.1 TDD			CCR.1.1 TDD		
		Conf 3, 6, 9	CCR.2.1 TDD			CCR.2.1 TDD		
OCNG Pattern Note 1		Conf 1, 2, 4, 5, 7, 8	OP.1 Note 4			OP.1 Note 4		
		Conf 3, 6, 9	OP.1 Note 5			OP.1 Note 5		
SSB configuration		Conf 1, 2, 4, 5, 7,8	SSB.1 FR1			SSB.1 FR1		
		Conf 3, 6, 9	SSB.2 FR1			SSB.2 FR1		
SMTC configuration		Conf 1, 2, 3, 4, 5, 6, 7, 8, 9	SMTC.1			SMTC.1		
CSI-RS for tracking		Conf 1	TRS.1.1 FDD			TRS.1.1 FDD		
		Conf 2	TRS.1.1 TDD			TRS.1.1 TDD		

		Conf 3	TRS.1.2 TDD			TRS.1.2 TDD			
		Conf 4	TRS.1.1 FDD			TRS.1.1 FDD			
		Conf 5	TRS.1.1 TDD			TRS.1.1 TDD			
		Conf 6	TRS.1.2 TDD			TRS.1.2 TDD			
		Conf 7	TRS.1.1 FDD			TRS.1.1 FDD			
		Conf 8	TRS.1.1 TDD			TRS.1.1 TDD			
		Conf 9	TRS.1.2 TDD			TRS.1.2 TDD			
DL initial BWP configuration		Conf 1, 2, 3, 4, 5, 6, 7, 8, 9	DLBWP.0.1			DLBWP.0.1			
DL dedicated BWP configuration		Conf 1, 2, 3, 4, 5, 6, 7, 8, 9	DLBWP.1.1			DLBWP.1.1			
UL dedicated BWP configuration		Conf 1, 2, 3, 4, 5, 6, 7, 8, 9	ULBWP.1.1			ULBWP.1.1			
EPRE ratio of PSS to SSS EPRE ratio of PBCH_DMRS to SSS EPRE ratio of PBCH to PBCH_DMRS EPRE ratio of PDCCH_DMRS to SSS EPRE ratio of PDCCH to PDCCH_DMRS EPRE ratio of PDSCH_DMRS to SSS EPRE ratio of PDSCH to PDSCH_DMRS EPRE ratio of OCNG DMRS to SSS EPRE ratio of OCNG to OCNG DMRS	dB	Conf 1, 2, 3, 4, 5, 6, 7, 8, 9	0			0			
N_{oc} Note 2	dBm / 15kHz	Conf 1, 2, 3, 4, 5, 6, 7, 8, 9	-102			-102			
	dBm/ SCS	Conf 1, 2, 4, 5, 7,8	-102			-102			
		Conf 3, 6, 9	-99			-99			
$\hat{E}_s / N_{oc}$	dB	Conf 1, 2, 3, 4, 5, 6, 7, 8, 9	16	16	16	16	16	16	
$\hat{E}_s / I_{ot}$ Note 3	dB	Conf 1, 2, 3, 4, 5, 6, 7, 8, 9	16	16	16	16	16	16	
SS-RSRP Note 3	dBm/ SCS	Conf 1, 2, 4, 5, 7,8	-86	-86	-86	-86	-86	-86	
		Conf 3, 6, 9	-83	-83	-83	-83	-83	-83	
Io Note 3	dBm/ 9.36 MHz	Conf 1, 2, 4, 5, 7,8	-57.9	-57.9	-57.9	-57.9	-57.9	-57.9	
	dBm/ 38.16 MHz	Conf 3, 6, 9	-51.8	-51.8	-51.8	-51.8	-51.8	-51.8	
Propagation Condition		Conf 1, 2, 3, 4, 5, 6, 7, 8, 9	AWGN			AWGN			
Antenna configuration		Conf 1, 2, 3, 4, 5, 6, 7, 8, 9	1 x 2			1 x 2			

NOTE 1: OCNG shall be used such that both cells are fully allocated, and a constant total transmitted power spectral density is achieved for all OFDM symbols.
NOTE 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for N_{oc} to be fulfilled within $BW_{occupied}$.
NOTE 3: $\hat{E}_s/I_{ot}$, Io, and SS-RSRP levels have been derived from other parameters for information purposes. They are not settable parameters themselves.
NOTE 4: All UL/DL transmission shall be confined within $BW_{occupied}$ (i.e. 10 MHz, 52 RBs) from $F_{C,low}$, and Io is independent of the $BW_{channel}$ configured.
NOTE 5: All UL/DL transmission shall be confined within $BW_{occupied}$ (i.e. 40 MHz, 106 RBs) from $F_{C,low}$, and Io is independent of the $BW_{channel}$ configured.
NOTE 6: $N_{RB,c}$. is derived from Table 5.3.2-1 in TS38.101-1[2] with configured $BW_{channel}$.

In test 1 the UE shall be ready to start transmission on the supplementary uplink carrier on SCell within 20 ms from the start of T2.

In test 1 the UE shall stop the transmission on the supplementary uplink carrier on SCell within 20 ms from the start of T3.

In test 2 the UE shall be ready to start transmission on the NR uplink carrier on SCell within 20 ms from the start of T2.

In test 2 the UE shall stop the transmission on the NR uplink carrier on SCell within 20 ms from the start of T3.

All of the above test requirements shall be fulfilled in order for the observed UE UL carrier configuration delay and UE UL carrier release delay to be counted as correct. The rate of correct observed UE UL carrier configuration delay and UE UL carrier release delay during repeated tests shall be at least 90%.

6.5.5 Link recovery procedures

6.5.5.0 Minimum conformance requirements

6.5.5.0.1 Minimum conformance requirements for SSB-based BFD and link recovery procedures

Same as in the clause 4.5.5.0.1.

6.5.5.0.3 Scheduling availability of UE during beam failure detection and candidate beam detection

Same as in the clause 4.5.5.0.3.

6.5.5.0.4 Requirements for Beam Failure Recovery in SCell

Same as in the clause 4.5.5.0.4.

6.5.5.0.2 Minimum conformance requirements for CSI-RS-based BFD and link recovery procedures

UE shall be able to evaluate whether the downlink radio link quality on the configured CSI-RS resource in set $\bar{q}_0$ estimated over the last $T_{Evaluate_BFD_CSI\text{-}RS}$ [ms] period becomes worse than the threshold $Q_{out_LR_CSI\text{-}RS}$ within $T_{Evaluate_BFD_CSI\text{-}RS}$ [ms] period.

The value of $T_{Evaluate_BFD_CSI\text{-}RS}$ is defined in Table 8.5.3.2-1 for FR1.

For FR1,

- P=1/(1 – $T_{CSI\text{-}RS}$/MGRP), when in the monitored cell there are measurement gaps configured for intra-frequency, inter-frequency or inter-RAT measurements, which are overlapping with some but not all occasions of the CSI-RS; and
- P=1 when in the monitored cell there are no measurement gaps overlapping with any occasion of the CSI-RS.

Longer evaluation period would be expected if the combination of BFD-RS, SMTC occasion and measurement gap configurations does not meet pervious conditions.

The values of M_{BFD} used in Table 6.5.5.0.2-1 is defined as

- M_{BFD} = 10, if the CSI-RS resource configured for BFD is transmitted with Density = 3.

Table 6.5.5.0.2-1: Evaluation period $T_{Evaluate_BFD_CSI\text{-}RS}$ for FR1

Configuration	$T_{Evaluate_BFD_CSI\text{-}RS}$ (ms)
no DRX	max([50], [M_{BFD} *P] * $T_{CSI\text{-}RS}$)
DRX cycle ≤ 320ms	max([50], [1.5×M_{BFD} *P]*max(T_{DRX}, $T_{CSI\text{-}RS}$))
DRX cycle > 320ms	[M_{BFD}*P] * T_{DRX}
Note: $T_{CSI\text{-}RS}$ is the periodicity of CSI-RS resource in the set $\bar{q}_0$. T_{DRX} is the DRX cycle length.	

When the radio link quality on all the configured RS resources in set $\bar{q}_0$ is worse than Q_{out_LR}, Layer 1 of the UE shall send a beam failure instance indication to the higher layers. A Layer 3 filter may be applied to the beam failure instance indications as specified in TS 38.331 [13].

The beam failure instance evaluation for the configured RS resources in set $\bar{q}_0$ shall be performed as specified in section 6 in TS 38.213 [8]. Two successive indications from Layer 1 shall be separated by at least $T_{Indication_interval_BFD}$.

When DRX is not used, $T_{Indication_interval_BFD}$ is max(2ms, $T_{BFD\text{-}RS,M}$), where $T_{BFD\text{-}RS,M}$ is the shortest periodicity of all configured RS resources in set $\bar{q}_0$ for the accessed cell, corresponding to either the shortest periodicity of the SSB in the set $\bar{q}_0$ or CSI-RS resource in the set $\bar{q}_0$.

When DRX is used, $T_{Indication_interval_BFD}$ is max(1.5*DRX_cycle_length, 1.5*$T_{BFD\text{-}RS,M}$) if DRX cycle_length is less than or equal to 320ms, and $T_{Indication_interval}$ is DRX_cycle_length if DRX cycle_length is greater than 320ms.

UE shall be able to evaluate whether the L1-RSRP measured on the configured CSI-RS resource in set $\bar{q}_1$ estimated over the last $T_{Evaluate_CBD_CSI\text{-}RS}$ [ms] period becomes better than the threshold Q_{in_LR} within $T_{Evaluate_CBD_CSI\text{-}RS}$ [ms] period provided CSI-RS Ês/Iot is according to Annex Table B.2.4.2 for a corresponding band.

The value of $T_{Evaluate_CBD_CSI\text{-}RS}$ is defined in Table 6.5.5.0.2-2 for FR1.

For FR1,

- P=1/(1 – $T_{CSI\text{-}RS}$/MGRP), when in the monitored cell there are measurement gaps configured for intra-frequency, inter-frequency or inter-RAT measurements, which are overlapping with some but not all occasions of the CSI-RS; and
- P=1 when in the monitored cell there are no measurement gaps overlapping with any occasion of the CSI-RS.

In both FR1 and FR2, if different SCS is used for SSB and CSI-RS, and the UE does not support *simultaneousRxDataSSB-DiffNumerology*, it is assumed that the CSI-RS configured for candidate beam detection and each SSB shall be TDMed transmitted.

The values of M_{CBD} used in Table 6.5.5.0.2-2 is defined as

- M_{CBD} = 3, if the CSI-RS resource configured in the set $\bar{q}_1$ is transmitted with Density = 3.

Table 6.5.5.0.2-2: Evaluation period $T_{Evaluate_CBD_CSI\text{-}RS}$ for FR1

Configuration	$T_{Evaluate_CBD_CSI\text{-}RS}$ (ms)
non-DRX	max([25], ceil(M_{CBD} *P) * $T_{CSI\text{-}RS}$)
DRX cycle ≤ 320ms	ceil(M_{CBD} *P*N) * max(T_{DRX}, $T_{CSI\text{-}RS}$)
DRX cycle > 320ms	ceil(M_{CBD} *P) *T_{DRX}
Note: $T_{CSI\text{-}RS}$ is the periodicity of CSI-RS resource in the set $\bar{q}_1$. T_{DRX} is the DRX cycle length.	

The normative reference for this requirement is TS 38.133 [6] clause 8.5.3.2, 8.5.4 and 8.5.6.2.

6.5.5.1 NR SA FR1 SSB-based beam failure detection and link recovery in non-DRX

6.5.5.1.1 Test purpose

The purpose of this test is to verify that the UE properly detects SSB-based beam failure in the set q_0 configured for a serving cell and that the UE performs correct SSB-based link recovery based on beam candidate set q_1. The purpose is to test the downlink monitoring for beam failure detection within the UEs active DL BWP, during the evaluation period, and link recovery, when no DRX is used. This test will partly verify the SSB based beam failure detection and link recovery for an FR1 serving cell requirements in TS 38.133 [6] clause 8.5.

6.5.5.1.2 Test applicability

This test applies to all types of NR UE release 15 and forward supporting 5GS NR SA FR1 and link recovery.

6.5.5.1.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 6.5.5.0.1.

The normative reference for this requirement is TS 38.133 [6] clause A.6.5.5.1.

6.5.5.1.4 Test description

The test consists of five successive time periods, with time duration of T1, T2, T3, T4 and T5 respectively. Figure 6.5.5.1.4-1 shows the five different time durations and the corresponding variation of the downlink SNR in the active cell to emulate SSB based beam failure. Figure 6.5.5.1.4-1 additionally shows the variation of the downlink L1-RSRP of the SSB in set q1 of the candidate beam used for link recovery

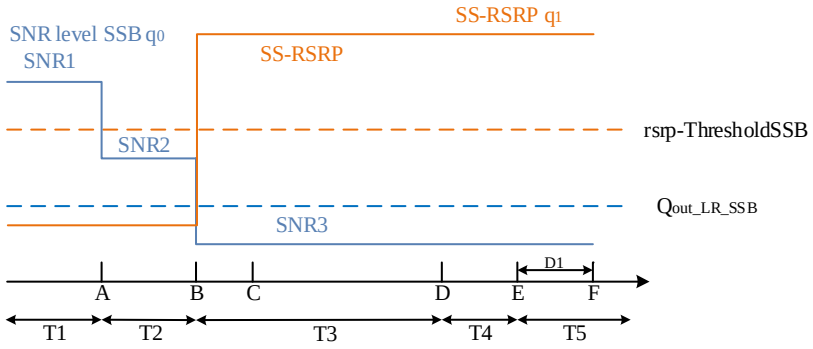


Figure 6.5.5.1.4-1: SNR and L1-RSRP variation for NR SA FR1 SSB-based beam failure detection and link recovery in non-DRX mode

6.5.5.1.4.1 Initial conditions

This test shall be tested using any of the test configurations in Table 6.5.5.1.4.1-1.

Table 6.5.5.1.4.1-1: Supported test configurations for NR SA FR1 SSB-based beam failure detection and link recovery in non-DRX mode

Configuration	Description
6.5.5.1-1	FDD duplex mode, 15 kHz SSB SCS, 10MHz bandwidth
6.5.5.1-2	TDD duplex mode, 15 kHz SSB SCS, 10MHz bandwidth
6.5.5.1-3	TDD duplex mode, 30 kHz SSB SCS, 40MHz bandwidth
Note: The UE is only required to pass in one of the supported test configurations in FR1	

Configure the test equipment and the DUT according to the parameters in Table 6.5.5.1.4.1-2.

Table 6.5.5.1.4.1-2: Initial conditions for NR SA FR1 SSB-based beam failure detection and link recovery in non-DRX mode

Parameter	Value		Comment
Test environment	NC		As specified in TS 38.508-1 [14] clause 4.1.
Test frequencies	As specified in Annex E, table E.4-1 and TS 38.508-1 [14] clause 4.3.1 and 4.4.2.		
Channel bandwidth	As specified by the test configuration selected from Table 6.5.5.1.4.1-1.		
Propagation conditions	AWGN		As specified in Annex C.2.2.
Connection Diagram	TE Part	A.3.1.7.1	As specified in TS 38.508-1 [14] Annex A.
	DUT Part	A.3.2.3.4	
Exceptions to connection diagram	- Without LTE link - For 4Rx capable UEs without any 2 Rx RF bands use A.3.2.5.2 for DUT part and A.3.1.8.4 for TE Part		

1. The general test parameter settings are set up according to Table 6.5.5.1.4.1-3.

2. Message contents are defined in clause 6.5.5.1.4.3.

3. There is one NR carrier and one NR cells specified in the test. Cell 1 is the NR cell used for connection setup with the power level set according to Annex C.1.2 and C.1.3 for this test.

Table 6.5.5.1.4.1-3: General test parameters for NR SA FR1 SSB-based beam failure detection and link recovery in non-DRX mode

Parameter		Unit	Value	Comment
			Test 1	
Active PSCell			Cell 1	
RF Channel Number			1	
Duplex mode	Config 1		FDD	
	Config 2, 3		TDD	
BWchannel	Config 1	MHz	10: NRB,c = 52	
	Config 2		10: NRB,c = 52	
	Config 3		40: NRB,c = 106	
DL initial BWP configuration	Config 1, 2, 3		DLBWP.0.1	
DL dedicated BWP configuration	Config 1, 2, 3		DLBWP.1.1	
UL initial BWP configuration	Config 1, 2, 3		ULBWP.0.1	
UL dedicated BWP configuration	Config 1, 2, 3		ULBWP.1.1	
TDD Configuration	Config 1		Not Applicable	
	Config 2		TDDConf.1.1	
	Config 3		TDDConf.2.1	
CORESET Reference Channel	Config 1		CR.1.1 FDD	
	Config 2		CR.1.1 TDD	
	Config 3		CR.2.1 TDD	
SSB Configuration	Config 1		SSB.3 FR1	
	Config 2		SSB.3 FR1	
	Config 3		SSB.4 FR1	
SMTC Configuration	Config 1, 2		SMTC.1	
	Config 3		SMTC.1	
PDSCH/PDCCH subcarrier spacing	Config 1, 2		15 KHz	
	Config 3		30 KHz	
PRACH Configuration	Config 1, 2		PRACH.2 FR1	
	Config 3		PRACH.2 FR1	
SSB Index assigned as BFD RS (q_0)			0	

SSB Index assigned as CBD RS (q_1)			1	
OCNG parameters			OP.1	
CP length			Normal	
Correlation Matrix and Antenna Configuration			2x2 Low	
Beam failure detection transmission parameters	DCI format		1-0	
	Number of Control OFDM symbols		2	
	Aggregation level	CCE	8	
	Ratio of hypothetical PDCCH RE energy to average CSI-RS RE energy	dB	0	
	Ratio of hypothetical PDCCH DMRS energy to average CSI-RS RE energy	dB	0	
	DMRS precoder granularity		REG bundle size	
	REG bundle size		6	
DRX			OFF	
Gap pattern ID			gp0	
gapOffset			0	
rlmInSyncOutOfSyncThreshold			absent	When the field is absent, the UE applies the value 0.
rsrp-ThresholdSSB	Config 1, 2	dBm/ SCS kHz	-98	Threshold used for $Q_{in_LR_SSB}$
	Config 3	dBm/ SCS kHz	-95	Threshold used for $Q_{in_LR_SSB}$
powerControlOffsetSS			db0	Used for deriving rsrp-ThresholdCSI-RS
beamFailureInstanceMaxCount			n1	see clause 5.17 of TS 38.321 [12]
beamFailureDetectionTimer			pbfd4	see clause 5.17 of TS 38.321 [12]
CSI-RS configuration for CSI reporting	Config 1		CSI-RS.1.1 FDD	
	Config 2		CSI-RS.1.1 TDD	
	Config 3		CSI-RS.2.1 TDD	
CSI-RS for tracking	Config 1		TRS.1.1 FDD	
	Config 2		TRS.1.1 TDD	
	Config 3		TRS.1.2 TDD	
SSB Index assigned as RLM RS			0, 1	
T310 Timer		ms	1000	
N310			2	
T1		s	0.2	During this time the UE shall be fully synchronized to cell 1
T2		s	0.37	
T3		s	0.24	
T4		s	0	
T5		s	0.17	
D1		s	0.13	
Note 1: All configurations are assigned to the UE prior to the start of time period T1.				

Note 2: UE-specific PDCCH is not transmitted after T1 starts.

6.5.5.1.4.2 Test procedure

Prior to the start of the time duration T1, the UE shall be fully synchronized to NR Cell 1. The UE shall be configured for periodic CSI reporting with a reporting periodicity of 5 ms. In the test, DRX configuration is not enabled. The UE is configured to perform inter-frequency measurements using GP ID #0 (40ms) in test 1

1. Ensure the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity *NR*, Connected without release *On* and Test Mode *On* according to TS 38.508-1 [14] clause 4.5.

2. The SS sends an *RRCReconfiguration* message to the UE to configure inter-frequency measurement.

3. The UE sends an *RRCReconfigurationComplete* message.

4. Set the parameters of NR Cell 1 according to T1 in Table 6.5.5.1.5-1. Propagation conditions are set according to Annex C.2.3. T1 starts.

5. When T1 expires the SS shall change the SNR value to T2 as specified in Table 6.5.5.1.5-1. T2 starts.

6. When T2 expires the SS shall change the SNR value to T3 as specified in Table 6.5.5.1.5-1. T3 starts.

7. When T3 expires the SS shall change the SNR value to T4 as specified in Table 6.5.5.1.5-1. T4 starts.

8. When T4 expires the SS shall change the SNR value to T5 as specified in Table 6.5.5.1.5-1. T5 starts.

9. If the SS:

   a) detects uplink power on NR carrier equal to or higher than minimum output power defined in TS 38.521-1 [17] clause 6.3.1.5 in each slot configured for CSI transmission (according CSI reporting on PUCCH) during the period from time point A to time point B

   and

   b) does not detect preamble on a beam associated with the candidate beam set $q_1$before time point B

   and

   c) detects preamble on a beam associated with the candidate beam set q_1 before time point F (D1 after the start of T5),

   the number of successful tests is increased by one.

   Otherwise the number of failed tests is increased by one.

10. Switch the UE off and on. Ensure the UE is in RRC_CONNECTED with generic procedure parameters Connectivity NR, Connected without release On and Test Mode *On* according to TS 38.508-1 [14] clause 4.5.

11. Repeat steps 4-10 for all subtests until the confidence level according to Tables G.2.3-1 in Annex G clause G.2 is achieved.

6.5.5.1.4.3 Message contents

Message contents are according to TS 38.508-1 [14] clause 4.6 and clause 7.3 with the following exceptions:

Table 6.5.5.1.4.3-1: Common Exception messages for NR SA FR1 SSB-based beam failure detection and link recovery in non-DRX mode

Default Message Contents	
Common contents of system information blocks exceptions	

Default RRC messages and information elements contents exceptions	Table H.3.1-6 with Condition BFD Table H.3.1-1 Table H.3.1-2 with Condition INTER-FREQ, L3 FILTERING NEEDED, GAP_NEEDED Table H.3.1-3 with Condition INTER-FREQ MO (where ssbFrequency is set to the ARFCN value of carrier center of High range) Table H.3.1-4 with A3-offset = 0 Table H.3.1-8 with Condition SSB BFD Table H.3.1-10 with Condition SSB Table H.3.1-10A Table H.3.5-4 Table 7.3.1-3 in TS 38.508-1 [14] with condition SMTC.1

Table 6.5.5.1.4.3-2: PDCCH *Search Space* for BFR

Derivation Path: TS 38.508-1 [14], Table 4.6.3-162			
Information Element	**Value/remark**	**Comment**	**Condition**
SearchSpace ::= SEQUENCE {			
searchSpaceId	4	BFR	
controlResourceSetId	2	BFR	
monitoringSlotPeriodicityAndOffset CHOICE {			
sl1	NULL		
}			
monitoringSymbolsWithinSlot	10000000000000	Symbol 0	
nrofCandidates SEQUENCE {			
aggregationLevel1	n0		
aggregationLevel2	n0		
aggregationLevel4	n0		
aggregationLevel8	n1	AL8	
aggregationLevel16	n0		
}			
searchSpaceType CHOICE {			
ue-Specific SEQUENCE {			USS
dci-Formats	formats0-0-And-1-0	DCI Format 1_0	
}			
}			
}			

Table 6.5.5.1.4.3-3: *RLF-TimersAndConstants*

Derivation Path: TS 38.508-1 [14], Table 4.6.3-150			
Information Element	**Value/remark**	**Comment**	**Condition**
RLF-TimersAndConstants ::= SEQUENCE {			
n310	n2		
}			

Table 6.5.5.1.4.3-4: Void

Table 6.5.5.1.4.3-5: *PDCCH-Config*

Derivation Path: TS 38.501-1 [14],Table 4.6.3-95			
Information Element	**Value/remark**	**Comment**	**Condition**
PDCCH-Config ::= SEQUENCE {			
controlResourceSetToAddModList SEQUENCE(SIZE (1..3)) OF ControlResourceSet {	2 entries		
ControlResourceSet[2]	ControlResourceSet	entry 2, BFR	
}			
controlResourceSetToReleaseList	Not present		

searchSpacesToAddModList SEQUENCE(SIZE (1..10)) OF SearchSpace {	2 entries		
SearchSpace[2]	SearchSpace	entry 2, BFR	
}			
searchSpacesToReleaseList	Not present		
downlinkPreemption	Not present		
tpc-PUSCH	Not present		
tpc-PUCCH	Not present		
tpc-SRS	Not present		
}			

Table 6.5.5.1.4.3-6: ControlResourceSet for BFR

Derivation Path: TS 38.501-1 [14],Table 7.3.1-15			
Information Element	**Value/remark**	**Comment**	**Condition**
ControlResourceSet ::= SEQUENCE {			
controlResourceSetId	2		
duration	2		
cce-REG-MappingType CHOICE {			
interleaved ::= SEQUENCE {			
reg-BundleSize	n6		
interleaverSize	n2		
shiftIndex	0		
}			
tci-StatesPDCCH-ToAddList	Not present		
}			

6.5.5.1.5 Test requirement

Tables 6.5.5.1.4.1-3 and 6.5.5.1.5-1 define the primary level settings including test tolerances for NR SA FR1 SSB-based beam failure detection and link recovery in DRX.

Table 6.5.5.1.5-1: NR Cell specific test parameters for NR SA FR1 SSB-based beam failure detection and link recovery in non-DRX mode

Parameter		**Unit**	**Test 1**				
			T1	**T2**	**T3**	**T4**	**T5**
EPRE ratio of PDCCH DMRS to SSS		dB	0				
EPRE ratio of PDCCH to PDCCH DMRS		dB					
EPRE ratio of PBCH DMRS to SSS		dB					
EPRE ratio of PBCH to PBCH DMRS		dB					
EPRE ratio of PSS to SSS		dB					
EPRE ratio of PDSCH DMRS to SSS		dB					
EPRE ratio of PDSCH to PDSCH DMRS		dB					
EPRE ratio of OCNG DMRS to SSS		dB					
EPRE ratio of OCNG to OCNG DMRS		dB					
SNR_ SSB of set q_0	Config 1	dB	5.8	-2.2	-12.8	-12.8	-12.8
	Config 2		5.8	-2.2	-12.8	-12.8	-12.8
	Config 3		5.8	-2.2	-12.8	-12.8	-12.8
SNR_SSB of set q1	Config 1	dB	-10.2	-10.2	10.2	10.2	10.2
	Config 2		-10.2	-10.2	10.2	10.2	10.2
	Config 3		-10.2	-10.2	10.2	10.2	10.2
SSB_RP of set q_1	Config 1	dBm/SCS kHz	-108.2	-108.2	-87.8	-87.8	-87.8
	Config 2		-108.2	-108.2	-87.8	-87.8	-87.8
	Config 3		-105.2	-105.2	-84.8	-84.8	-84.8
N_{oc}	Config 1	dBm/15 kHz	-98				
	Config 2		-98				
	Config 3		-98				
Propagation condition			TDL-C 300ns 100Hz				

Note 1:	OCNG shall be used such that the resources in Cell 1 are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.
Note 2:	The uplink resources for CSI reporting are assigned to the UE prior to the start of time period T1.
Note 3:	NZP CSI-RS resource set configuration for CSI reporting are assigned to the UE prior to the start of time period T1.
Note 4:	Measurement gap configuration is assigned to the UE prior to the start of time period T1
Note 5:	The timers and layer 3 filtering related parameters are configured prior to the start of time period T1.
Note 6:	The signal contains PDCCH for UEs other than the device under test as part of OCNG.
Note 7:	SNR levels correspond to the signal to noise ratio over the SSS REs.
Note 8:	The SNR in time periods T1, T2, T3, T4 and T5 is denoted as SNR1, SNR2 and SNR3 respectively in figure 6.5.5.1.4-1.
Note 9:	The SNR values are specified for a UE with 2RX antennas connected under test. For a UE with 4RX antennas connected under test, the SNR for RS in set q0 during T3, T4, and T5 from D.4.1.1, is -15dB-TT = -15.8dB (including test tolerances).

Table 6.5.5.1.5-2: Void

The UE behaviour during time durations T1, T2, T3, T4 and T5 shall be as follows:

During the time duration T1 and T2, the UE shall transmit uplink signal at least in all subframes configured for CSI transmission on Cell 1.

During the period from time point A to time point B the UE shall transmit uplink signal in Cell 1 in all uplink slots configured for CSI transmission according to the configured periodic CSI reporting for Cell 1.

During T3 the UE shall detect beam failure and initiate link recovery. During T4 and T5 the UE measures and evaluate beam candidate from beam candidate set q_1.

No later than time point F occurring no later than D1 = 130 ms after the start of T5, the UE shall transmit preamble on a beam associated with the candidate beam set q_1. The UE shall not transmit preamble on a beam associated with the candidate beam set q_1 earlier than time point B.

Test is concluded once the test equipment has received the initial preamble transmission from the UE. The rate of correct events observed during repeated tests shall be at least 90%.

6.5.5.2 NR SA FR1 SSB-based beam failure detection and link recovery in DRX

6.5.5.2.1 Test purpose

The purpose of this test is to verify that the UE properly detects SSB-based beam failure in the set q_0 configured for a serving cell and that the UE performs correct SSB-based link recovery based on beam candidate set q_1. The purpose is to test the downlink monitoring for beam failure detection within the UEs active DL BWP, during the evaluation period, and link recovery, when DRX is used. This test will partly verify the SSB based beam failure detection and link recovery for an FR1 serving cell requirements in TS 38.133 [6] clause 8.5.

6.5.5.2.2 Test applicability

This test applies to all types of NR UE release 15 and forward supporting 5GS NR SA FR1, link recovery and long DRX cycle.

6.5.5.2.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 6.5.5.0.1.

The normative reference for this requirement is TS 38.133 [6] clause A.6.5.5.2.

6.5.5.2.4 Test description

The test consists of five successive time periods, with time duration of T1, T2, T3, T4 and T5 respectively. Figure 6.5.5.2.4-1 shows the five different time durations and the corresponding variation of the downlink SNR in the active cell to emulate SSB based beam failure. Figure 6.5.5.2.4-1 additionally shows the variation of the downlink L1-RSRP of the SSB in set q_1 of the candidate beam used for link recovery.

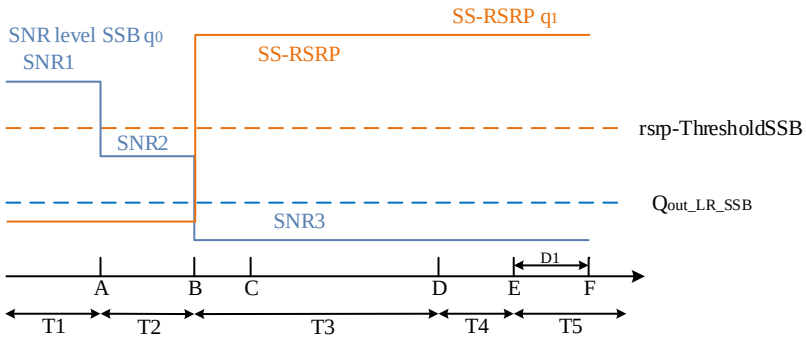


Figure 6.5.5.2.4-1: SNR and L1-RSRP variation for NR SA FR1 SSB-based beam failure detection and link recovery in DRX

6.5.5.2.4.1 Initial conditions

This test shall be tested using any of the test configurations in Table 6.5.5.2.4.1-1.

Table 6.5.5.2.4.1-1: Supported test configurations for NR SA FR1 SSB-based beam failure detection and link recovery in DRX

Configuration	Description
6.5.5.2-1	FDD duplex mode, 15 kHz SSB SCS, 10MHz bandwidth
6.5.5.2-2	TDD duplex mode, 15 kHz SSB SCS, 10MHz bandwidth
6.5.5.2-3	TDD duplex mode, 30 kHz SSB SCS, 40MHz bandwidth
Note: The UE is only required to pass in one of the supported test configurations in FR1	

Configure the test equipment and the DUT according to the parameters in Table 6.5.5.2.4.1-2.

Table 6.5.5.2.4.1-2: Initial conditions for NR SA FR1 SSB-based beam failure detection and link recovery in DRX

Parameter	Value		Comment
Test environment	NC		As specified in TS 38.508-1 [14] clause 4.1.
Test frequencies	As specified in Annex E, table E.4-1 and TS 38.508-1 [14] clause 4.3.1 and 4.4.2.		
Channel bandwidth	As specified by the test configuration selected from Table 6.5.5.2.4.1-1.		
Propagation conditions	AWGN		As specified in Annex C.2.2.
Connection Diagram	TE Part	A.3.1.7.1	As specified in TS 38.508-1 [14] Annex A.
	DUT Part	A.3.2.3.4	
Exceptions to connection diagram	- Without LTE link - For 4Rx capable UEs without any 2 Rx RF bands use A.3.2.5.2 for DUT part and A.3.1.8.4 for TE Part		

1. The general test parameter settings are set up according to Table 6.5.5.2.4.1-3.
2. Message contents are defined in clause 6.5.5.2.4.3.
3. There is one NR carrier and one NR cells specified in the test. Cell 1 is the NR cell used for connection setup with the power level set according to Annex C.1.2 and C.1.3 for this test.

Table 6.5.5.2.4.1-3: General test parameters for NR SA FR1 SSB-based beam failure detection and link recovery in DRX

Parameter	Unit	Value	Comment
		Test 1	

Active PSCell			Cell 1	
RF Channel Number			1	
Duplex mode	Config 1		FDD	
	Config 2, 3		TDD	
BWchannel	Config 1	MHz	10: NRB,c = 52	
	Config 2		10: NRB,c = 52	
	Config 3		40: NRB,c = 106	
DL initial BWP configuration	Config 1, 2, 3		DLBWP.0.1	
DL dedicated BWP configuration	Config 1, 2, 3		DLBWP.1.1	
UL initial BWP configuration	Config 1, 2, 3		ULBWP.0.1	
UL dedicated BWP configuration	Config 1, 2, 3		ULBWP.1.1	
TDD Configuration	Config 1		Not Applicable	
	Config 2		TDDConf.1.1	
	Config 3		TDDConf.2.1	
CORESET Reference Channel	Config 1		CR.1.1 FDD	
	Config 2		CR.1.1 TDD	
	Config 3		CR.2.1 TDD	
SSB Configuration	Config 1		SSB.3 FR1	
	Config 2		SSB.3 FR1	
	Config 3		SSB.4 FR1	
SMTC Configuration	Config 1, 2		SMTC.1	
	Config 3		SMTC.1	
PDSCH/PDCCH subcarrier spacing	Config 1, 2		15 KHz	
	Config 3		30 KHz	
PRACH Configuration	Config 1, 2		PRACH.2 FR1	
	Config 3		PRACH.2 FR1	
SSB Index assigned as BFD RS (q_0)			0	
SSB Index assigned as CBD RS (q_1)			1	
OCNG parameters			OP.1	
CP length			Normal	
Correlation Matrix and Antenna Configuration			2x2 Low	
Beam failure detection transmission parameters	DCI format		1-0	
	Number of Control OFDM symbols		2	
	Aggregation level	CCE	8	
	Ratio of hypothetical PDCCH RE energy to average CSI-RS RE energy	dB	0	
	Ratio of hypothetical PDCCH DMRS energy to average CSI-RS RE energy	dB	0	
	DMRS precoder granularity		REG bundle size	
	REG bundle size		6	
DRX			DRX.7	see clause A.3.3.7 of TS 38.133 [6]
Gap pattern ID			N.A.	
rlmInSyncOutOfSyncThreshold			absent	When the field is absent, the UE applies the

				value 0.
rsrp-ThresholdSSB	Config 1, 2	dBm/ SCS kHz	-98	Threshold used for $Q_{in_LR_SSB}$
	Config 3	dBm/ SCS kHz	-95	Threshold used for $Q_{in_LR_SSB}$
powerControlOffsetSS			db0	Used for deriving rsrp-ThresholdCSI-RS
beamFailureInstanceMaxCount			n1	see clause 5.17 of TS 38.321 [12]
beamFailureDetectionTimer			pbfd4	see clause 5.17 of TS 38.321 [12]
CSI-RS configuration for CSI reporting	Config 1		CSI-RS.1.1 FDD	
	Config 2		CSI-RS.1.1 TDD	
	Config 3		CSI-RS.2.1 TDD	
CSI-RS for tracking	Config 1		TRS.1.1 FDD	
	Config 2		TRS.1.1 TDD	
	Config 3		TRS.1.2 TDD	
SSB Index assigned as RLM RS			0, 1	
T310 Timer		ms	1000	
N310			2	
T1		s	1	During this time the UE shall be fully synchronized to cell 1
T2		s	5.17	
T3		s	3.24	
T4		s	0	
T5		s	1.97	
D1		s	1.93	
Note 1: All configurations are assigned to the UE prior to the start of time period T1. Note 2: UE-specific PDCCH is not transmitted after T1 starts.				

6.5.5.2.4.2 Test procedure

Prior to the start of the time duration T1, the UE shall be fully synchronized to NR Cell 1. The UE shall be configured for periodic CSI reporting with a reporting periodicity of 5 ms. In the test, DRX configuration is enabled.

1. Ensure the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity *NR*, Connected without release *On* and Test Mode *On* according to TS 38.508-1 [14] clause 4.5.

2. Set the parameters of NR Cell 1 according to T1 in Table 6.5.5.2.5-1. Propagation conditions are set according to Annex C.2.3. T1 starts.

3. When T1 expires the SS shall change the SNR value to T2 as specified in Table 6.5.5.2.5-1. T2 starts.

4. When T2 expires the SS shall change the SNR value to T3 as specified in Table 6.5.5.2.5-1. T3 starts.

5. When T3 expires the SS shall change the SNR value to T4 as specified in Table 6.5.5.2.5-1. T4 starts.

6. When T4 expires the SS shall change the SNR value to T5 as specified in Table 6.5.5.2.5-1. T5 starts.

7. If the SS:

a) detects uplink power on NR carrier equal to or higher than minimum output power defined in TS 38.521-1 [17] clause 6.3.1.5 in each slot configured for CSI transmission (according CSI reporting on PUCCH) during the period from time point A to time point B

and

b) does not detect preamble on a beam associated with the candidate beam set $q_1$before time point B

and

c) detects preamble on a beam associated with the candidate beam set q_1 before time point F (D1 after the start of T5),

the number of successful tests is increased by one.

Otherwise the number of failed tests is increased by one.

8. Switch the UE off and on. Ensure the UE is in RRC_CONNECTED with generic procedure parameters Connectivity NR, Connected without release On and Test Mode *On* according to TS 38.508-1 [14] clause 4.5.

9. Repeat steps 2-8 for all subtests until the confidence level according to Tables G.2.3-1 in Annex G clause G.2 is achieved.

6.5.5.2.4.3 Message contents

Message contents are according to TS 38.508-1 [14] clause 4.6 and clause 7.3 with the following exceptions:

Table 6.5.5.2.4.3-1: Common Exception messages for NR SA FR1 SSB-based beam failure detection and link recovery in DRX

Default Message Contents	
Common contents of system information blocks exceptions	
Default RRC messages and information elements contents exceptions	Table H.3.1-8 with Condition SSB BFD Table H.3.1-10 with Condition SSB Table H.3.1-10A Table H.3.5-4 Table H.3.7-1 with Condition DRX.7 Table 7.3.1-3 in TS 38.508-1 [14] with condition SMTC.1

Table 6.5.5.2.4.3-2: PDCCH *Search Space* for BFR

Derivation Path: TS 38.508-1 [14], Table 4.6.3-162			
Information Element	**Value/remark**	**Comment**	**Condition**
SearchSpace ::= SEQUENCE {			
searchSpaceId	4	BFR	
controlResourceSetId	2	BFR	
monitoringSlotPeriodicityAndOffset CHOICE {			
sl1	NULL		
}			
monitoringSymbolsWithinSlot	10000000000000	Symbol 0	
nrofCandidates SEQUENCE {			
aggregationLevel1	n0		
aggregationLevel2	n0		
aggregationLevel4	n0		
aggregationLevel8	n1	AL8	
aggregationLevel16	n0		
}			
searchSpaceType CHOICE {			
ue-Specific SEQUENCE {			USS
dci-Formats	formats0-0-And-1-0	DCI Format 1_0	
}			
}			
}			

Table 6.5.5.2.4.3-3: *RLF-TimersAndConstants*

Derivation Path: TS 38.508-1 [14], Table 4.6.3-150			
Information Element	**Value/remark**	**Comment**	**Condition**
RLF-TimersAndConstants ::= SEQUENCE {			

n310	n2		
}			

Table 6.5.5.2.4.3-4: Void

Table 6.5.5.2.4.3-5: *PDCCH-Config*

Derivation Path: TS 38.501-1 [14],Table 4.6.3-95			
Information Element	**Value/remark**	**Comment**	**Condition**
PDCCH-Config ::= SEQUENCE {			
controlResourceSetToAddModList SEQUENCE(SIZE (1..3)) OF ControlResourceSet {	2 entries		
ControlResourceSet[2]	ControlResourceSet	entry 2, BFR	
}			
controlResourceSetToReleaseList	Not present		
searchSpacesToAddModList SEQUENCE(SIZE (1..10)) OF SearchSpace {	2 entries		
SearchSpace[2]	SearchSpace	entry 2, BFR	
}			
searchSpacesToReleaseList	Not present		
downlinkPreemption	Not present		
tpc-PUSCH	Not present		
tpc-PUCCH	Not present		
tpc-SRS	Not present		
}			

Table 6.5.5.2.4.3-6: ControlResourceSet for BFR

Derivation Path: TS 38.501-1 [14],Table 7.3.1-15			
Information Element	**Value/remark**	**Comment**	**Condition**
ControlResourceSet ::= SEQUENCE {			
controlResourceSetId	2		
duration	2		
cce-REG-MappingType CHOICE {			
interleaved ::= SEQUENCE {			
reg-BundleSize	n6		
interleaverSize	n2		
shiftIndex	0		
}			
tci-StatesPDCCH-ToAddList	Not present		
}			

6.5.5.2.5 Test requirement

Tables 6.5.5.2.4.1-3 and 6.5.5.2.5-1 define the primary level settings including test tolerances for NR SA FR1 SSB-based beam failure detection and link recovery in DRX.

Table 6.5.5.2.5-1: NR Cell specific test parameters for NR SA FR1 SSB-based beam failure detection and link recovery in DRX

Parameter	**Unit**	**Test 1**				
		T1	**T2**	**T3**	**T4**	**T5**
EPRE ratio of PDCCH DMRS to SSS	dB	0				
EPRE ratio of PDCCH to PDCCH DMRS	dB					
EPRE ratio of PBCH DMRS to SSS	dB					
EPRE ratio of PBCH to PBCH DMRS	dB					
EPRE ratio of PSS to SSS	dB					
EPRE ratio of PDSCH DMRS to SSS	dB					
EPRE ratio of PDSCH to PDSCH DMRS	dB					
EPRE ratio of OCNG DMRS to SSS	dB					

EPRE ratio of OCNG to OCNG DMRS		dB					
SNR_ SSB of set q_0	Config 1	dB	5.8	-2.2	-12.8	-12.8	-12.8
	Config 2		5.8	-2.2	-12.8	-12.8	-12.8
	Config 3		5.8	-2.2	-12.8	-12.8	-12.8
SNR_SSB of set q1	Config 1	dB	-10.2	-10.2	10.2	10.2	10.2
	Config 2		-10.2	-10.2	10.2	10.2	10.2
	Config 3		-10.2	-10.2	10.2	10.2	10.2
SSB_RP of set q_1	Config 1	dBm/SCS kHz	-108.2	-108.2	−87.8	−87.8	−87.8
	Config 2		-108.2	-108.2	−87.8	−87.8	−87.8
	Config 3		-105.2	-105.2	−84.8	−84.8	−84.8
N_{oc}	Config 1	dBm/15 kHz	-98				
	Config 2		-98				
	Config 3		-98				
Propagation condition			TDL-C 300ns 100Hz				

Note 1: OCNG shall be used such that the resources in Cell 1 are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.
Note 2: The uplink resources for CSI reporting are assigned to the UE prior to the start of time period T1.
Note 3: NZP CSI-RS resource set configuration for CSI reporting are assigned to the UE prior to the start of time period T1.
Note 4: Void.
Note 5: The timers and layer 3 filtering related parameters are configured prior to the start of time period T1.
Note 6: The signal contains PDCCH for UEs other than the device under test as part of OCNG.
Note 7: SNR levels correspond to the signal to noise ratio over the SSS REs.
Note 8: The SNR in time periods T1, T2, T3, T4 and T5 is denoted as SNR1, SNR2 and SNR3 respectively in figure 6.5.5.2.4-1.
Note 9: The SNR values are specified for a UE with 2RX antennas connected under test. For a UE with 4RX antennas connected under test, the SNR for RS in set q0 during T3, T4, and T5 from D.4.1.1, is -15dB-TT = -15.8dB (including test tolerances).

The UE behaviour during time durations T1, T2, T3, T4 and T5 shall be as follows:

During the time duration T1 and T2, the UE shall transmit uplink signal at least in all subframes configured for CSI transmission on Cell 1.

During the period from time point A to time point B the UE shall transmit uplink signal in Cell 1 in all uplink slots configured for CSI transmission according to the configured periodic CSI reporting for Cell 1.

During T3 the UE shall detect beam failure and initiate link recovery. During T4 and T5 the UE measures and evaluate beam candidate from beam candidate set q_1.

No later than time point F occurring no later than D1 = 1930 ms after the start of T5, the UE shall transmit preamble on a beam associated with the candidate beam set q_1. The UE shall not transmit preamble on a beam associated with the candidate beam set q_1 earlier than time point B.

Test is concluded once the test equipment has received the initial preamble transmission from the UE. The rate of correct events observed during repeated tests shall be at least 90%.

6.5.5.3 NR SA FR1 CSI-RS-based beam failure detection and link recovery in non-DRX

6.5.5.3.1 Test purpose

The purpose of this test is to verify that the UE properly detects CSI-RS-based beam failure in the set q_0 configured for a serving cell and that the UE performs correct CSI-RS-based link recovery based on beam candidate set q_1. To test the downlink monitoring for beam failure detection within the UEs active DL BWP, during the evaluation period, and link recovery, when no DRX is used. This test will partly verify the CSI-RS based beam failure detection and link recovery for an FR1 serving cell requirements in TS 38.133 [6] clause 8.5.

6.5.5.3.2 Test applicability

This test applies to all types of NR UE release 15 and forward supporting 5GS NR SA FR1, CSI-RS based RLM and link recovery.

6.5.5.3.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 6.5.5.0.2.

The normative reference for this requirement is TS 38.133 [6] clause A.6.5.5.3.

6.5.5.3.4 Test description

The test consists of five successive time periods, with time duration of T1, T2, T3, T4 and T5 respectively. Figure 6.5.5.3.4-1 shows the five different time durations and the corresponding variation of the downlink SNR of the CSI-RS in set q0 in the active cell to emulate CSI-RS based beam failure and the variation of the downlink L1-RSRP of the CSI-RS in set q1 of the candidate beam used for link recovery.

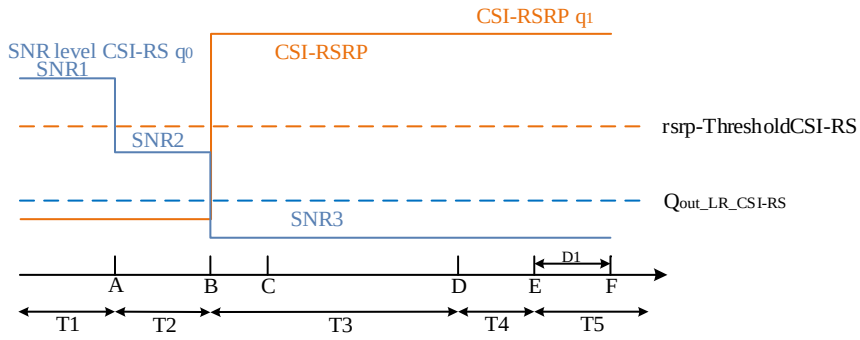


Figure 6.5.5.3.4-1: SNR and L1-RSRP variation for NR SA FR1 CSI-RS-based beam failure detection and link recovery in non-DRX

6.5.5.3.4.1 Initial conditions

This test shall be tested using any of the test configurations in Table 6.5.5.3.4.1-1.

Table 6.5.5.3.4.1-1: Supported test configurations for NR SA FR1 CSI-RS-based beam failure detection and link recovery in non-DRX

Configuration	Description
6.5.5.3-1	FDD duplex mode, 15 kHz SSB SCS, 10MHz bandwidth
6.5.5.3-2	TDD duplex mode, 15 kHz SSB SCS, 10MHz bandwidth
6.5.5.3-3	TDD duplex mode, 30 kHz SSB SCS, 40MHz bandwidth
Note: The UE is only required to pass in one of the supported test configurations in FR1	

Configure the test equipment and the DUT according to the parameters in Table 6.5.5.3.4.1-2.

Table 6.5.5.3.4.1-2: Initial conditions for NR SA FR1 CSI-RS-based beam failure detection and link recovery in non-DRX

Parameter	Value		Comment
Test environment	NC		As specified in TS 38.508-1 [14] clause 4.1.
Test frequencies	As specified in Annex E, table E.4-1 and TS 38.508-1 [14] clause 4.3.1 and 4.4.2.		
Channel bandwidth	As specified by the test configuration selected from Table 6.5.5.3.4.1-1.		
Propagation conditions	AWGN		As specified in Annex C.2.2.
Connection Diagram	TE Part	A.3.1.7.1	As specified in TS 38.508-1 [14] Annex A.
	DUT Part	A.3.2.3.4	
Exceptions to connection diagram	- Without LTE link - For 4Rx capable UEs without any 2Rx RF bands use A.3.2.5.2 for DUT part and A.3.1.8.4 for TE Part		

1. The general test parameter settings are set up according to Table 6.5.5.3.4.1-3.

2. Message contents are defined in clause 6.5.5.3.4.3.

3. There is one NR carrier and one NR cell specified in the test. Cell 1 is the NR cell used for connection setup with the power level set according to Annex C.1.2 and C.1.3 for this test.

Table 6.5.5.3.4.1-3: General test parameters for NR SA FR1 CSI-RS-based beam failure detection and link recovery in non-DRX

Parameter		Unit	Value	Comment
			Test 1	
Active PCell			Cell 1	
RF Channel Number			1	
Duplex mode	Config 1		FDD	
	Config 2, 3		TDD	
TDD Configuration	Config 1		Not Applicable	
	Config 2		TDDConf.1.1	
	Config 3		TDDConf.2.1	
CORESET Reference Channel	Config 1		CR.1.1 FDD	
	Config 2		CR.1.1 TDD	
	Config 3		CR.2.1 TDD	
SSB Configuration	Config 1		SSB.3 FR1	
	Config 2		SSB.3 FR1	
	Config 3		SSB.4 FR1	
SMTC Configuration	Config 1, 2		SMTC.1	
	Config 3		SMTC.1	
PDSCH/PDCCH subcarrier spacing	Config 1, 2		15 KHz	
	Config 3		30 KHz	
PRACH Configuration	Config 1, 2		PRACH.4 FR1	
	Config 3		PRACH.4 FR1	
csi-RS-Index assigned as beam failure detection RS in set q_0			0	
OCNG parameters			OP.1	
CP length			Normal	
Correlation Matrix and Antenna Configuration			2x2 Low	
Beam failure detection transmission parameters	DCI format		1-0	
	Number of Control OFDM symbols		2	
	Aggregation level	CCE	8	
	Ratio of hypothetical PDCCH RE energy to average CSI-RS RE energy	dB	0	
	Ratio of hypothetical PDCCH DMRS energy to average CSI-RS RE energy	dB	0	
	DMRS precoder granularity		REG bundle size	
	REG bundle size		6	
DRX			OFF	
Gap pattern ID			N.A.	
csi-RS-Index assigned as candidate beam detection RS in set q_1			1	N
rlmInSyncOutOfSyncThreshold			absent	When the field is absent, the UE applies the value 0.
rsrp-ThresholdSSB	Config 1, 2	dBm/SCS kHz	-98	Threshold used for $Q_{in_LR_SSB}$
	Config 3	dBm/SCS kHz	-95	Threshold used for $Q_{in_LR_SSB}$

powerControlOffsetSS			db0	Used for deriving rsrp-ThresholdCSI-RS
beamFailureInstanceMaxCount			n1	see TS 38.321 [12], section 5.17
beamFailureDetectionTimer			pbfd4	see TS 38.321 [12], section 5.17
CSI-RS configuration for q_0 and q_1	Config 1		CSI-RS.1.2 FDD	
	Config 2		CSI-RS.1.2 TDD	
	Config 3		CSI-RS.2.2 TDD	
CSI-RS configuration for CSI reporting	Config 1		CSI-RS.1.1 FDD	
	Config 2		CSI-RS.1.1 TDD	
	Config 3		CSI-RS.2.1 TDD	
TRS configuration	Config 1		TRS.1.1 FDD	
	Config 2		TRS.1.1 TDD	
	Config 3		TRS.1.2 TDD	
CSI-RS-Index assigned as RLM RS	Config 1		CSI-RS.1.2 FDD	
	Config 2		CSI-RS.1.2 TDD	
	Config 3		CSI-RS.2.2 TDD	
T310 Timer		ms	1000	
N310			2	
T1		s	0.2	During this time the UE shall be fully synchronized to cell 1
T2		s	0.18	
T3		s	0.14	
T4		s	0	
T5		s	0.08	
D1		s	0.04	
Note 1: UE-specific PDCCH is not transmitted after T1 starts.				

6.5.5.3.4.2 Test procedure

Prior to the start of the time duration T1, the UE shall be fully synchronized to NR Cell 1. The UE shall be configured for periodic CSI reporting with a reporting periodicity of 5 ms. In the test, DRX configuration is not enabled.

1. Ensure the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity *NR*, Connected without release *On* and Test Mode *On* according to TS 38.508-1 [14] clause 4.5.

2. Set the parameters of NR Cell 1 according to T1 in Table 6.5.5.3.5-1. Propagation conditions are set according to Annex C.2.3. T1 starts.

3. When T1 expires the SS shall change the SNR value to T2 as specified in Table 6.5.5.3.5-1. T2 starts.

4. When T2 expires the SS shall change the SNR value to T3 as specified in Table 6.5.5.3.5-1. T3 starts.

5. When T3 expires the SS shall change the SNR value to T4 as specified in Table 6.5.5.3.5-1. T4 starts.

6. When T4 expires the SS shall change the SNR value to T5 as specified in Table 6.5.5.3.5-1. T5 starts.

7. If the SS:

   a) detects uplink power on NR carrier equal to or higher than minimum output power defined in TS 38.521-1 [17] clause 6.3.1.5 in each slot configured for CSI transmission (according CSI reporting on PUCCH) during the period from time point A to time point B

   and

   b) does not detect preamble on a beam associated with the candidate beam set $q_1$before time point B

   and

   c) detects preamble on a beam associated with the candidate beam set q_1 before time point F (D1 after the start of T5),

   the number of successful tests is increased by one.

Otherwise the number of failed tests is increased by one.

8. Switch the UE off and on. Ensure the UE is in RRC_CONNECTED with generic procedure parameters Connectivity NR, Connected without release On and Test Mode *On* according to TS 38.508-1 [14] clause 4.5.

9. Repeat steps 2-8 for all subtests until the confidence level according to Tables G.2.3-1 in Annex G clause G.2 is achieved.

6.5.5.3.4.3 Message contents

Message contents are according to TS 38.508-1 [14] clause 7.3 with the following exceptions:

Table 6.5.5.3.4.3-1: Common Exception messages for NR SA FR1 CSI-RS-based beam failure detection and link recovery in non-DRX

Default Message Contents	
Common contents of system information blocks exceptions	
Default RRC messages and information elements contents exceptions	Table H.3.1-8 with Condition CSI-RS BFD Table H.3.1-10 with Condition CSI-RS Table H.3.1-10A Table H.3.5-4 Table 7.3.1-3 in TS 38.508-1 [14] with condition SMTC.1

Table 6.5.5.3.4.3-2: PDCCH *Search Space* for BFR

Derivation Path: TS 38.508-1 [14], Table 4.6.3-162			
Information Element	**Value/remark**	**Comment**	**Condition**
SearchSpace ::= SEQUENCE {			
searchSpaceId	4	BFR	
controlResourceSetId	2	BFR	
monitoringSlotPeriodicityAndOffset CHOICE {			
sl1	NULL		
}			
monitoringSymbolsWithinSlot	10000000000000	Symbol 0	
nrofCandidates SEQUENCE {			
aggregationLevel1	n0		
aggregationLevel2	n0		
aggregationLevel4	n0		
aggregationLevel8	n1	AL8	
aggregationLevel16	n0		
}			
searchSpaceType CHOICE {			
ue-Specific SEQUENCE {			USS
dci-Formats	formats0-0-And-1-0	DCI Format 1_0	
}			
}			
}			

Table 6.5.5.3.4.3-3: *RLF-TimersAndConstants*

Derivation Path: TS 38.508-1 [14], Table 4.6.3-150			
Information Element	**Value/remark**	**Comment**	**Condition**
RLF-TimersAndConstants ::= SEQUENCE {			
n310	n2		
}			

Table 6.5.5.3.4.3-4: Void

Table 6.5.5.3.4.3-5: *NZP-CSI-RS-Resource*

Derivation Path: TS 38.508-1 [14], Table 4.6.3-85			
Information Element	**Value/remark**	**Comment**	**Condition**
NZP-CSI-RS-Resource ::= SEQUENCE {			
powerControlOffsetSS	db0		
}			

Table 6.5.5.3.4.3-6: *PDCCH-Config*

Derivation Path: TS 38.501-1 [14],Table 4.6.3-95			
Information Element	**Value/remark**	**Comment**	**Condition**
PDCCH-Config ::= SEQUENCE {			
controlResourceSetToAddModList SEQUENCE(SIZE (1..3)) OF ControlResourceSet {	2 entries		
ControlResourceSet[2]	ControlResourceSet	entry 2, BFR	
}			
controlResourceSetToReleaseList	Not present		
searchSpacesToAddModList SEQUENCE(SIZE (1..10)) OF SearchSpace {	2 entries		
SearchSpace[2]	SearchSpace	entry 2, BFR	
}			
searchSpacesToReleaseList	Not present		
downlinkPreemption	Not present		
tpc-PUSCH	Not present		
tpc-PUCCH	Not present		
tpc-SRS	Not present		
}			

Table 6.5.5.3.4.3-7: ControlResourceSet for BFR

Derivation Path: TS 38.501-1 [14],Table 7.3.1-15			
Information Element	**Value/remark**	**Comment**	**Condition**
ControlResourceSet ::= SEQUENCE {			
controlResourceSetId	2		
duration	2		
cce-REG-MappingType CHOICE {			
interleaved ::= SEQUENCE {			
reg-BundleSize	n6		
interleaverSize	n2		
shiftIndex	0		
}			
tci-StatesPDCCH-ToAddList	Not present		
}			

6.5.5.3.5 Test requirement

Tables 6.5.5.3.4.1-3 and 6.5.5.3.5-1 define the primary level settings including test tolerances for NR SA FR1 CSI-RS-based beam failure detection and link recovery in non-DRX.

Table 6.5.5.3.5-1: NR Cell specific test parameters for NR SA FR1 CSI-RS-based beam failure detection and link recovery in non-DRX

Parameter	**Unit**	**Test 1**				
		T1	**T2**	**T3**	**T4**	**T5**
EPRE ratio of PDCCH DMRS to SSS	dB	0				
EPRE ratio of PDCCH to PDCCH DMRS	dB					
EPRE ratio of PBCH DMRS to SSS	dB					
EPRE ratio of PBCH to PBCH DMRS	dB					
EPRE ratio of PSS to SSS	dB					
EPRE ratio of PDSCH DMRS to SSS	dB					
EPRE ratio of PDSCH to PDSCH DMRS	dB					

EPRE ratio of OCNG DMRS to SSS		dB					
EPRE ratio of OCNG to OCNG DMRS		dB					
SNR_CSI-RS of set q_0	Config 1	dB	5.8	-2.2	-12.8	-12.8	-12.8
	Config 2		5.8	-2.2	-12.8	-12.8	-12.8
	Config 3		5.8	-2.2	-12.8	-12.8	-12.8
SNR_CSI-RS of set q1	Config 1	dB	-10.2	-10.2	10.2	10.2	10.2
	Config 2		-10.2	-10.2	10.2	10.2	10.2
	Config 3		-10.2	-10.2	10.2	10.2	10.2
CSI-RS_RP of set q_1	Config 1	dBm/SCS kHz	-108.2	-108.2	−87.8	−87.8	−87.8
	Config 2		-108.2	-108.2	−87.8	−87.8	−87.8
	Config 3		-105.2	-105.2	−84.8	−84.8	−84.8
N_{oc}	Config 1	dBm/15 kHz	-98				
	Config 2		-98				
	Config 3		-98				
Propagation condition			TDL-C 300ns 100Hz				

Note 1: OCNG shall be used such that the resources in Cell 1 are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.
Note 2: The uplink resources for CSI reporting are assigned to the UE prior to the start of time period T1.
Note 3: NZP CSI-RS resource set configuration for CSI reporting are assigned to the UE prior to the start of time period T1.
Note 4: Void
Note 5: The timers and layer 3 filtering related parameters are configured prior to the start of time period T1.
Note 6: The signal contains PDCCH for UEs other than the device under test as part of OCNG.
Note 7: SNR levels correspond to the signal to noise ratio over the REs carrying CSI-RS.
Note 8: The SNR in time periods T1, T2, T3, T4 and T5 is denoted as SNR1, SNR2 and SNR3 respectively in figure 6.5.5.3.4-1.
Note 9: The SNR values are specified for a UE with 2RX antennas connected under test. For a UE with 4RX antennas connected under test, the SNR for RS in set q0 during T3, T4, and T5 from D.4.1.1, is -15dB-TT = -15.8dB (including test tolerances).

The UE behaviour in each test during time durations T1, T2, T3, T4 and T5 shall be as follows:

During the time duration T1 and T2, the UE shall transmit uplink signal at least in all subframes configured for CSI transmission on Cell 1.

During the period from time point A to time point B the UE shall transmit uplink signal in Cell 1 in all uplink slots configured for CSI transmission according to the configured periodic CSI reporting for Cell 1.

During T3 the UE shall detect beam failure and initiate link recovery. During T4 and T5 the UE measures and evaluate beam candidate from beam candidate set q_1.

No later than time point F occurring no later than D1 = 40 ms after the start of T5, the UE shall transmit preamble on a beam associated with the candidate beam set q_1. The UE shall not transmit preamble on a beam associated with the candidate beam set q_1 earlier than time point B

Test is concluded once the test equipment has received the initial preamble transmission from the UE. The rate of correct events observed during repeated tests shall be at least 90%.

6.5.5.4 NR SA FR1 CSI-RS-based beam failure detection and link recovery in DRX

6.5.5.4.1 Test purpose

The purpose of this test is to verify that the UE properly detects CSI-RS-based beam failure in the set q_0 configured for a serving cell and that the UE performs correct CSI-RS-based link recovery based on beam candidate set q_1. To test the downlink monitoring for beam failure detection within the UEs active DL BWP, during the evaluation period, and link recovery, when DRX is used. This test will partly verify the CSI-RS based beam failure detection and link recovery for an FR1 serving cell requirements in TS 38.133 [6] clause 8.5.

6.5.5.4.2 Test applicability

This test applies to all types of NR UE release 15 and forward supporting 5GS NR SA FR1, CSI-RS based RLM, link recovery and long DRX cycle.

6.5.5.4.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 6.5.5.0.2.

The normative reference for this requirement is TS 38.133 [6] clause A.6.5.5.4.

6.5.5.4.4 Test description

The test consists of five successive time periods, with time duration of T1, T2, T3, T4 and T5 respectively. Figure 6.5.5.4.4-1 shows the five different time durations and the corresponding variation of the downlink SNR in the active cell to emulate CSI-RS based beam failure. Figure 6.5.5.4.4-1 additionally shows the variation of the downlink L1-RSRP of the CSI-RS in set q_1 of the candidate beam used for link recovery.

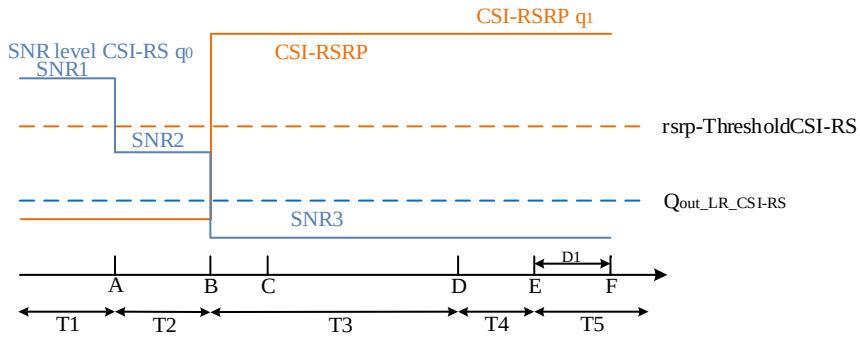


Figure 6.5.5.4.4-1: SNR and L1-RSRP variation for NR SA FR1 CSI-RS-based beam failure detection and link recovery in DRX

6.5.5.4.4.1 Initial conditions

This test shall be tested using any of the test configurations in Table 6.5.5.4.4.1-1.

Table 6.5.5.4.4.1-1: Supported test configurations for NR SA FR1 CSI-RS-based beam failure detection and link recovery in DRX

Configuration	Description
6.5.5.4-1	FDD duplex mode, 15 kHz SSB SCS, 10MHz bandwidth
6.5.5.4-2	TDD duplex mode, 15 kHz SSB SCS, 10MHz bandwidth
6.5.5.4-3	TDD duplex mode, 30 kHz SSB SCS, 40MHz bandwidth
Note: The UE is only required to pass in one of the supported test configurations in FR1	

Configure the test equipment and the DUT according to the parameters in Table 6.5.5.4.4.1-2.

Table 6.5.5.4.4.1-2: Initial conditions for NR SA FR1 CSI-RS-based beam failure detection and link recovery in DRX

Parameter	Value		Comment
Test environment	NC		As specified in TS 38.508-1 [14] clause 4.1.
Test frequencies	As specified in Annex E, table E.4-1 and TS 38.508-1 [14] clause 4.3.1 and 4.4.2.		
Channel bandwidth	As specified by the test configuration selected from Table 6.5.5.4.4.1-1.		
Propagation conditions	AWGN		As specified in Annex C.2.2.
Connection Diagram	TE Part	A.3.1.7.1	As specified in TS 38.508-1 [14] Annex A.
	DUT Part	A.3.2.3.4	
Exceptions to connection diagram	- Without LTE link - For 4Rx capable UEs without any 2Rx RF bands use A.3.2.5.2 for DUT part and A.3.1.8.4 for TE Part		

1. The general test parameter settings are set up according to Table 6.5.5.4.4.1-3.

2. Message contents are defined in clause 6.5.5.4.4.3.

3. There is one NR carrier and one NR cells specified in the test. Cell 1 is the NR cell used for connection setup with the power level set according to Annex C.1.2 and C.1.3 for this test.

Table 6.5.5.4.4.1-3: General test parameters for NR SA FR1 CSI-RS-based beam failure detection and link recovery in DRX

Parameter		Unit	Value	Comment
			Test 1	
Active PCell			Cell 1	
RF Channel Number			1	
Duplex mode	Config 1		FDD	
	Config 2, 3		TDD	
TDD Configuration	Config 1		Not Applicable	
	Config 2		TDDConf.1.1	
	Config 3		TDDConf.2.1	
CORESET Reference Channel	Config 1		CR.1.1 FDD	
	Config 2		CR.1.1 TDD	
	Config 3		CR.2.1 TDD	
SSB Configuration	Config 1		SSB.3 FR1	
	Config 2		SSB.3 FR1	
	Config 3		SSB.4 FR1	
SMTC Configuration	Config 1, 2		SMTC.1	
	Config 3		SMTC.1	
PDSCH/PDCCH subcarrier spacing	Config 1, 2		15 KHz	
	Config 3		30 KHz	
PRACH Configuration	Config 1, 2		PRACH.4 FR1	
	Config 3		PRACH.4 FR1	
csi-RS-Index assigned as beam failure detection RS in set q_0			0	
OCNG parameters			OP.1	
CP length			Normal	
Correlation Matrix and Antenna Configuration			2x2 Low	
Beam failure detection transmission parameters	DCI format		1-0	
	Number of Control OFDM symbols		2	
	Aggregation level	CCE	8	
	Ratio of hypothetical PDCCH RE energy to average CSI-RS RE energy	dB	0	
	Ratio of hypothetical PDCCH DMRS energy to average CSI-RS RE energy	dB	0	
	DMRS precoder granularity		REG bundle size	
	REG bundle size		6	
DRX			DRX.7	
Gap pattern ID			N.A.	
csi-RS-Index assigned as candidate beam detection RS in set q_1			1	
rlmInSyncOutOfSyncThreshold			absent	When the field is absent, the UE applies the value 0.
rsrp-ThresholdSSB	Config 1, 2	dBm/SCS kHz	-98	Threshold used for $Q_{in_LR_SSB}$
	Config 3	dBm/SCS kHz	-95	Threshold used for $Q_{in_LR_SSB}$

powerControlOffsetSS			db0	Used for deriving rsrp-ThresholdCSI-RS
beamFailureInstanceMaxCount			n1	see TS 38.321 [12], section 5.17
beamFailureDetectionTimer			pbfd4	see TS 38.321 [12], section 5.17
CSI-RS configuration for q_0 and q_1	Config 1		CSI-RS.1.2 FDD	
	Config 2		CSI-RS.1.2 TDD	
	Config 3		CSI-RS.2.2 TDD	
CSI-RS configuration for CSI reporting	Config 1		CSI-RS.1.1 FDD	
	Config 2		CSI-RS.1.1 TDD	
	Config 3		CSI-RS.2.1 TDD	
TRS configuration	Config 1		TRS.1.1 FDD	
	Config 2		TRS.1.1 TDD	
	Config 3		TRS.1.2 TDD	
CSI-RS-Index assigned as RLM RS	Config 1		CSI-RS.1.2 FDD	
	Config 2		CSI-RS.1.2 TDD	
	Config 3		CSI-RS.2.2 TDD	
T310 Timer		ms	1000	
N310			2	
T1		s	1	During this time the UE shall be fully synchronized to cell 1
T2		s	8.37	
T3		s	6.44	
T4		s	0	
T5		s	1.97	
D1		s	1.93	
Note 1: UE-specific PDCCH is not transmitted after T1 starts.				

6.5.5.4.4.2 Test procedure

Prior to the start of the time duration T1, the UE shall be fully synchronized to NR Cell 1. The UE shall be configured for periodic CSI reporting with a reporting periodicity of 5 ms. In the test, DRX configuration is enabled.

1. Ensure the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity *NR*, Connected without release *On* and Test Mode *On* according to TS 38.508-1 [14] clause 4.5.

2. Set the parameters of NR Cell 1 according to T1 in Table 6.5.5.4.5-1. Propagation conditions are set according to Annex C.2.3. T1 starts.

3. When T1 expires the SS shall change the SNR value to T2 as specified in Table 6.5.5.4.5-1. T2 starts.

4. When T2 expires the SS shall change the SNR value to T3 as specified in Table 6.5.5.4.5-1. T3 starts.

5. When T3 expires the SS shall change the SNR value to T4 as specified in Table 6.5.5.4.5-1. T4 starts.

6. When T4 expires the SS shall change the SNR value to T5 as specified in Table 6.5.5.4.5-1. T5 starts.

7. If the SS:

a) detects uplink power on NR carrier equal to or higher than minimum output power defined in TS 38.521-1 [17] clause 6.3.1.5 in each slot configured for CSI transmission (according CSI reporting on PUCCH) during the period from time point A to time point B

and

b) does not detect preamble on a beam associated with the candidate beam set $q_1$before time point B

and

c) detects preamble on a beam associated with the candidate beam set q_1 before time point F (D1 after the start of T5),

the number of successful tests is increased by one.

Otherwise the number of failed tests is increased by one.

8. Switch the UE off and on. Ensure the UE is in RRC_CONNECTED with generic procedure parameters Connectivity NR, Connected without release On and Test Mode *On* according to TS 38.508-1 [14] clause 4.5.

9. Repeat steps 2-8 for all subtests until the confidence level according to Tables G.2.3-1 in Annex G clause G.2 is achieved.

6.5.5.4.4.3 Message contents

Message contents are according to TS 38.508-1 [14] clause 7.3 with the following exceptions:

Table 6.5.5.4.4.3-1: Common Exception messages for NR SA FR1 CSI-RS-based beam failure detection and link recovery in DRX

Default Message Contents	
Common contents of system information blocks exceptions	
Default RRC messages and information elements contents exceptions	Table H.3.1-8 with Condition CSI-RS BFD Table H.3.1-10 with Condition CSI-RS Table H.3.1-10A Table H.3.5-4 Table H.3.7-1 with Condition DRX.7Table 7.3.1-3 in TS 38.508-1 [14] with condition SMTC.1

Table 6.5.5.4.4.3-2: PDCCH *Search Space* for BFR

Derivation Path: TS 38.508-1 [14], Table 4.6.3-162			
Information Element	**Value/remark**	**Comment**	**Condition**
SearchSpace ::= SEQUENCE {			
searchSpaceId	4	BFR	
controlResourceSetId	2	BFR	
monitoringSlotPeriodicityAndOffset CHOICE {			
sl1	NULL		
}			
monitoringSymbolsWithinSlot	10000000000000	Symbol 0	
nrofCandidates SEQUENCE {			
aggregationLevel1	n0		
aggregationLevel2	n0		
aggregationLevel4	n0		
aggregationLevel8	n1	AL8	
aggregationLevel16	n0		
}			
searchSpaceType CHOICE {			
ue-Specific SEQUENCE {			USS
dci-Formats	formats0-0-And-1-0	DCI Format 1_0	
}			
}			
}			

Table 6.5.5.4.4.3-3: *RLF-TimersAndConstants*

Derivation Path: TS 38.508-1 [14], Table 4.6.3-150			
Information Element	**Value/remark**	**Comment**	**Condition**
RLF-TimersAndConstants ::= SEQUENCE {			
n310	n2		
}			

Table 6.5.5.4.4.3-4: Void

Table 6.5.5.3.4.3-5: *NZP-CSI-RS-Resource*

Derivation Path: TS 38.508-1 [14], Table 4.6.3-85			
Information Element	**Value/remark**	**Comment**	**Condition**
NZP-CSI-RS-Resource ::= SEQUENCE {			
powerControlOffsetSS	db0		
}			

Table 6.5.5.4.4.3-6: *PDCCH-Config*

Derivation Path: TS 38.501-1 [14],Table 4.6.3-95			
Information Element	**Value/remark**	**Comment**	**Condition**
PDCCH-Config ::= SEQUENCE {			
controlResourceSetToAddModList SEQUENCE(SIZE (1..3)) OF ControlResourceSet {	2 entries		
ControlResourceSet[2]	ControlResourceSet	entry 2, BFR	
}			
controlResourceSetToReleaseList	Not present		
searchSpacesToAddModList SEQUENCE(SIZE (1..10)) OF SearchSpace {	2 entries		
SearchSpace[2]	SearchSpace	entry 2, BFR	
}			
searchSpacesToReleaseList	Not present		
downlinkPreemption	Not present		
tpc-PUSCH	Not present		
tpc-PUCCH	Not present		
tpc-SRS	Not present		
}			

Table 6.5.5.4.4.3-7: ControlResourceSet for BFR

Derivation Path: TS 38.501-1 [14],Table 7.3.1-15			
Information Element	**Value/remark**	**Comment**	**Condition**
ControlResourceSet ::= SEQUENCE {			
controlResourceSetId	2		
duration	2		
cce-REG-MappingType CHOICE {			
interleaved ::= SEQUENCE {			
reg-BundleSize	n6		
interleaverSize	n2		
shiftIndex	0		
}			
tci-StatesPDCCH-ToAddList	Not present		
}			

6.5.5.4.5 Test requirement

Tables 6.5.5.4.4.1-3 and 6.5.5.4.5-1 define the primary level settings including test tolerances for NR SA FR1 CSI-RS-based beam failure detection and link recovery in DRX.

Table 6.5.5.4.5-1: NR Cell specific test parameters for NR SA FR1 CSI-RS-based beam failure detection and link recovery in DRX

Parameter	**Unit**	**Test 1**				
		T1	**T2**	**T3**	**T4**	**T5**
EPRE ratio of PDCCH DMRS to SSS	dB	0				
EPRE ratio of PDCCH to PDCCH DMRS	dB					
EPRE ratio of PBCH DMRS to SSS	dB					
EPRE ratio of PBCH to PBCH DMRS	dB					
EPRE ratio of PSS to SSS	dB					
EPRE ratio of PDSCH DMRS to SSS	dB					
EPRE ratio of PDSCH to PDSCH DMRS	dB					

EPRE ratio of OCNG DMRS to SSS		dB					
EPRE ratio of OCNG to OCNG DMRS		dB					
SNR_CSI-RS of set q_0	Config 1	dB	5.8	-2.2	-12.8	-12.8	-12.8
	Config 2		5.8	-2.2	-12.8	-12.8	-12.8
	Config 3		5.8	-2.2	-12.8	-12.8	-12.8
SNR_CSI-RS of set q1	Config 1	dB	-10.2	-10.2	10.2	10.2	10.2
	Config 2		-10.2	-10.2	10.2	10.2	10.2
	Config 3		-10.2	-10.2	10.2	10.2	10.2
CSI-RS_RP of set q_1	Config 1	dBm/SCS kHz	-108.2	-108.2	−87.8	−87.8	−87.8
	Config 2		-108.2	-108.2	−87.8	−87.8	−87.8
	Config 3		-105.2	-105.2	−84.8	−84.8	−84.8
N_{oc}	Config 1	dBm/15 kHz	-98				
	Config 2		-98				
	Config 3		-98				
Propagation condition			TDL-C 300ns 100Hz				

Note 1: OCNG shall be used such that the resources in Cell 1 are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.
Note 2: The uplink resources for CSI reporting are assigned to the UE prior to the start of time period T1.
Note 3: NZP CSI-RS resource set configuration for CSI reporting are assigned to the UE prior to the start of time period T1.
Note 4: Void
Note 5: The timers and layer 3 filtering related parameters are configured prior to the start of time period T1.
Note 6: The signal contains PDCCH for UEs other than the device under test as part of OCNG.
Note 7: SNR levels correspond to the signal to noise ratio over the REs carrying CSI-RS.
Note 8: The SNR in time periods T1, T2, T3, T4 and T5 is denoted as SNR1, SNR2 and SNR3 respectively in figure 6.5.5.4.4-1.
Note 9: The SNR values are specified for a UE with 2RX antennas connected under test. For a UE with 4RX antennas connected under test, the SNR for RS in set q0 during T3, T4, and T5 from D.4.1.1, is -15dB-TT = -15.8dB (including test tolerances).

The UE behaviour during time durations T1, T2, T3, T4 and T5 shall be as follows:

During the time duration T1 and T2, the UE shall transmit uplink signal at least in all subframes configured for CSI transmission on Cell 1.

During the period from time point A to time point B the UE shall transmit uplink signal in Cell 1 in all uplink slots configured for CSI transmission according to the configured periodic CSI reporting for Cell 1.

During T3 the UE shall detect beam failure and initiate link recovery. During T4 and T5 the UE measures and evaluate beam candidate from beam candidate set q_1.

No later than time point F occurring no later than D1 = 1930 ms after the start of T5, the UE shall transmit preamble on a beam associated with the candidate beam set q_1. The UE shall not transmit preamble on a beam associated with the candidate beam set q_1 earlier than time point B.

Test is concluded once the test equipment has received the initial preamble transmission from the UE. The rate of correct events observed during repeated tests shall be at least 90%.

6.5.5.5 NR SA FR1 Scell CSI-RS-based beam failure detection and SSB-based link recovery in non-DRX

6.5.5.5.1 Test purpose

The purpose of this test is to verify that the UE properly detects CSI-RS-based beam failure in the set q_0 configured for a serving cell and that the UE performs correct SSB-based link recovery based on beam candidate set q_1. To test the downlink monitoring for beam failure detection within the UEs active DL BWP without *schedulingRequestID-BFR-SCell-r16* configuration, during the evaluation period, and link recovery, when no DRX is used. This test will partly verify the beam failure detection and link recovery for an FR1 serving cell requirements in TS 38.133 [6] clause 8.5.

6.5.5.5.2 Test applicability

This test applies to all types of NR UE release 16 and forward supporting 5GS NR SA FR1, CSI-RS based RLM, SSB link recovery and SCell beam failure recovery.

6.5.5.5.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 6.5.5.0.2 and 6.5.5.0.4.

The normative reference for this requirement is TS 38.133 [6] clause A.6.5.5.5.

6.5.5.5.4 Test description

The test consists of five successive time periods, with time duration of T1, T2, T3, T4 and T5 respectively. Figure 6.5.5.5.4-1 shows the SNR of the CSI-RS in set q_0 in the active SCell to emulate beam failure. Figure 6.5.5.5.4-1 additionally shows the variation of the downlink L1-RSRP of the SSB in set q_1 of the candidate beam used for link recovery.

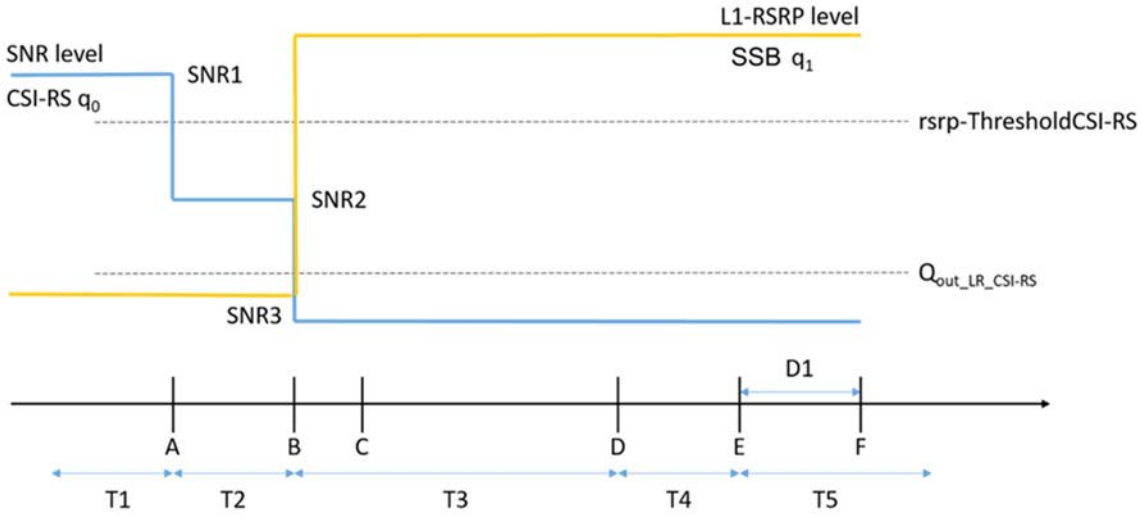


Figure 6.5.5.5.4-1: SNR and L1-RSRP variation for NR SA FR1 CSI-RS-based beam failure detection and SSB-based link recovery in non-DRX

6.5.5.5.4.1 Initial conditions

This test shall be tested using any of the test configurations in Table 6.5.5.5.4.1-1.

Table 6.5.5.5.4.1-1: Supported test configurations for FR1 PCell and SCell

Configuration	Description
6.5.5.5-1	FDD duplex mode, 15 kHz SSB SCS, 10MHz bandwidth
6.5.5.5-2	TDD duplex mode, 15 kHz SSB SCS, 10MHz bandwidth
6.5.5.5-3	TDD duplex mode, 30 kHz SSB SCS, 40MHz bandwidth
Note: The UE is only required to pass in one of the supported test configurations in FR1	

Configure the test equipment and the DUT according to the parameters in Table 6.5.5.5.4.1-2.

Table 6.5.5.5.4.1-2: Initial conditions for NR SA FR1 CSI-RS-based beam failure detection and SSB-based link recovery in non-DRX

Parameter	Value		Comment
Test environment	NC		As specified in TS 38.508-1 [14] clause 4.1.
Test frequencies	As specified in Annex E, table E.4-1 and TS 38.508-1 [14] clause 4.3.1 and 4.4.2.		
Channel bandwidth	As specified by the test configuration selected from Table 6.5.5.5.4.1-1.		
Propagation conditions	AWGN		As specified in Annex C.2.2.
Connection Diagram	TE Part	A.3.1.7.1	As specified in TS 38.508-1 [14] Annex A.
	DUT Part	A.3.2.3.4	
Exceptions to	- Without LTE link		

connection diagram	- For 4Rx capable UEs without any 2Rx RF bands use A.3.2.5.2 for DUT part and A.3.1.8.4 for TE Part	

1. The general test parameter settings are set up according to Table 6.5.5.5.4.1-3.

2. Message contents are defined in clause 6.5.5.5.4.3.

3. There is one NR carrier and two NR cells specified in the test. Cell 1 is the NR cell (PCell) used for connection setup and Cell 2 is the NR cell (SCell) with the power level set according to Annex C.1.2 and C.1.3 for this test.

Table 6.5.5.5.4.1-3: General test parameters for NR SA FR1 CSI-RS-based beam failure detection and SSB-based link recovery in non-DRX

Parameter		Unit	Value	Comment
			Test 1	
Active PCell			Cell 1	
RF Channel Number for PCell			1	
Active SCell			Cell 2	
RF Channel Number for SCEll			2	
Duplex mode	Config 1		FDD	
	Config 2, 3		TDD	
BW channel	Config 1	MHz	10: NRB,c = 52	
	Config 2		10: NRB,c = 52	
	Config 3		40: NRB,c = 106	
TDD Configuration	Config 1		Not Applicable	
	Config 2		TDDConf.1.1	
	Config 3		TDDConf.2.1	
CORESET Reference Channel	Config 1		CR.1.1 FDD	A.1.2
	Config 2		CR.1.1 TDD	
	Config 3		CR.2.1 TDD	
SSB Configuration	Config 1		SSB.1 FR1	A.3
	Config 2		SSB.1 FR1	
	Config 3		SSB.2 FR1	
SMTC Configuration	Config 1, 2		SMTC.1	A.4
	Config 3		SMTC.1	
PDSCH/PDCCH subcarrier spacing	Config 1, 2	kHz	15	
	Config 3		30	
PRACH Configuration	Config 1, 2		PRACH.2 FR1	Table A.7.1-1
	Config 3		PRACH.2 FR1	Table A.7.1-1
csi-RS-Index assigned as beam failure detection RS in set q_0 in activated SCell			0	
OCNG parameters			OP.1	A.2.1
CP length			Normal	
Correlation Matrix and Antenna Configuration			2x2 Low	
Beam failure detection transmission parameters	DCI format		1-0	
	Number of Control OFDM symbols		2	
	Aggregation level	CCE	8	
	Ratio of hypothetical PDCCH RE energy to average CSI-RS RE energy	dB	0	
	Ratio of hypothetical PDCCH DMRS energy to average CSI-RS RE energy	dB	0	
	DMRS precoder granularity		REG bundle size	

REG bundle size			6	
DRX			OFF	
Gap pattern ID			N.A.	
schedulingRequestID-BFR-SCell-r16			absent	When the field is absent, the random access procedure will be triggered for SCell BFR
SSB Index assigned as CBD RS (q1) in activated SCell			0	
rlmInSyncOutOfSyncThreshold			absent	When the field is absent, the UE applies the value 0. (TS 38.133 [6] Table 8.1.1-1).
rsrp-ThresholdBFR	Config 1, 2	dBm/SCS kHz	-98	Threshold used for $Q_{in_LR_SSB}$
	Config 3		-95	
powerControlOffsetSS			db0	Used for deriving rsrp-ThresholdCSI-RS
beamFailureInstanceMaxCount			n1	see clause 5.17 of TS 38.321 [12]
beamFailureDetectionTimer			pbfd4	see clause 5.17 of TS 38.321 [12]
CSI-RS configuration for q_0 in activated SCell	Config 1		CSI-RS.1.2 FDD	A.1.4
	Config 2		CSI-RS.1.2 TDD	
	Config 3		CSI-RS.2.2 TDD	
CSI-RS configuration for CSI reporting	Config 1		CSI-RS.1.1 FDD	A.1.4
	Config 2		CSI-RS.1.1 TDD	
	Config 3		CSI-RS.2.1 TDD	
TRS configuration	Config 1		TRS.1.1 FDD	
	Config 2		TRS.1.1 TDD	
	Config 3		TRS.1.2 TDD	
CSI-RS-Index assigned as RLM RS in PCell	Config 1		CSI-RS.1.2 FDD	A.1.4
	Config 2		CSI-RS.1.2 TDD	
	Config 3		CSI-RS.2.2 TDD	
T310 Timer		ms	1000	
N310			2	
T1		s	0.2	During this time the UE shall be fully synchronized to cell 1
T2		s	0.18	
T3		s	0.14	
T4		s	0	
T5		s	0.17	
D1		s	0.13	
Note 1: UE-specific PDCCH is not transmitted after T1 starts.				

6.5.5.5.4.2 Test procedure

Same test procedure as described in section 6.5.5.3.4.2, except following exception and steps 7 and 8:

Prior to the start of the time duration T1, the UE shall be fully synchronized to cell 1 and cell 2. The UE shall be configured for periodic CSI reporting with a reporting periodicity of 5 ms. In the test, DRX configuration is not enabled.

7. If the SS:

a) detects uplink power on the PCell equal to or higher than minimum output power defined in TS 38.521-1 [17] clause 6.3.1.5 in each slot configured for CSI transmission (according CSI reporting on PUCCH) during the period from time point A to time point B

and

b) does not detect preamble on the PCell before time point B

and

c) detects preamble on the preconfigured PRACH resource before time point F (D1 after the start of T5).

And

d) SS transmits a RAR to UE after receiving the preamble transmitted by the UE. SS detects the MAC-CE on the PCell transmitted by the UE providing the index for the activated SCell, and the index for the SSB provided by higher layer.

the number of successful tests is increased by one.

Otherwise the number of failed tests is increased by one.

8. If the iteration or random access procedure for BFD fails, the SS shall first attempt to release and add the FR1 SCell, by ensuring the UE is in state RRC_CONNECTED with generic procedure parameter *Connectivity* NR, Connected without release *On* and Test Mode *On* according to TS 38.508-1 [6] clause 4.5. If that also fails, then the UE is switched OFF/ON to proceed with the next iteration.

6.5.5.5.4.3 Message contents

Message contents are according to TS 38.508-1 [14] clause 7.3 with the following exceptions:

Table 6.5.5.5.4.3-1: Common Exception messages for NR SA FR1 SCell CSI-RS-based beam failure detection and SSB-based link recovery in DRX

Default Message Contents	
Common contents of system information blocks exceptions	
Default RRC messages and information elements contents exceptions	Table H.3.1-8 with Condition CSI-RS BFD Table H.3.1-10 with Condition SSB Table H.3.1-10A Table H.3.5-4 Table 7.3.1-3 in TS 38.508-1 [14] with condition SMTC.1

Table 6.5.5.5.4.3-2: PDCCH *Search Space* for BFR

Derivation Path: TS 38.508-1 [14], Table 4.6.3-162			
Information Element	**Value/remark**	**Comment**	**Condition**
SearchSpace ::= SEQUENCE {			
searchSpaceId	4	BFR	
controlResourceSetId	2	BFR	
monitoringSlotPeriodicityAndOffset CHOICE {			
sl1	NULL		
}			
monitoringSymbolsWithinSlot	10000000000000	Symbol 0	
nrofCandidates SEQUENCE {			
aggregationLevel1	n0		
aggregationLevel2	n0		
aggregationLevel4	n0		
aggregationLevel8	n1	AL8	
aggregationLevel16	n0		
}			
searchSpaceType CHOICE {			
ue-Specific SEQUENCE {			USS
dci-Formats	formats0-0-And-1-0	DCI Format 1_0	
}			
}			
}			

Table 6.5.5.5.4.3-3: *RLF-TimersAndConstants*

Derivation Path: TS 38.508-1 [14], Table 4.6.3-150			
Information Element	**Value/remark**	**Comment**	**Condition**
RLF-TimersAndConstants ::= SEQUENCE {			
n310	n2		
}			

Table 6.5.5.5.4.3-4: *PDCCH-Config*

Derivation Path: TS 38.501-1 [14],Table 4.6.3-95			
Information Element	**Value/remark**	**Comment**	**Condition**
PDCCH-Config ::= SEQUENCE {			
controlResourceSetToAddModList SEQUENCE(SIZE (1..3)) OF ControlResourceSet {	2 entries		
ControlResourceSet[2]	ControlResourceSet	entry 2, BFR	
}			
controlResourceSetToReleaseList	Not present		
searchSpacesToAddModList SEQUENCE(SIZE (1..10)) OF SearchSpace {	2 entries		
SearchSpace[2]	SearchSpace	entry 2, BFR	
}			
searchSpacesToReleaseList	Not present		
downlinkPreemption	Not present		
tpc-PUSCH	Not present		
tpc-PUCCH	Not present		
tpc-SRS	Not present		
}			

Table 6.5.5.5.4.3-5: ControlResourceSet for BFR

Derivation Path: TS 38.501-1 [14],Table 7.3.1-15			
Information Element	**Value/remark**	**Comment**	**Condition**
ControlResourceSet ::= SEQUENCE {			
controlResourceSetId	2		
duration	2		
cce-REG-MappingType CHOICE {			
interleaved ::= SEQUENCE {			
reg-BundleSize	n6		
interleaverSize	n2		
shiftIndex	0		
}			
tci-StatesPDCCH-ToAddList	Not present		
}			

6.5.5.5.5 Test requirement

Tables 6.5.5.5.4.1-3 and 6.5.5.5.5-1 define the primary level settings including test tolerances for NR SA FR1 SCell CSI-RS-based beam failure detection and SSB-based link recovery in non-DRX.

Table 6.5.5.5.5-1: NR Cell specific test parameters for NR SA FR1 SCell CSI-RS-based beam failure detection and SSB-based link recovery in non-DRX

Parameter	**Unit**	**Cell1**	**Test 1 Cell2**				
		T1 to T5	**T1**	**T2**	**T3**	**T4**	**T5**
EPRE ratio of PDCCH DMRS to SSS	dB		0				
EPRE ratio of PDCCH to PDCCH DMRS	dB						
EPRE ratio of PBCH DMRS to SSS	dB						

EPRE ratio of PBCH to PBCH DMRS		dB	0					
EPRE ratio of PSS to SSS		dB						
EPRE ratio of PDSCH DMRS to SSS		dB						
EPRE ratio of PDSCH to PDSCH DMRS		dB						
EPRE ratio of OCNG DMRS to SSS		dB						
EPRE ratio of OCNG to OCNG DMRS		dB						
SNR_CSI-RS of set q_0	Config 1	dB	5	5.8	-2.2	-12.8	-12.8	-12.8
	Config 2		5	5.8	-2.2	-12.8	-12.8	-12.8
	Config 3		5	5.8	-2.2	-12.8	-12.8	-12.8
SNR_SSB of set q_1	Config 1	dB	-10	-10.2	-10.2	10.2	10.2	10.2
	Config 2		-10	-10.2	-10.2	10.2	10.2	10.2
	Config 3		-10	-10.2	-10.2	10.2	10.2	10.2
SSB_RP of set q_1	Config 1	dBm/ SCS kHz	-108	-108.2	-108.2	−87.8	−87.8	−87.8
	Config 2		-108	-108.2	-108.2	−87.8	−87.8	−87.8
	Config 3		-105	-105.2	-105.2	−84.8	−84.8	−84.8
N_{oc}	Config 1	dBm/ 15kHz	-98	-98				
	Config 2		-98	-98				
	Config 3		-98	-98				
Propagation condition			TDL-C 300ns 100Hz	TDL-C 300ns 100Hz				

Note 1: OCNG shall be used such that the resources in Cell 1 are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.
Note 2: The uplink resources for CSI reporting are assigned to the UE prior to the start of time period T1.
Note 3: NZP CSI-RS resource set configuration for CSI reporting are assigned to the UE prior to the start of time period T1.
Note 4: Void
Note 5: The timers and layer 3 filtering related parameters are configured prior to the start of time period T1.
Note 6: The signal contains PDCCH for UEs other than the device under test as part of OCNG.
Note 7: SNR levels correspond to the signal to noise ratio over the REs carrying CSI-RS.
Note 8: The SNR in time periods T1, T2, T3, T4 and T5 is denoted as SNR1, SNR2 and SNR3 respectively in figure 6.5.5.5.4-1.
Note 9: The SNR values are specified for a UE with 2RX antennas connected under test. For a UE with 4RX antennas connected under test, the SNR for RS in set q0 during T3, T4, and T5 from D.4.1.1, is -15dB-TT = -15.8dB (including test tolerances).

The UE behaviour during time durations T1, T2, T3, T4 and T5 shall be as follows:

During the time duration T1 and T2, the UE shall transmit uplink signal at least in all subframes configured for CSI transmission on Cell 1.

During the period from time point A to time point B the UE shall transmit uplink signal in Cell 1 in all uplink slots configured for CSI transmission according to the configured periodic CSI reporting for Cell 1.

During T3 the UE shall detect beam failure and initiate link recovery. During T4 and T5 the UE measures and evaluate beam candidate from beam candidate set q_1.

No later than time point F occurring no later than D1 = 120+10 ms after the start of T5, the UE shall transmit preamble for UL-SCH resource application, followed by MAC-CE on the assigned uplink resources containing a beam associated with the candidate beam set q_1. The UE shall not transmit preamble earlier than time point B.

During T5, the System Simulator shall transmit a Random Access Response to UE after the System Simulator receives the preamble from UE. The UE shall transmit the msg.3 containing candidate beam set q1 for SCell BFR if UE receives the Random Access Response.

Test is concluded once the test equipment has received the initial preamble transmission from the UE. The rate of correct events observed during repeated tests shall be at least 90%.

6.5.5.6 NR SA FR1 Scell CSI-RS-based beam failure detection and SSB-based link recovery in DRX

6.5.5.6.1 Test purpose

The purpose of this test is to verify that the UE properly detects CSI-RS-based beam failure in the set q_0 configured for a serving cell and that the UE performs correct SSB-based link recovery based on beam candidate set q_1. To test the downlink monitoring for beam failure detection within the UEs active DL BWP without *schedulingRequestID-BFR-SCell-r16* configuration, during the evaluation period, and link recovery, when DRX is used. This test will partly verify the beam failure detection and link recovery for an FR1 serving cell requirements in TS 38.133 [6] clause 8.5.

6.5.5.6.2 Test applicability

This test applies to all types of NR UE release 16 and forward supporting 5GS NR SA FR1, CSI-RS based RLM, SSB link recovery and SCell beam failure recovery.

6.5.5.6.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 6.5.5.0.2 and 6.5.5.0.4.

The normative reference for this requirement is TS 38.133 [6] clause A.6.5.5.6.

6.5.5.6.4 Test description

The test consists of five successive time periods, with time duration of T1, T2, T3, T4 and T5 respectively. Figure 6.5.5.6.4-1 shows the SNR of the CSI-RS in set q_0 in the active SCell to emulate beam failure. Figure 6.5.5.6.4-1 additionally shows the variation of the downlink L1-RSRP of the SSB in set q_1 of the candidate beam used for link recovery.

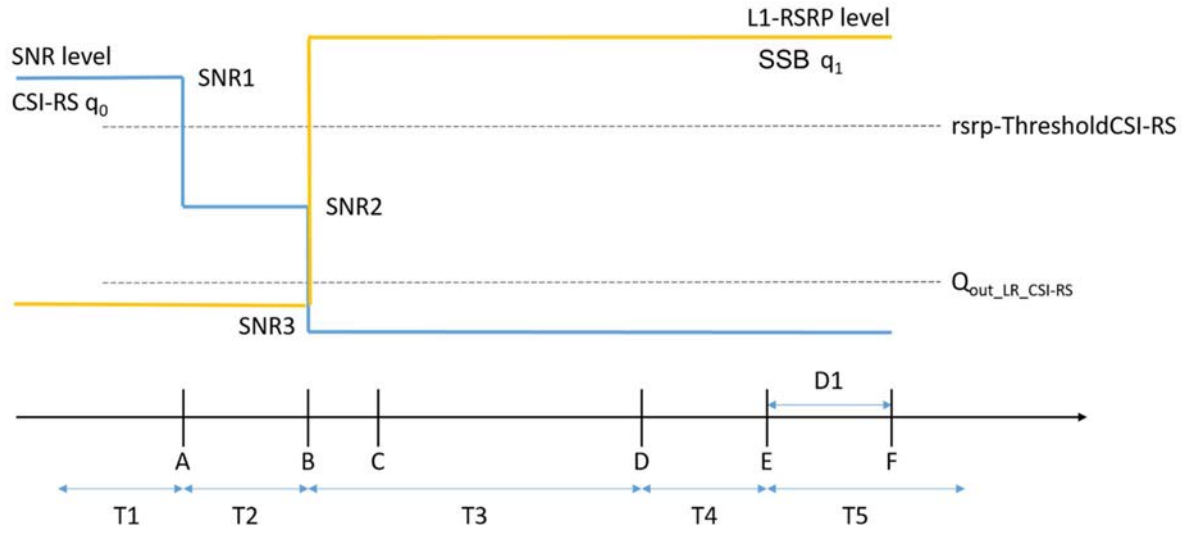


Figure 6.5.5.6.4-1: SNR and L1-RSRP variation for NR SA FR1 CSI-RS-based beam failure detection and SSB-based link recovery for SCell in DRX

6.5.5.6.4.1 Initial conditions

This test shall be tested using any of the test configurations in Table 6.5.5.6.4.1-1.

Table 6.5.5.6.4.1-1: Supported test configurations for FR1 PCell and SCell

Configuration	Description
6.5.5.6-1	FDD duplex mode, 15 kHz SSB SCS, 10MHz bandwidth
6.5.5.6-2	TDD duplex mode, 15 kHz SSB SCS, 10MHz bandwidth
6.5.5.6-3	TDD duplex mode, 30 kHz SSB SCS, 40MHz bandwidth
Note: The UE is only required to pass in one of the supported test configurations in FR1	

Configure the test equipment and the DUT according to the parameters in Table 6.5.5.6.4.1-2.

Table 6.5.5.6.4.1-2: Initial conditions for NR SA FR1 CSI-RS-based beam failure detection and SSB-based link recovery for SCell in DRX

Parameter	Value		Comment
Test environment	NC		As specified in TS 38.508-1 [14] clause 4.1.
Test frequencies	As specified in Annex E, table E.4-1 and TS 38.508-1 [14] clause 4.3.1 and 4.4.2.		
Channel bandwidth	As specified by the test configuration selected from Table 6.5.5.6.4.1-1.		
Propagation conditions	AWGN		As specified in Annex C.2.2.
Connection Diagram	TE Part	A.3.1.7.1	As specified in TS 38.508-1 [14] Annex A.
	DUT Part	A.3.2.3.4	
Exceptions to connection diagram	- Without LTE link - For 4Rx capable UEs without any 2Rx RF bands use A.3.2.5.2 for DUT part and A.3.1.8.4 for TE Part		

1. The general test parameter settings are set up according to Table 6.5.5.6.4.1-3.

2. Message contents are defined in clause 6.5.5.6.4.3.

3. There is one NR carrier and two NR cells specified in the test. Cell 1 is the NR cell (PCell) used for connection setup and Cell 2 is the NR cell (SCell) with the power level set according to Annex C.1.2 and C.1.3 for this test.

Table 6.5.5.6.4.1-3: General test parameters for NR SA FR1 CSI-RS-based beam failure detection and SSB-based link recovery for SCell in DRX

Parameter		Unit	Value	Comment
			Test 1	
Active PCell			Cell 1	
RF Channel Number for PCell			1	
Active SCell			Cell 2	
RF Channel Number for SCell			2	
Duplex mode	Config 1		FDD	
	Config 2, 3		TDD	
BWchannel	Config 1	MHz	10: NRB,c = 52	
	Config 2		10: NRB,c = 52	
	Config 3		40: NRB,c = 106	
TDD Configuration	Config 1		Not Applicable	
	Config 2		TDDConf.1.1	
	Config 3		TDDConf.2.1	
CORESET Reference Channel	Config 1		CR.1.1 FDD	A.1.2
	Config 2		CR.1.1 TDD	
	Config 3		CR.2.1 TDD	
SSB Configuration	Config 1		SSB.1 FR1	A.3
	Config 2		SSB.1 FR1	
	Config 3		SSB.2 FR1	
SMTC Configuration	Config 1, 2		SMTC.1	A.4
	Config 3		SMTC.1	
PDSCH/PDCCH	Config 1, 2	kHz	15	

subcarrier spacing	Config 3		30	
PRACH Configuration	Config 1, 2		PRACH.2 FR1	Table A.7.1-1
	Config 3		PRACH.2 FR1	Table A.7.1-1
csi-RS-Index assigned as beam failure detection RS in set q_0 in activated SCell			0	
OCNG parameters			OP.1	A.2.1
CP length			Normal	
Correlation Matrix and Antenna Configuration			2x2 Low	
Beam failure detection transmission parameters	DCI format		1-0	
	Number of Control OFDM symbols		2	
	Aggregation level	CCE	8	
	Ratio of hypothetical PDCCH RE energy to average CSI-RS RE energy	dB	0	
	Ratio of hypothetical PDCCH DMRS energy to average CSI-RS RE energy	dB	0	
	DMRS precoder granularity		REG bundle size	
	REG bundle size		6	
DRX			DRX.7	A.5
Gap pattern ID			N.A.	
schedulingRequestID-BFR-SCell-r16			absent	When the field is absent, the random access procedure will be triggered for SCell BFR
SSB Index assigned as CBD RS (q1) in activated SCell			0	
rlmInSyncOutOfSyncThreshold			absent	When the field is absent, the UE applies the value 0. (TS 38.133 [6] Table 8.1.1-1).
rsrp-ThresholdBFR	Config 1, 2	dBm/SCS	-98	Threshold used for $Q_{in_LR_SSB}$
	Config 3		-95	
powerControlOffsetSS			db0	Used for deriving rsrp-ThresholdCSI-RS
beamFailureInstanceMaxCount			n1	see clause 5.17 of TS 38.321 [12]
beamFailureDetectionTimer			pbfd4	see clause 5.17 of TS 38.321 [12]
CSI-RS configuration for q_0 in activated SCell	Config 1		CSI-RS.1.2 FDD	A.1.4
	Config 2		CSI-RS.1.2 TDD	
	Config 3		CSI-RS.2.2 TDD	
CSI-RS configuration for CSI reporting	Config 1		CSI-RS.1.1 FDD	A.1.4
	Config 2		CSI-RS.1.1 TDD	
	Config 3		CSI-RS.2.1 TDD	
TRS configuration	Config 1		TRS.1.1 FDD	
	Config 2		TRS.1.1 TDD	
	Config 3		TRS.1.2 TDD	
CSI-RS-Index assigned as RLM RS in PCell	Config 1		CSI-RS.1.2 FDD	A.1.4
	Config 2		CSI-RS.1.2 TDD	
	Config 3		CSI-RS.2.2 TDD	
T310 Timer		ms	1000	
N310			2	

T1	s	1	During this time the UE shall be fully synchronized to cell 1
T2	s	8.37	
T3	s	6.44	
T4	s	0	
T5	s	1.97	
D1	s	1.93	
Note 1: UE-specific PDCCH is not transmitted after T1 starts.			

6.5.5.6.4.2 Test procedure

Same test procedure as described in section 6.5.5.3.4.2, except following exception and step 7 and 8:

Prior to the start of the time duration T1, the UE shall be fully synchronized to cell 1 and cell 2. The UE shall be configured for periodic CSI reporting with a reporting periodicity of 5 ms. In the test, DRX configuration is not enabled.

7. If the SS:

   a) detects uplink power on the PCell equal to or higher than minimum output power defined in TS 38.521-1 [17] clause 6.3.1.5 in each slot configured for CSI transmission (according CSI reporting on PUCCH) during the period from time point A to time point B

   and

   b) does not detect preamble on the PCell before time point B

   and

   c) detects preamble on the preconfigured PRACH resource before time point F (D1 after the start of T5).

   And

   d) SS transmits a RAR to UE after receiving the preamble transmitted by the UE. SS detects the MAC-CE on the PCell transmitted by the UE providing the index for the activated SCell, and the index for the SSB provided by higher layer.

   the number of successful tests is increased by one.

   Otherwise the number of failed tests is increased by one.

8. If the iteration or random access procedure for BFD fails, the SS shall first attempt to release and add the FR1 SCell, by ensuring the UE is in state RRC_CONNECTED with generic procedure parameters *Connectivity* NR, Connected without release *On* and Test Mode *On* according to TS 38.508-1 [6] clause 4.5. If that also fails, then the UE is switched OFF/ON to proceed with the next iteration.

6.5.5.6.4.3 Message contents

Message contents are according to TS 38.508-1 [14] clause 7.3 with the following exceptions:

Table 6.5.5.6.4.3-1: Common Exception messages for NR SA FR1 SCell CSI-RS-based beam failure detection and SSB-based link recovery in DRX

Default Message Contents	
Common contents of system information blocks exceptions	
Default RRC messages and information elements contents exceptions	Table H.3.1-8 with Condition CSI-RS BFD Table H.3.1-10 with Condition SSB Table H.3.1-10A Table H.3.5-4 Table H.3.7-1 with Condition 'DRX.7' Table 7.3.1-3 in TS 38.508-1 [14] with condition SMTC.1

Table 6.5.5.6.4.3-2: PDCCH *Search Space* for BFR

Derivation Path: TS 38.508-1 [14], Table 4.6.3-162			
Information Element	**Value/remark**	**Comment**	**Condition**
SearchSpace ::= SEQUENCE {			
searchSpaceId	4	BFR	
controlResourceSetId	2	BFR	
monitoringSlotPeriodicityAndOffset CHOICE {			
sl1	NULL		
}			
monitoringSymbolsWithinSlot	10000000000000	Symbol 0	
nrofCandidates SEQUENCE {			
aggregationLevel1	n0		
aggregationLevel2	n0		
aggregationLevel4	n0		
aggregationLevel8	n1	AL8	
aggregationLevel16	n0		
}			
searchSpaceType CHOICE {			
ue-Specific SEQUENCE {			USS
dci-Formats	formats0-0-And-1-0	DCI Format 1_0	
}			
}			
}			

Table 6.5.5.6.4.3-3: *RLF-TimersAndConstants*

Derivation Path: TS 38.508-1 [14], Table 4.6.3-150			
Information Element	**Value/remark**	**Comment**	**Condition**
RLF-TimersAndConstants ::= SEQUENCE {			
n310	n2		
}			

Table 6.5.5.6.4.3-4: *PDCCH-Config*

Derivation Path: TS 38.501-1 [14],Table 4.6.3-95			
Information Element	**Value/remark**	**Comment**	**Condition**
PDCCH-Config ::= SEQUENCE {			
controlResourceSetToAddModList SEQUENCE(SIZE (1..3)) OF ControlResourceSet {	2 entries		
ControlResourceSet[2]	ControlResourceSet	entry 2, BFR	
}			
controlResourceSetToReleaseList	Not present		
searchSpacesToAddModList SEQUENCE(SIZE (1..10)) OF SearchSpace {	2 entries		
SearchSpace[2]	SearchSpace	entry 2, BFR	
}			
searchSpacesToReleaseList	Not present		
downlinkPreemption	Not present		
tpc-PUSCH	Not present		
tpc-PUCCH	Not present		
tpc-SRS	Not present		
}			

Table 6.5.5.6.4.3-5: ControlResourceSet for BFR

Derivation Path: TS 38.501-1 [14],Table 7.3.1-15			
Information Element	**Value/remark**	**Comment**	**Condition**
ControlResourceSet ::= SEQUENCE {			
controlResourceSetId	2		
duration	2		
cce-REG-MappingType CHOICE {			

interleaved ::= SEQUENCE {			
reg-BundleSize	n6		
interleaverSize	n2		
shiftIndex	0		
}			
tci-StatesPDCCH-ToAddList	Not present		
}			

6.5.5.6.5 Test requirement

Tables 6.5.5.6.4.1-3 and 6.5.5.6.5-1 define the primary level settings including test tolerances for NR SA FR1 SCell CSI-RS-based beam failure detection and SSB-based link recovery in DRX.

Table 6.5.5.6.5-1: NR Cell specific test parameters for NR SA FR1 SCell CSI-RS-based beam failure detection and SSB-based link recovery in DRX

Parameter		Unit	Cell 1	Test 1 Cell2				
			T1 to T5	T1	T2	T3	T4	T5
EPRE ratio of PDCCH DMRS to SSS		dB	0	0				
EPRE ratio of PDCCH to PDCCH DMRS		dB						
EPRE ratio of PBCH DMRS to SSS		dB						
EPRE ratio of PBCH to PBCH DMRS		dB						
EPRE ratio of PSS to SSS		dB						
EPRE ratio of PDSCH DMRS to SSS		dB						
EPRE ratio of PDSCH to PDSCH DMRS		dB						
EPRE ratio of OCNG DMRS to SSS		dB						
EPRE ratio of OCNG to OCNG DMRS		dB						
SNR_CSI-RS of set q_0	Config 1	dB	5	5.8	-2.2	-12.8	-12.8	-12.8
	Config 2	dB	5	5.8	-2.2	-12.8	-12.8	-12.8
	Config 3	dB	5	5.8	-2.2	-12.8	-12.8	-12.8
SNR_SSB of set q_1	Config 1	dB	-10	-10.2	-10.2	10.2	10.2	10.2
	Config 2	dB	-10	-10.2	-10.2	10.2	10.2	10.2
	Config 3	dB	-10	-10.2	-10.2	10.2	10.2	10.2
SSB_RP of set q_1	Config 1	dBm/ SCS kHz	-110	-108.2	-108.2	−87.8	−87.8	−87.8
	Config 2		-110	-108.2	-108.2	−87.8	−87.8	−87.8
	Config 3		-107	-105.2	-105.2	−84.8	−84.8	−84.8
N_{oc}	Config 1	dBm/15 kHz	-98	-98				
	Config 2		-98	-98				
	Config 3		-98	-98				
Propagation condition			TDL-C 300ns 100Hz	TDL-C 300ns 100Hz				

Note 1:	OCNG shall be used such that the resources in Cell 1 are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.
Note 2:	The uplink resources for CSI reporting are assigned to the UE prior to the start of time period T1.
Note 3:	NZP CSI-RS resource set configuration for CSI reporting are assigned to the UE prior to the start of time period T1.
Note 4:	Void
Note 5:	The timers and layer 3 filtering related parameters are configured prior to the start of time period T1.
Note 6:	The signal contains PDCCH for UEs other than the device under test as part of OCNG.
Note 7:	SNR levels correspond to the signal to noise ratio over the REs carrying CSI-RS.
Note 8:	The SNR in time periods T1, T2, T3, T4 and T5 is denoted as SNR1, SNR2 and SNR3 respectively in figure 6.5.5.6.4-1.
Note 9:	The SNR values are specified for a UE with 2RX antennas connected under test. For a UE with 4RX antennas connected under test, the SNR for RS in set q0 during T3, T4, and T5 from D.4.1.1, is -15dB-TT = -15.8dB (including test tolerances).

The UE behaviour during time durations T1, T2, T3, T4 and T5 shall be as follows:

During the time duration T1 and T2, the UE shall transmit uplink signal at least in all subframes configured for CSI transmission on Cell 1.

During the period from time point A to time point B the UE shall transmit uplink signal in Cell 1 in all uplink slots configured for CSI transmission according to the configured periodic CSI reporting for Cell 1.

During T3 the UE shall detect beam failure and initiate link recovery. During T4 and T5 the UE measures and evaluate beam candidate from beam candidate set q_1.

No later than time point F occurring no later than D1 = 120+10 ms after the start of T5, the UE shall transmit preamble for UL-SCH resource application, followed by MAC-CE on the assigned uplink resources containing a beam associated with the candidate beam set q_1. The UE shall not transmit preamble earlier than time point B.

During T5, the System Simulator shall transmit a Random Access Response to UE after the System Simulator receives the preamble from UE. The UE shall transmit the msg.3 containing candidate beam set q1 for SCell BFR if UE receives the Random Access Response.

Test is concluded once the test equipment has received the initial preamble transmission from the UE. The rate of correct events observed during repeated tests shall be at least 90%.

6.5.5.7 NR SA FR1 PCell TRP Specific CSI-RS-based Beam Failure Detection and Link Recovery in DRX

Editor's Note: This test case is incomplete in following aspects:

- TT analysis has not been provided
- TS 38.522 applicability spec update is pending

6.5.5.7.1 Test purpose

The purpose of this test is to verify that the UE properly detects TRP specific CSI-RS-based beam failure in the sets $q_{0,0}$ and $q_{0,1}$ configured for a serving cell and that the UE performs correct CSI-RS-based link recovery based on beam candidate set $q_{1,0}$ and $q_{1,1}$. The purpose is to test the downlink monitoring for beam failure detection on TRP1 within the UEs active DL BWP, during the evaluation period, and link recovery, when DRX is used. This test will partly verify the CSI-RS based TRP specific beam failure detection and link recovery for an FR1 serving cell requirements in TS 38.133 [6] clause 8.18 with *schedulingRequestID-BFR-r17* configured.

6.5.5.7.2 Test applicability

This test applies to all types of NR UE release 17 and forward supporting 5GS NR SA FR1, CSI-RS based RLM, TRP Specific CSI-RS-based link recovery and PCell beam failure recovery.

6.5.5.7.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 6.5.5.0.2.

The normative reference for this requirement is TS 38.133 [6] clause A.6.5.5.7.

6.5.5.7.4 Test description

The test consists of five successive time periods, with time duration of T1, T2, T3, T4 and T5 respectively. Figure A.6.5.5.7.1-1 shows the variation of the downlink SNR of the CSI-RS in set $q_{0,0}$ and $q_{0,1}$ for TRP1 and TRP2 respectively to emulate CSI-RS based beam failure on TRP1. Figure A.6.5.5.7.1-1 additionally shows the variation of the downlink L1-RSRP of the CSI-RS in set $q_{1,0}$ and $q_{1,1}$ of the candidate beam used for link recovery.

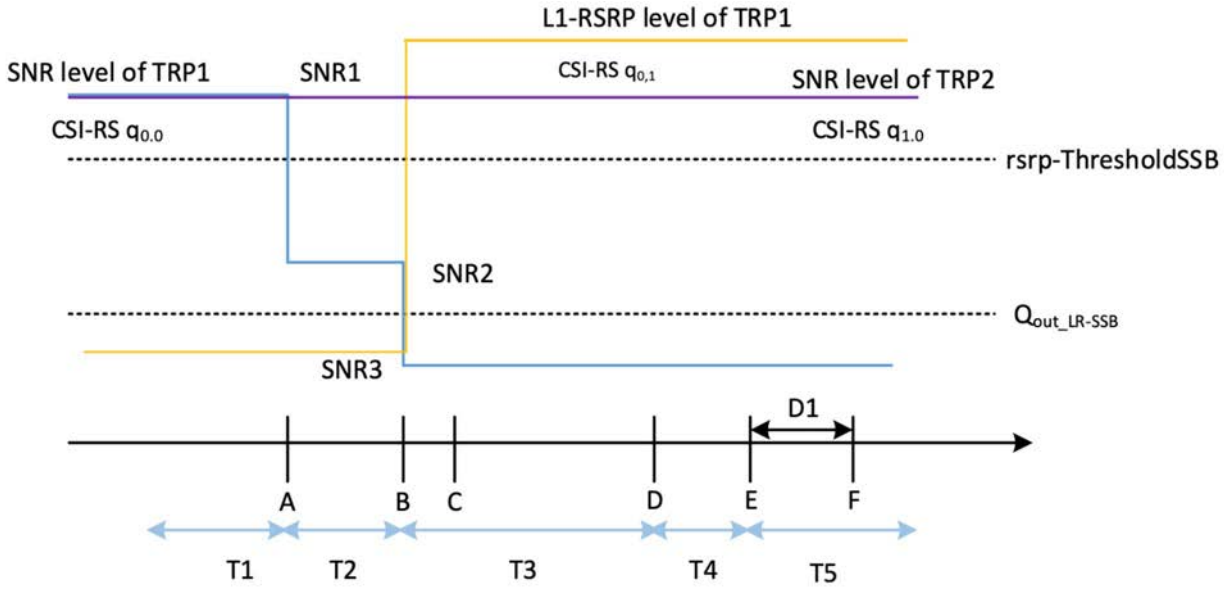


Figure 6.5.5.7.4-1: SNR and L1-RSRP variation for CSI-RS-based beam failure detection and link recovery testing in DRX mode

6.5.5.7.4.1 Initial conditions

This test shall be tested using any of the test configurations in Table 6.5.5.7.4.1-1.

Table 6.5.5.7.1-1: Supported test configurations for FR1 PCell

Configuration	Description
1	FDD duplex mode, 15 kHz SSB SCS, 10 MHz bandwidth
2	TDD duplex mode, 15 kHz SSB SCS, 10 MHz bandwidth
3	TDD duplex mode, 30 kHz SSB SCS, 40 MHz bandwidth
Note: The UE is only required to pass in one of the supported test configurations in FR1	

Configure the test equipment and the DUT according to the parameters in Table 6.5.5.7.4.1-2.

Table 6.5.5.7.4.1-2: Initial conditions for NR SA FR1 CSI-RS-based beam failure detection and link recovery in DRX

Parameter	Value		Comment
Test environment	NC		As specified in TS 38.508-1 [14] clause 4.1.
Test frequencies	As specified in Annex E, table E.4-1 and TS 38.508-1 [14] clause 4.3.1 and 4.4.2.		
Channel bandwidth	As specified by the test configuration selected from Table 6.5.5.7.4.1-1.		
Propagation conditions	AWGN		As specified in Annex C.2.2.
Connection Diagram	TE Part	A.3.1.7.1	As specified in TS 38.508-1 [14] Annex A.
	DUT Part	A.3.2.3.4	
Exceptions to connection diagram	- Without LTE link - For 4Rx capable UEs without any 2Rx RF bands use A.3.2.5.2 for DUT part and A.3.1.8.4 for TE Part		

1. The general test parameter settings are set up according to Table 6.5.5.7.4.1-3.

2. Message contents are defined in clause 6.5.5.7.4.3.

3. There is one NR carrier and one NR cells specified in the test. Cell 1 is the NR cell used for connection setup with the power level set according to Annex C.1.2 and C.1.3 for this test.

Table 6.5.5.7.4.1-3: General test parameters for FR1 PCell for CSI-RS-based TRP specific beam failure detection and link recovery testing in DRX mode

Parameter			Unit	Value	Comment
				Test1	
Active PCell				Cell 1	
RF Channel Number				1	
Duplex mode		Config 1		FDD	
		Config 2, 3		TDD	
TDD Configuration		Config 1		Not Applicable	
		Config 2		TDDConf.1.1	
		Config 3		TDDConf.2.1	
RMSI CORESET Reference Channel		Config 1		CR.1.1 FDD	
		Config 2		CR.1.1 TDD	
		Config 3		CR.2.1 TDD	
Dedicated CORESET Reference Channel		Config 1		CCR.1.1 FDD	
		Config 2		CCR.1.1 TDD	
		Config 3		CCR.2.1 TDD	
SSB Configuration		Config 1		SSB.3 FR1	
		Config 2		SSB.3 FR1	
		Config 3		SSB.4 FR1	
SMTC Configuration		Config 1, 2		SMTC.1	
		Config 3		SMTC.1	
PDSCH/PDCCH subcarrier spacing		Config 1, 2		15 KHz	
		Config 3		30 KHz	
PRACH Configuration		Config 1, 2,3		FR1 PRACH configuration 4	
OCNG parameters				OP.1	
CP length				Normal	
Correlation Matrix and Antenna Configuration				2x2 Low	
Beam failure detection transmission parameters	DCI format			1-0	
	Number of Control OFDM symbols			2	
	Aggregation level		CCE	8	
	Ratio of hypothetical PDCCH RE energy to average CSI-RS RE energy		dB	0	
	Ratio of hypothetical PDCCH DMRS energy to average CSI-RS RE energy		dB	0	
	DMRS precoder granularity			REG bundle size	
	REG bundle size			6	
DRX				DRX.7	
Gap pattern ID				N.A.	
schedulingRequestID-BFR- r17				Configured	
Periodicity of PUCCH for SR configuration for BFR on PCell		Config 1	slot	5	5ms
		Config 2, 3		10	
rlmInSyncOutOfSyncThreshold				absent	When the field is absent, the UE applies the value 0.
rsrp-ThresholdSSB		Config 1, 2	dBm/SCS	-98	Threshold used

	Config 3	kHz	-95	for $Q_{in_LR_SSB}$
powerControlOffsetSS			db0	Used for deriving rsrp-ThresholdCSI-RS
beamFailureInstanceMaxCount			n1	see clause 5.17 of TS 38.321 [12]
beamFailureDetectionTimer			pbfd4	see clause 5.17 of TS 38.321 [12]
CSI-RS configuration for TRP0	Config 1		CSI-RS.1.2 FDD	
	Config 2		CSI-RS.1.2 TDD	
	Config 3		CSI-RS.2.2 TDD	
CSI-RS configuration for TRP1	Config 1		CSI-RS.1.7 FDD	
	Config 2		CSI-RS.1.6 TDD	
	Config 3		CSI-RS.2.7 TDD	
CSI-RS Index assigned as BFD RS (q0,0)			0	
CSI-RS Index assigned as CBD RS (q1,0)			1	
CSI-RS Index assigned as BFD RS (q0,1)			2	
CSI-RS Index assigned as CBD RS (q1,1)			3	
CSI-RS index assigned as RLM RS			0,1,2,3	
CSI-RS configuration for CSI reporting	Config 1		CSI-RS.1.1 FDD	
	Config 2		CSI-RS.1.1 TDD	
	Config 3		CSI-RS.2.1 TDD	
TRS configuration	Config 1		TRS.1.1 FDD	
	Config 2		TRS.1.1 TDD	
	Config 3		TRS.1.2 TDD	
T310 Timer		ms	1000	
N310			2	
T1		s	1	During this time the UE shall be fully synchronized to cell 1
T2		s	8.37	
T3		s	6.44	
T4		s	0	
T5		s	1.97	
D1		s	1.93	
Note 1: UE-specific PDCCH is not transmitted after T1 starts.				

6.5.5.7.4.2 Test procedure

Prior to the start of the time duration T1, the UE shall be fully synchronized to cell 1. The UE shall be configured for periodic CSI reporting with a reporting periodicity of 5 ms. In the test, DRX configuration is enabled in PCell and DRX inactivity timer has already been expired, i.e. UE tries to decode PDCCH and to send periodic CQI during the period when On-duration timer is running. Time alignment timers shall be set to “infinity” so that UL timing alignment is maintained during the test.

1. Ensure the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity *NR*, Connected without release *On* and Test Mode *On* according to TS 38.508-1 [14] clause 4.5.

2. Set the parameters of NR Cell 1 according to T1 in Table 6.5.5.7.5-1. Propagation conditions are set according to Annex C.2.3. T1 starts.

3. When T1 expires the SS shall change the SNR1 and SNR2 values to T2 as specified in Table 6.5.5.7.5-1. T2 starts.

4. When T2 expires the SS shall change the SNR1 and SNR2 values to T3 as specified in Table 6.5.5.7.5-1. T3 starts.

5. When T3 expires the SS shall change the SNR1 and SNR2 values to T4 as specified in Table 6.5.5.7.5-1. T4 starts.

6. When T4 expires the SS shall change the SNR1 and SNR2 values to T5 as specified in Table 6.5.5.7.5-1. T5 starts.

7. If the SS:

a) detects uplink power on NR carrier equal to or higher than minimum output power defined in TS 38.521-1 [17] clause 6.3.1.5 in each slot configured for CSI transmission (according CSI reporting on PUCCH) during the period from time point A to time point B

and

b) does not detect preamble on a beam associated with the candidate beam set q_{10} and q_{11} before time point B

and

c) detects preamble on a beam associated with the candidate beam set q_{10} and q_{11} before time point F (D1 after the start of T5),

the number of successful tests is increased by one.

Otherwise the number of failed tests is increased by one.

8. If iteration or the random access procedure for BFD fails, switch the UE off and on. Ensure the UE is in RRC_CONNECTED with generic procedure parameters Connectivity NR, Connected without release On and Test Mode *On* according to TS 38.508-1 [14] clause 4.5.

9. Repeat steps 2-8 for all subtests until the confidence level according to Tables G.2.3-1 in Annex G clause G.2 is achieved.

6.5.5.7.4.3 Message contents

Message contents are according to TS 38.508-1 [14] clause 7.3 with the following exceptions:

Table 6.5.5.7.4.3-1: Common Exception messages for NR SA FR1 CSI-RS-based beam failure detection and link recovery in DRX

Default Message Contents	
Common contents of system information blocks exceptions	
Default RRC messages and information elements contents exceptions	Table H.3.1-8A with Condition CSI-RS BFD Table H.3.1-10 with Condition CSI-RS Table H.3.1-10A Table H.3.1-11 with Condition CSI-RS Table H.3.5-4 Table H.3.7-1 with Condition DRX.7 Table 7.3.1-3 in TS 38.508-1 [14] with condition SMTC.1,

Table 6.5.5.4.4.3-2: PDCCH *Search Space* for BFR

Derivation Path: TS 38.508-1 [14], Table 4.6.3-162			
Information Element	**Value/remark**	**Comment**	**Condition**
SearchSpace ::= SEQUENCE {			
searchSpaceId	4	BFR	
controlResourceSetId	2	BFR	
monitoringSlotPeriodicityAndOffset CHOICE {			
sl1	NULL		
}			
monitoringSymbolsWithinSlot	10000000000000	Symbol 0	
nrofCandidates SEQUENCE {			
aggregationLevel1	n0		
aggregationLevel2	n0		
aggregationLevel4	n0		
aggregationLevel8	n1	AL8	
aggregationLevel16	n0		
}			
searchSpaceType CHOICE {			
ue-Specific SEQUENCE {			USS
dci-Formats	formats0-0-And-1-0	DCI Format 1_0	
}			
}			

}			

Table 6.5.5.4.4.3-3: *RLF-TimersAndConstants*

Derivation Path: TS 38.508-1 [14], Table 4.6.3-150			
Information Element	**Value/remark**	**Comment**	**Condition**
RLF-TimersAndConstants ::= SEQUENCE {			
n310	n2		
}			

Table 6.5.5.4.4.3-4: Void

Table 6.5.5.3.4.3-5: *NZP-CSI-RS-Resource*

Derivation Path: TS 38.508-1 [14], Table 4.6.3-85			
Information Element	**Value/remark**	**Comment**	**Condition**
NZP-CSI-RS-Resource ::= SEQUENCE {			
powerControlOffsetSS	db0		
}			

Table 6.5.5.4.4.3-6: *PDCCH-Config*

Derivation Path: TS 38.501-1 [14],Table 4.6.3-95			
Information Element	**Value/remark**	**Comment**	**Condition**
PDCCH-Config ::= SEQUENCE {			
controlResourceSetToAddModList SEQUENCE(SIZE (1..3)) OF ControlResourceSet {	2 entries		
ControlResourceSet[2]	ControlResourceSet	entry 2, BFR	
}			
controlResourceSetToReleaseList	Not present		
searchSpacesToAddModList SEQUENCE(SIZE (1..10)) OF SearchSpace {	2 entries		
SearchSpace[2]	SearchSpace	entry 2, BFR	
}			
searchSpacesToReleaseList	Not present		
downlinkPreemption	Not present		
tpc-PUSCH	Not present		
tpc-PUCCH	Not present		
tpc-SRS	Not present		
}			

Table 6.5.5.4.4.3-7: ControlResourceSet for BFR

Derivation Path: TS 38.501-1 [14],Table 7.3.1-15			
Information Element	**Value/remark**	**Comment**	**Condition**
ControlResourceSet ::= SEQUENCE {			
controlResourceSetId	2		
duration	2		
cce-REG-MappingType CHOICE {			
interleaved ::= SEQUENCE {			
reg-BundleSize	n6		
interleaverSize	n2		
shiftIndex	0		
}			
tci-StatesPDCCH-ToAddList	Not present		
}			

Table 6.5.5.4.4.3-8:*MAC-CellGroupConfig for R17 BFR*

Derivation Path: TS 38.508-1, Table 4.6.3-68			
Information Element	Value/remark	Comment	Condition
MAC-CellGroupConfig ::= SEQUENCE {			
schedulingRequestID-BFR-r17	Not present		
schedulingRequestID-BFR2-r17	Not present		
schedulingRequestConfig-v1700	SchedulingRequest-Config		
}			

6.5.5.7.5 Test requirement

Tables 6.5.5.7.4.1-3 and 6.5.5.7.5-1 define the primary level settings including test tolerances for NR SA FR1 TRP specific CSI-RS-based beam failure detection and link recovery in DRX.

Table 6.5.5.7.5-1: Cell specific test parameters for FR1 PCell for CSI-RS-based beam failure detection and link recovery testing in DRX mode

Parameter		Unit	Test 1				
			T1	T2	T3	T4	T5
EPRE ratio of PDCCH DMRS to SSS		dB	0				
EPRE ratio of PDCCH to PDCCH DMRS		dB					
EPRE ratio of PBCH DMRS to SSS		dB					
EPRE ratio of PBCH to PBCH DMRS		dB					
EPRE ratio of PSS to SSS		dB					
EPRE ratio of PDSCH DMRS to SSS		dB					
EPRE ratio of PDSCH to PDSCH DMRS		dB					
EPRE ratio of OCNG DMRS to SSS		dB					
EPRE ratio of OCNG to OCNG DMRS		dB					
SNR_CSI-RS of set $q_{0,0}$	Config 1	dB	5+TT	-3+TT	-12+TT	-12+TT	-12+TT
	Config 2		5+TT	-3+TT	-12+TT	-12+TT	-12+TT
	Config 3		5+TT	-3+TT	-12+TT	-12+TT	-12+TT
SNR_CSI-RS of set $q_{0,1}$	Config 1	dB	5+TT	5+TT	5+TT	5+TT	5+TT
	Config 2		5+TT	5+TT	5+TT	5+TT	5+TT
	Config 3		5+TT	5+TT	5+TT	5+TT	5+TT
SNR_CSI-RS of set $q_{1,0}$	Config 1	dB	0.2+TT	0.2+TT	20.2+TT	20.2+TT	20.2+TT
	Config 2		0.2+TT	0.2+TT	20.2+TT	20.2+TT	20.2+TT
	Config 3		0.2+TT	0.2+TT	20.2+TT	20.2+TT	20.2+TT
CSI-RS_RP of set $q_{1,0}$	Config 1	dB/SCS kHz	-110+TT	-110+TT	-88+TT	-88+TT	-88+TT
	Config 2		-110+TT	-110+TT	-88+TT	-88+TT	-88+TT
	Config 3		-107+TT	-107+TT	-85+TT	-85+TT	-85+TT
N_{oc}	Config 1	dBm/15 KHz	-98+TT				
	Config 2		-98+TT				
	Config 3		-98+TT				
Propagation condition			TDL-C 300ns 100Hz				

Note 1:	OCNG shall be used such that the resources in Cell 1 are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.
Note 2:	The uplink resources for CSI reporting are assigned to the UE prior to the start of time period T1.
Note 3:	NZP CSI-RS resource set configuration for CSI reporting are assigned to the UE prior to the start of time period T1.
Note 4:	Void
Note 5:	The timers and layer 3 filtering related parameters are configured prior to the start of time period T1.
Note 6:	The signal contains PDCCH for UEs other than the device under test as part of OCNG.
Note 7:	SNR levels correspond to the signal to noise ratio over the REs carrying CSI-RS.
Note 8:	The SNR in time periods T1, T2, T3, T4 and T5 is denoted as SNR1, SNR2 and SNR3 respectively in figure 6.5.5.7.4-1.
Note 9:	The SNR values are specified for testing a UE which supports 2RX on at least one band. For testing of a UE which supports 4RX on all bands, the SNR during T3 is modified as specified in clause TS38.133 A.3.6.

The UE behaviour during time durations T1, T2, T3, T4 and T5 shall be as follows:

During the time duration T1 and T2, the UE shall transmit uplink signal at least in all subframes configured for CSI transmission on Cell 1.

During the period from time point A to time point B the UE shall transmit uplink signal in Cell 1 in all uplink slots configured for CSI transmission according to the configured periodic CSI reporting for Cell 1.

During T3 the UE shall detect beam failure and initiate link recovery. During T4 and T5 the UE measures and evaluate beam candidate from beam candidate set $q_{1,0}$.

No later than time point F occurring no later than D1 = 1920+10 ms after the start of T5, the UE shall transmit PUCCH with LRR, followed by BFR MAC CE containing a beam associated with the candidate beam set $q_{1,0}$. The UE shall not transmit PUCCH with an LRR with the candidate beam set $q_{1,0}$ earlier than time point B.

Test is concluded once the test equipment has received the initial preamble transmission from the UE. The rate of correct events observed during repeated tests shall be at least 90%.

6.5.6 Active BWP switch delay

6.5.6.1 DCI-based and time-based active BWP switch

6.5.6.1.0 Minimum conformance requirements

6.5.6.1.0.1 Minimum conformance requirements for DCI-based and time-based active BWP switch

For DCI-based BWP switch, after the UE receives BWP switching request at DL slot n on a serving cell, UE shall be able to receive PDSCH (for DL active BWP switch) or transmit PUSCH (for UL active BWP switch) on the new BWP on the serving cell on which BWP switch on the first DL or UL slot occurs right after a time duration of $T_{BWPswitchDelay}$ which starts from the beginning of DL slot n.

The UE is not required to transmit UL signals or receive DL signals until the first DL or UL slot occurs right after a time duration of $T_{BWPswitchDelay}$ which starts from the beginning of DL slot n except DCI triggering BWP switch on the cell where DCI-based BWP switch occurs. The UE is not required to follow the requirements defined in this clause when performing a DCI-based BWP switch between the BWPs in disjoint channel bandwidths or in partially overlapping channel bandwidths.

For timer-based BWP switch, the UE shall start BWP switch at DL slot n, where slot n is the first slot of a DL subframe (FR1) or DL half-subframe (FR2) immediately after a BWP-inactivity timer *bwp-InactivityTimer* [13] expires on a serving cell, and the UE shall be able to receive PDSCH (for DL active BWP switch) or transmit PUSCH (for UL active BWP switch) on the new BWP on the serving cell on which BWP switch on the first DL or UL slot occurs right after a time duration of $T_{BWPswitchDelay}$ which starts from the beginning of DL slot n.

The UE is not required to transmit UL signals or receive DL signals during time duration $T_{BWPswitchDelay}$ after *bwp-InactivityTimer* [13] expires on the cell where timer-based BWP switch occurs.

Depending on UE capability *bwp-SwitchingDelay* [13], UE shall finish BWP switch within the time duration $T_{BWPswitchDelay}$ defined in Table 6.5.6.1.0.1-1.

Table 6.5.6.1.0.1-1: BWP switch delay

μ	NR Slot length (ms)	BWP switch delay $T_{BWPswitchDelay}$ (slots)	
		Type 1[Note 1]	Type 2[Note 1]
0	1	1	3
1	0.5	2	5
2	0.25	3	9
3	0.125	6	18
Note 1: Depends on UE capability. Note 2: If the BWP switch involves changing of SCS, the BWP switch delay is determined by the smaller SCS between the SCS before BWP switch and the SCS after BWP switch.			

Provided the UE does not have the required TCI-state information to receive PDCCH and PDSCH in the new BWP, the UE shall use old TCI-states before the BWP switch until a new MAC CE updating the required TCI-state information for PDCCH and PDSCH is received after the BWP switch.

If UE has the information on the required TCI-state information to receive PDCCH and PDSCH in the new BWP,

- UE shall be able to receive PDCCH and PDSCH with old TCI-states before the delay as specified in TS 38.133 [6] Clause 8.10 in the new BWP.

- UE shall be able to receive PDCCH and PDSCH with new TCI-states after the delay as specified in TS 38.133 [6] Clause 8.10 in the new BWP.

If the BWP switch is triggered within DRX active time, and one of the two BWPs in a BWP switching is a dormant BWP [TS 38.321, 12], UE shall be able to complete active BWP switching within

- $T_{BWPswitchDelay}$, provided that the BWP switching request is received in any of the first 3 OFDM symbols of a slot corresponding to the serving cell where BWP switching occurs, or

- $T_{BWPswitchDelay}$ + 1, provided that the BWP switching request is received after the first 3 OFDM symbols of a slot corresponding to the serving cell where BWP switching occurs

When either of the DCI-based, timer-based or RRC-based downlink BWP switch and/or uplink BWP switch occur on multiple CCs simultaneously or over partially overlapping period, the interruption requirements described in this section apply for each BWP switch.

When UE receives a DCI indicating UE to switch its active BWP involving changes in any of the parameters listed in Table 6.5.6.1.0.1-3, the UE is allowed to cause interruption of up to X slot to other active serving cells if the UE is not capable of per-FR gap, or if the BWP switching involves SCS changing. When the BWP switch imposes changes in any of the parameters listed in Table 6.5.6.1.0.1-3 and the UE is capable of per-FR gap the UE is allowed to cause interruption of up to X slot to other active serving cells in the same frequency range wherein the UE is performing BWP switching. X is defined in Table 6.5.6.1.0.1-2. The starting time of interruption is only allowed within the BWP switching delay $T_{BWPswitchDelay}$ as defined in TS 38.133 [6] clause 8.6.2. Interruptions are not allowed during BWP switch involving any other parameter change.

When a BWP timer *bwp-InactivityTimer* defined in TS 38.331 [13] expires, UE is allowed to cause interruption of up to X slot to other active serving cells due to switching its active BWP involving changes in any of the parameters listed in Table 6.5.6.1.0.1-3 if the UE is not capable of per-FR gap, or if the BWP switching involves SCS changing. When the BWP switch imposes changes in any of the parameters listed in Table 6.5.6.1.0.1-3 and the UE is capable of per-FR gap, the UE is allowed to cause interruption of up to X slot to other active serving cells in the same frequency range wherein the UE is performing BWP switching. X is defined in Table 6.5.6.1.0.1-2. The starting time of interruption is only allowed within the BWP switching delay $T_{BWPswitchDelay}$ as defined in TS 38.133 [6] clause 8.6.2. Interruptions are not allowed during BWP switch involving any other parameter change.

Table 6.5.6.1.0.1-2: Interruption length X

μ	NR Slot length (ms)	interruption length X (slots)
0	1	1

1	0.5	1
2	0.25	3
3	0.125	5
Note1: void		

Table 6.5.6.1.0.1-3: Parameters which cause interruption other than SCS

Parameters	Comment
locationAndBandwidth	From TS 38.331 [13]
nrofSRS-Ports	
maxMIMO-Layers-r16	

The normative reference for this requirement is TS 38.133 [6] clauses 8.6.2 and 8.2.1.2.7

6.5.6.1.1 NR SA FR1-FR1 DCI-based DL active BWP switch in non-DRX

6.5.6.1.1.1 Test purpose

The purpose of this test is to verify the DL BWP switch delay requirement defined in TS 38.133 [6] clause 8.6, and interruption requirement on other active serving cell defined in TS 38.133 [6] clause 8.2.2.2.5.

6.5.6.1.1.2 Test applicability

This test applies to all types of NR UE release 15 onwards supporting BWP adaptation of at least 2 BWPs, DCI and timer-based active BWP switching delay Type1 or Type2 and 2DL CA.

6.5.6.1.1.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 6.5.6.1.0.1.

The normative reference for this requirement is TS 38.133 [6] clause A.6.5.6.1.1.

6.5.6.1.1.4 Test description

6.5.6.1.1.4.1 Initial conditions

This test shall be tested using any of the test configurations in this clause. The supported test configurations for PCell are shown in Table 6.5.6.1.1.4.1-1. Supported test configurations for NR SCell are shown in Table 6.5.6.1.1.4.1-1A below. Test configuration for NR PCell and test configuration for NR SCell are chosen independently.

Table 6.5.6.1.1.4.1-1: Supported test configurations for NR PCell for NR SA FR1-FR1 DCI-based DL active BWP switch with SCell in non-DRX

Config	Description
6.5.6.1.1-1	NR 15 kHz SSB SCS, ≥10 MHz bandwidth, FDD duplex mode
6.5.6.1.1-2	NR 15 kHz SSB SCS, ≥10 MHz bandwidth, TDD duplex mode
6.5.6.1.1-3	NR 30 kHz SSB SCS, ≥40 MHz bandwidth, TDD duplex mode
Note 1: The UE is only required to be tested in one of the supported test configurations Note 2: The UE is only required to be tested in one with smallest aggregated channel bandwidth from supported band combinations which is composed of CCs ≥ the bandwidth ($BW_{channel}$) defined in each test configuration,	

Table 6.5.6.1.1.4.1-1A: Supported test configurations for NR SCell for NR SA FR1-FR1 DCI-based DL active BWP switch with SCell in non-DRX

$Config_{SCell}$	Description
1	NR 15 kHz SSB SCS, ≥10 MHz bandwidth, FDD duplex mode
2	NR 15 kHz SSB SCS, ≥10 MHz bandwidth, TDD duplex mode
3	NR 30 kHz SSB SCS, ≥40 MHz bandwidth, TDD duplex mode
Note 1: The UE is only required to be tested in one of the supported test configurations Note 2: The UE is only required to be tested in one with smallest aggregated channel bandwidth from supported band combinations which is composed of CCs ≥ the bandwidth ($BW_{channel}$) defined in each test	

configuration,

Configure the test equipment and the DUT according to the parameters in Table 6.5.6.1.1.4.1-2.

Table 6.5.6.1.1.4.1-2: Initial conditions for NR SA FR1-FR1 DCI-based DL active BWP switch in non-DRX

Parameter	Value		Comment
Test environment	NC		As specified in TS 38.508-1 [14] clause 4.1.
Test frequencies	As specified in Annex E, Table E.4-1 and TS 38.508-1 [14] clause 4.3.1.		
Channel bandwidth	As specified by the test configuration selected from Table 6.5.6.1.1.4.1-1.		
Propagation conditions	AWGN		As specified in Annex C.2.2
Connection Diagram	TE Part	A.3.1.8.2	As specified in TS 38.508-1 [14] Annex A.
	DUT Part	A.3.2.3.4	
Exceptions to connection diagram	- Without LTE link - For 4Rx capable UEs without any 2Rx RF bands use A.3.2.5.2 for DUT part and A.3.1.8.4 for TE part.		

1. The general test parameter settings are set up according to Table 6.5.6.1.1.4.1-3.
2. Message contents are defined in clause 6.5.6.1.1.4.3.
3. The test scenario comprises of one NR PCell (Cell 1) and one NR SCell (Cell 2). Cell 1 and Cell 2 are configured according to Annex C.1.2 and C.1.3.

Table 6.5.6.1.1.4.1-3: General test parameters for DL BWP switch in SA

Parameter	Unit	Value	Comment
NR RF Channel Number		1, 2	Two NR radio channels are used for this test
Active PCell		Cell 1	PCell on RF channel number 1.
Active SCell		Cell 2	SCell on RF channel number 2.
CP length		Normal	
DRX		OFF	For both PCell and SCell
bwp-InactivityTimer	ms	200	
Cell-individual offset for cells on RF channel number 1	dB	0	Individual offset for cells on PCC.
Cell-individual offset for cells on RF channel number 2	dB	0	Individual offset for cells on SCC.
Cell2 timing offset to cell1	µs	3	Time alignment error as specified in TS 38.104 [28] clause 6.5.3.1.
T1	s	0.2	
T2	s	0.2	
T3	s	0.2	

6.5.6.1.1.4.2 Test procedure

The test consists of 3 successive time periods, with durations of T1, T2, and T3, respectively.

PDCCHs indicating new transmissions shall be sent continuously on SCell (Cell 2) to ensure that the UE would have ACK/NACK sending except for the time duration when BWP is switching on Cell 2 and the time duration of T2.

PDCCHs indicating new transmissions shall be sent continuously on PCell (Cell 1) to ensure that the UE will have ACK/NACK sending.

Before the test starts,

- UE is connected to Cell 1 (PCell) on radio channel 1 (PCC), and Cell 2 (SCell) on radio channel 2 (SCC).
- UE is configured with 2 different UE-specific downlink bandwidth parts for SCell, BWP-1 and BWP-2, in Cell 2 before starting the test. BWP-1 and BWP-2 always include bandwidth of the initial DL BWP and SSB.

- UE is configured with 1 UE-specific downlink bandwidth parts the same as initial BWP for PCell, BWP-0 in Cell 1 before starting the test.
- UE is indicated in *firstActiveDownlinkBWP-Id* that the active DL BWP is BWP-1 in SCell.
- UE is indicated in *firstActiveDownlinkBWP*-Id that the active DL BWP is BWP-0 in PCell.
- UE is configured with a *bwp-InactivityTimer* timer value for SCell.

All cells have constant signal levels throughout the test.

1. Ensure the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity *NR*, Connected without release *On* and Test Mode *On* according to TS 38.508-1 [14] clause 4.5.
2. The SS shall configure SCell (Cell 2) on the SCC as per TS 38.508-1 [14] clause 7.5.1. Set the parameters according to Tables 6.5.6.1.1.4.1-3 and 6.5.6.1.1.5-1. Propagation conditions are set according to Annex C clauses C.2.2.
3. The SS shall transmit an *RRCReconfiguration* message releasing the dedicated configuration of the *initialDownlinkBWP* and the *initialUplinkBWP* of Cell 2. This message also configures 2 different UE-specific bandwidth parts for Cell 2, BWP-1 and BWP-2 and indicates BWP-1 as the active DL BWP using *firstActiveDownlinkBWP-Id*, according to Table 6.5.6.1.1.4.3-2.
4. The SS shall send a DCI format 1_1 command for SCell DL BWP switch.
5. The UE shall receive the DCI format 1_1 command in SCell's slot # denoted i, then T1 starts and the UE switch its bandwidth part from BWP-1 to BWP-2:

   a) If the UE starts to report valid ACK/NACK for SCell on PCell from the first UL slot that occurs after the beginning of DL slot (i+$T_{BWPswitchDelay}$+k_1)

   and

   b) If the UE starts to report valid ACK/NACK for PCell from the first UL slot that occurs after the beginning of DL slot (i+$T_{BWPswitchDelay}$+ Interruption length + k_1)

   and

   c) If the number of consecutive missing ACK/NACK for PCell is no more than 1

   Then, the number of successful subtests is increased by one. Otherwise, count a fail for the test, switch off/on the UE and go to step 1.
6. If the UE sends valid ACK/NACK for the SCell on BWP-2, T2 starts. During T2, the SS shall not transmit DCI format for PDSCH reception on SCell.
7. T3 starts from the first slot #j of the DL subframe immediately after the slot wherein *bwp-InactivityTimer* timer expires and the SS restarts to send DCI format for PDSCH reception on SCell. Then, the UE shall switch its bandwidth part from BWP-2 back to the default bandwidth part – BWP-1:

   a) If the UE starts to report valid ACK/NACK for SCell on PCell from the first UL slot that occurs after the beginning of DL slot (j+$T_{BWPswitchDelay}$+k_1)

   and

   b) If the UE starts to report valid ACK/NACK for PCell from the first UL slot that occurs after the beginning of DL slot (j+$T_{BWPswitchDelay}$+ Interruption length + k_1)

   and

   c) If the number of consecutive missing ACK/NACK for PCell is no more than 1.

   Then, the number of successful subtests is increased by one. Otherwise, count a fail for the test, switch off/on the UE and go to step 1.
8. Repeat steps 4-7 until the confidence level according to Tables G.2.3-1 in Annex G clause G.2 is achieved.

The SS verifies the DL BWP switch time in SCell by counting the slots from the time when the BWP switch command is received or *bwp-InactivityTimer* timer expires till an ACK/NACK is received.

The SS verifies that potential interruption to PCell is carried out in the correct time span by monitoring ACK/NACK sent in PCell during BWP switch of SCell, respectively.

Interruption length is defined in TS 38.133 [6] Table 8.2.2.2.5-1-1.

If all subtests pass, the test passes. If one subtest fails, the test fails.

6.5.6.1.1.4.3 Message contents

Message contents are according to TS 38.508-1 [14] clause 7.3 with the following exceptions:

Table 6.5.6.1.1.4.3-1: Common Exception messages for NR SA FR1-FR1 DCI-based DL active BWP switch in non-DRX

Default Message Contents	
Common contents of system information blocks exceptions	

Table 6.5.6.1.1.4.3-1A: *RRCReconfiguration* (Step 3)

Derivation Path: TS 38.508-1 [14], Table 4.8.1-1B			
Information Element	**Value/remark**	**Comment**	**Condition**
RRCReconfiguration ::= SEQUENCE {			
criticalExtensions CHOICE {			
rrcReconfiguration SEQUENCE {			
nonCriticalExtension SEQUENCE {			
masterCellGroup	CellGroupConfig	Table 6.5.6.1.1.4.3-1B	
}			
}			
}			
}			

Table 6.5.6.1.1.4.3-1B: *CellGroupConfig* (Table 6.5.6.1.1.4.3-1A)

Derivation Path: TS 38.508-1 [14], Table 4.8.1-2 with condition SCell_add			
Information Element	**Value/remark**	**Comment**	**Condition**
CellGroupConfig ::= SEQUENCE {			
sCellToAddModList SEQUENCE (SIZE (1..maxNrofSCells)) OF SCellConfig {	1 entry		
SCellConfig[1] SEQUENCE {		entry 1	
sCellConfigDedicated	ServingCellConfig	Table 6.5.6.1.1.4.3-2	
}			
}			
}			

Table 6.5.6.1.1.4.3-2: *ServingCellConfig* (Table 6.5.6.1.1.4.3-1B)

Derivation Path: TS 38.508-1 [14], Table 4.6.3-167			
Information Element	**Value/remark**	**Comment**	**Condition**
ServingCellConfig ::= SEQUENCE {			
initialDownlinkBWP SEQUENCE {			
pdcch-Config CHOICE {			
release	NULL		
}			
pdsch-Config CHOICE {			
release	NULL		
}			
radioLinkMonitoringConfig CHOICE {			
release	NULL		

}			
downlinkBWP-ToAddModList SEQUENCE (SIZE (1..maxNrofBWPs)) OF SEQUENCE {	2 entries		
BWP-Downlink[1]	BWP-Downlink with condition BWP1	entry 1 Table 6.5.6.1.1.4.3-3	
BWP-Downlink[2]	BWP-Downlink with condition BWP2	entry 2 Table 6.5.6.1.1.4.3-3	
}			
firstActiveDownlinkBWP-Id	1	According to BWP-1	
bwp-InactivityTimer	ms200		
defaultDownlinkBWP-Id	1	According to BWP-1	
}			

Table 6.5.6.1.1.4.3-3: *BWP-Downlink* (Table 6.5.6.1.1.4.3-2)

Derivation Path: TS 38.508-1 [14], Table 4.6.3-9			
Information Element	**Value/remark**	**Comment**	**Condition**
BWP-Downlink ::= SEQUENCE {			
bwp-Id	1	BWP-1	BWP1
	2	BWP-2	BWP2
bwp-Common SEQUENCE {			
genericParameters	RIV defined in TS 38.214 [9] that corresponds to DLBWP.1.1		BWP1
	RIV defined in TS 38.214 [9] that corresponds to DLBWP.1.3		BWP2
}			
}			

Table 6.5.6.1.1.4.3-4: *Void*

Table 6.5.6.1.1.4.3-5: *Void*

Table 6.5.6.1.1.4.3-6: *PDSCH-TimeDomainResourceAllocationList*

Derivation Path: TS 38.508-1 [14], Table 4.6.3-103			
Information Element	**Value/remark**	**Comment**	**Condition**
PDSCH-TimeDomainResourceAllocationList ::= SEQUENCE(SIZE(1..maxNrofDL-Allocations)) OF PDSCH-TimeDomainResourceAllocation {	4 entries		
PDSCH-TimeDomainResourceAllocation[1] SEQUENCE {		entry 1	
k0	Not present		
mappingType	typeA		
startSymbolAndLength	53	Start symbol(S)=2, Length(L)=12	
}			
PDSCH-TimeDomainResourceAllocation[2] SEQUENCE {		entry 2	
k0	Not present		
mappingType	typeA		
startSymbolAndLength	72	S=2, L=6	
}			
PDSCH-TimeDomainResourceAllocation[3] SEQUENCE {		entry 3	
k0	$T_{BWPswitchDelay}$	Defined in Table	The DCI

		6.5.6.1.0.1-1	indicating BWP switch
mappingType	typeA		
startSymbolAndLength	53	Start symbol(S)=2, Length(L)=12	
}			
PDSCH-TimeDomainResourceAllocation[4] SEQUENCE {		entry 4	
k0	1		First DCI right after DCI-based BWP switch
mappingType	typeA		
startSymbolAndLength	53	Start symbol(S)=2, Length(L)=12	
}			
}			

Table 6.5.6.1.1.4.3-7: Void

Table 6.5.6.1.1.4.3-8: *PDSCH-Config*

Derivation Path: TS 38.508-1 [14], Table 4.6.3-100			
Information Element	**Value/remark**	**Comment**	**Condition**
PDSCH-Config ::= SEQUENCE {			
pdsch-TimeDomainAllocationList	PDSCH-TimeDomainResourceAllocationList		
}			

6.5.6.1.1.5 Test requirements

Tables 6.5.6.1.1.4.1-3 and 6.5.6.1.1.5-1 and 6.5.6.1.1.5-2 define the primary level settings including test tolerances.

Table 6.5.6.1.1.5-1: NR Cell specific test parameters for NR PCell for DL BWP switch in SA

Parameter		Unit	Cell 1
Frequency Range			FR1
Duplex mode	Config 1		FDD
	Config 2,3		TDD
TDD configuration	Config 1		Not Applicable
	Config 2		TDDConf.1.1
	Config 3		TDDConf.1.2
$BW_{channel}$		RB	Note 7
$BW_{occupied}$	Config 1,2		52 Note 5
	Config 3		106 Note 6
Active BWP ID			0
Initial DL BWP Configuration			DLBWP.0.2Note4
Initial UL BWP Configuration			ULBWP.0.2Note4
Active DL BWP-0 Configuration			DLBWP.0.2Note4
Active DL BWP-1 Configuration			N.A.
Active DL BWP-2 Configuration			N.A.
Active UL BWP-0 Configuration			ULBWP.0.2Note4
Active UL BWP-1 Configuration			N.A.
Active UL BWP-2 Configuration			N.A.
PDSCH Reference measurement channel	Config 1		SR.1.1 FDD
	Config 2		SR.1.1 TDD
	Config 3		SR.2.1 TDD
RMSI CORESET	Config 1		CR.1.1 FDD

parameters	Config 2		CR.1.1 TDD
	Config 3		CR.2.1 TDD
Dedicated CORESET parameters	Config 1		CCR.1.2 FDD
	Config 2		CCR.1.2 TDD
	Config 3		CCR.2.4 TDD
TRS Configuration	Config 1		TRS.1.1 FDD
	Config 2		TRS.1.1 TDD
	Config 3		TRS.1.2 TDD
OCNG Patterns	Config 1,2		OP.1 Note 5
	Config 3		OP.1 Note 6
SSB Configuration	Config 1,2		SSB.1 FR1
	Config 3		SSB.2 FR1
SMTC Configuration			SMTC.1
Correlation Matrix and Antenna Configuration			1x2 Low
EPRE ratio of PSS to SSS		dB	0
EPRE ratio of PBCH DMRS to SSS			
EPRE ratio of PBCH to PBCH DMRS			
EPRE ratio of PDCCH DMRS to SSS			
EPRE ratio of PDCCH to PDCCH DMRS			
EPRE ratio of PDSCH DMRS to SSS			
EPRE ratio of PDSCH to PDSCH			
EPRE ratio of OCNG DMRS to SSS(Note 1)			
EPRE ratio of OCNG to OCNG DMRS (Note 1)			
N_{oc} Note 2	Config 1,2	dBm/SCS	-104
	Config 3		-101
N_{oc} Note 2		dBm/15KHz	-104
SS-RSRP Note 3	Config 1,2	dBm/SCS	-87
	Config 3		-84
$\hat{E}_s/I_{ot}$		dB	17
$\hat{E}_s/N_{oc}$		dB	17
Io Note3	Config 1,2	dBm/ 9.36MHz	-58.96
	Config 3	dBm/ 38.16MHz	-52.86
Propagation Condition			AWGN

Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.

Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for N_{oc} to be fulfilled within $BW_{occupied}$.

Note 3 SS-RSRP and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.

Note 4: For unpaired spectrum, a DL BWP is linked with an UL BWP. DLBWP.0.2 is linked with ULBWP.0.2; DLBWP.1.1 is linked with ULBWP.1.1; DLBWP.1.3 is linked with ULBWP.1.3 defined in clause 12 of TS 38.213 [3].

Note 5: All UL/DL transmission shall be confined within $BW_{occupied}$ (i.e. 10 MHz, 52 RBs) from $F_{C,low}$, and Io is independent of the $BW_{channel}$ configured.

Note 6: All UL/DL transmission shall be confined within $BW_{occupied}$ (i.e. 40 MHz, 106 RBs) from $F_{C,low}$, and Io is independent of the $BW_{channel}$ configured.

Note 7: $N_{RB,c}$. is derived from Table 5.3.2-1 in TS38.101-1[2] with configured $BW_{channel}$.

Table 6.5.6.1.1.5-2: NR Cell specific test parameters for NR SCell for DL BWP switch in SA

Parameter		Unit	Cell2
Frequency Range			FR1
Duplex mode	$Config_{SCell}$ 1		FDD
	$Config_{SCell}$ 2,3		TDD
TDD configuration	$Config_{SCell}$ 1		Not Applicable

	$Config_{SCell}$ 2		TDDConf.1.1
	$Config_{SCell}$ 3		TDDConf.1.2
$BW_{channel}$			Note 7
$BW_{occupied}$	$Config_{SCell}$ 1,2	RB	52 Note 5
	$Config_{SCell}$ 3		106 Note 6
Active BWP ID			1, 2
Initial DL BWP Configuration			DLBWP.0.2Note4
Initial UL BWP Configuration			N.A.
Active DL BWP-0 Configuration			N.A.
Active DL BWP-1 Configuration			DLBWP.1.1Note4
Active DL BWP-2 Configuration			DLBWP.1.3Note4
Active UL BWP-0 Configuration			N.A.
Active UL BWP-1 Configuration			N.A.
Active UL BWP-2 Configuration			N.A.
PDSCH Reference measurement channel	$Config_{SCell}$ 1		SR.1.1 FDD
	$Config_{SCell}$ 2		SR.1.1 TDD
	$Config_{SCell}$ 3		SR.2.1 TDD
RMSI CORESET parameters	$Config_{SCell}$ 1		CR.1.1 FDD
	$Config_{SCell}$ 2		CR.1.1 TDD
	$Config_{SCell}$ 3		CR.2.1 TDD
Dedicated CORESET parameters	$Config_{SCell}$ 1		CCR.1.2 FDD
	$Config_{SCell}$ 2		CCR.1.2 TDD
	$Config_{SCell}$ 3		CCR.2.4 TDD
TRS Configuration	$Config_{SCell}$ 1		TRS.1.1 FDD
	$Config_{SCell}$ 2		TRS.1.1 TDD
	$Config_{SCell}$ 3		TRS.1.2 TDD
OCNG Patterns	$Config_{SCell}$ 1,2		OP.1 Note 5
	$Config_{SCell}$ 3		OP.1 Note 6
SSB Configuration	$Config_{SCell}$ 1,2		SSB.1 FR1
	$Config_{SCell}$ 3		SSB.2 FR1
SMTC Configuration			SMTC.1
Correlation Matrix and Antenna Configuration			1x2 Low
EPRE ratio of PSS to SSS		dB	0
EPRE ratio of PBCH DMRS to SSS			
EPRE ratio of PBCH to PBCH DMRS			
EPRE ratio of PDCCH DMRS to SSS			
EPRE ratio of PDCCH to PDCCH DMRS			
EPRE ratio of PDSCH DMRS to SSS			
EPRE ratio of PDSCH to PDSCH			
EPRE ratio of OCNG DMRS to SSS Note 1			
EPRE ratio of OCNG to OCNG DMRS Note 1			
N_{oc}Note 2	$Config_{SCell}$ 1,2	dBm/SCS	-104
	$Config_{SCell}$ 3		-101
N_{oc}Note 2		dBm/15KHz	-104
SS-RSRP Note 3	$Config_{SCell}$ 1,2	dBm/SCS	-87
	$Config_{SCell}$ 3		-84
$\hat{E}_s/I_{ot}$		dB	17
$\hat{E}_s/N_{oc}$		dB	17
Io^{Note3}	$Config_{SCell}$ 1,2	dBm/ 9.36MHz	-58.96
	$Config_{SCell}$ 3	dBm/ 38.16MHz	-52.86
Propagation Condition			AWGN

Note 1:	OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.
Note 2:	Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for N_{oc} to be fulfilled within $BW_{occupied}$.
Note 3	SS-RSRP and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.
Note 4:	For unpaired spectrum, a DL BWP is linked with an UL BWP. DLBWP.0.2 is linked with ULBWP.0.2; DLBWP.1.1 is linked with ULBWP.1.1; DLBWP.1.3 is linked with ULBWP.1.3 defined in clause 12 of TS 38.213 [3].
Note 5:	All UL/DL transmission shall be confined within $BW_{occupied}$ (i.e. 10 MHz, 52 RBs) from $F_{C,low}$, and Io is independent of the $BW_{channel}$ configured.
Note 6:	All UL/DL transmission shall be confined within $BW_{occupied}$ (i.e. 40 MHz, 106 RBs) from $F_{C,low}$, and Io is independent of the $BW_{channel}$ configured.
Note 7:	$N_{RB,c}$. is derived from Table 5.3.2-1 in TS38.101-1[2] with configured $BW_{channel}$.

During T1, the UE shall start to send the ACK/NACK for SCell on PCell from the first UL slot that occurs after the beginning of DL slot (i+$T_{BWPswitchDelay}$+k_1).

During T3, the UE shall start to send the ACK/NACK for SCell on PCell from the first UL slot that occurs after the beginning of DL slot (j+$T_{BWPswitchDelay}$+k_1).

Where, k_1 is the timing between DL data receiving and acknowledgement as specified in [9].

Depending on UE capability *bwp-SwitchingDelay* [13], UE shall finish BWP switch within the time duration $T_{BWPswitchDelay}$ defined in TS 38.133 [6] Table 8.6.2-1.

All of the above test requirements shall be fulfilled in order for the observed SCell active BWP switch delay to be counted as correct.

The rate of correct events observed during repeated tests shall be at least 90%.

During T1 and T3, the start time of PCell interruption during SCell active BWP switch shall not happen outside the BWP switch delay.

The interruption of PCell shall not be longer than the interruption duration specified for active BWP switch in TS 38.133 [6] clause 8.2.2.2.5.

All of the above test requirements shall be fulfilled in order for the observed SCell active BWP switch interruption to be counted as correct.

The rate of correct events observed during repeated tests shall be at least 90%.

NOTE: During T1, T3 if there are no uplink resources for reporting the ACK/NACK in the first UL slot that occurs after the beginning of DL slot (i+ $T_{BWPswitchDelay}$+k_1), (j+ $T_{BWPswitchDelay}$+k_1), then the UE shall use the next available uplink resource for reporting the corresponding ACK/NACK.

6.5.6.1.2 NR SA FR1 DCI-based DL active BWP switch in non-DRX

6.5.6.1.2.1 Test purpose

The purpose of this test is to verify the DL BWP switch delay requirement defined in TS 38.133 [6] clause 8.6.

6.5.6.1.2.2 Test applicability

This test applies to all types of NR UE release 15 onwards supporting BWP adaptation of at least 2 BWPs, DCI and timer-based active BWP switching delay Type1 or Type2.

6.5.6.1.2.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 6.5.6.1.0.1.

The normative reference for this requirement is TS 38.133 [6] clause A.6.5.6.1.2.

6.5.6.1.2.4 Test description

6.5.6.1.2.4.1 Initial conditions

This test shall be tested using any of the test configurations in Table 6.5.6.1.2.4.1-1.

Table 6.5.6.1.2.4.1-1: Supported test configurations for NR SA FR1 DCI-based DL active BWP switch in non-DRX

Config	Description
6.5.6.1.2-1	NR 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode
6.5.6.1.2-2	NR 15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode
6.5.6.1.2-3	NR 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode
Note 1: The UE is only required to be tested in one of the supported test configurations Note 2: A UE which fulfils the requirements in test case A.6.5.6.1.1 can skip the test cases in A.6.5.6.1.2	

Configure the test equipment and the DUT according to the parameters in Table 6.5.6.1.2.4.1-2.

Table 6.5.6.1.2.4.1-2: Initial conditions for NR SA FR1 DCI-based DL active BWP switch in non-DRX

Parameter	Value		Comment
Test environment	NC		As specified in TS 38.508-1 [14] clause 4.1.
Test frequencies	As specified in Annex E, Table E.4-1 and TS 38.508-1 [14] clause 4.3.1.		
Channel bandwidth	As specified by the test configuration selected from Table 6.5.6.1.2.4.1-1.		
Propagation conditions	AWGN		As specified in Annex C.2.2
Connection Diagram	TE Part	A.3.1.8.2	As specified in TS 38.508-1 [14] Annex A.
	DUT Part	A.3.2.3.4	
Exceptions to connection diagram	- Without LTE link - For 4Rx capable UEs without any 2Rx RF bands use A.3.2.5.2 for DUT part and A.3.1.8.4 for TE part.		

1. The general test parameter settings are set up according to Table 6.5.6.1.2.4.1-3.

2. Message contents are defined in clause 6.5.6.1.2.4.3.

3. The test scenario comprises of one NR PCell (Cell 1). Cell 1 is configured according to Annex C.1.2 and C.1.3.

Table 6.5.6.1.2.4.1-3: General test parameters for DL BWP switch in SA

Parameter	Unit	Value	Comment
NR RF Channel Number		1	One NR radio channel is used for this test
Active Cell		Cell 1	Cell1 on RF channel number 1.
CP length		Normal	
DRX		OFF	
bwp-InactivityTimer	ms	200	
T1	s	0.2	
T2	s	0.2	
T3	s	0.2	

6.5.6.1.2.4.2 Test procedure

The test consists of 3 successive time periods, with durations of T1, T2, and T3, respectively.

PDCCHs indicating new transmissions shall be sent continuously on Cell 1 to ensure that the UE would have ACK/NACK sending except for the time duration when BWP is switching on Cell 1 and the time duration of T2.

Before the test starts,

- UE is connected to Cell 1 on radio channel 1.

- UE is configured with 2 different UE-specific downlink bandwidth parts, BWP-1 and BWP-2 before starting the test. BWP-1 and BWP-2 always include bandwidth of the initial DL BWP and SSB.
- UE is indicated in *firstActiveDownlinkBWP-Id* that the active DL BWP is BWP-1.
- UE is configured with a *bwp-InactivityTimer* timer value for PCell.

The Cell 1 has constant signal levels throughout the test.

1. Ensure the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity *NR*, Connected without release *On* and Test Mode *On* according to TS 38.508-1 [14] clause 4.5.
2. Set the parameters according to Tables 6.5.6.1.2.4.1-3 and 6.5.6.1.2.5-1. Propagation conditions are set according to Annex C clauses C.2.2.
3. The SS shall transmit an *RRCReconfiguration* message releasing the dedicated configuration of the *initialDownlinkBWP* and the *initialUplinkBWP*. This message also configures 2 different UE-specific bandwidth parts, BWP-1 and BWP-2 and indicates BWP-1 as the active DL BWP using *firstActiveDownlinkBWP-Id*, according to Table 6.5.6.1.2.4.3-2.
4. The SS shall send a DCI format 1_1 command for Cell 1 DL BWP switch.
5. The UE shall receive the DCI format 1_1 command in slot # denoted i, then T1 starts and the UE switch its bandwidth part from BWP-1 to BWP-2:

   If the UE starts to report valid ACK/NACK for Cell 1 from the first UL slot that occurs after the beginning of DL slot (i+$T_{BWPswitchDelay}$+k_1). The number of successful subtests is increased by one. Otherwise, count a fail for the test, switch off/on the UE and go to step 1.
6. If the UE sends valid ACK/NACK for the Cell 1 on BWP-2, T2 starts. During T2, the SS shall not transmit DCI format for PDSCH reception on Cell 1.
7. T3 starts from the first slot #j of the DL subframe immediately after the slot wherein *bwp-InactivityTimer* timer expires and the SS restarts to send DCI format for PDSCH reception on PCell. Then, the UE shall switch its bandwidth part from BWP-2 back to the default bandwidth part, BWP-1:

   If the UE starts to report valid ACK/NACK for PCell from the first UL slot that occurs after the beginning of DL slot (j+$T_{BWPswitchDelay}$+k_1). The number of successful subtests is increased by one and go to step 8 after T3 expires. Otherwise, count a fail for the test, switch off/on the UE and go to step 1.

   8. Repeat steps 4-7 until the confidence level according to Tables G.2.3-1 in Annex G clause G.2 is achieved.

The SS verifies the DL BWP switch time by counting the slots from the time when the BWP switch command is received or *bwp-InactivityTimer* timer expires till an ACK/NACK is received.

If all subtests pass, the test passes. If one subtest fails, the test fails.

6.5.6.1.2.4.3 Message contents

Message contents are according to TS 38.508-1 [14] clause 7.3 with the following exceptions:

Table 6.5.6.1.2.4.3-1: Common Exception messages for NR SA FR1 DCI-based DL active BWP switch in non-DRX

Default Message Contents	
Common contents of system information blocks exceptions	

Table 6.5.6.1.2.4.3-1A: *Void*

Table 6.5.6.1.2.4.3-1B: *Void*

Table 6.5.6.1.2.4.3-1C: *RRCReconfiguration* (Step 3)

Derivation Path: TS 38.508-1 [14], Table 4.8.1-1B			
Information Element	**Value/remark**	**Comment**	**Condition**
RRCReconfiguration ::= SEQUENCE {			
criticalExtensions CHOICE {			
rrcReconfiguration SEQUENCE {			
nonCriticalExtension SEQUENCE {			
masterCellGroup	CellGroupConfig	Table 6.5.6.1.2.4.3-1D	
}			
}			
}			
}			

Table 6.5.6.1.2.4.3-1D: *CellGroupConfig* (Table 6.5.6.1.2.4.3-1C)

Derivation Path: TS 38.508-1 [14], Table 4.8.1-2			
Information Element	**Value/remark**	**Comment**	**Condition**
CellGroupConfig ::= SEQUENCE {			
spCellConfig SEQUENCE {			
spCellConfigDedicated	ServingCellConfig	Table 6.5.6.1.2.4.3-2	
}			
}			

Table 6.5.6.1.2.4.3-2: *ServingCellConfig* (Table 6.5.6.1.2.4.3-1D)

Derivation Path: TS 38.508-1 [14], Table 4.6.3-167			
Information Element	**Value/remark**	**Comment**	**Condition**
ServingCellConfig ::= SEQUENCE {			
initialDownlinkBWP SEQUENCE {			
pdcch-Config CHOICE {			
release	NULL		
}			
pdsch-Config CHOICE {			
release	NULL		
}			
radioLinkMonitoringConfig CHOICE {			
release	NULL		
}			
downlinkBWP-ToAddModList SEQUENCE (SIZE (1..maxNrofBWPs)) OF SEQUENCE {	2 entries		
BWP-Downlink[1]	BWP-Downlink with condition BWP1	entry 1 Table 6.5.6.1.2.4.3-3	
BWP-Downlink[2]	BWP-Downlink with condition BWP2	entry 2 Table 6.5.6.1.2.4.3-3	
}			
firstActiveDownlinkBWP-Id	1	According to BWP-1	
bwp-InactivityTimer	ms200		
defaultDownlinkBWP-Id	1	According to BWP-1	
uplinkConfig SEQUENCE {			
initialUplinkBWP SEQUENCE {			
pucch-Config CHOICE {			
release	NULL		
}			
pusch-Config CHOICE {			
release	NULL		
}			

srs-Config CHOICE {			
release	NULL		
uplinkBWP-ToAddModList SEQUENCE (SIZE (1..maxNrofBWPs)) OF SEQUENCE {			
BWP-Uplink[1]	BWP-Uplink with condition BWP1	entry 1 Table 6.5.6.1.2.4.3-4	
BWP-Uplink[2]	BWP-Uplink with condition BWP2	entry 2 Table 6.5.6.1.2.4.3-4	
firstActiveUplinkBWP-Id	1	According to BWP-1	
}			
}			
}			

Table 6.5.6.1.2.4.3-3: *BWP-Downlink* (Table 6.5.6.1.2.4.3-2)

Derivation Path: TS 38.508-1 [14], Table 4.6.3-9			
Information Element	**Value/remark**	**Comment**	**Condition**
BWP-Downlink ::= SEQUENCE {			
bwp-Id	1	BWP-1	BWP1
	2	BWP-2	BWP2
bwp-Common SEQUENCE {			
genericParameters	RIV defined in TS 38.214 [9] that corresponds to DLBWP.1.1		BWP1
	RIV defined in TS 38.214 [9] that corresponds to DLBWP.1.3		BWP2
}			
}			

Table 6.5.6.1.2.4.3-4: *BWP-Uplink* (Table 6.5.6.1.2.4.3-2)

Derivation Path: TS 38.508-1 [14], Table 4.6.3-13			
Information Element	**Value/remark**	**Comment**	**Condition**
BWP-Uplink ::= SEQUENCE {			
bwp-Id	1	BWP-1	BWP1
	2	BWP-2	BWP2
bwp-Common SEQUENCE {			
genericParameters	RIV defined in TS 38.214 [9] that corresponds to ULBWP.1.1	BWP-1	BWP1
	RIV defined in TS 38.214 [9] that corresponds to ULBWP.1.3	BWP-2	BWP2
}			
}			

Table 6.5.6.1.2.4.3-5: *Void*

Table 6.5.6.1.2.4.3-6: *PDSCH-TimeDomainResourceAllocationList*

Derivation Path: TS 38.508-1 [14], Table 4.6.3-103			
Information Element	**Value/remark**	**Comment**	**Condition**
PDSCH-TimeDomainResourceAllocationList ::= SEQUENCE(SIZE(1..maxNrofDL-Allocations)) OF PDSCH-TimeDomainResourceAllocation {	4 entries		
PDSCH-TimeDomainResourceAllocation[1] SEQUENCE {		entry 1	

k0	Not present		
mappingType	typeA		
startSymbolAndLength	53	Start symbol(S)=2, Length(L)=12	
}			
PDSCH-TimeDomainResourceAllocation[2] SEQUENCE {		entry 2	
k0	Not present		
mappingType	typeA		
startSymbolAndLength	72	S=2, L=6	
}			
PDSCH-TimeDomainResourceAllocation[3] SEQUENCE {		entry 3	
k0	$T_{BWPswitchDelay}$	Defined in Table 6.5.6.1.0.1-1	The DCI indicating BWP switch
mappingType	typeA		
startSymbolAndLength	53	Start symbol(S)=2, Length(L)=12	
}			
PDSCH-TimeDomainResourceAllocation[4] SEQUENCE {		entry 4	
k0	1		First DCI right after DCI-based BWP switch
mappingType	typeA		
startSymbolAndLength	53	Start symbol(S)=2, Length(L)=12	
}			
}			

Table 6.5.6.1.2.4.3-7: *PDSCH-Config*

Derivation Path: TS 38.508-1 [14], Table 4.6.3-100			
Information Element	**Value/remark**	**Comment**	**Condition**
PDSCH-Config ::= SEQUENCE {			
pdsch-TimeDomainAllocationList	PDSCH-TimeDomainResourceAllocationList		
}			

6.5.6.1.2.5 Test requirements

Tables 6.5.6.1.2.4.1-3 and 6.5.6.1.2.5-1 define the primary level settings including test tolerances.

Table 6.5.6.1.2.5-1: NR Cell specific test parameters for DL BWP switch in SA

Parameter		Unit	Cell 1
Frequency Range			FR1
Duplex mode	Config 1		FDD
	Config 2,3		TDD
TDD configuration	Config 1		Not Applicable
	Config 2		TDDConf.1.1
	Config 3		TDDConf.2.1
$BW_{channel}$	Config 1		10 MHz: $N_{RB,c}$ = 52
	Config 2		10 MHz: $N_{RB,c}$ = 52
	Config 3		40 MHz: $N_{RB,c}$ = 106
Active BWP ID			1, 2
Initial DL BWP Configuration	Config 1,2,3		DLBWP.0.2 Note 4

Active DL BWP-1 Configuration	Config 1,2,3		DLBWP.1.1 Note 4
Active DL BWP-2 Configuration	Config 1,2,3		DLBWP.1.3 Note 4
Initial UL BWP Configuration	Config 1,2,3		ULBWP.0.2 Note 4
Active UL BWP-1 Configuration	Config 1,2,3		ULBWP.1.1 Note 4
Active UL BWP-2 Configuration	Config 1		N/A
	Config 2,3		ULBWP.1.3 Note 4
PDSCH Reference measurement channel	Config 1		SR.1.1 FDD
	Config 2		SR.1.1 TDD
	Config 3		SR.2.1 TDD
RMSI CORESET parameters	Config 1		CR.1.1 FDD
	Config 2		CR.1.1 TDD
	Config 3		CR.2.1 TDD
Dedicated CORESET parameters	Config 1		CCR.1.2 FDD
	Config 2		CCR.1.2 TDD
	Config 3		CCR.2.4 TDD
OCNG Patterns			OP.1
SSB Configuration	Config 1,2		SSB.1 FR1
	Config 3		SSB.2 FR1
SMTC Configuration			SMTC.1
Correlation Matrix and Antenna Configuration			1x2 Low
TRS Configuration	Config 1,4		TRS.1.1 FDD
	Config 2,5		TRS.1.1 TDD
	Config 3,6		TRS.1.2 TDD
EPRE ratio of PSS to SSS		dB	0
EPRE ratio of PBCH DMRS to SSS			
EPRE ratio of PBCH to PBCH DMRS			
EPRE ratio of PDCCH DMRS to SSS			
EPRE ratio of PDCCH to PDCCH DMRS			
EPRE ratio of PDSCH DMRS to SSS			
EPRE ratio of PDSCH to PDSCH			
EPRE ratio of OCNG DMRS to SSS(Note 1)			
EPRE ratio of OCNG to OCNG DMRS (Note 1)			
N_{oc} Note 2	Config 1,2	dBm/SCS	-104
	Config 3		-101
N_{oc} Note 2		dBm/15kHz	-104
SS-RSRP Note 3	Config 1,2	dBm/SCS	-87
	Config 3		-84
$\hat{E}_s/I_{ot}$		dB	17
$\hat{E}_s/N_{oc}$		dB	17
Io Note3	Config 1,2	dBm/ 9.36MHz	-58.96
	Config 3	dBm/ 38.16MHz	-52.86
Propagation Condition			AWGN

Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.
Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for Noc to be fulfilled.
Note 3: SS-RSRP and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.
Note 4: For unpaired spectrum, a DL BWP is linked with an UL BWP. DLBWP.0.2 is linked with ULBWP.0.2; DLBWP.1.1 is linked with ULBWP.1.1; DLBWP.1.3 is linked with ULBWP.1.3 defined in clause 12 of TS 38.213 [8].

During T1, the UE shall start to send the ACK/NACK for PCell from the first UL slot that occurs after the beginning of DL slot (i+$T_{BWPswitchDelay}$+k_1).

During T3, the UE shall start to send the ACK/NACK for PCell from the first UL slot that occurs right after the beginning of DL slot (j+$T_{BWPswitchDelay}$+k_1).

Where, k_1 is the timing between DL data receiving and acknowledgement as specified in 38.214[9].

Depending on UE capability *bwp-SwitchingDelay* [13], UE shall finish BWP switch within the time duration $T_{BWPswitchDelay}$ defined in TS 38.133 [6] Table 8.6.2-1.

All of the above test requirements shall be fulfilled in order for the observed PCell active BWP switch delay to be counted as correct.

The rate of correct events observed during repeated tests shall be at least 90%.

NOTE: During T1, T3 if there are no uplink resources for reporting the ACK/NACK in the first UL slot that occurs after beginning of DL slot (i+ $T_{BWPswitchDelay}$+k_1), (j+ $T_{BWPswitchDelay}$+k_1), then the UE shall use the next available uplink resource for reporting the corresponding ACK/NACK.

6.5.6.2 RRC-based active BWP switch

6.5.6.2.0 Minimum conformance requirements

6.5.6.2.0.1 Minimum conformance requirements for RRC-based active BWP switch

For RRC-based BWP switch, after the UE receives RRC reconfiguration involving active BWP switching or parameter change of its active BWP, UE shall be able to receive PDSCH/PDCCH (for DL active BWP switch) or transmit PUSCH (for UL active BWP switch) on the new BWP on the serving cell on which BWP switch occurs on the first DL or UL slot right after a time duration of $\frac{T_{RRCprocessing\,Delay}+T_{BWPswitchDelayRRC}}{NR\ Slot\ length}$ slots which begins from the beginning of DL slot n, where

DL slot n is the last slot containing the RRC command, and

$T_{RRCprocessing\,Delay}$ is the length of the RRC procedure delay in ms as defined in clause 12 in TS 38.331 [13], and

$T_{BWPswitchDelayRRC} = 6ms$ is the time used by the UE to perform BWP switch.

The UE is not required to transmit UL signals or receive DL signals during the time defined by $T_{RRCprocessingDelay} + T_{BWPswitchDelayRRC}$ on the cell where RRC-based BWP switch occurs.

The normative reference for this requirement is TS 38.133 [6] clauses 8.6.3.

6.5.6.2.1 NR SA FR1 RRC-based DL active BWP switch in non-DRX

6.5.6.2.1.1 Test purpose

The purpose of this test is to verify the DL BWP switch delay requirement for RRC-based BWP switch defined in TS 38.133 [6] clause 8.6.

6.5.6.2.1.2 Test applicability

This test applies to all types of NR UE release 15 onwards supporting BWP adaptation of at least 2 BWPs.

6.5.6.2.1.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 6.5.6.2.0.1.

The normative reference for this requirement is TS 38.133 [6] clause A.6.5.6.2.1.

6.5.6.2.1.4 Test description

6.5.6.2.1.4.1 Initial conditions

This test shall be tested using any of the test configurations in Table 6.5.6.2.1.4.1-1.

Table 6.5.6.2.1.4.1-1: Supported test configurations for NR SA FR1 RRC-based DL active BWP switch in non-DRX

Config	Description
6.5.6.2.1-1	NR 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode
6.5.6.2.1-2	NR 15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode
6.5.6.2.1-3	NR 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode
Note 1: The UE is only required to be tested in one of the supported test configurations	

Configure the test equipment and the DUT according to the parameters in Table 6.5.6.2.1.4.1-2.

Table 6.5.6.2.1.4.1-2: Initial conditions for NR SA FR1 RRC-based DL active BWP switch in non-DRX

Parameter	Value		Comment
Test environment	NC		As specified in TS 38.508-1 [14] clause 4.1.
Test frequencies	As specified in Annex E, Table E.4-1 and TS 38.508-1 [14] clause 4.3.1.		
Channel bandwidth	As specified by the test configuration selected from Table 6.5.6.2.1.4.1-1.		
Propagation conditions	AWGN		As specified in Annex C.2.2
Connection Diagram	TE Part	A.3.1.8.2	As specified in TS 38.508-1 [14] Annex A.
	DUT Part	A.3.2.3.4	
Exceptions to connection diagram	- Without LTE link - For 4Rx capable UEs without any 2Rx RF bands use A.3.2.5.2 for DUT part and A.3.1.8.4 for TE part.		

1. The general test parameter settings are set up according to Table 6.5.6.2.1.4.1-3.

2. Message contents are defined in clause 6.5.6.2.1.4.3.

3. The test scenario comprises of one NR Cell (Cell 1). Cell 1 is configured according to Annex C.1.2 and C.1.3.

Table 6.5.6.2.1.4.1-3: General test parameters for DL BWP switch in SA

Parameter	Unit	Value	Comment
NR RF Channel Number		1	One NR radio channel is used for this test
Active Cell		Cell 1	PCell on RF channel number 1.
CP length		Normal	
DRX		OFF	
T1	s	0.2	

6.5.6.2.1.4.2 Test procedure

The test consists of 1 time period, with duration of T1.

PDCCHs indicating new transmissions shall be sent continuously on Cell 1 to ensure that the UE will have ACK/NACK sending.

Before the test starts,

- UE is connected to Cell 1 on radio channel 1.
- UE has bandwidth part BWP-1 in its RRC-configuration for Cell 1.
- UE is indicated in firstActiveDownlinkBWP-Id that the active DL BWP is BWP-1 of initial condition in Cell 1.

Cell 1 has constant signal level throughout the test.

1. Ensure the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity *NR*, Connected without release *On* and Test Mode *On* according to TS 38.508-1 [14] clause 4.5.

2. Set the parameters according to Tables 6.5.6.2.1.4.1-3 and 6.5.6.2.1.5-1. Propagation conditions are set according to Annex C clauses C.2.2.

3. The SS shall send an *RRCReconfiguration* message releasing the dedicated configuration of the *initialDownlinkBWP* and the *initialUplinkBWP*. This message also configures another UE-specific bandwidth part, BWP-1 and indicates BWP-1 as the active DL BWP using *firstActiveDownlinkBWP-Id*, according to the initial condition of Active BWP-1 in Table 6.5.6.2.1.5-1.

4. The UE shall transmit an *RRCReconfigurationComplete* message.

5. The SS shall send an *RRCReconfiguration* message with updated bandwidth part configuration for DL BWP switch, change the BWP according to the final condition of Active BWP-1 in Table 6.5.6.2.1.5-1. T1 starts.

6. The UE shall receive the *RRCReconfiguration* in PCell's slot # denoted i and reconfigure its bandwidth part with the updated bandwidth part configuration.

7 If the UE starts to report valid ACK/NACK for PCell from the first UL slot that occurs after the beginning of DL slot i + X + k1 then the number of successful tests is increased by one. Otherwise, the number of failure tests is increased by one. Where:

   - X = 16 for test configuration 6.5.6.2.1-1 and 6.5.6.2.1-2

   - X = 32 for test configuration 6.5.6.2.1-3.

8. After the SS receives the ACK/NACK in step 7) or when T1 expires, the SS shall transmit *RRCRelease* message to release the RRC connection.

9. After the RRC connection release, the SS:

   -transmits in NR Cell 1 a Paging message for the UE and ensures the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity *NR*, Connected without release *On* according to TS 38.508-1 [14] clause 4.5 (if the paging fails, switches off and on the UE and ensures the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity *NR*, Connected without release *On* according to TS 38.508-1 [14] clause 4.5),
   or
   - switches off and on the UE and ensures the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity *NR*, Connected without release *On* according to TS 38.508-1 [14] clause 4.5.

10. Repeat steps 2-9 until the confidence level according to Tables G.2.3-1 in Annex G clause G.2 is achieved.

The SS verifies the DL BWP switch time in PCell by counting the slots from the time when the RRC Reconfiguration message including updated BWP configuration is sent till a valid ACK/NACK is received.

6.5.6.2.1.4.3 Message contents

Message contents are according to TS 38.508-1 [14] clause 7.3 with the following exceptions:

Table 6.5.6.2.1.4.3-1: Common Exception messages for NR SA FR1 RRC-based DL active BWP switch in non-DRX

Default Message Contents	
Common contents of system information blocks exceptions	

Table 6.5.6.2.1.4.3-1A: *Void*

Table 6.5.6.2.1.4.3-1B: *Void*

Table 6.5.6.2.1.4.3-1C: *RRCReconfiguration* (1, Step 3, Step 5)

Derivation Path: TS 38.508-1 [14], Table 4.6.1-13 with condition NR			
Information Element	**Value/remark**	**Comment**	**Condition**
RRCReconfiguration ::= SEQUENCE {			
criticalExtensions CHOICE {			
rrcReconfiguration SEQUENCE {			
radioBearerConfig	Not present		

nonCriticalExtension SEQUENCE {			
masterCellGroup	CellGroupConfig	Table 6.5.6.2.1.4.3-1D	
dedicatedNAS-MessageList	Not present		
}			
}			
}			
}			

Table 6.5.6.2.1.4.3-1D: *CellGroupConfig* (Table 6.5.6.2.1.4.3-1C)

Derivation Path: TS 38.508-1 [14], Table 4.6.3-19			
Information Element	**Value/remark**	**Comment**	**Condition**
CellGroupConfig ::= SEQUENCE {			
spCellConfig SEQUENCE {			
spCellConfigDedicated	ServingCellConfig	Table 6.5.6.2.1.4.3-1E	
}			
}			

Table 6.5.6.2.1.4.3-1E: *ServingCellConfig* (Table 6.5.6.2.1.4.3-1D)

Derivation Path: TS 38.508-1 [14], Table 4.6.3-167			
Information Element	**Value/remark**	**Comment**	**Condition**
ServingCellConfig ::= SEQUENCE {			
initialDownlinkBWP SEQUENCE {			
pdcch-Config CHOICE {			
release	NULL		
}			
pdsch-Config CHOICE {			
release	NULL		
}			
radioLinkMonitoringConfig CHOICE {			
release	NULL		
}			
downlinkBWP-ToAddModList SEQUENCE (SIZE (1..maxNrofBWPs)) OF BWP-Downlink {	1 entry		
BWP-Downlink[1] SEQUENCE {	BWP-Downlink	entry 1 Table 6.5.6.2.1.4.3-1F	
}			
firstActiveDownlinkBWP-Id	1	BWP-1	
defaultDownlinkBWP-Id	1	BWP-1	
uplinkConfig SEQUENCE {			
initialUplinkBWP SEQUENCE {			
pucch-Config CHOICE {			
release	NULL		
}			
pusch-Config CHOICE {			
release	NULL		
}			
srs-Config CHOICE {			
release	NULL		
}			
uplinkBWP-ToAddModList SEQUENCE (SIZE (1..maxNrofBWPs)) OF BWP-Uplink {	1 entry		
BWP-Uplink[1]	BWP-Uplink	entry 1 Table 6.5.6.2.1.4.3-1G	
}			
firstActiveUplinkBWP-Id	1	BWP-1	
}			

}			

Table 6.5.6.2.1.4.3-1F: *BWP-Downlink* (Table 6.5.6.2.1.4.3-1E)

Derivation Path: TS 38.508-1 [14], Table 4.6.3-9			
Information Element	**Value/remark**	**Comment**	**Condition**
BWP-Downlink ::= SEQUENCE {			
bwp-Id	1		
bwp-Common SEQUENCE {			
genericParameters	RIV defined in TS 38.214 [9] that corresponds to DLBWP.1.3		Step 3
	RIV defined in TS 38.214 [9] that corresponds to DLBWP.1.1		Step 5
}			
}			

Table 6.5.6.2.1.4.3-1G: *BWP-Uplink* (Table 6.5.6.2.1.4.3-1E)

Derivation Path: TS 38.508-1 [14], Table 4.6.3-13			
Information Element	**Value/remark**	**Comment**	**Condition**
BWP-Uplink ::= SEQUENCE {			
bwp-Id	1		
bwp-Common SEQUENCE {			
genericParameters	RIV defined in TS 38.214 [9] that corresponds to ULBWP.1.3		Step 3
	RIV defined in TS 38.214 [9] that corresponds to ULBWP.1.1		Step 5
}			
}			

Table 6.5.6.2.1.4.3-2: *Void*

6.5.6.2.1.5 Test requirements

Tables 6.5.6.2.1.4.1-3 and 6.5.6.2.1.5-1 define the primary level settings including test tolerances.

Table 6.5.6.2.1.5-1: NR Cell specific test parameters for DL BWP switch

Parameter			Unit	Cell 1
Frequency Range				FR1
Duplex mode		Config 1		FDD
		Config 2,3		TDD
TDD configuration		Config 1		Not Applicable
		Config 2		TDDConf.1.1
		Config 3		TDDConf.2.1
$BW_{channel}$		Config 1		10 MHz: $N_{RB,c}$ = 52
		Config 2		10 MHz: $N_{RB,c}$ = 52
		Config 3		40 MHz: $N_{RB,c}$ = 106
Active BWP ID				1
Initial DL BWP Configuration		Config 1,2,3		DLBWP.0.2
Initial UL BWP Configuration		Config 1,2,3		ULBWP.0.2
Initial Condition	Active DL BWP-1 Configuration	Config 1,2,3		DLBWP.1.3

	Active UL BWP-1 Configuration	Config 1,2,3		ULBWP.1.3
Final Condition	Active DL BWP-1 Configuration	Config 1,2,3		DLBWP.1.1
	Active UL BWP-1 Configuration	Config 1,2,3		ULBWP.1.1
PDSCH Reference measurement channel		Config 1		SR.1.1 FDD
		Config 2		SR.1.1 TDD
		Config 3		SR.2.1 TDD
RMSI CORESET parameters		Config 1		CR.1.1 FDD
		Config 2		CR.1.1 TDD
		Config 3		CR.2.1 TDD
Dedicated CORESET parameters		Config 1		CCR.1.1 FDD
		Config 2		CCR.1.1 TDD
		Config 3		CCR.2.3 TDD
OCNG Patterns				OP.1
SSB Configuration		Config 1,2		SSB.1 FR1
		Config 3		SSB.2 FR1
SMTC Configuration				SMTC.1
TRS Configuration		Config 1		TRS.1.1 FDD
		Config 2		TRS.1.1 TDD
		Config 3		TRS.1.2 TDD
Antenna Configuration				1x2 Low
Propagation Condition				AWGN
EPRE ratio of PSS to SSS			dB	0
EPRE ratio of PBCH DMRS to SSS				
EPRE ratio of PBCH to PBCH DMRS				
EPRE ratio of PDCCH DMRS to SSS				
EPRE ratio of PDCCH to PDCCH DMRS				
EPRE ratio of PDSCH DMRS to SSS				
EPRE ratio of PDSCH to PDSCH				
EPRE ratio of OCNG DMRS to SSS(Note 1)				
EPRE ratio of OCNG to OCNG DMRS(Note 1)				
N_{oc} Note 2		Config 1,2	dBm/SCS	-104
		Config 3		-101
SS-RSRP Note 3		Config 1,2	dBm/SCS	-87
		Config 3		-84
$\hat{E}_s/I_{ot}$			dB	17
$\hat{E}_s/N_{oc}$			dB	17
Io Note3		Config 1,2	dBm/ 9.36MHz	-58.96
		Config 3	dBm/ 38.16MHz	-52.86

Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.

Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for N_{oc} to be fulfilled.

Note 3: SS-RSRP and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.

Note 4: Note 4: For unpaired spectrum, a DL BWP is linked with an UL BWP. DLBWP.0.2 is linked with ULBWP.0.2; DLBWP.1.1 is linked with ULBWP.1.1; DLBWP.1.3 is linked with ULBWP.1.3 defined in clause 12 of TS 38.213 [8].

During T1, the UE shall be ready for the reception of uplink grant for Cell from the first DL slot that occurs right after the beginning of slot $i + \frac{T_{\text{RRCprocessingDelay}} + T_{\text{BWPswitchDelayRRC}}}{\text{NR Slot length}}$ and starts to report valid ACK/NACK for PCell from the first UL slot that occurs after the beginning of DL slot $i + \frac{T_{\text{RRCprocessingDelay}} + T_{\text{BWPswitchDelayRRC}}}{\text{NR Slot length}} + k1$.

Where, *k1* is the timing between DL data receiving and acknowledgement as specified in [12].

All of the above test requirements shall be fulfilled in order for the observed Cell active BWP switch delay to be counted as correct.

The rate of correct events observed during repeated tests shall be at least 90%.

6.5.7 DL interruptions at switching between two uplink carriers

6.5.7.0 Minimum conformance requirements

The DL interruption requirements at dynamic switching between two uplink carriers specified in this clause are applicable for an uplink band pair of an inter-band UL CA configuration when the capability *uplinkTxSwitchingPeriod* is present, and is only applicable for uplink switching mechanism specified in clause 6.1.6 of TS 38.214 [9], where NR uplink carrier 1 is capable of one transmit antenna connector and NR uplink carrier 2 is capable of two transmit antenna connectors, and the two uplink carriers are in different bands with different carrier frequencies.

When dynamic switching between two uplink carriers is conducted, UE is allowed to cause DL interruption of X OFDM symbols in NR downlink carrier(s) as indicated by *uplinkTxSwitching-DL-Interruption* [13]. The DL interruption starts from the first OFDM symbol which fully or partially overlaps with the UL switching period located in either NR carrier 1 or carrier 2 as indicated in RRC signalling [13]. The DL interruption lengths of X are defined in Table 6.5.7.0-1.

No DL interruption is allowed in the NR downlink carrier(s) which is not indicated by *uplinkTxSwitching-DL-Interruption*. No DL interruption is allowed for some inter-band UL CA configurations as specified in clause 5.2A.2 of TS 38.101-1 [2].

Table 6.5.7.0-1: DL interruption length on NR carrier(s) in the unit of OFDM symbols (X) for switching between two uplink carriers

μ	NR Slot length (ms)	Uplink Tx switching period Note1		
		35us	140us	210us
0	1	2	3	4
1	0.5	3	6	7
2	0.25	4	10	14
Note 1: Uplink Tx switching period depends on UE capability *uplinkTxSwitchingPeriod*				

The normative reference for this requirement is TS 38.133 [6] clauses 8.2.2.2.10.

6.5.7.1 NR SA FR1 DL Interruptions at switching between two uplink carriers in FDD-TDD CA

6.5.7.1.1 Test purpose

The purpose of this test is to verify the DL interruption requirements during UE dynamic switching between two uplink carriers.

6.5.7.1.2 Test applicability

This test applies to all types of NR UE release 16 onwards, configured with *uplinkTxSwitchingPeriod*.

6.5.7.1.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 6.5.7.0.

The normative reference for this requirement is TS 38.133 [6] clause 8.2.2.2.10 and A.6.5.7.1

6.5.7.1.4 Test description

6.5.7.1.4.1 Initial conditions

This test shall be tested using any of the test configurations in Table 6.5.7.1.4.1-1.

Table 6.5.7.1.4.1-1: Supported test configurations

Config	Description
6.5.7.1-1	NR Cell 1: 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode NR Cell 2: 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode

Configure the test equipment and the DUT according to the parameters in Table 6.5.7.1.4.1-2.

Table 6.5.7.1.4.1-2: Initial conditions for DL interruptions at switching between two uplink carriers in FDD-TDD CA

Parameter	Value		Comment
Test environment	NC		As specified in TS 38.508-1 [14] clause 4.1.
Test frequencies	As specified in Annex E, Table E.4-1 and TS 38.508-1 [14] clause 4.3.1.		
Channel bandwidth	As specified by the test configuration selected from Table 6.5.7.1.4.1-1.		
Propagation conditions	AWGN		As specified in Annex C.2.2
Connection Diagram	TE Part	A.3.1.8.2a	As specified in TS 38.508-1 [14] Annex A.
	DUT Part	A.3.2.3.4	
Exceptions to connection diagram	- For 4Rx capable UEs without any 2Rx RF bands use A.3.2.5.2 for DUT part and A.3.1.8.4 for TE part. - Without LTE link - Without Faders		

1. The general test parameter settings are set up according to Table 6.5.7.1.4.1-3.
2. Message contents are defined in clause 6.5.7.1.4.3.
3. The test scenario comprises of two NR Cells. (Cell 1 and Cell 2). Cell 1 is configured according to Annex C.1.2 and C.1.3.

Table 6.5.7.1.4.1-3: General test parameters for DL interruptions at switching between two uplink carriers in FDD-TDD CA

Parameter	Unit	Test configuration	Value	Comment
RF Channel Number		Config 1	1, 2	Two radio channels are used for this test.
Active cell		Config 1	Cell 1: FR1 PCell Cell 2: FR1 SCell	FR1 PCell on RF channel number 1 FR1 SCell on RF channel number 2
CP length		Config 1	Normal	
DRX		Config 1	OFF	
Measurement gap pattern Id		Config 1	OFF	
Filter coefficient		Config 1	0	L3 filtering is not used
CSI-RS configuration for L1-RSRP reporting		Config 1	Cell 1: CSI-RS.1.5 FDD Cell 2: CSI-RS.2.5 TDD	
T1	s	Config 1	5	

6.5.7.1.4.2 Test procedure

The test consists of two active NR cells: Cell1(PCell) and Cell2(SCell). The test consists of one time period, with duration of T1. Prior to the start of the time duration T1, the UE shall be connected to Cell1 and Cell2 and the RRC message including *uplinkTxSwitching* is received at the UE antenna connector.

UE is configured to transmit SRS on both PCell and SCell on the last 2 symbols of special slot. DL interruption is expected to take place prior to the SRS symbols.

1. Ensure the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity *NR*, Connected without release *On* and Test Mode *On* according to TS 38.508-1 [14] clause 4.5.
2. Configure PCell (Cell1) and SCell(Cell2) according to Table 6.5.7.1.5-1. Propagation conditions are set according to Annex C clause C.2.2.
3. The SS shall transmit an RRCReconfiguration message to configure PCell (Cell1) and SCelll(Cell2) as per TS 38.508-1 [7] clause 7 with the message content exceptions defined in clause 6.5.7.1.4.3. *UplinkTxSwitching* is configured to the UE.
4. The UE shall transmit *RRCReconfigurationComplete* message.
5. Set the parameters according to T1 in Tables 6.5.7.1.5-1. T1 starts.
6. SS schedules UL transmission on PCell continuously on the DL slots of SCell.
7. SS triggers aperiodic CSI-RS for L1-RSRP reporting with power boosting 6dB on following symbol on the special slot on PCell and SCell:

   PCell (Cell1)

   - symbol#12 if UE does not report uplinkTxSwitching-DL-Interruption-r16;
   - otherwise,
     - symbol #8 if UE capability uplinkTxSwitchingPeriod is 210us or
     - symbol #9 if UE capability uplinkTxSwitchingPeriod is 140us or
     - symbol #10 if UE capability uplinkTxSwitchingPeriod is 35us.

   SCell(Cell2)

   - symbol#10 if UE does not report uplinkTxSwitching-DL-Interruption-r16;
   - otherwise,
   - symbol #4 if UE capability uplinkTxSwitchingPeriod is 210us or
   - symbol #5 if UE capability uplinkTxSwitchingPeriod is 140us or
   - symbol #8 if UE capability uplinkTxSwitchingPeriod is 35us.
8. After SS transmits the DCI trigger, the UE shall send L1-RSRP report containing valid L1-RSRP report for CSI-RS#0 and CSI-RS#1 at slot 5 from the reception of DCI trigger, if so increase the number of passed iterations by one otherwise increase the number of failed iterations by one and switch off the UE.
9. SS transmits in Cell 1 a Paging message (including PagingRecord with UE-Identity) for the UE and ensures the UE is in state RRC_CONNECTED TS 38.508-1 [14] clause 4.5. (if the paging fails, switches off and on the UE and ensures the UE is in state RRC_CONNECTED TS 38.508-1 [14] clause 4.5),

   or

   - switches off and on the UE and ensures the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity *NR*, Connected without release *On* according to TS 38.508-1 [14] clause 4.5.
10. Repeat step 3-9 until a test verdict has been achieved.

6.5.7.1.4.3 Message contents

Message contents are according to TS 38.508-1 [14] clause 7.3 with the following exceptions:

Table 6.5.7.1.4.3-1: Common Exception messages for DL interruptions at switching between two uplink carriers in FDD-TDD CA

Default Message Contents	
Common contents of system information blocks exceptions	

Table 6.5.7.1.4.3-2: *ServingCellConfig*

Derivation Path: TS 38.508-1 [14], Table 4.6.3-167			
Information Element	**Value/remark**	**Comment**	**Condition**
ServingCellConfig ::= SEQUENCE {			
uplinkConfig SEQUENCE {			
uplinkTxSwitching-r16 SEQUENCE {			
uplinkTxSwitchingPeriodLocation-r16	TRUE		
uplinkTxSwitchingCarrier-r16	carrier1	TE configures one of the two uplink carriers involved in dynamic UL TX switching as carrier1 and the other as carrier2	
	carrier2		
}			
}			
}			

Table 6.5.7.1.4.3-3: *CellGroupConfig*

Derivation Path: TS 38.508-1 [14], , Table 4.6.3-19			
Information Element	**Value/remark**	**Comment**	**Condition**
CellGroupConfig ::= SEQUENCE {			
uplinkTxSwitchingOption-r16	switchedUL		UE reports '*switchedUL*' or '*both*' for capability IE *uplinkTxSwitching-OptionSupport-r16*
	dualUL		UE reports '*dualUL'* for capability IE *uplinkTxSwitching-OptionSupport-r16*
}			

6.5.7.1.4.3-4: TDD-UL-DL-ConfigCommon

Derivation Path: TS 38.508-1 [14], Table 7.3.1-1 with condition TDDConf.2.1			
Information Element	**Value/remark**	**Comment**	**Condition**
TDD-UL-DL-ConfigCommon ::= SEQUENCE {			
pattern1 SEQUENCE {			
nrofDownlinkSymbols	11		
nrofUplinkSymbols	2		
}			
}			

6.5.7.1.4.3-5: SRS-Config

Derivation Path: TS 38.508-1 [14], Table 4.6.3-182

Information Element	Value/remark	Comment	Condition
SRS-Config ::= SEQUENCE {			
srs-ResourceSetToAddModList SEQUENCE (SIZE(0..maxNrofSRS-ResourceSets)) OF SEQUENCE {			
SRS-ResourceSet[1] SEQUENCE {		entry 1	
resourceType CHOICE {			
periodic SEQUENCE {			
}			
}			
}			
}			
srs-ResourceToAddModList SEQUENCE (SIZE(1..maxNrofSRS-Resources)) OF SEQUENCE {			
SRS-Resource[1] SEQUENCE {		entry 1	
nrofSRS-Ports	ports2		
resourceMapping SEQUENCE {			
startPosition	0		
nrofSymbols	n2		
}			
freqHopping SEQUENCE {			
c-SRS	0		
}			
groupOrSequenceHopping	neither		
resourceType CHOICE {			
periodic SEQUENCE {			
periodicityAndOffset-p CHOICE {			
sl8	3		
}			
}			
}			
}			
}			
}			

Table 6.5.7.1.4.3-6: *CSI-MeasConfig*

Derivation Path: TS 38.508-1 [14], Table 4.6.3-38			
Information Element	**Value/remark**	**Comment**	**Condition**
CSI-MeasConfig::= SEQUENCE {			
nzp-CSI-RS-ResourceToAddModList SEQUENCE (SIZE (1..maxNrofNZP-CSI-RS-Resources)) OF NZP-CSI-RS-Resource {			
NZP-CSI-RS-Resource[1] SEQUENCE {		entry 1	
nzp-CSI-RS-ResourceId	0		
resourceMapping SEQUENCE {			
frequencyDomainAllocation CHOICE {			
other	000001		
}			
nrofPorts	p1		
firstOFDMSymbolInTimeDomain	12		UE does not report uplinkTxSwitching-DL-Interruption-r16
	8		UE capability uplinkTxSwitchingPeriod is 210us
	9		UE capability

			uplinkTxSwitchingPeriod is 140us
	10		UE capability uplinkTxSwitchingPeriod is 35us
firstOFDMSymbolInTimeDomain2	Not present		
cdm-Type	noCDM		
density CHOICE {			
three			
}			
freqBand SEQUENCE {			
startingRB	0		
nrofRBs	106		
}			
}			
powerControlOffset	0		
powerControlOffsetSS	db6		UE configured with CSI-RS power boosting of 6dB
scramblingID	0		
periodicityAndOffset	Not Present		
qcl-InfoPeriodicCSI-RS	Not Present		
}			
}			
NZP-CSI-RS-Resource[2] SEQUENCE {		entry 2	
nzp-CSI-RS-ResourceId	1		
resourceMapping SEQUENCE {			
frequencyDomainAllocation CHOICE {			
other	000001		
}			
nrofPorts	p1		
firstOFDMSymbolInTimeDomain	10		UE does not report uplinkTxSwitching-DL-Interruption-r16
	4		UE capability uplinkTxSwitchingPeriod is 210us
	5		UE capability uplinkTxSwitchingPeriod is 140us
	8		UE capability uplinkTxSwitchingPeriod is 35us
firstOFDMSymbolInTimeDomain2	Not present		
cdm-Type	noCDM		
density CHOICE {			
three			
}			
freqBand SEQUENCE {			
startingRB	0		
nrofRBs	52		
}			

}			
powerControlOffset	0		
powerControlOffsetSS	db6		UE configured with CSI-RS power boosting of 6dB
scramblingID	0		
periodicityAndOffset	Not Present		
qcl-InfoPeriodicCSI-RS	Not Present		
}			
}			
nzp-CSI-RS-ResourceSetToAddModList SEQUENCE (SIZE (1..maxNrofNZP-CSI-RS-ResourceSets)) OF NZP-CSI-RS-ResourceSetId {	1 entry		
NZP-CSI-RS-ResourceSet[1]	NZP-CSI-RS-ResourceSet	entry 1 6.5.7.1.4.3-7	
}			
csi-ResourceConfigToAddModList SEQUENCE (SIZE (1..maxNrofCSI-ResourceConfigurations)) OF CSI-ResourceConfig {	1 entry		
CSI-ResourceConfig[1]		entry 1 Table 6.5.7.1.4.3-8	
}			
csi-ReportConfigToAddModList SEQUENCE (SIZE (1..maxNrofCSI-ReportConfigurations)) OF CSI-ReportConfig {	1 entry		
CSI-ReportConfig[1]	CSI-ReportConfig	entry 1 Table 6.5.7.1.4.3-9	
}			
}			

Table 6.5.7.1.4.3-7: *NZP-CSI-RS-ResourceSet*

Derivation Path: TS 38.508-1 [14], Table 4.6.3-87			
Information Element	**Value/remark**	**Comment**	**Condition**
NZP-CSI-RS-ResourceSet ::= SEQUENCE {			
nzp-CSI-ResourceSetId	0	For CSI-RS#0	
	1	For CSI-RS#1	
nzp-CSI-RS-Resources SEQUENCE (SIZE (1..maxNrofNZP-CSI-RS-ResourcesPerSet)) OF NZP-CSI-RS-ResourceId {	1 entry		
NZP-CSI-RS-ResourceId[1]	0	entry 1	
}			
repetition	off		
aperiodicTriggeringOffset	6		
trs-Info	Not present		
}			

Table 6.5.7.1.4.3-8: *CSI-ResourceConfig*

Derivation Path: TS 38.508-1 [14], Table 4.6.3-41			
Information Element	**Value/remark**	**Comment**	**Condition**
CSI-ResourceConfig ::= SEQUENCE {			
csi-ResourceConfigId	0	For CSI-RS#0	
	1	For CSI-RS#1	
csi-RS-ResourceSetList CHOICE {			
nzp-CSI-RS-SSB SEQUENCE {			
nzp-CSI-RS-ResourceSetList SEQUENCE (SIZE (1..maxNrofNZP-CSI-RS-ResourceSetsPerConfig)) OF NZP-CSI-RS-ResourceSetId {			
NZP-CSI-RS-ResourceSetId [1]	0		

}			
csi-SSB-ResourceSetList	Not present		
}			
}			
bwp-Id	0		
resourceType	aperiodic		
}			

Table 6.5.7.1.4.3-9: *CSI-ReportConfig*

Derivation Path: TS 38.508-1 [14], Table 4.6.3-39			
Information Element	**Value/remark**	**Comment**	**Condition**
CSI-ReportConfig ::= SEQUENCE {			
reportConfigId	0		
carrier	ServCellIndex		
resourcesForChannelMeasurement	0		
csi-IM-ResourcesForInterference	Not present		
nzp-CSI-RS-ResourcesForInterference	Not present		
reportConfigType CHOICE {			
Aperiodic SEQUENCE {			
reportSlotOffsetList SEQUENCE (SIZE (1..maxNrofUL-Allocations)) OF INTEGER {			
INTEGER	5		
INTEGER	5		
}			
}			
}			
reportQuantity CHOICE {			
cri-RSRP	NULL		
}			
reportFreqConfiguration	Not present		
timeRestrictionForChannelMeasurements	Not present		
timeRestrictionForInterferenceMeasurements	Not present		
codebookConfig	Not present		
dummy	Not present		
groupBasedBeamReporting	Not present		
cqi-Table	Not present		
subbandSize	Not present		
non-PMI-PortIndication	Not present		
semiPersistentOnPUSCH-v1530	Not present		
semiPersistentOnPUSCH-v1610	Not present		
aperiodic-v1610 SEQUENCE {			
reportSlotOffsetListDCI-0-2-r16	Not present		
reportSlotOffsetListDCI-0-1-r16 SEQUENCE (SIZE (1..maxNrofUL-Allocations-r16)) OF INTEGER {			
INTEGER	5		
INTEGER	5		
}			
}			
reportQuantity-r16	Not present		
codebookConfig-r16	Not present		
}			

6.5.7.1.5 Test requirements

Table 6.5.7.1.5-1 defines the primary level settings including test tolerances for DL interruptions at switching between two uplink carriers in FDD-TDD CA.

Table 6.5.7.1.5-1: Cell specific test parameters for DL interruptions at switching between two uplink carriers in FDD-TDD CA

Parameter		Unit	Cell1	Cell2
Frequency Range			FR1	FR1
Duplex mode	Config 1		FDD	TDD

TDD configuration	Config 1		N/A	TDDConf.2.1 except that: S='11DL:1GP:2UL'; *nrofDownlinkSymbols:11 nrofUplinkSymbols: 2*
$BW_{channel}$	Config 1		10 MHz: $N_{RB,c}$ = 52	40 MHz: $N_{RB,c}$ = 106
Initial BWP Configuration	Config 1		DLBWP.0.1	DLBWP.0.1
DL dedicated BWP configuration	Config 1		DLBWP.1.1	DLBWP.1.1
UL dedicated BWP configuration	Config 1		ULBWP.1.1	ULBWP.1.1
SRS configuration	Config 1		SRS configuration in Table 4.4.1.1.5-2 is applied except that: resourceMappingstartPosition: 0resourceMappingnrofSymbols: n2	SRS configuration in Table 4.4.1.1.5-2 is applied except that: resourceMappingstartPosition: 0 resourceMappingnrofSymbols: n2
PDSCH Reference measurement channel	Config 1		SR.1.1 FDD	SR.2.1 TDD
RMSI CORESET parameters	Config 1		CR.1.1 FDD	CR.2.1 TDD
Dedicated CORESET parameters	Config 1		CCR.1.1 FDD	CCR.2.1 TDD
OCNG Patterns			OP.1	OP.1
SMTC Configuration			SMTC.1	SMTC.1
SSB Configuration	Config 1		SSB.1 FR1	SSB.2 FR1
Correlation Matrix and Antenna Configuration			1x2 Low	2x2 Low
EPRE ratio of PSS to SSS		dB	0	0
EPRE ratio of PBCH DMRS to SSS				
EPRE ratio of PBCH to PBCH DMRS				
EPRE ratio of PDCCH DMRS to SSS				
EPRE ratio of PDCCH to PDCCH DMRS				
EPRE ratio of PDSCH DMRS to SSS				
EPRE ratio of PDSCH to PDSCH				
EPRE ratio of OCNG DMRS to SSS(Note 1)				
EPRE ratio of OCNG to OCNG DMRS (Note 1)				
N_{oc} Note 2		dBm/15 kHz	-105.1	-105.1
SS-RSRP Note 3		dBm/ SSB SCS	-88.1	85.1
CSI-RS RSRP Note6		dBm/SCS	-82.1	79.1
$\hat{E}_s/I_{ot}$		dB	17	17
$\hat{E}_s/N_{oc}$		dB	17	17
N_{oc} Note 2	Config 1	dBm/SCS	105.1	-102.1
Io Note3 on symbols without CSI-RS	Config 1	dBm/9.36 MHz	60.06	-
		dBm/ 38.16MHz	-	-53. 96
Io Note6 on symbols with CSI-RS	Config 1	dBm/9.36 MHz	-57.68	-
		dBm/ 38.16MHz	-	-51.58
Time offset to Cell1 Note 5		µs	-	0
Propagation Condition			AWGN	AWGN

Note 1:	OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.
Note 2:	Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for N_{oc} to be fulfilled.
Note 3:	SS-RSRP and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.
Note 4:	Void
Note 5:	Receive time difference between slot boundaries of signals received from the two cells at the UE antenna connector including time alignment error between the two cells.
Note 6:	CSI-RS RSRP and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.

UE shall send L1-RSRP report while meeting the accuracy requirements defined in TS 38.133 clause 10.1.19.2.

The DL interruption lengths of X are defined in Table 6.5.7.1.5-2

Table 6.5.7.1.5-2: DL interruption length on NR carrier(s) in the unit of OFDM symbols (X) for switching between two uplink carriers

μ	NR Slot length (ms)	Uplink Tx switching period Note1		
		35us	140us	210us
0	1	2	3	4
1	0.5	3	6	7
2	0.25	4	10	14
Note 1: Uplink Tx switching period depends on UE capability *uplinkTxSwitchingPeriod*				

The UE shall send L1-RSRP report at slot 5 from the reception of DCI trigger. The L1-RSRP report shall include the results of CSI-RS#0. Each L1-RSRP measurement report shall meet the corresponding absolute accuracy requirements in Table 6.5.7.1.5-4.

Table 6.5.7.1.5-3: L1-RSRP absolute accuracy requirements for the reported valuesof CSI-RS#0

Normal Conditions	T1
Lowest reported value (CSI-RS#0)	64
Highest reported value (CSI-RS#0)	84

Table 6.5.7.1.5-4: L1-RSRP absolute accuracy requirements for the reported values of CSI-RS#1

Normal Conditions	T1
Lowest reported value (CSI-RS#0)	67
Highest reported value (CSI-RS#0)	87

The rate of correct events observed during repeated tests shall be at least 90% with a confidence level of 95%.

6.5.7.2 NR SA FR1 DL Interruptions at switching between two uplink carriers in TDD-TDD CA

6.5.7.2.1 Test purpose

The purpose of this test is to verify the DL interruption requirements during UE dynamic switching between two uplink carriers.

6.5.7.2.2 Test applicability

This test applies to all types of NR UE release 16 onwards, configured with *uplinkTxSwitchingPeriod*.

6.5.7.2.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 6.5.7.0.

The normative reference for this requirement is TS 38.133 [6] clause 8.2.2.2.10 and A.6.5.7.2

6.5.7.2.4 Test description

6.5.7.2.4.1 Initial conditions

This test shall be tested using any of the test configurations in Table 6.5.7.2.4.1-1.

Table 6.5.7.2.4.1-1: Supported test configurations

Config	Description
6.5.7.2-1	NR Cell 1: 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode NR Cell 2: 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode

Configure the test equipment and the DUT according to the parameters in Table 6.5.7.2.4.1-2.

Table 6.5.7.2.4.1-2: Initial conditions for DL interruptions at switching between two uplink carriers in TDD-TDD CA

Parameter	Value		Comment
Test environment	NC		As specified in TS 38.508-1 [14] clause 4.1.
Test frequencies	As specified in Annex E, Table E.4-1 and TS 38.508-1 [14] clause 4.3.1.		
Channel bandwidth	As specified by the test configuration selected from Table 6.5.7.2.4.1-1.		
Propagation conditions	AWGN		As specified in Annex C.2.2
Connection Diagram	TE Part	A.3.1.8.2a	As specified in TS 38.508-1 [14] Annex A.
	DUT Part	A.3.2.3.4	
Exceptions to connection diagram	- For 4Rx capable UEs without any 2Rx RF bands use A.3.2.5.2 for DUT part and A.3.1.8.4 for TE part. - Without LTE link - Without Faders		

1. The general test parameter settings are set up according to Table 6.5.7.2.4.1-3.

2. Message contents are defined in clause 6.5.7.2.4.3.

3. The test scenario comprises of one NR Cell (Cell 1). Cell 1 is configured according to Annex C.1.2 and C.1.3.

Table 6.5.7.2.4.1-3: General test parameters for DL interruptions at switching between two uplink carriers in TDD-TDD CA

Parameter	Unit	Test configuration	Value	Comment
RF Channel Number		Config 1	1, 2	Two radio channels are used for this test.
Active cell		Config 1	Cell 1: FR1 PCell Cell 2: FR1 SCell	FR1 PCell on RF channel number 1 FR1 SCell on RF channel number 2
CP length		Config 1	Normal	
DRX		Config 1	OFF	
Measurement gap pattern Id		Config 1	OFF	
Filter coefficient		Config 1	0	L3 filtering is not used
CSI-RS configuration for L1-RSRP reporting		Config 1	Cell 1: CSI-RS.2.5 TDD Cell 2: CSI-RS.2.5 TDD	
T1	s	Config 1	5	

6.5.7.2.4.2 Test procedure

Same as in 6.5.7.1.4.2 with the following exception in step 7.

7. SS triggers aperiodic CSI-RS for L1-RSRP reporting with power boosting 6dB on following symbol on the special slot on PCell and SCell:

- symbol#10 if UE does not report uplinkTxSwitching-DL-Interruption-r16;
- otherwise,
  - symbol #4 if UE capability uplinkTxSwitchingPeriod is 210us or
  - symbol #5 if UE capability uplinkTxSwitchingPeriod is 140us or
  - symbol #8 if UE capability uplinkTxSwitchingPeriod is 35us.

6.5.7.2.4.3 Message contents

Same as in 6.5.7.1.4.2 with the following exception:

Table 6.5.7.2.4.3-6: *CSI-MeasConfig*

Derivation Path: TS 38.508-1 [14], Table 4.6.3-38			
Information Element	**Value/remark**	**Comment**	**Condition**
CSI-MeasConfig::= SEQUENCE {			
nzp-CSI-RS-ResourceToAddModList SEQUENCE (SIZE (1..maxNrofNZP-CSI-RS-Resources)) OF NZP-CSI-RS-Resource {			
NZP-CSI-RS-Resource[1] SEQUENCE {		entry 1	
nzp-CSI-RS-ResourceId	0		
resourceMapping SEQUENCE {			
frequencyDomainAllocation CHOICE {			
other	000001		
}			
nrofPorts	p1		
firstOFDMSymbolInTimeDomain	10		UE does not report uplinkTxSwitching-DL-Interruption-r16
	4		UE capability uplinkTxSwitchingPeriod is 210us
	5		UE capability uplinkTxSwitchingPeriod is 140us
	8		UE capability uplinkTxSwitchingPeriod is 35us
firstOFDMSymbolInTimeDomain2	Not present		
cdm-Type	noCDM		
density CHOICE {			
three			
}			
freqBand SEQUENCE {			
startingRB	0		
nrofRBs	106		
}			
}			
powerControlOffset	0		
powerControlOffsetSS	db6		
scramblingID	0		
periodicityAndOffset	Not Present		

qcl-InfoPeriodicCSI-RS	Not Present		
}			
}			
NZP-CSI-RS-Resource[2] SEQUENCE {		entry 2	
nzp-CSI-RS-ResourceId	1		
resourceMapping SEQUENCE {			
frequencyDomainAllocation CHOICE {			
other	000001		
}			
nrofPorts	p1		
firstOFDMSymbolInTimeDomain	10		UE does not report uplinkTxSwitching-DL-Interruption-r16
	4		UE capability uplinkTxSwitchingPeriod is 210us
	5		UE capability uplinkTxSwitchingPeriod is 140us
	8		UE capability uplinkTxSwitchingPeriod is 35us
firstOFDMSymbolInTimeDomain2	Not present		
cdm-Type	noCDM		
density CHOICE {			
three			
}			
freqBand SEQUENCE {			
startingRB	0		
nrofRBs	52		
}			
}			
powerControlOffset	0		
powerControlOffsetSS	db6		
scramblingID	0		
periodicityAndOffset	Not Present		
qcl-InfoPeriodicCSI-RS	Not Present		
}			
}			
nzp-CSI-RS-ResourceSetToAddModList SEQUENCE (SIZE (1..maxNrofNZP-CSI-RS-ResourceSets)) OF NZP-CSI-RS-ResourceSetId {	1 entry		
NZP-CSI-RS-ResourceSet[1]	NZP-CSI-RS-ResourceSet	entry 1 6.5.7.1.4.3-7	
}			
csi-ResourceConfigToAddModList SEQUENCE (SIZE (1..maxNrofCSI-ResourceConfigurations)) OF CSI-ResourceConfig {	1 entry		
CSI-ResourceConfig[1]		entry 1 Table 6.5.7.1.4.3-8	
}			
csi-ReportConfigToAddModList SEQUENCE (SIZE (1..maxNrofCSI-ReportConfigurations)) OF CSI-ReportConfig {	1 entry		
CSI-ReportConfig[1]	CSI-ReportConfig	entry 1 Table 6.5.7.1.4.3-9	

}			
}			

6.5.7.2.5 Test requirements

Table 6.5.7.1.5-1 defines the primary level settings including test tolerances for DL interruptions at switching between two uplink carriers in FDD-TDD CA.

Table 6.5.7.2.5-1:Cell specific test parameters for DL interruptions at switching between two uplink carriers in TDD-TDD CA

Parameter		Unit	Cell1	Cell2
Frequency Range			FR1	FR1
Duplex mode	Config 1		TDD	TDD
TDD configuration	Config 1		TDDConf.2.1 except that S='11DL:1GP:2UL'; *nrofDownlinkSymbols:11 nrofUplinkSymbols: 2*	TDDConf.2.2
$BW_{channel}$	Config 1		40 MHz: $N_{RB,c}$ = 106	40 MHz: $N_{RB,c}$ = 106
Initial BWP Configuration	Config 1		DLBWP.0.1	DLBWP.0.1
DL dedicated BWP configuration	Config 1		DLBWP.1.1	DLBWP.1.1
UL dedicated BWP configuration	Config 1		ULBWP.1.1	ULBWP.1.1
SRS configuration	Config 1		SRS configuration in Table 4.4.1.1.5-2 is applied except that: resourceMappingstartPosition: 0 resourceMappingnrofSymbols: n2	SRS configuration in Table 4.4.1.1.5-2 is applied except that: resourceMappingstartPosition: 0 resourceMappingnrofSymbols: n2
PDSCH Reference measurement channel	Config 1		SR.2.1 TDD	SR.2.1 TDD
RMSI CORESET parameters	Config 1		CR.2.1 TDD	CR.2.1 TDD
Dedicated CORESET parameters	Config 1		CCR.2.1 TDD	CCR.2.1 TDD
OCNG Patterns			OP.1	OP.1
SMTC Configuration			SMTC.1	SMTC.1
SSB Configuration	Config 1		SSB.2 FR1	SSB.2 FR1
Correlation Matrix and Antenna Configuration			1x2 Low	2x2 Low
EPRE ratio of PSS to SSS		dB	0	0
EPRE ratio of PBCH DMRS to SSS				
EPRE ratio of PBCH to PBCH DMRS				
EPRE ratio of PDCCH DMRS to SSS				
EPRE ratio of PDCCH to PDCCH DMRS				
EPRE ratio of PDSCH DMRS to SSS				
EPRE ratio of PDSCH to PDSCH				
EPRE ratio of OCNG DMRS to SSS(Note 1)				
EPRE ratio of OCNG to OCNG DMRS (Note 1)				
N_{oc} Note 2		dBm/15 kHz	-105.1	-105.1
SS-RSRP Note 3		dBm/ SSB SCS	-85.1	-85.1
CSI-RS RSRP Note6		dBm/SCS	-79.1	-79.1
$\hat{E}_s/I_{ot}$		dB	17	17
$\hat{E}_s/N_{oc}$		dB	17	17
N_{oc} Note 2	Config 1	dBm/SCS	-102.1	-102.1
Io Note3 on symbols without CSI-RS	Config 1	dBm/ 38.16MHz	-53.96	-53.96
Io Note6 on symbols with CSI-RS	Config 1	dBm/ 38.16MHz	-51.58	-51.58

Time offset to Cell1 Note 5	μs	-	0
Propagation Condition		AWGN	AWGN

Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.
Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for N_{oc} to be fulfilled.
Note 3: SS-RSRP and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.
Note 4: Void
Note 5: Receive time difference between slot boundaries of signals received from the two cells at the UE antenna connector including time alignment error between the two cells.
Note 6: CSI-RS RSRP and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.

UE shall send L1-RSRP report while meeting the accuracy requirements defined in TS 38.133 clause 10.1.19.2.

The DL interruption lengths of X are defined in Table 6.5.7.2.5-2

Table 6.5.7.2.5-2: DL interruption length on NR carrier(s) in the unit of OFDM symbols (X) for switching between two uplink carriers

μ	NR Slot length (ms)	Uplink Tx switching period Note1		
		35us	140us	210us
0	1	2	3	4
1	0.5	3	6	7
2	0.25	4	10	14

Note 1: Uplink Tx switching period depends on UE capability *uplinkTxSwitchingPeriod*

The UE shall send L1-RSRP report at slot 5 from the reception of DCI trigger. The L1-RSRP report shall include the results of CSI-RS#0 and CSI-RS#1. Each L1-RSRP measurement report shall meet the corresponding absolute accuracy requirements in Table 6.5.7.1.5-4.

Table 6.5.7.2.5-3: L1-RSRP absolute accuracy requirements for the reported values of CSI-RS#0 and CSI-RS#1

Normal Conditions	T1
Lowest reported value (CSI-RS#0)	67
Highest reported value (CSI-RS#0)	87

The rate of correct events observed during repeated tests shall be at least 90% with a confidence level of 95%.

6.5.8 UE specific CBW change

6.5.8.0 Minimum conformance requirements

6.5.8.0.1 Minimum conformance requirements for UE specific CBW change

The requirements in this clause apply for a UE receives reconfiguration of *offsetToCarrier* or *carrierBandwidth* to change channel bandwidth.

After the UE receives RRC reconfiguration involving *offsetToCarrier* or *carrierBandwidth* change on the old CBW, UE shall be able to receive PDSCH/PDCCH on the DL BWP with BWP ID firstActiveDownlinkBWP-Id or transmit PUSCH on the UL BWP with BWP ID firstActiveUplinkBWP-Id of the new CBW right after a time duration of $\frac{T_{RRCprocessingDelay}+T_{CBWchangeDelayRRC}}{NR\ Slot\ length}$ slots which begins from the beginning of DL slot n, where

- DL slot n is the last slot overlapping with the PDSCH containing the RRC command, and
- $T_{RRCprocessingDelay}$ is the length of the RRC procedure delay in millisecond as defined in TS 36.331 [29] clause 11.2 is the corresponding RRC message is embedded in E-UTRA RRC message, otherwise it is the length of the RRC procedure delay in millisecond as defined in TS 38.331 [13] clause 12, and

- $T_{CBWchangeDelayRRC} = 6\,ms$ is the time used by the UE to perform CBW change.

The UE is not required to transmit UL signals or receive DL signals during the above defined time duration $\frac{T_{RRCprocessingDelay}+T_{CBWchangeDelayRRC}}{NR\ Slot\ length}$ on the cell where UE-specific CBW change occurs. When $T_{HARQ} > T_{RRCprocessingDelay}$ a longer switching delay is allowed. Where T_{HARQ} is the time between DL data transmission and acknowledgement as specified in TS 38.213 [8].

The normative reference for this requirement is TS 38.133 [6] clause 8.13.1 and 8.13.2.

6.5.8.1 UE specific CBW change on PCell in FR1 in non-DRX

6.5.8.1.1 Test purpose

To verify the UE specific CBW change delay requirement defined in 38.133 [6] clause 8.13.

6.5.8.1.2 Test applicability

This test applies to all types of NR UEs from Release 16 onwards.

6.5.8.1.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 6.5.8.0.1.

The normative reference for this requirement is TS 38.133 [6] clause A.6.5.8.1.

6.5.8.1.4 Test description

The test scenario comprises of one Cell, PCell (Cell 1), which has constant signal levels throughout the test. The test consists of 1 time period with duration of T1.

During T1 the TE sends an *RRCReconfiguration* message containing *SCS-SpecificCarrier* to reconfigure UE-specific CBW. The test equipment verifies the UE specific CBW switching delay in PCell by estimating the time from the moment the *RRCReconfiguration* message including updated UE-specific CBW configuration is sent to the moment a valid ACK/NACK is received.

6.5.8.1.4.1 Initial conditions

This test shall be tested using any of the test configurations in Table 6.5.8.1.4.1-1.

Table 6.5.8.1.4.1-1: Supported test configurations

Configuration	Description
6.5.8.1-1	FDD duplex mode, 15 kHz SSB SCS, 10MHz bandwidth
6.5.8.1-2	TDD duplex mode, 15 kHz SSB SCS, 10MHz bandwidth
6.5.8.1-3	TDD duplex mode, 30 kHz SSB SCS, 40MHz bandwidth
Note: The UE is only required to pass in one of the supported test configurations in FR1	

Configure the test equipment and the DUT according to the parameters in Table 6.5.8.1.4.1-2.

Table 6.5.8.1.4.1-2: Initial conditions

Parameter	Value		Comment
Test environment	NC		As specified in TS 38.508-1 [14] clause 4.1.
Test frequencies	As specified in Annex E, table E.4-1 and TS 38.508-1 [14] clause 4.3.1 and 4.4.2.		
Channel bandwidth	As specified by the test configuration selected from Table 6.5.8.1.4.1-1.		
Propagation conditions	AWGN		As specified in Annex C.2.2.
Connection Diagram	TE Part	A.3.1.7.1	As specified in TS 38.508-1 [14] Annex A.
	DUT Part	A.3.2.3.4	
Exceptions to connection diagram	- Without LTE link		

1. The general test parameter settings are set up according to Table 6.5.8.1.4.1-3.

2. Message contents are defined in clause 6.5.8.1.4.3.

3. There is one NR carrier and one NR cells specified in the test. Cell 1 is the NR cell used for connection setup with the power level set according to Annex C.1.2 and C.1.3 for this test.

Table 6.5.8.1.4.1-3: General test parameters

Parameter	Unit	Value	Comment
NR RF Channel Number		1	One NR radio channel is used for this test
Active Cell		Cell 1	Cell on RF channel number 1.
CP length		Normal	
DRX		OFF	
T1	s	0.2	

6.5.8.1.4.2 Test procedure

1. Ensure the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity *NR*, Connected without release *On* and Test Mode *On* according to TS 38.508-1 [14] clause 4.5. UE has been configured with UE specific CBW (CBW-1), initial BWP (BWP-1) and *firstActiveDownlinkBWP-Id* indicating BWP-1 is the active BWP.

2. The SS starts sending PDCCHs indicating new transmissions continuously on Cell 1.

3. The SS sends an *RRCReconfiguration* message containing *SCS-SpecificCarrier* with updated UE specific CBW (CBW-2), dedicated BWP (BWP-1) and *firstActiveDownlinkBWP-Id* indicating BWP-1 is the active BWP.

4. T1 starts from the beginning of slot i, where slot i is the last slot carrying the PDSCH containing the *RRCReconfiguration* message in step 3.

5 If the UE starts to report valid ACK/NACK for PCell from the first UL slot that occurs after the beginning of DL slot i + $\frac{T_{RRCprocessingDelay}+T_{CBWchangeDelayRRC}}{NR\ Slot\ length}$, then the number of successful tests is increased by one.
Otherwise, the number of failure tests is increased by one.

6. After the SS receives the ACK/NACK in step 5 or when T1 expires, the SS shall

   - transmit *RRCRelease* message to release the RRC connection which includes the release of the established radio bearers as well as all radio resources

   or

   - switch the UE off.

7. Depending on the choice in step 6, the SS shall,

   - transmit in NR Cell 1 a *Paging* message including matched ng-5G-S-TMSI for the UE if an *RRCRelease* has been sent in step 6. If the paging fails, switches off and on the UE,

   or

   - switch on the UE if the UE is switched off in step 6.

8. Ensure the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity *NR*, Connected without release *On* and Test Mode *On* according to TS 38.508-1 [14] clause 4.5. UE has been configured with UE specific CBW (CBW-1), initial BWP (BWP-1) and *firstActiveDownlinkBWP-Id* indicating BWP-1 is the active BWP.

9. Repeat steps 2-8 until the confidence level according to Tables G.2.3-1 in Annex G clause G.2 is achieved.

6.5.8.1.4.3 Message contents

Message contents are according to TS 38.508-1 [14] clause 7.3 with the following exceptions:

Table 6.5.8.1.4.3-1:*ServingCellConfigCommon* (step 1, 3 and 8, test procedure)

Derivation Path: TS 38.508-1 [14], Table 4.6.3-168			
Information Element	**Value/remark**	**Comment**	**Condition**
ServingCellConfigCommon::= SEQUENCE {			
downlinkConfigCommon SEQUENCE {			
initialDownlinkBWP SEQUENCE {			
genericParameters	Set according to DLBWP.0.2		
}			
uplinkConfigCommon SEQUENCE {			
initialUplinkBWP SEQUENCE {	BWP-UplinkCommon		
genericParameters	Set according to ULBWP.0.2		
}			
}			
}			

Table 6.5.8.1.4.3-2: *ServingCellConfig* (step 1, 3 and 8, test procedure)

Derivation Path: TS 38.508-1 [14], Table 4.6.3-167			
Information Element	**Value/remark**	**Comment**	**Condition**
ServingCellConfig ::= SEQUENCE {			
uplinkConfig SEQUENCE {			
uplinkChannelBW-PerSCS-List SEQUENCE (SIZE (1..maxSCSs)) OF SCS-SpecificCarrier {	1 entry		
SCS-SpecificCarrier[1]	SCS-SpecificCarrier-UL	Entry 1 Table 6.5.8.1.4.3-4	
}			
}			
downlinkChannelBW-PerSCS-List SEQUENCE (SIZE (1..maxSCSs)) OF SCS-SpecificCarrier {	1 entry		
SCS-SpecificCarrier[1]	SCS-SpecificCarrier-DL	Entry 1 Table 6.5.8.1.4.3-3	
}			
}			

Table 6.5.8.1.4.3-3: *SCS-SpecificCarrier-DL* (Table 6.5.8.1.4.3-2)

Derivation Path: TS 38.508-1 [14] Table 4.6.3-160			
Information Element	**Value/remark**	**Comment**	**Condition**
SCS-SpecificCarrier ::= SEQUENCE {			
offsetToCarrier	0	CBW-1 (DLCBW.1.1)	step 1 or step 8
	The offset between Point A and the lowest usable subcarrier on this carrier.	CBW-2 (DLCBW.1.2)	step 3
}			

Table 6.5.8.1.4.3-4: *SCS-SpecificCarrier-UL* (Table 6.5.8.1.4.3-2)

Derivation Path: TS 38.508-1 [14] Table 4.6.3-160			
Information Element	**Value/remark**	**Comment**	**Condition**
SCS-SpecificCarrier ::= SEQUENCE {			
offsetToCarrier	0	CBW-1 (ULCBW.1.1)	step 1 or step 8
	The offset between Point A and the lowest usable subcarrier on this carrier.	CBW-2 (ULCBW.1.2)	step 3
}			

6.5.8.1.5 Test requirement

Tables 6.5.8.1.4.1-3 and 6.5.8.1.5-1 define the primary level settings including test tolerances.

Table 6.5.8.1.5-1: NR Cell specific test parameters

Parameter			Unit	Cell 1
Frequency Range				FR1
Duplex mode		Config 1		FDD
		Config 2,3		TDD
TDD configuration		Config 1		Not Applicable
		Config 2		TDDConf.1.1
		Config 3		TDDConf.2.1
$BW_{channel}$		Config 1		10 MHz: $N_{RB,c}$ = 52
		Config 2		10 MHz: $N_{RB,c}$ = 52
		Config 3		40 MHz: $N_{RB,c}$ = 106
Active DL BWP ID		Config 1,2, 3		0
Initial DL BWP Configuration (BWP-1)		Config 1,2, 3		DLBWP.0.2
Initial UL BWP Configuration (BWP-1)		Config 1,2, 3		ULBWP.0.2
Initial Condition	Active DL CBW Configureation (CBW-1)	Config 1, 2, 3		DLCBW.1.1
	Active UL CBW Configuration (CBW-1)	Config 1, 2, 3		ULCBW.1.1
Final Condition	Active DL CBW Configureation (CBW-2)	Config 1, 2, 3		DLCBW.1.2
	Active UL CBW Configuration (CBW-2)	Config 1, 2, 3		ULCBW.1.2
PDSCH Reference measurement channel		Config 1		SR.1.1 FDD
		Config 2		SR.1.1 TDD
		Config 3		SR2.1 TDD
RMSI CORESET parameters		Config 1		CR.1.1 FDD
		Config 2		CR.1.1 TDD
		Config 3		CR2.1 TDD
Dedicated CORESET parameters		Config 1		CCR.1.1 FDD
		Config 2		CCR.1.1 TDD
		Config 3		CCR.2.1 TDD
OCNG Patterns				OP.1
SSB Configuration		Config 1,2		SSB.1 FR1
		Config 3		SSB.2 FR1
SMTC Configuration				SMTC.1
TRS Configuration		Config 1		TRS.1.1 FDD
		Config 2		TRS.1.1 TDD
		Config 3		TRS.1.2 TDD
Antenna Configuration				1x2 Low
Propagation Condition				AWGN
EPRE ratio of PSS to SSS			dB	0
EPRE ratio of PBCH DMRS to SSS				
EPRE ratio of PBCH to PBCH DMRS				
EPRE ratio of PDCCH DMRS to SSS				
EPRE ratio of PDCCH to PDCCH DMRS				
EPRE ratio of PDSCH DMRS to SSS				
EPRE ratio of PDSCH to PDSCH				
EPRE ratio of OCNG DMRS to SSS(Note 1)				
EPRE ratio of OCNG to OCNG DMRS(Note 1)				
N_{oc} Note 2		Config 1,2	dBm/SCS	-104
		Config 3		-101

SS-RSRP Note 3	Config 1,2	dBm/SCS	-87
	Config 3		-84
$\hat{E}_s/I_{ot}$		dB	17
$\hat{E}_s/N_{oc}$		dB	17
Io Note3	Config 1,2	dBm/ 9.36MHz	-58.96
	Config 3	dBm/ 38.16MHz	-52.86
Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.			
Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for N_{oc} to be fulfilled.			
Note 3: SS-RSRP and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.			
Note 4: For unpaired spectrum, a DL BWP is linked with an UL BWP. DLBWP.0.1 is linked with ULBWP.0.1; DLBWP.1.1 is linked with ULBWP.1.1; as defined in clause 12 of TS 38.213 [3].			

During T1, the UE shall be ready for the reception of uplink grant for the PCell from the first DL slot that occurs right after the beginning of slot $i + \frac{T_{RRCprocessingDelay}+T_{CBWchangeDelayRRC}}{NR\ Slot\ length}$ and starts to report valid ACK/NACK for PCell from the first UL slot that occurs after the beginning of DL slot $i + \frac{T_{RRCprocessingDelay}+T_{CBWchangeDelayRRC}}{NR\ Slot\ length} + k1$.

Where, *k1* is the timing between DL data receiving and acknowledgement as specified in TS 38.213.

All of the above test requirements shall be fulfilled in order for the observed UE specific CBW change delay on the PCell to be counted as correct.

The rate of correct events observed during repeated tests shall be at least 90%.

6.6 Measurement procedures

6.6.1 Intra-frequency measurements

6.6.1.0 Minimum conformance requirements

6.6.1.0.1 Minimum conformance requirements for event-triggered measurement without gap

Same as 4.6.1.0.1

6.6.1.0.2 Minimum conformance requirements for event-triggered measurement with gap

[TS 38.133 [6], clause 9.2.6.2, 9.2.6.3]

The UE shall be able to identify a new detectable intra frequency cell within $T_{identify_intra_without_index}$ if UE is not indicated to report SSB based RRM measurement result with the associated SSB index (*reportQuantityRsIndexes* or *maxNrofRSIndexesToReport* is not configured), or the UE is indicated that the neighbour cell is synchronous with the serving cell (*deriveSSB-IndexFromCell* is enabled). It is assumed that *deriveSSB-IndexFromCell* is always enabled for FR1 TDD and FR2.

$$T_{identify_intra_without_index} = T_{PSS/SSS_sync_intra} + T_{SSB_measurement_period_intra} \quad ms$$

Where:

T_{PSS/SSS_sync_intra}: it is the time period used in PSS/SSS detection given in table 6.6.1.0.2-1.

$T_{SSB_measurement_period_intra}$: equal to a measurement period of SSB based measurement given in table 6.6.1.0.2-2.

$CSSF_{intra}$: it is a carrier specific scaling factor and is determined according to $CSSF_{within_gap,i}$ in TS 38.133 [6] section 9.1.5.2.2 for measurement within outside measurement gaps.

Table 6.6.1.0.2-1: Time period for PSS/SSS detection (Frequency range FR1)

DRX cycle	T_{PSS/SSS_sync_intra}
No DRX	max(600ms, 5 x max(MGRP, SMTC period)) x $CSSF_{intra}$
DRX cycle≤ 320ms	max(600ms, ceil(1.5x 5) x max(MGRP, SMTC period, DRX cycle)) x $CSSF_{intra}$
DRX cycle > 320ms	5 x max(MGRP, DRX cycle) x $CSSF_{intra}$

Table 6.6.1.0.2-2: Measurement period for intra-frequency measurements with gaps (Frequency Range FR1)

DRX cycle	$T_{SSB_measurement_period_intra}$
No DRX	max(200ms, 5 x max(MGRP, SMTC period)) x $CSSF_{intra}$
DRX cycle≤ 320ms	max(200ms, ceil(1.5x 5) x max(MGRP, SMTC period, DRX cycle)) x $CSSF_{intra}$
DRX cycle>320ms	5 x max(MGRP, DRX cycle) x $CSSF_{intra}$

[TS 38.133 [6], clause 9.2.2]

The requirements given above apply, provided:

- The cell being identified or measured is detectable.

An intra-frequency cell shall be considered detectable when for each relevant SSB:

- SS-RSRP related side conditions given in TS 38.133 [6] sections 10.1.2 are fulfilled for a corresponding Band,
- SS-RSRQ related side conditions given in TS 38.133 [6] sections 10.1.7 are fulfilled for a corresponding Band,

- SS-SINR related side conditions given in TS 38.133 [6] Sections 10.1.12 are fulfilled for a corresponding Band,
- SSB_RP and SSB Ês/Iot according to TS 38.133 [6] Annex B.2.2 for a corresponding Band.

[TS 38.133 [6], clause 9.2.4.2]

The RSRP measurement accuracy for all measured cells shall be as specified in TS 38.133 [6] clauses 10.1.2.1.1 and 10.1.2.1.2, the RSRQ measurement accuracy for all measured cells shall be as specified in TS 38.133 [6] clauses 10.1.7.1.1, and the SINR measurement accuracy for all measured cells shall be as specified in the TS 38.133 [6] clause 10.1.12.1.1.

Reported RSRP, RSRQ and SINR measurements contained in event triggered measurement reports shall meet the requirements in TS 38.133 [6] clauses 10.1.2.1.1, 10.1.2.1.2, 10.1.7.1.1 and 10.1.12.1.1, respectively.

The UE shall not send any event triggered measurement reports, as long as no reporting criteria are fulfilled.

The measurement reporting delay is defined as the time between an event that will trigger a measurement report and the point when the UE starts to transmit the measurement report over the air interface. This requirement assumes that that the measurement report is not delayed by other RRC signalling on the DCCH. This measurement reporting delay excludes a delay uncertainty resulted when inserting the measurement report to the TTI of the uplink DCCH. The delay uncertainty is: 2 x TTI_{DCCH}. This measurement reporting delay excludes a delay which caused by no UL resources for UE to send the measurement report.

The event triggered measurement reporting delay, measured without L3 filtering shall be less than $T_{identify_intra_without_index}$ defined in TS 38.133 [6] section 9.2.6.2. When L3 filtering is used an additional delay can be expected.

The normative reference for this requirement is TS 38.133 [6] clauses 9.2.2, 9.2.4.2, 9.2.6.2 and 9.2.6.3.

6.6.1.0.3 Void

6.6.1.0.4 Minimum conformance requirements for event-triggered measurement with gap with SSB index reading

[TS 38.133 [6], clause 9.2.6.2, 9.2.6.3]

UE shall be able to identify a new detectable intra frequency cell within $T_{identify_intra_with_index}$.

$$T_{identify_intra_with_index} = T_{PSS/SSS_sync_intra} + T_{SSB_measurement_period_intra} + T_{SSB_time_index_intra}\ ms$$

Where:

T_{PSS/SSS_sync_intra}: it is the time period used in PSS/SSS detection given in table 6.6.1.0.4-1.

$T_{SSB_time_index_intra}$: it is the time period used to acquire the index of the SSB being measured given in table 6.6.1.0.4-2.

$T_{SSB_measurement_period_intra}$: equal to a measurement period of SSB based measurement given in table 6.6.1.0.4-3.

$CSSF_{intra}$: it is a carrier specific scaling factor and is determined according to $CSSF_{within_gap,\ i}$ in TS 38.133 section 9.1.5.2.2 for measurement conducted within measurement gaps.

When intrafrequency SMTC is fully non overlapping with measurement gaps or intrafrequency SMTC is fully overlapping with MGs, K_p=1

When intrafrequency SMTC is partially overlapping with measurement gaps, K_p = 1/(1- (SMTC period /MGRP)), where SMTC period < MGRP.

Table 6.6.1.0.4-1: Time period for PSS/SSS detection (Frequency range FR1)

DRX cycle	T_{PSS/SSS_sync_intra}
No DRX	max(600ms, 5 x max(MGRP, SMTC period)) x $CSSF_{intra}$
DRX cycle≤ 320ms	max(600ms, ceil(1.5x 5) x max(MGRP, SMTC period, DRX cycle)) x $CSSF_{intra}$
DRX cycle>320ms	[5] x max(MGRP, DRX cycle) x $CSSF_{intra}$

Table 6.6.1.0.4-2: Time period for time index detection (Frequency range FR1)

DRX cycle	$T_{SSB_time_index_intra}$
No DRX	max(120ms, ceil(3 x K_p) x SMTC period)[Note 1] x $CSSF_{intra}$
DRX cycle≤ 320ms	max(120ms, ceil (1.5 x 3 x K_p) x max(SMTC period, DRX cycle)) x $CSSF_{intra}$
DRX cycle>320ms	ceil(3 x K_p) x DRX cycle x $CSSF_{intra}$
NOTE 1: If different SMTC periodicities are configured for different cells, the SMTC period in the requirement is the one used by the cell being identified	

Table 6.6.1.0.4-3: Measurement period for intra-frequency measurements with gaps (Frequency Range FR1)

DRX cycle	$T_{SSB_measurement_period_intra}$
No DRX	max(200ms, 5 x max(MGRP, SMTC period)) x $CSSF_{intra}$
DRX cycle≤ 320ms	max(200ms, ceil(1.5x 5) x max(MGRP, SMTC period, DRX cycle)) x $CSSF_{intra}$
DRX cycle>320ms	5 x max(MGRP, DRX cycle) x $CSSF_{intra}$

[TS 38.133 [6], clause 9.2.2]

The requirements given above apply, provided:

- The cell being identified or measured is detectable.

An intra-frequency cell shall be considered detectable when for each relevant SSB:

- SS-RSRP related side conditions given in TS 38.133 [6] sections 10.1.2 are fulfilled for a corresponding Band,
- SS-RSRQ related side conditions given in TS 38.133 [6] sections 10.1.7 are fulfilled for a corresponding Band,
- SS-SINR related side conditions given in TS 38.133 [6] sections 10.1.12 are fulfilled for a corresponding Band,
- SSB_RP and SSB Ês/Iot according to TS 38.133 [6] Annex B.2.2 for a corresponding Band.

[TS 38.133 [6], clause 9.2.4.2]

The RSRP measurement accuracy for all measured cells shall be as specified in TS 38.133 [6] clauses 10.1.2.1.1 and 10.1.2.1.2, the RSRQ measurement accuracy for all measured cells shall be as specified in TS 38.133 [6] clauses 10.1.7.1.1, and the SINR measurement accuracy for all measured cells shall be as specified in the TS 38.133 [6] clause 10.1.12.1.1.

Reported RSRP, RSRQ and SINR measurements contained in event triggered measurement reports shall meet the requirements in TS 38.133 [6] clauses 10.1.2.1.1, 10.1.2.1.2, 10.1.7.1.1 and 10.1.12.1.1, respectively.

The UE shall not send any event triggered measurement reports, as long as no reporting criteria are fulfilled.

The measurement reporting delay is defined as the time between an event that will trigger a measurement report and the point when the UE starts to transmit the measurement report over the air interface. This requirement assumes that that the measurement report is not delayed by other RRC signalling on the DCCH. This measurement reporting delay excludes a delay uncertainty resulted when inserting the measurement report to the TTI of the uplink DCCH. The delay uncertainty is: 2 x TTI_{DCCH}. This measurement reporting delay excludes a delay which caused by no UL resources for UE to send the measurement report.

The event triggered measurement reporting delay, measured without L3 filtering shall be less than Tidentify_intra_with_index defined in TS 38.133 [6] section 9.2.6.2. When L3 filtering is used an additional delay can be expected.

The normative reference for this requirement is TS 38.133 [6] clauses 9.2.2, 9.2.4.2, 9.2.6.2 and 9.2.6.3.

6.6.1.0.5 Void

6.6.1.1 NR SA FR1 event-triggered reporting without gap in non-DRX

6.6.1.1.1 Test purpose

To verify the UE's ability to make a correct reporting of an event within intra-frequency cell search without gap under non-DRX.

6.6.1.1.2 Test applicability

This test applies to all types of NR UE release 15 onwards.

6.6.1.1.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 6.6.1.0.1.

The normative reference for this requirement is TS 38.133 [6] clause A.6.6.1.1.

6.6.1.1.4 Test description

6.6.1.1.4.1 Initial conditions

This test shall be tested using any of the test configurations in Table 6.6.1.1.4.1-1.

Table 6.6.1.1.4.1-1: Supported test configurations for NR SA FR1 event-triggered reporting without gap in non-DRX

Test Case ID	Description
6.6.1.1-1	15 kHz SSB SCS, 10MHz bandwidth, FDD duplex mode
6.6.1.1-2	15 kHz SSB SCS, 10MHz bandwidth, TDD duplex mode
6.6.1.1-3	30 kHz SSB SCS, 40MHz bandwidth, TDD duplex mode
Note: The UE is only required to be tested in one of the supported test configurations.	

Configure the test requirement and the DUT according to the parameters in Table 6.6.1.1.4.1-2.

Table 6.6.1.1.4.1-2: Initial conditions for NR SA FR1 event-triggered reporting without gap in non-DRX

Parameter	Value		Comment
Test environment	NC		As specified in TS 38.508-1 [14] clause 4.1.
Test frequencies	As specified in Annex E, Table E.4-1 and TS 38.508-1 [14] clause 4.3.1.		
Channel bandwidth	As specified by the test configuration selected from Table 6.6.1.1.4.1-1.		
Propagation conditions	AWGN		As specified in Annex C.2.2
Connection Diagram	TE Part	A.3.1.8.2	As specified in TS 38.508-1 [14] Annex A.
	DUT Part	A.3.2.3.4	
Exceptions to connection diagram	- Without LTE link - For 4Rx capable UEs without any 2Rx RF bands use A.3.2.5.2 for DUT part and A.3.1.8.4 for TE part.		

1. The test parameters for PCell and neighbour cell are given in Table 6.6.1.1.4.1-3 below.
2. Message contents are defined in clause 6.6.1.1.4.3.
3. There is one carrier and two cells specified in the test. NR Cell 1 is the cell used for connection setup with the power level set according to Annex C.1.1 and C.1.2 for this test.

Table 6.6.1.1.4.1-3: General test parameters for SA intra-frequency event triggered reporting tests without gap for FR1 under non-DRX

Parameter	Unit	Test configuration	Value	Comment

Active cell		1, 2, 3	Cell 1	
Neighbour cell		1, 2, 3	Cell 2	Cell to be identified.
RF Channel Number		1, 2, 3	1: Cell 1 and Cell 2	
SSB configuration		1	SSB.1 FR1	
		2	SSB.1 FR1	
		3	SSB.2 FR1	
SMTC configuration		1	SMTC.2	
		2	SMTC.1	
		3	SMTC.1	
A3-Offset	dB	1, 2, 3	-4.5	
CP length		1, 2, 3	Normal	
Hysteresis	dB	1, 2, 3	0	
Time To Trigger	s	1, 2, 3	0	
Filter coefficient		1, 2, 3	0	L3 filtering is not used
DRX		1, 2, 3		OFF
Time offset between serving and neighbour cells		1	3 ms	Asynchronous cells. The timing of Cell 2 is 3 ms later than the timing of Cell 1.
		2	3 µs	Synchronous cells
		3	3 µs	Synchronous cells
T1	s	1, 2, 3	5	
T2	s	1, 2, 3	5	

6.6.1.1.4.2 Test procedure

Two cells are deployed in the test, which are FR1 PCell (NR Cell 1) and a FR1 neighbour cell (NR Cell 2) on the same frequency as the PCell. The general and cell specific test parameters for PCell and neighbour cell are given in Table 6.6.1.1.4.1-3 and Table 6.6.1.1.5-1, respectively. In the measurement control information a measurement object is configured for the frequency of the PCell, and it is indicated to the UE that event-triggered reporting with Event A3 is used. The test consists of two successive time periods, with time duration of T1, and T2 respectively. During time duration T1, the UE shall not have any timing information of NR Cell 2.

1. Ensure the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity *NR*, Connected without release *On* and Test Mode *On* according to TS 38.508-1 [14] clause 4.5.

2. Set the parameters according to T1 in Table 6.6.1.1.5-1.

3. SS shall transmit an *RRCReconfiguration* message.

4. The UE shall transmit *RRCReconfigurationComplete* message. T1 starts.

5. When T1 expires, the SS shall switch the power setting from T1 to T2 as specified in Table 6.6.1.1.5-1. T2 starts.

6. UE shall transmit a *MeasurementReport* message triggered by Event A3. If the overall delays measured from the beginning of time period T2 is less than 802 ms then the number of successful tests is increased by one. If the UE fails to report the event within the overall delays measured requirement then the number of failure tests is increased by one.

7. After the SS receive the *MeasurementReport* message in step 6) or when T2 expires, the SS shall:

   - transmit *RRCRelease* message to release the RRC connection which includes the release of the established radio bearers as well as all radio resources

   OR

   - switch the UE off.

8. Set NR Cell 2 physical cell identity = ((current NR cell 2 physical cell identity + 1) mod 14 + 2) for next iteration of the test procedure loop.

9. Depending on the choice in Step 7, the SS:
   - if the RRC Connection Release has been sent, transmits in NR Cell 1 a Paging message (including PagingRecord with UE-Identity) for the UE and ensures the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity *NR*, Connected without release *On* according to TS 38.508-1 [14] clause 4.5 (if the paging fails, switches off and on the UE and ensures the UE is in state RRC_CONNECTED with generic

procedure parameters Connectivity *NR*, Connected without release *On* according to TS 38.508-1 [14] clause 4.5),
Or
- if the device has been switched off, switcheson the UE and ensures the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity *NR*, Connected without release *On* according to TS 38.508-1 [14] clause 4.5.

10. Repeat step 2-9 until the confidence level according to Tables G.2.3-1 in Annex G clause G.2 is achieved.

6.6.1.1.4.3 Message contents

Message contents are according to TS 38.508-1 [14] clause 4.6 with the following exceptions:

Table 6.6.1.1.4.3-1: Common Exception messages SA intra frequency event triggered reporting tests without gap under non-DRX

Default Message Contents	
Common contents of system information blocks exceptions	
Default RRC messages and information elements contents exceptions	Table H.3.1-1 Table H.3.1-2 with Condition INTRA-FREQ Table H.3.1-3 with Condition INTRA-FREQ MO, SSB.1 FR1, SMTC.2 for configuration 6.6.1.1-1 Table H.3.1-3 with Condition INTRA-FREQ MO, SSB.1 FR1, SMTC.1 and synchronous cells for configuration 6.6.1.1-2 Table H.3.1-3 with Condition INTRA-FREQ MO, SSB.2 FR1, SMTC.1 and synchronous cells for configuration 6.6.1.1-3 Table H.3.1-4 with A3-offset = -4.5dB Table H.3.1-5 with Condition INTRA-FREQ Table H.3.1-7 with Condition INTRA-FREQ Table H.3.1-8 with Condition SSB RLM

6.6.1.1.5 Test requirement

Table 6.6.1.1.4.1-3 and Table 6.6.1.1.5-1 define the primary level settings including test tolerances for NR SA event triggered reporting test without gap under non-DRX.

Table 6.6.1.1.5-1: NR Cell specific test parameters for SA intra-frequency event triggered reporting tests without gap under non-DRX

Parameter	Unit	Test configuration	Cell 1		Cell 2	
			T1	T2	T1	T2
TDD configuration		1	N/A		N/A	
		2	TDDConf.1.1		TDDConf.1.1	
		3	TDDConf.2.1		TDDConf.2.1	
PDSCH RMC configuration		1	SR.1.1 FDD		N/A	
		2	SR.1.1 TDD			
		3	SR.2.1 TDD			
RMSI CORESET RMC configuration		1	CR.1.1 FDD		CR.1.1 FDD	
		2	CR.1.1 TDD		CR.1.1 TDD	
		3	CR.2.1 TDD		CR.2.1 TDD	
Dedicated CORESET RMC configuration		1	CCR.1.1 FDD		CCR.1.1 FDD	
		2	CCR.1.1 TDD		CCR.1.1 TDD	
		3	CCR.2.1 TDD		CCR.2.1 TDD	
OCNG Patterns		1, 2, 3	OP.1		OP.1	
TRS Configuration		1	TRS.1.1 FDD		N/A	
		2	TRS.1.1 TDD		N/A	
		3	TRS.1.2 TDD		N/A	

Initial BWP configuration		1, 2, 3	DLBWP.0.1 ULBWP.0.1		DLBWP.0.1 ULBWP.0.1	
Active DL BWP configuration		1, 2, 3	DLBWP.1.1		DLBWP.1.1	
Active UL BWP configuration		1, 2, 3	ULBWP.1.1		ULBWP.1.1	
RLM-RS		1, 2, 3	SSB		SSB	
N_{oc} Note 2	dBm/SCS	1	-98			
		2	-98			
		3	-95			
N_{oc} Note 2	dBm/15 KHz	1	-98			
		2				
		3				
$\hat{E}_s/I_{ot}$	dB	1	4	-1.46	-Infinity	-1.46
		2				
		3				
$\hat{E}_s/N_{oc}$	dB	1	4	4	-Infinity	4
		2				
		3				
SS-RSRP Note 3	dBm/SCS KHz	1	-94	-94	-Infinity	-94
		2	-94	-94	-Infinity	-94
		3	-91	-91	-Infinity	-91
Io	dBm/9.36 MHz	1	-64.60	-62.25	Specified in Cell 1 columns	
	dBm/9.36 MHz	2	-64.60	-62.25		
	dBm/38.16 MHz	3	-58.50	-56.16		
Propagation Condition		1, 2, 3	AWGN			
Note 1: The resources for uplink transmission are assigned to the UE prior to the start of time period T2. Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for N_{oc} to be fulfilled. Note 3: SS-RSRP levels have been derived from other parameters for information purposes. They are not settable parameters themselves.						

The overall delays measured is defined as the time from the beginning of time period T2, to the moment the UE send one Event A3 triggered measurement report to NR Cell 2.

The overall delays measured in the test may be up to $2xTTI_{DCCH}$ higher than the measurement reporting delays because of TTI insertion uncertainty of the measurement report in DCCH.

The overall delays measured test requirement is expressed as:

Overall delays measured = measurement reporting delay + TTI insertion uncertainty

Measurement reporting delay = $T_{identify_intra_without_index}$

$T_{identify_intra_without_index} = (T_{PSS/SSS_sync_intra} + T_{SSB_measurement_period_intra})$ ms

T_{PSS/SSS_sync_intr}= max [600 ms, ceil $(5 \times K_p) \times$ SMTC period] $\times CSSF_{intra}$ = 600 ms

$T_{SSB_measurement_period_intra}$= max [200 ms, ceil($5 \times K_p$) $\times$ SMTC period] $\times CSSF_{intra}$ = 200 ms

TTI insertion uncertainty = 2 ms

The overall delays measured shall be less than a total of 802 ms in this test case (note: this gives a total of 800 ms for measurement reporting delay plus 2 ms for TTI insertion uncertainty).

For the test to pass, the total number of successful tests shall be more than 90% of the cases with a confidence level of 95%.

6.6.1.2 NR SA FR1 event-triggered reporting without gap in DRX

6.6.1.2.1 Test purpose

To verify the UE's ability to make a correct reporting of an event within intra-frequency cell search without gap under DRX.

6.6.1.2.2 Test applicability

This test applies to all types of NR UE release 15 and forward supporting 5GS NR SA FR1 and long DRX cycle.

6.6.1.2.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 6.6.1.0.1.

The normative reference for this requirement is TS 38.133 [6] clause A.6.6.1.2.

6.6.1.2.4 Test description

6.6.1.2.4.1 Initial conditions

This test shall be tested using any of the test configurations in Table 6.6.1.2.4.1-1.

Table 6.6.1.2.4.1-1: Supported test configurations for NR SA FR1 event-triggered reporting without gap in DRX

Test Case ID	Description
6.6.1.2-1	15 kHz SSB SCS, 10MHz bandwidth, FDD duplex mode
6.6.1.2-2	15 kHz SSB SCS, 10MHz bandwidth, TDD duplex mode
6.6.1.2-3	30 kHz SSB SCS, 40MHz bandwidth, TDD duplex mode
Note: The UE is only required to be tested in one of the supported test configurations.	

Configure the test equipment and the DUT according to the parameters in Table 6.6.1.2.4.1-2.

Table 6.6.1.2.4.1-2: Initial conditions for NR SA FR1 event-triggered reporting without gap in DRX

Parameter	Value		Comment
Test environment	NC		As specified in TS 38.508-1 [14] clause 4.1.
Test frequencies	As specified in Annex E, table E.4-1 and TS 38.508-1 [14] clause 4.3.1.		
Channel bandwidth	As specified by the test configuration selected from Table 6.6.1.2.4.1-1.		
Propagation conditions	AWGN		As specified in Annex C.2.2.
Connection Diagram	TE Part	A.3.1.8.2	As specified in TS 38.508-1 [14] Annex A.
	DUT Part	A.3.2.3.4	
Exceptions to connection diagram	- Without LTE link - For 4Rx capable UEs without any 2Rx RF bands use A.3.2.5.2 for DUT part and A.3.1.8.4 for TE part.		

1. The test parameters for PCell and neighbour cell are given in Table 6.6.1.2.4.1-3 below.
2. Message contents are defined in clause 6.6.1.2.4.3.
3. There is one carrier and two cells specified in the test. NR Cell 1 is the cell used for connection setup with the power level set according to Annex C.1.1 and C.1.2 for this test.

Table 6.6.1.2.4.1-3: General test parameters for SA intra-frequency event triggered reporting tests without gap for FR1 under DRX

Parameter	Unit	Test configuration	Value		Comment
			Test 1	Test 2	
Active cell		1, 2, 3	Cell 1		
Neighbour cell		1, 2, 3	Cell 2		Cell to be identified.

RF Channel Number		1, 2, 3	1: Cell 1 and Cell 2		
SSB configuration		1	SSB.1 FR1		
		2	SSB.1 FR1		
		3	SSB.2 FR1		
SMTC configuration		1	SMTC.2		
		2	SMTC.1		
		3	SMTC.1		
A3-Offset	dB	1, 2, 3	-4.5		
CP length		1, 2, 3	Normal		
Hysteresis	dB	1, 2, 3	0		
Time To Trigger	s	1, 2, 3	0		
Filter coefficient		1, 2, 3	0		L3 filtering is not used
DRX	ms	1, 2, 3	DRX.1	DRX.7	
Time offset between serving and neighbour cells		1	3 ms		Asynchronous cells. The timing of Cell 2 is 3ms later than the timing of Cell 1
		2	3 us		Synchronous cells
		3	3 us		Synchronous cells
T1	s	1, 2, 3	5		
T2	s	1, 2, 3	5	10	

6.6.1.2.4.2 Test procedure

Two cells are deployed in the test, which are FR1 PCell (NR Cell 1) and a FR1 neighbour cell (NR Cell 2) on the same frequency as the PCell. The general and cell specific test parameters for PCell and neighbour cell are given in Table 6.6.1.2.4.1-3 and Table 6.6.1.2.5-1, respectively. In the measurement control information a measurement object is configured for the frequency of the PCell, and it is indicated to the UE that event-triggered reporting with Event A3 is used. The test consists of two successive time periods, with time duration of T1, and T2 respectively. During time duration T1, the UE shall not have any timing information of NR Cell 2.

1. Ensure the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity *NR*, Connected without release *On* and Test Mode *On* according to TS 38.508-1 [14] clause 4.5.

2. Set the parameters according to T1 in Table 6.6.1.2.5-1.

3. SS shall transmit an *RRCReconfiguration* message.

4. The UE shall transmit *RRCReconfigurationComplete* message. T1 starts.

5. When T1 expires, the SS shall switch the power setting from T1 to T2 as specified in Table 6.6.1.2.5-1. T2 starts.

6. UE shall transmit a *MeasurementReport* message triggered by Event A3. If the overall delays measured from the beginning of time period T2 is less than 922 ms for Test 1 or less than 6402 ms for Test 2 then the number of successful tests is increased by one. If the UE fails to report the event within the overall delays measured requirement then the number of failure tests is increased by one.

7. After the SS receive the *MeasurementReport* message in step 6) or when T2 expires, the SS shall:

   - transmit *RRCRelease* message to release the RRC connection which includes the release of the established radio bearers as well as all radio resources

   OR

   - switch the UE off.

8. Set NR Cell 2 physical cell identity = ((current NR cell 2 physical cell identity + 1) mod 14 + 2) for next iteration of the test procedure loop.

9. Depending on the choice in Step 7, the SS:
   - if the RRC Connection Release has been sent, transmits in NR Cell 1 a Paging message (including PagingRecord with UE-Identity) for the UE and ensures the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity *NR*, Connected without release *On* according to TS 38.508-1 [14] clause 4.5 (if the paging fails, switches off and on the UE and ensures the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity *NR*, Connected without release *On* according to TS 38.508-1 [14] clause 4.5),

OR
- if the device has been switched off, switches on the UE and ensures the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity *NR*, Connected without release *On* according to TS 38.508-1 [14] clause 4.5.

10. Repeat step 2-9 until the confidence level according to Tables G.2.3-1 in Annex G clause G.2 is achieved.

11. Repeat step 1-10 for each sub-test in Table 6.6.1.2.4.1-1 as appropriate.

6.6.1.2.4.3 Message contents

Message contents are according to TS 38.508-1 [14] clause 4.6 with the following exceptions:

Table 6.6.1.2.4.3-1: Common Exception messages for SA intra frequency event triggered reporting tests without gap under DRX

Default Message Contents	
Common contents of system information blocks exceptions	
Default RRC messages and information elements contents exceptions	Table H.3.1-1 Table H.3.1-2 with Condition INTRA-FREQ Table H.3.1-3 with Condition INTRA-FREQ MO SSB.1 FR1, SMTC.2 for configuration 6.6.1.2-1 Table H.3.1-3 with Condition INTRA-FREQ MO SSB.1 FR1, SMTC.1 and synchronous cells for configuration 6.6.1.2-2 Table H.3.1-3 with Condition INTRA-FREQ MO SSB.2 FR1, SMTC .1 and synchronous cells for configuration 6.6.1.2-3 Table H.3.1-4 with A3-offset = -4.5dB Table H.3.1-5 with Condition INTRA-FREQ Table H.3.1-7 with Condition INTRA-FREQ Table H.3.1-8 with Condition SSB RLM Table H.3.7-1 with Condition DRX.1 and Offset for test 1 Table H.3.7-1 with Condition DRX.7 and Offset for test 2

6.6.1.2.5 Test requirement

Table 6.6.1.2.4.1-3 and Table 6.6.1.2.5-1 define the primary level settings including test tolerances for NR event triggered reporting in synchronous cells when DRX is used test.

Table 6.6.1.2.5-1: NR Cell specific test parameters for SA intra-frequency event triggered reporting tests without gap under DRX

Parameter	Unit	Test configuration	Cell 1		Cell 2	
			T1	T2	T1	T2
TDD configuration		1	N/A		N/A	
		2	TDDConf.1.1		TDDConf.1.1	
		3	TDDConf.2.1		TDDConf.2.1	
PDSCH RMC configuration		1	SR.1.1 FDD		N/A	
		2	SR.1.1 TDD			
		3	SR.2.1 TDD			
RMSI CORESET RMC configuration		1	CR.1.1 FDD		CR.1.1 FDD	
		2	CR.1.1 TDD		CR.1.1 TDD	
		3	CR.2.1 TDD		CR.2.1 TDD	
Dedicated CORESET RMC configuration		1	CCR.1.1 FDD		CCR.1.1 FDD	
		2	CCR.1.1 TDD		CCR.1.1 TDD	
		3	CCR.2.1 TDD		CCR.2.1 TDD	
OCNG Patterns		1, 2, 3	OP.1		OP.1	
		1	TRS.1.1 FDD		N/A	

TRS Configuration		2	TRS.1.1 TDD		N/A	
		3	TRS.1.2 TDD		N/A	
Initial BWP configuration		1, 2, 3	DLBWP.0.1 ULBWP.0.1		DLBWP.0.1 ULBWP.0.1	
Active DL BWP configuration		1, 2, 3	DLBWP.1.1		DLBWP.1.1	
Active UL BWP configuration		1, 2, 3	ULBWP.1.1		ULBWP.1.1	
RLM-RS		1, 2, 3	SSB		SSB	
N_{oc} Note 2	dBm/SCS	1	-98			
		2	-98			
		3	-95			
N_{oc} Note 2	dBm/15 KHz	1	-98			
		2				
		3				
$\hat{E}_s/I_{ot}$	dB	1	4	-1.46	-Infinity	-1.46
		2				
		3				
$\hat{E}_s/N_{oc}$	dB	1	4	4	-Infinity	4
		2				
		3				
SS-RSRP Note 3	dBm/SCS KHz	1	-94	-94	-Infinity	-94
		2	-94	-94	-Infinity	-94
		3	-91	-91	-Infinity	-91
Io	dBm/9.36 MHz	1	-64.60	-62.25	Specified in Cell 1 columns	
	dBm/9.36 MHz	2	-64.60	-62.25		
	dBm/38.16 MHz	3	-58.50	-56.16		
Propagation Condition		1, 2, 3	AWGN			

Note 1: The resources for uplink transmission are assigned to the UE prior to the start of time period T2.
Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for N_{oc} to be fulfilled.
Note 3: SS-RSRP levels have been derived from other parameters for information purposes. They are not settable parameters themselves.

In Test 1 when DRX cycle length = 40 ms, the overall delay measured is defined as the time from the beginning of time period T2 to the moment the UE send one Event A3 triggered measurement report on PUSCH.

In Test 2 when DRX cycle length = 640 ms, the overall delay measured is defined as the time from the beginning of time period T2 to the moment the UE starts to send preambles on the PRACH for Scheduling Request (SR) to obtain allocation to send the measurement report to NR Cell 2 on PUSCH.

For both tests:

The overall delays measured is defined as the time from the beginning of time period T2 to the moment the UE send one Event A3 triggered measurement report to NR Cell 2.

The overall delays measured in the test may be up to $2xTTI_{DCCH}$ higher than the measurement reporting delays because of TTI insertion uncertainty of the measurement report in DCCH.

The overall delay measured when DRX cycle length is 40 ms test requirement is expressed as:

Overall delays measured = measurement reporting delay + TTI insertion uncertainty

Measurement reporting delay = $T_{identify_intra_without_index}$

$T_{identify_intra_without_index} = (T_{PSS/SSS_sync_intra} + T_{SSB_measurement_period_intra})$ ms

$T_{PSS/SSS_sync_intra} = \max[600ms, ceil(1.5 \times 5 \times K_p) \times \max(SMTC\ period, DRX\ cycle)] \times CSSF_{intra} = 600ms$

$T_{SSB_measurement_period_intra} = \max[200ms, ceil(1.5 \times 5 \times K_p) \times \max(SMTC\ period, DRX\ cycle)] \times CSSF_{intra} = 320ms$

TTI insertion uncertainty = 2 ms

The overall delay measured when DRX cycle length is 40 ms shall be less than a total of 922 ms.

The overall delay measured when DRX cycle length is 640 ms test requirement is expressed as:

Overall delays measured = measurement reporting delay + TTI insertion uncertainty

Measurement reporting delay = $T_{identify_intra_without_index}$

$T_{identify_intra_without_index} = (T_{PSS/SSS_sync_intra} + T_{SSB_measurement_period_intra})$ ms

$T_{PSS/SSS_sync_intra} = ceil(5 \times K_p) \times DRX\ cycle \times CSSF_{intra} = 3200ms$

$T_{SSB_measurement_period_intra} = ceil(5 \times K_p) \times DRX\ cycle \times CSSF_{intra} = 3200ms$

TTI insertion uncertainty = 2 ms

The overall delay measured when DRX cycle length is 640 ms shall be less than a total of 6402 ms.

For the test to pass, the total number of successful tests shall be more than 90% of the cases with a confidence level of 95%.

6.6.1.3 NR SA FR1 event-triggered reporting with gap in non-DRX

6.6.1.3.1 Test purpose

The purpose of this test is to verify UE's ability to make a correct reporting of an event with gaps under non-DRX within intra-frequency cell search with gaps requirements.

6.6.1.3.2 Test applicability

This test applies to all types of NR UE release 15 onwards supporting 5GS NR SA FR1, CSI-RS-based RLM and BWP operation without bandwidth restriction.

6.6.1.3.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 6.6.1.0.2.

The normative reference for this requirement is TS 38.133 [6] clause A.6.6.1.3.

6.6.1.3.4 Test description

6.6.1.3.4.1 Initial conditions

This test shall be tested using any of the test configurations in Table 6.6.1.3.4.1-1.

Table 6.6.1.3.4.1-1: Supported test configurations for NR SA FR1 event-triggered reporting with gap in non-DRX

Test Case ID	Description
6.6.1.3-1	NR 15 kHz SSB SCS, 10MHz bandwidth, FDD duplex mode
6.6.1.3-2	NR 15 kHz SSB SCS, 10MHz bandwidth, TDD duplex mode
6.6.1.3-3	NR 30 kHz SSB SCS, 40MHz bandwidth, TDD duplex mode
Note 1: The UE is only required to be tested in one of the supported test configurations	

Configure the test equipment and the DUT according to the parameters in Table 6.6.1.3.4.1-2.

Table 6.6.1.3.4.1-2: Initial conditions for NR SA FR1 event-triggered reporting with gap in non-DRX

Parameter	Value	Comment
Test environment	**NC**	**As specified in TS 38.508-1 [14] clause 4.1.**
Test frequencies	As specified in Annex E, table E.4-1 and TS 38.508-1 [14] clause 4.3.1 and 4.4.2.	
Channel bandwidth	As specified by the test configuration selected from Table 6.6.1.3.4.1-1.	
Propagation conditions	AWGN	As specified in Annex C.2.2.

Connection Diagram	TE Part	A.3.1.8.2	As specified in TS 38.508-1 [14] Annex A.
	DUT Part	A.3.2.3.4	
Exceptions to connection diagram	- Without LTE link - For 4Rx capable UEs without any 2Rx RF bands use A.3.2.5.2 for DUT part and A.3.1.8.4 for TE part.		

1. The general test parameter settings are set up according to Table 6.6.1.3.4.1-3.

2. Message contents are defined in clause 6.6.1.3.4.3.

3. There is one NR carrier and two cells specified in the test. Cell 1 is the cell used for connection setup with the power level set according to Annex C.1.1 and C.1.2 for this test.

Table 6.6.1.3.4.1-3: General test parameters for NR SA FR1 event-triggered reporting with gap in non-DRX

Parameter	Unit	Test configuration	Value	Comment
Active cell		1, 2, 3	Cell 1	
Neighbour cell		1, 2, 3	Cell 2	Cell to be identified.
RF Channel Number		1, 2, 3	1: Cell 1 and Cell 2	
Measurement gap type		1, 2, 3	Per-UE gaps	
Measurement gap repetition periodicity	ms	1, 2, 3	40	
Measurement gap length	ms	1, 2, 3	6	
Measurement gap offset	ms	1, 2, 3	39	
SSB configuration		1	SSB.1 FR1	
		2	SSB.1 FR1	
		3	SSB.2 FR1	
SMTC configuration		1	SMTC.2	
		2	SMTC.1	
		3	SMTC.1	
CSI-RS parameters		1	CSI-RS.1.2 FDD resource #0	
		2	CSI-RS.1.2 TDD resource #0	
		3	CSI-RS.2.2 TDD resource #0	
A3-Offset	dB	1, 2, 3	-4.5	
CP length		1, 2, 3	Normal	
Hysteresis	dB	1, 2, 3	0	
Time To Trigger	s	1, 2, 3	0	
Filter coefficient		1, 2, 3	0	L3 filtering is not used
DRX	ms	1, 2, 3		OFF
Time offset between serving and neighbour cells		1	3 ms	Asynchronous cells. The timing of Cell 2 is 3ms later than the timing of Cell 1.
		2	3 μs	Synchronous cells
		3	3 μs	Synchronous cells
T1	s	1, 2, 3	5	
T2	s	1, 2, 3	5	

6.6.1.3.4.2 Test procedure

Two cells are deployed in the test, which are FR1 PCell (Cell 1) and a FR1 neighbour cell (Cell 2) on the same frequency as the PCell. The general and cell specific test parameters for PCell and neighbour cell are given in Table 6.6.1.3.4.1-3 and Table 6.6.1.3.5-1, respectively. In the measurement control information a measurement object is configured for the frequency of the PCell, and it is indicated to the UE that event-triggered reporting with Event A3 is used. The test consists of two successive time periods, with time duration of T1, and T2 respectively. During time duration T1, the UE shall not have any timing information of Cell 2.

There are two BWPs configured in Cell 1, BWP1 which contains the cell defining SSB, and BWP2 which does not contain any SSB of Cell 1. During the whole test, BWP2 is always scheduled as the active BWP for the UE.

1. Ensure the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity *NR*, Connected without release *On* and Test Mode *On* according to TS 38.508-1 [14] clause 4.5.

2. Set the parameters according to T1 in Table 6.6.1.3.5-1.

3. SS shall transmit an *RRCReconfiguration* message.

4. The UE shall transmit *RRCReconfigurationComplete* message. T1 starts.

5. When T1 expires, the SS shall switch the power setting from T1 to T2 as specified in Table 6.6.1.3.5-1.

6. UE shall transmit a *MeasurementReport* message triggered by Event A3. If the overall delays measured from the beginning of time period T2 is less than 802 ms then the number of successful tests is increased by one. If the UE fails to report the event within the overall delays measured requirement then the number of failure tests is increased by one.

7. After the SS receive the MeasurementReport message in step 6) or when T2 expires, the SS shall:

   - transmit RRCRelease message to release the RRC connection which includes the release of the established radio bearers as well as all radio resources

   OR

   - switch the UE off.

8. Set Cell 2 physical cell identity = ((current cell 2 physical cell identity + 1) mod 14 + 2) for next iteration of the test procedure loop.

9. Depending on the choice in Step 7, the SS:
   - if the RRC Connection Release has been sent, transmits in Cell 1 a Paging message (including PagingRecord with UE-Identity) for the UE and ensures the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity NR, Connected without release On according to TS 38.508-1 [14] clause 4.5 (if the paging fails, switches off and on the UE and ensures the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity NR, Connected without release On according to TS 38.508-1 [14] clause 4.5),
   OR
   - if the device has been switched off, switches on the UE and ensures the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity NR, Connected without release On according to TS 38.508-1 [14] clause 4.5.

10. Repeat step 2-9 until the confidence level according to Tables G.2.3-1 in Annex G clause G.2 is achieved.

6.6.1.3.4.3 Message contents

Message contents are according to TS 38.508-1 [14] clause 4.6 with the following exceptions:

Table 6.6.1.3.4.3-1: Common Exception messages for NR SA FR1 event-triggered reporting with gap in non-DRX

Default Message Contents	
Common contents of system information blocks exceptions	

Default RRC messages and information elements contents exceptions	Table H.3.1-1 Table H.3.1-2 with Condition INTRA-FREQ and GAP NEEDED Table H.3.1-3 with Condition INTRA-FREQ MO, SSB.1 FR1, SMTC.2 for Configuration 6.6.1.3-1 Table H.3.1-3 with Condition INTRA-FREQ MO, SSB.1 FR1, SMTC.1 and Synchronous cells for Configuration 6.6.1.3-2 Table H.3.1-3 with ConditionINTRA-FREQ MO, SSB.2 FR1, SMTC.1 and Synchronous cells for Configuration 6.6.1.3-3 Table H.3.1-4 with A3-offset = -4.5dB Table H.3.1-5 with Condition INTRA-FREQ Table H.3.1-6 with Condition Pattern #0 Table H.3.1-7 with Condition INTRA-FREQ Table H.3.1-8 with Condition CSI-RS RLM

Table 6.6.1.3.4.3-2: *ServingCellConfig*

Derivation Path: TS 38.508-1 [14], Table 4.6.3-167			
Information Element	**Value/remark**	**Comment**	**Condition**
ServingCellConfig ::= SEQUENCE {			
downlinkBWP-ToAddModList SEQUENCE (SIZE (1..maxNrofBWPs)) OF SEQUENCE {			
BWP-Downlink[1]	BWP-Downlink with condition BWP-Id1	DLBWP.1.2 configuration	
}			
firstActiveDownlinkBWP-Id	1	Active DL BWP-ID (BWP2)	BWP-Id1
defaultDownlinkBWP-Id	0	Initial BWP (BWP1)	
uplinkConfig SEQUENCE {			
uplinkBWP-ToAddModList SEQUENCE (SIZE (1..maxNrofBWPs)) OF SEQUENCE {			
BWP-Uplink[1]	BWP-Uplink with condition BWP-Id1	ULBWP.1.2 configuration	
}			
firstActiveUplinkBWP-Id	1	Active UL BWP-ID (BWP2)	BWP-Id1
}			
}			

Condition	Explanation
BWP-Id1	Active BWP (BWP2)

6.6.1.3.5 Test requirement

Table 6.6.1.3.4.1-3 and Table 6.6.1.3.5-1 define the primary level settings including test tolerances for NR SA FR1 event-triggered reporting with gap in non-DRX test.

Table 6.6.1.3.5-1: NR Cell specific test parameters for NR SA FR1 event-triggered reporting with gap in non-DRX

Parameter	Unit	Test configuration	Cell 1		Cell 2	
			T1	T2	T1	T2
TDD configuration		1	N/A		N/A	
		2	TDDConf.1.1		TDDConf.1.1	
		3	TDDConf.2.1		TDDConf.2.1	
PDSCH RMC configuration		1	SR.1.1 FDD		N/A	
		2	SR.1.1 TDD			

		3	SR.2.1 TDD			
RMSI CORESET RMC configuration		1	CR.1.1 FDD		CR.1.1 FDD	
		2	CR.1.1 TDD		CR.1.1 TDD	
		3	CR.2.1 TDD		CR.2.1 TDD	
Dedicated CORESET RMC configuration		1	CCR.1.2 FDD		CCR.1.1 FDD	
		2	CCR.1.2 TDD		CCR.1.1 TDD	
		3	CCR.2.1 TDD		CCR.2.1 TDD	
OCNG Patterns		1, 2, 3	OP.1		OP.1	
TRS Configuration		1	TRS.1.1 FDD		N/A	
		2	TRS.1.1 TDD		N/A	
		3	TRS.1.2 TDD		N/A	
Initial BWP configuration		1, 2, 3	DLBWP.0.1 ULBWP.0.1		DLBWP.0.1 ULBWP.0.1	
Active DL BWP configuration		1, 2, 3	DLBWP.1.2		DLBWP.1.1	
Active UL BWP configuration		1, 2, 3	ULBWP.1.2		ULBWP.1.1	
RLM-RS		1, 2, 3	CSI-RS		SSB	
N_{oc} Note 2	dBm/SCS	1	-98			
		2	-98			
		3	-95			
N_{oc} Note 2	dBm/15 KHz	1	-98			
		2				
		3				
$\hat{E}_s/I_{ot}$	dB	1	4	-1.46	-Infinity	-1.46
		2				
		3				
$\hat{E}_s/N_{oc}$	dB	1	4	4	-Infinity	4
		2				
		3				
SS-RSRP Note 3	dBm/SCS KHz	1	-94	-94	-Infinity	-94
		2	-94	-94	-Infinity	-94
		3	-91	-91	-Infinity	-91
Io	dBm/9.36 MHz	1	-64.60	-62.25	Specified in Cell 1 columns	
	dBm/9.36 MHz	2	-64.60	-62.25		
	dBm/38.16 MHz	3	-58.50	-56.16		
Propagation Condition		1, 2, 3	AWGN			

Note 1: The resources for uplink transmission are assigned to the UE prior to the start of time period T2.
Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for N_{oc} to be fulfilled.
Note 3: SS-RSRP levels have been derived from other parameters for information purposes. They are not settable parameters themselves.

The overall delays measured is defined as the time from the beginning of time period T2, to the moment the UE send one Event A3 triggered measurement report.

The overall delays measured in the test may be up to $2xTTI_{DCCH}$ higher than the measurement reporting delays because of TTI insertion uncertainty of the measurement report in DCCH.

The overall delays measured test requirement is expressed as:

Overall delays measured = measurement reporting delay + TTI insertion uncertainty

Measurement reporting delay = $T_{identify_intra_without_index}$

$T_{identify_intra_without_index} = T_{PSS/SSS_sync_intra} + T_{SSB_measurement_period_intra}$

T_{PSS/SSS_sync_intra} = 600 ms

$T_{SSB_measurement_period_intra}$ = 200 ms

TTI insertion uncertainty = 2 ms

The overall delays measured shall be less than a total of 802 ms in this test case (note: this gives a total of 800 ms for measurement reporting delay plus 2 ms for TTI insertion uncertainty).

For the test to pass, the total number of successful tests shall be more than 90% of the cases with a confidence level of 95%.

6.6.1.4 NR SA FR1 event-triggered reporting with gap in DRX

6.6.1.4.1 Test purpose

The purpose of this test is to verify UE's ability to make a correct reporting of an event with gaps under DRX within intra-frequency cell search with gaps requirements.

6.6.1.4.2 Test applicability

This test applies to all types of NR UE release 15 and forward supporting 5GS NR SA FR1, CSI-RS-based RLM, BWP operation without bandwidth restriction and long DRX cycle.

6.6.1.4.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 6.6.1.0.2.

The normative reference for this requirement is TS 38.133 [6] clause A.6.6.1.4.

6.6.1.4.4 Test description

6.6.1.4.4.1 Initial conditions

This test shall be tested using any of the test configurations in Table 6.6.1.4.4.1-1.

Table 6.6.1.4.4.1-1: Supported test configurations for NR SA FR1 event-triggered reporting with gap in DRX

Test Case ID	Description
6.6.1.4-1	NR 15 kHz SSB SCS, 10MHz bandwidth, FDD duplex mode
6.6.1.4-2	NR 15 kHz SSB SCS, 10MHz bandwidth, TDD duplex mode
6.6.1.4-3	NR 30 kHz SSB SCS, 40MHz bandwidth, TDD duplex mode
Note 1: The UE is only required to be tested in one of the supported test configurations	

Configure the test equipment and the DUT according to the parameters in Table 6.6.1.4.4.1-2.

Table 6.6.1.4.4.1-2: Initial conditions for NR SA FR1 event-triggered reporting with gap in DRX

Parameter	Value		Comment
Test environment	NC		As specified in TS 38.508-1 [14] clause 4.1.
Test frequencies	As specified in Annex E, table E.4-1 and TS 38.508-1 [14] clause 4.3.1 and 4.4.2.		
Channel bandwidth	As specified by the test configuration selected from Table 6.6.1.4.4.1-1.		
Propagation conditions	AWGN		As specified in Annex C.2.2.
Connection Diagram	TE Part	A.3.1.8.2	As specified in TS 38.508-1 [14] Annex A.
	DUT Part	A.3.2.3.4	
Exceptions to connection diagram	- Without LTE link - For 4Rx capable UEs without any 2Rx RF bands use A.3.2.5.2 for DUT part and A.3.1.8.4 for TE part.		

1. The general test parameter settings are set up according to Table 6.6.1.4.4.1-3.
2. Message contents are defined in clause 6.6.1.4.4.3.
3. There is one NR carrier and two cells specified in the test. Cell 1 is the cell used for connection setup with the power level set according to Annex C.1.1 and C.1.2 for this test.

Table 6.6.1.4.4.1-3: General test parameters for NR SA FR1 event-triggered reporting with gap in DRX

Parameter	Unit	Test configuration	Value		Comment
			Test 1	Test 2	
Active cell		1, 2, 3	Cell 1		
Neighbour cell		1, 2, 3	Cell 2		Cell to be identified.
RF Channel Number		1, 2, 3	1: Cell 1 and Cell 2		
Measurement gap type		1, 2, 3	Per-UE gaps		
Measurement gap repetition periodicity	ms	1, 2, 3	40		
Measurement gap length	ms	1, 2, 3	6		
Measurement gap offset	ms	1, 2, 3	39		
SSB configuration		1	SSB.1 FR1		
		2	SSB.1 FR1		
		3	SSB.2 FR1		
SMTC configuration		1	SMTC.2		
		2	SMTC.1		
		3	SMTC.1		
CSI-RS parameters		1	CSI-RS.1.2 FDD resource #0		
		2	CSI-RS.1.2 TDD resource #0		
		3	CSI-RS.2.2 TDD resource #0		
A3-Offset	dB	1, 2, 3	-4.5		
CP length		1, 2, 3	Normal		
Hysteresis	dB	1, 2, 3	0		
Time To Trigger	s	1, 2, 3	0		
Filter coefficient		1, 2, 3	0		L3 filtering is not used
DRX	ms	1, 2, 3	DRX.1	DRX.7	
Time offset between serving and neighbour cells		1	3 ms		Asynchronous cells. The timing of Cell 2 is 3ms later than the timing of Cell 1.
		2	3 μs		Synchronous cells
		3	3 μs		Synchronous cells
T1	s	1, 2, 3	5		
T2	s	1, 2, 3	5	10	

6.6.1.4.4.2 Test procedure

Two cells are deployed in the test, which are FR1 PCell (Cell 1) and a FR1 neighbour cell (Cell 2) on the same frequency as the PCell. The general and cell specific test parameters for PCell and neighbour cell are given in Table 6.6.1.4.4.1-3 and Table 6.6.1.4.4.2-1, respectively. In the measurement control information a measurement object is configured for the frequency of the PCell, and it is indicated to the UE that event-triggered reporting with Event A3 is used. The test consists of two successive time periods, with time duration of T1, and T2 respectively. During time duration T1, the UE shall not have any timing information of Cell 2.

There are two BWPs configured in Cell 1, BWP1 which contains the cell defining SSB, and BWP2 which does not contain any SSB of Cell 1. During the whole test, BWP2 is always scheduled as the active BWP for the UE.

In Test 1 when DRX cycle = 40 ms is used, UE needs to be provided at least once every 500 ms with new Timing Advance Command MAC control element to restart the Timer Alignment Timer to keep the UE uplink time alignment. Furthermore, the UE is allocated with PUSCH resource at every DRX cycle. In Test 2 when DRX = 640 ms is used, the uplink time alignment is not maintained and the UE needs to use RACH to obtain uplink allocation for measurement reporting.

1. Ensure the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity *NR*, Connected without release *On* and Test Mode *On* according to TS 38.508-1 [14] clause 4.5.

2. Set the parameters according to T1 in Table 6.6.1.4.5-1.

3. SS shall transmit an *RRCReconfiguration* message.

4. The UE shall transmit *RRCReconfigurationComplete* message. T1 starts.

5. When T1 expires, the SS shall switch the power setting from T1 to T2 as specified in Table 6.6.1.4.5-1.

6. UE shall transmit a *MeasurementReport* message triggered by Event A3. If the overall delays measured from the beginning of time period T2 is less than 922 ms for Test 1 or less than 6402 ms for Test 2 then the number of successful tests is increased by one. If the UE fails to report the event within the overall delays measured requirement then the number of failure tests is increased by one.

7. After the SS receive the *MeasurementReport* message in step 6) or when T2 expires, the SS shall:

   - transmit *RRCRelease* message to release the RRC connection which includes the release of the established radio bearers as well as all radio resources

   OR

   - switch the UE off.

8. Set Cell 2 physical cell identity = ((current cell 2 physical cell identity + 1) mod 14 + 2) for next iteration of the test procedure loop.

9. Depending on the choice in Step 7, the SS:
   - if the RRC Connection Release has been sent, transmits in Cell 1 a Paging message (including PagingRecord with UE-Identity) for the UE and ensures the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity NR, Connected without release On according to TS 38.508-1 [14] clause 4.5 (if the paging fails, switches off and on the UE and ensures the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity NR, Connected without release On according to TS 38.508-1 [14] clause 4.5),
   OR
   - if the device has been switched off, switches on the UE and ensures the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity NR, Connected without release On according to TS 38.508-1 [14] clause 4.5.

10. Repeat step 2-9 until the confidence level according to Tables G.2.3-1 in Annex G clause G.2 is achieved.

11. Repeat step 1-10 for each sub-test in Table 6.6.1.4.4.1-3 as appropriate.

6.6.1.4.4.3 Message contents

Message contents are according to TS 38.508-1 [14] clause 4.6 with the following exceptions:

Table 6.6.1.4.4.3-1: Common Exception messages for NR SA FR1 event-triggered reporting with gap in DRX

Default Message Contents	
Common contents of system information blocks exceptions	

Default RRC messages and information elements contents exceptions	Table H.3.1-1 Table H.3.1-2 with Condition INTRA-FREQ and GAP NEEDED Table H.3.1-3 with Condition INTRA-FREQ MO, SSB.1 FR1, SMTC.2 for configuration 6.6.1.4-1 Table H.3.1-3 with Condition INTRA-FREQ MO, SSB.1 FR1, SMTC.1 and synchronous cells for configuration 6.6.1.4-2 Table H.3.1-3 with Condition INTRA-FREQ MO, SSB.2 FR1, SMTC.1 and synchronous cells for configuration 6.6.1.4-3 Table H.3.1-4 with A3-offset = -4.5dB Table H.3.1-5 with Condition INTRA-FREQ Table H.3.1-6 with Condition Pattern #0 Table H.3.1-7 with Condition INTRA-FREQ Table H.3.7-1 with Condition DRX.1 and Gap for test 1 Table H.3.7-1 with Condition DRX.7 and Gap for test 2 Table H.3.1-8 with Condition CSI-RS RLM

Table 6.6.1.4.4.3-2: *ServingCellConfig*

Derivation Path: TS 38.508-1 [14], Table 4.6.3-167			
Information Element	**Value/remark**	**Comment**	**Condition**
ServingCellConfig ::= SEQUENCE {			
downlinkBWP-ToAddModList SEQUENCE (SIZE (1..maxNrofBWPs)) OF SEQUENCE {			
BWP-Downlink[1]	BWP-Downlink with condition BWP-Id1	DLBWP.1.2 configuration	
}			
firstActiveDownlinkBWP-Id	1	Active DL BWP-ID (BWP2)	BWP-Id1
defaultDownlinkBWP-Id	0	Initial BWP (BWP1)	
uplinkConfig SEQUENCE {			
uplinkBWP-ToAddModList SEQUENCE (SIZE (1..maxNrofBWPs)) OF SEQUENCE {			
BWP-Uplink[1]	BWP-Uplink with condition BWP-Id1	ULBWP.1.2 configuration	
}			
firstActiveUplinkBWP-Id	1	Active UL BWP-ID (BWP2)	BWP-Id1
}			
}			

Condition	Explanation
BWP-Id1	Active BWP (BWP2)

6.6.1.4.5 Test requirement

Table 6.6.1.4.4.1-3 and Table 6.6.1.4.5-1 define the primary level settings including test tolerances for NR SA FR1 event-triggered reporting with gap in DRX test.

Table 6.6.1.4.5-1: NR Cell specific test parameters for NR SA FR1 event-triggered reporting with gap in DRX

Parameter	Unit	Test configuration	Cell 1		Cell 2	
			T1	T2	T1	T2
TDD configuration		1	N/A		N/A	
		2	TDDConf.1.1		TDDConf.1.1	

		3	TDDConf.2.1		TDDConf.2.1	
PDSCH RMC configuration		1	SR.1.1 FDD		N/A	
		2	SR.1.1 TDD			
		3	SR.2.1 TDD			
RMSI CORESET RMC configuration		1	CR.1.1 FDD		CR.1.1 FDD	
		2	CR.1.1 TDD		CR.1.1 TDD	
		3	CR.2.1 TDD		CR.2.1 TDD	
Dedicated CORESET RMC configuration		1	CCR.1.2 FDD		CCR.1.1 FDD	
		2	CCR.1.2 TDD		CCR.1.1 TDD	
		3	CCR.2.1 TDD		CCR.2.1 TDD	
OCNG Patterns		1, 2, 3	OP.1		OP.1	
TRS configuration		1	TRS.1.1 FDD		N/A	
		2	TRS.1.1 TDD		N/A	
		3	TRS.1.2 TDD		N/A	
Initial BWP configuration		1, 2, 3	DLBWP.0.1 ULBWP.0.1		DLBWP.0.1 ULBWP.0.1	
Active DL BWP configuration		1, 2, 3	DLBWP.1.2		DLBWP.1.1	
Active UL BWP configuration		1, 2, 3	ULBWP.1.2		ULBWP.1.1	
RLM-RS		1, 2, 3	CSI-RS		SSB	
N_{oc} Note 2	dBm/SCS	1	-98			
		2	-98			
		3	-95			
N_{oc} Note 2	dBm/15 KHz	1	-98			
		2				
		3				
$\hat{E}_s/I_{ot}$	dB	1	4	-1.46	-Infinity	-1.46
		2				
		3				
$\hat{E}_s/N_{oc}$	dB	1	4	4	-Infinity	4
		2				
		3				
SS-RSRP Note 3	dBm/SCS KHz	1	-94	-94	-Infinity	-94
		2	-94	-94	-Infinity	-94
		3	-91	-91	-Infinity	-91
Io	dBm/9.36 MHz	1	-64.60	-62.25	Specified in Cell 1 columns	
	dBm/9.36 MHz	2	-64.60	-62.25		
	dBm/38.16 MHz	3	-58.50	-56.16		
Propagation Condition		1, 2, 3	AWGN			

Note 1: The resources for uplink transmission are assigned to the UE prior to the start of time period T2.
Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for N_{oc} to be fulfilled.
Note 3: SS-RSRP levels have been derived from other parameters for information purposes. They are not settable parameters themselves.

In Test 1 when DRX cycle length = 40 ms is used, the overall delay measured is defined as the time from the beginning of time period T2, to the moment the UE send one Event A3 triggered measurement report on PUSCH.

In Test 2 when DRX cycle length = 640 ms is used, the overall delay measured is defined as the time from the beginning of time period T2, to the moment the UE starts to send preambles on the PRACH for Scheduling Request (SR) to obtain allocation to send the measurement report on PUSCH.

For both tests:

The overall delays measured in the test may be up to $2xTTI_{DCCH}$ higher than the measurement reporting delays because of TTI insertion uncertainty of the measurement report in DCCH.

NOTE 1: The actual overall delays measured in the test may be up to one DRX cycle higher than the measurement reporting delays above because UE is allowed to delay the initiation of the measurement reporting procedure to the next until the Active Time.

NOTE 2: In order to calculate the rate of correct events the system simulator shall verify that it has received correct Event A3 measurement report.

The overall delays measured test requirement is expressed as:

Overall delays measured = measurement reporting delay + TTI insertion uncertainty

Measurement reporting delay = $T_{identify_intra_without_index}$

$T_{identify_intra_without_index} = T_{PSS/SSS_sync_intra} + T_{SSB_measurement_period_intra}$

T_{PSS/SSS_sync_intra} = 600 ms for Test 1, and T_{PSS/SSS_sync_intra} =3200 ms for Test 2

$T_{SSB_measurement_period_intra}$ = 320 ms for Test 1, and $T_{SSB_measurement_period_intra}$ = 3200 ms for Test 2

TTI insertion uncertainty = 2 ms

For Test 1, the overall delays measured shall be less than a total of 922 ms (note: this gives a total of 920 ms for measurement reporting delay plus 2 ms for TTI insertion uncertainty).

For Test 2, the overall delays measured shall be less than a total of 6402 ms (note: this gives a total of 6400 ms for measurement reporting delay plus 2 ms for TTI insertion uncertainty).

For the test to pass, the total number of successful tests shall be more than 90% of the cases with a confidence level of 95%.

6.6.1.5 NR SA FR1 event-triggered reporting without gap in non-DRX with SSB index reading

6.6.1.5.1 Test purpose

The purpose of this test is to verify UE's ability to make a correct reporting of an event within intra-frequency cell search without gaps requirements.

6.6.1.5.2 Test applicability

This test applies to all types of NR UE release 15 onwards.

6.6.1.5.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 6.6.1.0.1.

The normative reference for this requirement is TS 38.133 [6] clause A.6.6.1.5.

6.6.1.5.4 Test description

6.6.1.5.4.1 Initial conditions

This test shall be tested using any of the test configurations in Table 6.6.1.5.4.1-1.

Table 6.6.1.5.4.1-1: Supported test configurations for NR SA FR1 event-triggered reporting without gap in non-DRX with SSB index reading

Configuration	Description
6.6.1.5-1	15 kHz SSB SCS, 10MHz bandwidth, FDD duplex mode
Note: The UE is only required to be tested in one of the supported test configurations.	

Configure the test equipment and the DUT according to the parameters in Table 6.6.1.5.4.1-2.

Table 6.6.1.5.4.1-2: Initial conditions for NR SA FR1 event-triggered reporting without gap in non-DRX with SSB index reading

Parameter	Value	Comment
Test environment	NC	As specified in TS 38.508-1 [14] clause 4.1.
Test frequencies	As specified in Annex E, table E.4-1 and TS 38.508-1 [14] clause 4.3.1 and 4.4.2.	

Channel bandwidth	As specified by the test configuration selected from Table 6.6.1.5.4.1-1.		
Propagation conditions	AWGN		As specified in Annex C.2.2.
Connection Diagram	TE Part	A.3.1.8.2	As specified in TS 38.508-1 [14] Annex A.
	DUT Part	A.3.2.3.4	
Exceptions to connection diagram	- Without LTE link - For 4Rx capable UEs without any 2Rx RF bands use A.3.2.5.2 for DUT part and A.3.1.8.4 for TE part.		

1. The general test parameter settings are set up according to Table 6.6.1.5.4.1-3.

2. Message contents are defined in clause 6.6.1.5.4.3.

3. There is one NR carrier and two cells specified in the test. Cell 1 is the cell used for connection setup with the power level set according to Annex C.1.1 and C.1.2 for this test.

Table 6.6.1.5.4.1-3: General test parameters for NR SA FR1 event-triggered reporting without gap in non-DRX with SSB index reading

Parameter	Unit	Test configuration	Value	Comment
Active cell		1	Cell 1	
Neighbour cell		1	Cell 2	Cell to be identified.
RF Channel Number		1	1: Cell 1 and Cell 2	
SSB configuration		1	SSB.1 FR1	
SMTC configuration		1	SMTC.2	
A3-Offset	dB	1	-4.5	
CP length		1	Normal	
Hysteresis	dB	1	0	
Time To Trigger	s	1	0	
Filter coefficient		1	0	L3 filtering is not used
DRX	ms	1		OFF
Time offset between serving and neighbour cells		1	3 ms	Asynchronous cells. The timing of Cell 2 is 3ms later than the timing of Cell 1.
T1	s	1	5	
T2	s	1	5	

6.6.1.5.4.2 Test procedure

Two cells are deployed in the test, which are FR1 PCell (Cell 1) and a FR1 neighbour cell (Cell 2) on the same frequency as the PCell. The general and cell specific test parameters for PCell and neighbour cell are given in Table 6.6.1.5.4.1-3 and Table 6.6.1.5.5-1, respectively. In the measurement control information a measurement object is configured for the frequency of the PCell, and it is indicated to the UE that event-triggered reporting with Event A3 is used. The test consists of two successive time periods, with time duration of T1, and T2 respectively. During time duration T1, the UE shall not have any timing information of Cell 2.

1. Ensure the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity *NR*, Connected without release *On* and Test Mode *On* according to TS 38.508-1 [14] clause 4.5.

2. Set the parameters according to T1 in Table 6.6.1.5.5-1.

3. SS shall transmit an *RRCReconfiguration* message.

4. The UE shall transmit *RRCReconfigurationComplete* message. T1 starts.

5. When T1 expires, the SS shall switch the power setting from T1 to T2 as specified in Table 6.6.1.5.5-1.

6. UE shall transmit a *MeasurementReport* message triggered by Event A3. If the overall delays measured from the beginning of time period T2 is less than 922 ms then the number of successful tests is increased by one. If the

UE fails to report the event within the overall delays measured requirement then the number of failure tests is increased by one.

7. After the SS receive the *MeasurementReport* message in step 6) or when T2 expires, the SS shall:

   - transmit RRCRelease message to release the RRC connection which includes the release of the established radio bearers as well as all radio resources

   OR

   - switch the UE off.

8. Set Cell 2 physical cell identity = ((current cell 2 physical cell identity + 1) mod 14 + 2) for next iteration of the test procedure loop.

9. Depending on the choice in Step 7, the SS:
   - if the RRC Connection Release has been sent, transmits in Cell 1 a Paging message (including PagingRecord with UE-Identity) for the UE and ensures the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity NR, Connected without release On according to TS 38.508-1 [14] clause 4.5 (if the paging fails, switches off and on the UE and ensures the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity NR, Connected without release On according to TS 38.508-1 [14] clause 4.5),
   OR
   - if the device has been switched off, switches on the UE and ensures the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity NR, Connected without release On according to TS 38.508-1 [14] clause 4.5.

10. Repeat step 2-9 until the confidence level according to Tables G.2.3-1 in Annex G clause G.2 is achieved.

6.6.1.5.4.3 Message contents

Message contents are according to TS 38.508-1 clause 4.6 with the following exceptions:

Table 6.6.1.5.4.3-1: Common Exception messages for NR SA FR1 event-triggered reporting without gap in non-DRX with SSB index reading

Default Message Contents	
Common contents of system information blocks exceptions	
Default RRC messages and information elements contents exceptions	Table H.3.1-1 Table H.3.1-2 with Condition INTRA-FREQ Table H.3.1-3 with Condition INTRA-FREQ MO, SSB.1 FR1, SMTC.2 for Configuration 6.6.1.5-1 Table H.3.1-4 with SSB Index and A3-offset = -4.5 dB Table H.3.1-5 with Condition INTRA-FREQ Table H.3.1-7 with Condition INTRA-FREQ and SSB Index Table H.3.1-8 with Condition SSB RLM

6.6.1.5.5 Test requirement

Table 6.6.1.5.4.1-3 and Table 6.6.1.5.5-1 define the primary level settings including test tolerances for SA event triggered reporting without gap under non-DRX with SSB index reading test.

Table 6.6.1.5.5-1: NR Cell specific test parameters for NR SA FR1 event-triggered reporting without gap in non-DRX with SSB index reading

Parameter	Unit	Test configuration	Cell 1		Cell 2	
			T1	T2	T1	T2
TDD configuration		1	N/A		N/A	
PDSCH RMC configuration		1	SR.1.1 FDD		N/A	
RMSI CORESET RMC configuration		1	CR.1.1 FDD		CR.1.1 FDD	
Dedicated CORESET RMC configuration		1	CCR.1.1 FDD		CCR.1.1 FDD	

OCNG Patterns		1	OP.1		OP.1	
TRS configuration		1	TRS.1.1 FDD		N/A	
Initial BWP configuration		1	DLBWP.0.1 ULBWP.0.1		DLBWP.0.1 ULBWP.0.1	
Active DL BWP configuration		1	DLBWP.1.1		DLBWP.1.1	
Active UL BWP configuration		1	ULBWP.1.1		ULBWP.1.1	
RLM-RS		1	SSB		SSB	
N_{oc} Note 2	dBm/SCS	1	-98			
N_{oc} Note 2	dBm/15 KHz	1	-98			
$\hat{E}_s/I_{ot}$	dB	1	4	-1.46	-Infinity	-1.46
$\hat{E}_s/N_{oc}$	dB	1	4	4	-Infinity	4
SS-RSRP Note 3	dBm/SCS KHz	1	-94	-94	-Infinity	-94
Io	dBm/9.36 MHz	1	-64.60	-62.25	Specified in Cell 1 columns	
Propagation Condition		1	AWGN			

Note 1: The resources for uplink transmission are assigned to the UE prior to the start of time period T2.

Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for N_{oc} to be fulfilled.

Note 3: SS-RSRP levels have been derived from other parameters for information purposes. They are not settable parameters themselves.

The overall delays measured is defined as the time from the beginning of time period T2, to the moment the UE send one Event A3 triggered measurement report.

The overall delays measured in the test may be up to $2xTTI_{DCCH}$ higher than the measurement reporting delays because of TTI insertion uncertainty of the measurement report in DCCH.

The overall delays measured test requirement is expressed as:

Overall delays measured = measurement reporting delay + TTI insertion uncertainty

Measurement reporting delay = $T_{identify_intra_with_index}$

$T_{identify_intra_with_index} = T_{PSS/SSS_sync_intra} + T_{SSB_measurement_period_intra} + T_{SSB_time_index_intra}$

T_{PSS/SSS_sync_intra} = 600 ms

$T_{SSB_time_index_intra}$ = 120 ms

$T_{SSB_measurement_period_intra}$ = 200 ms

TTI insertion uncertainty = 2 ms

The overall delays measured shall be less than a total of 922 ms in this test case (note: this gives a total of 920 ms for measurement reporting delay plus 2 ms for TTI insertion uncertainty).

For the test to pass, the total number of successful tests shall be more than 90% of the cases with a confidence level of 95%.

6.6.1.6 NR SA FR1 event-triggered reporting with gap in non-DRX with SSB index reading

6.6.1.6.1 Test purpose

The purpose of this test is to verify UE's ability to make a correct reporting of an event within intra-frequency cell search with gaps requirements.

6.6.1.6.2 Test applicability

This test applies to all types of NR UE release 15 onwards supporting 5GS NR SA FR1, CSI-RS-based RLM and BWP operation without bandwidth restriction.

6.6.1.6.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 6.6.1.0.4.

The normative reference for this requirement is TS 38.133 [6] clause A.6.6.1.6.

6.6.1.6.4 Test description

6.6.1.6.4.1 Initial conditions

This test shall be tested using any of the test configurations in Table 6.6.1.6.4.1-1.

Table 6.6.1.6.4.1-1: Supported test configurations for NR SA FR1 event-triggered reporting with gap in non-DRX with SSB index reading

Configuration	Description
6.6.1.6-1	15 kHz SSB SCS, 10MHz bandwidth, FDD duplex mode
Note: The UE is only required to be tested in one of the supported test configurations.	

Configure the test equipment and the DUT according to the parameters in Table 6.6.1.3.4.1-2.

Table 6.6.1.6.4.1-2: Initial conditions for NR SA FR1 event-triggered reporting with gap in non-DRX with SSB index reading

Parameter	Value		Comment
Test environment	NC		As specified in TS 38.508-1 [14] clause 4.1.
Test frequencies	As specified in Annex E, table E.4-1 and TS 38.508-1 [14] clause 4.3.1 and 4.4.2.		
Channel bandwidth	As specified by the test configuration selected from Table 6.6.1.6.4.1-1.		
Propagation conditions	AWGN		As specified in Annex C.2.2.
Connection Diagram	TE Part	A.3.1.8.2	As specified in TS 38.508-1 [14] Annex A.
	DUT Part	A.3.2.3.4	
Exceptions to connection diagram	- Without LTE link - For 4Rx capable UEs without any 2Rx RF bands use A.3.2.5.2 for DUT part and A.3.1.8.4 for TE part.		

1. The general test parameter settings are set up according to Table 6.6.1.6.4.1-3.
2. Message contents are defined in clause 6.6.1.6.4.3.
3. There is one NR carrier and two cells specified in the test. Cell 1 is the cell used for connection setup with the power level set according to Annex C.1.1 and C.1.2 for this test.

Table 6.6.1.6.4.1-3: General test parameters for NR SA FR1 event-triggered reporting with gap in non-DRX with SSB index reading

Parameter	Unit	Test configuration	Value	Comment
Active cell		1	Cell 1	
Neighbour cell		1	Cell 2	Cell to be identified.
RF Channel Number		1	1: Cell 1 and Cell 2	
Measurement gap type		1	Per-UE gaps	
Measurement gap repetition periodicity	ms	1	40	
Measurement gap length	ms	1	6	
Measurement gap offset	ms	1	39	
SSB configuration		1	SSB.1 FR1	

SMTC configuration		1	SMTC.2	
CSI-RS parameters		1	CSI-RS.1.2 FDD resource #0	
A3-Offset	dB	1	-4.5	
CP length		1	Normal	
Hysteresis	dB	1	0	
Time To Trigger	s	1	0	
Filter coefficient		1	0	L3 filtering is not used
DRX	ms	1		OFF
Time offset between serving and neighbour cells		1	3 ms	Asynchronous cells. The timing of Cell 2 is 3ms later than the timing of Cell 1.
T1	s	1	5	
T2	s	1	5	

6.6.1.6.4.2 Test procedure

Two cells are deployed in the test, which are FR1 PCell (Cell 1) and a FR1 neighbour cell (Cell 2) on the same frequency as the PCell. The general and cell specific test parameters for PCell and neighbour cell are given in Table 6.6.1.6.4.1-3 and Table 6.6.1.6.5-1, respectively. In the measurement control information a measurement object is configured for the frequency of the PCell, and it is indicated to the UE that event-triggered reporting with Event A3 is used. The test consists of two successive time periods, with time duration of T1, and T2 respectively. During time duration T1, the UE shall not have any timing information of Cell 2.

There are two BWPs configured in Cell 1, BWP1 which contains the cell defining SSB, and BWP2 which does not contain any SSB of Cell 1. During the whole test, BWP2 is always scheduled as the active BWP for the UE.

1. Ensure the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity *NR*, Connected without release *On* and Test Mode *On* according to TS 38.508-1 [14] clause 4.5.

2. Set the parameters according to T1 in Table 6.6.1.6.5-1.

3. SS shall transmit an RRCReconfiguration message.

4. The UE shall transmit RRCReconfigurationComplete message. T1 starts.

5. When T1 expires, the SS shall switch the power setting from T1 to T2 as specified in Table 6.6.1.3.5-1.

6. UE shall transmit a MeasurementReport message triggered by Event A3. If the overall delays measured from the beginning of time period T2 is less than 922 ms then the number of successful tests is increased by one. If the UE fails to report the event within the overall delays measured requirement then the number of failure tests is increased by one.

7. After the SS receive the MeasurementReport message in step 6) or when T2 expires, the SS shall:

   - transmit RRCRelease message to release the RRC connection which includes the release of the established radio bearers as well as all radio resources

   OR

   - switch the UE off.

8. Set Cell 2 physical cell identity = ((current cell 2 physical cell identity + 1) mod 14 + 2) for next iteration of the test procedure loop.

9. Depending on the choice in Step 7, the SS:
   - if the RRC Connection Release has been sent, transmits in Cell 1 a Paging message (including PagingRecord with UE-Identity) for the UE and ensures the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity NR, Connected without release On according to TS 38.508-1 [14] clause 4.5 (if the paging fails, switches off and on the UE and ensures the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity NR, Connected without release On according to TS 38.508-1 [14] clause 4.5),
   OR
   - if the device has been switched off, switches on the UE and ensures the UE is in state RRC_CONNECTED

with generic procedure parameters Connectivity NR, Connected without release On according to TS 38.508-1 [14] clause 4.5.

10. Repeat step 2-9 until the confidence level according to Tables G.2.3-1 in Annex G clause G.2 is achieved.

6.6.1.6.4.3 Message contents

Message contents are according to TS 38.508-1 clause 4.6 with the following exceptions:

Table 6.6.1.6.4.3-1: Common Exception messages for NR SA FR1 event-triggered reporting with gap in non-DRX with SSB index reading

Default Message Contents	
Common contents of system information blocks exceptions	
Default RRC messages and information elements contents exceptions	Table H.3.1-1 Table H.3.1-2 with Condition INTRA-FREQ and GAP NEEDED Table H.3.1-3 with Condition INTRA-FREQ MO, SSB.1 FR1, SMTC.2 for Configuration 6.6.1.6-1 Table H.3.1-4 with SSB index and A3-offset = -4.5dB. Table H.3.1-5 with Condition INTRA-FREQ Table H.3.1-6 with Condition Pattern #0 Table H.3.1-7 with Condition INTRA-FREQ and SSB index Table H.3.1-8 with Condition CSI-RS RLM

Table 6.6.1.6.4.3-2: *ServingCellConfig*

Derivation Path: TS 38.508-1 [14], Table 4.6.3-167			
Information Element	**Value/remark**	**Comment**	**Condition**
ServingCellConfig ::= SEQUENCE {			
downlinkBWP-ToAddModList SEQUENCE (SIZE (1..maxNrofBWPs)) OF SEQUENCE {			
BWP-Downlink[1]	BWP-Downlink with condition BWP-Id1	DLBWP.1.2 configuration	
}			
firstActiveDownlinkBWP-Id	1	Active DL BWP-ID (BWP2)	BWP-Id1
defaultDownlinkBWP-Id	0	Initial BWP (BWP1)	
uplinkConfig SEQUENCE {			
uplinkBWP-ToAddModList SEQUENCE (SIZE (1..maxNrofBWPs)) OF SEQUENCE {			
BWP-Uplink[1]	BWP-Uplink with condition BWP-Id1	ULBWP.1.2 configuration	
}			
firstActiveUplinkBWP-Id	1	Active UL BWP-ID (BWP2)	BWP-Id1
}			
}			

Condition	Explanation
BWP-Id1	Active BWP (BWP2)

6.6.1.6.5 Test requirement

Table 6.6.1.6.4.1-3 and Table 6.6.1.6.5-1 define the primary level settings including test tolerances for SA event triggered reporting tests with per-UE gaps under non-DRX with SSB index reading test.

Table 6.6.1.6.5-1: NR Cell specific test parameters for NR SA FR1 event-triggered reporting with gap in non-DRX with SSB index reading

Parameter	Unit	Test configuration	Cell 1		Cell 2	
			T1	T2	T1	T2

TDD configuration		1	N/A		N/A	
PDSCH RMC configuration		1	SR.1.1 FDD		N/A	
RMSI CORESET RMC configuration		1	CR.1.1 FDD		CR.1.1 FDD	
Dedicated CORESET RMC configuration		1	CCR.1.2 FDD		CCR.1.1 FDD	
OCNG Patterns		1	OP.1		OP.1	
TRS configuration		1	TRS.1.1 FDD		N/A	
Initial BWP configuration		1	DLBWP.0.1 ULBWP.0.1		DLBWP.0.1 ULBWP.0.1	
Active DL BWP configuration		1	DLBWP.1.2		DLBWP.1.1	
Active UL BWP configuration		1	ULBWP.1.2		ULBWP.1.1	
RLM-RS		1	CSI-RS		SSB	
N_{oc} Note 2	dBm/SCS	1	-98			
N_{oc} Note 2	dBm/15 KHz	1	-98			
$\hat{E}_s / I_{ot}$	dB	1	4	-1.46	-Infinity	-1.46
$\hat{E}_s / N_{oc}$	dB	1	4	4	-Infinity	4
SS-RSRP Note 3	dBm/SCS KHz	1	-94	-94	-Infinity	-94
Io	dBm/9.36 MHz	1	-64.60	-62.25	Specified in Cell 1 columns	
Propagation Condition		1	AWGN			

Note 1: The resources for uplink transmission are assigned to the UE prior to the start of time period T2.

Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for N_{oc} to be fulfilled.

Note 3: SS-RSRP levels have been derived from other parameters for information purposes. They are not settable parameters themselves.

The overall delays measured is defined as the time from the beginning of time period T2, to the moment the UE send one Event A3 triggered measurement report.

The overall delays measured in the test may be up to 2xTTIDCCH higher than the measurement reporting delays because of TTI insertion uncertainty of the measurement report in DCCH.

The overall delays measured test requirement is expressed as:

Overall delays measured = measurement reporting delay + TTI insertion uncertainty

Measurement reporting delay = $T_{identify_intra_with_index}$

$T_{identify_intra_with_index} = T_{PSS/SSS_sync_intra} + T_{SSB_measurement_period_intra} + T_{SSB_time_index_intra}$

T_{PSS/SSS_sync_intra} = 600 ms

$T_{SSB_time_index_intra}$ = 120 ms

$T_{SSB_measurement_period_intra}$ = 200 ms

TTI insertion uncertainty = 2 ms

The overall delays measured shall be less than a total of 922 ms in this test case (note: this gives a total of 920 ms for measurement reporting delay plus 2 ms for TTI insertion uncertainty).

For the test to pass, the total number of successful tests shall be more than 90% of the cases with a confidence level of 95%.

6.6.1.7 NR SA FR1 event-triggered reporting without gap in DRX for UE configured with highSpeedMeasFlag-r16

6.6.1.7.1 Test purpose

To verify the UE's ability to make a correct reporting of an event within intra-frequency cell search without gap under DRX for UE configured with highSpeedMeasFlag-r16.

6.6.1.7.2 Test applicability

This test applies to all types of NR UE release 15 onwards that supports measurement enhancements in high speed scenario.

6.6.1.7.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 6.6.1.0.1.

The normative reference for this requirement is TS 38.133 [6] clause A.6.6.1.7.

6.6.1.7.4 Test description

6.6.1.7.4.1 Initial conditions

This test shall be tested using any of the test configurations in Table 6.6.1.7.4.1-1.

Table 6.6.1.7.4.1-1: Supported test configurations for NR SA FR1 event-triggered reporting without gap in DRX for UE configured with highSpeedMeasFlag-r16

Configuration	Description
6.6.1.7-1	15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode
6.6.1.7-2	15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode
6.6.1.7-3	30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode
Note: The UE is only required to be tested in one of the supported test configurations.	

Configure the test equipment and the DUT according to the parameters in Table 6.6.1.7.4.1-2.

Table 6.6.1.7.4.1-2: Initial conditions for NR SA FR1 event-triggered reporting without gap in DRX for UE configured with highSpeedMeasFlag-r16

Parameter	Value		Comment
Test environment	NC		As specified in TS 38.508-1 [14] clause 4.1.
Test frequencies	As specified in Annex E, table E.4-1 and TS 38.508-1 [14] clause 4.3.1.		
Channel bandwidth	As specified by the test configuration selected from Table 6.6.1.2.4.1-1.		
Propagation conditions	AWGN		As specified in Annex C.2.2.
Connection Diagram	TE Part	A.3.1.8.2	As specified in TS 38.508-1 [14] Annex A.
	DUT Part	A.3.2.3.4	
Exceptions to connection diagram	- Without LTE link - For 4Rx capable UEs without any 2Rx RF bands use A.3.2.5.2 for DUT part and A.3.1.8.4 for TE part.		

1. The test parameters for PCell and neighbour cell are given in Table 6.6.1.7.4.1-3 below.

2. Message contents are defined in clause 6.6.1.7.4.3.

3. There is one carrier and two cells specified in the test. NR Cell 1 is the cell used for connection setup with the power level set according to Annex C.1.1 and C.1.2 for this test.

Table 6.6.1.7.4.1-3: General test parameters for SA intra-frequency event triggered reporting tests without gap for FR1 under DRX for UE configured with highSpeedMeasFlag-r16

Parameter	Unit	Test configuration	Value	Comment
highSpeedMeasFlag-r16		1,2,3	Present	To enable high speed measurement enhancements
Active cell		1, 2, 3	Cell 1	
Neighbour cell		1, 2, 3	Cell 2	Cell to be identified.
RF Channel Number		1, 2, 3	1: Cell 1 and Cell 2	
SSB configuration		1	SSB.1 FR1	
		2	SSB.1 FR1	
		3	SSB.2 FR1	
SMTC configuration		1	SMTC.2	
		2	SMTC.1	
		3	SMTC.1	
A3-Offset	dB	1, 2, 3	-4.5	
CP length		1, 2, 3	Normal	
Hysteresis	dB	1, 2, 3	0	
Time To Trigger	s	1, 2, 3	0	
Filter coefficient		1, 2, 3	0	L3 filtering is not used
DRX		1, 2, 3	DRX.7	640ms DRX cycle
Time offset between serving and neighbour cells		1	3 ms	Asynchronous cells. The timing of Cell 2 is 3ms later than the timing of Cell 1.
		2	3 μs	Synchronous cells
		3	3 μs	Synchronous cells
T1	s	1, 2, 3	5	
T2	s	1, 2, 3	6	

6.6.1.7.4.2 Test procedure

Two cells are deployed in the test, which are FR1 PCell (NR Cell 1) and a FR1 neighbour cell (NR Cell 2) on the same frequency as the PCell. The general and cell specific test parameters for PCell and neighbour cell are given in Table 6.6.1.7.4.1-3 and Table 6.6.1.7.5-1, respectively. In the measurement control information a measurement object is configured for the frequency of the PCell, and it is indicated to the UE that event-triggered reporting with Event A3 is used. The test consists of two successive time periods, with time duration of T1, and T2 respectively. During time duration T1, the UE shall not have any timing information of NR Cell 2.

1. Ensure the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity *NR*, Connected without release *On* and Test Mode *On* according to TS 38.508-1 [14] clause 4.5.

2. Set the parameters according to T1 in Table 6.6.1.7.5-1.

3. SS shall transmit an *RRCReconfiguration* message.

4. The UE shall transmit *RRCReconfigurationComplete* message. T1 starts.

5. When T1 expires, the SS shall switch the power setting from T1 to T2 as specified in Table 6.6.1.7.5-1. T2 starts.

6. UE shall transmit a *MeasurementReport* message triggered by Event A3. If the overall delays measured from the beginning of time period T2 is less than 5122 ms then the number of successful tests is increased by one. If the UE fails to report the event within the overall delays measured requirement then the number of failure tests is increased by one.

7. After the SS receive the *MeasurementReport* message in step 6) or when T2 expires, the SS shall:

   - transmit *RRCRelease* message to release the RRC connection which includes the release of the established radio bearers as well as all radio resources

   OR

   - switch the UE off.

8. Set NR Cell 2 physical cell identity = ((current cell 2 physical cell identity + 1) mod 1008) for next iteration of the test procedure loop.

9. Depending on the choice in Step 7, the SS:
   - if the RRC Connection Release has been sent, transmits in NR Cell 1 a Paging message (including PagingRecord with UE-Identity) for the UE and ensures the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity *NR*, Connected without release *On* according to TS 38.508-1 [14] clause 4.5 (if the paging fails, switches off and on the UE and ensures the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity *NR*, Connected without release *On* according to TS 38.508-1 [14] clause 4.5),
   OR
   - if the device has been switched off, switches on the UE and ensures the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity *NR*, Connected without release *On* according to TS 38.508-1 [14] clause 4.5.

10. Repeat step 2-9 until the confidence level according to Tables G.2.3-1 in Annex G clause G.2 is achieved.

6.6.1.7.4.3 Message contents

Message contents are according to TS 38.508-1 [14] clause 4.6 with the following exceptions:

Table 6.6.1.7.4.3-1: Common Exception messages for SA intra frequency event triggered reporting tests without gap under DRX for UE configured with highSpeedMeasFlag-r16

Default Message Contents	
Common contents of system information blocks exceptions	Table H.2.1-3 with Condition HighSpeedMeas
Default RRC messages and information elements contents exceptions	Table H.3.1-1 Table H.3.1-2 Table H.3.1-4 with A3-offset = -4.5dB Table H.3.1-5 Table H.3.1-7 with Condition INTRA-FREQ Table H.3.1-8 with Condition SSB RLM Table H.3.7-1 with Condition DRX.7 and Offset
Specific message contents exceptions for Test Configuration 6.6.1.7-1	Table H.3.1-3 with Condition INTRA-FREQ MO Table 7.3.1-3 in TS 38.508-1 [14] with condition SMTC.2 Table 7.3.1-3a in TS 38.508-1 [14] with condition SSB.1 FR1
Specific message contents exceptions for Test Configuration 6.6.1.7-2	Table H.3.1-3 with Condition INTRA-FREQ MO and synchronous cells Table 7.3.1-3 in TS 38.508-1 [14] with condition SMTC.1 Table 7.3.1-3a in TS 38.508-1 [14] with condition SSB.1 FR1
Specific message contents exceptions for Test Configuration 6.6.1.7-3	Table H.3.1-3 with Condition INTRA-FREQ MO and synchronous cells Table 7.3.1-3 in TS 38.508-1 [14] with condition SMTC.1 Table 7.3.1-3a in TS 38.508-1 [14] with condition SSB.2 FR1

6.6.1.7.5 Test requirement

Table 6.6.1.7.4.1-3 and Table 6.6.1.7.5-1 define the primary level settings including test tolerances for NR event triggered reporting in synchronous cells when DRX is used

Table 6.6.1.7.5-1: NR Cell specific test parameters for SA intra-frequency event triggered reporting tests without gap under DRX for UE configured with highSpeedMeasFlag-r16

Parameter	Unit	Test configuration	Cell 1		Cell 2	
			T1	T2	T1	T2
TDD configuration		1	TN/A		TN/A	
		2	TDDConf.1.1		TDDConf.1.1	
		3	TDDConf.2.1		TDDConf.2.1	
PDSCH RMC configuration		1	SR.1.1 FDD		N/A	
		2	SR.1.1 TDD			
		3	SR.2.1 TDD			
		1	CR.1.1 FDD		CR.1.1 FDD	
		2	CR.1.1 TDD		CR.1.1 TDD	

RMSI CORESET RMC configuration		3	CR.2.1 TDD		CR.2.1 TDD	
Dedicated CORESET RMC configuration		1	CCR.1.1 FDD		CCR.1.1 FDD	
		2	CCR.1.1 TDD		CCR.1.1 TDD	
		3	CCR.2.1 TDD		CCR.2.1 TDD	
OCNG Patterns		1, 2, 3	OP.1		OP.1	
TRS configuration		1	TRS.1.1 FDD		N/A	
		2	TRS.1.1 TDD		N/A	
		3	TRS.1.2 TDD		N/A	
Initial BWP configuration		1, 2, 3	DLBWP.0.1 ULBWP.0.1		DLBWP.0.1 ULBWP.0.1	
Active DL BWP configuration		1, 2, 3	DLBWP.1.1		DLBWP.1.1	
Active UL BWP configuration		1, 2, 3	ULBWP.1.1		ULBWP.1.1	
RLM-RS		1, 2, 3	SSB		SSB	
N_{oc} Note 2	dBm/SCS	1	-98			
		2	-98			
		3	-95			
N_{oc} Note 2	dBm/15 kHz	1	-98			
		2				
		3				
$\hat{E}_s/I_{ot}$	dB	1	4	-1.46	-Infinity	-1.46
		2				
		3				
$\hat{E}_s/N_{oc}$	dB	1	4	4	-Infinity	4
		2				
		3				
SS-RSRP Note 3	dBm/SCS kHz	1	-94+TT	-94	-Infinity	-94
		2	-94	-94	-Infinity	-94
		3	-91	-91	-Infinity	-91
Io	dBm/9.36 MHz	1	-64.60	-62.25	-64.60	-62.25
	dBm/9.36 MHz	2	-64.60	-62.25T	-64.60	-62.25
	dBm/38.16 MHz	3	-58.50	-56.16	-58.50	-56.16
Propagation Condition		1, 2	AWGN		AWGN 1944Hz Note 4	
		3	AWGN		AWGN 3334Hz Note 5	

Note 1: The resources for uplink transmission are assigned to the UE prior to the start of time period T2.

Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for N_{oc} to be fulfilled.

Note 3: SS-RSRP levels have been derived from other parameters for information purposes. They are not settable parameters themselves.

Note 4: The AWGN 1944 Hz condition is a non fading propagation channel with one tap. Doppler shift is a constant 1944Hz.

Note 5: The AWGN 3334 Hz condition is a non fading propagation channel with one tap. Doppler shift is a constant 3334Hz.

The overall delays measured is defined as the time from the beginning of time period T2 to the moment the UE send one Event A3 triggered measurement report to NR Cell 2. When DRX cycle length = 640 ms, the overall delay measured is defined as the time from the beginning of time period T2 to the moment the UE starts to send preambles on the PRACH for Scheduling Request (SR) to obtain allocation to send the measurement report to NR Cell 2 on PUSCH.

The overall delays measured in the test may be up to $2xTTI_{DCCH}$ higher than the measurement reporting delays because of TTI insertion uncertainty of the measurement report in DCCH.

The overall delay measured when DRX cycle length is 640 ms test requirement is expressed as:

Overall delays measured = measurement reporting delay + TTI insertion uncertainty

Measurement reporting delay = $T_{identify_intra_without_index}$

$T_{identify_intra_without_index} = (T_{PSS/SSS_sync_intra} + T_{SSB_measurement_period_intra})$ ms

T_{PSS/SSS_sync_intra} = ceil(5 × K_p) × DRX cycle × $CSSF_{intra}$ = 3200ms

$T_{SSB_measurement_period_intra}$ = ceil(Y × K_p) × DRX cycle × $CSSF_{intra}$ = 1920ms

TTI insertion uncertainty = 2 ms

The overall delay measured when DRX cycle length is 640 ms shall be less than a total of 5122 ms.

For the test to pass, the total number of successful tests shall be more than 90% of the cases with a confidence level of 95%.

6.6.1.8 NR SA FR1 event triggered reporting without gap in DRX for UE configured with highSpeedMeasCA-Scell-r17

Editor's Note: This test case is incomplete in following aspects:

- TT analysis is missing.

6.6.1.8.1 Test purpose

The purpose of this test is to verify TBD

6.6.1.8.2 Test applicability

This test applies to all types of E-UTRA UE release 16 and forward supporting enhanced NR CA measurement requirements in high-speed scenario.

6.6.1.8.3 Minimum conformance requirements

The minimum conformance requirements are defined in clause 6.6.1.0.1

The normative reference for this requirement is TS 38.133 [6] clause A.6.6.1.8.

6.6.1.8.4 Test description

6.6.1.8.4.1 Initial conditions

This test shall be tested using any of the test configurations in Table 6.6.1.8.4.1-1.

Table 6.6.1.8.4.1-1: Supported test configurations for NR SA FR1 event triggered reporting without gap in DRX for UE configured with highSpeedMeasCA-Scell-r17

Configuration	Description
6.6.1.8-1	15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode
6.6.1.8-2	15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode
6.6.1.8-3	30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode
Note: The UE is only required to be tested in one of the supported test configurations.	

Configure the test equipment and the DUT according to the parameters in Table 6.6.1.8.4.1-2.

Table 6.6.1.8.4.1-2: Initial conditions for NR SA FR1 event triggered reporting without gap in DRX for UE configured with highSpeedMeasCA-Scell-r17

Parameter	Value		Comment
Test environment	NC		As specified in TS 38.508-1 [14] clause 4.1.
Test frequencies	As specified in Annex E, table E.2-1 and TS 38.508-1 [14] clause 4.3.1.		
Channel bandwidth	As specified by the test configuration selected from Table 6.6.1.8.4.1-1.		
Propagation conditions	AWGN		As specified in clause C.2.1.
Connection Diagram	TE Part	A.3.1.8.2	As specified in TS 38.508-1 [14] Annex A.
	DUT Part	A.3.2.3.4	
Exceptions to connection diagram	- Without LTE link - For 4Rx capable UEs without any 2Rx RF bands use A.3.2.5.2 for DUT part and A.3.1.8.4 for TE part.		

1. The general test parameter settings are set up according to Table 6.6.1.8.4.1-3.

2. Message contents are defined in clause 6.6.1.8.4.3.

3. There is two carriers and three cells specified in the test. NR Cell 1 is the PCell used for connection setup with the power level set according to Annex C.1.1 and C.1.2 for this test. NR Cell 2 is is a FR1 deactivated SCell and NR Cell 3 is a neighbour cell on the same frequency as the SCell.

Table 6.6.1.8.4.1-3: General test parameters for NR SA FR1 event triggered reporting without gap in DRX for UE configured with highSpeedMeasCA-Scell-r17

Parameter	Unit	Test configuration	Value	Comment
highSpeedMeasCA-Scell-r17		1,2,3	Present	To enable high speed measurement enhancements
Active cell		1, 2, 3	Cell 1	
Neighbour cell		1, 2, 3	Cell 2	Cell to be identified.
RF Channel Number		1, 2, 3	1: Cell 1 2: Cell 2 and Cell 3	
SSB configuration		1	SSB.1 FR1	
		2	SSB.1 FR1	
		3	SSB.2 FR1	
SMTC configuration		1	SMTC.2	
		2	SMTC.1	
		3	SMTC.1	
A6-Offset	dB	1, 2, 3	-4.5	
CP length		1, 2, 3	Normal	
Hysteresis	dB	1, 2, 3	0	
Time To Trigger	s	1, 2, 3	0	
Filter coefficient		1, 2, 3	0	L3 filtering is not used
DRX		1, 2, 3	DRX.6	
measCycleSCell		1, 2, 3	640ms	
Time offset between serving and neighbour cells		1	3 ms	Asynchronous cells. The timing of Cell 2 is 3ms later than the timing of Cell 1.
		2	3 μs	Synchronous cells
		3	3 μs	Synchronous cells
T1	s	1, 2, 3	5	
T2	s	1, 2, 3	10	

6.6.1.8.4.2 Test procedure

Same test procedure as in 6.6.1.7.4.2 except following step 6:

6. UE shall transmit a *MeasurementReport* message triggered by Event A3. If the overall delays measured from the beginning of time period T2 is less than 5760 ms then the number of successful tests is increased by one. If the UE fails to report the event within the overall delays measured requirement, then the number of failure tests is increased by one.

6.6.1.8.4.3 Message contents

Table 6.6.1.8.4.3-1: Common Exception messages for NR SA FR1 event triggered reporting without gap in DRX for UE configured with highSpeedMeasCA-Scell-r17

Default Message Contents	
Common contents of system information blocks exceptions	
Default RRC messages and information elements contents exceptions	Table H.3.1-1 Table H.3.1-2 Table H.3.1-5 Table H.3.1-7 with Condition INTRA-FREQ Table H.3.1-8 with Condition SSB RLM Table H.3.7-1 with Condition DRX.6

Specific message contents exceptions for Test Configuration 6.6.1.8-1	Table H.3.1-3 with Condition INTRA-FREQ MO Table 7.3.1-3 in TS 38.508-1 [14] with condition SMTC.2 Table 7.3.1-3a in TS 38.508-1 [14] with condition SSB.1 FR1
Specific message contents exceptions for Test Configuration 6.6.1.8-2	Table H.3.1-3 with Condition INTRA-FREQ MO and synchronous cells Table 7.3.1-3 in TS 38.508-1 [14] with condition SMTC.1 Table 7.3.1-3a in TS 38.508-1 [14] with condition SSB.1 FR1
Specific message contents exceptions for Test Configuration 6.6.1.8-3	Table H.3.1-3 with Condition INTRA-FREQ MO and synchronous cells Table 7.3.1-3 in TS 38.508-1 [14] with condition SMTC.1 Table 7.3.1-3a in TS 38.508-1 [14] with condition SSB.2 FR1

Table 6.6.1.8.4.3-2: ReportConfigNR-DEFAULT(a6-offset): NR report configuration for event A6

Derivation Path: 38.508-1 [14] Table 4.6.3-142 with condition EVENT_A6			
Information Element	**Value/remark**	**Comment**	**Condition**
ReportConfigNR::= SEQUENCE {			
reportType CHOICE {			
eventTriggered SEQUENCE {			
eventId CHOICE {			
eventA6 SEQUENCE {			
a6-Offset CHOICE {			
rsrp	-9	The actual value is field value * 0.5 dB.	
}			
hysteresis	0		
timeToTrigger	ms0		
}			
}			
}			
}			
}			

Table 6.6.1.8.4.3-3: ServingCellConfigCommon

Derivation Path: TS 38.508-1[14], Table 4.6.3-168 with condition R17 HST FR1			
Information Element	**Value/remark**	**Comment**	**Condition**
ServingCellConfigCommon ::= SEQUENCE {			
HighSpeedConfig-v1700 SEQUENCE {			
highSpeedMeasCA-Scell-r17	true		
}			
}			

Table 6.6.1.8.4.3-4: MeasObjectNR-DEFAULT: measCycleSCell configuration for SCell intra-frequency measurements

Derivation Path: TS 38.508-1 [14], Table 4.6.3-76			
Information Element	**Value/remark**	**Comment**	**Condition**
MeasObjectNR::= SEQUENCE {			
measCycleSCell-v1530	sf160		
}			

6.6.1.8.5 Test requirement

Table 6.6.1.8.5-1 defines the primary level settings including test tolerances for EN-DC FR1 interruptions at SRS carrier based switching in asynchronous EN-DC.

Table 6.6.1.8.5-1: NR cell specific test parameters for NR SA FR1 event triggered reporting without gap in DRX for UE configured with highSpeedMeasCA-Scell-r17

Parameter	Unit	Test configuration	Cell 1		Cell 2		Cell 3	
TDD configuration		1	N/A		N/A		N/A	
		2	TDDConf.1.1		TDDConf.1.1		TDDConf.1.1	
		3	TDDConf.2.1		TDDConf.2.1		TDDConf.2.1	
PDSCH RMC configuration		1	SR.1.1 FDD		N/A		N/A	
		2	SR.1.1 TDD					
		3	SR.2.1 TDD					
RMSI CORESET RMC configuration		1	CR.1.1 FDD		N/A		N/A	
		2	CR.1.1 TDD		N/A		N/A	
		3	CR.2.1 TDD		N/A		N/A	
Dedicated CORESET RMC configuration		1	CCR.1.1 FDD		N/A		N/A	
		2	CCR.1.1 TDD		N/A		N/A	
		3	CCR.2.1 TDD		N/A		N/A	
OCNG Patterns		1, 2, 3	OP.1		OP.1		OP.1	
TRS configuration		1	TRS.1.1 FDD		N/A		N/A	
		2	TRS.1.1 TDD		N/A		N/A	
		3	TRS.1.2 TDD		N/A		N/A	
Initial BWP configuration		1, 2, 3	DLBWP.0.1 ULBWP.0.1		DLBWP.0.1 ULBWP.0.1		DLBWP.0.1 ULBWP.0.1	
Active DL BWP configuration		1, 2, 3	DLBWP.1.1		DLBWP.1.1		DLBWP.1.1	
Active UL BWP configuration		1, 2, 3	ULBWP.1.1		ULBWP.1.1		ULBWP.1.1	
RLM-RS		1, 2, 3	SSB		SSB		SSB	
N_{oc} Note 2	dBm/SCS	1	-98+TT					
		2	-98+TT					
		3	-95+TT					
N_{oc} Note 2	dBm/15 kHz	1	-98+TT					
		2						
		3						
$\hat{E}_s / I_{ot}$	dB	1	4+TT	-1.46+TT	4+TT	-1.46+TT	-Infinity	-1.46+TT
		2						
		3						
$\hat{E}_s / N_{oc}$	dB	1	4+TT	4+TT	4+TT	4+TT	-Infinity	4+TT
		2						
		3						
SS-RSRP Note 3	dBm/SCS kHz	1	-94+TT	-94+TT	-94+TT	-94+TT	-Infinity	-94+TT
		2	-94+TT	-94+TT	-94+TT	-94+TT	-Infinity	-94+TT
		3	-91+TT	-91+TT	-91+TT	-91+TT	-Infinity	-91+TT
Io	dBm/9.36 MHz	1	-64.60+TT	-62.25+TT	-64.60+TT	-62.25+TT	-64.60+TT	-62.25+TT
	dBm/9.36 MHz	2	-64.6+T T 0	-62.25+TT	-64.60+TT	-62.25+TT	-64.60+TT	-62.25+TT
	dBm/38.16 MHz	3	-58.50+TT	-56.16+TT	-58.50+TT	-56.16+TT	-58.50+TT	-56.16+TT
Propagation Condition		1,2	AWGN				AWGN 1944Hz Note 4	
		3	AWGN				AWGN 3334Hz Note 5	

Note 1:	The resources for uplink transmission are assigned to the UE prior to the start of time period T2.
Note 2:	Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for N_{oc} to be fulfilled.
Note 3:	SS-RSRP levels have been derived from other parameters for information purposes. They are not settable parameters themselves.
Note 4:	The AWGN 1944 Hz condition is a non fading propagation channel with one tap. Doppler shift is a constant 1944Hz.
Note 5:	The AWGN 3334 Hz condition is a non fading propagation channel with one tap. Doppler shift is a constant 3334Hz.

The UE shall send one Event A6 triggered measurement report, with a measurement reporting delay less than 5760 ms from the beginning of time period T2. The UE is not required to read the neighbour cell SSB index in this test.

The UE shall not send event triggered measurement reports, as long as the reporting criteria are not fulfilled.

The rate of correct events observed during repeated tests shall be at least 90% with the confidence level of 95%.

NOTE: The actual overall delays measured in the test may be up to $2xTTI_{DCCH}$ higher than the measurement reporting delays above because of TTI insertion uncertainty of the measurement report in DCCH.

6.6.2 Inter-frequency measurements

6.6.2.0 Minimum conformance requirements for Inter-frequency measurements

6.6.2.0.1 Minimum conformance requirements for Inter-frequency measurement with measurement gaps

Same as clause 4.6.2.0 when measurement gaps are provided, or the UE supports capability of conducting such measurements without gaps.

6.6.2.0.2 Minimum conformance requirements for Inter-frequency measurement without measurement gaps

If UE supports *interFrequencyMeas-NoGap-r16* and the flag *interFrequencyConfig-NoGap-r16* is configured by the Network, UE shall be able to identify a new detectable inter frequency cell within $T_{identify_inter_without_index}$ if UE is not indicated to report SSB based RRM measurement result with the associated SSB index (*reportQuantityRsIndexes* or *maxNrofRSIndexesToReport* is not configured). Otherwise UE shall be able to identify a new detectable inter frequency cell within $T_{identify_inter_with_index}$. The UE shall be able to identify a new detectable inter frequency SS block of an already detected cell within $T_{identify_inter_without_index}$. It is assumed that when UE performs inter-frequency measurements without measurement gaps in a TDD bands on FR1 and FR2, the following condition is met:

- SFN and frame boundary across serving cell and inter-frequency neighbour cells is aligned

$T_{identify_inter_without_index} = (T_{PSS/SSS_sync_inter} + T_{SSB_measurement_period_inter})$ ms

$T_{identify_inter_with_index} = (T_{PSS/SSS_sync_inter} + T_{SSB_measurement_period_inter} + T_{SSB_time_index_inter})$ ms

Where:

T_{PSS/SSS_sync_inter}: it is the time period used in PSS/SSS detection given in table 6.6.2.0-1

$T_{SSB_time_index_inter}$: it is the time period used to acquire the index of the SSB being measured given in table 6.6.2.0-2.

$T_{SSB_measurement_period_inter}$: equal to a measurement period of SSB based measurement given in table 6.6.2.0-3 and table 6.6.2.0-4.

$CSSF_{inter}$: it is a carrier specific scaling factor and is determined according to $CSSF_{outside_gap,i}$ in clause 9.1.5.1 for measurement conducted outside measurement gaps, i.e. when inter frequency SMTC is fully non overlapping or partially overlapping with measurement gaps or according to $CSSF_{within_gap,i}$ in clause 9.1.5.2 for measurement conducted within measurement gaps, i.e. when inter frequency SMTC is fully overlapping with measurement gaps.

M_{pss/sss_sync_inter}: For a UE supporting FR2 power class 1, M_{pss/sss_sync_inter} = 40 samples. For a UE supporting FR2 power class 2, M_{pss/sss_sync_inter} = 24 samples. For a UE supporting FR2 power class 3, M_{pss/sss_sync_inter} = 24 samples. For a UE supporting FR2 power class 4, M_{pss/sss_sync} = 24 samples.

$M_{meas_period_inter}$: For a UE supporting FR2 power class 1, $M_{meas_period_inter}$ =40 samples. For a vehicle mounted UE supporting FR2 power class 2, $M_{meas_period_inter}$ =24 samples. For a UE supporting FR2 power class 3, $M_{meas_period_inter}$ =24 samples. For a UE supporting FR2 power class 4, $M_{meas_period_inter}$ = 24 samples.

When inter frequency SMTC is fully non overlapping with measurement gaps or inter frequency SMTC is fully overlapping with MGs, Kp=1.

When inter frequency SMTC is partially overlapping with measurement gaps, Kp = 1/(1- (SMTC period /MGRP)), where SMTC period < MGRP.

For FR2,

$K_{layer1_measurement}$=1,

- if all of the reference signals configured for RLM, BFD, CBD or L1-RSRP for beam reporting on any FR2 serving frequency in the same band outside measurement gap are not fully overlapped by intra-frequency SMTC occasions, or

- if all of the reference signal configured for RLM, BFD, CBD or L1-RSRP for beam reporting on any FR2 serving frequency in the same band outside measurement gap and fully-overlapped by intra-frequency SMTC occasions are not overlapped with any of the SSB symbols and the RSSI symbols, and 1 symbol before each consecutive SSB symbols and the RSSI symbols, and 1 symbol after each consecutive SSB symbols and the RSSI symbols, given that *SSB-ToMeasure* and *SS-RSSI-Measurement* are configured, where SSB symbols are indicated by *SSB-ToMeasure* and RSSI symbols are indicated by *SS-RSSI-Measurement*;

$K_{layer1_measurement}$=1.5, otherwise.

If the above-mentioned reference signal configured for L1-RSRP measurement is aperiodic CSI-RS resource, longer cell identification delay would be expected.

Table 6.6.2.0-1: Time period for PSS/SSS detection, (FR1)

DRX cycle	T_{PSS/SSS_sync_inter}
No DRX	max(600ms, ceil(5 x K_p) x SMTC period)[Note 1] x $CSSF_{inter}$
DRX cycle≤ 320ms	max(600ms, ceil(1.5x 5 x K_p) x max(SMTC period,DRX cycle)) x $CSSF_{inter}$
DRX cycle>320ms	ceil(5 x K_p) x DRX cycle x $CSSF_{inter}$
NOTE 1: If different SMTC periodicities are configured for different cells, the SMTC period in the requirement is the one used by the cell being identified.	

Table 6.6.2.0-2: Time period for time index detection (FR1)

DRX cycle	$T_{SSB_time_index_inter}$
No DRX	max(120ms, ceil(3 x K_p) x SMTC period)[Note 1] x $CSSF_{inter}$
DRX cycle≤ 320ms	max(120ms, ceil (1.5 x 3 x K_p) x max(SMTC period,DRX cycle)) x $CSSF_{inter}$
DRX cycle>320ms	Ceil(3 x K_p) x DRX cycle x $CSSF_{inter}$
NOTE 1: If different SMTC periodicities are configured for different cells, the SMTC period in the requirement is the one used by the cell being identified.	

The UE physical layer shall be capable of reporting SS-RSRP, SS-RSRQ and SS-SINR measurements to higher layers with measurement accuracy as specified in TS 38.133 [6] clauses 10.1.4, 10.1.5, 10.1.9, 10.1.10, 10.1.14 and 10.1.15, respectively, as shown in table 6.6.2.0-3 and 6.6.2.0-4, if UE supports inter-frequency measurement without measurement gaps:

Table 6.6.2.0-3: Measurement period for inter-frequency measurements without gaps ((FR1)

DRX cycle	$T_{SSB_measurement_period_inter}$
No DRX	max(200ms, ceil(5 x K_p) x SMTC period)[Note 1] x $CSSF_{inter}$

DRX cycle≤ 320ms	max(200ms, ceil(1.5x 5 x K_p) x max(SMTC period,DRX cycle)) x $CSSF_{inter}$
DRX cycle>320ms	ceil(5 x K_p) x DRX cycle x $CSSF_{inter}$
NOTE 1: If different SMTC periodicities are configured for different cells, the SMTC period in the requirement is the one used by the cell being identified.	

Table 6.6.2.0-4: Measurement period for inter-frequency measurements without gaps (FR2)

DRX cycle	$T_{SSB_measurement_period_inter}$
No DRX	max(400ms, ceil($M_{meas_period_inter}$ x K_p x $K_{layer1_measurement}$) x SMTC period)[Note 1] x $CSSF_{inter}$
DRX cycle≤ 320ms	max(400ms, ceil(1.5x $M_{meas_period_inter}$ x K_p x $K_{layer1_measurement}$) x max(SMTC period,DRX cycle)) x $CSSF_{inter}$
DRX cycle>320ms	ceil($M_{meas_period_inter}$ xK_p x $K_{layer1_measurement}$) x DRX cycle x $CSSF_{inter}$
NOTE 1: If different SMTC periodicities are configured for different cells, the SMTC period in the requirement is the one used by the cell being identified.	

If UE supports *interFrequencyMeas-NoGap-r16* and the flag *interFrequencyConfig-NoGap-r16* is configured by the Network, UE is required to be capable of measuring without measurement gaps when the SSB is completely contained in the active bandwidth part of the UE. When any of the conditions in the following clauses is met, there are restrictions on the scheduling availability; otherwise, there is no scheduling restriction. Note that the SSB symbols to be measured in the following clauses are the SSB symbols indicated by SSB-ToMeasure [2], if it is configured; otherwise, all L SSB symbols within the SMTC window duration defined in clause 4.1 of TS 38.213 [3] are included.

The scheduling availability requirements when UE performs inter-frequency measurements without measurement gaps in a TDD bands on FR1 and FR2 in TS 38.133 [6] clause 9.3.9.3.1~9.3.9.3.3 are valid under the following conditions:

- SFN and frame boundary across serving cell and inter-frequency neighbour cells is aligned, and

When UE performs inter-frequency measurements without measurement gaps in a TDD band, the following restrictions apply due to SS-RSRP or SS-SINR measurement

- UE is not expected to transmit PUCCH/PUSCH/SRS on SSB symbols to be measured, and on 1 data symbol before each consecutive SSB symbols to be measured and 1 data symbol after each consecutive SSB symbols to be measured within SMTC window duration.

When UE performs inter-frequency measurements without measurement gaps in a TDD band, the following restrictions apply due to SS-RSRQ measurement

- UE is not expected to transmit PUCCH/PUSCH/SRS on SSB symbols to be measured, RSSI measurement symbols, and on 1 data symbol before each consecutive SSB to be measured/RSSI symbols and 1 data symbol after each consecutive SSB to be measured/RSSI symbols within SMTC window duration.

When TDD intra-band carrier aggregation is performed, the scheduling restrictions due to one serving cell should also apply to all other serving cells in the same band on the symbols that fully or partially overlap with aforementioned restricted symbols.

For UE which do not support *simultaneousRxDataSSB-DiffNumerology-Inter-r16* [14] the following restrictions apply due to SS-RSRP/RSRQ/SINR measurement

- If UE performs inter-frequency measurements without measurement gaps in a TDD band, UE is not expected to transmit PUCCH/PUSCH/SRS or receive PDCCH/PDSCH/TRS/CSI-RS for CQI on SSB symbols to be measured, and on 1 data symbol before each consecutive SSB symbols to be measured and 1 data symbol after each consecutive SSB symbols to be measured within SMTC window duration.

- If UE performs inter-frequency measurements without measurement gaps in a FDD band, UE is not expected to transmit PUCCH/PUSCH/SRS or receive PDCCH/PDSCH/TRS/CSI-RS for CQI on all symbols within SMTC window duration.

When intra-band carrier aggregation is performed, the scheduling restrictions due to a given serving cell should also apply to all other serving cells in the same band on the symbols that fully or partially overlap with aforementioned restricted symbols.

The normative reference for this requirement is TS 38.133 [6] clause 9.3.2, 9.3.4, 9.3.5, 9.3.6.3.

6.6.2.1 NR SA FR1-FR1 event-triggered reporting in non-DRX

6.6.2.1.1 Test purpose

To verify that the UE makes correct reporting of an event in non-DRX within inter-frequency NR cell search requirements without SSB time index detection in TS 38.133 [6] clause 9.3.4.

6.6.2.1.2 Test applicability

This test applies to all types of NR UE from Release 15 onwards. Test 1 is applicable to UEs not supporting per-FR gap (IndependentGapConfig, as defined in TS 38.306 [11]) and Test 2 is applicable only to UEs supporting per-FR gap and Gap Pattern Id 4.

6.6.2.1.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 6.6.2.0.

The normative reference for this requirement is TS 38.133 [6] clause A.6.6.2.1.

6.6.2.1.4 Test description

6.6.2.1.4.1 Initial conditions

This test shall be tested using any of the test configurations in Table 6.6.2.1.4.1-1. Configure the test equipment and the DUT according to the parameters in Table 6.6.2.1.4.1-2. Test environment parameters are given in Table 6.6.2.1.4.1-3.

Table 6.6.2.1.4.1-1: SA FR1-FR1 event triggered reporting tests in non-DRX supported test configurations

Test Case ID	Description
6.6.2.1-1	NR 15 kHz SSB SCS, 10MHz bandwidth, FDD duplex mode
6.6.2.1-2	NR 15 kHz SSB SCS, 10MHz bandwidth, TDD duplex mode
6.6.2.1-3	NR 30 kHz SSB SCS, 40MHz bandwidth, TDD duplex mode
Note 1: The UE is only required to be tested in one of the supported test configurations Note 2: target NR cell has the same SCS, BW and duplex mode as NR serving cell	

Table 6.6.2.1.4.1-2: SA FR1-FR1 general test parameters for SA inter-frequency event triggered reporting for FR1 without SSB time index detection in non DRX

Parameter	Unit	Test configuration	Value		Comment
			Test 1	Test 2	
NR RF Channel Number		Config 1,2,3	1, 2		Two FR1 NR carrier frequencies are used.
Active cell		Config 1,2,3	NR cell 1 (Pcell)		NR Cell 1 is on NR RF channel number 1.
Neighbour cell		Config 1,2,3	NR cell2		NR cell 2 is on NR RF channel number 2.
Gap Pattern Id		Config 1,2,3	0	4	As specified in TS 38.133 clause 9.1.2-1.
Measurement gap offset		Config 1,2,3	9	9	
A3-Offset	dB	Config 1,2,3	-6		
Hysteresis	dB	Config 1,2,3	0		
CP length		Config 1,2,3	Normal		

TimeToTrigger	s	Config 1,2,3	0		
Filter coefficient		Config 1,2,3	0		L3 filtering is not used
DRX		Config 1,2,3	OFF		DRX is not used
Time offset between serving and neighbour cells		Config 1	3ms		Asynchronous cells. The timing of Cell 2 is 3ms later than the timing of Cell 1.
		Config 2,3	3μs		Synchronous cells.
T1	s	Config 1,2,3	5		
T2	s	Config 1,2,3	1	1	

Table 6.6.2.1.4.1-3: Test Environment parameters for SA inter-frequency event triggered reporting without SSB time index detection in non-DRX

Parameter	Value		Comment
Test environment	NC		As specified in TS 38.508-1 [14] clause 4.1.
Test frequencies	As specified in Annex E, Table E.4-1 and TS 38.508-1 [14] clause 4.3.1 and 4.4.2.		
Channel bandwidth	As specified by the test configuration selected from Table 6.6.2.1.4.1-1.		
Propagation conditions	AWGN		As specified in Annex C.2.2.
Connection Diagram	TE Part	A.3.1.8.2	As specified in TS 38.508-1 [14] Annex A.
	DUT Part	A.3.2.3.4	
Exceptions to connection diagram	- Without LTE link - For 4Rx capable UEs without any 2Rx RF bands use A.3.2.5.1 for DUT part and A.3.1.8.4 for TE part.		

1. Message contents are defined in clause 6.6.2.1.4.3.

2. There are two NR cells on two carriers specified in the test. Cell 1 is the cell used for connection setup and Cell 2 is a target cell on a different carrier than Cell 1. The power levels and settings for Cell 2 are set according to Annex C.1.2.

6.6.2.1.4.2 Test procedure

In this test, there are two cells: NR cell 1 as PCell in FR1 on NR RF channel 1 and NR cell 2 as neighbour cell in FR1 on NR RF channel 2.

In test 1 measurement gap pattern configuration # 0 as defined in Table 6.6.2.1.4.1-2 is provided for UE that does not support per-FR gap and in test 2 measurement gap pattern configuration #4 as defined in Table 6.6.2.1.4.1-2 is provided for UE that supports per-FR gap.

In the measurement control information, it is indicated to the UE that event-triggered reporting with Event A3 is used. The test consists of two successive time periods, with time duration of T1, and T2 respectively. During time duration T1, the UE shall not have any timing information of NR cell 2.

1. Ensure the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity NR SA, Connected without release *On* and Test Mode *On* according to TS 38.508-1 [14] clause 4.5.

2. Set the parameters according to T1 in Table 6.6.2.1.4.1-2.

3. The SS shall transmit an *RRCReconfiguration* message.

4. The UE shall transmit *RRCReconfigurationComplete* message. T1 starts.

5. When T1 expires, the SS shall switch the power setting from T1 to T2 as specified in Table 6.6.2.1.4.1-2. T2 Starts.

6. UE shall transmit a *MeasurementReport* message triggered by Event A3. If the overall delays measured from the beginning of time period T2 is less than 920 ms for Test 1 and 760 ms for Test 2 then the number of successful

tests is increased by one. If the UE fails to report the event within the overall delays measured requirement then the number of failure tests is increased by one.

7. After the SS receives the *MeasurementReport* message in step 6 or when T2 expires, the SS shall:

   - transmit RRCRelease message to release the RRC connection which includes the release of the established radio bearers as well as all radio resources

   OR

   - switch the UE off.

8. Set Cell 3 physical cell identity = ((current cell 3 physical cell identity + 1) mod 14 + 2) for next iteration of the test procedure loop.

9. Depending on the choice in Step 7, the SS:

   - if the RRC Connection Release has been sent, transmits in Cell 1 a *Paging* message (including PagingRecord with ue-Identity) for the UE and ensures the UE in state RRC_CONNECTED with generic procedure parameters Connectivity NR SA, Connected without release *On* according to TS 38.508-1 [14] clause 4.5. (if the paging fails, switches off and on the UE and ensures the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity NR SA, Connected without release *On* according to TS 38.508-1 [14] clause 4.5.), OR:
   - if the device has been switched off, switches on the UE and ensures the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity NR SA, Connected without release *On* according to TS 38.508-1 [14] clause 4.5.

10. Repeat step 2-9 until the confidence level according to Tables G.2.3-1 in Annex G clause G.2 is achieved.

11. Repeat step 1-10 for each sub-test in Table 6.6.2.1.4.1-2 as appropriate.

6.6.2.1.4.3 Message contents

Message contents are according to TS 38.508-1 [14] clause 7.3 with the following exceptions:

Table 6.6.2.1.4.3-1: Common Exception messages SA inter frequency event triggered reporting without SSB time index detection in non-DRX

Default Message Contents	
Common contents of system information blocks exceptions	
Default RRC messages and information elements contents exceptions	Table H.3.1-1 Table H.3.1-2 with Conditions GAP NEEDED and INTER-FREQ Table H.3.1-4 with A3-offset = -6dB Table H.3.1-5 Table H.3.1-6 with Conditions gapUE, Pattern #0 and gap offset = 9 for Test 1 Table H.3.1-6 with Conditions gapFR1, Pattern #4 and gap offset = 9 for Test 2 Table H.3.1-7 with Condition INTER-FREQ
Specific message contents exceptions for Test Configuration 6.6.2.1-1	Table H.3.1-3 with Conditions INTER-FREQ MO Table 7.3.1-3 in TS 38.508-1 [14] with condition SMTC.5
Specific message contents exceptions for Test Configuration 6.6.2.1-2	Table H.3.1-3 with Conditions INTER-FREQ MO and Synchronous cells Table 7.3.1-3 in TS 38.508-1 [14] with condition SMTC.4
Specific message contents exceptions for Test Configuration 6.6.2.1-3	Table H.3.1-3 with Conditions INTER-FREQ MO and Synchronous cells Table 7.3.1-3 in TS 38.508-1 [14] with condition SMTC.4

6.6.2.1.5 Test requirement

Table 6.6.2.1.5-1 defines the primary level settings including test tolerances for all tests.

Table 6.6.2.1.5-1: Cell specific test parameters for SA inter-frequency event triggered reporting for FR1 without SSB time index detection in non-DRX

Parameter		Unit	Test configuration	Cell 1		Cell 2	
				T1	T2	T1	T2
NR RF Channel Number			Config 1,2,3	1		2	
Duplex mode			Config 1	FDD			
			Config 2,3	TDD			
TDD configuration			Config 1	Not Applicable			
			Config 2	TDDConf.1.1			
			Config 3	TDDConf.2.1			
$BW_{channel}$		MHz	Config 1,2	10: $N_{RB,c}$ = 52			
			Config 3	40: $N_{RB,c}$ = 106			
BWP BW		MHz	Config 1,2	10: $N_{RB,c}$ = 52			
			Config 3	40: $N_{RB,c}$ = 106			
BWP configuration	Initial DL BWP		Config 1, 2, 3	DLBWP.0.1		NA	
	Initial UL BWP			ULBWP.0.1		NA	
	Dedicated DL BWP			DLBWP.1.1		NA	
	Dedicated UL BWP			ULBWP.1.1		NA	
TRS configuration			Config 1	TRS.1.1 FDD		NA	
			Config 2	TRS.1.1 TDD		NA	
			Config 3	TRS.1.2 TDD		NA	
OCNG Patterns			Config 1,2,3	OP.1		OP.1	
PDSCH Reference measurement channel			Config 1	SR.1.1 FDD		-	
			Config 2	SR.1.1 TDD			
			Config 3	SR 2.1 TDD			
RMSI CORESET Reference Channel			Config 1	CR.1.1 FDD		-	
			Config 2	CR.1.1 TDD			
			Config 3	CR 2.1 TDD			
Dedicated CORESET Reference Channel			Config 1	CCR.1.1 FDD		-	
			Config 2	CCR.1.1 TDD			
			Config 3	CCR.2.1 TDD			
SSB parameters			Config 1	SSB.1 FR1		SSB.5 FR1	
			Config 2	SSB.1 FR1		SSB.5 FR1	
			Config 3	SSB.2 FR1		SSB.6 FR1	
SMTC configuration			Config 1	SMTC.2		SMTC.5	
			Config 2, 3	SMTC.1		SMTC.4	
PDSCH/PDCCH subcarrier spacing		kHz	Config 1,2	15			
			Config 3	30			
EPRE ratio of PSS to SSS			Config 1,2,3	0		0	
EPRE ratio of PBCH DMRS to SSS							
EPRE ratio of PBCH to PBCH DMRS							
EPRE ratio of PDCCH DMRS to SSS							
EPRE ratio of PDCCH to PDCCH DMRS							
EPRE ratio of PDSCH DMRS to SSS							
EPRE ratio of PDSCH to PDSCH							

EPRE ratio of OCNG DMRS to SSS(Note 1)						
EPRE ratio of OCNG to OCNG DMRS (Note 1)						
N_{oc} Note2	dBm/15 kHz		-98		-98	
N_{oc} Note2	dBm/S CS	Config 1,2	-98		-98	
		Config 3	-95		-95	
SS-RSRP Note 3	dBm/S CS	Config 1,2	-94	-94	-Infinity	-91
		Config 3	-91	-91	-Infinity	-88
$\hat{E}_s/I_{ot}$	dB	Config 1,2,3,4,5,6	4	4	-Infinity	7
$\hat{E}_s/N_{oc}$	dB	Config 1,2,3	4	4	-Infinity	7
Io Note3	dBm/9.36MHz	Config 1,2	-64.59	-64.59	-70.05	-62.26
	dBm/38.16MHz	Config 3	-58.49	-58.49	-63.94	-56.15
Propagation Condition		Config 1,2,3	AWGN		AWGN	

Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.
Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for N_{oc} to be fulfilled.
Note 3: SS-RSRP and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.
Note 4: SS-RSRP minimum requirements are specified assuming independent interference and noise at each receiver antenna port.

In test 1 with per-UE gap, the UE shall send one Event A3 triggered measurement report, with a measurement reporting delay less than 920 ms from the beginning of time period T2. The UE shall not send event triggered measurement reports, as long as the reporting criteria are not fulfilled. The rate of correct events observed during repeated tests shall be at least 90%. with a confidence level of 95%

In test 2 with per-FR gap, the UE shall send one Event A3 triggered measurement report, with a measurement reporting delay less than 760 ms from the beginning of time period T2. The UE shall not send event triggered measurement reports, as long as the reporting criteria are not fulfilled. The rate of correct events observed during repeated tests shall be at least 90% with a confidence level of 95%.

In test 1 and 2 UE is not required to report SSB time index.

NOTE: The actual overall delays measured in the test may be up to $2xTTI_{DCCH}$ higher than the measurement reporting delays above because of TTI insertion uncertainty of the measurement report in DCCH.

6.6.2.2 NR SA FR1-FR1 event-triggered reporting in DRX

6.6.2.2.1 Test purpose

To verify that the UE makes correct reporting of an event in DRX within inter-frequency NR cell search requirements without SSB time index detection in TS 38.133 [6] clause 9.3.4.

6.6.2.2.2 Test applicability

This test applies to all types of NR UE Release 15 and forward supporting 5GS NR SA FR1 and long DRX cycle. Test 1 and Test 2 are applicable to UEs not supporting per-FR gap (IndependentGapConfig, as defined in TS 38.306 [11]) and Test 3 and Test 4 are applicable only to UEs supporting per-FR gap and Gap Pattern Id 4.

6.6.2.2.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 6.6.2.0.

The normative reference for this requirement is TS 38.133 [6] clause A.6.6.2.2.

6.6.2.2.4 Test description

6.6.2.2.4.1 Initial conditions

This test shall be tested using any of the test configurations in Table 6.6.2.2.4.1-1. Configure the test equipment and the DUT according to the parameters in Table 6.6.2.2.4.1-2. Test environment parameters are given in Table 6.6.2.2.4.1-3.

Table 6.6.2.2.4.1-1: SA FR1-FR1 event triggered reporting tests in DRX supported test configurations

Test Case ID	Description
6.6.2.2-1	NR 15 kHz SSB SCS, 10MHz bandwidth, FDD duplex mode
6.6.2.2-2	NR 15 kHz SSB SCS, 10MHz bandwidth, TDD duplex mode
6.6.2.2-3	NR 30 kHz SSB SCS, 40MHz bandwidth, TDD duplex mode
Note 1: The UE is only required to be tested in one of the supported test configurations Note 2: target NR cell has the same SCS, BW and duplex mode as NR serving cell	

Table 6.6.2.2.4.1-2: General test parameters for SA inter-frequency event triggered reporting for FR1 without SSB time index detection in DRX

Parameter	Unit	Test configuration	Value				Comment
			Test 1	Test 2	Test 3	Test 4	
NR RF Channel Number		Config 1,2,3	1, 2				Two FR1 NR carrier frequencies are used
Active cell		Config 1,2,3	NR cell 1 (Pcell)				NR Cell 1 is on NR RF channel number 1
Neighbour cell		Config 1,2,3	NR cell2				NR cell 2 is on NR RF channel number 2.
Gap Pattern Id		Config 1,2,3	0		4		As specified in TS 38.133 clause 9.1.2-1
Measurement gap offset		Config 1,2,3	9		9		
A3-Offset	dB	Config 1,2,3	-6				
Hysteresis	dB	Config 1,2,3	0				
CP length		Config 1,2,3	Normal				
TimeToTrigger	s	Config 1,2,3	0				
Filter coefficient		Config 1,2,3	0				L3 filtering is not used
DRX		Config 1,2,3	DRX .1	DRX .7	DRX .1	DRX .7	As specified in clause A.5
Time offset between serving and neighbour cells		Config 1	3ms				Asynchronous cells. The timing of Cell 2 is 3ms later than the timing of Cell 1.
		Config 2,3	3μs				Synchronous cells
T1	s	Config 1,2,3	5				
T2	s	Config 1,2,3	1.1	11	1.1	11	

Table 6.6.2.2.4.1-3: Test Environment parameters for SA inter-frequency event triggered reporting for FR1 without SSB time index detection in DRX

Parameter	Value		Comment
Test environment	NC		As specified in TS 38.508-1 [14] clause 4.1.
Test frequencies	As specified in Annex E, Table E.4-1 and TS 38.508-1 [14] clause 4.3.1 and 4.4.2.		
Channel bandwidth	As specified by the test configuration selected from Table 6.6.2.2.4.1-1.		
Propagation conditions	AWGN		As specified in Annex C.2.2.
Connection Diagram	TE Part	A.3.1.8.2	As specified in TS 38.508-1 [14] Annex A.
	DUT Part	A.3.2.3.4	

Exceptions to connection diagram	- Without LTE link - For 4Rx capable UEs without any 2Rx RF bands use A.3.2.5.1 for DUT part and A.3.1.8.4 for TE part.	

1. Message contents are defined in clause 6.6.2.2.4.3.

2. There are two NR cells on two carriers specified in the test. Cell 1 is the cell used for connection setup and Cell 2 is a target cell on a different carrier than Cell 1. The power levels and settings for Cell 2 are set according to Annex C.1.2.

6.6.2.2.4.2 Test procedure

In this test, there are two cells: NR cell 1 as PCell in FR1 on NR RF channel 1 and NR cell 2 as neighbour cell in FR1 on NR RF channel 2.

In test 1&2 measurement gap pattern configuration # 0 as defined in Table 6.6.2.2.4.1-2 is provided for UE that does not support per-FR gap and in test 3&4 measurement gap pattern configuration #4 as defined in Table 6.6.2.2.4.1-2 is provided for UE that supports per-FR gap.

In the measurement control information, it is indicated to the UE that event-triggered reporting with Event A3 is used. The test consists of two successive time periods, with time duration of T1, and T2 respectively. During time duration T1, the UE shall not have any timing information of NR cell 2.

UE needs to be provided at least once every 500ms with new Timing Advance Command MAC control element to restart the Time alignment timer to keep UE uplink time alignment. Furthermore UE is allocated with PUSCH resource at every DRX cycle.

1. Ensure the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity NR SA, Connected without release *On* and Test Mode *On* according to TS 38.508-1 [14] clause 4.5.

2. Set the parameters according to T1 in Table 6.6.2.2.4.1-2 and 6.6.2.2.5-1.

3. The SS shall transmit an *RRCReconfiguration* message.

4. The UE shall transmit *RRCReconfigurationComplete* message. T1 starts.

5. When T1 expires, the SS shall switch the power setting from T1 to T2 as specified in Table 6.6.2.2.5-1. T2 Starts.

6. UE shall transmit a *MeasurementReport* message triggered by Event A3. If the overall delays measured from the beginning of time period T2 is less than 1080 ms for Test 1, 10240 ms for Test 2, 1080 ms for Test 3 and 10240 ms for Test 4 then the number of successful tests is increased by one. If the UE fails to report the event within the overall delays measured requirement then the number of failure tests is increased by one.

7. After the SS receives the *MeasurementReport* message in step 6 or when T2 expires, the SS shall:

   - transmit RRCRelease message to release the RRC connection which includes the release of the established radio bearers as well as all radio resources

   OR

   - switch the UE off.

8. Set Cell 3 physical cell identity = ((current cell 3 physical cell identity + 1) mod 14 + 2) for next iteration of the test procedure loop.

9. Depending on the choice in Step 7, the SS:

   - if the RRC Connection Release has been sent, transmits in Cell 1 a *Paging* message (including PagingRecord with ue-Identity) for the UE and ensures the UE in state RRC_CONNECTED with generic procedure parameters Connectivity NR SA, Connected without release *On* according to TS 38.508-1 [14] clause 4.5. (if the paging fails, switches off and on the UE and ensures the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity NR SA, Connected without release *On* according to TS 38.508-1 [14] clause 4.5.), OR
   - if the device has been switched off, switches on the UE and ensures the UE is in state RRC_CONNECTED

with generic procedure parameters Connectivity NR SA, Connected without release *On* according to TS 38.508-1 [14] clause 4.5.

10. Repeat step 2-9 until the confidence level according to Tables G.2.3-1 in Annex G clause G.2 is achieved.

11. Repeat step 1-10 for each sub-test in Table 6.6.2.2.4.1-2 as appropriate.

6.6.2.2.4.3 Message contents

Message contents are according to TS 38.508-1 [14] clause 7.3 with the following exceptions:

Table 6.6.2.2.4.3-1: Common Exception messages SA inter frequency event triggered reporting without SSB time index detection in non-DRX

Default Message Contents	
Common contents of system information blocks exceptions	
Default RRC messages and information elements contents exceptions	Table H.3.1-1 Table H.3.1-2 with Conditions GAP NEEDED and INTER-FREQ Table H.3.1-4 with A3-offset = -6dB Table H.3.1-5 Table H.3.1-6 with Conditions gapUE, Pattern #0 and gap offset = 9 for Test 1 and Test 2 Table H.3.1-6 with Conditions gapFR1, Pattern #4 and gap offset = 9 for Test 3 and Test 4 Table H.3.1-7 with Condition INTER-FREQ Table H.3.7-1 with Condition DRX.1 and Gap and INTER-FREQ for Test 1 and Test 3 Table H.3.7-1 with Condition DRX.7 and Gap and INTER-FREQ for Test 2 and Test 4
Specific message contents exceptions for Test Configuration 6.6.2.2-1	Table H.3.1-3 with Conditions INTER-FREQ MO and Table 7.3.1-3 in TS 38.508-1 [14] with condition SMTC.5
Specific message contents exceptions for Test Configuration 6.6.2.2-2	Table H.3.1-3 with Conditions INTER-FREQ MO and Synchronous cells Table 7.3.1-3 in TS 38.508-1 [14] with condition SMTC.4
Specific message contents exceptions for Test Configuration 6.6.2.2-3	Table H.3.1-3 with Conditions INTER-FREQ MO and Synchronous cells Table 7.3.1-3 in TS 38.508-1 [14] with condition SMTC.4

6.6.2.2.5 Test requirement

Table 6.6.2.2.5-1 defines the primary level settings including test tolerances for all tests.

Table 6.6.2.2.5-1: Cell specific test parameters for SA inter-frequency event triggered reporting for FR1 without SSB time index detection

Parameter		Unit	Test configuration	Cell 1		Cell 2	
				T1	T2	T1	T2
NR RF Channel Number			Config 1,2,3	1		2	
Duplex mode			Config 1	FDD			
			Config 2,3	TDD			
TDD configuration			Config 1	Not Applicable			
			Config 2	TDDConf.1.1			
			Config 3	TDDConf.2.1			
$BW_{channel}$		MHz	Config 1,2	10: $N_{RB,c}$ = 52			
			Config 3	40: $N_{RB,c}$ = 106			
BWP BW		MHz	Config 1,2	10: $N_{RB,c}$ = 52			
			Config 3	40: $N_{RB,c}$ = 106			
BWP configuration	Initial DL BWP		Config 1, 2, 3	DLBWP.0.1		NA	
	Initial UL BWP			ULBWP.0.1		NA	
	Dedicated DL BWP			DLBWP.1.1		NA	

	Dedicated UL BWP			ULBWP.1.1		NA	
TRS configuration			Config 1	TRS.1.1 FDD		NA	
			Config 2	TRS.1.1 TDD		NA	
			Config 3	TRS.1.2 TDD		NA	
OCNG Patterns			Config 1,2,3	OP.1		OP.1	
PDSCH Reference measurement channel			Config 1	SR.1.1 FDD		-	
			Config 2	SR.1.1 TDD			
			Config 3	SR 2.1 TDD			
RMSI CORESET Reference Channel			Config 1	CR.1.1 FDD		-	
			Config 2	CR.1.1 TDD			
			Config 3	CR 2.1 TDD			
Dedicated CORESET Reference Channel			Config 1	CCR.1.1 FDD		-	
			Config 2	CCR.1.1 TDD			
			Config 3	CCR.2.1 TDD			
SSB parameters			Config 1	SSB.1 FR1		SSB.5 FR1	
			Config 2	SSB.1 FR1		SSB.5 FR1	
			Config 3	SSB.2 FR1		SSB.6 FR1	
SMTC configuration			Config 1	SMTC.2		SMTC.5	
			Config 2, 3	SMTC.1		SMTC.4	
PDSCH/PDCCH subcarrier spacing		kHz	Config 1,2	15			
			Config 3	30			
EPRE ratio of PSS to SSS			Config 1,2,3	0		0	
EPRE ratio of PBCH DMRS to SSS							
EPRE ratio of PBCH to PBCH DMRS							
EPRE ratio of PDCCH DMRS to SSS							
EPRE ratio of PDCCH to PDCCH DMRS							
EPRE ratio of PDSCH DMRS to SSS							
EPRE ratio of PDSCH to PDSCH							
EPRE ratio of OCNG DMRS to SSS(Note 1)							
EPRE ratio of OCNG to OCNG DMRS (Note 1)							
N_{oc} Note2		dBm/15 kHz	Config 1,2,3	-98		-98	
N_{oc} Note2		dBm/SCS	Config 1,2	-98		-98	
			Config 3	-95		-95	
SS-RSRP Note 3		dBm/SCS	Config 1,2	-94	-94	-Infinity	-91
			Config 3	-91	-91	-Infinity	-88
$\hat{E}_s/I_{ot}$		dB	Config 1,2,3,4,5,6	4	4	-Infinity	7
$\hat{E}_s/N_{oc}$		dB	Config 1,2,3	4	4	-Infinity	7
Io Note3		dBm/9.36MHz	Config 1,2	-64.59	-64.59	-70.05	-62.2
		dBm/38.16MHz	Config 3	-58.49	-58.49	-63.94	-56.15
Propagation Condition			Config 1,2,3	AWGN		AWGN	

Note 1:	OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.
Note 2:	Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for N_{oc} to be fulfilled.
Note 3:	SS-RSRP and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.
Note 4:	SS-RSRP minimum requirements are specified assuming independent interference and noise at each receiver antenna port.

In test 1 with per-UE gap, the UE shall send one Event A3 triggered measurement report, with a measurement reporting delay less than 1080 ms from the beginning of time period T2. The UE shall not send event triggered measurement reports, as long as the reporting criteria are not fulfilled. The rate of correct events observed during repeated tests shall be at least 90% with a confidence level of 95%.

In test 2 with per-UE gap, the UE shall send one Event A3 triggered measurement report, with a measurement reporting delay less than 10240 ms from the beginning of time period T2. The UE shall not send event triggered measurement reports, as long as the reporting criteria are not fulfilled. The rate of correct events observed during repeated tests shall be at least 90% with a confidence level of 95%.

In test 3 with per-FR gap, the UE shall send one Event A3 triggered measurement report, with a measurement reporting delay less than 1080 ms from the beginning of time period T2. The UE shall not send event triggered measurement reports, as long as the reporting criteria are not fulfilled. The rate of correct events observed during repeated tests shall be at least 90% with a confidence level of 95%.

In test 4 with per-FR gap, the UE shall send one Event A3 triggered measurement report, with a measurement reporting delay less than 10240 ms from the beginning of time period T2. The UE shall not send event triggered measurement reports, as long as the reporting criteria are not fulfilled. The rate of correct events observed during repeated tests shall be at least 90% with a confidence level of 95%.

In test 1, 2, 3 and 4 UE is not required to report SSB time index.

NOTE: The actual overall delays measured in the test may be up to $2xTTI_{DCCH}$ higher than the measurement reporting delays above because of TTI insertion uncertainty of the measurement report in DCCH.

6.6.2.3 Void

6.6.2.4 Void

6.6.2.5 NR SA FR1-FR1 event-triggered reporting in non-DRX with SSB time index detection

6.6.2.5.1 Test purpose

To verify that the UE makes correct reporting of an event in non-DRX within inter-frequency NR cell search requirements with SSB time index detection in TS 38.133 [6] clause 9.3.4.

6.6.2.5.2 Test applicability

This test applies to all types of NR UE from Release 15 onwards. Test 1 is applicable to UEs not supporting per-FR gap (IndependentGapConfig, as defined in TS 38.306 [11]) and Test 2 is applicable only to UEs supporting per-FR gap and Gap Pattern Id 4.

6.6.2.5.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 6.6.2.0.

The normative reference for this requirement is TS 38.133 [6] clause A.6.6.2.5.

6.6.2.5.4 Test description

6.6.2.5.4.1 Initial conditions

This test shall be tested using any of the test configurations in Table 6.6.2.5.4.1-1. Configure the test equipment and the DUT according to the parameters in Table 6.6.2.5.4.1-2. Test environment parameters are given in Table 6.6.2.5.4.1-3.

Table 6.6.2.5.4.1-1: SA FR1-FR1 event triggered reporting tests in non-DRX with SSB time index detection supported test configurations

Test Case ID	Description
6.6.2.5-1	NR 15 kHz SSB SCS, 10MHz bandwidth, FDD duplex mode
6.6.2.5-2	NR 15 kHz SSB SCS, 10MHz bandwidth, TDD duplex mode
6.6.2.5-3	NR 30 kHz SSB SCS, 40MHz bandwidth, TDD duplex mode
Note 1: The UE is only required to be tested in one of the supported test configurations Note 2: target NR cell has the same SCS, BW and duplex mode as NR serving cell	

Table 6.6.2.5.4.1-2: General test parameters for SA inter-frequency event triggered reporting for FR1 with SSB time index detection in non-DRX

Parameter	Unit	Test configuration	Value		Comment
			Test 1	Test 2	
NR RF Channel Number		Config 1,2,3	1, 2		Two FR1 NR carrier frequencies are used
Active cell		Config 1,2,3	NR cell 1 (Pcell)		NR Cell 1 is on NR RF channel number 1
Neighbour cell		Config 1,2,3	NR cell2		NR cell 2 is on NR RF channel number 2
Gap Pattern Id		Config 1,2,3	0	4	As specified in TS 38.133 clause 9.1.2-1
Measurement gap offset		Config 1,2,3	9	9	
A3-Offset	dB	Config 1,2,3	-6		
Hysteresis	dB	Config 1,2,3	0		
CP length		Config 1,2,3	Normal		
TimeToTrigger	s	Config 1,2,3	0		
Filter coefficient		Config 1,2,3	0		L3 filtering is not used
DRX		Config 1,2,3	OFF		DRX is not used
Time offset between serving and neighbour cells		Config 1	3ms		Asynchronous cells. The timing of Cell 2 is 3ms later than the timing of Cell 1.
		Config 2,3	3μs		Synchronous cells
T1	s	Config 1,2,3	5		
T2	s	Config 1,2,3	1.1	1	

Table 6.6.2.5.4.1-3: Environment test parameters for SA inter-frequency event triggered reporting for FR1 without SSB time index detection in non-DRX

Parameter	Value	Comment
Test environment	NC	As specified in TS 38.508-1 [14] clause 4.1.
Test frequencies	As specified in Annex E, Table E.4-1 and TS 38.508-1 [14] clause 4.3.1 and 4.4.2.	

Channel bandwidth	As specified by the test configuration selected from Table 6.6.2.5.4.1-1.		
Propagation conditions	AWGN		As specified in Annex C.2.2.
Connection Diagram	TE Part	A.3.1.8.2	As specified in TS 38.508-1 [14] Annex A.
	DUT Part	A.3.2.3.4	
Exceptions to connection diagram	- Without LTE link - For 4Rx capable UEs without any 2Rx RF bands use A.3.2.5.1 for DUT part and A.3.1.8.4 for TE part.		

1. Message contents are defined in clause 6.6.2.5.4.3.

2. There are two NR cells on two carriers specified in the test. Cell 1 is the cell used for connection setup and Cell 2 is a target cell on a different carrier than Cell 1. The power levels and settings for Cell 2 are set according to Annex C.1.2.

6.6.2.5.4.2 Test procedure

In this test, there are two cells: NR cell 1 as PCell in FR1 on NR RF channel 1 and NR cell 2 as neighbour cell in FR1 on NR RF channel 2.

In test 1 measurement gap pattern configuration # 0 as defined in Table 6.6.2.5.4.1-2 is provided for UE that does not support per-FR gap and in test 2 measurement gap pattern configuration #4 as defined in Table 6.6.2.5.4.1-2 is provided for UE that supports per-FR gap.

In the measurement control information, it is indicated to the UE that event-triggered reporting with Event A3 is used. The test consists of two successive time periods, with time duration of T1, and T2 respectively. During time duration T1, the UE shall not have any timing information of NR cell 2.

1. Ensure the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity NR SA, Connected without release *On* and Test Mode *On* according to TS 38.508-1 [14] clause 4.5.

2. Set the parameters according to T1 in Table 6.6.2.5.4.1-2.

3. The SS shall transmit an *RRCReconfiguration* message.

4. The UE shall transmit *RRCReconfigurationComplete* message. T1 starts.

5. When T1 expires, the SS shall switch the power setting from T1 to T2 as specified in Table 6.6.2.5.4.1-2. T2 Starts.

6. UE shall transmit a *MeasurementReport* message triggered by Event A3. If the overall delays measured from the beginning of time period T2 is less than 1040 ms for Test 1 and 880 ms for Test 2 then the number of successful tests is increased by one. If the UE fails to report the event within the overall delays measured requirement then the number of failure tests is increased by one.

7. After the SS receives the *MeasurementReport* message in step 6 or when T2 expires, the SS shall:

   - transmit RRCRelease message to release the RRC connection which includes the release of the established radio bearers as well as all radio resources

   OR

   - switch the UE off.

8. Set Cell 3 physical cell identity = ((current cell 3 physical cell identity + 1) mod 14 + 2) for next iteration of the test procedure loop.

9. Depending on the choice in Step 7, the SS:

   - if the RRC Connection Release has been sent, transmits in Cell 1 a *Paging* message (including PagingRecord with ue-Identity) for the UE and ensures the UE in state RRC_CONNECTED with generic procedure parameters Connectivity NR SA, Connected without release *On* according to TS 38.508-1 [14] clause 4.5. (if the paging fails, switches off and on the UE and ensures the UE is in state RRC_CONNECTED with generic procedure

parameters Connectivity NR SA, Connected without release *On* according to TS 38.508-1 [14] clause 4.5.), OR
- if the device has been switched off, switches on the UE and ensures the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity NR SA, Connected without release *On* according to TS 38.508-1 [14] clause 4.5.

10. Repeat step 2-9 until the confidence level according to Tables G.2.3-1 in Annex G clause G.2 is achieved.

11. Repeat step 1-10 for each sub-test in Table 6.6.2.5.4.1-2 as appropriate.

6.6.2.5.4.3 Message contents

Message contents are according to TS 38.508-1 [14] clause 7.3 with the following exceptions:

Table 6.6.2.5.4.3-1: Common Exception messages SA inter frequency event triggered reporting without SSB time index detection in non-DRX

Default Message Contents	
Common contents of system information blocks exceptions	
Default RRC messages and information elements contents exceptions	Table H.3.1-1 Table H.3.1-2 with Conditions GAP NEEDED and INTER-FREQ Table H.3.1-4 with A3-offset = -6dB and Condition SSB Index Table H.3.1-5 Table H.3.1-6 with Conditions gapUE, Pattern #0 and gap offset = 9 for Test 1 Table H.3.1-6 with Conditions gapFR1, Pattern #4 and gap offset = 9 for Test 2 Table H.3.1-7 with Conditions INTER-FREQ and SSB Index
Specific message contents exceptions for Test Configuration 6.6.2.5-1	Table H.3.1-3 with Conditions INTER-FREQ MO Table 7.3.1-3 in TS 38.508-1 [14] with condition SMTC.5
Specific message contents exceptions for Test Configuration 6.6.2.5-2	Table H.3.1-3 with Conditions INTER-FREQ MO and Synchronous cells Table 7.3.1-3 in TS 38.508-1 [14] with condition SMTC.4
Specific message contents exceptions for Test Configuration 6.6.2.5-3	Table H.3.1-3 with Conditions INTER-FREQ MO and Synchronous cells Table 7.3.1-3 in TS 38.508-1 [14] with condition SMTC.4

6.6.2.5.5 Test requirement

Table 6.6.2.4.5-1 defines the primary level settings including test tolerances for all tests.

Table 6.6.2.5.1-3: Cell specific test parameters for SA inter-frequency event triggered reporting for FR1 with SSB time index detection

Parameter		Unit	Test configuration	Cell 1		Cell 2	
				T1	T2	T1	T2
NR RF Channel Number			Config 1,2,3	1		2	
Duplex mode			Config 1	FDD			
			Config 2,3	TDD			
TDD configuration			Config 1	Not Applicable			
			Config 2	TDDConf.1.1			
			Config 3	TDDConf.2.1			
$BW_{channel}$		MHz	Config 1,2	10: $N_{RB,c}$ = 52			
			Config 3	40: $N_{RB,c}$ = 106			
BWP BW		MHz	Config 1,2	10: $N_{RB,c}$ = 52			
			Config 3	40: $N_{RB,c}$ = 106			
BWP configuration	Initial DL BWP		Config 1, 2, 3	DLBWP.0.1		NA	
	Initial UL BWP			ULBWP.0.1		NA	

	Dedicated DL BWP			DLBWP.1.1		NA	
	Dedicated UL BWP			ULBWP.1.1		NA	
TRS configuration			Config 1	TRS.1.1 FDD		NA	
			Config 2	TRS.1.1 TDD		NA	
			Config 3	TRS.1.2 TDD		NA	
OCNG Patterns			Config 1,2,3	OP.1		OP.1	
PDSCH Reference measurement channel			Config 1	SR.1.1 FDD		-	
			Config 2	SR.1.1 TDD			
			Config 3	SR 2.1 TDD			
RMSI CORESET Reference Channel			Config 1	CR.1.1 FDD		-	
			Config 2	CR.1.1 TDD			
			Config 3	CR 2.1 TDD			
Dedicated CORESET Reference Channel			Config 1	CCR.1.1 FDD		-	
			Config 2	CCR.1.1 TDD			
			Config 3	CCR.2.1 TDD			
SSB parameters			Config 1	SSB.1 FR1		SSB.5 FR1	
			Config 2	SSB.1 FR1		SSB.5 FR1	
			Config 3	SSB.2 FR1		SSB.6 FR1	
SMTC configuration			Config 1	SMTC.2		SMTC.5	
			Config 2, 3	SMTC.1		SMTC.4	
PDSCH/PDCCH subcarrier spacing		kHz	Config 1,2	15			
			Config 3	30			
EPRE ratio of PSS to SSS			Config 1,2,3	0		0	
EPRE ratio of PBCH DMRS to SSS							
EPRE ratio of PBCH to PBCH DMRS							
EPRE ratio of PDCCH DMRS to SSS							
EPRE ratio of PDCCH to PDCCH DMRS							
EPRE ratio of PDSCH DMRS to SSS							
EPRE ratio of PDSCH to PDSCH							
EPRE ratio of OCNG DMRS to SSS(Note 1)							
EPRE ratio of OCNG to OCNG DMRS (Note 1)							
N_{oc} Note2		dBm/15 kHz		-98		-98	
N_{oc} Note2		dBm/SCS	Config 1,2	-98		-98	
			Config 3	-95		-95	
SS-RSRP Note 3		dBm/SCS	Config 1,2	-94	-94	-Infinity	-91
			Config 3	-91	-91	-Infinity	-88
$\hat{E}_s/I_{ot}$		dB	Config 1,2,3	4	4	-Infinity	7
$\hat{E}_s/N_{oc}$		dB	Config 1,2,3	4	4	-Infinity	7
Io Note3		dBm/9.36MHz	Config 1,2	-64.59	-64.59	-70.05	-62.2
		dBm/38.16MHz	Config 3	-58.4	-58.49	-63.94	-56.15
Propagation Condition			Config 1,2,3	AWGN		AWGN	

Note 1:	OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.
Note 2:	Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for N_{oc} to be fulfilled.
Note 3:	SS-RSRP and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.
Note 4:	SS-RSRP minimum requirements are specified assuming independent interference and noise at each receiver antenna port.

In test 1 with per-UE gap, the UE shall send one Event A3 triggered measurement report, with a measurement reporting delay less than 1040 ms from the beginning of time period T2. The UE shall not send event triggered measurement reports, as long as the reporting criteria are not fulfilled. The rate of correct events observed during repeated tests shall be at least 90% with a confidence level of 95%.

In test 2 with per-FR gap, the UE shall send one Event A3 triggered measurement report, with a measurement reporting delay less than 880 ms from the beginning of time period T2. The UE shall not send event triggered measurement reports, as long as the reporting criteria are not fulfilled. The rate of correct events observed during repeated tests shall be at least 90% with a confidence level of 95%.

In test 1 and 2 UE is required to report SSB time index.

NOTE: The actual overall delays measured in the test may be up to $2xTTI_{DCCH}$ higher than the measurement reporting delays above because of TTI insertion uncertainty of the measurement report in DCCH.

6.6.2.6 NR SA FR1-FR1 event-triggered reporting in DRX with SSB time index detection

6.6.2.6.1 Test purpose

To verify that the UE makes correct reporting of an event in DRX within inter-frequency NR cell search requirements with SSB time index detection in TS 38.133 [6] clause 9.3.4.

6.6.2.6.2 Test applicability

This test applies to all types of NR UE Release 15 and forward supporting 5GS NR SA FR1 and long DRX cycle. Test 1 and Test 2 are applicable to UEs not supporting per-FR gap (IndependentGapConfig, as defined in TS 38.306 [11]) and Test 3 and Test 4 are applicable only to UEs supporting per-FR gap and Gap Pattern Id 4.

6.6.2.6.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 6.6.2.0.

The normative reference for this requirement is TS 38.133 [6] clause A.6.6.2.6.

6.6.2.6.4 Test description

6.6.2.6.4.1 Initial conditions

This test shall be tested using any of the test configurations in Table 6.6.2.6.4.1-1. Configure the test equipment and the DUT according to the parameters in Table 6.6.2.6.4.1-2. Test environment parameters are given in Table 6.6.2.6.4.1-3.

Table 6.6.2.6.4.1-1: SA FR1-FR1 event triggered reporting tests in DRX with SSB time index detection supported test configurations

Test Case ID	Description
6.6.2.6-1	NR 15 kHz SSB SCS, 10MHz bandwidth, FDD duplex mode
6.6.2.64-2	NR 15 kHz SSB SCS, 10MHz bandwidth, TDD duplex mode
6.6.2.6-3	NR 30 kHz SSB SCS, 40MHz bandwidth, TDD duplex mode
Note 1: The UE is only required to be tested in one of the supported test configurations Note 2: target NR cell has the same SCS, BW and duplex mode as NR serving cell	

Table 6.6.2.6.4.1-2: General test parameters for SA inter-frequency event triggered reporting for FR1 with SSB time index detection

Parameter	Unit	Test configuration	Value				Comment
			Test 1	Test 2	Test 3	Test 4	
NR RF Channel Number		Config 1,2,3	1, 2				Two FR1 NR carrier frequencies are used
Active cell		Config 1,2,3	NR cell 1 (Pcell)				NR Cell 1 is on NR RF channel number 1
Neighbour cell		Config 1,2,3	NR cell2				NR cell 2 is on NR RF channel number 2
Gap Pattern Id		Config 1,2,3	0		4		As specified in TS 38.133 clause 9.1.2-1
Measurement gap offset		Config 1,2,3	9		9		
A3-Offset	dB	Config 1,2,3	-6				
Hysteresis	dB	Config 1,2,3	0				
CP length		Config 1,2,3	Normal				
TimeToTrigger	s	Config 1,2,3	0				
Filter coefficient		Config 1,2,3	0				L3 filtering is not used
DRX		Config 1,2,3	DRX .1	DRX .7	DRX .1	DRX .7	As specified in clause A.5
Time offset between serving and neighbour cells		Config 1	3ms				Asynchronous cells. The timing of Cell 2 is 3ms later than the timing of Cell 1.
		Config 2,3	3μs				Synchronous cells
T1	s	Config 1,2,3	5				
T2	s	Config 1,2,3	1.3	13.5	1.3	13.5	

Table 6.6.2.6.4.1-3: Test Environment parameters for SA inter-frequency event triggered reporting for FR1 without SSB time index detection in DRX

Parameter	Value		Comment
Test environment	NC		As specified in TS 38.508-1 [14] clause 4.1.
Test frequencies	As specified in Annex E, Table E.4-1 and TS 38.508-1 [14] clause 4.3.1 and 4.4.2.		
Channel bandwidth	As specified by the test configuration selected from Table 6.6.2.6.4.1-1.		
Propagation conditions	AWGN		As specified in Annex C.2.2.
Connection Diagram	TE Part	A.3.1.8.2	As specified in TS 38.508-1 [14] Annex A.
	DUT Part	A.3.2.3.4	
Exceptions to connection diagram	- Without LTE link - For 4Rx capable UEs without any 2Rx RF bands use A.3.2.5.1 for DUT part and A.3.1.8.4 for TE part.		

1. Message contents are defined in clause 6.6.2.6.4.3.

2. There are two NR cells on two carriers specified in the test. Cell 1 is the cell used for connection setup and Cell 2 is a target cell on a different carrier than Cell 1. The power levels and settings for Cell 2 are set according to Table Annex C.1.2.

6.6.2.6.4.2 Test procedure

In this test, there are two cells: NR cell 1 as PCell in FR1 on NR RF channel 1 and NR cell 2 as neighbour cell in FR1 on NR RF channel 2.

In test 1&2 measurement gap pattern configuration # 0 as defined in Table 6.6.2.6.4.1-2 is provided for UE that does not support per-FR gap and in test 3&4 measurement gap pattern configuration #4 as defined in Table 6.6.2.6.4.1-2 is provided for UE that supports per-FR gap.

In the measurement control information, it is indicated to the UE that event-triggered reporting with Event A3 is used. The test consists of two successive time periods, with time duration of T1, and T2 respectively. During time duration T1, the UE shall not have any timing information of NR cell 2.

1. Ensure the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity NR SA, Connected without release *On* and Test Mode *On* according to TS 38.508-1 [14] clause 4.5.

2. Set the parameters according to T1 in Table 6.6.2.6.4.1-2 and Table 6.6.2.6.5-1.

3. The SS shall transmit an *RRCReconfiguration* message.

4. The UE shall transmit *RRCReconfigurationComplete* message. T1 starts.

5. When T1 expires, the SS shall switch the power setting from T1 to T2 as specified in Table 6.6.2.6.5-1. T2 Starts.

6. UE shall transmit a *MeasurementReport* message triggered by Event A3. If the overall delays measured from the beginning of time period T2 is less than 1280 ms for Test 1, 13440 ms for Test 2, 1280 ms for Test 3 and 13440 ms for Test 4, then the number of successful tests is increased by one. If the UE fails to report the event within the overall delays measured requirement then the number of failure tests is increased by one.

7. After the SS receives the *MeasurementReport* message in step 6 or when T2 expires, the SS shall:

   - transmit RRCRelease message to release the RRC connection which includes the release of the established radio bearers as well as all radio resources

   OR

   - switch the UE off.

8. Set Cell 3 physical cell identity = ((current cell 3 physical cell identity + 1) mod 14 + 2) for next iteration of the test procedure loop.

9. Depending on the choice in Step 7, the SS:

   - if the RRC Connection Release has been sent, transmits in Cell 1 a *Paging* message (including PagingRecord with ue-Identity) for the UE and ensures the UE in state RRC_CONNECTED with generic procedure parameters Connectivity NR SA, Connected without release *On* according to TS 38.508-1 [14] clause 4.5. (if the paging fails, switches off and on the UE and ensures the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity NR SA, Connected without release *On* according to TS 38.508-1 [14] clause 4.5.),
   OR
   - if the device has been switched off, switches on the UE and ensures the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity NR SA, Connected without release *On* according to TS 38.508-1 [14] clause 4.5.

10. Repeat step 2-9 until the confidence level according to Tables G.2.3-1 in Annex G clause G.2 is achieved.

11. Repeat step 1-10 for each sub-test in Table 6.6.2.6.4.1-2 as appropriate.

6.6.2.6.4.3 Message contents

Message contents are according to TS 38.508-1 [14] clause 7.3 with the following exceptions:

Table 6.6.2.6.4.3-1: Common Exception messages SA inter frequency event triggered reporting without SSB time index detection in non-DRX

Default Message Contents	
Common contents of system information blocks exceptions	

Default RRC messages and information elements contents exceptions	Table H.3.1-1 Table H.3.1-2 with Conditions GAP NEEDED and INTER-FREQ Table H.3.1-4 with A3-offset = -6dB and Condition SSB Index Table H.3.1-5 Table H.3.1-6 with Conditions gapUE, Pattern #0 and gap offset = 9 for Test 1 and Test 2 Table H.3.1-6 with Conditions gapFR1 and Pattern #4 and gap offset = 9 for Test 3 and Test 4 Table H.3.1-7 with Conditions INTER-FREQ and SSB Index Table H.3.7-1 with Condition DRX.1 and Gap and INTER-FREQ for Test 1 and Test 3 Table H.3.7-1 with Condition DRX.7 and Gap and INTER-FREQ for Test 2 and Test 4
Specific message contents exceptions for Test Configuration 6.6.2.6-1	Table H.3.1-3 with Conditions INTER-FREQ MO Table 7.3.1-3 in TS 38.508-1 [14] with condition SMTC.5
Specific message contents exceptions for Test Configuration 6.6.2.6-2	Table H.3.1-3 with Conditions INTER-FREQ MO and Synchronous cells Table 7.3.1-3 in TS 38.508-1 [14] with condition SMTC.4
Specific message contents exceptions for Test Configuration 6.6.2.6-3	Table H.3.1-3 with Conditions INTER-FREQ MO and Synchronous cells Table 7.3.1-3 in TS 38.508-1 [14] with condition SMTC.4

6.6.2.6.5 Test requirement

Table 6.6.2.6.5-1 defines the primary level settings including test tolerances for all tests.

Table 6.6.2.6.5-1: Cell specific test parameters for SA inter-frequency event triggered reporting for FR1 with SSB time index detection

Parameter		Unit	Test configuration	Cell 1		Cell 2	
				T1	T2	T1	T2
NR RF Channel Number			Config 1,2,3	1		2	
Duplex mode			Config 1	FDD			
			Config 2,3	TDD			
TDD configuration			Config 1	Not Applicable			
			Config 2	TDDConf.1.1			
			Config 3	TDDConf.2.1			
$BW_{channel}$		MHz	Config 1,2	10: $N_{RB,c}$ = 52			
			Config 3	40: $N_{RB,c}$ = 106			
BWP BW		MHz	Config 1,2	10: $N_{RB,c}$ = 52			
			Config 3	40: $N_{RB,c}$ = 106			
BWP configuration	Initial DL BWP		Config 1, 2, 3	DLBWP.0.1		NA	
	Initial UL BWP			ULBWP.0.1		NA	
	Dedicated DL BWP			DLBWP.1.1		NA	
	Dedicated UL BWP			ULBWP.1.1		NA	
TRS configuration			Config 1	TRS.1.1 FDD		NA	
			Config 2	TRS.1.1 TDD		NA	
			Config 3	TRS.1.2 TDD		NA	
OCNG Patterns			Config 1,2,3	OP.1		OP.1	
PDSCH Reference measurement channel			Config 1	SR.1.1 FDD		-	
			Config 2	SR.1.1 TDD			
			Config 3	SR 2.1 TDD			
RMSI CORESET Reference Channel			Config 1	CR.1.1 FDD		-	
			Config 2	CR.1.1 TDD			
			Config 3	CR 2.1 TDD			
Dedicated CORESET Reference Channel			Config 1	CCR.1.1 FDD		-	
			Config 2	CCR.1.1 TDD			
			Config 3	CCR.2.1 TDD			
SSB parameters			Config 1	SSB.1 FR1		SSB.5 FR1	
			Config 2	SSB.1 FR1		SSB.5 FR1	

		Config 3	SSB.2 FR1		SSB.6 FR1	
SMTC configuration		Config 1	SMTC.2		SMTC.5	
		Config 2, 3	SMTC.1		SMTC.4	
PDSCH/PDCCH subcarrier spacing	kHz	Config 1,2	15			
		Config 3	30			
EPRE ratio of PSS to SSS		Config 1,2,3	0		0	
EPRE ratio of PBCH DMRS to SSS						
EPRE ratio of PBCH to PBCH DMRS						
EPRE ratio of PDCCH DMRS to SSS						
EPRE ratio of PDCCH to PDCCH DMRS						
EPRE ratio of PDSCH DMRS to SSS						
EPRE ratio of PDSCH to PDSCH						
EPRE ratio of OCNG DMRS to SSS(Note 1)						
EPRE ratio of OCNG to OCNG DMRS (Note 1)						
N_{oc} Note2	dBm/15 kHz		-98		-98	
N_{oc} Note2	dBm/SCS	Config 1,2	-98		-98	
		Config 3	-95		-95	
SS-RSRP Note 3	dBm/SCS	Config 1,2	-94	-94	-Infinity	-91
		Config 3	-91	-91	-Infinity	-88
$\hat{E}_s/I_{ot}$	dB	Config 1,2,3,4,5,6	4	4	-Infinity	7
$\hat{E}_s/N_{oc}$	dB	Config 1,2,3	4	4	-Infinity	7
Io Note3	dBm/9.36MHz	Config 1,2	-64.59	-64.59	-70.05	-62.26
	dBm/38.16MHz	Config 3	-58.49	-58.49	-63.94	-56.15
Propagation Condition		Config 1,2,3	AWGN		AWGN	

Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.

Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for N_{oc} to be fulfilled.

Note 3: SS-RSRP and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.

Note 4: SS-RSRP minimum requirements are specified assuming independent interference and noise at each receiver antenna port.

In test 1 with per-UE gap, the UE shall send one Event A3 triggered measurement report, with a measurement reporting delay less than 1280 ms from the beginning of time period T2. The UE shall not send event triggered measurement reports, as long as the reporting criteria are not fulfilled. The rate of correct events observed during repeated tests shall be at least 90% with a confidence level of 95%.

In test 2 with per-UE gap, the UE shall send one Event A3 triggered measurement report, with a measurement reporting delay less than 13440 ms from the beginning of time period T2. The UE shall not send event triggered measurement reports, as long as the reporting criteria are not fulfilled. The rate of correct events observed during repeated tests shall be at least 90% with a confidence level of 95%.

In test 3 with per-FR gap, the UE shall send one Event A3 triggered measurement report, with a measurement reporting delay less than 1280 ms from the beginning of time period T2. The UE shall not send event triggered measurement

reports, as long as the reporting criteria are not fulfilled. The rate of correct events observed during repeated tests shall be at least 90% with a confidence level of 95%.

In test 4 with per-FR gap, the UE shall send one Event A3 triggered measurement report, with a measurement reporting delay less than 13440 ms from the beginning of time period T2. The UE shall not send event triggered measurement reports, as long as the reporting criteria are not fulfilled. The rate of correct events observed during repeated tests shall be at least 90% with a confidence level of 95%.

In test 1, 2, 3 and 4 UE is required to report SSB time index.

NOTE: The actual overall delays measured in the test may be up to $2xTTI_{DCCH}$ higher than the measurement reporting delays above because of TTI insertion uncertainty of the measurement report in DCCH.

6.6.2.7 Void

6.6.2.8 Void

6.6.2.9 NR SA FR1-FR1 event triggered reporting tests with additional mandatory gap pattern

Editor's Note: This test case is incomplete in following aspects:

- Message contents are missing.
- TT analysis is missing.
- Test applicability needs to be updated
- Cell mapping is missing in Annex E

6.6.2.9.1 Test purpose

To verify that the UE makes correct reporting of an event when mandatory gap pattern with 3ms MGL is configured within inter-frequency NR cell search requirements in TS 38.133 [6] clause 9.3.4.

6.6.2.9.2 Test applicability

This test applies to all types of NR UE release 16 onwards.

6.6.2.9.3 Minimum conformance requirements

The minimum conformance requirements are defined in clause 6.6.2.0.1.

The normative reference for this requirement is TS 38.133 [6] clause A.6.6.2.9.

6.6.2.9.4 Test description

6.6.2.9.4.1 Initial conditions

This test shall be tested using any of the test configurations in Table 6.6.2.9.4.1-1.

Table 6.6.2.9.4.1-1: SA FR1 event triggered reporting tests with additional mandatory gap pattern supported test configurations

Configuration	Description
6.6.2.9-1	15 kHz SSB SCS, 10 MHz bandwidth, FDD – TDD duplex mode
6.6.2.9-2	15 kHz SSB SCS, 10 MHz bandwidth, TDD – TDD duplex mode
6.6.2.9-3	30 kHz SSB SCS, 40 MHz bandwidth, TDD – TDD duplex mode
NOTE.1: The UE is only required to be tested in one of the supported test configurations.	

Configure the test equipment and the DUT according to the parameters in Table 6.6.2.9.4.1-2.

Table 6.6.2.9.4.1-2: Test Environment parameters for SA FR1 event triggered reporting tests with additional mandatory gap pattern

Parameter	Value		Comment
Test environment	NC		As specified in TS 38.508-1 [14] clause 4.1.
Test frequencies	As specified in Annex E, table E.4-1 and TS 38.508-1 [14] clause 4.3.1 and 4.4.2..		
Channel bandwidth	As specified by the test configuration selected from Table 6.6.2.9.4.1-1.		
Propagation conditions	AWGN		As specified in clause C.2.2.
Connection Diagram	TE Part	A.3.1.8.2	As specified in TS 38.508-1 [14] Annex A.
	DUT Part	A.3.2.3.4	
Exceptions to connection diagram	- Without LTE link - For 4Rx capable UEs without any 2Rx RF bands use A.3.2.5.1 for DUT part and A.3.1.8.4 for TE part.		

1. The general test parameter settings are set up according to Table 6.6.2.9.4.1-3.
2. Message contents are defined in clause 6.6.2.9.4.3.
3. There are two NR cells on two carriers specified in the test. Cell 1 is the cell used for connection setup and Cell 2 is a target cell on a different carrier than Cell 1. The power levels and settings for Cell 2 are set according to Annex C.1.2.

Table 6.6.2.9.4.1-3: General test parameters for SA inter-frequency event triggered reporting with additional mandatory gap pattern

Parameter	Unit	Test configuration	Value		Comment
			Test 1	Test 2	
NR RF Channel Number		Config 1,2,3	1, 2		Two FR1 NR carrier frequencies is used.
Active cell		Config 1,2,3	NR cell 1 (Pcell)		NR Cell 1 is on NR RF channel number 1.
Neighbour cell		Config 1,2,3	NR cell2		NR cell 2 is on NR RF channel number 2.
Gap Pattern Id		Config 1,2,3	3	2	As specified in clause 9.1.2-1.
Measurement gap offset		Config 1,2,3	9	9	
SMTC-SSB parameters		Config 1	SSB.1 FR1		As specified in clause A.3.10.1
		Config 2	SSB.1 FR1		As specified in clause A.3.10.1
		Config 3	SSB.2 FR1		As specified in clause A.3.10.1
A3-Offset	dB	Config 1,2,3	-6		
Hysteresis	dB	Config 1,2,3	0		
CP length		Config 1,2,3	Normal		
TimeToTrigger	s	Config 1,2,3	0		
Filter coefficient		Config 1,2,3	0		L3 filtering is not used
DRX		Config 1,2,3	OFF		DRX is not used
Time offset between serving and neighbour cells		Config 1	3ms		Asynchronous cells. The timing of Cell 2 is 3ms later than the timing of Cell 1.
		Config 2,3	3μs		Synchronous cells.
T1	s	Config 1,2,3	5		
T2	s	Config 1,2,3	1	1	

6.6.2.9.4.2 Test procedure

In this test, there are two cells: NR cell 1 as PCell in FR1 on NR RF channel 1 and NR cell 2 as neighbour cell in FR1 on NR RF channel 2.

In test 1 measurement gap pattern configuration # 3 as defined in Table 6.6.2.9.4.1-2 is provided for UE that does not support per-FR gap and in test 2 measurement gap pattern configuration #2 as defined in Table 6.6.2.9.4.1-2 is provided for UE that supports per-FR gap.

In the measurement control information, it is indicated to the UE that event-triggered reporting with Event A3 is used. The test consists of two successive time periods, with time duration of T1, and T2 respectively. During time duration T1, the UE shall not have any timing information of NR cell 2.

1. Ensure the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity NR SA, Connected without release *On* and Test Mode *On* according to TS 38.508-1 [14] clause 4.5.

2. Set the parameters according to T1 in Table 6.6.2.9.4.1-2.

3. The SS shall transmit an *RRCReconfiguration* message.

4. The UE shall transmit *RRCReconfigurationComplete* message. T1 starts.

5. When T1 expires, the SS shall switch the power setting from T1 to T2 as specified in Table 6.6.2.9.4.1-2. T2 Starts.

6. UE shall transmit a *MeasurementReport* message triggered by Event A3. If the overall delays measured from the beginning of time period T2 is less than 1280 ms for Test 1 and 920 ms for Test 2 then the number of successful tests is increased by one. If the UE fails to report the event within the overall delays measured requirement, then the number of failure tests is increased by one.

7. After the SS receives the *MeasurementReport* message in step 6 or when T2 expires, the SS shall:

   - transmit RRCRelease message to release the RRC connection which includes the release of the established radio bearers as well as all radio resources

   OR

   - switch the UE off.

8. Set Cell 2 physical cell identity = ((current cell 2 physical cell identity + 1) mod 14 + 2) for next iteration of the test procedure loop.

9. Depending on the choice in Step 7, the SS:

   - if the RRC Connection Release has been sent, transmits in Cell 1 a *Paging* message (including PagingRecord with ue-Identity) for the UE and ensures the UE in state RRC_CONNECTED with generic procedure parameters Connectivity NR SA, Connected without release *On* according to TS 38.508-1 [14] clause 4.5. (if the paging fails, switches off and on the UE and ensures the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity NR SA, Connected without release *On* according to TS 38.508-1 [14] clause 4.5.),
     OR:

   - if the device has been switched off, switches on the UE and ensures the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity NR SA, Connected without release *On* according to TS 38.508-1 [14] clause 4.5.

10. Repeat step 2-9 until the confidence level according to Tables G.2.3-1 in Annex G clause G.2 is achieved.

11. Repeat step 1-10 for each sub-test in Table 6.6.2.9.4.1-2 as appropriate.

6.6.2.9.4.3 Message contents

TBD

6.6.2.9.5 Test requirement

Table 6.6.2.9.5-1 defines the primary level settings including test tolerances for SA inter-frequency event triggered reporting with additional mandatory gap pattern.

Table 6.6.2.9.5-1: Cell specific test parameters for SA inter-frequency event triggered reporting with additional mandatory gap pattern

Parameter		Unit	Test configuration	Cell 1		Cell 2	
				T1	T2	T1	T2
NR RF Channel Number			Config 1,2,3	1		2	
Duplex mode			Config 1	FDD			
			Config 2,3	TDD			
TDD configuration			Config 1	Not Applicable			
			Config 2	TDDConf.1.1			
			Config 3	TDDConf.2.1			
$BW_{channel}$		MHz	Config 1,2	10: $N_{RB,c}$ = 52			
			Config 3	40: $N_{RB,c}$ = 106			
BWP BW		MHz	Config 1,2	10: $N_{RB,c}$ = 52			
			Config 3	40: $N_{RB,c}$ = 106			
BWP configuration	Initial DL BWP		Config 1, 2, 3	DLBWP.0.1		NA	
	Initial UL BWP			ULBWP.0.1		NA	
	Dedicated DL BWP			DLBWP.1.1		NA	
	Dedicated UL BWP			ULBWP.1.1		NA	
TRS configuration			Config 1	TRS.1.1 FDD		NA	
			Config 2	TRS.1.1 TDD		NA	
			Config 3	TRS.1.2 TDD		NA	
OCNG Patterns defined in A.3.2.1.1 (OP.1)			Config 1,2,3	OP.1		OP.1	
PDSCH Reference measurement channel			Config 1	SR.1.1 FDD			
			Config 2	SR.1.1 TDD			
			Config 3	SR2.1 TDD			
CORESET Reference Channel			Config 1	CR.1.1 FDD			
			Config 2	CR.1.1 TDD			
			Config 3	CR2.1 TDD			
SSB parameters			Config 1	SSB.1 FR1		SSB.5 FR1	
			Config 2	SSB.1 FR1		SSB.5 FR1	
			Config 3	SSB.2 FR1		SSB.6 FR1	
SMTC configuration defined in A.3.11			Config 1	SMTC.1		SMTC.4	
			Config 2, 3	SMTC.1		SMTC.4	
PDSCH/PDCCH subcarrier spacing		kHz	Config 1,2	15			
			Config 3	30			
EPRE ratio of PSS to SSS			Config 1,2,3	0		0	
EPRE ratio of PBCH DMRS to SSS							
EPRE ratio of PBCH to PBCH DMRS							
EPRE ratio of PDCCH DMRS to SSS							
EPRE ratio of PDCCH to PDCCH DMRS							
EPRE ratio of PDSCH DMRS to SSS							
EPRE ratio of PDSCH to PDSCH							
EPRE ratio of OCNG DMRS to SSS (Note 1)							
EPRE ratio of OCNG to OCNG DMRS (Note 1)							
N_{oc} Note2		dBm/15 kHz		-98+TT		-98+TT	
			Config 1,2	-98+TT		-98+TT	

N_{oc} Note2	dBm/SCS	Config 3	-95+TT		-95+TT	
SS-RSRP Note 3	dBm/SCS	Config 1,2	-94+TT	-94+TT	-Infinity	-91+TT
		Config 3	-91+TT	-91+TT	-Infinity	-88+TT
$\hat{E}_s/I_{ot}$	dB	Config 1,2,3,4,5,6	4+TT	4+TT	-Infinity	7+TT
$\hat{E}_s/N_{oc}$	dB	Config 1,2,3	4+TT	4+TT	-Infinity	7+TT
Io Note3	dBm/9.36MHz	Config 1,2	-64.59+TT	-64.59+TT	-70.05+TT	-62.26+TT
	dBm/38.16MHz	Config 3	-58.49+TT	-58.49+TT	-63.94+TT	-56.15+TT
Propagation Condition		Config 1,2,3	AWGN		AWGN	

Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.
Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for N_{oc} to be fulfilled.
Note 3: SS-RSRP and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.
Note 4: SS-RSRP minimum requirements are specified assuming independent interference and noise at each receiver antenna port.

In test 1 with per-UE gap, the UE shall send one Event A3 triggered measurement report, with a measurement reporting delay less than 1280 ms from the beginning of time period T2. The UE shall not send event triggered measurement reports, as long as the reporting criteria are not fulfilled.

In test 2 with per-FR gap, the UE shall send one Event A3 triggered measurement report, with a measurement reporting delay less than 920 ms from the beginning of time period T2. The UE shall not send event triggered measurement reports, as long as the reporting criteria are not fulfilled.

In test 1 and 2 UE is not required to report SSB time index.

The rate of correct events observed during repeated tests shall be at least 90% with the confidence level of 95%.

6.6.2.10 NR SA FR1-FR1 event triggered reporting tests for FR1 without gap when DRX is used

Editor's Note: This test case is incomplete in following aspects:

- Message contents are missing.
- TT analysis is missing.
- Test applicability needs to be updated
- Cell mapping is missing in Annex E

6.6.2.10.1 Test purpose

To verify that the UE makes correct reporting of an event when no gap is configured and DRX is used within inter-frequency NR cell search requirements in TS 38.133 [6] clause 9.3.9.

6.6.2.10.2 Test applicability

This test applies to all types of NR UE release 16 which supports interFrequencyMeas-Nogap-r16.

6.6.2.10.3 Minimum conformance requirements

The minimum conformance requirements are defined in clause 6.6.2.0.2.

The normative reference for this requirement is TS 38.133 [6] clause A.6.6.2.10.

6.6.2.10.4 Test description

6.6.2.10.4.1 Initial conditions

This test shall be tested using any of the test configurations in Table 6.6.2.10.4.1-1.

Table 6.6.2.10.4.1-1: SA event triggered reporting tests for FR1 without gap when DRX is used supported test configurations

Configuration	Description
6.6.2.10-1	NR 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode
6.6.2.10-2	NR 15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode
6.6.2.10-3	NR 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode
Note 1: The UE is only required to be tested in one of the supported test configurations Note 2: target NR cell has the same SCS, BW and duplex mode as NR serving cell	

Configure the test equipment and the DUT according to the parameters in Table 6.6.2.10.4.1-2.

Table 6.6.2.10.4.1-2: Test Environment parameters for SA event triggered reporting tests for FR1 without gap when DRX is used

Parameter	Value		Comment
Test environment	NC		As specified in TS 38.508-1 [14] clause 4.1.
Test frequencies	As specified in Annex E, table E.4-1 and TS 38.508-1 [14] clause 4.3.1 and 4.4.2..		
Channel bandwidth	As specified by the test configuration selected from Table 6.6.2.10.4.1-1.		
Propagation conditions	AWGN		As specified in clause C.2.2.
Connection Diagram	TE Part	A.3.1.8.2	As specified in TS 38.508-1 [14] Annex A.
	DUT Part	A.3.2.3.4	
Exceptions to connection diagram	- Without LTE link - For 4Rx capable UEs without any 2Rx RF bands use A.3.2.5.1 for DUT part and A.3.1.8.4 for TE part.		

1. The general test parameter settings are set up according to Table 6.6.2.10.4.1-3.
2. Message contents are defined in clause 6.6.2.10.4.3.
3. There are two NR cells on two carriers specified in the test. Cell 1 is the cell used for connection setup and Cell 2 is a target cell on a different carrier than Cell 1. The power levels and settings for Cell 2 are set according to Annex C.1.2.

Table 6.6.2.10.4.1-3: General test parameters for SA event triggered reporting tests for FR1 without gap when DRX is used

Parameter	Unit	Test configuration	Value	Comment
NR RF Channel Number		Config 1,2,3	1, 2	Two FR1 NR carrier frequencies is used.
Active cell		Config 1,2,3	NR cell 1 (Pcell)	NR Cell 1 is on NR RF channel number 1.
Neighbour cell		Config 1,2,3	NR cell2	NR cell 2 is on NR RF channel number 2.
A3-Offset	dB	Config 1,2,3	-6	
Hysteresis	dB	Config 1,2,3	0	
CP length		Config 1,2,3	Normal	
TimeToTrigger	s	Config 1,2,3	0	
Filter coefficient		Config 1,2,3	0	L3 filtering is not used
DRX		Config 1,2,3	DRX.1	As specified in clause A.3.3
Time offset between serving and neighbour cells		Config 1	3ms	Asynchronous cells. The timing of Cell 2 is 3ms later than the timing of Cell 1.
		Config 2,3	3μs	Synchronous cells.

T1	s	Config 1,2,3	5	
T2	s	Config 1,2,3	1	

6.6.2.10.4.2 Test procedure

In this test, there are two cells: NR cell 1 as PCell in FR1 on NR RF channel 1 and NR cell 2 as neighbour cell in FR1 on NR RF channel 2.

In the measurement control information, it is indicated to the UE that event-triggered reporting with Event A3 is used. The test consists of two successive time periods, with time duration of T1, and T2 respectively. During time duration T1, the UE shall not have any timing information of NR cell 2.

1. Ensure the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity NR SA, Connected without release *On* and Test Mode *On* according to TS 38.508-1 [14] clause 4.5.

2. Set the parameters according to T1 in Table 6.6.2.10.4.1-2.

3. The SS shall transmit an *RRCReconfiguration* message.

4. The UE shall transmit *RRCReconfigurationComplete* message. T1 starts.

5. When T1 expires, the SS shall switch the power setting from T1 to T2 as specified in Table 6.6.2.10.4.1-2. T2 Starts.

6. UE shall transmit a *MeasurementReport* message triggered by Event A3. If the overall delays measured from the beginning of time period T2 is less than 1080 ms for Test Configuration 1 and 900 ms for Test Configuration 2 and 3then the number of successful tests is increased by one. If the UE fails to report the event within the overall delays measured requirement, then the number of failure tests is increased by one.

7. After the SS receives the *MeasurementReport* message in step 6 or when T2 expires, the SS shall:

   - transmit RRCRelease message to release the RRC connection which includes the release of the established radio bearers as well as all radio resources

   OR

   - switch the UE off.

8. Set Cell 2 physical cell identity = ((current cell 2 physical cell identity + 1) mod 14 + 2) for next iteration of the test procedure loop.

9. Depending on the choice in Step 7, the SS:

   - if the RRC Connection Release has been sent, transmits in Cell 1 a *Paging* message (including PagingRecord with ue-Identity) for the UE and ensures the UE in state RRC_CONNECTED with generic procedure parameters Connectivity NR SA, Connected without release *On* according to TS 38.508-1 [14] clause 4.5. (if the paging fails, switches off and on the UE and ensures the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity NR SA, Connected without release *On* according to TS 38.508-1 [14] clause 4.5.),
     OR:

   - if the device has been switched off, switches on the UE and ensures the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity NR SA, Connected without release *On* according to TS 38.508-1 [14] clause 4.5.

10. Repeat step 2-9 until the confidence level according to Tables G.2.3-1 in Annex G clause G.2 is achieved.

11. Repeat step 1-10 for each sub-test in Table 6.6.2.10.4.1-2 as appropriate.

6.6.2.10.4.3 Message contents

TBD

6.6.2.10.5 Test requirement

Table 6.6.2.10.5-1 defines the primary level settings including test tolerances for SA event triggered reporting tests for FR1 without gap when DRX is used.

Table 6.6.2.10.5-1: Cell specific test parameters for SA event triggered reporting tests for FR1 without gap when DRX is used

Parameter		Unit	Test configuration	Cell 1		Cell 2	
				T1	T2	T1	T2
NR RF Channel Number			Config 1,2,3	1		2	
Duplex mode			Config 1	FDD			
			Config 2,3	TDD			
TDD configuration			Config 1	Not Applicable			
			Config 2	TDDConf.1.1			
			Config 3	TDDConf.2.1			
$BW_{channel}$		MHz	Config 1,2	10: $N_{RB,c}$ = 52			
			Config 3	40: $N_{RB,c}$ = 106			
BWP BW		MHz	Config 1,2	10: $N_{RB,c}$ = 52			
			Config 3	40: $N_{RB,c}$ = 106			
BWP configuration	Initial DL BWP		Config 1, 2, 3	DLBWP.0.1		NA	
	Initial UL BWP		Config 1, 2, 3	ULBWP.0.1		NA	
	Dedicated DL BWP			DLBWP.1.1		NA	
	Dedicated UL BWP			ULBWP.1.1		NA	
TRS configuration			Config 1	TRS.1.1 FDD		NA	
			Config 2	TRS.1.1 TDD		NA	
			Config 3	TRS.1.2 TDD		NA	
OCNG Patterns defined in A.3.2.1.1 (OP.1)			Config 1,2,3	OP.1		OP.1	
PDSCH Reference measurement channel			Config 1	SR.1.1 FDD		NA	
			Config 2	SR.1.1 TDD		NA	
			Config 3	SR2.1 TDD		NA	
CORESET Reference Channel			Config 1	CR.1.1 FDD		NA	
			Config 2	CR.1.1 TDD		NA	
			Config 3	CR2.1 TDD		NA	
SSB parameters			Config 1	SSB.1 FR1		SSB.5 FR1	
			Config 2	SSB.1 FR1		SSB.5 FR1	
			Config 3	SSB.2 FR1		SSB.6 FR1	
SMTC configuration defined in A.3.11			Config 1	SMTC.2		SMTC.5	
			Config 2, 3	SMTC.1		SMTC.4	
PDSCH/PDCCH subcarrier spacing		kHz	Config 1,2	15			
			Config 3	30			
EPRE ratio of PSS to SSS			Config 1,2,3	0		0	
EPRE ratio of PBCH DMRS to SSS							
EPRE ratio of PBCH to PBCH DMRS							
EPRE ratio of PDCCH DMRS to SSS							
EPRE ratio of PDCCH to PDCCH DMRS							
EPRE ratio of PDSCH DMRS to SSS							
EPRE ratio of PDSCH to PDSCH							

EPRE ratio of OCNG DMRS to SSS (Note 1)						
EPRE ratio of OCNG to OCNG DMRS (Note 1)						
N_{oc} Note2	dBm/15 kHz	Config 1,2,3	-98+TT		-98+TT	
N_{oc} Note2	dBm/SCS	Config 1,2	-98+TT		-98+TT	
		Config 3	-95+TT		-95+TT	
SS-RSRP Note 3	dBm/SCS	Config 1,2	-94+TT	-94+TT	-Infinity	-91+TT
		Config 3	-91+TT	-91+TT	-Infinity	-88+TT
$\hat{E}_s/I_{ot}$	dB	Config 1,2,3,4,5,6	4+TT	4+TT	-Infinity	7+TT
$\hat{E}_s/N_{oc}$	dB	Config 1,2,3	4+TT	4+TT	-Infinity	7+TT
Io Note3	dBm/9.36MHz	Config 1,2	-64.59+TT	-64.59+TT	-70.05+TT	-62.2+TT
	dBm/38.16MHz	Config 3	-58.49+TT	-58.49+TT	-63.94+TT	-56.15+TT
Propagation Condition		Config 1,2,3	AWGN		AWGN	

Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.

Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for N_{oc} to be fulfilled.

Note 3: SS-RSRP and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.

Note 4: SS-RSRP minimum requirements are specified assuming independent interference and noise at each receiver antenna port.

In test config 1, UE is required to report SSB time index. UE is not required to report SSB time index. The UE shall send one Event A3 triggered measurement report, with a measurement reporting delay less than 1080 ms from the beginning of time period T2. The UE shall not send event triggered measurement reports, as long as the reporting criteria are not fulfilled.

In test config 2 and 3, UE is not required to report SSB time index. The UE shall send one Event A3 triggered measurement report, with a measurement reporting delay less than 900 ms from the beginning of time period T2. The UE shall not send event triggered measurement reports, as long as the reporting criteria are not fulfilled.

The rate of correct events observed during repeated tests shall be at least 90% with the confidence level of 95%.

NOTE: The actual overall delays measured in the test may be up to $2xTTI_{DCCH}$ higher than the measurement reporting delays above because of TTI insertion uncertainty of the measurement report in DCCH.

6.6.2.11 NR SA FR1-FR1 event triggered reporting tests for FR1 without gap when DRX is not used

Editor's Note: This test case is incomplete in following aspects:

- Message contents are missing.
- TT analysis is missing.
- Test Procedure is FFS.
- Test applicability needs to be updated
- Cell mapping is missing in Annex E

6.6.2.11.1 Test purpose

To verify that the UE makes correct reporting of an event when no gap is configured and DRX is not used within inter-frequency NR cell search requirements in TS 38.133 [6] clause 9.3.9.

6.6.2.11.2 Test applicability

This test applies to all types of NR UE release 16 which supports interFrequencyMeas-Nogap-r16.

6.6.2.11.3 Minimum conformance requirements

The minimum conformance requirements are defined in clause 6.6.2.0.2.

The normative reference for this requirement is TS 38.133 [6] clause A.6.6.2.11.

6.6.2.11.4 Test description

6.6.2.11.4.1 Initial conditions

This test shall be tested using any of the test configurations in Table 6.6.2.11.4.1-1.

Table 6.6.2.11.4.1-1: SA event triggered reporting tests for FR1 without gap when DRX is not used supported test configurations

Configuration	Description
6.6.2.11-1	15 kHz SSB SCS, 10 MHz bandwidth, FDD – TDD duplex mode
6.6.2.11-2	15 kHz SSB SCS, 10 MHz bandwidth, TDD – TDD duplex mode
6.6.2.11-3	30 kHz SSB SCS, 40 MHz bandwidth, TDD – TDD duplex mode
NOTE.1: The UE is only required to be tested in one of the supported test configurations.	

Configure the test equipment and the DUT according to the parameters in Table 6.6.2.11.4.1-2.

Table 6.6.2.11.4.1-2: Test Environment parameters for SA event triggered reporting tests for FR1 without gap when DRX is not used

Parameter	Value		Comment
Test environment	NC		As specified in TS 38.508-1 [14] clause 4.1.
Test frequencies	As specified in Annex E, table E.4-1 and TS 38.508-1 [14] clause 4.3.1 and 4.4.2..		
Channel bandwidth	As specified by the test configuration selected from Table 6.6.2.11.4.1-1.		
Propagation conditions	AWGN		As specified in clause C.2.2.
Connection Diagram	TE Part	A.3.1.8.2	As specified in TS 38.508-1 [14] Annex A.
	DUT Part	A.3.2.3.4	
Exceptions to connection diagram	- Without LTE link - For 4Rx capable UEs without any 2Rx RF bands use A.3.2.5.1 for DUT part and A.3.1.8.4 for TE part.		

1. The general test parameter settings are set up according to Table 6.6.2.10.4.1-3.
2. Message contents are defined in clause 6.6.2.10.4.3.
3. There are two NR cells on two carriers specified in the test. Cell 1 is the cell used for connection setup and Cell 2 is a target cell on a different carrier than Cell 1. The power levels and settings for Cell 2 are set according to Annex C.1.2.

Table 6.6.2.11.4.1-3: General test parameters for SA event triggered reporting tests for FR1 without gap when DRX is not used

Parameter	Unit	Test configuration	Value	Comment
NR RF Channel Number		Config 1,2,3	1, 2	Two FR1 NR carrier frequencies is used.
Active cell		Config 1,2,3	NR cell 1 (Pcell)	NR Cell 1 is on NR RF channel number 1.

Neighbour cell		Config 1,2,3	NR cell2	NR cell 2 is on NR RF channel number 2.
A3-Offset	dB	Config 1,2,3	-6	
Hysteresis	dB	Config 1,2,3	0	
CP length		Config 1,2,3	Normal	
TimeToTrigger	s	Config 1,2,3	0	
Filter coefficient		Config 1,2,3	0	L3 filtering is not used
DRX		Config 1,2,3	OFF	DRX is not used
Time offset between serving and neighbour cells		Config 1	3ms	Asynchronous cells. The timing of Cell 2 is 3ms later than the timing of Cell 1.
		Config 2,3	3μs	Synchronous cells.
T1	s	Config 1,2,3	5	
T2	s	Config 1,2,3	1	

6.6.2.11.4.2 Test procedure

In this test, there are two cells: NR cell 1 as PCell in FR1 on NR RF channel 1 and NR cell 2 as neighbour cell in FR1 on NR RF channel 2.

In the measurement control information, it is indicated to the UE that event-triggered reporting with Event A3 is used. The test consists of two successive time periods, with time duration of T1, and T2 respectively. During time duration T1, the UE shall not have any timing information of NR cell 2.

1. Ensure the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity NR SA, Connected without release *On* and Test Mode *On* according to TS 38.508-1 [14] clause 4.5.

2. Set the parameters according to T1 in Table 6.6.2.11.4.1-2.

3. The SS shall transmit an *RRCReconfiguration* message.

4. The UE shall transmit *RRCReconfigurationComplete* message. T1 starts.

5. When T1 expires, the SS shall switch the power setting from T1 to T2 as specified in Table 6.6.2.11.4.1-2. T2 Starts.

6. UE shall transmit a *MeasurementReport* message triggered by Event A3. If the overall delays measured from the beginning of time period T2 is less than 800 ms then the number of successful tests is increased by one. If the UE fails to report the event within the overall delays measured requirement, then the number of failure tests is increased by one.

7. After the SS receives the *MeasurementReport* message in step 6 or when T2 expires, the SS shall:

   - transmit RRCRelease message to release the RRC connection which includes the release of the established radio bearers as well as all radio resources

   OR

   - switch the UE off.

8. Set Cell 2 physical cell identity = ((current cell 2 physical cell identity + 1) mod 14 + 2) for next iteration of the test procedure loop.

9. Depending on the choice in Step 7, the SS:

- if the RRC Connection Release has been sent, transmits in Cell 1 a *Paging* message (including PagingRecord with ue-Identity) for the UE and ensures the UE in state RRC_CONNECTED with generic procedure parameters Connectivity NR SA, Connected without release *On* according to TS 38.508-1 [14] clause 4.5. (if the paging fails, switches off and on the UE and ensures the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity NR SA, Connected without release *On* according to TS 38.508-1 [14] clause 4.5.), OR:

- if the device has been switched off, switches on the UE and ensures the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity NR SA, Connected without release *On* according to TS 38.508-1 [14] clause 4.5.

10. Repeat step 2-9 until the confidence level according to Tables G.2.3-1 in Annex G clause G.2 is achieved.

11. Repeat step 1-10 for each sub-test in Table 6.6.2.11.4.1-2 as appropriate.

6.6.2.11.4.3 Message contents

TBD

6.6.2.11.5 Test requirement

Table 6.6.2.11.5-1 defines the primary level settings including test tolerances for SA event triggered tests for FR1 without gap when DRX is not used.

Table 6.6.2.11.5-1: Cell specific test parameters for SA event triggered reporting tests for FR1 without gap when DRX is not used

Parameter		Unit	Test configuration	Cell 1		Cell 2	
				T1	T2	T1	T2
NR RF Channel Number			Config 1,2,3	1		2	
Duplex mode			Config 1	FDD			
			Config 2,3	TDD			
TDD configuration			Config 1	Not Applicable			
			Config 2	TDDConf.1.1			
			Config 3	TDDConf.2.1			
$BW_{channel}$		MHz	Config 1,2	10: $N_{RB,c}$ = 52			
			Config 3	40: $N_{RB,c}$ = 106			
BWP BW		MHz	Config 1,2	10: $N_{RB,c}$ = 52			
			Config 3	40: $N_{RB,c}$ = 106			
BWP configuration	Initial DL BWP		Config 1, 2, 3	DLBWP.0.1		NA	
	Initial UL BWP			ULBWP.0.1		NA	
	Dedicated DL BWP			DLBWP.1.1		NA	
	Dedicated UL BWP			ULBWP.1.1		NA	
TRS configuration			Config 1	TRS.1.1 FDD		NA	
			Config 2	TRS.1.1 TDD		NA	
			Config 3	TRS.1.2 TDD		NA	
OCNG Patterns defined in A.3.2.1.1 (OP.1)			Config 1,2,3	OP.1		OP.1	
PDSCH Reference measurement channel			Config 1	SR.1.1 FDD			
			Config 2	SR.1.1 TDD			
			Config 3	SR2.1 TDD			
CORESET Reference Channel			Config 1	CR.1.1 FDD			
			Config 2	CR.1.1 TDD			
			Config 3	CR2.1 TDD			
SSB parameters			Config 1	SSB.1 FR1		SSB.5 FR1	
			Config 2	SSB.1 FR1		SSB.5 FR1	
			Config 3	SSB.2 FR1		SSB.6 FR1	
SMTC configuration defined in A.3.11			Config 1	SMTC.2		SMTC.5	
			Config 2, 3	SMTC.1		SMTC.4	
PDSCH/PDCCH subcarrier spacing		kHz	Config 1,2	15			
			Config 3	30			
EPRE ratio of PSS to SSS			Config 1,2,3	0		0	
EPRE ratio of PBCH DMRS to SSS							

EPRE ratio of PBCH to PBCH DMRS						
EPRE ratio of PDCCH DMRS to SSS						
EPRE ratio of PDCCH to PDCCH DMRS						
EPRE ratio of PDSCH DMRS to SSS						
EPRE ratio of PDSCH to PDSCH						
EPRE ratio of OCNG DMRS to SSS(Note 1)						
EPRE ratio of OCNG to OCNG DMRS (Note 1)						
N_{oc} Note2	dBm/15 kHz		-98+TT		-98+TT	
N_{oc} Note2	dBm/SCS	Config 1,2	-98+TT		-98+TT	
		Config 3	-95+TT		-95+TT	
SS-RSRP Note 3	dBm/SCS	Config 1,2	-94+TT	-94+TT	-Infinity	-91+TT
		Config 3	-91+TT	-91+TT	-Infinity	-88+TT
$\hat{E}_s/I_{ot}$	dB	Config 1,2,3,4,5,6	4	4	-Infinity	7+TT
$\hat{E}_s/N_{oc}$	dB	Config 1,2,3	4	4	-Infinity	7+TT
Io Note3	dBm/9.36MHz	Config 1,2	-64.59+TT	-64.59+TT	-70.05+TT	-62.26+TT
	dBm/38.16MHz	Config 3	-58.49+TT	-58.49+TT	-63.94+TT	-56.15+TT
Propagation Condition		Config 1,2,3	AWGN		AWGN	

Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.

Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for N_{oc} to be fulfilled.

Note 3: SS-RSRP and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.

Note 4: SS-RSRP minimum requirements are specified assuming independent interference and noise at each receiver antenna port.

The UE shall send one Event A3 triggered measurement report, with a measurement reporting delay less than 800 ms from the beginning of time period T2. The UE shall not send event triggered measurement reports, as long as the reporting criteria are not fulfilled.

The UE is not required to read the neighbour cell SSB index in this test.

The rate of correct events observed during repeated tests shall be at least 90% with the confidence level of 95%.

6.6.2.12 NR SA FR1-FR1 event triggered reporting tests without SSB time index detection in DRX for UE configured with highSpeedMeasInterFreq-r17

Editor's Note: This test case is incomplete in following aspects:

- TT analysis is missing.

6.6.2.12.1 Test purpose

The purpose of this test is to verify TBD

6.6.2.12.2 Test applicability

This test applies to all types of E-UTRA UE release 16 and forward supporting enhanced inter-frequency NR measurement requirements in high-speed scenario

6.6.2.12.3 Minimum conformance requirements

The minimum conformance requirements are defined in clause 6.6.2.0.1

The normative reference for this requirement is TS 38.133 [6] clause A.6.6.2.12

6.6.2.12.4 Test description

6.6.2.12.4.1 Initial conditions

This test shall be tested using any of the test configurations in Table 6.6.2.12.4.1-1.

Table 6.6.2.12.4.1-1: Supported test configurations for NR SA FR1-FR1 event triggered reporting tests without SSB time index detection in DRX for UE configured with highSpeedMeasInterFreq-r17

Config	Description
6.6.2.12-1	NR 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode
6.6.2.12-2	NR 15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode
6.6.2.12-3	NR 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode
Note 1: The UE is only required to be tested in one of the supported test configurations Note 2: target NR cell has the same SCS, BW and duplex mode as NR serving cell	

Configure the test equipment and the DUT according to the parameters in Table 6.6.2.12.4.1-2.

Table 6.6.2.12.4.1-2: Initial conditions for NR SA FR1-FR1 event triggered reporting tests without SSB time index detection in DRX for UE configured with highSpeedMeasInterFreq-r17

Parameter	Value		Comment
Test environment	NC		As specified in TS 38.508-1 [14] clause 4.1.
Test frequencies	As specified in Annex E, table E.2-1 and TS 38.508-1 [14] clause 4.3.1.		
Channel bandwidth	As specified by the test configuration selected from Table 6.6.2.12.4.1-1.		
Propagation conditions	AWGN		As specified in clause C.2.1.
Connection Diagram	TE Part	A.3.1.8.2	As specified in TS 38.508-1 [14] Annex A.
	DUT Part	A.3.2.3.4	
Exceptions to connection diagram	- Without LTE link - For 4Rx capable UEs without any 2Rx RF bands use A.3.2.5.1 for DUT part and A.3.1.8.4 for TE part.		

1. The general test parameter settings are set up according to Table 6.6.2.12.4.1-3.
2. Message contents are defined in clause 6.6.2.12.4.3.
3. There are two NR cells on two carriers specified in the test. Cell 1 is the cell used for connection setup and Cell 2 is a target cell on a different carrier than Cell 1. The power levels and settings for Cell 2 are set according to Annex C.1.2.

Table 6.6.2.12.4.1-3: General test parameters for NR SA FR1-FR1 event triggered reporting tests without SSB time index detection in DRX for UE configured with highSpeedMeasInterFreq-r17

Parameter	Unit	Test configuration	Value		Comment
			Test 1	Test 2	
NR RF Channel Number		Config 1,2,3	1, 2		Two FR1 NR carrier frequencies is used.
Active cell		Config 1,2,3	NR cell 1 (Pcell)		NR Cell 1 is on NR RF channel number 1.

Neighbour cell		Config 1,2,3	NR cell2		NR cell 2 is on NR RF channel number 2.
Gap Pattern Id		Config 1,2,3	0	4	As specified in clause 9.1.2-1.
Measurement gap offset		Config 1,2,3	9	9	
A3-Offset	dB	Config 1,2,3	-6		
Hysteresis	dB	Config 1,2,3	0		
CP length		Config 1,2,3	Normal		
TimeToTrigger	s	Config 1,2,3	0		
Filter coefficient		Config 1,2,3	0		L3 filtering is not used
DRX		Config 1,2,3	DRX.4		As specified in clause A.3.3
Time offset between serving and neighbour cells		Config 1	3ms		Asynchronous cells. The timing of Cell 2 is 3ms later than the timing of Cell 1.
		Config 2,3	3μs		Synchronous cells.
T1	s	Config 1,2,3	5		
T2	s	Config 1,2,3	2.3	2.3	

6.6.2.12.4.2 Test procedure

In the measurement control information, it is indicated to the UE that event-triggered reporting with Event A3 is used. The test consists of two successive time periods, with time duration of T1, and T2 respectively. During time duration T1, the UE shall not have any timing information of NR cell 2.

1. Ensure the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity NR SA, Connected without release *On* and Test Mode *On* according to TS 38.508-1 [14] clause 4.5.

2. Set the parameters according to T1 in Table 6.6.2.12.4.1-2.

3. The SS shall transmit an *RRCReconfiguration* message.

4. The UE shall transmit *RRCReconfigurationComplete* message. T1 starts.

5. When T1 expires, the SS shall switch the power setting from T1 to T2 as specified in Table 6.6.2.12.4.1-2. T2 Starts.

6. UE shall transmit a *MeasurementReport* message triggered by Event A3. If the overall delays measured from the beginning of time period T2 is less than 2240 ms Test 1 and Test 2 then the number of successful tests is increased by one. If the UE fails to report the event within the overall delays measured requirement, then the number of failure tests is increased by one.

7. After the SS receives the *MeasurementReport* message in step 6 or when T2 expires, the SS shall:

   - transmit RRCRelease message to release the RRC connection which includes the release of the established radio bearers as well as all radio resources

   OR

   - switch the UE off.

8. Set Cell 3 physical cell identity = ((current cell 3 physical cell identity + 1) mod 14 + 2) for next iteration of the test procedure loop.

9. Depending on the choice in Step 7, the SS:

   - if the RRC Connection Release has been sent, transmits in Cell 1 a *Paging* message (including PagingRecord with ue-Identity) for the UE and ensures the UE in state RRC_CONNECTED with generic procedure parameters Connectivity NR SA, Connected without release *On* according to TS 38.508-1 [14] clause 4.5. (if the paging fails, switches off and on the UE and ensures the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity NR SA, Connected without release *On* according to TS 38.508-1 [14] clause 4.5.), OR:

- if the device has been switched off, switches on the UE and ensures the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity NR SA, Connected without release *On* according to TS 38.508-1 [14] clause 4.5.

10. Repeat step 2-9 until the confidence level according to Tables G.2.3-1 in Annex G clause G.2 is achieved.

11. Repeat step 1-10 for each sub-test in Table 6.6.2.12.4.1-2 as appropriate.

6.6.2.12.4.3 Message contents

Message contents are according to TS 38.508-1 [14] clause 7.3 with the following exceptions:

Table 6.6.2.12.4.3-1: Common Exception messages SA inter frequency event triggered reporting without SSB time index detection in non-DRX

Default Message Contents	
Common contents of system information blocks exceptions	
Default RRC messages and information elements contents exceptions	Table H.3.1-1 Table H.3.1-2 with Conditions GAP NEEDED and INTER-FREQ Table H.3.1-4 with A3-offset = -6dB Table H.3.1-5 Table H.3.1-6 with Conditions gapUE, Pattern #0 and gap offset = 9 for Test 1 Table H.3.1-6 with Conditions gapFR1, Pattern #4 and gap offset = 9 for Test 2 Table H.3.1-7 with Condition INTER-FREQ
Specific message contents exceptions for Test Configuration 6.6.2.1-1	Table H.3.1-3 with Conditions INTER-FREQ MO Table 7.3.1-3 in TS 38.508-1 [14] with condition SMTC.5
Specific message contents exceptions for Test Configuration 6.6.2.1-2	Table H.3.1-3 with Conditions INTER-FREQ MO and Synchronous cells Table 7.3.1-3 in TS 38.508-1 [14] with condition SMTC.4
Specific message contents exceptions for Test Configuration 6.6.2.1-3	Table H.3.1-3 with Conditions INTER-FREQ MO and Synchronous cells Table 7.3.1-3 in TS 38.508-1 [14] with condition SMTC.4

Table 6.6.2.12.4.3-2: *SIB4*: NR inter frequency cell re-selection with highSpeedMeasInterFreq-r17

Derivation Path: Table H.2.2-2			
Information Element	**Value/remark**	**Comment**	**Condition**
SIB4 ::= SEQUENCE {			
InterFreqCarrierFreqInfo-v1700 ::= SEQUENCE {			
highSpeedMeasInterFreq-r17	TRUE		
}			
}			

6.6.2.12.5 Test requirement

Table 6.6.2.12.5-1 defines the primary level settings including test tolerances for EN-DC FR1 interruptions at SRS carrier based switching in asynchronous EN-DC.

Table 6.6.2.12.5-1: NR cell specific test parameters for NR SA FR1-FR1 event triggered reporting tests without SSB time index detection in DRX for UE configured with highSpeedMeasInterFreq-r17

Parameter	Unit	Test configuration	Cell 1		Cell 2	
			T1	T2	T1	T2
NR RF Channel Number		Config 1,2,3	1		2	
Duplex mode		Config 1	FDD			
		Config 2,3	TDD			
TDD configuration		Config 1	Not Applicable			

			Config 2	TDDConf.1.1	
			Config 3	TDDConf.2.1	
$BW_{channel}$		MHz	Config 1,2	10: $N_{RB,c}$ = 52	
			Config 3	40: $N_{RB,c}$ = 106	
BWP BW		MHz	Config 1,2	10: $N_{RB,c}$ = 52	
			Config 3	40: $N_{RB,c}$ = 106	
BWP configuration	Initial DL BWP		Config 1, 2, 3	DLBWP.0.1	NA
	Initial UL BWP		Config 1, 2, 3	ULBWP.0.1	NA
	Dedicated DL BWP			DLBWP.1.1	NA
	Dedicated UL BWP			ULBWP.1.1	NA
TRS configuration			Config 1	TRS.1.1 FDD	NA
			Config 2	TRS.1.1 TDD	NA
			Config 3	TRS.1.2 TDD	NA
OCNG Patterns defined in A.3.2.1.1 (OP.1)			Config 1,2,3	OP.1	OP.1
PDSCH Reference measurement channel			Config 1	SR.1.1 FDD	NA
			Config 2	SR.1.1 TDD	NA
			Config 3	SR2.1 TDD	NA
RMSI CORESET Reference Channel			Config 1	CR.1.1 FDD	NA
			Config 2	CR.1.1 TDD	NA
			Config 3	CR.2.1 TDD	NA
Dedicated CORESET Reference Channel			Config 1	CCR.1.1 FDD	NA
			Config 2	CCR.1.1 TDD	NA
			Config 3	CCR.2.1 TDD	NA
SSB parameters			Config 1	SSB.1 FR1	SSB.5 FR1
			Config 2	SSB.1 FR1	SSB.5 FR1
			Config 3	SSB.2 FR1	SSB.6 FR1
SMTC configuration defined in A.3.11			Config 1	SMTC.2	SMTC.5
			Config 2, 3	SMTC.1	SMTC.4
PDSCH/PDCCH subcarrier spacing		kHz	Config 1,2	15	
			Config 3	30	
EPRE ratio of PSS to SSS			Config 1,2,3	0	0
EPRE ratio of PBCH DMRS to SSS					
EPRE ratio of PBCH to PBCH DMRS					
EPRE ratio of PDCCH DMRS to SSS					
EPRE ratio of PDCCH to PDCCH DMRS					
EPRE ratio of PDSCH DMRS to SSS					
EPRE ratio of PDSCH to PDSCH					
EPRE ratio of OCNG DMRS to SSS(Note 1)					
EPRE ratio of OCNG to OCNG DMRS (Note 1)					
N_{oc} Note2		dBm/15 kHz	Config 1,2,3	-98	-98
N_{oc} Note2		dBm/SCS	Config 1,2	-98	-98
			Config 3	-95	-95

SS-RSRP Note 3	dBm/SCS	Config 1,2	-94	-94	-Infinity	-91
		Config 3	-91	-91	-Infinity	-88
$\hat{E}_s/I_{ot}$	dB	Config 1,2,3	4	4	-Infinity	7
$\hat{E}_s/N_{oc}$	dB	Config 1,2,3	4	4	-Infinity	7
Io Note3	dBm/9.36MHz	Config 1,2	-64.59	-64.59	-70.05	-62.2
	dBm/38.16MHz	Config 3	-58.49	-58.49	-63.94	-56.15
Propagation Condition		Config 1,2	AWGN		AWGN 1944Hz Note 5	
		Config 3	AWGN		AWGN 3334Hz Note 6	

Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.
Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for N_{oc} to be fulfilled.
Note 3: SS-RSRP and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.
Note 4: SS-RSRP minimum requirements are specified assuming independent interference and noise at each receiver antenna port.
Note 5: The AWGN 1944 Hz condition is a non fading propagation channel with one tap. Doppler shift is a constant 1944Hz.
Note 6: The AWGN 3334 Hz condition is a non fading propagation channel with one tap. Doppler shift is a constant 3334Hz.

In test 1, the UE shall send one Event A3 triggered measurement report, with a measurement reporting delay less than 2240 ms from the beginning of time period T2. The UE shall not send event triggered measurement reports, as long as the reporting criteria are not fulfilled.

In test 2, the UE shall send one Event A3 triggered measurement report, with a measurement reporting delay less than 2240 ms from the beginning of time period T2. The UE shall not send event triggered measurement reports, as long as the reporting criteria are not fulfilled.

In test 1&2, UE is not required to report SSB time index.

The rate of correct events observed during repeated tests shall be at least 90% with the confidence level of 95%.

NOTE: The actual overall delays measured in the test may be up to $2xTTI_{DCCH}$ higher than the measurement reporting delays above because of TTI insertion uncertainty of the measurement report in DCCH.

6.6.3 Inter-RAT Measurements

6.6.3.0 Minimum conformance requirements

6.6.3.0.1 Minimum conformance requirements for inter-RAT event triggered reporting to E-UTRAN FDD

The requirements are applicable for NR−E-UTRAN FDD RSRP, RSRQ, and RS-SINR measurements.

In the requirements, an E-UTRAN FDD cell is considered to be detectable when:

- RSRP related conditions in the accuracy requirements in TS 38.133 [6] Section 10.2.2 are fulfilled for a corresponding Band, together with the corresponding side conditions in Annex B.2.3 and Annex B.3.3 of TS 36.133 [23],

- RSRQ related conditions in the accuracy requirements in TS 38.133 [6] Section 10.2.3 are fulfilled for a corresponding Band, together with the corresponding side conditions in Annex B.2.3 and Annex B.3.3 of TS 36.133 [23],

- RS-SINR related conditions in the accuracy requirements in TS 38.133 [6] Section 10.2.5 are fulfilled for a corresponding Band, together with the corresponding side conditions in Annex B.2.3 and Annex B.3.19 of TS 36.133 [23].

6.6.3.0.1.1 Requirements when no DRX is used

When the UE requires measurement gaps to identify and measure inter-RAT cells and an appropriate measurement gap pattern is scheduled, the UE shall be able to identify a new detectable FDD cell within $T_{Identify,\ E\text{-}UTRAN\ FDD}$ according to the following expression:

$$T_{Identify,E-UTRAN\ FDD} = T_{BasicIdentify} * \frac{480}{T_{Inter1}} * CSSF_{interRAT} \quad ms,$$

where:

$T_{BasicIdentify}$ = 480 ms,

T_{Inter1} is defined in TS 38.133 [6] section 9.4.1,

$CSSF_{interRAT} = CSSF_{within_gap_i_}$ is the scaling factor for the measured inter-RAT E-UTRA carrier i which is calculated as specified in TS 38.133 [6] section 9.1.5.2.

Identification of a cell shall include detection of the cell and additionally performing a single measurement with measurement period of $T_{Measure,\ E\text{-}UTRAN\ FDD}$ defined in Table 6.6.3.0.1.1-1.

Table 6.6.3.0.1.1-1: Measurement period and measurement bandwidth

Configuration	Physical Layer Measurement period: $T_{Measure,\ E\text{-}UTRAN\ FDD}$ [ms]	Measurement bandwidth [RB]
0	480 x $CSSF_{interRAT}$	6
1 (note 1)	240 x $CSSF_{interRAT}$	50
NOTE 1: This configuration is optional.		

The UE shall be capable of identifying and performing NR – E-UTRAN FDD RSRP, RSRQ, and RS-SINR measurements of at least 4 E-UTRAN FDD cells per E-UTRA FDD carrier frequency layer for up to 7 E-UTRA FDD carrier frequency layers.

If higher layer filtering is used, an additional cell identification delay can be expected.

The NR – E-UTRAN FDD RSRP measurement accuracy for all measured cells shall be as specified in TS 38.133 [6] section 10.2.2. The NR – E-UTRAN FDD RSRQ measurement accuracy for all measured cells shall be as specified in TS 38.133 [6] section 10.2.3. The NR – E-UTRAN FDD RS-SINR measurement accuracy for all measured cells shall be as specified in TS 38.133 [6] section 10.2.5.

6.6.3.0.1.2 Requirements when DRX is used

When DRX is in use and measurement gaps are configured, the UE shall be able to identify a new detectable E-UTRAN FDD cell within $T_{Identify,\ E\text{-}UTRAN\ FDD}$ specified in Table 6.6.3.0.1.2-1. When RRM enhancement for high speed is configured the UE shall be able to identify a new detectable E-UTRAN FDD cell within $T_{Identify,\ E\text{-}UTRAN\ FDD}$ specified in Table 6.6.3.0.1.2-2.

Table 6.6.3.0.1.2-1: Requirement to identify a newly detectable E-UTRAN FDD cell

DRX cycle length (s)	$T_{Identify,\ E\text{-}UTRAN\ FDD}$ (s) (DRX cycles)	
	Gap period = 40 ms, 20 ms	Gap period = 80 ms
≤0.16	Non-DRX requirements in Section 6.6.3.0.1.1 apply	Non-DRX requirements in Section 6.6.3.0.1.1 apply
0.256	5.12*K (20*$CSSF_{interRAT}$)	7.68*K (30*$CSSF_{interRAT}$)
0.32	6.4*K (20*$CSSF_{interRAT}$)	7.68*K (24*$CSSF_{interRAT}$)
0.32< DRX-cycle ≤10.24	Note1 (20*$CSSF_{interRAT}$)	Note1 (20*$CSSF_{interRAT}$)
NOTE 1: The time depends on the DRX cycle length. NOTE 2: $CSSF_{interRAT}$ is as defined in Section 6.6.3.0.1.1.		

Table 6.6.3.0.1.2-2: Requirement to identify a newly detectable E-UTRAN FDD cell for UE configured with RRM enhancement for high speed

DRX cycle length (s)	$T_{Identify, E-UTRAN FDD}$ (s) (DRX cycles)	
	Gap period = 40 ms, 20 ms	Gap period = 80 ms
≤0.16	Non-DRX requirements in clause 9.4.2.2 apply	Non-DRX requirements in clause 9.4.2.2 apply
0.16<DRx cycle<=0.32	Note 1(15*$CSSF_{interRAT}$)	
0.32<DRx cycle <= 0.64	Note 1(10*$CSSF_{interRAT}$)	
DRx cycle = 1.024	Note 1(10*$CSSF_{interRAT}$)	Note 1(10*$CSSF_{interRAT}$)
DRx cycle = 1.28	Note 1(8*$CSSF_{interRAT}$)	Note 1(8*$CSSF_{interRAT}$)
1.28< DRX-cycle ≤10.24	Note1 (20*$CSSF_{interRAT}$)	Note1 (20*$CSSF_{interRAT}$)
NOTE 1: The time depends on the DRX cycle length. NOTE 2: $CSSF_{interRAT}$ is as defined in clause 9.4.2.2.		

When DRX is in use, the UE shall be capable of performing NR – E-UTRAN FDD RSRP, RSRQ, and RS-SINR measurements of at least 4 identified E-UTRAN FDD cells per E-UTRA FDD frequency layer during each layer 1 measurement period, for up to 7 E-UTRA FDD carrier frequency layers, and the UE physical layer shall be capable of reporting NR – E-UTRAN FDD RSRP, RSRQ, and RS-SINR measurements to higher layers with the measurement period $T_{measure, E-UTRAN FDD}$ specified in Table 6.6.3.0.1.2-3.

Table 6.6.3.0.1.2-3: Requirement to measure E-UTRAN FDD cells

DRX cycle length (s)	$T_{measure, E-UTRAN FDD}$ (s) (DRX cycles)
≤0.08	Non-DRX requirements in Section 6.6.3.0.1.1 apply
0< DRX-cycle ≤10.24	Note1 (5* $CSSF_{interRAT}$)
NOTE 1: The time depends on the DRX cycle length. NOTE 2: $CSSF_{interRAT}$ is as defined in Section 6.6.3.0.1.1.	

If higher layer filtering is used, an additional cell identification delay can be expected.

The NR – E-UTRAN FDD RSRP measurement accuracy for all measured cells shall be as specified in TS 38.133 [6] Section 10.2.2. The NR – E-UTRAN FDD RSRQ measurement accuracy for all measured cells shall be as specified in TS 38.133 [6] Section 10.2.3. The NR – E-UTRAN FDD RS-SINR measurement accuracy for all measured cells shall be as specified in TS 38.133 [6] Section 10.2.5.

6.6.3.0.1.3 Measurement reporting requirements for Event-Triggered Reporting

The reported NR – E-UTRAN FDD RSRP, RSRQ, and RS-SINR measurements contained in event-triggered measurement reports shall meet the requirements in TS 38.133 [6] clauses 10.2.2, 10.2.3, and 10.2.5, respectively.

The UE shall not send any event-triggered measurement reports, as long as no reporting criteria are fulfilled.

The measurement reporting delay is defined as the time between an event that will trigger a measurement report and the point when the UE starts to transmit the measurement report over the air interface. This requirement assumes that that the measurement report is not delayed by other RRC signalling on the DCCH. This measurement reporting delay excludes a delay uncertainty resulted when inserting the measurement report to the TTI of the uplink DCCH. The delay uncertainty is: 2 x TTI_{DCCH} where TTI_{DCCH} is the duration of subframe or slot or subslot when the measurement report is transmitted on the PUSCH with subframe or slot or subslot duration. This measurement reporting delay excludes a delay which caused by no UL resources for UE to send the measurement report.

The event triggered measurement reporting delay, measured without L3 filtering shall be less than $T_{Identify, E-UTRAN FDD}$ defined in clauses 6.6.3.0.1.1 and 6.6.3.0.1.2 without DRX and with DRX, respectively. When L3 filtering is used, an additional delay can be expected.

If a cell which has been detectable at least for the time period $T_{Identify, E-UTRAN FDD}$ becomes undetectable for a period ≤ 5 seconds and then the cell becomes detectable again and triggers an event as per TS 38.331 [13], the event triggered measurement reporting delay shall be less than $T_{Measure, E-UTRAN FDD}$ provided the timing to that cell has not changed more than ± 50 Ts while measurement gap has not been available and the L3 filter has not been used.

The normative reference for this requirement is TS 38.133 [6] clause 9.4.2.

6.6.3.0.2 Minimum conformance requirements for inter-RAT event triggered reporting to E-UTRAN TDD

The requirements are applicable for NR−E-UTRAN TDD RSRP, RSRQ, and RS-SINR measurements.

In the requirements, an E-UTRAN TDD cell is considered to be detectable when:

- RSRP related conditions in the accuracy requirements in TS 38.133 [6] Section 10.2.2 are fulfilled for a corresponding Band, together with the corresponding side conditions in Annex B.2.3 and Annex B.3.3 of TS 36.133 [23],
- RSRQ related conditions in the accuracy requirements in TS 38.133 [6] Section 10.2.3 are fulfilled for a corresponding Band, together with the corresponding side conditions in Annex B.2.3 and Annex B.3.3 of TS 36.133 [23],
- RS-SINR related conditions in the accuracy requirements in TS 38.133 [6] Section 10.2.5 are fulfilled for a corresponding Band, together with the corresponding side conditions in Annex B.2.3 and Annex B.3.19 of TS 36.133 [23].

6.6.3.0.2.1 Requirements when no DRX is used

When the UE requires measurement gaps to identify and measure inter-RAT cells and an appropriate measurement gap pattern is scheduled, the UE shall be able to identify a new detectable TDD cell within $T_{Identify,\ E\text{-}UTRAN\ TDD}$ according to the following expression:

- When configuration 0 or configuration 1 in Table 6.6.3.0.2-1 is applied,

$$T_{Identify,E-UTRAN\ TDD} = T_{BasicIdentify} * \frac{480}{T_{Inter1}} * CSSF_{interRAT} \quad ms\ ,$$

- When configuration 2 or configuration 3 in Table 6.6.3.0.2-1 is applied,

$$T_{Identify,E-UTRAN\ TDD} = (T_{BasicIdentify} * \frac{480}{T_{Inter1}} + 240) * CSSF_{interRAT} \quad ms,$$

where:

$T_{BasicIdentify}$ = 480 ms,

T_{Inter1} is defined in TS 38.133 [6] section 9.4.1,

$CSSF_{interRAT} = CSSF_{within_gap_i_}$ is the scaling factor for the measured inter-RAT E-UTRA carrier i which is calculated as specified in TS 38.133 [6] section 9.1.5.2.

Identification of a cell shall include detection of the cell and additionally performing a single measurement with measurement period of $T_{Measure,\ E\text{-}UTRAN\ TDD}$ defined in Table 6.6.3.0.2.1-1.

Table 6.6.3.0.2.1-1: $T_{Measure,\ E\text{-}UTRAN\ TDD}$ for different configurations

Configuration	Measurement bandwidth [RB]	Number of UL/DL sub-frames per half frame (5 ms)		DwPTS		$T_{Measure,\ E\text{-}UTRAN\ TDD}$ [ms]
		DL	UL	Normal CP	Extended CP	
0	6	2	2	$19760 \cdot T_s$	$20480 \cdot T_s$	480 x $CSSF_{interRAT}$
1 (note 1)	50	2	2	$19760 \cdot T_s$	$20480 \cdot T_s$	240 x $CSSF_{interRAT}$
2	6	1	3	$19760 \cdot T_s$	$20480 \cdot T_s$	720 x $CSSF_{interRAT}$
3 (Note 1)	50	1	3	$19760 \cdot T_s$	$20480 \cdot T_s$	480 x $CSSF_{interRAT}$
NOTE 1: This configuration is optional. NOTE 2: Void						

The UE shall be capable of identifying and performing NR – E-UTRAN TDD RSRP, RSRQ, and RS-SINR measurements of at least 4 E-UTRAN TDD cells per E-UTRA TDD carrier frequency layer for up to 7 E-UTRA TDD carrier frequency layers.

If higher layer filtering is used, an additional cell identification delay can be expected.

The NR – E-UTRAN TDD RSRP measurement accuracy for all measured cells shall be as specified in TS 38.133 [6] section 10.2.2. The NR – E-UTRAN TDD RSRQ measurement accuracy for all measured cells shall be as specified in TS 38.133 [6] section 10.2.3. The NR – E-UTRAN TDD RS-SINR measurement accuracy for all measured cells shall be as specified in TS 38.133 [6] section 10.2.5.

6.6.3.0.2.1 Requirements when DRX is used

When DRX is in use and measurement gaps are configured, the UE shall be able to identify a new detectable E-UTRAN TDD cell within $T_{Identify,\ E\text{-}UTRAN\ TDD}$ specified in Table 6.6.3.0.2.1-1. When RRM enhancement for high speed is configured the UE shall be able to identify a new detectable E-UTRAN TDD cell within $T_{Identify,\ E\text{-}UTRAN\ TDD}$ specified in Table 6.6.3.0.2.1-2.

Table 6.6.3.0.2.1-1: Requirement to identify a newly detectable E-UTRAN TDD cell

DRX cycle length (s)	$T_{Identify,\ E\text{-}UTRAN\ TDD}$ (s) (DRX cycles)	
	Gap period = 40 ms, 20 ms	Gap period = 80 ms
≤0.16	Non-DRX requirements in Section 6.6.3.0.2.1 apply	Non-DRX requirements in Section 6.6.3.0.2.1 apply
0.256	5.12*K (20*$CSSF_{interRAT}$)	7.68*K (30*$CSSF_{interRAT}$)
0.32	6.4*K (20*$CSSF_{interRAT}$)	7.68*K (24*$CSSF_{interRAT}$)
0.32< DRX-cycle ≤10.24	Note1 (20*$CSSF_{interRAT}$)	Note1 (20*$CSSF_{interRAT}$)
NOTE 1: The time depends on the DRX cycle length. NOTE 2: $CSSF_{interRAT}$ is as defined in Section 6.6.3.0.2.1.		

Table 6.6.3.0.2.1-2: Requirement to identify a newly detectable E-UTRAN TDD cell for UE configured with RRM enhancement for high speed

DRX cycle length (s)	$T_{Identify,\ E\text{-}UTRAN\ TDD}$ (s) (DRX cycles)	
	Gap period = 40 ms, 20 ms	**Gap period = 80 ms**
≤0.16	Non-DRX requirements in clause 9.4.3.2 apply	Non-DRX requirements in clause 9.4.3.2 apply
0.16<DRx cycle<=0.32	Note 1(15*$CSSF_{interRAT}$)	
0.32<DRx cycle <= 0.64	Note 1(10*$CSSF_{interRAT}$)	
DRx cycle = 1.024	Note 1(10*$CSSF_{interRAT}$)	Note 1(10*$CSSF_{interRAT}$)
DRx cycle = 1.28	Note 1(8*$CSSF_{interRAT}$)	Note 1(8*$CSSF_{interRAT}$)
1.28< DRX-cycle ≤10.24	Note1 (20*$CSSF_{interRAT}$)	Note1 (20*$CSSF_{interRAT}$)
NOTE 1: The time depends on the DRX cycle length. NOTE 2: $CSSF_{interRAT}$ is as defined in clause 9.4.3.2.		

When DRX is in use, the UE shall be capable of performing NR – E-UTRAN TDD RSRP, RSRQ, and RS-SINR measurements of at least 4 identified E-UTRAN TDD cells per E-UTRA TDD frequency layer during each layer 1 measurement period, for up to 7 E-UTRA TDD carrier frequency layers, and the UE physical layer shall be capable of reporting NR – E-UTRAN TDD RSRP, RSRQ, and RS-SINR measurements to higher layers with the measurement period $T_{measure,\ E\text{-}UTRAN\ TDD}$ specified in Table 6.6.3.0.2.1-3.

Table 6.6.3.0.2.1-3: Requirement to measure E-UTRAN TDD cells

DRX cycle length (s)	$T_{measure,\ E\text{-}UTRAN\ TDD}$ (s) (DRX cycles)
≤0.08	Non-DRX Requirements in Section 6.6.3.0.2.1 apply
0.128	For configuration 2, non-DRX requirements in section 6.6.3.0.2.1 apply, Otherwise: Note1 (5*$CSSF_{interRAT}$)
0.128<DRX-cycle≤10.24	Note1 (5*$CSSF_{interRAT}$)
NOTE 1: The time depends on the DRX cycle length. NOTE 2: $CSSF_{interRAT}$ is as defined in Section 6.6.3.0.2.1.	

If higher layer filtering is used, an additional cell identification delay can be expected.

The NR – E-UTRAN TDD RSRP measurement accuracy for all measured cells shall be as specified in TS 38.133 [6] Section 10.2.2. The NR – E-UTRAN TDD RSRQ measurement accuracy for all measured cells shall be as specified in TS 38.133 [6] Section 10.2.3. The NR – E-UTRAN TDD RS-SINR measurement accuracy for all measured cells shall be as specified in TS 38.133 [6] Section 10.2.5.

6.6.3.0.2.3 Measurement reporting requirements for Event-Triggered Reporting

The reported NR – E-UTRAN TDD RSRP, RSRQ, and RS-SINR measurements contained in event-triggered measurement reports shall meet the requirements in TS 38.133 [6] clauses 10.2.2, 10.2.3, and 10.2.5, respectively.

The UE shall not send any event-triggered measurement reports, as long as no reporting criteria are fulfilled.

The measurement reporting delay is defined as the time between an event that will trigger a measurement report and the point when the UE starts to transmit the measurement report over the air interface. This requirement assumes that that the measurement report is not delayed by other RRC signalling on the DCCH. This measurement reporting delay excludes a delay uncertainty resulted when inserting the measurement report to the TTI of the uplink DCCH. The delay uncertainty is: 2 x TTI_{DCCH} where TTI_{DCCH} is the duration of subframe or slot or subslot when the measurement report is transmitted on the PUSCH with subframe or slot or subslot duration. This measurement reporting delay excludes a delay which caused by no UL resources for UE to send the measurement report.

The event triggered measurement reporting delay, measured without L3 filtering shall be less than $T_{Identify, E-UTRAN TDD}$ defined in clauses 6.6.3.0.2.1 and 6.6.3.0.2.2 without DRX and with DRX, respectively. When L3 filtering is used, an additional delay can be expected.

If a cell which has been detectable at least for the time period $T_{Identify, E-UTRAN TDD}$ becomes undetectable for a period ≤ 5 seconds and then the cell becomes detectable again and triggers an event as per TS 38.331 [13], the event triggered measurement reporting delay shall be less than $T_{Measure, E-UTRAN TDD}$ provided the timing to that cell has not changed more than $\pm$ 50 Ts while measurement gap has not been available and the L3 filter has not been used.

The normative reference for this requirement is TS 38.133 [6] clause 9.4.3.

6.6.3.1 NR SA FR1 – E-UTRAN event-triggered reporting in non-DRX

Editor's Note:

- Test Tolerances need to be updated to the latest 38.133 power levels and propagation conditions

6.6.3.1.1 Test purpose

This test is to verify that the UE makes correct event-triggered reporting of inter-RAT E-UTRAN measurements when operating in standalone (SA) operation with PCell in FR1 under the cell search and measurement requirements.

6.6.3.1.2 Test applicability

This test applies to all types of NR UE supporting SA FR1 from Release 15 onwards.

6.6.3.1.3 Minimum conformance requirements

The normative reference for this requirement is TS 38.133 [6] clause A.6.6.3.1.

6.6.3.1.3.1 NR – E-UTRAN FDD requirement

The minimum conformance requirements are specified in clause 6.6.3.0.1.

6.6.3.1.3.2 NR – E-UTRAN TDD requirement

The minimum conformance requirements are specified in clause 6.6.3.0.2.

6.6.3.1.4 Test description

6.6.3.1.4.1 Initial conditions

This test shall be tested using any of the test configurations in Table 6.6.3.1.4.1-1.

Table 6.6.3.1.4.1-1: supported test configurations

Test Case ID	Description
6.6.3.1-1	NR 15 kHz SSB SCS, 10MHz bandwidth, FDD duplex mode, LTE FDD
6.6.3.1-2	NR 15 kHz SSB SCS, 10MHz bandwidth, TDD duplex mode, LTE FDD
6.6.3.1-3	NR 30 kHz SSB SCS, 40MHz bandwidth, TDD duplex mode, LTE FDD
6.6.3.1-4	NR 15 kHz SSB SCS, 10MHz bandwidth, FDD duplex mode, LTE TDD
6.6.3.1-5	NR 15 kHz SSB SCS, 10MHz bandwidth, TDD duplex mode, LTE TDD
6.6.3.1-6	NR 30 kHz SSB SCS, 40MHz bandwidth, TDD duplex mode, LTE TDD
NOTE: The UE is only required to be tested in one of the supported test configurations	

Configure the test equipment and the DUT according to the parameters in Table 6.6.3.1.4.1-2 and Table 6.6.3.1.4.1-3.

Table 6.6.3.1.4.1-2: Initial conditions for SA inter-RAT E-UTRAN event triggered reporting in non-DRX with PCell in FR1

Parameter	Value		Comment
Test environment	NC		As specified in TS 38.508-1 [14] clause 4.1.
Test frequencies	As specified in Annex E, Table E.4-2 and TS 38.508-1 [14] sclause 4.3.1.		
Channel bandwidth	As specified by the test configuration selected from Table 6.6.3.1.5-1 and Table 6.6.3.1.5-2..		
Propagation conditions	AWGN		As specified in Annex C.2.2.
Connection Diagram	TE Part	A.3.1.8.3	As specified in TS 38.508-1 [14] Annex A.
	DUT Part	A.3.2.3.2	
Exceptions to connection diagram	N/A		

Table 6.6.3.1.4.1-3: General test parameters for SA inter-RAT E-UTRAN event triggered reporting in non-DRX with PCell in FR1

Parameter	Unit	Value	Comment
NR RF Channel Number		1	1 NR carrier frequency is used in the test
LTE RF Channel Number		1	1 LTE carrier frequency is used in the test
Channel Bandwidth	MHz	As specified in Tables 6.6.3.1.5-1 and 6.6.3.1.5-2.	
Active cell		Cell 1	Cell 1 is on RF channel number 1
Neighbour cell		Cell 2	Cell 2 is on RF channel number 2
Gap Pattern Id		0	As specified in Clause TS 38.133 [6] Table 9.1.2-1. Per-UE gap pattern.
NR measurement quantity		SS-RSRP	Measurement quantity for Cell 1
Inter-RAT E-UTRAN measurement quantity		RSRP	Measurement quantity for Cell 2
b2-Threshold1	dBm	Note 1	SS-RSRP threshold for SS-RSRP measurement on cell1 for event B2
b2-Threshold2EUTRA	dBm	-95	E-UTRAN RSRP threshold for SS-RSRP measurement on cell1 for event B2
Hysteresis	dB	0	
TimeToTrigger	s	0	
Filter coefficient		0	L3 filtering is not used
DRX		OFF	OFF
T1	s	5	
T2	s	5	
NOTE 1: Values are defined in Table 6.6.3.1.5-1			

1. Message contents are defined in clause 6.6.3.1.4.3.
2. Cell 1 is the NR PCell and Cell 2 is an inter-RAT E-UTRAN inter-RAT neighbour cell. The connection setup is done according to the settings in Annex C.1.1 and C.1.2.

6.6.3.1.4.2 Test procedure

The test consists of two successive time periods, with time durations of T1 and T2 respectively. During time duration T1, the UE shall not have any timing information of cell 2. Gap pattern configuration is configured before T2 begins to enable inter-frequency monitoring.

1. Ensure the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity *NR*, Connected without release *On* and Test Mode *On* according to TS 38.508-1 [14] clause 4.5.

2. Set the parameters according to T1 in Table 6.6.3.1.5-1 and 6.6.3.1.5-2. Propagation conditions are set according to Annex C clause C.2.2.

3. SS shall transmit an *RRCReconfiguration* message.

4. The UE shall transmit *RRCReconfigurationComplete* message. T1 starts.

5. When T1 expires, the SS shall switch the power setting from T1 to T2 as specified in Table 6.6.3.1.5-1 and 6.6.3.1.5-2.

6. UE shall transmit a MeasurementReport message triggered by Event B2. If the measurement reporting delay from the beginning of time period T2 is less than 3842ms the number of successful tests is increased by one. If the UE fails to report the event within the measurement reporting delay requirement then the number of failure tests is increased by one.

7. After the SS receive the MeasurementReport message in step 6 or when T2 expires, the SS shall:

   - transmit *RRCRelease* message to release the RRC connection which includes the release of the established radio bearers as well as all radio resources

   OR

   - switch the UE off.

8. Set Cell 2 physical cell identity = ((current cell 2 physical cell identity + 1) mod 14 + 2) for next iteration of the test procedure loop.

9. Depending on the choice in Step 7, the SS:
   - if the RRC Connection Release has been sent, transmits in Cell 1 a Paging message (including PagingRecord with UE-Identity) for the UE and ensures the UE is in state RRC_CONNECTED according to TS 38.508-1 [14] clause 4.5.4 (if the paging fails, switches off and on the UE and ensures the UE is in the state RRC_CONNECTED with generic procedure parameters Connectivity *NR*, Connected without release *On* according to TS 38.508-1 [14] clause 4.5,
   OR
   - if the device has been switched off, switches on the UE and ensures the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity *NR*, Connected without release *On* according to TS 38.508-1 [14] clause 4.5.

10. Repeat step 2-9 until the confidence level according to Tables G.2.3-1 in Annex G clause G.2 is achieved.

6.6.3.1.4.3 Message contents

Message contents are according to TS 38.508-1 [14] clause 4.6 with the following exceptions:

Table 6.6.3.1.4.3-1: Common Exception messages NR SA FR1 – E-UTRAN event-triggered reporting in non-DRX

Default Message Contents	
Common contents of system information blocks exceptions	

Default RRC messages and information elements contents exceptions	Table H.3.1-1 Table H.3.1-2 with Conditions GAP NEEDED and INTER-RAT Table H.3.1-3A Table H.3.1-4A Table H.3.1-5 with Condition INTER-RAT Table H.3.1-6 with Condition Pattern #0 Table H.3.1-7 with Condition INTER-RAT
Specific message content exceptions for Test Configurations 6.6.3.1-1 and 6.6.3.1-4	Table H.3.1-3 Table 7.3.1-3 in TS 38.508-1 [14] with condition SMTC.1
Specific message content exceptions for Test Configurations 6.6.3.1-2, 6.6.3.1-3, 6.6.3.1-5 and 6.6.3.1-6	Table H.3.1-3 with Condition Synchronous cells Table 7.3.1-3 in TS 38.508-1 [14] with condition SMTC.1

6.6.3.1.5 Test requirement

Table 6.6.3.1.5-1 and Table 6.6.3.1.5-2 define the primary level settings including test tolerances for all tests.

Table 6.6.3.1.5-1: PCell specific test parameters for SA inter-RAT E-UTRA event triggered reporting in non-DRX with PCell in FR1

Parameter		Unit	Configuration	Cell 1	
				T1	T2
RF channel number			1, 2, 3, 4, 5, 6	1	
Duplex mode			1, 2, 3	FDD	
			4, 5, 6	TDD	
TDD Configuration	SCS=15 KHz		2, 5	TDDConf.1.1	
	SCS=30 KHz		3, 6	TDDConf.2.1	
$BW_{channel}$		MHz	1, 4	10: $N_{RB,c}$ = 52 (FDD)	
			2, 5	10: $N_{RB,c}$ = 52 (TDD)	
			3, 6	40: $N_{RB,c}$ = 106 (TDD)	
PDSCH reference measurement channel			1, 4	SR.1.1 FDD	
			2, 5	SR.1.1 TDD	
			3, 6	SR.2.1 TDD	
CORESET reference channel			1, 4	CR.1.1 FDD	
			2, 5	CR.1.1 TDD	
			3, 6	CR.2.1 TDD	
Dedicated CORSET reference channel			1, 4	CCR.1.1 FDD	
			2, 5	CCR.1.1 TDD	
			3, 6	CCR.2.1 TDD	
BWP configurations	Initial DL BWP		1, 2, 3, 4, 5, 6	DLBWP.0.1	
	Dedicated DL BWP		1, 2, 3, 4, 5, 6	DLBWP.1.1	
	Initial UL BWP		1, 2, 3, 4, 5, 6	ULBWP.0.1	
	UL BWP		1, 2, 3, 4, 5, 6	ULBWP.1.1	
OCNG pattern note1			1, 2, 3, 4, 5, 6	OP.1	
SMTC configuration			1, 2, 3, 4, 5, 6	SMTC.1	

SSB configuration		1, 2, 4, 5	SSB.1 FR1	
		3, 6	SSB.2 FR1	
CSI-RS for tracking		1, 4	TRS.1.1 FDD	
		2, 5	TRS.1.1 TDD	
		3, 6	TRS.1.2 TDD	
b2-Threshold1	dBm	1, 2, 4, 5	-96	
		3, 6	-93	
EPRE ratio of PSS to SSS	dB	1, 2, 3, 4, 5, 6	0	
EPRE ratio of PBCH_DMRS to SSS				
EPRE ratio of PBCH to PBCH_DMRS				
EPRE ratio of PDCCH_DMRS to SSS				
EPRE ratio of PDCCH to PDCCH_DMRS				
EPRE ratio of PDSCH_DMRS to SSS				
EPRE ratio of PDSCH to PDSCH_DMRS				
EPRE ratio of OCNG DMRS to SSS				
EPRE ratio of OCNG to OCNG DMRS				
N_{oc} note2	dBm/15 KHz	1, 2, 3, 4, 5, 6	-104+TT	
N_{oc} note2	dBm/SCS	1, 2, 4, 5	-104+TT	
		3, 6	-101+TT	
$\hat{E}_s/N_{oc}$	dB	1, 2, 3, 4, 5, 6	16+TT	0+TT
$\hat{E}_s/I_{ot}$ note3	dB	1, 2, 3, 4, 5, 6	16+TT	0+TT
SS-RSRP note3	dBm/SCS	1, 2, 4, 5	-88+TT	-104+TT
		3, 6	-85+TT	-101+TT
SSB_RP note3	dBm/SCS	1, 2, 4, 5	-88+TT	-104+TT
		3, 6	-85+TT	-101+TT
Io note3	dBm/9.36 MHz	1, 2, 4, 5	-59.94+TT	-73.04+TT
	dBm/38.16 MHz	3, 6	-53.84+TT	-66.93+TT
Propagation condition		1, 2, 3, 4, 5, 6	AWGN	
Antenna Configuration and Correlation Matrix		1, 2, 3, 4, 5, 6	1x2	

NOTE 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.

NOTE 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for N_{oc} to be fulfilled.

NOTE 3: $\hat{E}_s/I_{ot}$, SS-RSRP, SSB_RP and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.

Table 6.6.3.1.5-2: E-UTRAN neighbour cell specific test parameters for SA inter-RAT E-UTRAN event triggered reporting in non-DRX with PCell in FR1

Parameter	Unit	Configuration	Cell 2	
			T1	T2
RF channel number		1, 2, 3, 4, 5, 6	2	
Duplex mode		1, 2, 3	FDD	
		4, 5, 6	TDD	
TDD special subframe configuration note1		4, 5, 6	6	
TDD uplink-downlink configuration note1		4, 5, 6	1	
$BW_{channel}$	MHz	1, 2, 3, 4, 5, 6	5MHz: $N_{RB,c}$ = 25 10MHz: $N_{RB,c}$ = 50 20MHz: $N_{RB,c}$ = 100	
PDSCH parameters: DL Reference Measurement Channel note2		1, 2, 3	5MHz: R.7 FDD 10MHz: R.3 FDD 20MHz: R.6 FDD	
		4, 5, 6	5MHz: R.4 TDD 10MHz: R.0 TDD 20MHz: R.3 TDD	

PCFICH/PDCCH/PHICH parameters: DL Reference Measurement Channel note2		1, 2, 3	5MHz: R.11 FDD 10MHz: R.6 FDD 20MHz: R.10 FDD	
		4, 5, 6	5MHz: R.11 TDD 10MHz: R.6 TDD 20MHz: R.10 TDD	
OCNG Patterns note2		1, 2, 3	5MHz: OP.20 FDD 10MHz: OP.10 FDD 20MHz: OP.17 FDD	
		4, 5, 6	5MHz: OP.9 TDD 10MHz: OP.1 TDD 20MHz: OP.7 TDD	
PBCH_RA PBCH_RB PSS_RA SSS_RA PCFICH_RB PHICH_RA PHICH_RB PDCCH_RA PDCCH_RB PDSCH_RA PDSCH_RB OCNG_RA note3 OCNG_RB note3	dB	1, 2, 3, 4, 5, 6	0	
N_{oc} note4	dBm/15kHz	1, 2, 3, 4, 5, 6	-104+TT	
$\hat{E}_s/N_{oc}$	dB	1, 2, 3, 4, 5, 6	-Infinity	17+TT
$\hat{E}_s/I_{ot}$ note5	dB	1, 2, 3, 4, 5, 6	-Infinity	17+TT
RSRP note5	dBm/15kHz	1, 2, 3, 4, 5, 6	-Infinity	-87+TT
SCH_RP note5	dBm/15kHz	1, 2, 3, 4, 5, 6	-Infinity	-87+TT
Io note5	dBm/9MHz	1, 2, 3, 4, 5, 6	-73.21+TT+10log ($N_{RB,c}$ /50)	-56.12+TT+10log ($N_{RB,c}$ /50)
Propagation Condition not 6		1, 2, 3, 4, 5, 6	AWGN	
Antenna Configuration and Correlation Matrix note6		1, 2, 3, 4, 5, 6	1x2	

NOTE 1: Special subframe and uplink-downlink configurations are specified in table 4.2-1 in TS 36.211 [24].
NOTE 2: DL RMCs and OCNG patterns are specified in sections A 3.1 and A 3.2 of TS 36.133 [23] respectively.
NOTE 3: OCNG shall be used such that all cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.
NOTE 4: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for N_{oc} to be fulfilled.
NOTE 5: $\hat{E}_s/I_{ot}$, RSRP, SCH_RP and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.
NOTE 6: Propagation condition and correlation matrix are defined in section B.2 in TS 36.101 [27].

The UE shall send one Event B2 triggered measurement report for Cell 2 to the PCell, with a measurement reporting delay less than 3842ms from the start of period T2. The measurement reporting delay is defined as the time from the beginning of time period T2 to the moment when the UE sends the measurement report on PUSCH.

The UE shall not send event-triggered measurement reports as long as the reporting criteria is not fulfilled.

The overall delays measured test requirement is expressed as:

$T_{identify,E\text{-}UTRAN\ FDD} = T_{BasicIdentify} * 480 / T_{Inter1} * CSSF_{interRAT}$ ms

Which:

$T_{BasicIdentify} = 480$,

$T_{Inter1} = 60$,

$CSSF_{interRAT} = 1$

TTI insertion uncertainty = TTI_{DCCH} = 1 ms; 2xTTI_{DCCH} = 2 ms

The overall delays measured shall be less than a total of 3842 ms in this test case (note: this gives a total of 3840 ms for measurement reporting delay plus 2 ms for TTI insertion uncertainty).

The rate of correct events observed during repeated tests shall be at least 90% with confidence level of 95%.

6.6.3.2 NR SA FR1 – E-UTRAN event-triggered reporting in DRX

Editor's Note:

Test Tolerances need to be updated to the latest 38.133 power levels and propagation conditions

6.6.3.2.1 Test purpose

This test is to verify that the UE makes correct event-triggered reporting of inter-RAT E-UTRAN measurements when operating in standalone (SA) operation with PCell in FR1 when DRX is used under the cell search and measurement requirements.

6.6.3.2.2 Test applicability

This test applies to all types of NR UE Release 15 and forward supporting 5GS NR SA FR1, E-UTRAN and long DRX cycle.

6.6.3.2.3 Minimum conformance requirements

The minimum conformance requirements are specified in clauses 6.6.3.0.1 and 6.6.3.0.2.

The normative reference for this requirement is TS 38.133 [6] clause A.6.6.3.2.

6.6.3.2.4 Test description

6.6.3.2.4.1 Initial conditions

This test shall be tested using any of the test configurations in Table 6.6.3.2.4.1-1.

Table 6.6.3.2.4.1-1: Supported test configurations in SA inter-RAT E-UTRAN event triggered reporting in DRX with PCell in FR1

Test Case ID	Description
6.6.3.2-1	NR 15 kHz SSB SCS, 10MHz bandwidth, FDD duplex mode, LTE FDD
6.6.3.2-2	NR 15 kHz SSB SCS, 10MHz bandwidth, TDD duplex mode, LTE FDD
6.6.3.2-3	NR 30 kHz SSB SCS, 40MHz bandwidth, TDD duplex mode, LTE FDD
6.6.3.2-4	NR 15 kHz SSB SCS, 10MHz bandwidth, FDD duplex mode, LTE TDD
6.6.3.2-5	NR 15 kHz SSB SCS, 10MHz bandwidth, TDD duplex mode, LTE TDD
6.6.3.2-6	NR 30 kHz SSB SCS, 40MHz bandwidth, TDD duplex mode, LTE TDD
NOTE: The UE is only required to be tested in one of the supported test configurations	

Configure the test equipment and the DUT according to the parameters in Table 6.6.3.2.4.1-2 and Table 6.6.3.2.4.1-3.

Table 6.6.3.2.4.1-2: Initial conditions for SA inter-RAT E-UTRAN event triggered reporting in DRX with PCell in FR1

Parameter	Value		Comment
Test environment	NC		As specified in TS 38.508-1 [14] clause 4.1.
Test frequencies	As specified in Annex E, Table E.4-2 and TS 38.508-1 [14] sclause 4.3.1.		
Channel bandwidth	As specified by the test configuration selected from Table 6.6.3.2.4.1-1.		
Propagation conditions	AWGN		As specified in Annex C.2.2.
Connection Diagram	TE Part	A.3.1.8.3	As specified in TS 38.508-1 [14] Annex A.
	DUT Part	A.3.2.3.2	
Exceptions to connection diagram	N/A		

Table 6.6.3.2.4.1-3: General test parameters for SA inter-RAT E-UTRAN event triggered reporting in DRX with PCell in FR1

Parameter	Unit	Value		Comment
NR RF Channel Number		1		1 NR carrier frequency is used in the test
LTE RF Channel Number		2		1 LTE carrier frequency is used in the test
Channel Bandwidth	MHz	As specified in Tables 6.6.3.2.5-1 and 6.6.3.2.5-2.		
Active cell		Cell 1		Cell 1 is on RF channel number 1
Neighbour cell		Cell 2		Cell 2 is on RF channel number 2
Gap Pattern Id		0		As specified in Clause TS 38.133 [6] Table 9.1.2-1. Per-UE gap pattern.
NR measurement quantity		SS-RSRP		Measurement quantity for Cell 1
Inter-RAT E-UTRAN measurement quantity		RSRP		Measurement quantity for Cell 2
b2-Threshold1	dBm	note 1		SS-RSRP threshold for SS-RSRP measurement on cell1 for event B2
b2-Threshold2EUTRA	dBm	-95		E-UTRAN RSRP threshold for SS-RSRP measurement on cell1 for event B2
Hysteresis	dB	0		
TimeToTrigger	s	0		
Filter coefficient		0		L3 filtering is not used
DRX		DRX.1	DRX.7	DRX cycle configurations DRX.1 and DRX.7 are defined in Table A.3.3.1-1 and Table A.3.3.2-1 respectively.
T1	s	5		
T2	s	5	15	
NOTE 1: Values are defined in Table 6.6.3.2.5-1				

1. Message contents are defined in clause 6.6.3.2.4.3.

2. There are two cells: Cell 1 and Cell 2. Cell 1 is the NR PCell and Cell 2 is an inter-RAT E-UTRAN inter-RAT neighbour cell. Cell 1 is configured according to Annex C.1.1 and C.1.2, Cell 2 is configured according to TS 36.521-3 [26] Annex C.1.0 and C.1.1.

6.6.3.2.4.2 Test procedure

In each test there are two cells: Cell 1 and Cell 2. Cell 1 is the NR PCell and Cell 2 is an inter-RAT E-UTRAN inter-RAT neighbour cell. In the measurement control information from the PCell it is indicated to the UE that event-triggered reporting with Event B2 (PCell becomes worse than threshold1 and inter RAT neighbour becomes better than threshold2) is to be used. Each test consists of two consecutive time periods, with durations T1 and T2, respectively. Prior to the start of time duration T1, the UE shall be fully synchronized to Cell 1. During T1, the UE shall not have any information on Cell 2.

In each test the UE shall be provided at least once every 500ms with new Timing Advance Command MAC control element to restart the Time alignment timer to keep UE uplink time alignment. Furhtermore the UE shall be allocated with PUSCH resource at every DRX cycle.

1. Ensure the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity NR, Connected without release On and Test Mode *On* according to TS 38.508-1 [14] clause 4.5.

2. Set the parameters according to T1 in Table 6.6.3.2.5-1 and 6.6.3.2.5-2.

3. SS shall transmit an RRCReconfiguration message.

4. The UE shall transmit RRCReconfigurationComplete message. T1 starts.

5. When T1 expires, the SS shall switch the power setting from T1 to T2 as specified in Tables 6.6.3.2.5-1 and 6.6.3.2.5-2. T2 starts.

6. UE shall transmit a MeasurementReport message triggered by Event B2. If the overall delays measured from the beginning of time period T2 is less than 3.48 s for Test 1 or less than 12.8 s for Test 2 then the number of successful tests is increased by one. If the UE fails to report the event within the overall delays measured requirement then the number of failure tests is increased by one.

7. After the SS receive the MeasurementReport message in step 6) or when T2 expires, the SS shall:

   - transmit *RRCRelease* message to release the RRC connection which includes the release of the established radio bearers as well as all radio resources

   OR

   - switch the UE off .

8. Set Cell 2 physical cell identity = ((current cell 2 physical cell identity + 1) mod 14+2) for next iteration of the test procedure loop.

9. Depending on the choice in Step 7, the SS:
   - if the RRC Connection Release has been sent, transmits in Cell 1 a Paging message (including PagingRecord with ue-Identity) for the UE and ensures the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity NR, Connected without release On according to TS 38.508-1 [14] clause 4.5 (if the paging fails, switches off and on the UE and ensures the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity NR, Connected without release On according to TS 38.508-1 [14] clause 4.5),
   OR
   - if the device has been switched off, switches on the UE and ensures the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity NR, Connected without release On according to TS 38.508-1 [14] clause 4.5.

10. Repeat step 2-9 until the confidence level according to Tables G.2.3-1 in Annex G clause G.2 is achieved.

6.6.3.2.4.3 Message contents

Message contents are according to TS 38.508-1 [14] clause 4.6 with the following exceptions:

Table 6.6.3.2.4.3-1: Common Exception messages NR SA FR1 – E-UTRAN event-triggered reporting in DRX

Default Message Contents	
Common contents of system information blocks exceptions	
Default RRC messages and information elements contents exceptions	Table H.3.1-1 Table H.3.1-2 with Conditions GAP NEEDED and INTER-RAT Table H.3.1-3A Table H.3.1-4A Table H.3.1-5 with Condition INTER-RAT Table H.3.1-6 with Condition Pattern #0 Table H.3.1-7 with Condition INTER-RAT Table H.3.7-1 with Condition DRX.1 and Gap for Test 1 Table H.3.7-1 with Condition DRX.7 and OFFSET for Test 2
Specific message content exceptions for Test Configurations 6.6.3.2-1 and 6.6.3.2-4	Table H.3.1-3 Table 7.3.1-3 in TS 38.508-1 [14] with condition SMTC.1

Specific message content exceptions for Test Configurations 6.6.3.2-2, 6.6.3.2-3, 6.6.3.2-5 and 6.6.3.2-6	Table H.3.1-3 with Condition Synchronous cells Table 7.3.1-3 in TS 38.508-1 [14] with condition SMTC.1

6.6.3.2.5 Test requirement

Table 6.6.3.2.5-1 and Table 6.6.3.2.5-2 defines the primary level settings including test tolerances for all tests.

Table 6.6.3.2.5-1: PCell specific test parameters for SA inter-RAT E-UTRA event triggered reporting in DRX with PCell in FR1

Parameter		Unit	Configuration	Cell 1	
				T1	T2
RF channel number			1, 2, 3, 4, 5, 6	1	
Duplex mode			1, 2, 3	FDD	
			4, 5, 6	TDD	
TDD Configuration	SCS=15 KHz		2, 5	TDDConf.1.1	
	SCS=30 KHz		3, 6	TDDConf.2.1	
$BW_{channel}$		MHz	1, 4	10: $N_{RB,c}$ = 52 (FDD)	
			2, 5	10: $N_{RB,c}$ = 52 (TDD)	
			3, 6	40: $N_{RB,c}$ = 106 (TDD)	
PDSCH reference measurement channel			1, 4	SR.1.1 FDD	
			2, 5	SR.1.1 TDD	
			3, 6	SR.2.1 TDD	
RMSI CORESET reference channel			1, 4	CR.1.1 FDD	
			2, 5	CR.1.1 TDD	
			3, 6	CR.2.1 TDD	
Dedicated CORSET reference channel			1, 4	CCR.1.1 FDD	
			2, 5	CCR.1.1 TDD	
			3, 6	CCR.2.1 TDD	
BWP configurations	Initial DL BWP		1, 2, 3, 4, 5, 6	DLBWP.0.1	
	Dedicated DL BWP		1, 2, 3, 4, 5, 6	DLBWP.1.1	
	Initial UL BWP		1, 2, 3, 4, 5, 6	ULBWP.0.1	
	Dedicated UL BWP		1, 2, 3, 4, 5, 6	ULBWP.1.1	
OCNG pattern[Note1]			1, 2, 3, 4, 5, 6	OP.1	
SMTC configuration			1, 2, 3, 4, 5, 6	SMTC.1	
SSB configuration			1, 2, 4, 5	SSB.1 FR1	
			3, 6	SSB.2 FR1	
CSI-RS for tracking			1, 4	TRS.1.1 FDD	
			2, 5	TRS.1.1 TDD	
			3, 6	TRS.1.2 TDD	
b2-Threshold1		dBm	1, 2, 4, 5	-96	
			3, 6	-93	
EPRE ratio of PSS to SSS		dB	1, 2, 3, 4, 5, 6	0	
EPRE ratio of PBCH_DMRS to SSS					
EPRE ratio of PBCH to PBCH_DMRS					
EPRE ratio of PDCCH_DMRS to SSS					
EPRE ratio of PDCCH to PDCCH_DMRS					
EPRE ratio of PDSCH_DMRS to SSS					
EPRE ratio of PDSCH to PDSCH_DMRS					
EPRE ratio of OCNG DMRS to SSS					
EPRE ratio of OCNG to OCNG DMRS					
N_{oc}[Note2]		dBm/15 KHz	1, 2, 3, 4, 5, 6	-104+TT	
N_{oc}[Note2]		dBm/SCS	1, 2, 4, 5	-104+TT	
			3, 6	-101+TT	
$\hat{E}_s/N_{oc}$		dB	1, 2, 3, 4, 5, 6	16+TT	0+TT
$\hat{E}_s/I_{ot}$[Note3]		dB	1, 2, 3, 4, 5, 6	16+TT	0+TT

SS-RSRP[Note3]	dBm/SCS	1, 2, 4, 5	-88+TT	-104+TT
		3, 6	-85+TT	-101+TT
SSB_RP[Note3]	dBm/SCS	1, 2, 4, 5	-88+TT	-104+TT
		3, 6	-85+TT	-101+TT
Io[Note3]	dBm/9.36 MHz	1, 2, 4, 5	-59.94+TT	-73.04+TT
	dBm/38.16 MHz	3, 6	-53.84+TT	-66.93+TT
Propagation condition		1, 2, 3, 4, 5, 6	AWGN	
Antenna Configuration and Correlation Matrix		1, 2, 3, 4, 5, 6	1x2	

Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.

Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for N_{oc} to be fulfilled.

Note 3: $\hat{E}_s/I_{ot}$, SS-RSRP, SSB_RP and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.

Table 6.6.3.2.5-2: E-UTRAN neighbour cell specific test parameters for SA inter-RAT E-UTRAN event triggered reporting in DRX with PCell in FR1

Parameter	Unit	Configuration	Cell 2	
			T1	T2
RF channel number		1, 2, 3, 4, 5, 6	2	
Duplex mode		1, 2, 3	FDD	
		4, 5, 6	TDD	
TDD special subframe configuration[Note1]		4, 5, 6	6	
TDD uplink-downlink configuration[Note1]		4, 5, 6	1	
$BW_{channel}$	MHz	1, 2, 3, 4, 5, 6	5MHz: $N_{RB,c}$ = 25 10MHz: $N_{RB,c}$ = 50 20MHz: $N_{RB,c}$ = 100	
PDSCH parameters: DL Reference Measurement Channel[Note2]		1, 2, 3	5MHz: R.7 FDD 10MHz: R.3 FDD 20MHz: R.6 FDD	
		4, 5, 6	5MHz: R.4 TDD 10MHz: R.0 TDD 20MHz: R.3 TDD	
PCFICH/PDCCH/PHICH parameters: DL Reference Measurement Channel[Note2]		1, 2, 3	5MHz: R.11 FDD 10MHz: R.6 FDD 20MHz: R.10 FDD	
		4, 5, 6	5MHz: R.11 TDD 10MHz: R.6 TDD 20MHz: R.10 TDD	
OCNG Patterns[Note2]		1, 2, 3	5MHz: OP.20 FDD 10MHz: OP.10 FDD 20MHz: OP.17 FDD	
		4, 5, 6	5MHz: OP.9 TDD 10MHz: OP.1 TDD 20MHz: OP.7 TDD	
PBCH_RA	dB	1, 2, 3, 4, 5, 6	0	
PBCH_RB				
PSS_RA				
SSS_RA				
PCFICH_RB				
PHICH_RA				
PHICH_RB				
PDCCH_RA				
PDCCH_RB				
PDSCH_RA				
PDSCH_RB				
OCNG_RA[Note3]				
OCNG_RB[Note3]				
N_{oc}[Note4]	dBm/15kHz	1, 2, 3, 4, 5, 6	-104+TT	

$\hat{E}_s/N_{oc}$	dB	1, 2, 3, 4, 5, 6	-Infinity	17+TT
$\hat{E}_s/I_{ot}$ Note5	dB	1, 2, 3, 4, 5, 6	-Infinity	17+TT
RSRP Note5	dBm/15kHz	1, 2, 3, 4, 5, 6	-Infinity	-87+TT
SCH_RP Note5	dBm/15kHz	1, 2, 3, 4, 5, 6	-Infinity	-87+TT
Io Note5	dBm/9MHz	1, 2, 3, 4, 5, 6	-73.21+TT+10log ($N_{RB,c}$ /50)	-56.12+TT +10log ($N_{RB,c}$ /50)
Propagation Condition Note6		1, 2, 3, 4, 5, 6	AWGN	
Antenna Configuration and Correlation Matrix Note6		1, 2, 3, 4, 5, 6	1x2	

Note 1: Special subframe and uplink-downlink configurations are specified in table 4.2-1 in TS 36.211.
Note 2: DL RMCs and OCNG patterns are specified in sections A 3.1 and A 3.2 of TS 36.133 respectively.
Note 3: OCNG shall be used such that all cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.
Note 4: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for N_{oc} to be fulfilled.
Note 5: $\hat{E}_s/I_{ot}$, RSRP, SCH_RP and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.
Note 6: Propagation condition and correlation matrix are defined in section B.2 in TS 36.101 [27].

In test 1, the UE shall send one Event B2 triggered measurement report for Cell 2 to the PCell, with a measurement reporting delay less than 3.84s from the start of period T2. The measurement reporting delay is defined as the time from the beginning of time period T2 to the moment when the UE sends the measurement report on PUSCH.

In test 2, the UE shall send one Event B2 triggered measurement report for Cell 2 to the PCell, with a measurement reporting delay less than 12.8s from the start of period T2. The measurement reporting delay is defined as the time from the beginning of time period T2 to the moment when the UE sends the measurement report on PUSCH.

The UE shall not send event-triggered measurement reports as long as the reporting criteria is not fulfilled.

The rate of correct events observed during repeated tests shall be at least 90%.

6.6.3.3 NR SA FR1 – E-UTRAN event-triggered reporting in DRX for UE configured with highSpeedMeasFlag-r16

6.6.3.3.1 Test purpose

This test is to verify that the UE makes correct event-triggered reporting of inter-RAT E-UTRAN measurements when operating in standalone (SA) operation with PCell in FR1 when DRX is used under the cell search and measurement requirements for UE configured with RRM enhancement for high speed.

6.6.3.3.2 Test applicability

This test applies to all types of NR UE supporting SA FR1 configured with RRM enhancement for high speed from Release 15 onwards.

6.6.3.3.3 Minimum conformance requirements

The minimum conformance requirements are specified in clauses 6.6.3.0.1 and 6.6.3.0.2.

The normative reference for this requirement is TS 38.133 [6] clause A.6.6.3.3.

6.6.3.3.4 Test description

6.6.3.3.4.1 Initial conditions

This test shall be tested using any of the test configurations in Table 6.6.3.3.4.1-1.

Table 6.6.3.3.4.1-1: Supported test configurations in SA inter-RAT E-UTRAN event triggered reporting in DRX with PCell in FR1 for UE configured with highSpeedMeasFlag-r16

Test Case ID	Description
6.6.3.3-1	NR 15 kHz SSB SCS, 10MHz bandwidth, FDD duplex mode, LTE FDD
6.6.3.3-2	NR 15 kHz SSB SCS, 10MHz bandwidth, TDD duplex mode, LTE FDD
6.6.3.3-3	NR 30 kHz SSB SCS, 40MHz bandwidth, TDD duplex mode, LTE FDD

6.6.3.3-4	NR 15 kHz SSB SCS, 10MHz bandwidth, FDD duplex mode, LTE TDD
6.6.3.3-5	NR 15 kHz SSB SCS, 10MHz bandwidth, TDD duplex mode, LTE TDD
6.6.3.3-6	NR 30 kHz SSB SCS, 40MHz bandwidth, TDD duplex mode, LTE TDD
NOTE: The UE is only required to be tested in one of the supported test configurations	

Configure the test equipment and the DUT according to the parameters in Table 6.6.3.3.4.1-2 and Table 6.6.3.3.4.1-3.

Table 6.6.3.3.4.1-2: Initial conditions for SA inter-RAT E-UTRAN event triggered reporting in DRX with PCell in FR1 for UE configured with highSpeedMeasFlag-r16

Parameter	Value		Comment
Test environment	NC		As specified in TS 38.508-1 [14] clause 4.1.
Test frequencies	As specified in Annex E, Table E.4-2 and TS 38.508-1 [14] clause 4.3.1.		
Channel bandwidth	As specified by the test configuration selected from Table 6.6.3.3.4.1-1.		
Propagation conditions	AWGN		As specified in Annex C.2.2.
Connection Diagram	TE Part	A.3.1.8.3	As specified in TS 38.508-1 [14] Annex A.
	DUT Part	A.3.2.3.2	
Exceptions to connection diagram	N/A		

Table 6.6.3.3.4.1-3: General test parameters for SA inter-RAT E-UTRAN event triggered reporting in DRX with PCell in FR1 for UE configured with highSpeedMeasFlag-r16

Parameter	Unit	Value	Comment
NR RF Channel Number		1	1 NR carrier frequency is used in the test
LTE RF Channel Number		2	1 LTE carrier frequency is used in the test
Channel Bandwidth	MHz	As specified in Tables A.6.6.3.3.1-2 and A.6.6.3.3.1-3.	
Active cell		Cell 1	Cell 1 is on RF channel number 1
Neighbour cell		Cell 2	Cell 2 is on RF channel number 2
Gap Pattern Id		0	As specified in Clause Table 9.1.2-1. Per-UE gap pattern.
NR measurement quantity		SS-RSRP	Measurement quantity for Cell 1
Inter-RAT E-UTRAN measurement quantity		RSRP	Measurement quantity for Cell 2
b2-Threshold1	dBm	Note 1	SS-RSRP threshold for SS-RSRP measurement on cell1 for event B2
b2-Threshold2EUTRA	dBm	-97	E-UTRAN RSRP threshold for SS-RSRP measurement on cell1 for event B2
Hysteresis	dB	0	
TimeToTrigger	s	0	
Filter coefficient		0	L3 filtering is not used
DRX		DRX.6	DRX cycle configurations DRX.6 is defined in Table A.3.3.1-6.
T1	s	5	
T2	s	5	
Note 1: Values are defined in TS 38.133 Table 6.6.3.3.5-1			

1. Message contents are defined in clause 6.6.3.3.4.3.

2. Cell 1 is the NR PCell and Cell 2 is an inter-RAT E-UTRAN inter-RAT neighbour cell. The connection setup is done according to the settings in Annex C.1.1 and C.1.2.

3. UE is configured with highSpeedMeasFlag-r16

6.6.3.3.4.2 Test procedure

In each test there are two cells: Cell 1 and Cell 2. Cell 1 is the NR PCell and Cell 2 is an inter-RAT E-UTRAN inter-RAT neighbour cell. In the measurement control information from the PCell it is indicated to the UE that event-

triggered reporting with Event B2 (PCell becomes worse than threshold1 and inter RAT neighbour becomes better than threshold2) is to be used. Each test consists of two consecutive time periods, with durations T1 and T2, respectively. Prior to the start of time duration T1, the UE shall be fully synchronized to Cell 1. During T1, the UE shall not have any information on Cell 2.

In each test the UE shall be provided at least once every 500ms with new Timing Advance Command MAC control element to restart the Time alignment timer to keep UE uplink time alignment. Furhtermore the UE shall be allocated with PUSCH resource at every DRX cycle.

1. Ensure the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity NR, Connected without release On and Test Mode *On* according to TS 38.508-1 [14] clause 4.5.

2. Set the parameters according to T1 in Table 6.6.3.3.5-1 and 6.6.3.3.5-2.

3. SS shall transmit an RRCReconfiguration message.

4. The UE shall transmit RRCReconfigurationComplete message. T1 starts.

5. When T1 expires, the SS shall switch the power setting from T1 to T2 as specified in Tables 6.6.3.3.5-1 and 6.6.3.3.5-2. T2 starts.

6. UE shall transmit a MeasurementReport message triggered by Event B2. If the overall delays measured from the beginning of time period T2 is less than 4.8s then the number of successful tests is increased by one. If the UE fails to report the event within the overall delays measured requirement then the number of failure tests is increased by one.

7. After the SS receive the MeasurementReport message in step 6) or when T2 expires, the SS shall:

   - transmit *RRCRelease* message to release the RRC connection which includes the release of the established radio bearers as well as all radio resources

   OR

   - switch the UE off .

8. Set Cell 2 physical cell identity = ((current cell 2 physical cell identity + 1) mod 14+2) for next iteration of the test procedure loop.

9. Depending on the choice in Step 7, the SS:
   - if the RRC Connection Release has been sent, transmits in Cell 1 a Paging message (including PagingRecord with ue-Identity) for the UE and ensures the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity NR, Connected without release On according to TS 38.508-1 [14] clause 4.5 (if the paging fails, switches off and on the UE and ensures the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity NR, Connected without release On according to TS 38.508-1 [14] clause 4.5),
   OR
   - if the device has been switched off, switches on the UE and ensures the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity NR, Connected without release On according to TS 38.508-1 [14] clause 4.5.

10. Repeat step 2-9 until the confidence level according to Tables G.2.3-1 in Annex G clause G.2 is achieved.

6.6.3.3.4.3 Message contents

Message contents are according to TS 38.508-1 [14] clause 7.3 with the following exceptions:

Table 6.6.3.3.4.3-1: Common Exception messages

Default Message Contents	
Common contents of system information blocks on condition of HighSpeedMeas with exceptions	Table H.2.1-3 with Condition HighSpeedMeas

Default RRC messages and information elements contents exceptions	Table H.3.1-1 Table H.3.1-2 with Conditions GAP NEEDED and INTER-RAT Table H.3.1-3 with Condition SSB.1 FR1 for configuration 6.6.3.3-1, 6.6.3.3-2, 6.6.3.3-4, 6.6.3.3-5 Table H.3.1-3 with Condition SSB.2 FR1 for configuration 6.6.3.3-3, 6.6.3.3-6 Table H.3.1-3A Table H.3.1-4A Table H.3.1-5 with Condition INTER-RAT Table H.3.1-6 with Condition Pattern #0 Table H.3.1-7 with Condition INTER-RAT Table H.3.7-1 with Condition DRX.6 and Gap

6.6.3.3.5 Test requirement

Table 6.6.3.3.5-1 and Table 6.6.3.3.5-2 defines the primary level settings including test tolerances for all tests.

Table 6.6.3.3.5-1: PCell specific test parameters for SA inter-RAT E-UTRA event triggered reporting in DRX with PCell in FR1 for UE configured with highSpeedMeasFlag-r16

Parameter		Unit	Configuration	Cell 1	
				T1	T2
RF channel number			1, 2, 3, 4, 5, 6	1	
Duplex mode			1, 2, 3	FDD	
			4, 5, 6	TDD	
TDD Configuration	SCS=15 KHz		2, 5	TDDConf.1.1	
	SCS=30 KHz		3, 6	TDDConf.2.1	
$BW_{channel}$		MHz	1, 4	10: $N_{RB,c}$ = 52 (FDD)	
			2, 5	10: $N_{RB,c}$ = 52 (TDD)	
			3, 6	40: $N_{RB,c}$ = 106 (TDD)	
PDSCH reference measurement channel			1, 4	SR.1.1 FDD	
			2, 5	SR.1.1 TDD	
			3, 6	SR.2.1 TDD	
CORSET reference channel			1, 4	CR.1.1 FDD	
			2, 5	CR.1.1 TDD	
			3, 6	CR.2.1 TDD	
BWP configurations	Initial DL BWP		1, 2, 3, 4, 5, 6	DLBWP.0.1	
	Dedicated DL BWP		1, 2, 3, 4, 5, 6	DLBWP.1.1	
	Initial UL BWP		1, 2, 3, 4, 5, 6	ULBWP.0.1	
	Dedicated UL BWP		1, 2, 3, 4, 5, 6	ULBWP.1.1	
OCNG pattern[Note1]			1, 2, 3, 4, 5, 6	OP.1	
SMTC configuration			1, 2, 3, 4, 5, 6	SMTC.1	
SSB configuration			1, 2, 4, 5	SSB.1 FR1	
			3, 6	SSB.2 FR1	
b2-Threshold1		dBm	1, 2, 4, 5	-98	
			3, 6	-95	
EPRE ratio of PSS to SSS		dB	1, 2, 3, 4, 5, 6	0	
EPRE ratio of PBCH_DMRS to SSS					
EPRE ratio of PBCH to PBCH_DMRS					
EPRE ratio of PDCCH_DMRS to SSS					
EPRE ratio of PDCCH to PDCCH_DMRS					
EPRE ratio of PDSCH_DMRS to SSS					
EPRE ratio of PDSCH to PDSCH_DMRS					
EPRE ratio of OCNG DMRS to SSS					
EPRE ratio of OCNG to OCNG DMRS					
N_{oc}[Note2]		dBm/15 KHz	1, 2, 3, 4, 5, 6	-106	
N_{oc}[Note2]		dBm/SCS	1, 2, 4, 5	-106	
			3, 6	-103	
$\hat{E}_s/N_{oc}$		dB	1, 2, 3, 4, 5, 6	18	-2
$\hat{E}_s/I_{ot}$[Note3]		dB	1, 2, 3, 4, 5, 6	18	-2
SS-RSRP[Note3]		dBm/SCS	1, 2, 4, 5	-88	-108
			3, 6	-85	-105
SSB_RP[Note3]		dBm/SCS	1, 2, 4, 5	-88	-108

		3, 6	-85	-105
Io^{Note3}	dBm/9.36 MHz	1, 2, 4, 5	-59.98	-75.92
	dBm/38.16 MHz	3, 6	-53.88	-69.82
Propagation condition		1, 2, 3, 4, 5, 6	AWGN	
Antenna Configuration and Correlation Matrix		1, 2, 3, 4, 5, 6	1x2 Low	
Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols. Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for N_{oc} to be fulfilled. Note 3: $\hat{E}_s/I_{ot}$, SS-RSRP, SSB_RP and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.				

Table 6.6.3.3.5-2: E-UTRAN neighbour cell specific test parameters for SA inter-RAT E-UTRAN event triggered reporting in DRX with PCell in FR1 for UE configured with highSpeedMeasFlag-r16

Parameter	Unit	Configuration	Cell 2	
			T1	T2
RF channel number		1, 2, 3, 4, 5, 6	2	
Duplex mode		1, 2, 3	FDD	
		4, 5, 6	TDD	
TDD special subframe configuration[Note1]		4, 5, 6	6	
TDD uplink-downlink configuration[Note1]		4, 5, 6	1	
$BW_{channel}$	MHz	1, 2, 3, 4, 5, 6	5 MHz: $N_{RB,c}$ = 25 10 MHz: $N_{RB,c}$ = 50 20 MHz: $N_{RB,c}$ = 100	
PDSCH parameters: DL Reference Measurement Channel[Note2]		1, 2, 3	5 MHz: R.7 FDD 10 MHz: R.3 FDD 20 MHz: R.6 FDD	
		4, 5, 6	5 MHz: R.4 TDD 10 MHz: R.0 TDD 20 MHz: R.3 TDD	
PCFICH/PDCCH/PHICH parameters: DL Reference Measurement Channel[Note2]		1, 2, 3	5 MHz: R.11 FDD 10 MHz: R.6 FDD 20 MHz: R.10 FDD	
		4, 5, 6	5 MHz: R.11 TDD 10 MHz: R.6 TDD 20 MHz: R.10 TDD	
OCNG Patterns[Note2]		1, 2, 3	5 MHz: OP.20 FDD 10 MHz: OP.10 FDD 20 MHz: OP.17 FDD	
		4, 5, 6	5 MHz: OP.9 TDD 10 MHz: OP.1 TDD 20 MHz: OP.7 TDD	
PBCH_RA	dB	1, 2, 3, 4, 5, 6	0	
PBCH_RB				
PSS_RA				
SSS_RA				
PCFICH_RB				
PHICH_RA				
PHICH_RB				
PDCCH_RA				
PDCCH_RB				
PDSCH_RA				
PDSCH_RB				
OCNG_RA[Note3]				
OCNG_RB[Note3]				
N_{oc}[Note4]	dBm/15kHz	1, 2, 3, 4, 5, 6	-106	
$\hat{E}_s/N_{oc}$	dB	1, 2, 3, 4, 5, 6	-Infinity	19

$\hat{E}_s/I_{ot}$ Note5	dB	1, 2, 3, 4, 5, 6	-Infinity	19
RSRP Note5	dBm/15kHz	1, 2, 3, 4, 5, 6	-Infinity	-87
SCH_RP Note5	dBm/15kHz	1, 2, 3, 4, 5, 6	-Infinity	-87
Io Note5	dBm/9MHz	1, 2, 3, 4, 5, 6	-78.22+10log ($N_{RB,c}$ /50)	-59.16+10log ($N_{RB,c}$ /50)
Propagation Condition Note6		1, 2, 3, 4, 5, 6	AWGN1944	
Antenna Configuration and Correlation Matrix Note6		1, 2, 3, 4, 5, 6	1x2 Low	

Note 1: Special subframe and uplink-downlink configurations are specified in table 4.2-1 in TS 36.211 [23].
Note 2: DL RMCs and OCNG patterns are specified in clauses A 3.1 and A 3.2 of TS 36.133 [15] respectively.
Note 3: OCNG shall be used such that all cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.
Note 4: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for N_{oc} to be fulfilled.
Note 5: $\hat{E}_s/I_{ot}$, RSRP, SCH_RP and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.
Note 6: Propagation condition and correlation matrix are defined in clause B.2 in TS 36.101 [25].

The UE shall send one Event B2 triggered measurement report for Cell 2 to the PCell, with a measurement reporting delay less than 4.8s from the start of period T2. The measurement reporting delay is defined as the time from the beginning of time period T2 to the moment when the UE sends the measurement report on PUSCH.

The UE shall not send event-triggered measurement reports as long as the reporting criteria is not fulfilled.

The rate of correct events observed during repeated tests shall be at least 90% with a confidence level of 95%.

6.6.4 L1-RSRP measurement for beam reporting

6.6.4.0 Minimum conformance requirements

6.6.4.0.1 Minimum conformance requirements for SSB-based L1-RSRP measurement for beam reporting

Same as clause 4.6.4.0.1

The normative reference for this requirement is TS 38.133 [6] clause 9.5.3.1, 9.5.4.1 and 9.5.5.1.

6.6.4.0.2 Minimum conformance requirements for CSI-RS-based L1-RSRP measurement for beam reporting

Same as clause 4.6.4.0.2

The normative reference for this requirement is TS 38.133 [6] clauses 9.5.3.1, 9.5.4.2 and 9.5.5.2.

6.6.4.1 NR SA FR1 SSB-based L1-RSRP measurement in non-DRX

6.6.4.1.1 Test purpose

To verify that the UE makes correct reporting of L1-RSRP measurement in non-DRX within L1-RSRP measurement requirements in TS 38.133 [6] clause 9.5.4.1.

6.6.4.1.2 Test applicability

This test applies to all types of NR UE release 15 and forward.

6.6.4.1.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 6.6.4.0.1.

The normative reference for this requirement is TS 38.133 [6] clause A.6.6.4.1.

6.6.4.1.4 Test description

6.6.4.1.4.1 Initial conditions

This test shall be tested using any of the test configurations in Table 6.6.4.1.4.1-1. Configure the test equipment and the DUT according to the parameters in Table 6.6.4.1.4.1-2. Test environment parameters are given in Table 6.6.4.1.4.1-3.

Table 6.6.4.1.4.1-1: NR SA SSB based L1-RSRP measurement supported test configurations

Test Case ID	Description
6.6.4.1-1	NR 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode
6.6.4.1-2	NR 15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode
6.6.4.1-3	NR 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode
Note: The UE is only required to be tested in one of the supported test configurations	

Table 6.6.4.1.4.1-2: General test parameters for NR SA SSB based L1-RSRP measurement

Parameter	Config	Unit	Value
SSB GSCN	1~3		freq1
Duplex mode	1		FDD
	2		TDD
	3		TDD
TDD Configuration	1		N/A
	2		TDDConf.1.1
	3		TDDConf.2.1
$BW_{channel}$	1	MHz	10: $N_{RB,c}$ = 52
	2		10: $N_{RB,c}$ = 52
	3		40: $N_{RB,c}$ = 106
PDSCH Reference measurement channel	1		SR.1.1 FDD
	2		SR.1.1 TDD
	3		SR.2.1 TDD
RMSI CORESET Reference Channel	1		CR.1.1 FDD
	2		CR.1.1 TDD
	3		CR.2.1 TDD
Dedicated CORESET Reference Channel	1		CCR.1.1 FDD
	2		CCR.1.1 TDD
	3		CCR.2.1 TDD
SSB configuration	1		SSB.3 FR1
	2		SSB.3 FR1
	3		SSB.4 FR1
OCNG Patterns	1~3		OP.1
Initial BWP Configuration	1~3		DLBWP.0.1 ULBWP.0.1
Dedicated BWP configuration	1~3		DLBWP.1.1 ULBWP.1.1
SMTC configuration	1~3		SMTC.1
TRS Configuration	1		TRS.1.1 FDD
	2		TRS.1.1 TDD
	3		TRS.1.2 TDD
DRX configuration	1~3		Off
reportConfigType	1~3		periodic
reportQuantity	1~3		ssb-Index-RSRP
Number of reported RS	1~3		2
L1-RSRP reporting period	1~3	slot	80
T1	1~3	s	5
T2	1~3	s	1
EPRE ratio of PSS to SSS	1~3	dB	0
EPRE ratio of PBCH DMRS to SSS			
EPRE ratio of PBCH to PBCH DMRS			

EPRE ratio of PDCCH DMRS to SSS			
EPRE ratio of PDCCH to PDCCH DMRS			
EPRE ratio of PDSCH DMRS to SSS			
EPRE ratio of PDSCH to PDSCH DMRS			
EPRE ratio of OCNG DMRS to SSS Note 1			
EPRE ratio of OCNG to OCNG DMRS Note 1			
Propagation condition	1~3		AWGN
Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.			

Table 6.6.4.1.4.1-3: Test Environment parameters for NR SA SSB based L1-RSRP measurement

Parameter	Value		Comment
Test environment	NC		As specified in TS 38.508-1 [14] clause 4.1.
Test frequencies	As specified in Annex E, Table E.2-1 and TS 38.508-1 [14] clause 4.3.1 and 4.4.2.		
Channel bandwidth	As specified by the test configuration selected from Table 4.6.3.1.4.1-1.		
Propagation conditions	AWGN		As specified in Annex C.2.2.
Connection Diagram	TE Part	A.3.1.8.2	As specified in TS 38.508-1 [14] Annex A.
	DUT Part	A.3.2.3.4	
Exceptions to connection diagram	For 4Rx capable UEs without any 2 Rx RF bands use A.3.2.5.2 for DUT part and A.3.1.8.4 for TE Part		

1. Message contents are defined in clause 6.6.4.1.4.3.
2. Single Cell is used, which is NR FR1 Pcell. The connection setup is done according to the settings in Annex C.1.2 and C.1.3. The test parameters are given in tables 6.6.4.1.4.1-2 and 6.6.4.1.5-1. UE is configured to perform RLM and BFD based on the SSBs.

6.6.4.1.4.2 Test procedure

Prior to the start of the time duration T1, the UE shall be configured for periodic CSI reporting in PUCCH [format 2] with a reporting periodicity as mentioned in the above table 6.6.4.1.4.1-2. Before the test, UE is configured to perform RLM, BFD and L1-RSRP measurement based on the SSBs.

1. Ensure the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity NR SA, Connected without release *On* and Test Mode *On*, according to TS 38.508-1 [14] clause 4.5 and general test parameters set according to Table 6.6.4.1.4.1-2.
2. Set the parameters according to T1 in Table 6.6.4.1.5-1. T1 starts.
3. The UE shall be transmitting CSI on PUCCH with a periodicity of 80 slots.
4. When T1 expires, the SS shall set the parameters according to T2 in 6.6.4.1.5-1. T2 starts.
5. The UE shall start sending valid L1-RSRP reports. The SS shall check following requirements:

   - R1: the UE shall start to transmit valid reports no later than 720 ms for configuration 1, 2, 4 and 5 and no later than 680 ms for configuration 3 and 6 from the beginning of time period T2. A valid report shall meet the absolute L1-RSRP requirement for SSB#1 (Table 6.6.4.1.5-2 for test configurations 1, 2, 4 and 5 and Table 6.6.4.1.5-3 for test configurations 3 and 6) and the relative L1-RSRP requirement for SSB#0 in Table 6.6.4.1.5-4. If the first valid report is received earlier than the specified time, the number of passed iterations for R1 is increased by one. Otherwise, the number of failed iterations for R1 is increased by one.

- R2: the UE shall transmit reports every 80 slots until the end of time period T2. If the reports are received accordingly, the number of passed iterations for R2 is increased by one. Otherwise, the number of failed iterations for R2 is increased by one.

- R3: The L1-RSRP value of SSB#1 reported by the UE is compared to the expected L1-RSRP value for SSB#1. In all consecutive reports after the first valid value is received, if the resulting value is outside the limits in Table 6.6.4.1.5-2 for test configurations 1, 2, 4 and 5 and in Table 6.6.4.1.5-3 for test configurations 3 and 6 or the UE fails to report the measurement value for SSB#1, the number of failed iterations for R3 is increased by one. Otherwise, the number of passed iterations for R3 is increased by one.

-R4: The DIFF RSRP value of SSB#0 reported by the UE is compared to the expected DIFF RSRP value. In all consecutive reports after the first valid value is received, if the resulting value is outside the limits in Table 6.6.4.1.5-4 or the UE fails to report the measurement value for SSB#0, the number of failed iterations for R4 is increased by one. Otherwise, the number of passed iterations for R4 is increased by one.

6. The SS waits until T2 expires.

7. The SS shall transmit *RRCRelease* message to release the RRC connection which includes the release of the established radio bearers as well as all radio resources.

8. After the RRC connection release, the SS:

- transmits in Cell 1 a *Paging* message (including PagingRecord with ue-Identity) for the UE and ensures the UE in state RRC_CONNECTED with generic procedure parameters Connectivity NR SA, Connected without release *On* and Test Mode *On* according to TS 38.508-1 [14] clause 4.5. (if the paging fails, switches off and on the UE and ensures the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity NR SA, Connected without release *On* and Test Mode *On* according to TS 38.508-1 [14] clause 4.5.),
or:
- switches off and on the UE and ensures the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity NR SA, Connected without release *On* and Test Mode *On* according to TS 38.508-1 [14] clause 4.5.

9. Repeat steps 2-8 until the confidence level according to Tables G.2.3-1 in Annex G clause G.2 is achieved.

6.6.4.1.4.3 Message contents

Message contents are according to TS 38.508-1 [14] clause 7.3 with the following exceptions:

Table 6.6.4.1.4.3-1: Common Exception messages NR SA SSB based L1-RSRP measurement

Default Message Contents	
Common contents of system information blocks exceptions	
Default RRC messages and information elements contents exceptions	Table H.3.6-2 with conditions PERIODIC and SS-RSRP Table H.3.6-3 with condition SSB

Table 6.6.4.1.4.3-2: RadioLinkMonitoringConfig

Derivation Path: TS 38.508-1 [14], Table 4.6.3-133			
Information Element	**Value/remark**	**Comment**	**Condition**
RadioLinkMonitoringConfig ::= SEQUENCE {			
failureDetectionResourcesToAddModList SEQUENCE (SIZE(1..maxNrofFailureDetectionResources)) OF SEQUENCE {	1 entry		
purpose	both	UE is configured to perform RLM and BFD based on the SSBs.	
detectionResource CHOICE {			
ssb-Index	0		
}			
}			
}			

6.6.4.1.5 Test requirement

Table 6.6.4.1.5-1 defines the primary level settings including test tolerances for all tests.

Table 6.6.4.1.5-1: SSB specific test parameters for NR SA SSB based L1-RSRP measurement

Parameter	Config	Unit	SSB#0		SSB#1	
			T1	T2	T1	T2
N_{oc} Note2	1~3	dBm/15kHz	-94.65			
N_{oc} Note2	1,2	dBm/SSB SCS	-94.65			
	3		-91.65			
$\hat{E}_s / I_{ot}$	1~3	dB	0	0	-Infinity	3.5
SSB RSRP Note3	1,2	dBm/SSB SCS	-94.65	-94.65	-Infinity	-91.15
	3		-91.65	-91.65	-Infinity	-88.14
Io Note3	1,2	dBm/9.36 MHz	-63.69	-63.69	-66.70	-61.59
	3	dBm/38.16 MHz	-57.59	-57.59	-60.61	-55.49
$\hat{E}_s / N_{oc}$	1~3	dB	0	0	-Infinity	3.5

Note 1: The resources for uplink transmission are assigned to the UE prior to the start of time period T2.

Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for N_{oc} to be fulfilled.

Note 3: SS-RSRP and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.

The UE shall send L1-RSRP report every 80 slots. No later than 640ms plus 80 slots from the beginning of time period T2, UE shall send L1-RSRP report including results of both SSB0 and SSB1. Each L1-RSRP measurement report shall meet the corresponding absolute accuracy requirements in Table 4.6.4.1.5-2 for for test configurations 1, 2, 4 and 5 and the corresponding absolute accuracy requirements in Table 4.6.4.1.5-3 for test configurations 3 and 6 and the corresponding relative accuracy requirements in Table 4.6.4.1.5-4 for all test configurations.

Table 6.6.4.1.5-2: L1-RSRP absolute accuracy requirements for the reported values for test configurations 1 and 2

Normal Conditions	T1	T2
Lowest reported value (SSB#1)	-	55
Highest reported value (SSB#1)	-	75

Table 6.6.4.1.5-3: L1-RSRP absolute accuracy requirements for the reported values for test configurations 3

Normal Conditions	T1	T2
Lowest reported value (SSB#1)	-	58
Highest reported value (SSB#1)	-	78

Table 6.6.4.1.5-4: L1-RSRP relative accuracy requirements for the reported values for all test configurations

	T1	T2
Lowest DIFF RSRP reported (SSB#0)	-	0
Highest DIFF RSRP reported (SSB#0)	-	3

For the test to pass, the ratio of successful reported values for each requirement (R1 to R4) shall be more than 90% with a confidence level of 95%. Each requirement is evaluated independently of the others.NOTE:
The actual overall delays measured in the test may be up to $2xTTI_{DCCH}$ higher than the measurement reporting delays above because of TTI insertion uncertainty of the measurement report in DCCH.

6.6.4.2 NR SA FR1 SSB-based L1-RSRP measurement in DRX

6.6.4.2.1 Test purpose

To verify that the UE makes correct reporting of L1-RSRP measurement in DRX within L1-RSRP measurement requirements in TS 38.133 [6] clause 9.5.4.1.

6.6.4.2.2 Test applicability

This test applies to all types of NR UE release 15 and forward supporting 5GS NR SA FR1 and long DRX cycle.

6.6.4.2.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 6.6.4.0.1.

The normative reference for this requirement is TS 38.133 [6] clause A.6.6.4.2.

6.6.4.2.4 Test description

6.6.4.2.4.1 Initial conditions

This test shall be tested using any of the test configurations in Table 6.6.4.2.4.1-1. Configure the test equipment and the DUT according to the parameters in Table 6.6.4.2.4.1-2. Test environment parameters are given in Table 6.6.4.2.4.1-3.

Table 6.6.4.2.4.1-1: SA SSB based L1-RSRP measurement supported test configurations

Test Case ID	Description
6.6.4.2-1	NR 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode
6.6.4.2-2	NR 15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode
6.6.4.2-3	NR 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode
Note: The UE is only required to be tested in one of the supported test configurations	

Table 6.6.4.2.4.1-2: General test parameters for NR SA SSB based L1-RSRP measurement

Parameter	Config	Unit	Value
SSB GSCN	1~3		freq1
Duplex mode	1		FDD
	2		TDD
	3		TDD
TDD Configuration	1		N/A
	2		TDDConf.1.1
	3		TDDConf.2.1
$BW_{channel}$	1	MHz	10: $N_{RB,c}$ = 52
	2		10: $N_{RB,c}$ = 52
	3		40: $N_{RB,c}$ = 106
PDSCH Reference measurement channel	1		SR.1.1 FDD
	2		SR.1.1 TDD
	3		SR.2.1 TDD
RMSI CORESET Reference Channel	1		CR.1.1 FDD
	2		CR.1.1 TDD
	3		CR.2.1 TDD
Dedicated CORESET Reference Channel	1		CCR.1.1 FDD
	2		CCR.1.1 TDD
	3		CCR.2.1 TDD
SSB configuration	1		SSB.3 FR1
	2		SSB.3 FR1
	3		SSB.4 FR1
OCNG Patterns	1~3		OP.1

Initial BWP Configuration	1~3		DLBWP.0.1 ULBWP.0.1
Dedicated BWP configuration	1~3		DLBWP.1.1 ULBWP.1.1
SMTC configuration	1~3		SMTC.1
TRS Configuration	1		TRS.1.1 FDD
	2		TRS.1.1 TDD
	3		TRS.1.2 TDD
DRX configuration	1~3		DRX.3
reportConfigType	1~3		periodic
reportQuantity	1~3		ssb-Index-RSRP
Number of reported RS	1~3		2
L1-RSRP reporting period	1~3	slot	80
T1	1~3	s	5
T2	1~3	s	1
EPRE ratio of PSS to SSS	1~3	dB	0
EPRE ratio of PBCH DMRS to SSS			
EPRE ratio of PBCH to PBCH DMRS			
EPRE ratio of PDCCH DMRS to SSS			
EPRE ratio of PDCCH to PDCCH DMRS			
EPRE ratio of PDSCH DMRS to SSS			
EPRE ratio of PDSCH to PDSCH DMRS			
EPRE ratio of OCNG DMRS to SSS Note 1			
EPRE ratio of OCNG to OCNG DMRS Note 1			
Propagation condition	1~3		AWGN
Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.			

Table 6.6.4.2.4.1-3: Test Environment parameters for NR SA SSB based L1-RSRP measurement

Parameter	Value		Comment
Test environment	NC		As specified in TS 38.508-1 [14] clause 4.1.
Test frequencies	As specified in Annex E, Table E.2-1 and TS 38.508-1 [14] clause 4.3.1 and 4.4.2.		
Channel bandwidth	As specified by the test configuration selected from Table 4.6.3.1.4.1-1.		
Propagation conditions	AWGN		As specified in Annex C.2.2.
Connection Diagram	TE Part	A.3.1.8.2	As specified in TS 38.508-1 [14] Annex A.
	DUT Part	A.3.2.3.4	
Exceptions to connection diagram	For 4Rx capable UEs without any 2 Rx RF bands use A.3.2.5.2 for DUT part and A.3.1.8.4 for TE Part		

1. Message contents are defined in clause 6.6.4.2.4.3.

2. Single Cell is used, which is NR FR1 Pcell. The connection setup is done according to the settings in Annex C.1.2 and C.1.3. The test parameters are given in tables 6.6.4.2.4.1-2 and 6.6.4.2.5-1. UE is configured to perform RLM and BFD based on the SSBs. DRX is configured as specified in Table 6.6.4.2.4.1-2.

6.6.4.2.4.2 Test procedure

Same test procedure as in subclause 6.6.4.1.4.2 with tables 6.6.4.1.4.1-2 and 6.6.4.1.5-1 replaced by tables 6.6.4.2.4.1-2 and 6.6.4.2.5-1.

6.6.4.2.4.3 Message contents

Same message content as in subclause 6.6.4.1.4.3 with the following exception:

Table 6.6.4.2.4.3-1: Common Exception messages EN-DC SSB based L1-RSRP measurement in DRX

Default Message Contents	
Common contents of system information blocks exceptions	
Default RRC messages and information elements contents exceptions	Table H.3.7-1 with condition DRX.3

6.6.4.2.5 Test requirement

Table 6.6.4.2.5-1 defines the primary level settings including test tolerances for all tests.

Table 6.6.4.2.5-1: SSB specific test parameters for NR SA SSB based L1-RSRP measurement

Parameter	Config	Unit	SSB#0		SSB#1	
			T1	T2	T1	T2
N_{oc} Note2	1~3	dBm/15kHz	-94.65			
N_{oc} Note2	1,2	dBm/SSB SCS	-94.65			
	3		-91.65			
$\hat{E}_s / I_{ot}$	1~3	dB	0	0	-Infinity	3.5
SSB RSRP Note3	1,2	dBm/SSB SCS	-94.65	-94.65	-Infinity	-91.15
	3		-91.65	-91.65	-Infinity	-88.14
Io Note3	1,2	dBm/9.36 MHz	-63.69	-63.69	-66.70	-61.59
	3	dBm/38.16 MHz	-57.59	-57.59	-60.61	-55.49
$\hat{E}_s / N_{oc}$	1~3	dB	0	0	-Infinity	3.5

Note 1: The resources for uplink transmission are assigned to the UE prior to the start of time period T2.
Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for N_{oc} to be fulfilled.
Note 3: SS-RSRP and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.

The UE shall send L1-RSRP report every 80 slots. No later than 640ms plus 80 slots from the beginning of time period T2, UE shall send L1-RSRP report including results of both SSB0 and SSB1. Each L1-RSRP measurement report shall meet the corresponding absolute accuracy requirements in Table 6.6.4.2.5-2 for for test configurations 1, 2, 4 and 5 and the corresponding absolute accuracy requirements in Table 6.6.4.2.5-3 for test configurations 3 and 6 and the corresponding relative accuracy requirements in Table 6.6.4.2.5-4 for all test configurations.

Table 6.6.4.2.5-2: L1-RSRP absolute accuracy requirements for the reported values for test configurations 1 and 2

Normal Conditions	T1	T2
Lowest reported value (SSB#1)	-	55
Highest reported value (SSB#1)	-	75

Table 6.6.4.2.5-3: L1-RSRP absolute accuracy requirements for the reported values for test configurations 3

Normal Conditions	T1	T2
Lowest reported value (SSB#1)	-	58
Highest reported value (SSB#1)	-	78

Table 6.6.4.2.5-4: L1-RSRP relative accuracy requirements for the reported values for all test configurations

	T1	T2
Lowest DIFF RSRP reported (SSB#0)	-	0
Highest DIFF RSRP reported (SSB#0)	-	3

The rate of correct events observed during repeated tests shall be at least 90% with a confidence level of 95%.

NOTE: The actual overall delays measured in the test may be up to $2xTTI_{DCCH}$ higher than the measurement reporting delays above because of TTI insertion uncertainty of the measurement report in DCCH.

6.6.4.3 NR SA FR1 CSI-RS-based L1-RSRP measurement in non-DRX

6.6.4.3.1 Test purpose

To verify that the UE makes correct reporting of L1-RSRP measurement in non-DRX within L1-RSRP measurement requirements in TS 38.133 [6] clause 9.5.4.1.

6.6.4.3.2 Test applicability

This test applies to all types of NR UE release 15 and forward.

6.6.4.3.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 6.6.4.0.2.

The normative reference for this requirement is TS 38.133 [6] clause A.6.6.4.3.

6.6.4.3.4 Test description

6.6.4.3.4.1 Initial conditions

This test shall be tested using any of the test configurations in Table 6.6.4.3.4.1-1. Configure the test equipment and the DUT according to the parameters in Table 6.6.4.3.4.1-2. Test environment parameters are given in Table 6.6.4.3.4.1-3.

Table 6.6.4.3.4.1-1:NR SA SSB based L1-RSRP measurement supported test configurations

Test Case ID	Description
6.6.4.3-1	NR 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode
6.6.4.3-2	NR 15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode
6.6.4.3-3	NR 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode
Note: The UE is only required to be tested in one of the supported test configurations	

Table 6.6.4.3.4.1-2: General test parameters for NR SA SSB based L1-RSRP measurement

Parameter	Config	Unit	Value
SSB GSCN	1~3		freq1
Duplex mode	1		FDD
	2		TDD
	3		TDD
TDD Configuration	1		N/A
	2		TDDConf.1.1
	3		TDDConf.2.1
$BW_{channel}$	1	MHz	10: $N_{RB,c}$ = 52
	2		10: $N_{RB,c}$ = 52
	3		40: $N_{RB,c}$ = 106
	1		SR.1.1 FDD

PDSCH Reference measurement channel	2		SR.1.1 TDD
	3		SR.2.1 TDD
RMSI CORESET Reference Channel	1		CR.1.1 FDD
	2		CR.1.1 TDD
	3		CR.2.1 TDD
Dedicated CORESET Reference Channel	1		CCR.1.1 FDD
	2		CCR.1.1 TDD
	3		CCR.2.1 TDD
SSB configuration	1		SSB.3 FR1
	2		SSB.3 FR1
	3		SSB.4 FR1
CSI-RS configuration	1		CSI-RS 1.3 FDD
	2		CSI-RS 1.3 TDD
	3		CSI-RS 2.3 TDD
OCNG Patterns	1~3		OP.1
TRS Configuration	1		TRS.1.1 FDD
	2		TRS.1.1 TDD
	3		TRS.1.2 TDD
Initial BWP Configuration	1~3		DLBWP.0.1 ULBWP.0.1
Dedicated BWP configuration	1~3		DLBWP.1.1 ULBWP.1.1
SMTC configuration	1~3		SMTC.1
DRX configuration	1~3		Off
reportConfigType	1~3		aperiodic
reportQuantity	1~3		cri-RSRP
Number of reported RS	1~3		2
qcl-Info	1~3		SSB#0 for resource#0 SSB#1 for resource#1
reportSlotOffsetList	1~3	slots	8
T1	1~3	s	5
EPRE ratio of PSS to SSS	1~3	dB	0
EPRE ratio of PBCH DMRS to SSS			
EPRE ratio of PBCH to PBCH DMRS			
EPRE ratio of PDCCH DMRS to SSS			
EPRE ratio of PDCCH to PDCCH DMRS			
EPRE ratio of PDSCH DMRS to SSS			
EPRE ratio of PDSCH to PDSCH DMRS			
EPRE ratio of OCNG DMRS to SSS Note 1			
EPRE ratio of OCNG to OCNG DMRS Note 1			
Propagation condition	1~3		AWGN
Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.			

Table 6.6.4.3.4.1-3: Test Environment parameters for NR SA SSB based L1-RSRP measurement

Parameter	Value		Comment
Test environment	NC		As specified in TS 38.508-1 [14] clause 4.1.
Test frequencies	As specified in Annex E, Table E.2-1 and TS 38.508-1 [14] clause 4.3.1 and 4.4.2.		
Channel bandwidth	As specified by the test configuration selected from Table 4.6.3.1.4.1-1.		
Propagation conditions	AWGN		As specified in Annex C.2.2.
Connection Diagram	TE Part	A.3.1.8.2	As specified in TS 38.508-1 [14] Annex A.
	DUT Part	A.3.2.3.4	

Exceptions to connection diagram	For 4Rx capable UEs without any 2 Rx RF bands use A.3.2.5.2 for DUT part and A.3.1.8.4 for TE Part	

1. Message contents are defined in clause 6.6.4.3.4.3.

2. Single Cell is used, which is NR FR1 Pcell. The connection setup is done according to the settings in Annex C.1.2 and C.1.3. The test parameters are given in tables 6.6.4.3.4.1-2 and 6.6.4.3.5-1. UE is configured to perform RLM and BFD based on the SSBs.

6.6.4.3.4.2 Test procedure

The test consists of a single time period T1, during which the UE is triggered via DCI to report L1-RSRP on aperiodic CSI-RS resources. Prior to the start of the time duration T1, the UE shall be fully synchronized to PCell. UE is also configured to measure L1-RSRP based on SSB. Upon receiving the DCI trigger, UE provides the report back based on the reporting configuration as defined in table 6.6.4.3.4.1-2.

1. Ensure the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity NR SA, Connected without release *On* and Test Mode *On,* according to TS 38.508-1 [14] clause 4.5.

2. Set the parameters according to T1 in Table 6.6.4.3.5-1. T1 starts.

3. After 80ms from the start of the test the SS transmits the DCI trigger in slot 0 for configuration 1,2 and slot 8 for configuration 3. The corresponding CSI-RS set is transmitted with the offset of 0 slots after the DCI trigger.

4. The SS shall check following requirements:

   - R1: the UE shall send L1-RSRP report at slot 8 from the reception of DCI trigger. If the report is received at slot 8 from the reception of DCI trigger, the number of passed iterations for R1 is increased by one. Otherwise, the number of failed iterations for R1 is increased by one.

   - R2: The L1-RSRP value of CSI-RS#1 reported by the UE is compared to the expected L1-RSRP value for CSI-RS #1. If the resulting value is outside the limits in Table 6.6.4.3.5-2 for test configurations 1, 2, 4 and 5 and in Table 6.6.4.3.5-3 for test configurations 3 and 6 or the UE fails to report the measurement value for CSI-RS #1, the number of failed iterations for R2 is increased by one. Otherwise, the number of passed iterations for R2 is increased by one.

   -R3: The DIFF RSRP value of CSI-RS #0 reported by the UE is compared to the expected DIFF RSRP value. If the resulting value is outside the limits in Table 6.6.4.3.5-4 or the UE fails to report the measurement value for CSI-RS #0, the number of failed iterations for R3 is increased by one. Otherwise, the number of passed iterations for R3 is increased by one.

5. Void.

6. The SS shall transmit *RRCRelease* message to release the RRC connection which includes the release of the established radio bearers as well as all radio resources.

7. After the RRC connection release, the SS:

   - transmits in Cell 1 a *Paging* message (including PagingRecord with ue-Identity) for the UE and ensures the UE in state RRC_CONNECTED with generic procedure parameters Connectivity NR SA, Connected without release *On* and Test Mode *On* according to TS 38.508-1 [14] clause 4.5. (if the paging fails, switches off and on the UE and ensures the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity NR SA, Connected without release *On* and Test Mode *On* according to TS 38.508-1 [14] clause 4.5.),
   or:
   - switches off and on the UE and ensures the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity NR SA, Connected without release *On* and Test Mode *On* according to TS 38.508-1 [14] clause 4.5.

8. Repeat steps 2-7 until the confidence level according to Tables G.2.3-1 in Annex G clause G.2 is achieved.

6.6.4.3.4.3 Message contents

Message contents are according to TS 38.508-1 [14] clause 7.3 with the following exceptions:

Table 6.6.4.3.4.3-1: Common Exception messages NR SA CSI-RS-based L1-RSRP measurement

Default Message Contents	
Common contents of system information blocks exceptions	
Default RRC messages and information elements contents exceptions	Table H.3.6-2 with conditions APERIODIC and CSI-RSRP Table H.3.6-3 with conditions CSI-RS TS 38.508-1 [14] Table 7.3.1-21 with condition APERIODIC

Table 6.6.4.3.4.3-2: RadioLinkMonitoringConfig

Derivation Path: TS 38.508-1 [14], Table 4.6.3-133			
Information Element	**Value/remark**	**Comment**	**Condition**
RadioLinkMonitoringConfig ::= SEQUENCE {			
failureDetectionResourcesToAddModList SEQUENCE (SIZE(1..maxNrofFailureDetectionResources)) OF SEQUENCE {	1 entry		
purpose	both	UE is configured to perform RLM and BFD based on the SSBs.	
}			
}			

6.6.4.3.5 Test requirement

Table 6.6.4.3.5-1 defines the primary level settings including test tolerances for all tests.

Table 6.6.4.3.5-1: SSB specific test parameters for NR SA SSB based L1-RSRP measurement

Parameter	Config	Unit	CSI-RS#0	CSI-RS#1
N_{oc} Note1	1~3	dBm/15kHz	-94.65	
N_{oc} Note1	1,2	dBm/SSB SCS	-94.65	
	3		-91.65	
$\hat{E}_s / I_{ot}$	1~3	dB	0	3.5
CSI-RS RSRP Note2	1,2	dBm/SSB SCS	-94.65	-91.15
	3		-91.65	-88.14
Io Note2	1,2	dBm/9.36 MHz	-63.69	-61.59
	3	dBm/38.16 MHz	-57.59	-55.49
$\hat{E}_s / N_{oc}$	1~3	dB	0	3.5
Note 1: Void Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for N_{oc} to be fulfilled. Note 3: CSI-RS RSRP and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.				

After 80ms from the beginning of the test, the UE shall send L1-RSRP report at slot 8 from the reception of DCI triggering the L1-RSRP measurement. The L1-RSRP report shall include the results for both CSI-RS#0 and CSI-RS#1.

Each L1-RSRP measurement report shall meet the corresponding absolute accuracy requirements in Table 6.6.4.3.5-2 for for test configurations 1, 2, 4 and 5 and the corresponding absolute accuracy requirements in Table 6.6.4.3.5-3 for

test configurations 3 and 6 and the corresponding relative accuracy requirements in Table 6.6.4.3.5-4 for all test configurations.

Table 6.6.4.3.5-2: L1-RSRP absolute accuracy requirements for the reported values for test configurations 1 and 2

Normal Conditions	T1
Lowest reported value (CSI-RS#1)	55
Highest reported value (CSI-RS#1)	75

Table 6.6.4.3.5-3: L1-RSRP absolute accuracy requirements for the reported values for test configurations 3

Normal Conditions	T1
Lowest reported value (CSI-RS#1)	58
Highest reported value (CSI-RS#1)	78

Table 6.6.4.3.5-4: L1-RSRP relative accuracy requirements for the reported values for all test configurations

	T1
Lowest DIFF RSRP reported (CSI-RS#0)	0
Highest DIFF RSRP reported (CSI-RS#0)	3

For the test to pass, the ratio of successful reported values for each requirement (R1 to R3) shall be more than 90% with a confidence level of 95%. Each requirement is evaluated independently of the others.NOTE:
The actual overall delays measured in the test may be up to $2xTTI_{DCCH}$ higher than the measurement reporting delays above because of TTI insertion uncertainty of the measurement report in DCCH.

6.6.4.4 NR SA FR1 CSI-RS-based L1-RSRP measurement in DRX

6.6.4.4.1 Test purpose

To verify that the UE makes correct reporting of L1-RSRP measurement in DRX within L1-RSRP measurement requirements in TS 38.133 [6] clause 9.5.4.1.

6.6.4.4.2 Test applicability

This test applies to all types of NR UE release 15 and forward supporting 5GS NR SA FR1 and long DRX cycle.

6.6.4.4.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 6.6.4.0.2.

The normative reference for this requirement is TS 38.133 [6] clause A.6.6.4.4.

6.6.4.4.4 Test description

6.6.4.4.4.1 Initial conditions

This test shall be tested using any of the test configurations in Table 6.6.4.4.4.1-1. Configure the test equipment and the DUT according to the parameters in Table 6.6.4.4.4.1-2. Test environment parameters are given in Table 6.6.4.4.4.1-3.

Table 6.6.4.4.4.1-1: NR SA SSB based L1-RSRP measurement supported test configurations

Test Case ID	Description
6.6.4.4-1	NR 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode
6.6.4.4-2	NR 15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode
6.6.4.4-3	NR 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode
Note: The UE is only required to be tested in one of the supported test configurations	

Table 6.6.4.4.4.1-2: General test parameters for NR SA SSB based L1-RSRP measurement

Parameter	Config	Unit	Value
SSB GSCN	1~3		freq1
Duplex mode	1		FDD
	2		TDD
	3		TDD
TDD Configuration	1		N/A
	2		TDDConf.1.1
	3		TDDConf.2.1
$BW_{channel}$	1	MHz	10: $N_{RB,c}$ = 52
	2		10: $N_{RB,c}$ = 52
	3		40: $N_{RB,c}$ = 106
PDSCH Reference measurement channel	1		SR.1.1 FDD
	2		SR.1.1 TDD
	3		SR.2.1 TDD
RMSI CORESET Reference Channel	1		CR.1.1 FDD
	2		CR.1.1 TDD
	3		CR.2.1 TDD
Dedicated CORESET Reference Channel	1		CCR.1.1 FDD
	2		CCR.1.1 TDD
	3		CCR.2.1 TDD
SSB configuration	1		SSB.3 FR1
	2		SSB.3 FR1
	3		SSB.4 FR1
CSI-RS configuration	1		CSI-RS 1.3 FDD
	2		CSI-RS 1.3 TDD
	3		CSI-RS 2.3 TDD
OCNG Patterns	1~3		OP.1
TRS Configuration	1		TRS.1.1 FDD
	2		TRS.1.1 TDD
	3		TRS.1.2 TDD
Initial BWP Configuration	1~3		DLBWP.0.1 ULBWP.0.1
Dedicated BWP configuration	1~3		DLBWP.1.1 ULBWP.1.1
SMTC configuration	1~3		SMTC.1
DRX configuration	1~3		DRX.3
reportConfigType	1~3		aperiodic
reportQuantity	1~3		cri-RSRP
Number of reported RS	1~3		2
qcl-Info	1~3		SSB#0 for resource#0 SSB#1 for resource#1
reportSlotOffsetList	1~3	slots	8
T1	1~3	s	5
EPRE ratio of PSS to SSS	1~3	dB	0
EPRE ratio of PBCH DMRS to SSS			
EPRE ratio of PBCH to PBCH DMRS			
EPRE ratio of PDCCH DMRS to SSS			
EPRE ratio of PDCCH to PDCCH DMRS			
EPRE ratio of PDSCH DMRS to SSS			
EPRE ratio of PDSCH to PDSCH DMRS			
EPRE ratio of OCNG DMRS to SSS Note 1			
EPRE ratio of OCNG to OCNG DMRS Note 1			
Propagation condition	1~3		AWGN

Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.

Table 6.6.4.4.4.1-3: Test Environment parameters for NR SA SSB based L1-RSRP measurement

Parameter	Value		Comment
Test environment	NC		As specified in TS 38.508-1 [14] clause 4.1.
Test frequencies	As specified in Annex E, Table E.2-1 and TS 38.508-1 [14] clause 4.3.1 and 4.4.2.		
Channel bandwidth	As specified by the test configuration selected from Table 4.6.3.1.4.1-1.		
Propagation conditions	AWGN		As specified in Annex C.2.2.
Connection Diagram	TE Part	A.3.1.8.2	As specified in TS 38.508-1 [14] Annex A.
	DUT Part	A.3.2.3.4	
Exceptions to connection diagram	For 4Rx capable UEs without any 2 Rx RF bands use A.3.2.5.2 for DUT part and A.3.1.8.4 for TE Part		

1. Message contents are defined in clause 6.6.4.4.4.3.
2. Single Cell is used, which is NR FR1 Pcell. The connection setup is done according to the settings in Annex C.1.2 and C.1.3. The test parameters are given in tables 6.6.4.4.4.1-2 and 6.6.4.4.5-1. UE is configured to perform RLM and BFD based on the SSBs.

6.6.4.4.4.2 Test procedure

Same test procedure as in subclause 6.6.4.3.4.2 with tables 6.6.4.3.4.1-2 and 6.6.4.3.5-1 replaced by tables 6.6.4.4.4.1-2 and 6.6.4.4.5-1.

6.6.4.4.4.3 Message contents

Same message content as in subclause 6.6.4.3.4.3 with the following exception:

Table 6.6.4.4.4.3-1: Common Exception messages NR SA CSI-RS-based L1-RSRP measurement

Default Message Contents	
Common contents of system information blocks exceptions	
Default RRC messages and information elements contents exceptions	Table H.3.7-1 with condition DRX.3 and Offset

6.6.4.4.5 Test requirement

Table 6.6.4.4.5-1 defines the primary level settings including test tolerances for all tests.

Table 6.6.4.4.5-1: SSB specific test parameters for NR SA SSB based L1-RSRP measurement

Parameter	Config	Unit	CSI-RS#0	CSI-RS#1
N_{oc} Note1	1~3	dBm/15kHz	-94.65	
N_{oc} Note1	1,2	dBm/SSB SCS	-94.65	
	3		-91.65	
$\hat{E}_s / I_{ot}$	1~3	dB	0	3.5
CSI-RS RSRP Note2	1,2	dBm/SSB SCS	-94.65	-91.15
	3		-91.65	-88.14
Io Note2	1,2	dBm/9.36 MHz	-63.69	-61.59
	3	dBm/38.16 MHz	-57.59	-55.49
$\hat{E}_s / N_{oc}$	1~3	dB	0	3.5
Note 1: Void Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for N_{oc} to be fulfilled.				

Note 3:	CSI-RS RSRP and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.

After 80ms from the beginning of the test, the UE shall send L1-RSRP report at slot 8 from the reception of DCI triggering the L1-RSRP measurement. The L1-RSRP report shall include the results for both CSI-RS#0 and CSI-RS#1.

Each L1-RSRP measurement report shall meet the corresponding absolute accuracy requirements in Table 6.6.4.4.5-2 for for test configurations 1, 2, 4 and 5 and the corresponding absolute accuracy requirements in Table 6.6.4.4.5-3 for test configurations 3 and 6 and the corresponding relative accuracy requirements in Table 6.6.4.4.5-4 for all test configurations.

Table 6.6.4.4.5-2: L1-RSRP absolute accuracy requirements for the reported values for test configurations 1 and 2

Normal Conditions	T1
Lowest reported value (CSI-RS#1)	55
Highest reported value (CSI-RS#1)	75

Table 6.6.4.4.5-3: L1-RSRP absolute accuracy requirements for the reported values for test configurations 3

Normal Conditions	T1
Lowest reported value (CSI-RS#1)	58
Highest reported value (CSI-RS#1)	78

Table 6.6.4.4.5-4: L1-RSRP relative accuracy requirements for the reported values for all test configurations

	T1
Lowest DIFF RSRP reported (CSI-RS#0)	0
Highest DIFF RSRP reported (CSI-RS#0)	3

The rate of correct events observed during repeated tests shall be at least 90% with a confidence level of 95%.

NOTE: The actual overall delays measured in the test may be up to $2xTTI_{DCCH}$ higher than the measurement reporting delays above because of TTI insertion uncertainty of the measurement report in DCCH.

6.6.4.5 NR SA FR1 SSB-based L1-RSRP measurement in DRX for UE configured with highSpeedMeasFlag-r16

Editor's note: This test case is incomplete. The following aspects are either missing or not yet determined:

- The feasibility of configuring different channel models to different SSBs needs further study.

- The TT analysis may need to be redone after concluding if the new test configuration is testable.

6.6.4.5.1 Test purpose

To verify that the UE makes correct reporting of L1-RSRP measurement in DRX within L1-RSRP measurement requirements for UE configured with highSpeedMeasFlag-r16 in TS 38.133 clause 9.5.4.1

6.6.4.5.2 Test applicability

This test applies to all types of NR UE release 15 and forward supporting 5GS NR SA FR1, measurement enhancements in high speed scenario and long DRX cycle

6.6.4.5.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 6.6.4.0.1.

The normative reference for this requirement is TS 38.133 [6] clause A.6.6.4.5.

6.6.4.5.4 Test description

6.6.4.5.4.1 Initial conditions

This test shall be tested using any of the test configurations in Table 6.6.4.5.4.1-1. Configure the test equipment and the DUT according to the parameters in Table 6.6.4.5.4.1-2. Test environment parameters are given in Table 6.6.4.5.4.1-3.

Table 6.6.4.5.4.1-1: SA SSB based L1-RSRP measurement supported test configurations for UE configured with highSpeedMeasFlag-r16

Test Case ID	Description
6.6.4.5-1	NR 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode
6.6.4.5-2	NR 15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode
6.6.4.5-3	NR 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode
Note: The UE is only required to be tested in one of the supported test configurations	

Table 6.6.4.5.4.1-2: General test parameters for NR SA SSB based L1-RSRP measurement for UE configured with highSpeedMeasFlag-r16

Parameter	Config	Unit	Value
SSB GSCN	1~3		freq1
Duplex mode	1		FDD
	2		TDD
	3		TDD
TDD Configuration	1		N/A
	2		TDDConf.1.1
	3		TDDConf.2.1
$BW_{channel}$	1	MHz	10: $N_{RB,c}$ = 52
	2		10: $N_{RB,c}$ = 52
	3		40: $N_{RB,c}$ = 106
PDSCH Reference measurement channel	1		SR.1.1 FDD
	2		SR.1.1 TDD
	3		SR.2.1 TDD
RMSI CORESET Reference Channel	1		CR.1.1 FDD
	2		CR.1.1 TDD
	3		CR.2.1 TDD
Dedicated CORESET Reference Channel	1		CCR.1.1 FDD
	2		CCR.1.1 TDD
	3		CCR.2.1 TDD
SSB configuration	1		SSB.3 FR1
	2		SSB.3 FR1
	3		SSB.4 FR1
OCNG Patterns	1~3		OP.1
Initial BWP Configuration	1~3		DLBWP.0.1 ULBWP.0.1
Dedicated BWP configuration	1~3		DLBWP.1.1 ULBWP.1.1
SMTC configuration	1~3		SMTC.1
TRS Configuration	1		TRS.1.1 FDD
	2		TRS.1.1 TDD
	3		TRS.1.2 TDD
DRX configuration	1~3		DRX.3
reportConfigType	1~3		periodic
reportQuantity	1~3		ssb-Index-RSRP
Number of reported RS	1~3		2
L1-RSRP reporting period	1~3	slot	80
T1	1~3	s	5
T2	1~3	s	2
EPRE ratio of PSS to SSS	1~3	dB	0
EPRE ratio of PBCH DMRS to SSS			
EPRE ratio of PBCH to PBCH DMRS			

EPRE ratio of PDCCH DMRS to SSS			
EPRE ratio of PDCCH to PDCCH DMRS			
EPRE ratio of PDSCH DMRS to SSS			
EPRE ratio of PDSCH to PDSCH DMRS			
EPRE ratio of OCNG DMRS to SSS Note 1			
EPRE ratio of OCNG to OCNG DMRS Note 1			
Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.			

Table 6.6.4.5.4.1-3: Test Environment parameters for NR SA SSB based L1-RSRP measurement

Parameter	Value		Comment
Test environment	NC		As specified in TS 38.508-1 [14] clause 4.1.
Test frequencies	As specified in Annex E, Table E.4-1 and TS 38.508-1 [14] clause 4.3.1 and 4.4.2.		
Channel bandwidth	As specified by the test configuration selected from Table 6.6.4.5.4.1-1.		
Propagation conditions	AWGN		As specified in Annex C.2.2.
Connection Diagram	TE Part	A.3.1.8.2 with n=1	As specified in TS 38.508-1 [14] Annex A.
	DUT Part	A.3.2.3.4	
Exceptions to connection diagram	- Without LTE link - For 4Rx capable UEs without any 2 Rx RF bands use A.3.2.5.2 for DUT part and A.3.1.8.4 with n=1 for TE Part		

1. Message contents are defined in clause 6.6.4.5.4.3.

2. Single Cell is used, which is NR FR1 Pcell. The connection setup is done according to the settings in Annex C.1.2 and C.1.3. The test parameters are given in Table 6.6.4.5.4.1-2 and 6.6.4.5.5-1. UE is configured to perform RLM, BFD and L1-RSRP measurement based on the SSBs. DRX is configured as specified in Table 6.6.4.5.4.1-2.

6.6.4.5.4.2 Test procedure

Prior to the start of the time duration T1, the UE shall be configured for periodic CSI reporting in PUCCH [format 2] with a reporting periodicity as mentioned in the above table 6.6.4.5.4.1-2. Before the test, UE is configured to perform RLM, BFD and L1-RSRP measurement based on the SSBs.

1. Ensure the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity NR SA, Connected without release *On* and Test Mode *On*, according to TS 38.508-1 [14] clause 4.5 and general test parameters set according to Table 6.6.4.1.4.1-2.

2. Set the parameters according to T1 in Table 6.6.4.1.5-1. T1 starts.

3. The UE shall be transmitting CSI on PUCCH with a periodicity of 80 slots.

4. When T1 expires, the SS shall set the parameters according to T2 in 6.6.4.1.5-1. T2 starts.

5. If the UE sends L1-RSRP reports meeting the corresponding absolute accuracy requirements in Table 6.6.4.5.5-2 for test configurations 1 and 2 the corresponding absolute accuracy requirements in Table 6.6.4.5.5-3 for test configurations 3 and the corresponding relative accuracy requirements in Table 6.6.4.5.5-4 for all test configurations every 80 slots from no later than 640 ms plus 80 slots for all configurations from the beginning of time period T2 until the end of time period T2, the number of passed iterations is increased by one, otherwise the number of failed iterations is increased by one.

6. The SS waits until T2 expires.

7. The SS shall transmit *RRCRelease* message to release the RRC connection which includes the release of the established radio bearers as well as all radio resources.

8. After the RRC connection release, the SS:

   - transmits in Cell 1 a *Paging* message (including PagingRecord with ue-Identity) for the UE and ensures the UE in state RRC_CONNECTED with generic procedure parameters Connectivity NR SA, Connected without release *On* and Test Mode *On* according to TS 38.508-1 [14] clause 4.5. (if the paging fails, switches off and on the UE and ensures the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity NR SA, Connected without release *On* and Test Mode *On* according to TS 38.508-1 [14] clause 4.5.),
   or:
   - switches off and on the UE and ensures the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity NR SA, Connected without release *On* and Test Mode *On* according to TS 38.508-1 [14] clause 4.5.

9. Repeat steps 2-8 until the confidence level according to Tables G.2.3-1 in Annex G clause G.2 is achieved.

6.6.4.5.4.3 Message contents

Message contents are according to TS 38.508-1 [14] clause 7.3 with the following exceptions:

Table 6.6.4.5.4.3-1: Common Exception messages NR SA SSB based L1-RSRP measurement

Default Message Contents	
Common contents of system information blocks exceptions	Table H.2.1-3 with Condition HighSpeedMeas
Default RRC messages and information elements contents exceptions	Table H.3.6-2 with conditions PERIODIC and SS-RSRP Table H.3.6-3 with conditions SSB Table H.3.7-1 with condition DRX.3

Table 6.6.4.5.4.3-2: RadioLinkMonitoringConfig

Derivation Path: TS 38.508-1 [14], Table 4.6.3-133			
Information Element	**Value/remark**	**Comment**	**Condition**
RadioLinkMonitoringConfig ::= SEQUENCE {			
failureDetectionResourcesToAddModList SEQUENCE (SIZE(1..maxNrofFailureDetectionResources)) OF SEQUENCE {	1 entry		
purpose	both	UE is configured to perform RLM and BFD based on the SSBs.	
detectionResource CHOICE {			
ssb-Index	0		
}			
}			
}			

6.6.4.5.5 Test requirement

Table 6.6.4.5.5-1: SSB specific test parameters for UE configured with *highSpeedMeasFlag-r16*

Parameter	Config	Unit	SSB#0		SSB#1	
			T1	T2	T1	T2
N_{oc} Note2	1~3	dBm/15kHz	-94.6			
N_{oc} Note2	1,2	dBm/SSB SCS	-94.65			
	3		-91.65			
$\hat{E}_s/I_{ot}$	1~3	dB	0	0	-Infinity	3.53

SSB RSRP Note3	1,2	dBm/SSB SCS	-94.65	-94.65	-Infinity	-91.15
	3		-91.65	-91.65	-Infinity	-88.14
Io Note3	1,2	dBm/9.36 MHz	-63.69	-63.69	-66.70	-61.59
	3	dBm/38.16 MHz	-57.59	-57.59	-60.61	-55.49
$\hat{E}_s / N_{oc}$	1~3	dB	0	0	-Infinity	3.5
Propagation conditions	1,2		AWGN		AWGN 1944 Hz Note4	
	3		AWGN		AWGN 3334 Hz Note5	

Note 1: The resources for uplink transmission are assigned to the UE prior to the start of time period T2.

Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for N_{oc} to be fulfilled.

Note 3: SS-RSRP and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.

Note 4: The AWGN 1944 Hz condition is a non-fading propagation channel with one tap. Doppler shift is a constant 1944 Hz.

Note 5: The AWGN 3334 Hz condition is a non-fading propagation channel with one tap. Doppler shift is a constant 3334 Hz.

The UE shall send L1-RSRP report every 80 slots. No later than 640ms plus 80 slots from the beginning of time period T2, UE shall send L1-RSRP report including results of both SSB0 and SSB1. Each L1-RSRP measurement report shall meet the corresponding absolute accuracy requirements in Table 6.6.4.5.5-2 for for test configurations 1 and 2 and the corresponding absolute accuracy requirements in Table 6.6.4.5.5-3 for test configurations 3 and the corresponding relative accuracy requirements in Table 6.6.4.5.5-4 for all test configurations.

Table 6.6.4.5.5-2: L1-RSRP absolute accuracy requirements for the reported values for test configurations 1 and 2

Normal Conditions	T1	T2
Lowest reported value (SSB#1)	-	55
Highest reported value (SSB#1)	-	75

Table 6.6.4.5.5-3: L1-RSRP absolute accuracy requirements for the reported values for test configurations 3

Normal Conditions	T1	T2
Lowest reported value (SSB#1)	-	58
Highest reported value (SSB#1)	-	78

Table 6.6.4.5.5-4: L1-RSRP relative accuracy requirements for the reported values for all test configurations

	T1	T2
Lowest DIFF RSRP reported (SSB#0)	-	0
Highest DIFF RSRP reported (SSB#0)	-	3

The rate of correct events observed during repeated tests shall be at least 90% with a confidence level of 95%.

NOTE: The actual overall delays measured in the test may be up to $2xTTI_{DCCH}$ higher than the measurement reporting delays above because of TTI insertion uncertainty of the measurement report in DCCH.

6.6.5 UTRAN inter-RAT measurement

6.6.5.1 NR SA FR1 – UTRAN event-triggered reporting in non-DRX

6.6.5.1.1 Test purpose

This test is to verify that the UE makes correct event-triggered reporting of inter-RAT UTRAN measurements when operating in standalone (SA) operation with PCell in FR1 under the cell search and measurement requirements.

6.6.5.1.2 Test applicability

This test applies to all types of NR UE supporting SA FR1 from Release 16 onwards and support UTRA FDD.

6.6.5.1.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 6.3.1.0.3.

The normative reference for this requirement is TS 38.133 [6] clause A.6.6.5.1.

6.6.5.1.4 Test description

6.6.5.1.4.1 Initial conditions

This test shall be tested using any of the test configurations in Table 6.6.5.1.4.1-1.

Table 6.6.5.1.4.1-1: supported test configurations

Test Case ID	Description
6.6.5.1-1	NR 15 kHz SSB SCS, 10MHz bandwidth, FDD duplex mode, UTRAN FDD
6.6.5.1-2	NR 15 kHz SSB SCS, 10MHz bandwidth, TDD duplex mode, UTRAN FDD
6.6.5.1-3	NR 30 kHz SSB SCS, 40MHz bandwidth, TDD duplex mode, UTRAN FDD
NOTE: The UE is only required to be tested in one of the supported test configurations	

Configure the test equipment and the DUT according to the parameters in Table 6.6.5.1.4.1-2 and Table 6.6.5.1.4.1-3.

Table 6.6.5.1.4.1-2: Initial conditions for SA inter-RAT UTRAN event triggered reporting in non-DRX with PCell in FR1

Parameter	Value		Comment
Test environment	NC		As specified in TS 38.508-1 [14] clause 4.1.
Test frequencies	As specified in Annex E, Table E.4-3 and TS 38.508-1 [14] sclause 4.3.1.		
Channel bandwidth	As specified by the test configuration selected from Table 6.6.5.1.5-1 and Table 6.6.5.1.5-2.		
Propagation conditions	AWGN		As specified in Annex C.2.2.
Connection Diagram	TE Part	A.3.1.8.2	As specified in TS 38.508-1 [14] Annex A.
	UE Part	A.3.2.3.2	
Exceptions to connection diagram	SS LTE in Figure A.3.1.8.2 is replaced by SS UTRA LTE TX/RX in Figure A.3.2.3.2 is replaced by UTRA TX/RX		

Table 6.6.5.1.4.1-3: General test parameters for SA inter-RAT UTRAN FDD event triggered reporting in non-DRX with PCell in FR1

Parameter	Unit	Value	Comment
NR RF Channel Number		1	1 NR carrier frequency is used in the test
UTRA RF Channel Number		2	1 UTRA carrier frequency is used in the test
Channel Bandwidth	MHz	As specified in Table 6.6.5.1.5-1 and Table 6.6.5.1.5-2	
Active cell		Cell 1	Cell 1 is on RF channel number 1
Neighbour cell		Cell 2	Cell 2 is on RF channel number 2

Gap Pattern Id		0	As specified in Clause Table FFS Per-UE gap pattern.
Inter-RAT UTRA measurement quantity		CPICH Ec/Io	Measurement quantity for Cell 2
b1-ThresholdUTRA-FDD	dB	-16.5	CPICH Ec/Io threshold for SS-RSRP measurement on cell1 for event B1
Hysteresis	dB	0	
TimeToTrigger	s	0	
Filter coefficient		0	L3 filtering is not used
DRX		OFF	OFF
T1	s	5	
T2	s	5	
Note 1: Values are defined in Table A.6.6.5.1.1-3			

1. Message contents are defined in clause 6.6.5.1.4.3.

2. Cell 1 is the NR PCell and Cell 2 is an inter-RAT UTRAN inter-RAT neighbour cell. Cell 1 is configured according to Annex C.1.1 and C.1.2, Cell 2 is configured according to TS 36.521-3 Annex C.0 and C.1.

6.6.5.1.4.2 Test procedure

The test consists of two successive time periods, with time durations of T1 and T2 respectively. During time duration T1, the UE shall not have any timing information of cell 2. Gap pattern configuration is configured before T2 begins to enable inter-frequency monitoring.

1. Ensure the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity *NR*, Connected without release *On* and Test Mode *On* according to TS 38.508-1 [14] clause 4.5.

2. Set the parameters according to T1 in Table 6.6.5.1.5-1 and 6.6.5.1.5-2. Propagation conditions are set according to Annex C clause C.2.2.T1 starts.

3. SS shall transmit an *RRCReconfiguration* message to confogure Event B1 measurement reporting.

4. The UE shall transmit an *RRCReconfigurationComplete* message.

5. When T1 expires, the SS shall switch the power setting from T1 to T2 as specified in Table 6.6.5.1.5-1 and 6.6.5.1.5-2.

6. UE shall transmit a *MeasurementReport* message triggered by Event B1. If the measurement reporting delay from the beginning of time period T2 is less than 3842ms the number of successful tests is increased by one. If the UE fails to report the event within the measurement reporting delay requirement then the number of failure tests is increased by one.

7. After the SS receive the *MeasurementReport* message in step 6 or when T2 expires, the SS shall:

   - transmit *RRCRelease* message to release the RRC connection which includes the release of the established radio bearers as well as all radio resources

   OR

   - switch the UE off.

8. Set Cell 2 primary scrambling code = ((current cell 2 primary scrambling code - 50) mod 200 + 100) for next iteration of the test procedure loop.

9. Depending on the choice in Step 7, the SS:
   - if the RRC Connection Release has been sent, transmits in Cell 1 a Paging message (including PagingRecord with UE-Identity) for the UE and ensures the UE is in state RRC_CONNECTED according to TS 38.508-1 [14] clause 4.5.4 (if the paging fails, switches off and on the UE and ensures the UE is in the state RRC_CONNECTED with generic procedure parameters Connectivity *NR*, Connected without release *On* according to TS 38.508-1 [14] clause 4.5,
   OR
   - if the device has been switched off, switches on the UE and ensures the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity *NR*, Connected without release *On* according to TS 38.508-1 [14] clause 4.5.

10.Repeat step 2-9 until the confidence level according to Tables G.2.3-1 in Annex G clause G.2 is achieved.

6.6.5.1.4.3 Message contents

Table 6.6.5.1.4.3-1: RRCReconfiguration (Step 3)

Derivation Path: TS 38.508-1 [14] Table 4.6.1-13 with condition NR_MEAS			
Information Element	**Value/remark**	**Comment**	**Condition**
RRCReconfiguration ::= SEQUENCE {			
criticalExtensions CHOICE {			
rrcReconfiguration SEQUENCE {			
measConfig	MeasConfig	Table 6.6.5.1.4.3-2	
}			
}			
}			

Table 6.6.5.1.4.3-2: MeasConfig (Table 6.6.5.1.4.3-1)

Derivation Path: Table H.3.1-2 with condition INTER-RAT and GAP NEEDED			
Information Element	**Value/remark**	**Comment**	**Condition**
MeasConfig ::= SEQUENCE {			
measObjectToAddModList SEQUENCE (SIZE (1..maxNrofMeasId)) OF MeasObjectToAddMod {	2 entries		
MeasObjectToAddMod[1] SEQUENCE {		entry 1	
measObjectId	1		
measObject CHOICE {			
measObjectNR	MeasObjectNR-DEFAULT specified in Table H.3.1-3 with condition INTRA-FREQ MO		
}			
}			
MeasObjectToAddMod[2] SEQUENCE {		entry 2	
measObjectId	2		
measObject CHOICE {			
measObjectUTRA-FDD-r16	MeasObjectUTRA-FDD	Table 6.6.5.1.4.3-3	
}			
}			
}			
reportConfigToAddModList SEQUENCE (SIZE (1..maxReportConfigId)) OF ReportConfigToAddMod {	1 entry		
ReportConfigToAddMod[1] SEQUENCE {		entry 1	
reportConfigId	1		
reportConfig CHOICE {			
reportConfigInterRAT	ReportConfigInterRAT(*16*) specified in 38.508-1 [14] Table 4.6.3-141 with condition EVENT_B1_UTRA	Actual value of UTRA threshold = (16-49)/2 = -16.5dB	
}			
}			
}			
measGapConfig	MeasGapConfig specified in Table H.3.1-6 with condition gapUE and Pattern #0		
}			

Table 6.6.5.1.4.3-3: MeasObjectUTRA-FDD (Table 6.6.5.1.4.3-2)

Derivation Path: TS 38.508-1 [14], Table 4.6.3-77A

Information Element	Value/remark	Comment	Condition
MeasObjectUTRA-FDD-r16 ::= SEQUENCE {			
carrierFreq-r16	ARFCN-ValueUTRA-FDD-r16 for UTRA Cell 2		
}			

Table 6.6.5.1.4.3-4: MeasurementReport (Step 6)

Derivation Path: TS 38.508-1 [14], Table 4.6.1-5A			
Information Element	**Value/remark**	**Comment**	**Condition**
MeasurementReport ::= SEQUENCE {			
criticalExtensions CHOICE {			
measurementReport SEQUENCE {			
measResults	MeasResults	Table 6.6.5.1.4.3-5	
}			
}			
}			

Table 6.6.5.1.4.3-5: MeasResults (Table 6.6.5.1.4.3-4)

Derivation Path: TS 38.508-1 [14] Table 4.6.3-79 with condition B1_UTRA			
Information Element	**Value/remark**	**Comment**	**Condition**
MeasResults ::= SEQUENCE {			
measResultNeighCells CHOICE {			
measResultListUTRA-FDD-r16 SEQUENCE (SIZE (1..maxCellReport)) OF MeasResultUTRA-FDD-r16 {	1 entry		
MeasResultUTRA-FDD-r16[1] SEQUENCE {		entry 1	
physCellId-r16	PhysCellIdUTRA-FDD-r16 of UTRA Cell 2		
measResult-r16 SEQUENCE {			
utra-FDD-EcN0-r16	INTEGER (0..49)		
}			
}			
}			
}			
}			

6.6.5.1.5 Test requirement

Table 6.6.5.1.5-1 and Table 6.6.5.1.5-2 define the primary level settings including test tolerances for all tests.

Table 6.6.5.1.5-1: PCell specific test parameters for SA inter-RAT UTRA FDD event triggered reporting in non-DRX with PCell in FR1

Parameter		Unit	Configuration	Cell 1	
				T1	T2
RF channel number			1, 2, 3	1	
Duplex mode			1, 2, 3	FDD	
TDD Configuration	SCS=15 KHz		2	TDDConf.1.1	
	SCS=30 KHz		3	TDDConf.1.2	
$BW_{channel}$		MHz	1	10: $N_{RB,c}$ = 52 (FDD)	
			2	10: $N_{RB,c}$ = 52 (TDD)	
			3	40: $N_{RB,c}$ = 106 (TDD)	
PDSCH reference measurement channel			1	SR.1.1 FDD	
			2	SR.1.1 TDD	
			3	SR.2.1 TDD	
CORSET reference channel			1	CR.1.1 FDD	
			2	CR.1.1 TDD	
			3	CR.2.1 TDD	

BWP configurations	Initial DL BWP		1, 2, 3	DLBWP.0.1	
	Dedicated DL BWP		1, 2, 3	DLBWP.1.1	
	Initial UL BWP		1, 2, 3	ULBWP.0.1	
	Dedicated UL BWP		1, 2, 3	ULBWP.1.1	
OCNG pattern[Note1]			1, 2, 3	OP.1	
SMTC configuration			1, 2, 3	SMTC.1	
SSB configuration			1, 2	SSB.1 FR1	
			3	SSB.2 FR1	
CSI-RS for tracking			1	TRS.1.1 FDD	
			2	TRS.1.1 TDD	
			3	TRS.1.2 TDD	
EPRE ratio of PSS to SSS		dB	1, 2, 3	0	
EPRE ratio of PBCH_DMRS to SSS					
EPRE ratio of PBCH to PBCH_DMRS					
EPRE ratio of PDCCH_DMRS to SSS					
EPRE ratio of PDCCH to PDCCH_DMRS					
EPRE ratio of PDSCH_DMRS to SSS					
EPRE ratio of PDSCH to PDSCH_DMRS					
EPRE ratio of OCNG DMRS to SSS					
EPRE ratio of OCNG to OCNG DMRS					
N_{oc}[Note2]		dBm/15 KHz	1, 2, 3	-106	
N_{oc}[Note2]		dBm/SCS	1, 2	-106	
			3	-103	
$\hat{E}_s/N_{oc}$		dB	1, 2, 3	18	-2
$\hat{E}_s/I_{ot}$[Note3]		dB	1, 2, 3	18	-2
SS-RSRP[Note3]		dBm/SCS	1, 2	-88	-108
			3	-85	-105
SSB_RP[Note3]		dBm/SCS	1, 2	-88	-108
			3	-85	-105
Io[Note3]		dBm/9.36 MHz	1, 2	-59.98	-75.92
		dBm/38.16 MHz	3	-53.88	-69.82
Propagation condition			1, 2, 3	ETDLA30	
Antenna Configuration and Correlation Matrix			1, 2, 3	1x2 Low	

Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.

Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for N_{oc} to be fulfilled.

Note 3: $\hat{E}_s/I_{ot}$, SS-RSRP, SSB_RP and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.

Table 6.6.5.1.5-2: UTRAN neighbour cell specific test parameters for SA inter-RAT UTRAN FDD event triggered reporting in non-DRX with PCell in FR1

Parameter	Unit	Cell 2	
		T1	T2
UTRA RF Channel Number		2	
CPICH_Ec/Ior	dB	-10	
PCCPCH_Ec/Ior	dB	-12	
SCH_Ec/Ior	dB	-12	
PICH_Ec/Ior	dB	-15	
DPCH_Ec/Ior	dB	N/A	
OCNS		-0.941	
$\hat{I}_{or}/I_{oc}$	dB	-Infinity	-1.8
I_{oc}	dBm/3.84 MHz	-70	
CPICH_Ec/Io	dB	-Infinity	-14

Propagation Condition		AWGN
Note 1: The DPCH level is controlled by the power control loop. Note 2: The power of the OCNS channel that is added shall make the total power from the cell to be equal to I_{or}.		

The UE shall send one Event B1 triggered measurement report for Cell 2 to the PCell, with a measurement reporting delay less than 2.4s from the start of period T2, i.e. when Cell 2 becomes detectable. The measurement reporting delay is defined as the time from the beginning of time period T2 to the moment when the UE sends the measurement report on PUSCH.

The UE shall not send event-triggered measurement reports as long as the reporting criteria is not fulfilled.

The rate of correct events observed during repeated tests shall be at least 90%.

6.6.6

6.6.6.1 NR SA FR1 SRS-RSRP measurement in non-DRX

Editor's NOTE: This test case is incomplete in following aspects:

- Message contents are missing.
- TT analysis is missing.
- Test Procedure might need update.
- Test applicability needs to be updatedW

6.6.6.1.1 Test purpose

To verify that the UE makes correct reporting of SRS-RSRP measurement within SRS-RSRP measurement requirements in TS 38.133 [6] clause 9.7.2.5.

6.6.6.1.2 Test applicability

FFS.

6.6.6.1.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 4.6.5.0.1.

The normative reference for this requirement is TS 38.133 [6] clause A.6.6.6.1.

6.6.6.1.4 Test description

6.6.6.1.4.1 Initial conditions

This test shall be tested using any of the test configurations in Table 6.6.6.1.4.1-1. Configure the test equipment and the DUT according to the parameters in Table 6.6.6.1.4.1-2. Test environment parameters are given in Table 6.6.6.1.4.1-3.

Table 6.6.6.1.4.1-1: Applicable NR configurations for FR1 SRS-RSRP test

Configuration	Description
1	NR 15 kHz SRS SCS, 10 MHz bandwidth, TDD duplex mode
2	NR 30 kHz SRS SCS, 40 MHz bandwidth, TDD duplex mode
Note: The UE is only required to be tested in one of the supported test configurations	

Table 6.6.6.1.4.1-2: General test parameters for SRS-RSRP event triggered reporting for PCell in FR1

Parameter	Unit	Test configuration	Value	Comment
Active cell		1, 2	Cell 1	
RF Channel Number		1, 2	1: Cell 1	
SSB configuration		1	SSB.1 FR1	
		2	SSB.2 FR1	
SMTC configuration		1	SMTC.1	

		2	SMTC.1	
SRS configuration		1	SRSConf.1	Table A.6.6.6.1.2-3
		2	SRSConf.2	
CP length		1, 2	Normal	
i1-Threshold	dBm	1	-97	
		2	-95	
Hysteresis	dB	1, 2	0	
Time To Trigger	s	1, 2	0	
Filter coefficient		1, 2	0	L3 filtering is not used
DRX		1, 2	DRX.7	
Time offset between DL from serving cell and SRS from test system	µs	1,2	17.67	
T1	s	1, 2	5	
T2	s	1, 2	5	

Table 6.6.6.1.4.1-3: Test Environment parameters for EN-DC SRS-RSRP event triggered reporting for PSCell in FR1

Parameter	Value		Comment
Test environment	NC		As specified in TS 38.508-1 [14] clause 4.1.
Test frequencies	As specified in Annex E, Table E.2-1 and TS 38.508-1 [14] clause 4.3.1 and 4.4.2.		
Channel bandwidth	As specified by the test configuration selected from Table 4.6.5.2.4.1-1.		
Propagation conditions	AWGN		As specified in clause C.2.2.
Connection Diagram	TE Part	A.3.1.7.1	As specified in TS 38.508-1 [14] Annex A.
	DUT Part	A.3.2.3.4	
Exceptions to connection diagram	For 4Rx capable UEs without any 2 Rx RF bands use A.3.2.5.2 for DUT part and A.3.1.8.4 for TE Part		

1. Message contents are defined in clause 6.6.6.1.4.3.
2. Cell 1 is the E-UTRA serving cell (PCell) for the EN-DC setup. The power levels and settings for Cell 1 are set according to Annex A.6. Cell 2 is NR FR1 cell (PSCell). Cell 2 is the target for SRS-RSRP measurements. In the measurement control information, a measurement object is configured for the frequency of the PSCell, and it is indicated to the UE that event-triggered reporting with Event I1 is used. The test consists of two successive time periods, with time duration of T1 and T2, respectively.

6.6.6.1.4.2 Test procedure

FFS

6.6.6.1.4.3 Message contents

Message contents are according to TS 38.508-1 [14] clause 7.3 with the following exceptions:

FFS

6.6.6.1.5 Test requirement

Table 6.6.6.1.5-1 defines the primary level settings including test tolerances for all tests.

Table 6.6.6.1.5-1: NR Cell specific test parameters for SRS-RSRP event triggered reporting for PCell in FR1

Parameter	Unit	Test configuration	Cell 1	
			T1	T2
TDD configuration		1	TDDConf.1.1	
		2	TDDConf.2.1	
PDSCH RMC configuration		1	SR.1.1 TDD	
		2	SR.2.1 TDD	

RMSI CORESET RMC configuration		1	CR.1.1 TDD
		2	CR.2.1 TDD
Dedicated CORESET RMC configuration		1	CCR.1.1 TDD
		2	CCR.2.1 TDD
OCNG Patterns		1, 2	OP.1
TRS Configuration		1	TRS.1.1 TDD
		2	TRS.1.2 TDD
Initial BWP configuration		1, 2	DLBWP.0.1 ULBWP.0.1
Active DL BWP configuration		1, 2	DLBWP.1.1
Active UL BWP configuration		1, 2	ULBWP.1.1
N_{oc} Note 2	dBm/15 kHz	1	-98
		2	
N_{oc} Note 2	dBm/SCS	1	-98
		2	-95
Propagation Condition		1, 2	AWGN

Note 1: The resources for uplink transmission are assigned to the UE prior to the start of time period T2.
Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for N_{oc} to be fulfilled.

Table 6.6.6.1.5-2: NR Cell specific test parameters for SRS-RSRP event triggered reporting for neighbour cell UE

Parameter	Unit	Test configuration	Neighbour cell UE	
			T1	T2
N_{oc} Note 2	dBm/15 kHz	1	-98	
		2		
N_{oc} Note 2	dBm/SCS	1	-98	
		2	-95	
$\hat{E}_s/I_{ot}$	dB	1	-infinity	4
		2		
$\hat{E}_s/N_{oc}$	dB	1	-infinity	4+TT
		2		
SRS-RSRP Note 3	dBm/SCS kHz	1	-infinity	-94+TT
		2	-infinity	-91+TT
Io	dBm/9.36 MHz	1	-70.05	-64.59
	dBm/38.16 MHz	2	-63.96	-58.50
Propagation Condition		1, 2	AWGN	

Note 1: The resources for uplink transmission are assigned to the UE prior to the start of time period T2.
Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for N_{oc} to be fulfilled.
Note 3: SRS-RSRP levels have been derived from other parameters for information purposes. They are not settable parameters themselves.

Table 6.6.6.1.5-3: SRS configuration for measurement reporting

	Field	SRSConf.1	SRSConf.2	Comments
SRS-ResourceSet	srs-ResourceSetId	0	0	
	srs-ResourceIdList	0	0	

	resourceType	Periodic	Periodic	
	Usage	Codebook	Codebook	
SRS-Resource	SRS-ResourceId	0	0	
	nrofSRS-Ports	Port1	Port1	
	transmissionComb	n2	n2	
	combOffset-n2	0	0	
	cyclicShift-n2	0	0	
	resourceMapping startPosition	0	0	
	resourceMapping nrofSymbols	n1	n1	
	resourceMapping repetitionFactor	n1	n1	
	freqDomainPosition	0	0	
	freqDomainShift	0	0	
	freqHopping c-SRS	12	12	
	freqHopping b-SRS	0	0	
	freqHopping b-hop	0	0	
	groupOrSequenceHopping	Neither	Neither	
	resourceType	Periodic	Periodic	
	periodicityAndOffset	sl640, 4	sl640, 9	
	sequenceId	0	0	Any 10 bit number

The UE shall send one Event I1 triggered measurement report, with a measurement reporting delay less than 1920 ms from the beginning of time period T2.

The UE shall not send event triggered measurement reports, as long as the reporting criteria are not fulfilled.

The rate of correct events observed during repeated tests shall be at least 90%.

NOTE: The actual overall delays measured in the test may be up to $2xTTI_{DCCH}$ higher than the measurement reporting delays above because of TTI insertion uncertainty of the measurement report in DCCH.

6.6.7

6.6.8 L1-SINR measurement for beam reporting

6.6.8.0 Minimum conformance requirements

6.6.8.0.1 L1-SINR reporting with CSI-RS based CMR and no dedicated IMR configured

Same as clause 4.6.7.0.1

The normative reference for this requirement is TS 38.133 [6] clause 9.8.3, 9.8.4.1 and 9.8.5.2.

6.6.8.0.2 L1-SINR reporting with SSB based CMR and dedicated IMR configured

Same as clause 4.6.7.0.2

The normative reference for this requirement is TS 38.133 [6] clause 9.8.3, 9.8.4.2 and 9.8.5.

6.6.8.0.3 L1-SINR reporting with CSI-RS based CMR and dedicated IMR configured

Same as clause 4.6.7.0.3

The normative reference for this requirement is TS 38.133 [6] clause 9.8.3, 9.8.4.3 and 9.8.5.

6.6.8.1 NR SA FR1 CSI-RS based CMR and no dedicated IMR L1-SINR measurement in DRX

6.6.8.1.1 Test purpose

To verify that the UE makes correct reporting of L1-SINR measurement in DRX within L1-SINR measurement requirements in TS 38.133 [6] clause 9.8.4.1.

6.6.8.1.2 Test applicability

This test applies to all types of NR UE release 16 and forward, supporting L1-SINR measurement and long DRX cycle.

6.6.8.1.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 6.6.8.0.1.

The normative reference for this requirement is TS 38.133 [6] clause A.6.6.8.1.

6.6.8.1.4 Test description

6.6.8.1.4.1 Initial conditions

This test shall be tested using any of the test configurations in Table 6.6.8.1.4.1-1. Configure the test equipment and the DUT according to the parameters in Table 6.6.8.1.4.1-2. Test environment parameters are given in Table 6.6.8.1.4.1-3.

Table 6.6.8.1.4.1-1: NR SA CSI-RS based CMR and no dedicated IMR L1-SINR measurement supported test configurations

Config	Description
1	NR 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode
2	NR 15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode
3	NR 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode
Note: The UE is only required to be tested in one of the supported test configurations	

Table 6.6.8.1.4.1-2: General test parameters for NR SA CSI-RS based CMR and no dedicated IMR L1-SINR measurement

Parameter	Config	Unit	Value
SSB GSCN	1~3		freq1
Duplex mode	1		FDD
	2		TDD
	3		TDD
TDD Configuration	1		N/A
	2		TDDConf.1.1
	3		TDDConf.2.1
$BW_{channel}$	1	MHz	10: $N_{RB,c}$ = 52
	2		10: $N_{RB,c}$ = 52
	3		40: $N_{RB,c}$ = 106
PDSCH Reference measurement channel	1		SR.1.1 FDD
	2		SR.1.1 TDD
	3		SR.2.1 TDD
RMSI CORESET Reference Channel	1		CR.1.1 FDD
	2		CR.1.1 TDD
	3		CR.2.1 TDD
Dedicated CORESET Reference Channel	1		CCR.1.1 FDD
	2		CCR.1.1 TDD
	3		CCR.2.1 TDD
SSB configuration	1		SSB.3 FR1
	2		SSB.3 FR1
	3		SSB.4 FR1
CSI-RS configuration	1		CSI-RS 1.3 FDD
	2		CSI-RS 1.3 TDD
	3		CSI-RS 2.3 TDD

OCNG Patterns	1~3		OP.1
TRS Configuration	1		TRS.1.1 FDD
	2		TRS.1.1 TDD
	3		TRS.1.2 TDD
Initial BWP Configuration	1~3		DLBWP.0.1 ULBWP.0.1
Dedicated BWP configuration	1~3		DLBWP.1.1 ULBWP.1.1
SMTC configuration	1~3		SMTC.1
DRX configuration	1~3		DRX.3
reportConfigType	1~3		aperiodic
reportQuantity-r16	1~3		cri-SINR-r16
Number of reported RS	1~3		2
qcl-Info	1~3		SSB#0 for resource#0
			SSB#1 for resource#1
reportSlotOffsetList	1~3	slots	26
T1	1~3	s	5
EPRE ratio of PSS to SSS	1~3	dB	0
EPRE ratio of PBCH DMRS to SSS			
EPRE ratio of PBCH to PBCH DMRS			
EPRE ratio of PDCCH DMRS to SSS			
EPRE ratio of PDCCH to PDCCH DMRS			
EPRE ratio of PDSCH DMRS to SSS			
EPRE ratio of PDSCH to PDSCH DMRS			
EPRE ratio of OCNG DMRS to SSS Note 1			
EPRE ratio of OCNG to OCNG DMRS Note 1			
Propagation condition	1~3		AWGN
Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.			

Table 6.6.8.1.4.1-3: Test Environment parameters for NR SA CSI-RS based CMR and no dedicated IMR L1-SINR measurement

Parameter	Value		Comment
Test environment	NC		As specified in TS 38.508-1 [14] clause 4.1.
Test frequencies	As specified in Annex E, Table E.2-1 and TS 38.508-1 [14] clause 4.3.1 and 4.4.2.		
Channel bandwidth	As specified by the test configuration selected from Table 6.6.8.1.4.1-1.		
Propagation conditions	AWGN		As specified in Annex C.2.2.
Connection Diagram	TE Part	A.3.1.8.2 with n = 1	As specified in TS 38.508-1 [14] Annex A.
	DUT Part	A.3.2.3.4	
Exceptions to connection diagram	For 4Rx capable UEs without any 2 Rx RF bands use A.3.2.5.2 for DUT part and A.3.1.8.5 for TE Part		

1. Message contents are defined in clause 6.6.8.1.4.3.

2. Single Cell is used, which is NR FR1 Pcell. The connection setup is done according to the settings in Annex C.1.2 and C.1.3. The test parameters are given in tables 6.6.8.1.4.1-2 and 6.6.8.1.5-1. UE is configured to perform RLM and BFD based on the SSBs.

6.6.8.1.4.2 Test procedure

The test consists of a single time period T1, during which the UE is triggered via DCI to report L1-SINR on aperiodic CSI-RS resources. Prior to the start of the time duration T1, the UE shall be fully synchronized to PCell. UE is also configured to measure L1-SINR based on SSB. Upon receiving the DCI trigger, UE provides the report back based on the reporting configuration as defined in Table 6.6.8.1.4.1-2.

1. Ensure the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity NR SA, Connected without release *On* and Test Mode *On*, according to TS 38.508-1 [14] clause 4.5.

2. Set the parameters according to T1 in Table 6.6.8.1.5-1. T1 starts.

3. After 80ms from the start of the test the SS transmits the DCI trigger in slot 1 for configuration 1, 2 and slot 8 for configuration 3. The corresponding CSI-RS set is transmitted with the offset of 4 slots after the DCI trigger.

4. The SS shall check following requirements:

   - R1: the UE shall send L1-SINR report at slot 26 from the reception of DCI trigger. If the report is received at slot 26 from the reception of DCI trigger, the number of passed iterations for R1 is increased by one. Otherwise, the number of failed iterations for R1 is increased by one.

   - R2: The L1-SINR value of CSI-RS#1 reported by the UE is compared to the expected L1-SINR value for CSI-RS#1. If the resulting value is outside the limits in Table 6.6.8.1.5-2 for all test configurations or the UE fails to report the measurement value for CSI-RS #1, the number of failed iterations for R2 is increased by one. Otherwise, the number of passed iterations for R2 is increased by one.

   - R3: The DIFF SINR value of CSI-RS #0 reported by the UE is compared to the expected DIFF SINR value. If the resulting value is outside the limits in Table 6.6.8.1.5-4 or the UE fails to report the measurement value for CSI-RS#0, the number of failed iterations for R3 is increased by one. Otherwise, the number of passed iterations for R3 is increased by one..

5. If after T1 expiry no report is received or received report did not contain L1-SINR of both CSI-RS#0 and CSI-RS#1 or UE sent the L1-SINR report at different slot than 26 from the reception of DCI trigger, the number of 'failed' iterations is increased by one, otherwise, the number of 'passed' iterations is increased by one.

6. The SS shall transmit *RRCRelease* message to release the RRC connection which includes the release of the established radio bearers as well as all radio resources.

7. After the RRC connection release, the SS:

   - transmits in Cell 1 a *Paging* message (including PagingRecord with ue-Identity) for the UE and ensures the UE in state RRC_CONNECTED with generic procedure parameters Connectivity NR SA, Connected without release *On* and Test Mode *On* according to TS 38.508-1 [14] clause 4.5. (if the paging fails, switches off and on the UE and ensures the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity NR SA, Connected without release *On* and Test Mode *On* according to TS 38.508-1 [14] clause 4.5.),
   or:
   - switches off and on the UE and ensures the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity NR SA, Connected without release *On* and Test Mode *On* according to TS 38.508-1 [14] clause 4.5.

8. Repeat steps 2-7 until the confidence level according to Tables G.2.3-1 in Annex G clause G.2 is achieved.

6.6.8.1.4.3 Message contents

Message contents are according to TS 38.508-1 [14] clause 7.3 with the following exceptions:

Table 6.6.8.1.4.3-1: Common Exception messages NR SA CSI-RS based CMR and no dedicated IMR L1-SINR measurement

Default Message Contents	
Common contents of system information blocks exceptions	
Default RRC messages and information elements contents exceptions	Table H.3.6A-1 with conditions APERIODIC and CSI-SINR Table H.3.6A-2 with conditions CSI-RS and APERIODIC Table H.3.7-1 with condition DRX.3

Table 6.6.8.1.4.3-2: RadioLinkMonitoringConfig

Derivation Path: TS 38.508-1 [14], Table 4.6.3-133			
Information Element	**Value/remark**	**Comment**	**Condition**
RadioLinkMonitoringConfig ::= SEQUENCE {			

failureDetectionResourcesToAddModList SEQUENCE (SIZE(1..maxNrofFailureDetectionResources)) OF SEQUENCE {	1 entry		
purpose	both	UE is configured to perform RLM and BFD based on the SSBs.	
}			
}			

6.6.8.1.5 Test requirement

Table 6.6.8.1.5-1 defines the primary level settings including test tolerances for all tests.

Table 6.6.8.1.5-1: CSI-RS specific test parameters for NR SA CSI-RS based CMR and no dedicated IMR L1-SINR measurement

Parameter	Config	Unit	CSI-RS#0	CSI-RS#1
N_{oc} Note1	1~3	dBm/15kHz	-94.65	
N_{oc} Note1	1,2	dBm/SSB SCS	-94.65	
	3		-91.65	
$\hat{E}_s / I_{ot}$	1~3	dB	0	3
CSI-RS RSRP Note3	1,2	dBm/SSB SCS	-94.65	-91.65
	3		-91.65	-88.65
Io Note2	1,2	dBm/9.36 MHz	-63.69	-61.93
	3	dBm/38.16 MHz	-57.59	-55.84
$\hat{E}_s / N_{oc}$	1~3	dB	0	3
Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for N_{oc} to be fulfilled.				
Note 3: CSI-RS RSRP and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.				

After 80ms from the beginning of the test, the UE shall send L1-SINR report at slot 26 from the reception of DCI triggering the L1-SINR measurement. The L1-SINR report shall include the results for both CSI-RS#0 and CSI-RS#1.

Each L1-SINR measurement report shall meet the corresponding absolute accuracy requirements in Table 6.6.8.1.5-2 for all test configurations and the corresponding relative accuracy requirements in Table 6.6.8.1.5-4 for all test configurations.

Table 6.6.8.1.5-2: L1-SINR absolute accuracy requirements for the reported values for all test configurations

Normal Conditions	T1
Lowest reported value (CSI-RS#1)	41
Highest reported value (CSI-RS#1)	64

Table 6.6.8.1.5-3: Void

Table 6.6.8.1.5-4: L1-SINR relative accuracy requirements for the reported values for all test configurations

	T1
Lowest DIFF SINR reported (CSI-RS#0)	0
Highest DIFF SINR reported (CSI-RS#0)	7

For the test to pass, the ratio of successful reported values for each requirement (R1 to R3) shall be more than 90% with a confidence level of 95%. Each requirement is evaluated independently of the others..

NOTE: The actual overall delays measured in the test may be up to $2xTTI_{DCCH}$ higher than the measurement reporting delays above because of TTI insertion uncertainty of the measurement report in DCCH.

6.6.8.2 NR SA FR1 SSB based CMR and dedicated IMR L1-SINR measurement in non-DRX

6.6.8.2.1 Test purpose

To verify that the UE makes correct reporting of L1-SINR measurement in non-DRX within L1-SINR measurement requirements in TS 38.133 [6] clause 9.8.4.2.

6.6.8.2.2 Test applicability

This test applies to all types of NR UE release 16 and forward, supporting L1-SINR measurement.

6.6.8.2.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 6.6.8.0.2.

The normative reference for this requirement is TS 38.133 [6] clause A.6.6.8.2.

6.6.8.2.4 Test description

6.6.8.2.4.1 Initial conditions

This test shall be tested using any of the test configurations in Table 6.6.8.2.4.1-1. Configure the test equipment and the DUT according to the parameters in Table 6.6.8.2.4.1-2. Test environment parameters are given in Table 6.6.8.2.4.1-3.

Table 6.6.8.2.4.1-1: NR SA SSB based CMR and dedicated IMR L1-SINR measurement supported test configurations

Config	Description
1	NR 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode
2	NR 15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode
3	NR 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode
Note: The UE is only required to be tested in one of the supported test configurations	

Table 6.6.8.2.4.1-2: General test parameters for NR SA SSB based CMR and dedicated IMR L1-SINR measurement

Parameter	Config	Unit	Value
SSB GSCN	1~3		freq1
Duplex mode	1		FDD
	2		TDD
	3		TDD
TDD Configuration	1		N/A
	2		TDDConf.1.1
	3		TDDConf.2.1
$BW_{channel}$	1	MHz	10: $N_{RB,c}$ = 52
	2		10: $N_{RB,c}$ = 52

	3		40: $N_{RB,c}$ = 106
PDSCH Reference measurement channel	1		SR.1.1 FDD
	2		SR.1.1 TDD
	3		SR.2.1 TDD
RMSI CORESET Reference Channel	1		CR.1.1 FDD
	2		CR.1.1 TDD
	3		CR.2.1 TDD
Dedicated CORESET Reference Channel	1		CCR.1.1 FDD
	2		CCR.1.1 TDD
	3		CCR.2.1 TDD
SSB configuration	c		SSB.3 FR1
	2		SSB.3 FR1
	3		SSB.4 FR1
CSI-RS configuration	1		CSI-RS 1.1A FDD
	2		CSI-RS 1.1A TDD
	3		CSI-RS 2.1A TDD
OCNG Patterns	1~3		OP.1
Initial BWP Configuration	1~3		DLBWP.0.1 ULBWP.0.1
Dedicated BWP configuration	1~3		DLBWP.1.1 ULBWP.1.1
SMTC configuration	1~3		SMTC.1
TRS Configuration	1		TRS.1.1 FDD
	2		TRS.1.1 TDD
	3		TRS.1.2 TDD
DRX configuration	1~3		off
reportConfigType	1~3		periodic
reportQuantity-r16	1~3		ssb-Index-SINR-r16
Number of reported RS	1~3		2
L1-SINR reporting period	1~3	slot	80
T1	1~3	s	5
T2	1~3	s	1
EPRE ratio of PSS to SSS	1~3	dB	0
EPRE ratio of PBCH DMRS to SSS			
EPRE ratio of PBCH to PBCH DMRS			
EPRE ratio of PDCCH DMRS to SSS			
EPRE ratio of PDCCH to PDCCH DMRS			
EPRE ratio of PDSCH DMRS to SSS			
EPRE ratio of PDSCH to PDSCH DMRS			
EPRE ratio of OCNG DMRS to SSS Note 1			
EPRE ratio of OCNG to OCNG DMRS Note 1			
Propagation condition	1~3		AWGN
Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.			

Table 6.6.8.2.4.1-3: Test Environment parameters for NR SA SSB based CMR and dedicated IMR L1-SINR measurement

Parameter	Value		Comment
Test environment	NC		As specified in TS 38.508-1 [14] clause 4.1.
Test frequencies	As specified in Annex E, Table E.2-1 and TS 38.508-1 [14] clause 4.3.1 and 4.4.2.		
Channel bandwidth	As specified by the test configuration selected from Table 6.6.8.2.4.1-1.		
Propagation conditions	AWGN		As specified in Annex C.2.2.
	TE Part	A.3.1.8.2 with n = 1TBD	As specified in TS 38.508-1 [14] Annex A.

Connection Diagram	DUT Part	A.3.2.3.4TBD	
Exceptions to connection diagram	For 4Rx capable UEs without any 2 Rx RF bands use A.3.2.5.2 for DUT part and A.3.1.8.5 for TE Part		

1. Message contents are defined in clause 6.6.8.2.4.3.

2. Single Cell is used, which is NR FR1 Pcell. The connection setup is done according to the settings in Annex C.1.2 and C.1.3. The test parameters are given in tables 6.6.8.2.4.1-2, 6.6.8.2.5-1 and 6.6.8.2.5-2. UE is configured to perform RLM and BFD based on the SSBs.

6.6.8.2.4.2 Test procedure

Prior to the start of the time duration T1, the UE shall be configured for periodic CSI reporting in PUCCH [format 2] with a reporting periodicity as mentioned in the above Table 6.6.8.2.4.1-2. Before the test, UE is configured to perform RLM, BFD and L1-SINR measurement based on the SSBs.

1. Ensure the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity NR SA, Connected without release *On* and Test Mode *On*, according to TS 38.508-1 [14] clause 4.5 and general test parameters set according to Table 6.6.8.2.4.1-2.

2. Set the parameters according to T1 in Table 6.6.8.2.5-1 and Table 6.6.8.2.5-2. T1 starts. SS transmits CSI-RS as IMR with a periodicity of 20 slots.

3. The UE shall be transmitting CSI on PUCCH with a periodicity of 80 slots.

4. When T1 expires, the SS shall set the parameters according to T2 in Table 6.6.8.2.5-1 and Table 6.6.8.2.5-2. T2 starts. SS transmits CSI-RS as IMR with a periodicity of 20 slots.

5. If the UE sends L1-SINR reports meeting the corresponding absolute accuracy requirements in Table 6.6.8.2.5-3 for test configurations 1 and 2 the corresponding absolute accuracy requirements in Table 6.6.8.2.5-4 for test configurations 3 and the corresponding relative accuracy requirements in Table 6.6.8.2.5-5 for all test configurations every 80 slots from no later than 720 ms for configuration 1 and 2 and no later than 680 ms for configuration 3 from the beginning of time period T2 until the end of time period T2, the number of passed iterations is increased by one, otherwise the number of failed iterations is increased by one. The UE shall start sending valid L1-SINR reports. The SS shall check following requirements:

   - R1: the UE shall start to transmit valid reports no later than 720 ms for configuration 1,2 and no later than 680 ms for configuration 3 from the beginning of time period T2. A valid report shall meet the absolute L1-SINR requirement for SSB#1 (Table 6.6.8.2.5-3 for all configurations) and the relative L1-SINR requirement for SSB#0 in Table 6.6.8.2.5-5. If the first valid report is received earlier than the specified time, the number of passed iterations for R1 is increased by one. Otherwise, the number of failed iterations for R1 is increased by one.

   - R2: the UE shall transmit reports every 80 slots until the end of time period T2. If the reports are received accordingly, the number of passed iterations for R2 is increased by one. Otherwise, the number of failed iterations for R2 is increased by one.

   - R3: The L1-SINR value of SSB#1 reported by the UE is compared to the expected L1-SINR value for SSB#1. In all consecutive reports after the first valid value is received, if the resulting value is outside the limits in Table 6.6.8.2.5-3 for all configurations or the UE fails to report the measurement value for SSB#1, the number of failed iterations for R3 is increased by one. Otherwise, the number of passed iterations for R3 is increased by one.

-R4: The DIFF SINR value of SSB#0 reported by the UE is compared to the expected DIFF SINR value. In all consecutive reports after the first valid value is received, if the resulting value is outside the limits in Table6.6.8.2.5-5 for all configurations or the UE fails to report the measurement value for SSB#0, the number of failed iterations for R4 is increased by one. Otherwise, the number of passed iterations for R4 is increased by one.

6. The SS waits until T2 expires.

7. The SS shall transmit *RRCRelease* message to release the RRC connection which includes the release of the established radio bearers as well as all radio resources.

8. After the RRC connection release, the SS:

   - transmits in Cell 1 a *Paging* message (including PagingRecord with ue-Identity) for the UE and ensures the UE in state RRC_CONNECTED with generic procedure parameters Connectivity NR SA, Connected without release *On* and Test Mode *On* according to TS 38.508-1 [14] clause 4.5. (if the paging fails, switches off and on the UE and ensures the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity NR SA, Connected without release *On* and Test Mode *On* according to TS 38.508-1 [14] clause 4.5.),
   or:
   - switches off and on the UE and ensures the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity NR SA, Connected without release *On* and Test Mode *On* according to TS 38.508-1 [14] clause 4.5.

9. Repeat steps 2-8 until the confidence level according to Tables G.2.3-1 in Annex G clause G.2 is achieved.

6.6.8.2.4.3 Message contents

Message contents are according to TS 38.508-1 [14] clause 7.3 with the following exceptions:

Table 6.6.8.2.4.3-1: Common Exception messages NR SA SSB based CMR and dedicated IMR L1-SINR measurement

Default Message Contents	
Common contents of system information blocks exceptions	
Default RRC messages and information elements contents exceptions	Table H.3.6A-1 with conditions PERIODIC and SS-SINR and CSI-RS_IMR Table H.3.6A-2 with conditions SSB and PERIODIC Table H.3.6A-3 with condition PERIODIC

Table 6.6.8.2.4.3-2: RadioLinkMonitoringConfig

Derivation Path: TS 38.508-1 [14], Table 4.6.3-133			
Information Element	**Value/remark**	**Comment**	**Condition**
RadioLinkMonitoringConfig ::= SEQUENCE {			
failureDetectionResourcesToAddModList SEQUENCE (SIZE(1..maxNrofFailureDetectionResources)) OF SEQUENCE {	1 entry		
purpose	both	UE is configured to perform RLM and BFD based on the SSBs.	
detectionResource CHOICE {			
ssb-Index	0		
}			
}			
}			

6.6.8.2.5 Test requirement

Table 6.6.8.2.5-1 and Table 6.6.8.2.5-2 define the primary level settings including test tolerances for all tests.

Table 6.6.8.2.5-1: SSB specific test parameters for NR SA SSB based CMR and dedicated IMR L1-SINR measurement

Parameter	Config	Unit	SSB#0		SSB#1	
			T1	T2	T1	T2
N_{oc} Note2	1~3	dBm/15kHz	-94.65			
N_{oc} Note2	1,2	dBm/SSB SCS	-94.65			
	3		-91.65			

$\hat{E}_s/I_{ot}$	1~3	dB	0.5	0.5	-Infinity	3
SSB RSRP Note3	1,2	dBm/SSB SCS	-94.15	-94.15	-Infinity	-91.65
	3		-91.14	-91.14	-Infinity	-88.65
Io Note3	1,2	dBm/9.36 MHz	-63.43	-63.43	-66.70	-61.93
	3	dBm/38.16 MHz	-57.33	-57.33	-60.61	-55.84
$\hat{E}_s/N_{oc}$	1~3	dB	0.5	0.5	-Infinity	3
Note 1: The resources for uplink transmission are assigned to the UE prior to the start of time period T2.						
Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for N_{oc} to be fulfilled.						
Note 3: SS-RSRP and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.						

Table 6.6.8.2.5-2: CSI-RS specific test parameters for NR SA SSB based CMR and dedicated IMR L1-SINR measurement

Parameter	Config	Unit	CSI-RS#0		CSI-RS#1	
			T1	T2	T1	T2
N_{oc} Note2	1~3	dBm/15kHz	-94.65			
N_{oc} Note2	1,2	dBm/CSI-RS SCS	-94.65			
	3		-91.65			
$\hat{E}_s/I_{ot}$	1~3	dB	0.5	0.5	-Infinity	3
CSI-RS RSRP Note3	1,2	dBm/CSI-RS SCS	-94.15	-94.15	-Infinity	-91.65
	3		-91.14	-91.14	-Infinity	-88.65
Io Note3	1,2	dBm/9.36 MHz	-63.43	-63.43	-66.70	-61.93
	3	dBm/38.16 MHz	-57.33	-57.33	-60.61	-55.84
$\hat{E}_s/N_{oc}$	1~3	dB	0.5	0.5	-Infinity	3
Note 1: The resources for uplink transmission are assigned to the UE prior to the start of time period T2.						
Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for N_{oc} to be fulfilled.						
Note 3: SS-RSRP and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.						

The UE shall send L1-SINR report every 80 slots. No later than 640ms plus 80 slots from the beginning of time period T2, UE shall send L1-SINR report including results of both SSB#0+CSI-RS#0 and SSB#1+CSI-RS#1. Each L1-SINR measurement report shall meet the corresponding absolute accuracy requirements in Table 6.6.8.2.5-3 for all test configurations and the corresponding relative accuracy requirements in Table 6.6.8.2.5-4 for all test configurations.

Table 6.6.8.2.5-3: L1-SINR absolute accuracy requirements for the reported values for all test configurations

Normal Conditions	T1	T2
Lowest reported value (SSB#1)	-	44
Highest reported value (SSB#1)	-	61

Table 6.6.8.2.5-4: Void

Table 6.6.8.2.5-5: L1-SINR relative accuracy requirements for the reported values for all test configurations

	T1	T2
Lowest DIFF SINR reported (SSB#0)	-	0
Highest DIFF SINR reported (SSB#0)	-	5

For the test to pass, the ratio of successful reported values for each requirement (R1 to R4) shall be more than 90% with a confidence level of 95%. Each requirement is evaluated independently of the others..

NOTE: The actual overall delays measured in the test may be up to $2xTTI_{DCCH}$ higher than the measurement reporting delays above because of TTI insertion uncertainty of the measurement report in DCCH.

6.6.8.3 NR SA FR1 CSI-RS based CMR and dedicated IMR L1-SINR measurement in non-DRX

6.6.8.3.1 Test purpose

To verify that the UE makes correct reporting of L1-SINR measurement in non-DRX within L1-SINR measurement requirements in TS 38.133 [6] clause 9.8.4.3.

6.6.8.3.2 Test applicability

This test applies to all types of NR UE release 16 and forward, supporting L1-SINR measurement.

6.6.8.3.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 6.6.8.0.3.

The normative reference for this requirement is TS 38.133 [6] clause A.6.6.8.3.

6.6.8.3.4 Test description

6.6.8.3.4.1 Initial conditions

This test shall be tested using any of the test configurations in Table 6.6.8.3.4.1-1. Configure the test equipment and the DUT according to the parameters in Table 6.6.8.3.4.1-2. Test environment parameters are given in Table 6.6.8.3.4.1-3.

Table 6.6.8.3.4.1-1: NR SA CSI-RS based CMR and dedicated IMR L1-SINR measurement supported test configurations

Config	Description
1	NR 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode
2	NR 15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode
3	NR 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode
Note: The UE is only required to be tested in one of the supported test configurations	

Table 6.6.8.3.4.1-2: General test parameters for NR SA CSI-RS based CMR and dedicated IMR L1-SINR measurement

Parameter	Config	Unit	Value
SSB GSCN	1~3		freq1
Duplex mode	1		FDD
	2		TDD
	3		TDD
TDD Configuration	1		N/A
	2		TDDConf.1.1
	3		TDDConf.2.1
$BW_{channel}$	1	MHz	10: $N_{RB,c}$ = 52
	2		10: $N_{RB,c}$ = 52

	3		40: $N_{RB,c}$ = 106
PDSCH Reference measurement channel	1		SR.1.1 FDD
	2		SR.1.1 TDD
	3		SR.2.1 TDD
RMSI CORESET Reference Channel	1		CR.1.1 FDD
	2		CR.1.1 TDD
	3		CR.2.1 TDD
Dedicated CORESET Reference Channel	1		CCR.1.1 FDD
	2		CCR.1.1 TDD
	3		CCR.2.1 TDD
SSB configuration	1		SSB.3 FR1
	2		SSB.3 FR1
	3		SSB.4 FR1
CSI-RS configuration	1		CSI-RS 1.3 FDD
	2		CSI-RS 1.3 TDD
	3		CSI-RS 2.3 TDD
CSI-IM configuration	1		CSI-IM.1.2 FDD
	2		CSI-IM.1.2 TDD
	3		CSI-IM.2.2 TDD
OCNG Patterns	1~3		OP.1
TRS Configuration	1		TRS.1.1 FDD
	2		TRS.1.1 TDD
	3		TRS.1.2 TDD
Initial BWP Configuration	1~3		DLBWP.0.1 ULBWP.0.1
Dedicated BWP configuration	1~3		DLBWP.1.1 ULBWP.1.1
SMTC configuration	1~3		SMTC.1
DRX configuration	1~3		Off
reportConfigType	1~3		aperiodic
reportQuantity-r16	1~3		cri-SINR-r16
Number of reported RS	1~3		2
qcl-Info	1~3		SSB#0 for resource#0
			SSB#1 for resource#1
reportSlotOffsetList	1~3	slots	26
T1	1~3	s	5
EPRE ratio of PSS to SSS	1~3	dB	0
EPRE ratio of PBCH DMRS to SSS			
EPRE ratio of PBCH to PBCH DMRS			
EPRE ratio of PDCCH DMRS to SSS			
EPRE ratio of PDCCH to PDCCH DMRS			
EPRE ratio of PDSCH DMRS to SSS			
EPRE ratio of PDSCH to PDSCH DMRS			
EPRE ratio of OCNG DMRS to SSS Note 1			
EPRE ratio of OCNG to OCNG DMRS Note 1			
Propagation condition	1~3		AWGN
Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.			

Table 6.6.8.3.4.1-3: Test Environment parameters for NR SA CSI-RS based CMR and dedicated IMR L1-SINR measurement

Parameter	Value		Comment
Test environment	NC		As specified in TS 38.508-1 [14] clause 4.1.
Test frequencies	As specified in Annex E, Table E.2-1 and TS 38.508-1 [14] clause 4.3.1 and 4.4.2.		
Channel bandwidth	As specified by the test configuration selected from Table 6.6.8.3.4.1-1.		
Propagation conditions	AWGN		As specified in Annex C.2.2.
	TE Part	A.3.1.8.2 with n = 1	As specified in TS 38.508-1 [14] Annex A.

Connection Diagram	DUT Part	A.3.2.3.4	
Exceptions to connection diagram	For 4Rx capable UEs without any 2 Rx RF bands use A.3.2.5.2 for DUT part and A.3.1.8.5 for TE Part		

1. Message contents are defined in clause 6.6.8.3.4.3.

2. Single Cell is used, which is NR FR1 Pcell. The connection setup is done according to the settings in Annex C.1.2 and C.1.3. The test parameters are given in tables 6.6.8.3.4.1-2 and 6.6.8.3.5-1. UE is configured to perform RLM and BFD based on the SSBs.

6.6.8.3.4.2 Test procedure

The test consists of a single time period T1, during which the UE is triggered via DCI to report L1-SINR on aperiodic CSI-RS resources. Prior to the start of the time duration T1, the UE shall be fully synchronized to PCell. UE is also configured to measure L1-SINR based on SSB. Upon receiving the DCI trigger, UE provides the report back based on the reporting configuration as defined in table 6.6.8.3.4.1-2.

1. Ensure the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity NR SA, Connected without release *On* and Test Mode *On*, according to TS 38.508-1 [14] clause 4.5.

2. Set the parameters according to T1 in Table 6.6.8.3.5-1. T1 starts.

3. After 80ms from the start of the test the SS transmits the DCI trigger in slot 1 for configuration 1, 2 and slot 8 for configuration 3. The corresponding CSI-RS set is transmitted with the offset of 4 slots after the DCI trigger.

4. The SS shall check following requirements:

   - R1: the UE shall send L1-SINR report at slot 26 from the reception of DCI trigger. If the report is received at slot 26 from the reception of DCI trigger, the number of passed iterations for R1 is increased by one. Otherwise, the number of failed iterations for R1 is increased by one.

   - R2: The L1-SINR value of CSI-RS#1 reported by the UE is compared to the expected L1-SINR value for CSI-RS#1. If the resulting value is outside the limits in Table 6.6.8.3.5-2 for all test configurations or the UE fails to report the measurement value for CSI-RS #1, the number of failed iterations for R2 is increased by one. Otherwise, the number of passed iterations for R2 is increased by one.

- R3: The DIFF SINR value of CSI-RS #0 reported by the UE is compared to the expected DIFF SINR value. If the resulting value is outside the limits in Table 6.6.8.3.5-4 or the UE fails to report the measurement value for CSI-RS#0, the number of failed iterations for R3 is increased by one. Otherwise, the number of passed iterations for R3 is increased by one.5. If after T1 expiry no report is received or received report did not contain L1-SINR of both CSI-RS#0 as CMR + CSI-IM#0 as IMR and CSI-RS#1 as CMR + CSI-IM#1 as IMR or UE sent the L1-SINR report at different slot than 26 from the reception of DCI trigger, the number of 'failed' iterations is increased by one, otherwise, the number of 'passed' iterations is increased by one.

6. The SS shall transmit *RRCRelease* message to release the RRC connection which includes the release of the established radio bearers as well as all radio resources.

7. After the RRC connection release, the SS:

   - transmits in Cell 1 a *Paging* message (including PagingRecord with ue-Identity) for the UE and ensures the UE in state RRC_CONNECTED with generic procedure parameters Connectivity NR SA, Connected without release *On* and Test Mode *On* according to TS 38.508-1 [14] clause 4.5. (if the paging fails, switches off and on the UE and ensures the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity NR SA, Connected without release *On* and Test Mode *On* according to TS 38.508-1 [14] clause 4.5.),
   or:
   - switches off and on the UE and ensures the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity NR SA, Connected without release *On* and Test Mode *On* according to TS 38.508-1 [14] clause 4.5.

8. Repeat steps 2-7 until the confidence level according to Tables G.2.3-1 in Annex G clause G.2 is achieved.

6.6.8.3.4.3 Message contents

Message contents are according to TS 38.508-1 [14] clause 7.3 with the following exceptions:

Table 6.6.8.3.4.3-1: Common Exception messages NR SA CSI-RS based CMR and dedicated IMR L1-SINR measurement

Default Message Contents	
Common contents of system information blocks exceptions	
Default RRC messages and information elements contents exceptions	Table H.3.6A-1 with conditions APERIODIC and CSI-SINR and CSI-IM_IMR Table H.3.6A-2 with conditions CSI-RS and APERIODIC Table H.3.6A-4 with condition APERIODIC

Table 6.6.8.3.4.3-2: RadioLinkMonitoringConfig

Derivation Path: TS 38.508-1 [14], Table 4.6.3-133			
Information Element	**Value/remark**	**Comment**	**Condition**
RadioLinkMonitoringConfig ::= SEQUENCE {			
failureDetectionResourcesToAddModList SEQUENCE (SIZE(1..maxNrofFailureDetectionResources)) OF SEQUENCE {	1 entry		
purpose	both	UE is configured to perform RLM and BFD based on the SSBs.	
}			
}			

6.6.8.3.5 Test requirement

Table 6.6.8.3.5-1 defines the primary level settings including test tolerances for all tests.

Table 6.6.8.3.5-1: CSI-RS specific test parameters for NR SA CSI-RS based CMR and dedicated IMR L1-SINR measurement

Parameter	Config	Unit	CSI-RS#0	CSI-RS#1
N_{oc} Note1	1~3	dBm/15kHz	-94.65	
N_{oc} Note1	1,2	dBm/SSB SCS	-94.65	
	3		-91.65	
$\hat{E}_s / I_{ot}$	1~3	dB	0	3
CSI-RS RSRP Note2	1,2	dBm/SSB SCS	-94.65	-91.65
	3		-91.65	-88.65
Io Note2	1,2	dBm/9.36 MHz	-63.69	-61.93
	3	dBm/38.16 MHz	-57.59	-55.84
$\hat{E}_s / N_{oc}$	1~3	dB	0	3

Note 1: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for N_{oc} to be fulfilled.

Note 2: CSI-RS RSRP and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.

After 80ms from the beginning of the test, the UE shall send L1-SINR report at slot 26 from the reception of DCI triggering the L1-SINR measurement. The L1-SINR report shall include the results for both CSI-RS#0 as CMR + CSI-IM#0 as IMR and CSI-RS#1 as CMR + CSI-IM#1 as IMR.

Each L1-SINR measurement report shall meet the corresponding absolute accuracy requirements in Table 6.6.8.3.5-2 for all test configurations and the corresponding relative accuracy requirements in Table 6.6.8.3.5-4 for all test configurations.

Table 6.6.8.3.5-2: L1-SINR absolute accuracy requirements for the reported values for test configurations 1 and 2

Normal Conditions	T1
Lowest reported value (CSI-RS#1)	43
Highest reported value (CSI-RS#1)	62

Table 6.6.8.3.5-3: Void

Table 6.6.8.3.5-4: L1-SINR relative accuracy requirements for the reported values for all test configurations

	T1
Lowest DIFF SINR reported (CSI-RS#0)	0
Highest DIFF SINR reported (CSI-RS#0)	6

For the test to pass, the ratio of successful reported values for each requirement (R1 to R3) shall be more than 90% with a confidence level of 95%. Each requirement is evaluated independently of the others.

NOTE: The actual overall delays measured in the test may be up to $2xTTI_{DCCH}$ higher than the measurement reporting delays above because of TTI insertion uncertainty of the measurement report in DCCH.

6.6.9 Idle Mode CA/DC Measurements

6.6.9.0 Minimum conformance requirements

For a UE which supports *idleInactiveNR-MeasReport-r16* or *idleInactiveEUTRA-MeasReport-r16* the UE shall support the idle mode CA measurements on the serving cell, and carriers configured for idle mode CA/DC measurement reporting provided T331 has not expired, the serving cell is supporting idle mode CA/DC measurement reporting and the serving cell is in the validity area.

This subclause defines the requirements for the detected cell status for the idle mode CA/DC measurement when UE transitions from RRC Connected mode to Idle mode and after UE has entered Idle mode. The requirements are applicable to an NE-DC and NR carrier aggregation capable UE which has been configured with one or more of following, one or more SCells, one E-UTRAN PSCell or one or more downlink E-UTRAN SCells during the Connected mode and which supports *idleInactiveNR-MeasReport-r16* or *idleInactiveEUTRA-MeasReport-r16.* The requirements are applicable for SCell(s) and E-UTRAN FDD and TDD PSCell and SCells.

Upon releasing the connection and if the UE has been configured with idle mode CA measurement reporting, following requirements apply concerning the detected cells in Connected mode upon state transitioning to Idle mode and during Idle mode:

- A cell which is detected cell in Connected mode prior to connection release, shall remain detected after UE has entered Idle mode and during Idle mode, provided that the following conditions are met:
  - The UE has been provided with a list of cells and/or carrier frequencies for early measurement reporting by dedicated RRC signalling and
  - The detected cell is among the list of cells or on a carrier frequency provided for early measurement reporting, and

- The UE is provided with a valid timer T331 by dedicated RRC signalling, and
- The detected cell and SSBs remains detectable until UE reconnect to the network and transmits the early measurement report, and
- The carrier frequency of the detected cell and the carrier frequency of the serving cell are among the supported band combination of the UE.

An inter-RAT E-UTRAN cell is considered detectable according to RSRP, RSRP Ês/Iot, SCH_RP and SCH Ês/Iot defined in TS 36.133 [23] Annex B.1.1 and Annex B.1.2 for a corresponding Band. An inter-frequency cell is considered detectable according to the conditions in TS 38.133 [6] Annex B.1.2 and B.1.3 for a corresponding band. An SSB of an inter-frequency cell is considered detectable according to SSB_RP and SSB Ês/Iot defined in TS 38.133 [6] Annex B.1.2 and B.1.3 for a corresponding Band.

While T331 is running, the UE shall perform measurement on the configured inter-frequency carriers for idle mode CA/DC measurement reporting according to the UE measurement capability.

A UE which supports *idleInactiveNR-MeasReport-r16* shall support idle mode CA/DC measurements of:

- at least 7 inter-frequency carriers which are also configured for inter-frequency mobility measurements, and
- at least 7 inter-frequency carriers which are not configured for inter-frequency mobility measurements.

The UE shall be capable of monitoring a total of at least 7 inter-frequency carriers for idle mode CA/DC measurements comprising of carriers configured for inter-frequency mobility measurements and carriers not configured for inter-frequency mobility measurements.

For inter-frequency carriers configured for idle mode CA/DC measurements, if Srxlev $\leq S_{nonIntraSearchP}$ or Squal $\leq S_{nonIntraSearchQ}$ the inter-frequency measurement requirements in TS 38.133 [6] clause 4.2.2.4 shall apply, where UE shall search for and measure inter-frequency layers configured for idle mode CA/DC measurements in preparation for possible reporting. If Srxlev > $S_{nonIntraSearchP}$ and Squal > $S_{nonIntraSearchQ}$ the UE shall search for inter-frequency layers configured for idle mode CA/DC measurements at least every $T_{higher_priority_search}$ where $T_{higher_priority_search}$ is described in TS 38.133 [6] clause 4.2.2.7, where UE shall search for and measure inter-frequency layers configured for idle mode CA/DC measurements in preparation for possible reporting.

For UE supporting *idleInactiveNR-MeasBeamReport-r16*, if the UE is configured with *beamMeasConfigIdle-r16* for idle mode CA/DC measurement, the UE shall be capable of performing SS-RSRP, SS-RSRQ for at least

- 7 SSBs with different SSB index and/or PCI on an inter-frequency layer in FR1,
- 10 SSBs with different SSB index and/or PCI on an inter-frequency layer in FR2.

For UE supporting *idleInactiveNR-MeasBeamReport-r16*, if the UE is configured with *beamMeasConfigIdle-r16* for idle mode CA/DC measurement, the UE shall be able to acquire the SSB index for a newly detectable inter-RAT NR cell and perform RSRP/RSRQ measurement within the requirements defined in TS 38.133 [6] clause 4.2.2.4 plus $T_{SSB_index,NR}$, where $T_{SSB_index,NR}$ is the additional time period used to acquire the index of the SSB being measured as defined in table 4.4.2.2-1.

Table 6.6.9.0-1: T_{SSB_index,NR_Inter}

DRX cycle length [s]	Scaling Factor (N1)		T_{SSB_index,NR_Inter} [s] (number of DRX cycles)
	FR1	FR2[Note1]	
0.32	1	8	N2 x 1.28 x N1 x 1.5 (N2 x 4 x N1 x 1.5)
0.64		5	N2 x 1.28 x N1 (N2 x 2 x N1)
1.28		4	N2 x 1.28 x N1 (N2 x 1 x N1)
2.56		3	N2 x 2.56 x N1 (N2 x 1 x N1)

Note 1:	Applies for UE supporting power class 2&3&4. For UE supporting power class 1, N1 = 8 for all DRX cycle length.
NOTE 2:	N2 = 3 if the NR inter-frequency carrier for idle mode CA/DC measurement reporting is in FR1, and N2 = 5 if the NR inter-frequency carrier for idle mode CA/DC measurement reporting is in FR2.

In the absence or expiration of T331, it is up to UE implementation to perform the idle mode CA/DC measurement.

For inter-frequency carriers configured for idle mode CA/DC measurements, the UE shall be capable of performing SS-RSRP and SS-RSRQ measurements of the carriers, and the UE physical layer shall be capable of reporting SS-RSRP and SS-RSRQ measurements of the carriers configured for idle mode CA/DC measurements to higher layers, with measurement accuracy as specified in clauses [38.133] and [38.133], respectively.

The UE shall be able to report idle mode CA/DC measurements when idle mode CA/DC measurement reporting is requested by the network.

The UE shall measure the RSRP and RSRQ level of the serving cell and evaluate the cell selection criterion S defined in clause 4.2.2.2 and the UE physical layer shall be capable of reporting RSRP and RSRQ measurements of the serving cell to higher layers, with measurement accuracy as specified in TS 38.133 [6] clauses 10.1.2B, 10.1.3B, 10.1.7B and 10.1.8B.

6.6.9.1 NR SA FR1 Idle mode CA/DC measurement for FR1

6.6.9.1.1 Test purpose

The purpose of this test is to verify that the UE performs the required measurements on the serving cell and the configured inter-frequency carrier for idle mode measurement reporting after the UE has entered Idle mode. This test will partly verify the Idle mode CA/DC measurements requirements in TS 38.133 [6] clause 4.4.

6.6.9.1.2 Test applicability

This test applies to all types of NR UE release 16 onwards, supporting 2DL CA and *idleInactiveNR-MeasReport-r16*.

6.6.9.1.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 6.6.9.0.

The normative reference for this requirement is TS 38.133 [6] clause 4.4and A.6.6.9.1

6.6.9.1.4 Test description

6.6.9.1.4.1 Initial conditions

This test shall be tested using any of the test configurations in Table 6.6.9.1.4.1-1.

Table 6.6.9.1.4.1-1: Supported test configurations

Test Case ID	Description
6.6.9.1-1	NR 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode
6.6.9.1-2	NR 15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode
6.6.9.1-3	NR 30kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode
Note 1: The UE is only required to be tested in one of the supported test configurations Note 2: Target NR cell has the same SCS, BW and duplex mode as NR serving cell	

Test environment parameters are given in Table 6.6.9.1.4.1-2.

Table 6.6.9.1.4.1-2: Initial conditions for SA Idle mode CA/DC measurement for FR1

Parameter	Value		Comment
Test environment	NC		As specified in TS 38.508-1 [14] clause 4.1.
Test frequencies	As specified in Annex E, Table E.4-1 and TS 38.508-1 [14] clause 4.3.1.		
Channel bandwidth	As specified by the test configuration selected from Table 6.6.9.1.4.1-1.		
Propagation conditions	AWGN		As specified in Annex C.2.2
Connection Diagram	TE Part	A.3.1.8.3	As specified in TS 38.508-1 [14] Annex A.
	DUT Part	A.3.2.3.2	
Exceptions to connection diagram			

1. The general test parameter settings are set up according to Table 6.6.9.1.4.1-3.
2. Message contents are defined in clause 6.6.9.1.4.3.
3. The test scenario comprises of two NR Cells. NR Cell 1 is the cell used for connection setup with the power level set according to Annex C.1.1 and C.1.2 for this test.

Table 6.6.9.1.4.1-3: General test parameters for SA Idle mode CA/DC measurement for FR1

Parameter	Unit	Test configuration	Value	Comment

NR RF Channel Number		Config 1,2,3	1, 2	Two FR1 NR carrier frequencies is used
Active cell		Config 1,2,3	NR cell 1 (Pcell)	NR Cell 1 is on NR RF channel number 1.
Neighbour cell		Config 1,2,3	NR cell2	NR cell 2 is on NR RF channel number 2.
SMTC-SSB parameters		Config 1	SSB.1 FR1	As specified in clause A.3.10.1
		Config 2	SSB.1 FR1	As specified in clause A.3.10.1
		Config 3	SSB.2 FR1	As specified in clause A.3.10.1
Hysteresis	dB	Config 1,2,3	0	
PRACH configuration index		Config 1,2,3	102	The detailed configuration is specified in TS 38.211 clause 6.3.3.2
CP length		Config 1,2,3	Normal	
TimeToTrigger	s	Config 1,2,3	0	
Filter coefficient		Config 1,2,3	0	L3 filtering is not used
DRX in connected mode		Config 1,2,3	OFF	DRX is not used
DRX in idle mode	s	Config 1,2,3	0.32	The value shall be used for all cells in the test.
T331	s		300	
Time offset between serving and neighbour cells		Config 1	3ms	Asynchronous cells. The timing of Cell 2 is 3ms later than the timing of Cell 1.
		Config 2,3	3μs	Synchronous cells
T1	s	Config 1,2,3	10	
T2	s	Config 1,2,3	11.52	
T3	s	Config 1,2,3	10	

6.6.9.1.4.2 Test procedure

Two cells are deployed in the test, one FR1 NR PCell (Cell 1) on RF channel 1 and an FR1 NR neighbour cell (Cell 2) on RF channel 2. The test consists of 3 successive time periods, with time duration of T1, T2, and T3 respectively. During T1, UE is connected to Cell 1 and has not any timing information about Cell 2. UE is configured with early measurement reporting with channel 2. Beam level reporting for early measurements is not configured.

1. Ensure the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity NR SA, Connected without release *On* and Test Mode *On* according to TS 38.508-1 [14] clause 4.5.

2. Set the parameters according to T1 in Table 6.6.9.1.5-1. T1 starts.

3. When T1 expires, the SS shall transmit an *RRCRelease* message including *measIdleCarrierListNR-r16* (Table 6.6.9.1.4.3-3) and switch the parameters according to T2 in Table 6.6.9.1.5-2. T2 starts.

4. Ensure the UE is in state RRC_IDLE until T2 expires. T3 starts.

6. The SS transmits in Cell a Paging message (including PagingRecord with ue-Identity) for the UE and ensures the UE is in State RRC_CONNECTED according to TS 38.508-1 [14]clause 4.5.

7. During the connection setup the UE is reports *idleMeasAvailable-r16* in the *RRCSetupComplete* message.

8. TE shall send the *UEInformationRequest* message, requesting UE to provide ide mode measurements results (Table 6.6.9.1.4.3-5).

9. If UE responds with *UEInformationResponse* message containing the idle mode measurement results with SS-RSRP values within the limits in Table 6.6.9.1.5-3 for configuration 1 and 2 and Table 6.6.9.1.5-4 for configuration 3, and SS-RSRQ values within the limits in Table 6.6.9.1.5-5 for configuration 1, 2 and 3, the number of passed iterations is increased by one. Otherwise, the number of failed iterations is increased by one.

10. Repeat step 2-9 until the confidence level according to Tables G.2.3-1 in Annex G clause G.2 is achieved.

6.6.9.1.4.3 Message contents

Message contents are according to TS 38.508-1 [14] clause 7.3 with the following exceptions:

Table 6.6.9.1.4.3-1: Common Exception messages for SA Idle mode CA/DC measurement for FR1

Default Message Contents	
Common contents of system information blocks exceptions	

Table 6.6.9.1.4.3-2: *SIB1* for SA Idle mode CA/DC measurement for FR1

Derivation Path: TS 38.508-1 [14], Table 4.6.1-28			
Information Element	**Value/remark**	**Comment**	**Condition**
SIB1 ::= SEQUENCE {			
nonCriticalExtension SEQUENCE {			
idleModeMeasurementsNR-r16	TRUE	This field indicates that a UE that is configured for NR idle/inactive measurements shall perform the measurements while camping in this cell and report availability of these measurements when establishing or resuming a connection in this cell. If absent, a UE is not required to perform NR idle/inactive measurements.	
}			
}			

Table 6.6.9.1.4.3-3: *RRCRelease* for SA Idle mode CA/DC measurement for FR1

Derivation Path: TS 38.508-1 [14], Table 4.6.1-16			
Information Element	**Value/remark**	**Comment**	**Condition**
RRCRelease ::= SEQUENCE {			
criticalExtensions CHOICE {			
rrcRelease SEQUENCE {			
MeasIdleConfigDedicated-r16 ::= SEQUENCE {			
measIdleCarrierListNR-r16 ::= SEQUENCE {		Serving cell not included	
MeasIdleCarrierNR-r161 ::= SEQUENCE {			
carrierFreq-r16	ARFCN value of NR channel 2		
ssbSubcarrierSpacing-r16	kHz15	Config 1,2	
	kHz30	Config 3	
frequencyBandList	Not present		
measCellListNR-r16	Not present		
reportQuantities-r16	both		
qualityThreshold-r16	Not present		
ssb-MeasConfig-r16 SEQUENCE {			
nrofSS-BlocksToAverage-r16	Not present		
absThreshSS-BlocksConsolidation-r16	Not present		
smtc-r16	SSB-MTC	TS 38.508-1 [14], Table 7.3.1-3	

ssb-ToMeasure-r16	SSB-ToMeasure	TS 38.508-1 [14], Table 7.3.1-31	
deriveSSB-IndexFromCell-r16	false		
	true		FR1_TDD, FR2_TDD
ss-RSSI-Measurement-r16	Not present		
}			
beamMeasConfigIdle-r16	Not present		
}			
}			
}			
measIdleCarrierListEUTRA-r16	Not present		
measIdleDuration-r16	sec300		
validityAreaList-r16 ::= SEQUENCE {			
ValidityArea-r16 ::= SEQUENCE {			
carrierFreq-r16	ARFCN value of NR channel 1		
validityCellList-r16 ::= SEQUENCE {			
PCI-Range	PhysCellId of Cell 1		
}			
}			
}			
}			
}			
}			

Table 6.6.9.1.4.3-4: *RRCSetupComplete* for SA Idle mode CA/DC measurement for FR1

Derivation Path: TS 38.508-1 [14], Table 4.6.1-22:			
Information Element	**Value/remark**	**Comment**	**Condition**
RRCSetupComplete ::= SEQUENCE {			
rrc-TransactionIdentifier	RRC-TransactionIdentifier		
criticalExtensions CHOICE {			
rrcSetupComplete SEQUENCE {			
idleMeasAvailable-r16	TRUE	Indication that the UE has idle/inactive measurement report available.	
}			
}			
}			

Table 6.6.9.1.4.3-5: *UEInformationRequest*

Derivation Path: 38.508-1 14, Table 4.6.1-32A			
Information Element	**Value/remark**	**Comment**	**Condition**
UEInformationRequest-r16 ::= SEQUENCE {			
rrc-TransactionIdentifier	RRC-TransactionIdentifier		
criticalExtensions CHOICE {			
ueInformationRequest-r16 SEQUENCE {			
idleModeMeasurementReq-r16	TRUE	UE shall report the idle/inactive measurement information, if available, to the network in the *UEInformationResponse* message.	
}			

}			
}			

Table 6.6.9.1.4.3-6: *UEInformationResponse*

Derivation Path: 38.508-1 14, Table 4.6.1-32B			
Information Element	**Value/remark**	**Comment**	**Condition**
UEInformationResponse-r16 ::= SEQUENCE {			
rrc-TransactionIdentifier	RRC-TransactionIdentifier		
criticalExtensions CHOICE {			
ueInformationResponse-r16 SEQUENCE {			
measResultIdleNR-r16 ::= SEQUENCE {			
rsrp-Result-r16	INTEGER(0..127)	Integer value for RSRP measurements is according to Table 10.1.6.1-1 in TS 38.133 14	
}			
}			
}			
}			

6.6.9.1.5 Test requirements

Tables 6.6.9.1.5-1 and 6.6.9.1.5-2 define the primary level settings including test tolerances and tables 6.6.9.1.5-3, 6.6.9.1.5-4, 6.6.9.1.5-5 and 6.6.9.1.5-6 define accuracy requirements define for SA Idle mode CA/DC measurement for FR1.

Table 6.6.9.1.5-1: Cell specific test parameters for connected mode for SA Idle mode CA/DC measurement for FR1

Parameter		**Unit**	**Test configuration**	**Cell 1**			**Cell 2**		
				T1	**T2**	**T3**	**T1**	**T2**	**T3**
NR RF Channel Number			Config 1,2,3	1			2		
Duplex mode			Config 1	FDD					
			Config 2,3	TDD					
TDD configuration			Config 1	Not Applicable					
			Config 2	TDDConf.1.1					
			Config 3	TDDConf.2.1					
$BW_{channel}$		MHz	Config 1,2	10: $N_{RB,c}$ = 52					
			Config 3	40: $N_{RB,c}$ = 106					
BWP BW		MHz	Config 1,2	10: $N_{RB,c}$ = 52					
			Config 3	40: $N_{RB,c}$ = 106					
BWP configuration	Initial DL BWP		Config 1, 2, 3	DLBWP.0.1			NA		
	Initial UL BWP			ULBWP.0.1			NA		
	Dedicated DL BWP			DLBWP.1.1			NA		
	Dedicated UL BWP			ULBWP.1.1			NA		
TRS configuration			Config 1	TRS.1.1 FDD			NA		
			Config 2	TRS.1.1 TDD			NA		
			Config 3	TRS.1.2 TDD			NA		
OCNG Patterns defined in A.3.2.1.1 (OP.1)			Config 1,2,3	OP.1			OP.1		
PDSCH Reference measurement channel			Config 1	SR.1.1 FDD			SR.1.1 FDD		
			Config 2	SR.1.1 TDD			SR.1.1 TDD		
			Config 3	SR2.1 TDD			SR2.1 TDD		

CORESET Reference Channel		Config 1	CR.1.1 FDD			CR.1.1 FDD		
		Config 2	CR.1.1 TDD			CR.1.1 TDD		
		Config 3	CR2.1 TDD			CR2.1 TDD		
SSB parameters		Config 1	SSB.1 FR1			SSB.5 FR1		
		Config 2	SSB.1 FR1			SSB.5 FR1		
		Config 3	SSB.2 FR1			SSB.6 FR1		
SMTC configuration defined in A.3.11		Config 1	SMTC.2			SMTC.5		
		Config 2, 3	SMTC.1			SMTC.4		
PDSCH/PDCCH subcarrier spacing	kHz	Config 1,2	15					
		Config 3	30					
EPRE ratio of PSS to SSS		Config 1,2,3	0			0		
EPRE ratio of PBCH DMRS to SSS								
EPRE ratio of PBCH to PBCH DMRS								
EPRE ratio of PDCCH DMRS to SSS								
EPRE ratio of PDCCH to PDCCH DMRS								
EPRE ratio of PDSCH DMRS to SSS								
EPRE ratio of PDSCH to PDSCH								
EPRE ratio of OCNG DMRS to SSS(Note 1)								
EPRE ratio of OCNG to OCNG DMRS (Note 1)								
N_{oc} Note2	dBm/15 kHz		-98			-98		
N_{oc} Note2	dBm/SCS	Config 1,2	-98			-98		
		Config 3	-95			-95		
SS-RSRP Note 3	dBm/SCS	Config 1,2	-91	-91	-91	-infinity	-98	-98
		Config 3	-88	-88	-88	-infinity	-95	-95
$\hat{E}_s/I_{ot}$	dB	Config 1,2,3,4,5,6	7	7	7	-infinity	0	0
$\hat{E}_s/N_{oc}$	dB	Config 1,2,3	7	7	7	infinity	0	0
Io Note3	dBm/9.36MHz	Config 1,2	-62.26	-62.26	-62.26	-70.5	-67.04	-67.04
	dBm/38.16MHz	Config 3	-56.15	-56.15	-56.15	-63.94	-60.93	-60.93
Propagation Condition		Config 1,2,3	AWGN			AWGN		

Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.

Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for N_{oc} to be fulfilled.

Note 3: SS-RSRP and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.

Note 4: SS-RSRP minimum requirements are specified assuming independent interference and noise at each receiver antenna port.

Table 6.6.9.1.5-2: Cell specific test parameters for idle mode for SA Idle mode CA/DC measurement for FR1

Parameter	Unit	Test configuration	Cell 1			Cell 2		
			T1	T2	T3	T1	T2	T3
NR RF Channel Number		1,2,3	1			2		
TDD configuration		1	N/A			N/A		
		2	TDDConf.1.1			TDDConf.1.1		
		3	TDDConf.2.1			TDDConf.2.1		
PDSCH RMC configuration		1	SR.1.1 FDD			SR.1.1 FDD		
		2	SR.1.1 TDD			SR.1.1 TDD		
		3	SR.2.1 TDD			SR.2.1 TDD		
RMSI CORESET RMC configuration		1	CR.1.1 FDD			CR.1.1 FDD		
		2	CR.1.1 TDD			CR.1.1 TDD		
		3	CR.2.1 TDD			CR.2.1 TDD		
Dedicated CORESET RMC configuration		1	CCR.1.1 FDD			CCR.1.1 FDD		
		2	CCR.1.1 TDD			CCR.1.1 TDD		
		3	CCR.2.1 TDD			CCR.2.1 TDD		
OCNG Pattern		1, 2, 3	OP.1 defined in A.3.2.1			OP.1 defined in A.3.2.1		
Initial DL BWP configuration		1, 2, 3	DLBWP.0.1			DLBWP.0.1		
Initial UL BWP configuration		1, 2, 3	ULBWP.0.1			ULBWP.0.1		
RLM-RS		1, 2, 3	SSB			SSB		
Qrxlevmin	dBm/SCS	1, 2	-140			-140		
		3	-137			-137		
Pcompensation	dB	1, 2, 3	0			0		
Cell_selection_and_reselection_quality_measurement		1, 2, 3	SS-RSRP			SS-RSRP		
$\hat{E}_s / I_{ot}$	dB	1	14	14	14	-infinity	12	12
		2						
		3						
N_{oc} Note2	dBm/SCS	1	-98					
		2	-98					
		3	-95					
N_{oc} Note2	dBm/15 kHz	1	-98					
		2						
		3						
$\hat{E}_s / N_{oc}$	dB	1	7	7	7	-infinity	0	0
		2						
		3						
SS-RSRP Note3	dBm/SCS	1	-91	-91	-91	-infinity	-98	-98
		2	-91	-91	-91	-infinity	-98	-98
		3	-88	-88	-88	-infinity	-95	-95
Io	dBm/9.36 MHz	1	-62.26	-62.26	-62.26	-70.5	-67.04	-67.04
	dBm/9.36 MHz	2	-62.26	-62.26	-62.26	-70.5	-67.04	-67.04
	dBm/38.16 MHz	3	-56.15	-56.15	-56.15	-63.94	-60.93	-60.93
Treselection	s	1, 2, 3	0	0	0	0	0	0
SnonintrasearchP	dB	1, 2, 3	Not sent			Not sent		
Propagation Condition		1, 2, 3	AWGN					

Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.

Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for N_{oc} to be fulfilled.

Note 3: SS-RSRP levels have been derived from other parameters for information purposes. They are not settable parameters themselves.

Table 6.6.9.1.5-3: Absolute accuracy requirements for Cell 1 and Cell 2 SS-RSRP reported values for test configurations 1 and 2

Normal Conditions	T3
Lowest reported value (Cell 1)	54
Highest reported value (Cell 1)	77
Lowest reported value (Cell 2)	47
Highest reported value (Cell 2)	70

Table 6.6.9.1.5-4: Absolute accuracy requirements for Cell 1 and Cell 2 SS-RSRP reported values for test configurations 3

Normal Conditions	T3
Lowest reported value (Cell 1)	57
Highest reported value (Cell 1)	80
Lowest reported value (Cell 2)	50
Highest reported value (Cell 2)	73

Table 6.6.9.1.5-5: Absolute accuracy requirements for Cell 1 and Cell 2 SS-RSRQ reported values for test configurations 1, 2 and 3

Normal Conditions	T3
Lowest reported value (Cell 1)	55
Highest reported value (Cell 1)	72
Lowest reported value (Cell 2)	51
Highest reported value (Cell 2)	67

During the time period T2 the UE is in Idle mode and the signal level of cell 2 is changed. The UE shall not perform reselection. The UE shall perform Idle Mode CA measurement according to Section 4.4.

At the start of T3 the UE is paged for connection setup. During the connection setup the UE is requested to transmit early measurement report for cell 2. The UE shall send early measurement report to the PCell.

After receiving the requested early measurement report, the test equipment verifies the accuracy of measurement reported for Cell 2 meets the requirements in Section 10.1.4B for SS-RSRP and 10.1.8B for SS-RSRQ and test ends.

The rate of correct events observed during repeated tests shall be at least 90% with a confidence level of 95%.

6.6.10 to 6.6.14

6.6.15 Idle Mode inter-RAT CA/DC Measurements

6.6.15.0 Minimum conformance requirements

For a UE which supports *idleInactiveNR-MeasReport-r16* or *idleInactiveEUTRA-MeasReport-r16* the UE shall support the idle mode CA measurements on the serving cell, and carriers configured for idle mode CA/DC measurement reporting provided T331 has not expired, the serving cell is supporting idle mode CA/DC measurement reporting and the serving cell is in the validity area.

This subclause defines the requirements for the detected cell status for the idle mode CA/DC measurement when UE transitions from RRC Connected mode to Idle mode and after UE has entered Idle mode. The requirements are applicable to an NE-DC and NR carrier aggregation capable UE which has been configured with one or more of following, one or more SCells, one E-UTRAN PSCell or one or more downlink E-UTRAN SCells during the Connected mode and which supports *idleInactiveNR-MeasReport-r16* or *idleInactiveEUTRA-MeasReport-r16.* The requirements are applicable for SCell(s) and E-UTRAN FDD and TDD PSCell and SCells.

Upon releasing the connection and if the UE has been configured with idle mode CA measurement reporting, following requirements apply concerning the detected cells in Connected mode upon state transitioning to Idle mode and during Idle mode:

- A cell which is detected cell in Connected mode prior to connection release, shall remain detected after UE has entered Idle mode and during Idle mode, provided that the following conditions are met:

- The UE has been provided with a list of cells and/or carrier frequencies for early measurement reporting by dedicated RRC signalling and
- The detected cell is among the list of cells or on a carrier frequency provided for early measurement reporting, and
- The UE is provided with a valid timer T331 by dedicated RRC signalling, and
- The detected cell and SSBs remains detectable until UE reconnect to the network and transmits the early measurement report, and
- The carrier frequency of the detected cell and the carrier frequency of the serving cell are among the supported band combination of the UE.

An inter-RAT E-UTRAN cell is considered detectable according to RSRP, RSRP Ês/Iot, SCH_RP and SCH Ês/Iot defined in TS 36.133 [23] Annex B.1.1 and Annex B.1.2 for a corresponding Band. An inter-frequency cell is considered detectable according to the conditions in TS 38.133 [6] Annex B.1.2 and B.1.3 for a corresponding band. An SSB of an inter-frequency cell is considered detectable according to SSB_RP and SSB Ês/Iot defined in TS 38.133 [6] Annex B.1.2 and B.1.3 for a corresponding Band.

The UE shall measure the RSRP and RSRQ level of the serving cell and evaluate the cell selection criterion S defined in clause 4.2.2.2 and the UE physical layer shall be capable of reporting RSRP and RSRQ measurements of the serving cell to higher layers, with measurement accuracy as specified in TS 38.133 [6] clauses 10.1.2B, 10.1.3B, 10.1.7B and 10.1.8B.

While T331 is running, the UE shall perform measurement on the configured inter-RAT carriers for idle mode CA/DC measurement reporting according to the UE measurement capability.

A UE which supports *idleInactiveEUTRA-MeasReport-r16* shall support idle mode DC measurements of:

- at least 7 E-UTRAN inter-RAT carriers which are also configured for E-UTRAN inter-RATmobility measurements, and
- at least 1 E-UTRAN inter-RAT carrier which is not configured for E-UTRAN inter-RAT mobility measurements.

The UE shall be capable of monitoring a total of at least 7 inter-RAT carriers for idle mode CA/DC measurements comprising of carriers configured for inter-RAT mobility measurements and carriers not configured for inter-RAT mobility measurements.

For inter-RAT carriers configured for idle mode CA/DC measurements, if Srxlev $\leq S_{nonIntraSearchP}$ or Squal $\leq S_{nonIntraSearchQ}$ the inter-RAT measurement requirements in TS 38.133 [6] clause 4.2.2.5 shall apply, where UE shall search for and measure inter-RAT layers configured for idle mode CA/DC measurements in preparation for possible reporting. If Srxlev > $S_{nonIntraSearchP}$ and Squal > $S_{nonIntraSearchQ}$ the UE shall search for inter-RAT layers configured for idle mode CA/DC measurements at least every $T_{higher_priority_search}$ where $T_{higher_priority_search}$ is described in TS 38.133 [6] clause 4.2.2, where UE shall search for and measure inter-RAT layers configured for idle mode CA/DC measurements in preparation for possible reporting.

For overlapping inter-RAT carriers configured for idle mode CA/DC measurements, the UE shall be capable of performing RSRP and RSRQ measurements of the carriers, and the UE physical layer shall be capable of reporting RSRP and RSRQ measurements of the carriers configured for idle mode CA/DC measurements to higher layers, with measurement accuracy as specified in TS 36.133 [23] clauses in 9.1.3B.3 and 9.1.6B.2, respectively.

The UE shall be able to report idle mode CA measurements when idle mode CA measurement reporting is requested by the network.

6.6.15.1 NR SA FR1 Idle Mode measurements of inter-RAT CA candidate cells for early reporting

6.6.15.1.1 Test purpose

The purpose of this test is to verify that the UE properly retains the detected cell status for the idle mode CA/DC measurement when UE transitions from RRC Connected mode to Idle mode, when the UE has entered Idle mode. Additionally, test that the UE performs the required measurements on the serving cell and the configured inter-RAT

carrier for idle mode measurement reporting. This test will partly verify the Idle mode CA measurements in TS 38.133 [6] clause 4.4. In the test, connected mode DRX configuration is not configured in either PCell or PSCell.

Additionally, the purpose of this test is to verify that the SS-RSRP, SS-RSRQ, RSRP and RSRQ measurement accuracy is within the specified limits. This test will verify the accuracy requirements in TS 38.133 [6] clauses 10.1.2B and 10.1.7B for intra-frequency measurements and clause 10.2.4 and 10.2.5 for the inter-RAT measurements.

6.6.15.1.2 Test applicability

This test applies to all types of NR UE release 16, supporting NE-DC and *idleInactiveEUTRA-MeasReport-r16.*

6.6.15.1.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 6.5.15.0.

The normative reference for this requirement is TS 38.133 [6] clauses 4.4, 10.1.2B, 10.1.7B, 10.2.4 and 10.2.5 and A.6.6.15

6.6.15.1.4 Test description

6.6.15.1.4.1 Initial conditions

This test shall be tested using any of the test configurations in Table 6.6.15.1.4.1-1.

Table 6.6.15.1.4.1-1: Supported test configurations

Test Case ID	Description
6.6.15.1-1	FR1 FDD SSB SCS 15kHz BW 10MHz – LTE FDD 10MHz
6.6.15.1-2	FR1 FDD SSB SCS 15kHz BW 10MHz – LTE TDD 10MHz
6.6.15.1-3	FR1 TDD SSB SCS 30kHz BW 40MHz – LTE FDD 10MHz
6.6.15.1-4	FR1 TDD SSB SCS 30kHz BW 40MHz – LTE TDD 10MHz
Note 1: The UE is only required to be tested in one of the supported test configurations	

Configure the test equipment and the DUT according to the parameters in Table 6.6.15.1.4.1-2.

Table 6.6.15.1.4.1-2: Initial conditions for Idle Mode measurements of inter-RAT DC candidate cells for early reporting

Parameter	Value		Comment
Test environment	NC		As specified in TS 38.508-1 [14] clause 4.1.
Test frequencies	As specified in Annex E, Table E.4-1 and TS 38.508-1 [14] clause 4.3.1.		
Channel bandwidth	As specified by the test configuration selected from Table 6.6.15.1.4.1-1.		
Propagation conditions	AWGN		As specified in Annex C.2.2
Connection Diagram	TE Part	A.3.1.8.3	As specified in TS 38.508-1 [14] Annex A.
	DUT Part	A.3.2.3.2	
Exceptions to connection diagram			

1. The general test parameter settings are set up according to Table 6.6.15.1.4.1-3 and Table 6.6.15.1.4.1-4.
2. Message contents are defined in clause 6.6.15.1.4.3.
3. The test scenario comprises of two NR Cells. (Cell 1 and Cell 2). Cell 1 is configured according to Annex C.1.2 and C.1.3.

Table 6.6.15.1.4.1-3: General test parameters for Idle Mode measurements of inter-RAT DC candidate cells for early reporting

Parameter	Unit	Value	Comment
RF Channel Number		1, 2	Two radio channels are used for this test
Active PCell		Cell 1	PCell on RF channel number 1 in FR1

PSCell		Cell 2	PSCell on RF channel number 2 in LTE. Cell 2 is of higher priority.
DRX		OFF	For both PCell and PSCell once configured
PRACH configuration in Cell 2		PRACH_2CE	PRACH configuration as specified in Clause A.3.16 in TS 36.133
T331	s	300	
CSI reporting periodicity and offset configuration for Cell 2	ms	2	
T1	s	0.5	During this time the PCell is known and PSCell is configured.
T2	s	0.5	PSCell access.
T3 + T4	s	66	During this time the UE is configured to perform inter-RAT measurements in idle mode on the PSCell carrier.
T5	s	0.5	UE is paged and connection is setup. Network requests measurement report from the UE.

Table 6.6.15.1.4.1-4: General idle mode test parameters for Idle Mode measurements of inter-RAT DC candidate cells for early reporting

Parameter	Unit	Test configuration	Value	Comment
Serving cell		1, 2, 3, 4	Cell1	The UE camps on cell 1 which is the former PCell.
Neighbour cell		1, 2, 3, 4	Cell2	The UE shall perform inter-RAT measurements on cell 2 which is the former PSCell.
RF Channel Number		1, 2, 3, 4	1, 2	
Time offset between cells		1, 2, 3, 4	3 μs	Synchronous cells
Access Barring Information	-	1, 2, 3,4	Not Sent	No additional delays in random access procedure.
SSB configuration		1, 2	SSB.1 FR1	Serving cell
		3, 4	SSB.2 FR1	Serving cell
SMTC configuration Serving cell		1, 2, 3, 4	SMTC.2	
DRX cycle length	s	1, 2, 3, 4	1.28	The value shall be used for all cells in the test.
PRACH configuration index		1, 2, 3, 4	190	The detailed configuration is specified in TS 38.211 clause 6.3.3.2
rangeToBestCell		1, 2, 3, 4	Not configured	
T3	s	1, 2, 3, 4	0.5	T3 needs to be defined so that cell measurement time is taken into account.
T4	s	1, 2, 3, 4	65	T4 needs to be defined so that cell measurement time is taken into account.

6.6.15.1.4.2 Test procedure

Two cells are deployed in the test, cell 1, which is the PCell in connected, and serving cell in idle mode, on radio channel 1 in FR1, and cell 2, which is the PSCell in connected, and measured LTE inter-RAT cell in idle mode, on radio channel 2 in LTE. The test consists of 5 successive time periods, with time duration of T1, T2, T3, T4 and T5 respectively. Prior to the start of the time duration T1, the UE shall be fully synchronized to cell 1 and cell 2. During T1 cell 2, the PSCell, shall be configured.

1. Ensure the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity NR SA, Connected without release *On* and Test Mode *On* according to TS 38.508-1 [14] clause 4.5.

2. The SS shall set the parameters according to Table 6.6.15.1.5-1 and Table 6.6.15.1.5-2 as appropriate. T1 starts.

3. The SS then shall transmit RRCReconfiguration message with condition NE-DC according to TS 38.508-1 [6] Table 4.6.1-13 to add E-UTRA cell (PSCell).

4. The UE shall transmit an RRCReconfigurationComplete message.

5. The UE shall send a PRACH to PSCell during T1.
6. After the UE has transmitted the random-access preamble on the PSCell, the SS shall set T2 parameters according to Table 6.6.15.1.5-1 and Table 6.6.15.1.5-2 as appropriate. T2 starts.
7. After T2, the SS shall set T3 parameters according to Table 6.6.15.1.5-1 and Table 6.6.15.1.5-2 as appropriate and send the RRCRelease. T3 starts.
8. During the time periods T3 and T4 the UE is in Idle mode configured to perform inter-RAT idle mode CA/DC measurements on Cell 2. The UE shall not perform reselection.
9. After T3 is expired, the SS shall set T4 parameters according to Table 6.6.15.1.5-1 and Table 6.6.15.1.5-2 as appropriate. T4 starts.
10. After T4 expires the SS shall set T5 parameters according to Table 6.6.15.1.5-1 and Table 6.6.15.1.5-2 as appropriate, T5 starts.
11. The SS transmits in Cell 1 a Paging message (including PagingRecord with UE-Identity). During the connection setup the UE is reports *idleMeasAvailable-r16* in the *RRCSetupComplete* message.
12. The SS shall send the *UEInformationRequest* message, requesting UE to report idle mode CA/DC measurements.
13. If UE responds with *UEInformationResponse* message containing the idle mode measurement results with SS-RSRP values within the limits in Table 6.6.15.1.5-3 for configuration 1 and 2 and Table 6.6.15.1.5-4 for configuration 3, and SS-RSRQ values within the limits in Table 6.6.15.1.5-5 for configuration 1, 2 and 3, the number of passed iterations is increased by one. Otherwise, the number of failed iterations is increased by one.
14. If paging in step 11 succeeds, go to step 15, otherwise switch off the UE.
15. Switch on the UE and ensure the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity NR with Connected without release On according to TS 38.508-1 [14] clause 4.5.
16. Repeat step 2-15 until a test verdict has been achieved.

6.6.15.1.4.3 Message contents

Message contents are according to TS 38.508-1 [14] clause 7.3 with the following exceptions:

Table 6.6.15.1.4.3-1: Common Exception messages for

Default Message Contents	
Common contents of system information blocks exceptions	

Table 6.6.15.1.4.3-2: *SIB1* for NR SA FR1 Idle mode CA/DC measurement of inter-RAT DC candidate cells for early reporting

Derivation Path: TS 38.508-1 [14], Table 4.6.1-28			
Information Element	**Value/remark**	**Comment**	**Condition**
SIB1 ::= SEQUENCE {			
nonCriticalExtension SEQUENCE {			
idleModeMeasurementsEUTRA-r16	TRUE	This field indicates that a UE that is configured for EUTRA idle/inactive measurements shall perform the measurements while camping in this cell and report availability of these measurements when establishing	

		or resuming a connection in this cell. If absent, a UE is not required to perform EUTRA idle/inactive measurements.	
}			
}			

Table 6.6.15.1.4.3-3: *RRCRelease* for SA Idle mode CA/DC measurement for FR1

Derivation Path: TS 38.508-1 [14], Table 4.6.1-16			
Information Element	**Value/remark**	**Comment**	**Condition**
RRCRelease ::= SEQUENCE {			
criticalExtensions CHOICE {			
rrcRelease SEQUENCE {			
MeasIdleConfigDedicated-r16 ::= SEQUENCE {			
measIdleCarrierListNR-r16 ::= SEQUENCE {	Not present		
measIdleCarrierListEUTRA-r16 ::= SEQUENCE {			
MeasIdleCarrierEUTRA-r16 ::= SEQUENCE {			
carrierFreqEUTRA-r16	ARFCN value of Cell 2		
EUTRA-AllowedMeasBandwidth	mbw6		
measCellListEUTRA-r16	Not present		
reportQuantitiesEUTRA-r16	both		
qualityThresholdEUTRA-r16	Not present		
}			
}			
measIdleDuration-r16	sec300		
validityAreaList-r16 ::= SEQUENCE {			
ValidityArea-r16 ::= SEQUENCE {			
carrierFreq-r16	ARFCN value of NR channel 1		
validityCellList-r16 ::= SEQUENCE {			
PCI-Range	PhysCellId of Cell 1		
}			
}			
}			
}			
}			
}			

Table 6.6.15.1.4.3-4: *RRCSetupComplete* for SA Idle mode CA/DC measurement for FR1

Derivation Path: TS 38.508-1 [14], Table 4.6.1-22:			
Information Element	**Value/remark**	**Comment**	**Condition**
RRCSetupComplete ::= SEQUENCE {			
rrc-TransactionIdentifier	RRC-TransactionIdentifier		
criticalExtensions CHOICE {			
rrcSetupComplete SEQUENCE {			
idleMeasAvailable-r16	TRUE	Indication that the UE has idle/inactive measurement report available.	
}			
}			
}			

Table 6.6.15.1.4.3-5: *UEInformationRequest*

Derivation Path: 38.508-1 14, Table 4.6.1-32A			
Information Element	**Value/remark**	**Comment**	**Condition**
UEInformationRequest-r16 ::= SEQUENCE {			
rrc-TransactionIdentifier	RRC-TransactionIdentifier		
criticalExtensions CHOICE {			
ueInformationRequest-r16 SEQUENCE {			
idleModeMeasurementReq-r16	TRUE	UE shall report the idle/inactive measurement information, if available, to the network in the *UEInformationResponse* message.	
}			
}			
}			

Table 6.6.15.1.4.3-6: *UEInformationResponse*

Derivation Path: 38.508-1 14, Table 4.6.1-32B			
Information Element	**Value/remark**	**Comment**	**Condition**
UEInformationResponse-r16 ::= SEQUENCE {			
rrc-TransactionIdentifier	RRC-TransactionIdentifier		
criticalExtensions CHOICE {			
ueInformationResponse-r16 SEQUENCE {			
measResultIdleEUTRA-r16 ::= SEQUENCE {			
measResultsPerCarrierListIdleEUTRA-r16 SEQUENCE			
carrierFreqEUTRA-r16	ARFCN of Cell 2		
measResultsPerCellListIdleEUTRA-r16 SEQUENCE			
rsrp-ResultEUTRA-r16	INTEGER (0..97)		
rsrq-ResultEUTRA-r16	INTEGER (-30..46)		
}			
}			
}			
}			

6.6.15.1.5 Test requirements

Tables 6.6.15.1.5-1 and 6.6.15.1.5-2 define the primary level settings including test tolerances and tables 6.6.15.1.5-3, 6.6. 15.1.5-4, 6.6. 15.1.5-5 and 6.6.15.1.5-6 define accuracy requirements define for Idle mode CA/DC measurement.

Table 6.6.15.1.5-1: Cell specific test parameters for NR cell for Idle Mode measurements of inter-RAT DC candidate cells for early reporting

Parameter	**Unit**	**Config**	**Test 1**				
			Cell 1				
			T1	**T2**	**T3**	**T4**	**T5**
AoA setup		1,2,3,4	N/A				
Assumption for UE beams Note 5 R: Rough		1,2,3,4	N/A	N/A	R	R	N/A
Frequency Range		1,2,3,4	FR1				
Duplex mode		1, 2	FDD				
		3, 4	TDD				
TDD Configuration 1: TDDConf.1.1 2: TDDConf.2.1		1,2	-				
		3,4	1	1	2	2	1
$BW_{channel}$	MHz	1, 2	1	1	-	-	1

1: 10: $N_{RB,c}$ = 52 2: 40: $N_{RB,c}$ = 106		3, 4	2	2	-	-	2
Initial Downlink BWP configuration		1,2,3,4	DLBWP.0.1				
Initial Uplink BWP configuration		1,2,3,4	ULBWP.0.1				
Dedicated Downlink BWP configuration 1: DLBWP.1.1		1,2,3,4	1	1	-	-	1
Dedicated Uplink BWP configuration 1: ULBWP.1.1		1,2,3,4	1	1	-	-	1
PDSCH Reference Measurement Channel 1: SR.1.1 FDD 2: SR.2.1 TDD	FDD	1,2	1	1	1	1	1
	TDD	3,4	2	2	2	2	2
TRS configuration		1,2,3,4	-				
TCI state		1,2,3,4	-				
RMSI CORESET parameters	FDD	1,2	CR.1.1 FDD				
	TDD	3,4	CR.2.1 TDD				
Dedicated CORESET parameters	FDD	1,2	CCR.1.1 FDD				
	TDD	3,4	CCR.2.1 TDD				
OCNG Patterns[Note1]		1,2,3,4	OP.1 defined in A.3.2.1				
SSB configuration 1: SSB.1 FR1 2: SSB.2 FR1		1,2	1				
		3,4	2				
SMTC configuration		1,2,3,4	SMTC.2				
Correlation Matrix and Antenna config		1,2,3,4	1x2 Low				
EPRE ratio of PSS to SSS	dB	1,2,3,4	0	0	-	-	0
EPRE ratio of PBCH DMRS to SSS			0	0	-	-	0
EPRE ratio of PBCH to PBCH DMRS			0	0	-	-	0
EPRE ratio of PDCCH DMRS to SSS			0	0	-	-	0
EPRE ratio of PDCCH to PDCCH DMRS			0	0	-	-	0
EPRE ratio of PDSCH DMRS to SSS			0	0	-	-	0
EPRE ratio of PDSCH to PDSCH			0	0	-	-	0
EPRE ratio of OCNG DMRS to SSS			0	0	-	-	0
N_{oc} [Note2]	dBm/ 15kHz	1,2	-98	-98	-98	-98	-98
		3,4					
N_{oc} [Note2]	dBm/SCS	1,2	-98	-98	-98	-98	-98
		3,4	-95	-95	-95	-95	-95
$\hat{E}_s/I_{ot}$	dB	1,2,3,4	5	5	5	5	5
$\hat{E}_s/N_{oc}$	dB	1,2,3,4	5	5	5	5	5
SS-RSRP[Note3,4]	dBm/SCS	1,2	-93	-93	-93	-93	-93
		3,4	-90	-90	-90	-90	-90
Io[Note3,4]	dBm/ 9.36 MHz	1,2	-63.85	-63.85	-63.85	-63.85	-63.85
	dBm/ 38.16 MHz	3,4	-57.76	-57.76	-57.76	-57.76	-57.76
Qrxlevmin	dBm/SCS	1, 2	-	-	-140		-
	dBm/SCS	3, 4	-	-	-137		-
Pcompensation	dB	1,2,3,4	-	-	0	0	-
$Qhyst_s$	dB	1,2,3,4	-	-	0	0	-
$Qoffset_{s,n}$	dB	1,2,3,4	-	-	0	0	-
Cell_selection_and_ reselection_quality_measurement		1,2,3,4	SS-RSRP				
Treselection	s	1,2,3,4	-		0		-
SnonintrasearchP	dB	1,2,3,4	-		Not sent		-

SnonintrasearchQ	dB	1,2,3,4	-	Not sent	-
$Thresh_{x, high}$	dB	1,2,3,4	-	52	-
Propagation Condition	dB	1,2,3,4	-	AWGN	-

Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.
Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for N_{oc} to be fulfilled.
Note 3: SSB_RP and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.
Note 4: SSB_RP minimum requirements are specified assuming independent interference and noise at each receiver antenna port.

Table 6.6.15.1.5-2: Cell specific test parameters for LTE cell for Idle Mode measurements of inter-RAT DC candidate cells for early reporting

Parameter	Unit	Config	Test 1				
			Cell 2				
			T1	T2	T3	T4	T5
Frequency Range		1,2,3,4	LTE				
Duplex mode		1, 3	FDD				
		2, 4	TDD				
$BW_{channel}$	MHz	1,2,3,4	10	10	-	-	10
Measurement bandwidth	n_{PRB}	1,2,3,4	-	-	22-27	22-27	-
PDSCH Reference Measurement Channel 1: R.1 FDD 2: R.1 TDD	FDD	1,3	1	1	-	-	1
	TDD	2,4	2	2	-	-	2
PDCCH/PCFICH/PHICH Reference measurement channel defined in A.3.1.2.1 and A.3.1.2.2 in 36.133 1: R.6 FDD 2: R.6 TDD		1,3	1	1	-	-	1
		2,4	2	2	-	-	2
OCNG Patterns defined in A.3.2.1.1 (OP.2 FDD) and A.3.2.1.2 (OP.2 TDD) in 36.133 1: OP.2 FDD 2: OP.2 TDD		1,3	1				
		2,4	2				
Correlation Matrix and Antenna config		1,2,3,4	1x2 Low				
PBCH_RA	dB	1,2,3,4	N/A	N/A	0	0	N/A
PBCH_RB			N/A	N/A	0	0	N/A
PSS_RA			N/A	N/A	0	0	N/A
SSS_RA			N/A	N/A	0	0	N/A
PCFICH_RB			N/A	N/A	0	0	N/A
PHICH_RA			N/A	N/A	0	0	N/A
PHICH_RB			N/A	N/A	0	0	N/A
PDCCH_RA			N/A	N/A	0	0	N/A
PDCCH_RB			N/A	N/A	0	0	N/A
PDSCH_RA			N/A	N/A	0	0	N/A
PDSCH_RB			N/A	N/A	0	0	N/A
$OCNG_RA^{Note\ 1}$			N/A	N/A	0	0	N/A
$OCNG_RB^{Note\ 1}$			N/A	N/A	0	0	N/A
N_{oc} Note2	dBm/ 15kHz	1,2	-98	-98	-98	-98	-98
		3,4					
$\hat{E}_s/I_{ot}$	dB	1,2,3,4	5	5	-3	8	5
$\hat{E}_s/N_{oc}$	dB	1,2,3,4	5	5	-3	8	5
$RSRP^{Note3,4}$	dBm/SCS	1,2,3,4	-93	-93	-101	-90	-93
$Io^{Note3,4}$	dBm/ 9.36 MHz	1,2, 3, 4	-61.01	-61.01	-65.44	-58.57	-61.01
Qrxlevmin	dBm/SCS	1,2,3,4	-	-	-140		-

Pcompensation	dB	1,2,3,4	-	-	0	0	-
$Qhyst_s$	dB	1,2,3,4	-	-	0	0	-
$Qoffset_{s,n}$	dB	1,2,3,4	-	-	0	0	-
Cell_selection_and_ reselection_quality_measurement		1,2,3,4	RSRP and RSRQ				
Treselection	s	1,2,3,4	-		0		-
SnonintrasearchP	dB	1,2,3,4	-		Not sent		-
SnonintrasearchQ	dB	1,2,3,4	-		Not sent		-
Propagation Condition	dB	1,2,3,4	-		AWGN		-
Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.							
Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for N_{oc} to be fulfilled.							
Note 3: SSB_RP and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.							
Note 4: SSB_RP minimum requirements are specified assuming independent interference and noise at each receiver antenna port.							

Table 6.6.15.1.5-3: Absolute accuracy requirements for the Cell 1 and Cell 2 RSRP reported values for test configurations 1 and 2

Normal Conditions	T5
Lowest reported value (Cell 1)	52
Highest reported value (Cell 1)	75
Lowest reported value (Cell 2)	39
Highest reported value (Cell 2)	62

Table 6.6.15.1.5-4: Absolute accuracy requirements for the Cell 1 and Cell 2 RSRP reported values for test configurations 3

Normal Conditions	T5
Lowest reported value (Cell 1)	55
Highest reported value (Cell 1)	78
Lowest reported value (Cell 2)	39
Highest reported value (Cell 2)	62

Table 6.6.15.1.5-5: Absolute accuracy requirements for the Cell 1 and Cell 2 RSRQ reported values for test configurations 1, 2 and 3.

Normal Conditions	T5
Lowest reported value (Cell 1)	54
Highest reported value (Cell 1)	71
Lowest reported value (Cell 2)	6
Highest reported value (Cell 2)	27

During time durations T1 the UE shall start transmitting preamble on PSCell. During T2 the UE perform intra-frequency measurements on the PCell and the PSCell.

During the time-period T3 the connection is released, and UE enters idle mode. During the time period T3 and T4 the UE is camped in Idle mode and at T4 the signal level of cell 2 is changed. The UE shall not perform reselection. The UE shall perform Idle Mode DC/CA measurement according to Section 4.4.

At the start of T5 the UE is paged for connection setup. During the connection setup the UE is requested to transmit early measurement report. The UE shall send early measurement report to the PCell including idle mode CA/DC measurement from cell 2.

After receiving the requested early measurement report, the test equipment verifies that the accuracy of measurement reported for serving Cell 1 and Cell 2 meets the requirements in Sections 10.1.2B and 10.1.7B and Sections 10.2.4 and 10.2.5, respectively and test ends.

The rate of correct events observed during repeated tests shall be at least 90% with a confidence level of 95%.

6.6.16

6.6.17

6.6.18 SA event triggered reporting tests with concurrent gaps

6.6.18.0 Minimum conformance requirements

6.6.18.0.1 Minimum conformance requirements for Intra-frequency measurement

The UE shall be able to identify a new detectable intra-frequency cell within the time period specified in TS 38.133 [6].

Intra-frequency measurements without measurement gaps:

When UE supports *concurrentMeasGap-r17* and is configured with concurrent measurement gaps,

K_p is the scaling factor for an SSB frequency layer to be measured without measurement gaps. $K_p = N_{total} / N_{available}$, where $N_{available}$ and N_{total} are calculated as follows:

- For a window W of duration max(SMTC period, MGRP_max), where MGRP max is the maximum MGRP across all configured per-UE measurement gap and/or per-FR measurement gap within the same FR as the SSB frequency layer, and starting from the beginning of any SMTC occasion:
  - N_{total} is the total number of SMTC occasions within the window, including those overlapped with measurement gap occasions within the window, and
  - $N_{available}$ is the number of SMTC occasions that are not overlapped with any non-dropped MG occasion within the window W, after accounting for measurement gap collisions by applying the measurement gap collision rule in TS 38.133 [6] section 9.1.8.3.

    $K_p = 1$ when $N_{available} = 0$.
- Otherwise, when UE is not configured with or UE does not support concurrent measurement gaps:

  When intra-frequency SMTC is fully non overlapping with measurement gaps or intra-frequency SMTC is fully overlapping with MGs, $K_p = 1$

  When intra-frequency SMTC is partially overlapping with measurement gaps, K_p = 1/(1- (SMTC period /MGRP)), where SMTC period < MGRP. When intra-frequency SMTC is partially overlapping with the ML of NCSG, K_p = 1/(1- (SMTC period /VIRP)), where SMTC period < VIRP. For calculation of K_p, if the high layer signalling (TS 38.331 [13]) of *smtc2* is configured, for cells indicated in the *pci-List* parameter in *smtc2*, the SMTC periodicity corresponds to the value of higher layer parameter *smtc2*; for the other cells, the SMTC periodicity corresponds to the value of higher layer parameter *smtc1*.

  If the higher layer signalling in TS38.331 [13] signalling of *smtc2* is present and smtc1 is fully overlapping with measurement gaps and smtc2 is partially overlapping with measurement gaps, time period requirements are not specified to identify a new detectable intra-frequency cell.

Intra-frequency measurements with measurement gaps:

K_{gap} is the scaling factor for a SSB frequency layer to be measured within an associated measurement gap pattern. $K_{gap} = 1$ when the UE is not configured with concurrent measurement gaps or not supporting [concurrent measurement gaps]. Otherwise, $K_{gap} = N_{total} / N_{available}$, where $N_{available}$ and N_{total} are calculated as follows:

For a window W of duration max(SMTC period, MGRP_max), where MGRP max is the maximum MGRP across all configured per-UE measurement gap and per-FR measurement gap within the same FR as the SSB frequency layer, and starting from the beginning of any SMTC occasion:

- N_{total} is the total number of SMTC occasions that are covered by instances of the associated measurement gap within the window W, including those overlapped with other measurement gap occasions within the window, and

- $N_{available}$ is the number of SMTC occasions that are covered by instances of the non-dropped associated measurement gap within the window W after accounting for measurement gap collisions by applying the measurement gap collision rule in TS 38.133 [6] section 9.1.8.3.

When concurrent measurement gaps are configured, requirements in this clause do not apply if$N_{available}$ =0.

If the higher layer signalling in TS 38.331 [13] of *smtc2* is present and smtc1 is fully overlapping with measurement gaps and smtc2 is partially overlapping with measurement gaps, time period requirements are not specified for identify a new detectable intra-frequency cell.

The normative reference for this requirement is TS 38.133 [6] clauses 9.2.2, 9.2.4.3, 9.2.5 and 9.2.6.

6.6.18.0.2 Minimum conformance requirements for Inter-frequency measurement

The UE shall be able to identify a new detectable inter-frequency cell within the time period specified in TS 38.133 [6].

Inter-frequency measurements without measurement gaps:

When UE supports *concurrentMeasGap-r17* and is configured with concurrent measurement gaps,

K_p is a scaling factor for an SSB frequency layer to be measured without measurement gaps. $K_p = N_{total} / N_{available}$, where $N_{available}$ and N_{total} are calculated as follows:

For a window W of duration max(SMTC period, MGRP_max), where MGRP max is the maximum MGRP across all configured per-UE MG and per-FR MG within the same FR as the SSB frequency layer, and starting at the beginning of any SMTC occasion:

N_{total} is the total number of SMTC occasions within the window, including those overlapped with MG occasions within the window, and

$N_{available}$ is the number of SMTC occasions that are not overlapped with any MG occasion within the window W, after accounting for MG collisions by applying the selected gap collision rule provided that concurrent measurement gaps are configured.

$K_p = 1$ when $N_{available} = 0$.

Otherwise, when UE is not configured with or UE does not support concurrent measurement gaps:

When inter-frequency SMTC is fully non overlapping with measurement gaps or inter-frequency SMTC is fully overlapping with MGs, K_p =1.

When inter-frequency SMTC is partially overlapping with measurement gaps, K_p = 1/(1- (SMTC period /MGRP)), where SMTC period < MGRP. When inter-frequency SMTC is partially overlapping with the VIL of NCSG, K_p = 1/(1- (SMTC period /VIRP)), where SMTC period < VIRP.

Inter-frequency measurements with measurement gaps:

K_{gap} is a scaling factor for a SSB frequency layer to be measured within an associated measurement gap pattern. K_{gap} = 1 when the UE is not configured with concurrent measurement gaps. Otherwise, $K_{gap} = N_{total} / N_{available}$, where $N_{available}$ and N_{total} are calculated as follows:

- For a window W of duration max(SMTC period, MGRP_max), where MGRP_max is the maximum MGRP across all configured per-UE measurement gap(s) and per-FR measurement gap(s) within the same FR, and starting from the beginning of any SMTC occasion:

  - N_{total} is the total number of SMTC occasions that are covered by instances of the associated measurement gap within the window W, including those overlapped with other measurement gap occasions within the window, and

  - $N_{available}$ is the number of SMTC occasions that are covered by instances of the non-dropped associated measurement gap within the window W, after accounting for collisions between the measurement gaps by applying the measurement gap collision rule in TS 38.133 [6] section 9.1.8.3.

K_{gap} is only applicable for UE supporting *concurrentMeasGap-r17*. When concurrent measurement gaps are configured, requirements in this clause do not apply if $N_{available}$ =0.

The normative reference for this requirement is TS 38.133 [6] clause 9.3.2, 9.3.4, 9.3.5, 9.3.6.3, 9.3.9.

6.6.18.0.3 Minimum conformance requirements for Inter-RAT measurement

The requirements are application for NR−E-UTRAN FDD and NR−E-UTRAN TDD when DRX is used or not.

When the UE requires measurement gaps to identify and measure inter-RAT cells and an appropriate measurement gap pattern is scheduled, or when the UE is capable of concurrent measurement gap patterns and concurrent measurement gap patterns are scheduled, or the UE supports capability of conducting such measurements without gaps, the UE shall be able to identify a new detectable FDD or TDD cell within the time period specified in TS 38.133 [6].

For a UE supporting and configured with concurrent measurement gaps, K_{gap_EUTRA}: it is the scaling factor for an E-UTRAN frequency layer to be measured within the associated measurement gap pattern. K_{gap} = 1 when the UE is not configured with concurrent measurement gaps. Otherwise, $K_{gap_EUTRA} = N_{total} / N_{available}$ for UE configured with concurrent measurement gaps.

For a window W of duration MGRP_max, where MGRP_max is the maximum MGRP across all configured per-UE measurement gap(s) and per-FR measurement gap(s) for FR1, and starting from the beginning of any associated gap occasion:

N_{total} is the total number of associated gap occasions within the window, including those overlapped with other MG occasions within the window, and

$N_{available}$ is the number of non-dropped associated measurement gap occasions after accounting for collisions between the measurement gaps by applying the measurement gap collision rule in TS 38.133 [6] section 9.1.8.3.

Requirements do not apply for UE configured with concurrent measurement gaps, if $N_{available}$=0

The normative reference for this requirement is TS 38.133 [6] clause 9.4.2, 9.4.3.

6.6.18.0.4 Minimum conformance requirements for PRS measurement

When physical layer receives last of *NR-TDOA-ProvideAssistanceData* message and *NR-TDOA-RequestLocationInformation* message from LMF via LPP specified in TS 37.355 [38], the UE shall be able to measure multiple (up to the UE capability specified in TS 38.133 [6] Clause 9.9.2.3) DL RSTD measurements, defined in TS 38.215 [10], during the measurement period defined in TS 38.133 [6] Clause 9.9.2.5

$K_{p,PRS,i}$ is a scaling factor for a positioning frequency layer to be measured within the associated measurement gap pattern, which is defined as $K_{p,PRS,i} = N_{total} / N_{available}$ for UE configured with concurrent measurement gap, and $K_{p,PRS,i}$ = 1 for UE not configured with concurrent measurement gap.

- For a window W of duration max($T_{PRS,i}$, MGRP_max), where MGRP max is the maximum MGRP across all configured per-UE MG and per-FR MG within the same FR as the positioning frequency layer, and starting at the beginning of any associated gap occasions covering the PRS occasion:
  - N_{total} is the total number of associated gap occasions covering PRS occasions within the window, including those overlapped with other MG occasions within the window, and
  - $N_{available}$ is the number of non-dropped associated gap occasions covering PRS occasions within the window W, after further accounting for MG collisions by applying the selected gap collision rule
  - Requirements do not apply if $N_{available}$ =0.

The normative reference for this requirement is TS 38.133 [6] clause 9.9.2.

6.6.18.1 NR SA FR1 event-triggered reporting for concurrent gaps non-overlap with SSB-based measurements in both inter-frequency layers

Editor's Note: This test case is incomplete in following aspects:

- Concurrent gap configuration is missing in Annex Table H.3.1-6
- TT analysis is missing.
- Initial conditions and message contents contain []

6.6.18.1.1 Test purpose

The purpose of this test is to verify UE's ability to make a correct reporting for concurrent gaps non-overlap with SSB-based measurement in both inter-frequency layers within inter-frequency cell search requirements in TS 38.133 [6] clause 9.3.4.

6.6.18.1.2 Test applicability

This test applies to all types of NR UEs supporting concurrent gap capability from release 17 onwards.

6.6.18.1.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 6.6.18.0.2.

The normative reference for this requirement is TS 38.133 [6] clause A.6.6.18.1.

6.6.18.1.4 Test description

6.6.18.1.4.1 Initial conditions

This test shall be tested using any of the test configurations in Table 6.6.18.1.4.1-1.

Table 6.6.18.1.4.1-1: Supported test configurations

Config	Description
6.6.18.1-1	NR 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode
6.6.18.1-2	NR 15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode
6.6.18.1-3	NR 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode
Note 1: The UE is only required to be tested in one of the supported test configurations Note 2: Target NR cells have the same SCS, BW and duplex mode as NR serving cells	

Test environment parameters are given in Table 6.6.18.1.4.1-2.

Table 6.6.18.1.4.1-2: Test environment parameters

Parameter	Value		Comment
Test environment	NC		As specified in TS 38.508-1 [14] clause 4.1.
Test frequencies	As specified in Annex E, table E.4-1 and TS 38.508-1 [14] clause 4.3.1 and 4.4.2.		
Channel bandwidth	As specified by the test configuration selected from Table 6.6.18.1.4.1-1.		
Propagation conditions	AWGN		As specified in Annex C.2.2.
Connection Diagram	TE Part	A.3.1.8.2	As specified in TS 38.508-1 [14] Annex A.
	DUT Part	A.3.2.3.4	
Exceptions to connection diagram	- Without LTE link - For 4Rx capable UEs without any 2Rx RF bands use A.3.1.8.4 for TE part and A.3.2.5.2 for DUT part.		

1. The general test parameter settings are set up according to Table 6.6.18.1.4.1-3.

2. Message contents are defined in clause 6.6.18.1.4.3.

3. There are three NR carriers and three cells specified in the test. Cell 1 (NR cell 1) is the cell used for connection setup with the power level set according to Annex C.1.2 and C.1.3 for this test.

Table 6.6.18.1.4.1-3: General test parameters for SA inter-frequency event triggered reporting for FR1 concurrent gaps with fully non-overlapping scenario for SSB-based measurements in both inter-frequency layers

Parameter	Unit	Test configuration	Value	Comment

NR RF Channel Number		Config 1,2,3	1, 2, 3		Three FR1 NR carrier frequencies are used.
Active cell		Config 1,2,3	NR cell 1 (Pcell)		NR Cell 1 is on NR RF channel number 1.
Neighbour cell		Config 1,2,3	NR cells 2 and 3		NR cell 2 is on NR RF channel number 2. NR cell 3 is on NR RF channel number 3.
Gap Pattern Id		Config 1,2,3	0 for MeasGapId #0 1 for MeasGapId #1		As specified in clause 9.1.2-1.
Measurement gap offset		Config 1,2,3	39 for MeasGapId #0 19 for MeasGapId #1		
A3-Offset	dB	Config 1,2,3	-6		
Hysteresis	dB	Config 1,2,3	0		
CP length		Config 1,2,3	Normal		
TimeToTrigger	s	Config 1,2,3	0		
Filter coefficient		Config 1,2,3	0		L3 filtering is not used
DRX		Config 1,2,3	OFF		DRX is not used
Time offset between serving and neighbour cell 1		Config 1, 2, 3	3μs		Synchronous.
Time offset between serving and neighbour cell 2		Config 1, 2, 3	[5ms]		[Asynchronous. The timing of Cell 3 is 5ms later than the timing of Cell 1.]
T1	s	Config 1,2,3	5		
T2	s	Config 1,2,3	1.5	1.5	

6.6.18.1.4.2 Test procedure

In this test, there are three cells: NR cell 1 as PCell in FR1 on NR RF channel 1, NR cell 2 (Cell 2) as neighbour cell 1 in FR1 on NR RF channel 2, and NR cell 3 (Cell 3) as neighbour cell 2 in FR1 on NR RF channel 3. The test parameters are given in Table 6.6.18.1.4.1-3 and Table 6.6.18.1.5-1 respectively.

Two measurement gap patterns (MeasGapId #0 and MeasGapId #1) are configured with the gap pattern ID #0 and #1 as defined in Table 6.6.18.1.4.1-3. MeasGapId #1 is configured with a higher priority than MeasGapId #0. MeasGapId #0 and MeasGapId #1 are associated with the MOs for RF channel numbers #2 and #3 respectively.

In the measurement control information, it is indicated to the UE that event-triggered reporting with Event A3 is used for both frequency layers. The test consists of two successive time periods, with time duration of T1 and T2 respectively. During time duration T1, the UE shall not have any timing information of NR cell 2 and NR cell 3.

1. Ensure the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity NR SA, Connected without release *On* and Test Mode *On* according to TS 38.508-1 [14] clause 4.5.

2. Set the parameters according to T1 in Table 6.6.18.1.5-1.

3. SS shall transmit an *RRCReconfiguration* message.

4. The UE shall transmit *RRCReconfigurationComplete* message. T1 starts.

5. When T1 expires, the SS shall switch the power setting from T1 to T2 as specified in Table 6.6.18.1.5-1. T2 starts.

6. UE shall transmit a *MeasurementReport* message triggered by Event A3. If Cell2's overall delays measured from the beginning of time period T2 is less than 920 ms, and Cell3's overall delays measured from the beginning of time period T2 is less than 1280 ms, then the number of successful tests is increased by one. If the UE fails to report the events within the overall delays measured requirements, then the number of failure tests is increased by one.

7. After the SS receive the MeasurementReport message in step 6 or when T2 expires, the SS shall:

   - transmit RRCRelease message to release the RRC connection which includes the release of the established radio bearers as well as all radio resources

   OR

- switch the UE off.

8. Set Cell 2 physical cell identity = ((current cell 2 physical cell identity + 1) mod 14 + 2) for next iteration of the test procedure loop. And set Cell 3 physical cell identity = ((current cell 3 physical cell identity + 1) mod 14 + 2) for next iteration of the test procedure loop.

9. Depending on the choice in Step 7, the SS:
   - if the RRC Connection Release has been sent, transmits in Cell 1 a Paging message (including PagingRecord with UE-Identity) for the UE and ensures the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity NR SA, Connected without release On according to TS 38.508-1 [14] clause 4.5 (if the paging fails, switches off and on the UE and ensures the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity NR, Connected without release On according to TS 38.508-1 [14] clause 4.5),
   OR
   - if the device has been switched off, switches on the UE and ensures the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity NR SA, Connected without release On according to TS 38.508-1 [14] clause 4.5.

10. Repeat step 2-9 until the confidence level according to Tables G.2.3-1 in Annex G clause G.2 is achieved.

6.6.18.1.4.3 Message contents

Message contents are according to TS 38.508-1 [14] clause 4.6 with the following exceptions:

Table 6.6.18.1.4.3-1: Common Exception messages

Default Message Contents	
Common contents of system information blocks exceptions	
Default RRC messages and information elements contents exceptions	Table H.3.1-1 Table H.3.1-2 with conditions INTER-FREQ and GAP NEEDED Table H.3.1-4 with A3-offset = -6dB Table H.3.1-5 Table H.3.1-6 with conditions [TBD] Table H.3.1-7 with condition INTER-FREQ
Specific message contents exceptions for Cell 2	Table H.3.1-3 with conditions INTER-FREQ MO and Synchronous cells Table 7.3.1-3 in TS 38.508-1 [14] with condition SMTC.2
Specific message contents exceptions for Cell 3	Table H.3.1-3 with condition INTER-FREQ MO Table 7.3.1-3 in TS 38.508-1 [14] with condition SMTC.2

6.6.18.1.5 Test requirement

Table 6.6.18.1.5-1 defines the primary level settings including test tolerances for all tests.

Table 6.6.18.1.5-1: Cell specific test parameters for SA inter-frequency event triggered reporting for FR1 concurrent gaps with fully non-overlapping scenario for SSB-based measurements in both inter-frequency layers

Parameter	Unit	Test configuration	Cell 1		Cell 2		Cell 3	
			T1	T2	T1	T2	T1	T2
NR RF Channel Number		Config 1,2,3	1		2		3	
Duplex mode		Config 1	FDD					
		Config 2,3	TDD					
TDD configuration		Config 1	Not Applicable					
		Config 2	TDDConf.1.1					
		Config 3	TDDConf.2.1					
$BW_{channel}$	MHz	Config 1,2	10: $N_{RB,c}$ = 52					
		Config 3	40: $N_{RB,c}$ = 106					
BWP BW	MHz	Config 1,2	10: $N_{RB,c}$ = 52					
		Config 3	40: $N_{RB,c}$ = 106					

BWP configuration	Initial DL BWP		Config 1, 2, 3	DLBWP.0.1		NA		NA	
	Initial UL BWP			ULBWP.0.1		NA		NA	
	Dedicated DL BWP			DLBWP.1.1		NA		NA	
	Dedicated UL BWP			ULBWP.1.1		NA		NA	
TRS configuration			Config 1	TRS.1.1 FDD		NA		NA	
			Config 2	TRS.1.1 TDD		NA		NA	
			Config 3	TRS.1.2 TDD		NA		NA	
OCNG Patterns defined in A.3.2.1.1 (OP.1)			Config 1,2,3	OP.1		OP.1		OP.1	
PDSCH Reference measurement channel			Config 1	SR.1.1 FDD					
			Config 2	SR.1.1 TDD					
			Config 3	SR.2.1 TDD					
RMSI CORESET Reference Channel			Config 1	CR.1.1 FDD					
			Config 2	CR.1.1 TDD					
			Config 3	CR.2.1 TDD					
Dedicated CORESET Reference Channel			Config 1	CCR.1.1 FDD					
			Config 2	CCR.1.1 TDD					
			Config 3	CCR.2.1 TDD					
SSB parameters			Config 1,2,3	SSB.1 FR1		SSB.1 FR1		SSB.1 FR1	
SMTC configuration defined in A.3.11			Config 1,2,3	SMTC.2		SMTC.2		SMTC.2	
PDSCH/PDCCH subcarrier spacing		kHz	Config 1,2	15					
			Config 3	30					
EPRE ratio of PSS to SSS			Config 1,2,3	0		0		0	
EPRE ratio of PBCH DMRS to SSS									
EPRE ratio of PBCH to PBCH DMRS									
EPRE ratio of PDCCH DMRS to SSS									
EPRE ratio of PDCCH to PDCCH DMRS									
EPRE ratio of PDSCH DMRS to SSS									
EPRE ratio of PDSCH to PDSCH									
EPRE ratio of OCNG DMRS to SSS(Note 1)									
EPRE ratio of OCNG to OCNG DMRS (Note 1)									
N_{oc} Note2		dBm/15kHz		-98		-98		-98	
N_{oc} Note2		dBm/SCS	Config 1,2	-98		-98		-98	
			Config 3	-95		-95		-95	
SS-RSRP Note 3		dBm/SCS	Config 1,2	-94	-94	-Infinity	-91	-Infinity	-91
			Config 3	-91	-91	-Infinity	-88	-Infinity	-88
$\hat{E}_s/I_{ot}$		dB	Config 1,2,3	4	4	-Infinity	7	-Infinity	7
$\hat{E}_s/N_{oc}$		dB	Config 1,2,3	4	4	-Infinity	7	-Infinity	7
Io Note3		dBm/9.36MHz	Config 1,2	-64.59	-64.59	-70.05	-62.26	-70.05	-62.26

	dBm/38.16MHz	Config 3	-58.49	-58.49	-63.94	-56.15	-63.94	-56.15
Propagation Condition		Config 1,2,3	AWGN		AWGN		AWGN	

Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.

Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for N_{oc} to be fulfilled.

Note 3: SS-RSRP and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.

Note 4: SS-RSRP minimum requirements are specified assuming independent interference and noise at each receiver antenna port.

The UE shall send one Event A3 triggered measurement report for each neighbouring cell, with a measurement reporting delay less than 920 ms for cell 2 and 1280ms for cell 3 from the beginning of time period T2. The UE shall not send event triggered measurement reports, as long as the reporting criteria are not fulfilled. The rate of correct events observed during repeated tests shall be at least 90% with a confidence level of 95%.

UE is not required to report SSB time index.

NOTE: The actual overall delays measured in the test may be up to $2xTTI_{DCCH}$ higher than the measurement reporting delays above because of TTI insertion uncertainty of the measurement report in DCCH.

6.6.18.2 NR SA FR1 event-triggered reporting for concurrent gaps partially-overlap with SSB-based measurements in both inter-frequency layers

Editor's Note: This test case is incomplete in following aspects:

- Concurrent gap configuration is missing in Annex Table H.3.1-6
- TT analysis is missing.
- Message contents and test requirement contain []

6.6.18.2.1 Test purpose

The purpose of this test is to verify UE's ability to make a correct reporting for concurrent gaps partially-overlap with SSB-based measurement in both inter-frequency layers within inter-frequency cell search requirements in TS 38.133 [6] clause 9.3.4.

6.6.18.2.2 Test applicability

This test applies to all types of NR UEs supporting concurrent gap capability from release 17 onwards.

6.6.18.2.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 6.6.18.0.2.

The normative reference for this requirement is TS 38.133 [6] clause A.6.6.18.2.

6.6.18.2.4 Test description

6.6.18.2.4.1 Initial conditions

This test shall be tested using any of the test configurations in Table 6.6.18.2.4.1-1.

Table 6.6.18.2.4.1-1: Supported test configurations

Config	Description
6.6.18.2-1	NR 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode
6.6.18.2-2	NR 15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode
6.6.18.2-3	NR 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode

Note 1: The UE is only required to be tested in one of the supported test configurations

Note 2: Target NR cells have the same SCS, BW and duplex mode as NR serving cells

Test environment parameters are given in Table 6.6.18.2.4.1-2.

Table 6.6.18.2.4.1-2: Test environment parameters

Parameter	Value		Comment
Test environment	NC		As specified in TS 38.508-1 [14] clause 4.1.
Test frequencies	As specified in Annex E, table E.4-1 and TS 38.508-1 [14] clause 4.3.1 and 4.4.2.		
Channel bandwidth	As specified by the test configuration selected from Table 6.6.18.1.4.1-1.		
Propagation conditions	AWGN		As specified in Annex C.2.2.
Connection Diagram	TE Part	A.3.1.8.2	As specified in TS 38.508-1 [14] Annex A.
	DUT Part	A.3.2.3.4	
Exceptions to connection diagram	- Without LTE link - For 4Rx capable UEs without any 2Rx RF bands use A.3.1.8.4 for TE part and A.3.2.5.2 for DUT part.		

1. The general test parameter settings are set up according to Table 6.6.18.2.4.1-3.

2. Message contents are defined in clause 6.6.18.2.4.3.

3. There are three NR carriers and three cells specified in the test. Cell 1 (NR cell 1) is the cell used for connection setup with the power level set according to Annex C.1.2 and C.1.3 for this test.

Table 6.6.18.2.4.1-3: General test parameters for SA inter-frequency event triggered reporting for FR1 concurrent gap with partial overlapping scenario for SSB-based measurements in both inter-frequency layers

Parameter	Unit	Test configuration	Value		Comment
NR RF Channel Number		Config 1,2,3	1, 2, 3		Three FR1 NR carrier frequencies are used.
Active cell		Config 1,2,3	NR cell 1 (Pcell)		NR Cell 1 is on NR RF channel number 1.
Neighbour cell		Config 1,2,3	NR cells 2 and 3		NR cell 2 is on NR RF channel number 2. NR cell 3 is on NR RF channel number 3.
Gap Pattern Id		Config 1,2,3	0 for MeasGapId #1 1 for MeasGapId #2		As specified in clause 9.1.2-1.
Measurement gap offset	ms	Config 1,2,3	39 for MeasGapId #1 4 for MeasGapId #2		
A3-Offset	dB	Config 1,2,3	-6		
Hysteresis	dB	Config 1,2,3	0		
CP length		Config 1,2,3	Normal		
TimeToTrigger	s	Config 1,2,3	0		
Filter coefficient		Config 1,2,3	0		L3 filtering is not used
DRX		Config 1,2,3	OFF		DRX is not used
Time offset between serving and neighbour cell 1		Config 1, 2, 3	3μs		Synchronous.
Time offset between serving and neighbour cell 2		Config 1, 2, 3	5ms		Asynchronous. The timing of Cell 3 is 5ms later than the timing of Cell 1.
T1	s	Config 1,2,3	5		
T2	s	Config 1,2,3	1.5	1.5	

6.6.18.2.4.2 Test procedure

In this test, there are three cells: NR cell 1 as PCell in FR1 on NR RF channel 1, NR cell 2 (Cell 2) as neighbour cell 1 in FR1 on NR RF channel 2, and NR cell 3 (Cell 3) as neighbour cell 2 in FR1 on NR RF channel 3. The test

parameters are given in Table 6.6.18.2.4.1-3, and Table 6.6.18.2.5-1 respectively. The TE schedules continuous DL data on PCell throughout the test.

Two measurement gap patterns (MeasGapId #1 and MeasGapId #2) are configured with the gap pattern ID #0 and #1 as defined in Table 6.6.18.2.4.1-3. MeasGapId #2 is configured with a higher priority than MeasGapId #1. MeasGapId #1 and MeasGapId #2 are associated with the MOs for RF channel numbers #2 and #3, respectively.

In the measurement control information, it is indicated to the UE that event-triggered reporting with Event A3 is used for both frequency layers. The test consists of two successive time periods, with time duration of T1, and T2 respectively. During time duration T1, the UE shall not have any timing information of NR cell 2 and NR cell 3.

1. Ensure the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity NR SA, Connected without release *On* and Test Mode *On* according to TS 38.508-1 [14] clause 4.5.

2. Set the parameters according to T1 in Table 6.6.18.2.5-1.

3. The SS shall transmit an *RRCReconfiguration* message.

4. The UE shall transmit *RRCReconfigurationComplete* message. T1 starts.

5. The SS shall configure transmission of PDSCH with a maximum number of 1 HARQ transmission in Cell 1.

6. When T1 expires, the SS shall switch the power setting from T1 to T2 as specified in Table 6.6.18.2.5-1. T2 starts.

7. UE shall transmit a *MeasurementReport* message triggered by Event A3. If the overall delays measured from the beginning of time period T2 is less than 1280 ms for both Cell 2 and Cell 3, then the number of successful tests is increased by one. If the UE fails to report the event within the overall delays measured requirement, then the number of failure tests is increased by one.

8. After the SS receives the *MeasurementReport* message in step 7 or when T2 expires, the SS shall:

   - transmit RRCRelease message to release the RRC connection which includes the release of the established radio bearers as well as all radio resources

   OR

   - switch the UE off.

9. Set Cell 2 physical cell identity = ((current cell 2 physical cell identity + 1) mod 14 + 2) for next iteration of the test procedure loop. And set Cell 3 physical cell identity = ((current cell 3 physical cell identity + 1) mod 14 + 2) for next iteration of the test procedure loop.

10. Depending on the choice in Step 8, the SS:

    - if the RRC Connection Release has been sent, transmits in Cell 1 a *Paging* message (including PagingRecord with UE-Identity) for the UE and ensures the UE in state RRC_CONNECTED with generic procedure parameters Connectivity NR SA, Connected without release *On* according to TS 38.508-1 [14] clause 4.5. (if the paging fails, switches off and on the UE and ensures the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity NR SA, Connected without release *On* according to TS 38.508-1 [14] clause 4.5.),
    OR:
    - if the device has been switched off, switches on the UE and ensures the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity NR SA, Connected without release *On* according to TS 38.508-1 [14] clause 4.5.

11. Repeat step 2-10 until the confidence level according to Tables G.2.3-1 in Annex G clause G.2 is achieved.

6.6.18.2.4.3 Message contents

Message contents are according to TS 38.508-1 [14] clause 4.6 with the following exceptions:

Table 6.6.18.2.4.3-1: Common Exception messages

Default Message Contents

Common contents of system information blocks exceptions	
Default RRC messages and information elements contents exceptions	Table H.3.1-1 Table H.3.1-2 with conditions INTER-FREQ and GAP NEEDED Table H.3.1-4 with A3-offset = -6dB Table H.3.1-5 Table H.3.1-6 with condition [TBD] Table H.3.1-7 with condition INTER-FREQ
Specific message contents exceptions for Cell 2	Table H.3.1-3 with conditions INTER-FREQ MO and Synchronous cells Table 7.3.1-3 in TS 38.508-1 [14] with condition SMTC.2
Specific message contents exceptions for Cell 3	Table H.3.1-3 with condition INTER-FREQ MO Table 7.3.1-3 in TS 38.508-1 [14] with condition [SMTC.Y]

6.6.18.2.5 Test requirement

Table 6.6.18.2.5-1 defines the primary level settings including test tolerances for all tests.

Table 6.6.18.2.5-1: Cell specific test parameters for SA inter-frequency event triggered reporting for FR1 concurrent gap with partial-overlapping scenario for SSB-based measurements in both inter-frequency layers

Parameter		Unit	Test configuration	Cell 1		Cell 2		Cell 3	
				T1	T2	T1	T2	T1	T2
NR RF Channel Number			Config 1,2,3	1		2		3	
Duplex mode			Config 1	FDD					
			Config 2,3	TDD					
TDD configuration			Config 1	Not Applicable					
			Config 2	TDDConf.1.1					
			Config 3	TDDConf.2.1					
$BW_{channel}$		MHz	Config 1,2	10: $N_{RB,c}$ = 52					
			Config 3	40: $N_{RB,c}$ = 106					
BWP BW		MHz	Config 1,2	10: $N_{RB,c}$ = 52					
			Config 3	40: $N_{RB,c}$ = 106					
BWP configuration	Initial DL BWP		Config 1, 2, 3	DLBWP.0.1		NA		NA	
	Initial UL BWP			ULBWP.0.1		NA		NA	
	Dedicated DL BWP			DLBWP.1.1		NA		NA	
	Dedicated UL BWP			ULBWP.1.1		NA		NA	
TRS configuration			Config 1	TRS.1.1 FDD		NA		NA	
			Config 2	TRS.1.1 TDD		NA		NA	
			Config 3	TRS.1.2 TDD		NA		NA	
OCNG Patterns defined in A.3.2.1.1 (OP.1)			Config 1,2,3	OP.1		OP.1		OP.1	
PDSCH Reference measurement channel			Config 1	SR.1.1 FDD					
			Config 2	SR.1.1 TDD					
			Config 3	SR.2.1 TDD					
RMSI CORESET Reference Channel			Config 1	CR.1.1 FDD					
			Config 2	CR.1.1 TDD					
			Config 3	CR.2.1 TDD					
Dedicated CORESET Reference Channel			Config 1	CCR.1.1 FDD					
			Config 2	CCR.1.1 TDD					
			Config 3	CCR.2.1 TDD					
SSB parameters			Config 1,2,3	SSB.1 FR1		SSB.1 FR1		SSB.1 FR1	
SMTC configuration defined in A.3.11			Config 1,2,3	SMTC.2		SMTC.2		[SMTC.Y]	

PDSCH/PDCCH subcarrier spacing	kHz	Config 1,2	15					
		Config 3	30					
EPRE ratio of PSS to SSS		Config 1,2,3	0		0		0	
EPRE ratio of PBCH DMRS to SSS								
EPRE ratio of PBCH to PBCH DMRS								
EPRE ratio of PDCCH DMRS to SSS								
EPRE ratio of PDCCH to PDCCH DMRS								
EPRE ratio of PDSCH DMRS to SSS								
EPRE ratio of PDSCH to PDSCH								
EPRE ratio of OCNG DMRS to SSS(Note 1)								
EPRE ratio of OCNG to OCNG DMRS (Note 1)								
N_{oc} Note2	dBm/15kHz		-98		-98		-98	
N_{oc} Note2	dBm/SCS	Config 1,2	-98		-98		-98	
		Config 3	-95		-95		-95	
SS-RSRP Note 3	dBm/SCS	Config 1,2	-94	-94	-Infinity	-91	-Infinity	-91
		Config 3	-91	-91	-Infinity	-88	-Infinity	-88
$\hat{E}_s/I_{ot}$	dB	Config 1,2,3	4	4	-Infinity	7	-Infinity	7
$\hat{E}_s/N_{oc}$	dB	Config 1,2,3	4	4	-Infinity	7	-Infinity	7
Io Note3	dBm/9.36 MHz	Config 1,2	-64.59	-64.59	-70.05	-62.26	-70.05	-62.26
	dBm/38.16MHz	Config 3	-58.49	-58.49	-63.94	-56.15	-63.94	-56.15
Propagation Condition		Config 1,2,3	AWGN		AWGN		AWGN	

Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.

Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for N_{oc} to be fulfilled.

Note 3: SS-RSRP and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.

Note 4: SS-RSRP minimum requirements are specified assuming independent interference and noise at each receiver antenna port.

The UE shall send one Event A3 triggered measurement report for each neighbouring cell, with a measurement reporting delay less than 1280 ms from the beginning of time period T2. The UE shall not send event triggered measurement reports, as long as the reporting criteria are not fulfilled. The rate of correct events observed during repeated tests shall be at least 90% with a confidence level of 95%.

UE is not required to report SSB time index.

NOTE: The actual overall delays measured in the test may be up to $2xTTI_{DCCH}$ higher than the measurement reporting delays above because of TTI insertion uncertainty of the measurement report in DCCH.

6.6.18.3 NR SA FR1 NR - E-UTRAN and NR FR1 concurrent event-triggered reporting in non-DRX in FR1

Editor's Note: This test case is incomplete in following aspects:

- Concurrent gap configuration is missing in Annex Table H.3.1-6
- TT analysis is missing.
- Initial conditions and message contents contain []

6.6.18.3.1 Test purpose

The purpose of this test is to verify that the UE makes correct event-triggered reporting of concurrent inter-RAT E-UTRAN and NR FR1 measurements when operating in standalone (SA) operation with PCell in FR1.

6.6.18.3.2 Test applicability

This test applies to all types of NR UEs supporting concurrent gap capability from release 17 onwards.

6.6.18.3.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 6.6.18.0.2.

The normative reference for this requirement is TS 38.133 [6] clause A.6.6.18.3.

6.6.18.3.4 Test description

6.6.18.3.4.1 Initial conditions

This test shall be tested using any of the test configurations in Table 6.6.18.3.4.1-1.

Table 6.6.18.3.4.1-1: Supported test configurations

Configuration	Description
6.6.18.3-1	NR 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode, LTE FDD 10MHz
6.6.18.3-2	NR 15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode, LTE FDD 10MHz
6.6.18.3-3	NR 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode, LTE FDD 10MHz
6.6.18.3-4	NR 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode, LTE TDD 10MHz
6.6.18.3-5	NR 15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode, LTE TDD 10MHz
6.6.18.3-6	NR 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode, LTE TDD 10MHz
Note: The UE is only required to be tested in one of the supported test configurations	

Test environment parameters are given in Table 6.6.18.3.4.1-2.

Table 6.6.18.3.4.1-2: Test environment parameters

Parameter	Value		Comment
Test environment	NC		As specified in TS 38.508-1 [14] clause 4.1.
Test frequencies	As specified in Annex E, table E.4-1 and TS 38.508-1 [14] clause 4.3.1 and 4.4.2.		
Channel bandwidth	As specified by the test configuration selected from Table 6.6.18.3.4.1-1.		
Propagation conditions	AWGN		As specified in Annex C.2.2.
Connection Diagram	TE Part	A.3.1.8.2	As specified in TS 38.508-1 [14] Annex A.
	DUT Part	A.3.2.3.4	
Exceptions to connection diagram	- Without LTE link - For 4Rx capable UEs without any 2Rx RF bands use A.3.1.8.4 for TE part and A.3.2.5.2 for DUT part.		

1. The general test parameter settings are set up according to Table 6.6.18.3.4.1-3.
2. Message contents are defined in clause 6.6.18.3.4.3.
3. There are two NR carriers and one E-UTRA cell specified in the test. Cell 1 (NR cell 1) is the cell used for connection setup with the power level set according to Annex C.1.2 and C.1.3 for this test.

Table 6.6.18.3.4.1-3: General test parameters for NR SA FR1 NR - E-UTRAN and NR FR1 concurrent event-triggered reporting in non-DRX in FR1

Parameter	Unit	Test configuration	Value	Comment

NR RF Channel Number		1 - 6	1, 2	2 NR carrier frequency is used in the test. 1 FR1 and FR2 carrier frequency.
LTE RF Channel Number				1 LTE carrier frequency is used in the test
Channel Bandwidth	MHz	1 - 6	As specified in Tables A.6.6.3.1.1-2 and A.6.6.3.1.1-3.	
Active cell		1 - 6	NR Cell 1 (PCell in FR1)	Cell 1 is on RF channel number 1
Neighbour cell 1		1 - 6	Cell 2 (NR FR2)	Cell 2 is on RF channel number 2
Neighbour cell 2		1 - 6	Cell 3 (LTE)	Cell 3 is on RF channel number 3
Gap Pattern Id #1		1 - 6	0	As specified in Clause Table 9.1.2-1. Per-UE gap pattern.
Gap Pattern Id #2		1 - 6	0	Gap Pattern Id #2 is offset 20ms compared to Gap Pattern Id #1
Measurement gap offset		1 – 6	19 for Gap pattern Id #1	
NR measurement quantity			SS-RSRP	Measurement quantity for Cell 1
NR measurement quantity			SS-RSRP	Measurement quantity for Cell 2
Inter-RAT E-UTRAN measurement quantity			RSRP	Measurement quantity for Cell 3
CSI-RS for tracking parameters on NR RF Channel 1		1, 4	TRS.1.1 FDD	
		2, 5	TRS.1.1 TDD	
		3, 6	TRS.1.2 TDD	
SMTC-SSB parameters on NR RF Channel 1		1, 4	SSB.1 FR1	As specified in clause A.3.10.1
		2, 5	SSB.1 FR1	As specified in clause A.3.10.1
		3, 6	SSB.2 FR1	As specified in clause A.3.10.1
SMTC-SSB parameters on NR RF Channel 2		1 - 6	SSB.3 FR2	As specified in clause A.3.10.2
b2-Threshold1	dBm		Note 1	SS-RSRP threshold for SS-RSRP measurement on Cell 3 for event B2
b2-Threshold2EUTRA	dBm		-95	E-UTRAN RSRP threshold for SS-RSRP measurement on Cell 3 for event B2
Hysteresis	dB	1 – 6	0	
TimeToTrigger	s	1 – 6	0	
Filter coefficient		1 – 6	0	L3 filtering is not used
offsetMO	dB	1 - 6	6	NR Cell 2
a4-Threshold	dBm	1 – 6	-105	NR Cell 2
DRX			OFF	OFF
Time offset between serving and neighbour cells		1, 4	3ms	Asynchronous cells NR cells. The timing of Cell 2 is 3ms later than the timing of Cell 1.
		2, 3, 5, 6	3μs	Synchronous NR cells.
T1	s	1 – 6	5	for LTE Cell 3 and NR FR2 Cell 2
T2	s	1 - 6	5	for LTE Cell 3
			5.2 for PC1; 3.5 for other PC	for NR FR2 Cell 2

6.6.18.3.4.2 Test procedure

In this test, there are three cells: Cell 1 is the NR PCell, Cell 2 is an Inter-frequency NR FR1 neighbour cell on NR RF channel 2 and Cell 3 is an inter-RAT E-UTRAN neighbour cell. The test parameters are given in Table 6.6.18.3.4.1-3 and Tables 6.6.18.3.5-1/2 respectively.

In the measurement control information from the PCell it is indicated to the UE that event-triggered reporting with Event B2 (PCell becomes worse than threshold1 and inter RAT neighbour becomes better than threshold2) is to be used for the E-UTRAN cell (cell 3). In the measurement control information, it is indicated to the UE that event-triggered reporting with Event A4 is used for the NR FR1 cell (cell 2).

Each test consists of two consecutive time periods, with durations T1 and T2, respectively. Prior to the start of time duration T1, the UE shall be fully synchronized to Cell 1. During T1, the UE shall not have any information on Cell 2 and Cell 3.

Two concurrent per-UE measurement gap pattern configurations # 0 as defined in Table 6.6.18.3.4.1-3 are provided for a UE. Two measurement gap patterns (MeasGapId #0 and MeasGapId #1) are configured with the gap pattern ID #0 as defined in Table 6.6.18.3.4.1-3. MeasGapId #1 is configured with a higher priority than MeasGapId #0. MeasGapId #0 and MeasGapId #1 are associated with the MOs for RF channel numbers #1 and #2, respectively.

1. Ensure the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity NR SA, Connected without release *On* and Test Mode *On* according to TS 38.508-1 [14] clause 4.5.

2. Set the parameters according to T1 in Tables 6.6.18.3.5-1/2.

3. SS shall transmit an *RRCReconfiguration* message to configure Event A4 triggered measurement report for Cell 2, Event B2 triggered measurement report for Cell 3 to the PCell and two concurrent per-UE measurement gap patterns.

4. The UE shall transmit *RRCReconfigurationComplete* message. T1 starts.

5. When T1 expires, the SS shall switch the power setting from T1 to T2 as specified in Tables 6.6.18.3.5-1/2. T2 starts.

6. UE shall transmit a *MeasurementReport* message triggered by Event A4. If Cell2's overall delays measured from the beginning of period T2 is less than 5120 ms for UE supporting power class 1, or 3200 ms for UE supporting other power class, and Cell3's overall delays measured from the beginning of period T2 is less than 3.84 s, then the number of successful tests is increased by one. If the UE fails to report the events within the overall delays measured requirements, then the number of failure tests is increased by one.

7. After the SS receive the MeasurementReport message in step 6 or when T2 expires, the SS shall:

   - transmit RRCRelease message to release the RRC connection which includes the release of the established radio bearers as well as all radio resources

   OR

   - switch the UE off.

8. Set Cell 2 physical cell identity = ((current cell 2 physical cell identity + 1) mod 14 + 2) for next iteration of the test procedure loop. And set Cell 3 physical cell identity = ((current cell 3 physical cell identity + 1) mod 14 + 2) for next iteration of the test procedure loop.

9. Depending on the choice in Step 7, the SS:
   - if the RRC Connection Release has been sent, transmits in Cell 1 a Paging message (including PagingRecord with UE-Identity) for the UE and ensures the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity NR SA, Connected without release On according to TS 38.508-1 [14] clause 4.5 (if the paging fails, switches off and on the UE and ensures the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity NR, Connected without release On according to TS 38.508-1 [14] clause 4.5),
   OR
   - if the device has been switched off, switches on the UE and ensures the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity NR SA, Connected without release On according to TS 38.508-1 [14] clause 4.5.

10. Repeat step 2-9 until the confidence level according to Tables G.2.3-1 in Annex G clause G.2 is achieved.

6.6.18.3.4.3 Message contents

Message contents are according to TS 38.508-1 [14] clause 4.6 with the following exceptions:

Table 6.6.18.3.4.3-1: Common Exception messages

Default Message Contents	
Common contents of system information blocks exceptions	

Default RRC messages and information elements contents exceptions	Table H.3.1-1 Table H.3.1-2 with conditions INTER-RAT and GAP NEEDED Table H.3.1-4 Table H.3.1-5 with condition INTER-RAT Table H.3.1-6 with conditions [TBD] Table H.3.1-7 with condition INTER-RAT
Specific message content exceptions for Test Configurations 6.6.18.3-1 and 6.6.18.3-4	Table H.3.1-3 with conditions INTER-RAT MO and Synchronous cells Table 7.3.1-3 in TS 38.508-1 [14] with condition SMTC.2
Specific message content exceptions for Test Configurations 6.6.18.3-2, 6.6.18.3-3, 6.6.18.3-5 and 6.6.18.3-6	Table H.3.1-3 with condition INTER-RAT MO Table 7.3.1-3 in TS 38.508-1 [14] with condition SMTC.2

6.6.18.3.5 Test requirement

Tables 6.6.18.3.5-1/2 define the primary level settings including test tolerances for all tests.

Table 6.6.18.3.5-1: Cell specific test parameters of NR cells for NR SA FR1 NR - E-UTRAN and NR FR1 concurrent event-triggered reporting in non-DRX in FR1

Parameter		Unit	Test configuration	Cell 1		Cell 2	
				T1	T2	T1	T2
AoA setup			Config 1,2,3	N/A		Setup 1 as specified in clause A.3.15	
Beam Assumption[Note 7]			Config 1,2,3	N/A		Rough	
NR RF Channel Number			Config 1,2,3	1		2	
Duplex mode			Config 1	FDD		TDD	
			Config 2,3	TDD		TDD	
TDD configuration			Config 1	Not Applicable		TDDConf.3.1	
			Config 2	TDDConf.1.1		TDDConf.3.1	
			Config 3	TDDConf.2.1		TDDConf.3.1	
$BW_{channel}$		MHz	Config 1	10: $N_{RB,c}$ = 52		100: $N_{RB,c}$ = 66	
			Config 2	10: $N_{RB,c}$ = 52		100: $N_{RB,c}$ = 66	
			Config 3	40: $N_{RB,c}$ = 106		100: $N_{RB,c}$ = 66	
Data RBs allocated			Config 1	52		66	
			Config 2	52		66	
			Config 3	106		66	
BWP BW		MHz	Config 1	10: $N_{RB,c}$ = 52		100: $N_{RB,c}$ = 66	
			Config 2	10: $N_{RB,c}$ = 52		100: $N_{RB,c}$ = 66	
			Config 3	40: $N_{RB,c}$ = 106		100: $N_{RB,c}$ = 66	
BWP configuration	Initial DL BWP		Config 1,2,3	DLBWP.0.1		N/A	
	Initial UL BWP			ULBWP.0.1		N/A	
	Dedicated DL BWP			DLBWP.1.1		N/A	
	Dedicated UL BWP			ULBWP.1.1		N/A	
OCNG Patterns defined in A.3.2.1.1 (OP.1)			Config 1,2,3	OP.1		OP.1	
PDSCH Reference measurement channel			Config 1	SR.1.1 FDD		-	
			Config 2	SR.1.1 TDD			
			Config 3	SR.2.1 TDD			
RMSI CORESET Reference Channel			Config 1	CR.1.1 FDD		-	
			Config 2	CR.1.1 TDD			
			Config 3	CR.2.1 TDD			
Dedicated CORESET RMC configuration			Config 1	CCR.1.1 FDD		-	
			Config 2	CCR.1.1 TDD			
			Config 3	CCR.2.1 TDD			
SMTC configuration defined in A.3.11.1 and A.3.11.2			Config 1	SMTC.2		SMTC.2	
			Config 2,3	SMTC.1		SMTC.1	

PDSCH/PDCCH subcarrier spacing	kHz	Config 1,2	15	120	
		Config 3	30	120	
EPRE ratio of PSS to SSS		Config 1,2,3	0	0	
EPRE ratio of PBCH DMRS to SSS					
EPRE ratio of PBCH to PBCH DMRS					
EPRE ratio of PDCCH DMRS to SSS					
EPRE ratio of PDCCH to PDCCH DMRS					
EPRE ratio of PDSCH DMRS to SSS					
EPRE ratio of PDSCH to PDSCH					
EPRE ratio of OCNG DMRS to SSS(Note 1)					
EPRE ratio of OCNG to OCNG DMRS (Note 1)					
$\hat{E}_s$	dBm/SCS	Config 1,2,3	NA Link only, see clause A.3.7A	-Infinity	-87
SSB_RP Note 3	dBm/SCS	Config 1,2		-Infinity	-87
	Note5	Config 3		-Infinity	-87
$\hat{E}_s / I_{ot}$ BB Note 8	dB	Config 1,2,3		-Infinity	14.69
	dBm/95.04 MHz Note5	Config 1,2,3		-Infinity	-58.01
Propagation Condition		Config 1,2,3		AWGN	

NOTE 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.

NOTE 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for N_{oc} to be fulfilled.

NOTE 3: Ês/Iot, SS-RSRP, SSB_RP and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.

Table 6.6.18.3.5-2: Cell specific test parameters LTE cell for NR SA FR1 NR - E-UTRAN and NR FR1 concurrent event-triggered reporting in non-DRX in FR1

Parameter	Unit	Configuration	Cell 3	
			T1	T2
RF channel number		1, 2, 3, 4, 5, 6	1	
Duplex mode		1, 2, 3	FDD	
		4, 5, 6	TDD	
TDD special subframe configuration Note1		4, 5, 6	6	
TDD uplink-downlink configuration Note1		4, 5, 6	1	
$BW_{channel}$	MHz	1, 2, 3, 4, 5, 6	5 MHz: $N_{RB,c}$ = 25 10 MHz: $N_{RB,c}$ = 50 20 MHz: $N_{RB,c}$ = 100	
PDSCH parameters: DL Reference Measurement Channel Note2		1, 2, 3	5 MHz: R.7 FDD 10 MHz: R.3 FDD 20 MHz: R.6 FDD	
		4, 5, 6	5 MHz: R.4 TDD 10 MHz: R.0 TDD 20 MHz: R.3 TDD	
PCFICH/PDCCH/PHICH parameters:		1, 2, 3	5 MHz: R.11 FDD 10 MHz: R.6 FDD 20 MHz: R.10 FDD	

DL Reference Measurement Channel[Note2]				
		4, 5, 6	5 MHz: R.11 TDD 10 MHz: R.6 TDD 20 MHz: R.10 TDD	
OCNG Patterns[Note2]		1, 2, 3	5 MHz: OP.20 FDD 10 MHz: OP.10 FDD 20 MHz: OP.17 FDD	
		4, 5, 6	5 MHz: OP.9 TDD 10 MHz: OP.1 TDD 20 MHz: OP.7 TDD	
PBCH_RA	dB	1, 2, 3, 4, 5, 6	0	
PBCH_RB				
PSS_RA				
SSS_RA				
PCFICH_RB				
PHICH_RA				
PHICH_RB				
PDCCH_RA				
PDCCH_RB				
PDSCH_RA				
PDSCH_RB				
OCNG_RA[Note3]				
OCNG_RB[Note3]				
N_{oc}[Note4]	dBm/15kHz	1, 2, 3, 4, 5, 6	-104	
$\hat{E}_s/N_{oc}$	dB	1, 2, 3, 4, 5, 6	-Infinity	17
$\hat{E}_s/I_{ot}$[Note5]	dB	1, 2, 3, 4, 5, 6	-Infinity	17
RSRP[Note5]	dBm/15kHz	1, 2, 3, 4, 5, 6	-Infinity	-87
SCH_RP[Note5]	dBm/15kHz	1, 2, 3, 4, 5, 6	-Infinity	-87
Io[Note5]	dBm/9MHz	1, 2, 3, 4, 5, 6	-76.22+10log ($N_{RB,c}$ /50)	-59.13+10log ($N_{RB,c}$ /50)
Propagation Condition		1, 2, 3, 4, 5, 6	AWGN	
Antenna Configuration and Correlation Matrix		1, 2, 3, 4, 5, 6	1x2 Low	

NOTE 1: Special subframe and uplink-downlink configurations are specified in table 4.2-1 in TS 36.211 [24].
NOTE 2: DL RMCs and OCNG patterns are specified in sections A 3.1 and A 3.2 of TS 36.133 [23] respectively.
NOTE 3: OCNG shall be used such that all cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.
NOTE 4: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for N_{oc} to be fulfilled.
NOTE 5: $\hat{E}_s/I_{ot}$, RSRP, SCH_RP and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.
NOTE 6: Propagation condition and correlation matrix are defined in section B.2 in TS 36.101 [27].

The UE shall send one Event A4 triggered measurement report for Cell 2, with a measurement reporting delay less than X ms from the beginning of time period T2, where X is

5120 for UE supporting power class 1, or

3200 for UE supporting other power class.

The UE shall send one Event B2 triggered measurement report for Cell 3 to the PCell, with a measurement reporting delay less than 3.84s from the start of period T2.

The measurement reporting delay is defined as the time from the beginning of time period T2 to the moment when the UE sends the measurement report on PUSCH.

The UE shall not send event-triggered measurement reports as long as the reporting criteria is not fulfilled.

The rate of correct events observed during repeated tests shall be at least 90% with a confidence level of 95%.

NOTE: The actual overall delays measured in the test may be up to $2xTTI_{DCCH}$ higher than the measurement reporting delays above because of TTI insertion uncertainty of the measurement report in DCCH.

6.6.18.4 NR SA FR1 event triggered reporting tests for PRS and SSB measurement in FR1 without SSB time index detection when DRX is not used

Editor's Note: This test case is incomplete in following aspects:

- Concurrent gap configuration is missing in Annex Table H.3.1-6
- TT analysis is missing.
- Initial conditions and message contents contain []

6.6.18.4.1 Test purpose

The purpose of this test is to verify that the UE makes correct reporting of an event.

6.6.18.4.2 Test applicability

This test applies to all types of NR UEs supporting concurrent gap and independent measurement gap configurations for PRS measurement capability from release 17 onwards.

6.6.18.4.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 6.6.18.0.2.

The normative reference for this requirement is TS 38.133 [6] clause A.6.6.18.4.

6.6.18.4.4 Test description

6.6.18.4.4.1 Initial conditions

This test shall be tested using any of the test configurations in Table 6.6.18.4.4.1-1.

Table 6.6.18.4.4.1-1: Supported test configurations

Configuration	Description
6.6.18.4-1	NR 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode
6.6.18.4-2	NR 15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode
6.6.18.4-3	NR 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode
Note: The UE is only required to be tested in one of the supported test configurations	

Test environment parameters are given in Table 6.6.18.4.4.1-2.

Table 6.6.18.4.4.1-2: Test environment parameters

Parameter	Value		Comment
Test environment	NC		As specified in TS 38.508-1 [14] clause 4.1.
Test frequencies	As specified in Annex E, table E.4-1 and TS 38.508-1 [14] clause 4.3.1 and 4.4.2.		
Channel bandwidth	As specified by the test configuration selected from Table 6.6.18.4.4.1-1.		
Propagation conditions	AWGN		As specified in Annex C.2.2.
Connection Diagram	TE Part	A.3.1.8.2	As specified in TS 38.508-1 [14] Annex A.
	DUT Part	A.3.2.3.4	
Exceptions to connection diagram	- Without LTE link - For 4Rx capable UEs without any 2Rx RF bands use A.3.1.8.4 for TE part and A.3.2.5.2 for DUT part.		

1. The general test parameter settings are set up according to Table 6.6.18.4.4.1-3.
2. Message contents are defined in clause 6.6.18.4.4.3.
3. There are three NR carriers specified in the test. Cell 1 (NR cell 1) is the cell used for connection setup with the power level set according to Annex C.1.2 and C.1.3 for this test.

Table 6.6.18.4.4.1-3: General test parameters for NR SA FR1 event triggered reporting tests for PRS and SSB measurement in FR1 without SSB time index detection when DRX is not used

Parameter	Unit	Test configuration	Value	Comment
NR RF Channel Number		1,2,3	1: Cell 1 and Cell 3 2: Cell 2	Two TDD carrier frequencies are used for the NR cells.
Active cell		1,2,3	NR cell 1 (Pcell)	Cell 1 is the PCell and the DL-AoD reference cell in the positioning assistance data.
Neighbour cell		1,2,3	NR cell 2, NR cell 3	Cell 2 is an inter-frequency cell neighbour cell Cell 3 is a neighbour cell in the positioning assistance data.
$BW_{channel}$	MHz	1	10: $N_{RB,c}$ = 52	
		2	10: $N_{RB,c}$ = 52	
		3	40: $N_{RB,c}$ = 106	
SSB configuration		1	SSB.1 FR1	
		2	SSB.1 FR1	
		3	SSB.2 FR1	
SMTC configuration		1	SMTC.2	
		2	SMTC.1	
		3	SMTC.1	
Gap Pattern Id		Config 1,2,3	0 for MeasGapId #0 24 for MeasGapId #1	
Measurement gap offset	ms	Config 1,2,3	7 for MeasGapId #0 11 for MeasGapId #1	
DRX		1, 2, 3	NA	OFF
Time offset between serving and neighbour cells	µs	1, 2, 3	3	Synchronous cells
Expected RSTD	µs	1, 2, 3	3	
Expected RSTD uncertainty	µs	1, 2, 3	5	
T1	s	1, 2, 3	2	
T2	s	1, 2, 3	5	
NOTE 1: GP#24 is configured if UE supports MG#24, otherwise GP#0 is configured.				

6.6.18.4.4.2 Test procedure

In this test, there are three cells: NR cell 1 as PCell in FR1 on NR RF channel 1, NR cell 2 as neighbour cell in FR1 on NR RF channel 2 and NR cell 3 as neighbour cell in FR1 on NR RF channel 1. The test parameters are given in Table 6.6.18.4.4.1-3 and Table 6.6.18.4.5-1 respectively.

In the measurement control information, it is indicated to the UE that event-triggered reporting with Event A3 is used. The test consists of two successive time periods, with time duration of T1, and T2 respectively. During time duration T1, the UE shall not have any timing information of NR cell 2 and NR cell 3. Cell 1 and cell 3 transmit PRS during T2.

Two measurement gap patterns (MeasGapId #0 and MeasGapId #1) are configured with the gap pattern ID #0 and #1 as defined in Table 6.6.18.4.1-3. MeasGapId #1 is configured with a higher priority than MeasGapId #0. MeasGapId #0 and MeasGapId #1 are associated with the MOs for RF channel numbers #1 and #2, respectively.

The *NR-DL-AoD-RequestLocationInformation* message and *NR-DL-AoD-ProvideAssistanceData* message as defined in TS 37.355 [38] shall be provided to the UE during T1. The last slot containing the two messages for the assistance data and location information request is denoted as #n.

The beginning of the time interval T2 shall be aligned with the beginning of the first MG instance of MeasGapId #1 containing the PRS resources that is ΔT after slot #n, where ΔT = 50 ms is the maximum processing time of the assistance data and location information request.

1. Ensure the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity NR SA, Connected without release *On* and Test Mode *On* according to TS 38.508-1 [14] clause 4.5.

2. Set the parameters according to T1 in Table 6.6.18.4.5-1.

3. SS shall transmit an *RRCReconfiguration* message to configure Event A3 triggered measurement report and two independent measurement gap patterns for PRS measurement.

4. The UE shall transmit *RRCReconfigurationComplete* message. T1 starts.

5. When T1 expires, the SS shall switch the power setting from T1 to T2 as specified in Table 6.6.18.4.5-1. T2 starts.

6. UE shall transmit a *MeasurementReport* message triggered by Event A3. If Cell2's overall delays measured from the beginning of period T2 is less than 1840 ms, and report the PRS RSRP measurements for Cell 3 with respect to the reference cell in the DL-AoD assistance data, then the number of successful tests is increased by one. If the UE fails to report the events within the overall delays measured requirements, then the number of failure tests is increased by one.

7. After the SS receive the MeasurementReport message in step 6 or when T2 expires, the SS shall:

   - transmit RRCRelease message to release the RRC connection which includes the release of the established radio bearers as well as all radio resources

   OR

   - switch the UE off.

8. Set Cell 2 physical cell identity = ((current cell 2 physical cell identity + 1) mod 14 + 2) for next iteration of the test procedure loop. And set Cell 3 physical cell identity = ((current cell 3 physical cell identity + 1) mod 14 + 2) for next iteration of the test procedure loop.

9. Depending on the choice in Step 7, the SS:
   - if the RRC Connection Release has been sent, transmits in Cell 1 a Paging message (including PagingRecord with UE-Identity) for the UE and ensures the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity NR SA, Connected without release On according to TS 38.508-1 [14] clause 4.5 (if the paging fails, switches off and on the UE and ensures the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity NR, Connected without release On according to TS 38.508-1 [14] clause 4.5),
   OR
   - if the device has been switched off, switches on the UE and ensures the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity NR SA, Connected without release On according to TS 38.508-1 [14] clause 4.5.

10. Repeat step 2-9 until the confidence level according to Tables G.2.3-1 in Annex G clause G.2 is achieved.

6.6.18.4.4.3 Message contents

Message contents are according to TS 38.508-1 [14] clause 4.6 with the following exceptions:

Table 6.6.18.4.4.3-1: Common Exception messages

Default Message Contents	
Common contents of system information blocks exceptions	
Default RRC messages and information elements contents exceptions	Table H.3.1-1 Table H.3.1-2 with conditions INTER-FREQ and GAP NEEDED Table H.3.1-4 with A3-offset = -6dB Table H.3.1-5 Table H.3.1-6 with conditions [TBD] Table H.3.1-7 with condition INTER-FREQ
Specific message contents exceptions for Cell 2	Table H.3.1-3 with conditions INTER-FREQ MO and Synchronous cells Table 7.3.1-3 in TS 38.508-1 [14] with condition SMTC.2
Specific message contents exceptions for Cell 3	Table H.3.1-3 with condition INTER-FREQ MO Table 7.3.1-3 in TS 38.508-1 [14] with condition SMTC.2

6.6.18.4.5 Test requirement

Tables 6.6.18.4.5-1 define the primary level settings including test tolerances for all tests.

Table 6.6.18.4.5-1: Cell specific test parameters of NR cells for NR SA FR1 event triggered reporting tests for PRS and SSB measurement in FR1 without SSB time index detection when DRX is not used

Parameter		Unit	Test configuration	Cell 1		Cell 2		Cell 3	
				T1	T2	T1	T2	T1	T2
TDD configuration			1	N/A		N/A		N/A	
			2	TDDConf.1.1		TDDConf.1.1		TDDConf.1.1	
			3	TDDConf.2.1		TDDConf.2.1		TDDConf.2.1	
$BW_{channel}$		MHz	Config 1,2,3	100: $N_{RB,c}$ = 66		100: $N_{RB,c}$ = 66		100: $N_{RB,c}$ = 66	
BWP BW		MHz	Config 1,2,3	100: $N_{RB,c}$ = 66		100: $N_{RB,c}$ = 66		100: $N_{RB,c}$ = 66	
BWP configuration	Initial DL BWP		Config 1,2,3	DLBWP.0.1		N/A		N/A	
	Initial UL BWP			ULBWP.0.1		N/A		N/A	
	Dedicated DL BWP			DLBWP.1.1		N/A		N/A	
	Dedicated UL BWP			ULBWP.1.1		N/A		N/A	
OCNG Patterns defined in A.3.2.1.1 (OP.1)			Config 1,2,3	OP.1		OP.1		OP.1	
PDSCH RMC configuration			1	SR.1.1 FDD		N/A		N/A	
			2	SR.1.1 TDD					
			3	SR.2.1 TDD					
RMSI CORESET RMC configuration			1	CR.1.1 FDD		N/A		N/A	
			2	CR.1.1 TDD		N/A		N/A	
			3	CR.2.1 TDD		N/A		N/A	
Dedicated CORESET RMC configuration			1	CCR.1.1 FDD		N/A		N/A	
			2	CCR.1.1 TDD		N/A		N/A	
			3	CCR.2.1 TDD		N/A		N/A	
SSB parameters			Config 1	SSB.1 FR2		SSB.1 FR2		SSB.1 FR2	
SMTC configuration defined in A.3.11			Config 1	SMTC.4		SMTC.4		SMTC.4	
TRS Configuration			1	TRS.1.1 FDD		N/A		N/A	
			2	TRS.1.1 TDD		N/A		N/A	
			3	TRS.1.2 TDD		N/A		N/A	
PRS configuration			1	PRS.1.4 FR1		N/A		PRS.1.4 FR1	
			2	PRS.1.4 FR1		N/A		PRS.1.4 FR1	
			3	PRS.2.4 FR1		N/A		PRS.2.4 FR1	
PRS muting configuration			1, 2, 3	'10'		'01'		'01'	
N_{oc} Note2		dBm/15 kHz Note5	1	-98		-98		-98	
			2	-98		-98		-98	
			3	-98		-98		-98	
N_{oc} Note2		dBm/SCS Note4	1	-98		-98		-98	
			2	-98		-98		-98	
			3	-95		-95		-95	
SS-RSRP Note 3		dBm/SCS Note5	1	-94	-94	-Infinity	-94	N/A	N/A
			2	-94	-94	-Infinity	-94	N/A	N/A
			3	-91					
PRS-RSRP Note 3		dBm/SCS Note5	1	-Infinity	-101	N/A	N/A	-Infinity	-108
			2	-Infinity	-101	N/A	N/A	-Infinity	-108
			3	-Infinity	-98	N/A	N/A	-Infinity	-105
PRS $\hat{E}_s/I_{ot}$		dB	1,2,3	-Infinity	-3	N/A	N/A	-Infinity	-10

PRS $\hat{E}_s/N_{oc}$	dB	1,2,3	-Infinity	-3	N/A	N/A	-Infinity	-10
Io[Note3]	dBm/95.04 MHz Note5	1	-62.25		-64.60	-62.25	-62.25	
		2	-62.25		-64.60	-62.25	-62.25	
		3	-56.16		-58.50	-56.16	-56.16	
Propagation Condition		1,2,3	AWGN					

Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.
Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for N_{oc} to be fulfilled.
Note 3: SS-RSRP/PRS-RSRP and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.
Note 4: PRS-RSRP minimum requirements are specified assuming independent interference and noise at each receiver antenna port.
Note 5: Equivalent power received by an antenna with 0 dBi gain at the centre of the quiet zone
Note 6: As observed with 0 dBi gain antenna at the centre of the quiet zone
Note 7: Information about types of UE beam is given in B.2.1.3, and does not limit UE implementation or test system implementation

The UE shall send one Event A3 triggered measurement report for cell 2, with a measurement reporting delay less than 1840 ms from the beginning of period T2.

The PRS RSRP measurement time fulfils the requirements specified in TS 38.133[6] Clause 9.9.3.5. The UE shall perform and report the PRS RSRP measurements for Cell 3 with respect to the reference cell in the DL-AoD assistance data, Cell 1, within the time duration specified in TS 38.133[6] section 9.9.3.5 starting from the beginning of time interval T2.

The rate of the correct events for the neighbour cell observed during repeated tests shall be at least 90% with a confidence level of 95%, where the reported PRS RSRP measurement for each correct event shall be within the PRS RSRP reporting range specified in TS 38.133[6] Clause 10.1.24.3, i.e., between PRS RSRP_0 and PRS RSRP_126.

The UE shall not send event triggered measurement reports, as long as the reporting criteria are not fulfilled. The rate of correct events observed during repeated tests shall be at least 90% with a confidence level of 95%.

IUE is not required to report SSB time index.

NOTE: The actual overall delays measured in the test may be up to $2xTTI_{DCCH}$ higher than the measurement reporting delays above because of TTI insertion uncertainty of the measurement report in DCCH.

6.6.19

6.6.20 UE Rx-Tx time difference measurement for propagation delay compensation

Editor's note: This test case is incomplete. The following aspects are missing or TBD:

- Test purpose contains []

- Connection diagram is TBD

- Measurement Uncertainties and Test Tolerances are missing

6.6.20.0 Minimum conformance requirements

[38.133 clause 9.12.4.1, 9.12.5 and 10.1.25.3.1] for measurement time

When UE is configured with *prs-Ref-r17* in *MeasObjectRxTxDiff*-r17 defined in TS 38.331 [2] and provided with PRS resource configuration, the UE shall be able to measure UE Rx-Tx time difference on PCell within the measurement period $T_{UERx-Tx_PRS}$, where:

$$T_{UERxTx,PRS} = \left\lceil \frac{N_{PRS}^{slot}}{N'} \right\rceil * N_{sample} * K_{layer3} * LCM(T_{PRS}, T_{DRX})$$

Where:

N_{PRS}^{slot} is the maximum number of DL PRS resources configured in a slot,

N′ is UE capability for number of DL PRS resources that it can process in a slot corresponding to *maxNumberPRS-ResourceProcessedPerSlot-r17* as specified in TS38.331 [2],

N_{sample} is the number of UE Rx-Tx time difference measurement samples and N_{sample} = 4,

T_{PRS} is the PRS resource periodicity specific for RTT-based propagation delay compensation,

T_{DRX} is the DRX cycle length when DRX is in use, 1ms otherwise.

K_{layer3} is

N_{total} / $N_{available}$, when $N_{available}$>0

Where,

- For a window W of duration LCM(T_{PRS}, MGRP, T_{SMTC}), where T_{SMTC} is the periodicity of SMTC for intra-frequency measurement without gap, starting at the beginning of any PRS resource occasion:
  - N_{total} is the total number of PRS resource occasions within the window, including those overlapped with measurement gap occasions or SMTC occasions within the window, and
  - $N_{available}$ is the number of PRS resource occasions that are not overlapped with:
    - For FR1: any measurement gap occasions within the window W

No requirements shall apply if $N_{available}$=0.

UE is only required to perform UE Rx-Tx time difference on PRS within the active DL BWP.

When UE is configured to perform UE Rx-Tx time difference measurement based on PRS, the requirements apply provided that the SCS of the PRS is same as that of the active BWP on PCell.

If PRS resources overlap with Type 1A/1B/2 PPW, the UE is allowed longer measurement period to measure UE Rx-Tx time difference on PCell.

The UE Rx-Tx time difference measurement values contained in measurement report shall be based on the

measurement report mapping requirements specified below.

The reporting range for the absolute UE Rx-Tx time difference measurement (TUE Rx-Tx) is defined from -985024×Tc to 985024×Tc with the resolution step of 2*k*×Tc.

Table 6.6.20.0-1: Absolute UE Rx-Tx time difference measurement report mapping for *k*=5

Reported Quantity Value	Measured Quantity Value	Unit
RX-TX_TIME_DIFFERENCE_0000	$T_{UE\ Rx\text{-}Tx} < -985024$	T_c
RX-TX_TIME_DIFFERENCE_0001	$-985024 \le T_{UE\ Rx\text{-}Tx} < -984992$	T_c
RX-TX_TIME_DIFFERENCE_0002	$-984992 \le T_{UE\ Rx\text{-}Tx} < -984960$	T_c
…	…	…
RX-TX_TIME_DIFFERENCE_30782	$-32 \le T_{UE\ Rx\text{-}Tx} < 0$	T_c
RX-TX_TIME_DIFFERENCE_30783	$0 \le T_{UE\ Rx\text{-}Tx} < 32$	T_c
…	…	…
RX-TX_TIME_DIFFERENCE_61563	$984960 \le T_{UE\ Rx\text{-}Tx} < 984992$	T_c
RX-TX_TIME_DIFFERENCE_61564	$984992 \le T_{UE\ Rx\text{-}Tx} < 985024$	T_c
RX-TX_TIME_DIFFERENCE_61565	$985024 \le T_{UE\ Rx\text{-}Tx}$	T_c

[TS 38.133 clause 10.1.39.2] for measurement accuracy

The error in the reported value of UE Rx-Tx time difference measurement, including both the measurement error and the reporting quantization error, should be within the accuracy requirements specified in this clause.

The UE Rx-Tx time difference measurement accuracy requirements in this clause shall apply provided that:

- The UE transmits SRS within [-160, 160] msec of at least one PDC DL PRS resource from the serving cell (PCell).

When a serving cell change occurs during the UE Rx-Tx measurement period, the UE Rx-Tx time difference measurement accuracy requirements in this clause shall apply provided that the serving cell change does not impact SRS configuration for the UE Rx-Tx measurement.

The accuracy requirements in Table 6.6.20.0-2 for FR1 are valid under the following conditions:

Conditions defined in clause 7.3 of TS 38.101-1 [18] for reference sensitivity are fulfilled.

$PRP|_{dBm}$ according to Annex [TBD] for a corresponding Band.

AWGN propagation condition.

Table 6.6.20.0-2: UE Rx-Tx time difference measurement accuracy in FR1 in AWGN

Accuracy	Conditions						
	PRS Ês/Iot	Minimum PRS bandwidth	PRS SCS	PRS resource repetition ($T_{rep}^{PRS} * L_{PRS}/K_{comb}^{PRS}$ Note 3	NR operating band groups Note 2	Io Note 4 range	
						Minimum Io Note 1	Maximum Io
Tc Note 5	dB	RB	kHz			dBm / SCS_{PRS}	dBm/BW
± [78+δ+ε]	-3	≥[24]	15	≥[4]	NR_FDD_FR1_A, NR_TDD_FR1_A, NR_SDL_FR1_A	-121	-50
					NR_FDD_FR1_B	-120.5	
					NR_TDD_FR1_C	-120	
					NR_FDD_FR1_D, NR_TDD_FR1_D	-119.5	
					NR_FDD_FR1_E, NR_TDD_FR1_E	-119	
					NR_FDD_FR1_F	-118.5	
					NR_FDD_FR1_G	-118	
					NR_FDD_FR1_H	-117.5	
± [59+δ+ε]		≥[52]		≥[1]	Note 6	NOTE 6	NOTE 6
± [30+δ+ε]		>[104]		≥[1]	Note 6	NOTE 6	NOTE 6
± [57+δ+ε]		≥[24]	30	≥[4]	NR_FDD_FR1_A, NR_TDD_FR1_A, NR_SDL_FR1_A	-118	-50
					NR_FDD_FR1_B	-117.5	
					NR_TDD_FR1_C	-117	
					NR_FDD_FR1_D, NR_TDD_FR1_D	-116.5	
					NR_FDD_FR1_E, NR_TDD_FR1_E	-116	
					NR_FDD_FR1_F	-115.5	
					NR_FDD_FR1_G	-115	
					NR_FDD_FR1_H	-114.5	
± [30+δ+ε]		≥[48]		≥[1]	NOTE 6	NOTE 6	NOTE 6
± [15+δ+ε]		≥[132]		≥[1]	NOTE 6	NOTE 6	NOTE 6
± [29+δ+ε]		≥[24]	60	≥[4]	NR_FDD_FR1_A, NR_TDD_FR1_A, NR_SDL_FR1_A	-115	-50
					NR_FDD_FR1_B	-114.5	
					NR_TDD_FR1_C	-114	
					NR_FDD_FR1_D, NR_TDD_FR1_D	-113.5	
					NR_FDD_FR1_E, NR_TDD_FR1_E	-113	
					NR_FDD_FR1_F	-113.5	

					NR_FDD_FR1_G	-113	
					NR_FDD_FR1_H	-111.5	
± [15+δ+ε]		≥[64]		≥[1]	NOTE 6	NOTE 6	NOTE 6
± [7+δ+ε]		≥[132]		≥[1]	NOTE 6	NOTE 6	NOTE 6

NOTE 1: This minimum Io condition is expressed as the average Io per RE over all REs in an OFDM symbol.
NOTE 2: NR operating band groups are as defined in Section 3.5.
NOTE 3: $T_{\mathrm{rep}}^{\mathrm{PRS}}$, L_{PRS}, $K_{\mathrm{comb}}^{\mathrm{PRS}}$ are configured by higher layer parameter *dl-PRS-ResourceRepetitionFactor, dl-PRS-NumSymbols and dl-PRS-CombSizeN*defined in TS 37.355 [38].
NOTE 4: The Io is defined in PRS slots. The same Io range applies to PRS and non-PRS symbols. Io levels are different in PRS and non-PRS symbols within the same slot.
NOTE 5: Tc is the basic timing unit defined in TS 38.211 [6].
NOTE 6: The same bands and the same Io conditions for each band apply for this requirement as for the corresponding requirement with the PRS bandwidth of the smallest RB number for the corresponding SCS.
NOTE 7: δ is the margin determined from Table 10.1.39.2-3.
NOTE 8: ε is the margin for reporting quantization error and $\varepsilon = 16\ Tc$.

Table 6.6.20.0-3: Margin for UE Rx-Tx time difference measurement accuracy in FR1

Min(PRS BW, SRS BW) (RB)			Margin (Tc [Note 1])
SCS = 15 kHz	SCS = 30 kHz	SCS = 60 kHz	
≥ 24	N/A	N/A	[160]
≥ 52	≥ 24	N/A	[80]
≥ 104	≥ 48	≥ 24	[56]
N/A	≥ 132	≥ 64	[24]
N/A	N/A	≥ 132	[24]

NOTE 1: Tc is the basic timing unit defined in TS 38.211 [6].
NOTE 2: If SRS and PRS have different SCS, the margin corresponding to the smallest RS BW in MHz applies.

6.6.20.1 UE Rx-Tx time difference measurement with PRS for RTT-based PDC in FR1 SA

6.6.20.1.1 Test purpose

The purpose of the test is to verify that the UE Rx-Tx measurement for RTT-based PDC meets the requirements specified in TS 38.133[6] clause 9.12.4.1 for measurement delay and clause 10.1.X for measurement accuracy in AWGN propagation condition in FR1 in standalone scenario.

6.6.20.1.2 Test applicability

This test applies to all types of NR UE release 17 onwards supporting *rtt-BasedPDC-PRS-r17 or gNB-SideRTT-BasedPDC-r17*.

6.6.20.1.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 6.6.20.0.

The normative reference for this requirement is TS 38.133 [6] clauses 9.12.4.1, 9.12.5, 10.1.39.2 and A.6.6.20.

6.6.20.1.4 Test description

6.6.20.1.4.1 Initial conditions

This test shall be tested using any of the test configurations in Table 6.6.20.1.4.1-1

Table 6.6.20.1.4.1-1: Supported test configurations

Configuration	Description
6.6.20-1	15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode
6.6.20-2	15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode
6.6.20-3	30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode
Note: The UE is only required to be tested in one of the supported test configurations.	

Configure the test requirement and the DUT according to the parameters in Table 6.6.20.1.4.1-2.

Table 6.6.20.1.4.1-2: Initial conditions for UE Tx-Rx time difference measurement for FR1

Parameter	Value		Comment
Test environment	NC		As specified in TS 38.508-1 [14] clause 4.1.
Test frequencies	As specified in Annex E, Table E.4-1 and TS 38.508-1 [14] clause 4.3.1.		
Channel bandwidth	As specified by the test configuration selected from Table 6.6.20.1.4.1-1.		
Propagation conditions	AWGN		As specified in Annex C.2.2
Connection Diagram	TE Part	TBD	As specified in TS 38.508-1 [14] Annex A.
	DUT Part	TBD	
Exceptions to connection diagram			

1. The general test parameter settings are set up according to Table 6.6.20.1.4.1-3.

2. Message contents are defined in clause 6.6.20.1.4.3.

3. The test scenario comprises of 1 NR Cell. The connection setup with the power level set according to Annex C.1.1 and C.1.2 for this test.

Table 6.6.20.1.4.1-3: General test parameters

Parameter	Unit	Test configuration	Value
Active cell		1, 2, 3	Cell 1
RF Channel Number		1, 2, 3	1
$BW_{channel}$	MHz	1	10: $N_{RB,c}$ = 52
		2	10: $N_{RB,c}$ = 52
		3	40: $N_{RB,c}$ = 106
SSB configuration		1	SSB.1 FR1
		2	SSB.1 FR1
		3	SSB.2 FR1
SMTC configuration		1	SMTC.2
		2	SMTC.1
		3	SMTC.1
CP length		1, 2, 3	Normal
DRX		1, 2, 3	OFF
T1	s	1, 2, 3	5
T2	s	1, 2, 3	10

6.6.20.1.4.2 Test procedure

The test is considered with one cell (Cell 1) in FR1.

The test consists of two consecutive time intervals, with duration of T1 and T2. The Cell 1 mutes PRS transmission during T1 and transmits PRS during T2.

measObject with *measObjectRxTxDiff-r17,* and *NR-DL-PRS-PDC-Info* is defined ~~in~~ as per 6.6.20.1.4.3 and shall be provided to the UE during T1.

The last TTI containing the RRC configuration shall be provided to the UE ΔT ms before the start of T2, where ΔT = [TBD] ms. The UE is configured to transmit SRS during T2.

The general and cell specific test parameters for PCell is given in Table 6.6.20.1.4.1-3 and Table 6.6.20.1.5-1, respectively. In the measurement control information, a measurement object is configured for the frequency of the PCell, and. The test consists of two successive time periods, with time duration of T1, and T2 respectively.

1. Ensure the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity *NR*, Connected without release *On* and Test Mode *On* according to TS 38.508-1 [14] clause 4.5.

2. Set the parameters according to T1 in Table 6.6.20.1.5-1 as appropriate.

3. SS shall transmit an *RRCReconfiguration* message.

4. The UE shall transmit *RRCReconfigurationComplete* message. T1 starts.

5. When T1 expires, the SS shall switch the power setting from T1 to T2 as specified in Table 6.6.20.1.5-1. T2 starts.

6. The UE shall transmit periodically MeasurementReport messages.

7. After 10s wait from Step 3, the SS shall check the *result-k5-r17* reported values in the periodic MeasurementReport. If the *result-k5* value is outside the limits in Table 6.6.20.0-1 or the UE fails to report the measurement value for serving cell, the number of failed iterations is increased by one. Otherwise, the number of passed iterations is increased by one.

8. The SS shall continue checking the MeasurementReport messages transmitted by the UE until the confidence level according to Table G.2.3-1 in Annex G is achieved.

6.6.20.1.4.3 Message contents

Message contents are according to TS 38.508-1 [14] clause 7.3 with the following exceptions:

Default Message Contents	
Common contents of system information blocks exceptions	
Default RRC messages and information elements contents exceptions	Table 4.6.3-76B in 38.508-1 [14] with condition PRS_REF
Specific message contents exceptions for Test Configuration 6.6.20-1 and 6.6.20-2	Table 4.6.3-84AC in 38.508-1 [14] with condition SCS15
Specific message contents exceptions for Test Configuration 6.6.20-3	Table 4.6.3-84AC in 38.508-1 [14] with condition SCS30

6.6.20.1.5 Test requirements

Table 6.6.20.1.4.1-3 and Table 6.6.20.1.5-1 define the primary level settings including test tolerances for UE Rx-Tx time difference measurement with PRS for RTT-based PDC in FR1 SA.

Table 6.6.20.1.5-1: Cell specific test parameters

Parameter	Unit	Test configuration	Cell 1	
			T1	T2
TDD configuration		1	N/A	
		2	TDDConf.1.1	
		3	TDDConf.2.1	
PDSCH RMC configuration		1	SR.1.1 FDD	
		2	SR.1.1 TDD	
		3	SR.2.1 TDD	
RMSI CORESET RMC configuration		1	CR.1.1 FDD	
		2	CR.1.1 TDD	
		3	CR.2.1 TDD	
Dedicated CORESET RMC configuration		1	CCR.1.1 FDD	
		2	CCR.1.1 TDD	
		3	CCR.2.1 TDD	
OCNG Patterns		1, 2, 3	OP.1	
TRS Configuration		1	TRS.1.1 FDD	
		2	TRS.1.1 TDD	
		3	TRS.1.2 TDD	

Initial BWP configuration		1, 2, 3	DLBWP.0.1 ULBWP.0.1	
Active DL BWP configuration		1, 2, 3	DLBWP.1.1	
Active UL BWP configuration		1, 2, 3	ULBWP.1.1	
PRS configuration		1	PRS.1.2 FR1	
		2	PRS.1.2 FR1	
		3	PRS.2.2 FR1	
PRS muting info		1, 2, 3	'10'	
SRS configuration		1	[PDC-SRS.1]	
		2	[PDC-SRS.1]	
		3	[PDC-SRS.2]	
N_{oc} Note 2	dBm/SCS	1	-98	
		2	-98	
		3	-95	
N_{oc} Note 2	dBm/15 kHz	1	-98	
		2	-98	
		3	-98	
PRS $\hat{E}_s/I_{ot}$	dB	1	-Infinity	-2.41
		2		
		3		
PRS $\hat{E}_s/N_{oc}$	dB	1	-Infinity	-2
		2		
		3		
PRS-RSRP Note 3	dBm/SCS kHz	1	-Infinity	-100
		2	-Infinity	-100
		3	-Infinity	-97
Io	dBm/9.36 MHz	1	N/A	-67.67
	dBm/9.36 MHz	2		-67.67
	dBm/38.16 MHz	3		-61.57
Propagation Condition		1, 2, 3	AWGN	

Note 1: The resources for uplink transmission are assigned to the UE prior to the start of time period T2.

Note 2: The noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for N_{oc} to be fulfilled.

Note 3: PRS-RSRP levels have been derived from other parameters for information purposes. They are not settable parameters themselves.

The UE Rx-Tx time difference measurement time shall fulfils the requirements specified in clause 6.6.20.0. The UE shall perform and report the UE Rx-Tx time difference measurements for Cell 1 within the specified UE Rx-Tx time difference measurement time starting from the beginning of time interval T2.

The reported UE Rx-Tx measurement for each correct event shall be within the UE Rx-Tx reporting range specified in clause [10.1.25.3.1].

The UE Rx-Tx time difference measurement time fulfils the UE Rx-Tx measurement accuracy requirements specified in clause 6.6.20.0 for Cell 1.

For the test to pass, the ratio of successful reported values shall be more than 90% with a confidence level of 95%.

NOTE: The actual overall delays measured in the test may be up to $2xTTI_{DCCH}$ higher than the measurement reporting delays above because of TTI insertion uncertainty of the measurement report in DCCH.

6.6.21 UE Rx-Tx time difference measurement for propagation delay compensation with TRS

Editor's note: This test case is incomplete. The following aspects are missing or TBD:

- Test purpose contains []
- Connection diagram is TBD

- Measurement Uncertainties and Test Tolerances are missing

6.6.21.0 Minimum conformance requirements

[38.133 clause 9.12.4.2, 9.12.5 and 10.1.25.3.1] for measurement time

When UE is configured with *csi-RS-Ref-r17* in *MeasObjectRxTxDiff*-r17 defined in TS 38.331 [2] and provided with TRS resource configuration, the UE shall be able to measure UE Rx-Tx time difference on PCell within the measurement period $T_{UERx-Tx_TRS}$, where:

$$T_{UERxTx,TRS} = N_{sample} * K_{layer3} * LCM(T_{TRS}, T_{DRX})$$

Where

N_{sample} is the number of UE Rx-Tx time difference measurement samples and N_{sample} is [4],

T_{TRS} is the TRS resource periodicity specific for RTT-based propagation delay compensation,

T_{DRX} is the DRX cycle length when DRX is in use, 1ms otherwise.

K_{layer3} is

N_{total} / $N_{available}$ when $N_{available}$>0

Where,

- For a window W of duration LCM(T_{TRS}, MGRP, T_{SMTC}), where T_{SMTC} is the periodicity of SMTC for intra-frequency measurement without gap, starting at the beginning of any TRS resource occasion:
  - N_{total} is the total number of TRS resource occasions within the window, including those overlapped with measurement gap occasions or SMTC occasions within the window, and
  - $N_{available}$ is the number of TRS resource occasions that are not overlapped with
    - For FR1: any measurement gap occasions within the window W

No requirements shall apply if $N_{available}$=0.

UE is only required to perform UE Rx-Tx time difference on TRS within the active DL BWP. When UE is configured to perform UE Rx-Tx time difference measurement based on TRS, the requirements apply provided that the SCS of the TRS is same as that of the active BWP on PCell.

If TRS resources overlap with Type 1A/1B/2 PPW, the UE is allowed longer measurement period to measure UE Rx-Tx time difference on PCell.

The UE Rx-Tx time difference measurement values contained in measurement report shall be based on the measurement report mapping requirements specified in below.

The reporting range for the absolute UE Rx-Tx time difference measurement (TUE Rx-Tx) is defined from -985024×Tc to 985024×Tc with the resolution step of 2*k*×Tc.

Table 6.6.21.0-1: Absolute UE Rx-Tx time difference measurement report mapping for *k*=5

Reported Quantity Value	Measured Quantity Value	Unit
RX-TX_TIME_DIFFERENCE_0000	$T_{UE\ Rx-Tx} < -985024$	T_c
RX-TX_TIME_DIFFERENCE_0001	$-985024 \le T_{UE\ Rx-Tx} < -984992$	T_c
RX-TX_TIME_DIFFERENCE_0002	$-984992 \le T_{UE\ Rx-Tx} < -984960$	T_c
…	…	…
RX-TX_TIME_DIFFERENCE_30782	$-32 \le T_{UE\ Rx-Tx} < 0$	T_c
RX-TX_TIME_DIFFERENCE_30783	$0 \le T_{UE\ Rx-Tx} < 32$	T_c
…	…	…
RX-TX_TIME_DIFFERENCE_61563	$984960 \le T_{UE\ Rx-Tx} < 984992$	T_c
RX-TX_TIME_DIFFERENCE_61564	$984992 \le T_{UE\ Rx-Tx} < 985024$	T_c
RX-TX_TIME_DIFFERENCE_61565	$985024 \le T_{UE\ Rx-Tx}$	T_c

[TS 38.133 clause 10.1.39.3] for measurement accuracy

The error in the reported value of UE Rx-Tx time difference measurement, including both the measurement error and the reporting quantization error, should be within the accuracy requirements specified in this clause.

The UE Rx-Tx time difference measurement accuracy requirements in this clause shall not apply, if:

- N_{TA_offset} defined in Table 7.1.2-2 changes during the UE Rx-Tx measurement period or
- if the uplink transmission timing changes during the UE Rx-Tx measurement period due to the network-configured Timing Advance.

The UE Rx-Tx time difference measurement accuracy requirements in this clause shall apply provided that:

- The UE transmits SRS within [-160, 160] msec of at least one PDC TRS resource from the serving cell (PCell).

When a serving cell change occurs during the UE Rx-Tx measurement period, the UE Rx-Tx time difference measurement accuracy requirements in this clause shall apply provided that the serving cell change does not impact SRS configuration for the UE Rx-Tx measurement.

The accuracy requirements in Table 6.6.21.0-2 for FR1 are valid under the following conditions:

Conditions defined in clause 7.3 of TS 38.101-1 [18] for reference sensitivity are fulfilled.

$PRP|_{dBm}$ according to Annex [TBD] for a corresponding Band.

AWGN propagation condition.

Table 6.6.21.0-2: UE Rx-Tx time difference measurement accuracy in FR1 in AWGN

Accuracy	Conditions					
	TRS Ês/Iot	Minimum TRS bandwidth	TRS SCS	NR operating band groups[Note 2]	Io[Note 3] range	
					Minimum Io[Note 1]	Maximum Io
Tc[Note 4]	dB	RB	kHz		dBm / SCS_{TRS}	dBm/BW
[116+δ+ε]	-3	≥[24]	15	NR_FDD_FR1_A, NR_TDD_FR1_A, NR_SDL_FR1_A	-121	-50
				NR_FDD_FR1_B	-120.5	
				NR_TDD_FR1_C	-120	
				NR_FDD_FR1_D, NR_TDD_FR1_D	-119.5	
				NR_FDD_FR1_E, NR_TDD_FR1_E	-119	
				NR_FDD_FR1_F	-118.5	
				NR_FDD_FR1_G	-118	
				NR_FDD_FR1_H	-117.5	
[60+δ+ε]		≥[52]		Note 5	NOTE 5	NOTE 5
[29+δ+ε]		>[104]		Note 5	NOTE 5	NOTE 5
[56+δ+ε]		≥[24]	30	NR_FDD_FR1_A, NR_TDD_FR1_A, NR_SDL_FR1_A	-118	-50
				NR_FDD_FR1_B	-117.5	
				NR_TDD_FR1_C	-117	
				NR_FDD_FR1_D, NR_TDD_FR1_D	-116.5	
				NR_FDD_FR1_E, NR_TDD_FR1_E	-116	
				NR_FDD_FR1_F	-115.5	
				NR_FDD_FR1_G	-115	
				NR_FDD_FR1_H	-114.5	
[29+δ+ε]		≥[48]		NOTE 5	NOTE 5	NOTE 5
[15+δ+ε]		≥[132]		NOTE 5	NOTE 5	NOTE 5
[29+δ+ε]		≥[24]	60	NR_FDD_FR1_A, NR_TDD_FR1_A, NR_SDL_FR1_A	-115	-50

				NR_FDD_FR1_B	-114.5	
				NR_TDD_FR1_C	-114	
				NR_FDD_FR1_D, NR_TDD_FR1_D	-113.5	
				NR_FDD_FR1_E, NR_TDD_FR1_E	-113	
				NR_FDD_FR1_F	-113.5	
				NR_FDD_FR1_G	-113	
				NR_FDD_FR1_H	-111.5	
[14+δ+ε]		≥[64]		NOTE 5	NOTE 5	NOTE 5
[7+δ+ε]		≥[132]		NOTE 5	NOTE 5	NOTE 5

NOTE 1: This minimum Io condition is expressed as the average Io per RE over all REs in an OFDM symbol.
NOTE 2: NR operating band groups are as defined in Section 3.5.
NOTE 3: The Io is defined in TRS slots. The same Io range applies to TRS and non-TRS symbols. Io levels are different in TRS and non-TRS symbols within the same slot.
NOTE 4: Tc is the basic timing unit defined in TS 38.211 [6].
NOTE 5: The same bands and the same Io conditions for each band apply for this requirement as for the corresponding requirement with the TRS bandwidth of the smallest RB number for the corresponding SCS.
NOTE 6: δ is the margin determined from Table 10.1.39.3-3.
NOTE 7: ε is the margin for reporting quantitization error and $\varepsilon = 16\,Tc$.

Table 6.6.21.0-3: Margin for UE Rx-Tx time difference measurement accuracy in FR1

Min(TRS BW, SRS BW) (RB)			Margin (Tc [Note 1])
SCS = 15 kHz	SCS = 30 kHz	SCS = 60 kHz	
≥ 24	N/A	N/A	[160]
≥ 52	≥ 24	N/A	[80]
≥ 104	≥ 48	≥ 24	[56]
N/A	≥ 132	≥ 64	[24]
N/A	N/A	≥ 132	[24]

NOTE 1: Tc is the basic timing unit defined in TS 38.211 [6].
NOTE 2: If SRS and TRS have different SCS, the margin corresponding to the smallest RS BW in MHz applies.

6.6.21.1 UE Rx-Tx time difference measurement with TRS for RTT-based PDC in FR1 SA

6.6.21.1.1 Test purpose

The purpose of the test is to verify that the UE Rx-Tx measurement with TRS for RTT-based PDC meets the requirements specified in clause 9.12.4.2 for measurement delay and clause 10.1.X.2 for measurement accuracy in AWGN propagation condition in FR1 in standalone scenario.

6.6.21.1.2 Test applicability

This test applies to all types of NR UE release 17 onwards supporting *rtt-BasedPDC-CSI-RS-ForTracking-r17 or gNB-SideRTT-BasedPDC-r17*.

6.6.21.1.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 6.6.21.0.

The normative reference for this requirement is TS 38.133 [6] clauses 9.12.4.2, 9.12.5, 10.1.39.3 and A.6.6.21.

6.6.21.1.4 Test description

6.6.21.1.4.1 Initial conditions

This test shall be tested using any of the test configurations in Table 6.6.21.1.4.1-1

Table 6.6.21.1.4.1-1: Supported test configurations

Configuration	Description
6.6.21-1	15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode
6.6.21-2	15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode
6.6.21-3	30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode
Note: The UE is only required to be tested in one of the supported test configurations.	

Configure the test requirement and the DUT according to the parameters in Table 6.6.21.1.4.1-2.

Table 6.6.21.1.4.1-2: Initial conditions for UE Tx-Rx time difference measurement for FR1

Parameter	Value		Comment
Test environment	NC		As specified in TS 38.508-1 [14] clause 4.1.
Test frequencies	As specified in Annex E, Table E.4-1 and TS 38.508-1 [14] clause 4.3.1.		
Channel bandwidth	As specified by the test configuration selected from Table 6.6.21.1.4.1-1.		
Propagation conditions	AWGN		As specified in Annex C.2.2
Connection Diagram	TE Part	TBD	As specified in TS 38.508-1 [14] Annex A.
	DUT Part	TBD	

1. The general test parameter settings are set up according to Table 6.6.21.1.4.1-3.
2. Message contents are defined in clause 6.6.21.1.4.3.
3. The test scenario comprises of 1 NR Cell. The connection setup with the power level set according to Annex C.1.1 and C.1.2 for this test.

Table 6.6.21.1.4.1-3: General test parameters

Parameter	Unit	Test configuration	Value
Active cell		1, 2, 3	Cell 1
RF Channel Number		1, 2, 3	1
$BW_{channel}$	MHz	1	10: $N_{RB,c}$ = 52
		2	10: $N_{RB,c}$ = 52
		3	40: $N_{RB,c}$ = 106
SSB configuration		1	SSB.1 FR1
		2	SSB.1 FR1
		3	SSB.2 FR1
SMTC configuration		1	SMTC.2
		2	SMTC.1
		3	SMTC.1
CP length		1, 2, 3	Normal
DRX		1, 2, 3	OFF
T1	s	1, 2, 3	1
T2	s	1, 2, 3	1

6.6.21.1.4.2 Test procedure

The test is considered with one cell (Cell 1) in FR1.

The test consists of two consecutive time intervals, with duration of T1 and T2. Cell 1 does not have TRS transmission during T1 and transmits TRS during T2.

The measurement control information with *MeasObjectRxTxDiff* set to 'csi-RS-Ref' as defined in table 6.6.21.1.4.3-1, shall be provided to the UE during T1. The last TTI containing the RRC message shall be provided to the UE ΔT ms before the start of T2, where ΔT = 10 ms is the maximum processing time of the measurement request. The UE is configured to transmit SRS during T2.

The general and cell specific test parameters for PCell is given in Table 6.6.21.1.4.1-3 and Table 6.6.21.1.5-1, respectively. The test consists of two sub-tests with different TRS BW.

1. Ensure the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity *NR*, Connected without release *On* and Test Mode *On* according to TS 38.508-1 [14] clause 4.5.

2. Set the parameters according to T1 in Table 6.6.21.1.5-1 as appropriate.

3. SS shall transmit an *RRCReconfiguration* message.

4. The UE shall transmit *RRCReconfigurationComplete* message. T1 starts.

5. When T1 expires, the SS shall switch the power setting from T1 to T2 as specified in Table 6.6.21.1.5-1. T2 starts.

6. The UE shall transmit periodically MeasurementReport messages.

7. After 10s wait from Step 3, the SS shall check the *result-k5-r17* reported values in the periodic MeasurementReport. If the *result-k5* value is outside the limits in Table 6.6.21.0-2 or the UE fails to report the measurement value for serving cell, the number of failed iterations is increased by one. Otherwise, the number of passed iterations is increased by one.

8. The SS shall continue checking the MeasurementReport messages transmitted by the UE until the confidence level according to Table G.2.3-1 in Annex G is achieved.

6.6.21.1.4.3 Message contents

Message contents are according to TS 38.508-1 [14] clause 7.3 with the following exceptions:

Default Message Contents	
Common contents of system information blocks exceptions	
Default RRC messages and information elements contents exceptions	Table 4.6.3-76B in 38.508-1 [14] with condition CSI-RS_REF
Specific message contents exceptions for Test Configuration 6.6.21-1 and 6.6.21-2	Table 4.6.3-84AC in 38.508-1 [14] with condition SCS15
Specific message contents exceptions for Test Configuration 6.6.21-3	Table 4.6.3-84AC in 38.508-1 [14] with condition SCS30

6.6.21.1.5 Test requirements

Table 6.6.21.1.4.1-3 and Table 6.6.21.1.5-1 define the primary level settings including test tolerances for UE Rx-Tx time difference measurement with TRS for RTT-based PDC in FR1 SA.

Table 6.6.21.1.5-1: Cell specific test parameters

Parameter	Unit	Test configuration	Values	
			T1	T2
TDD configuration		1	N/A	
		2	TDDConf.1.1	
		3	TDDConf.2.1	
PDSCH RMC configuration		1	SR.1.1 FDD	
		2	SR.1.1 TDD	
		3	SR.2.1 TDD	
RMSI CORESET RMC configuration		1	CR.1.1 FDD	
		2	CR.1.1 TDD	
		3	CR.2.1 TDD	
Dedicated CORESET RMC configuration		1	CCR.1.1 FDD	
		2	CCR.1.1 TDD	
		3	CCR.2.1 TDD	
OCNG Patterns		1, 2, 3	OP.1	

TRS Configuration		1	TRS.1.1 FDD	
		2	TRS.1.1 TDD	
		3	TRS.1.2 TDD	
Initial BWP configuration		1, 2, 3	DLBWP.0.1 ULBWP.0.1	
Active DL BWP configuration		1, 2, 3	DLBWP.1.1	
Active UL BWP configuration		1, 2, 3	ULBWP.1.1	
SRS configuration		1	[PDC-SRS.1]	
		2	[PDC-SRS.1]	
		3	[PDC-SRS.2]	
N_{oc} Note 2	dBm/SCS	1	-98	
		2	-98	
		3	-95	
N_{oc} Note 2	dBm/15 kHz	1	-98	
		2		
		3		
TRS $\hat{E}_s/I_{ot}$	dB	1	-Infinity	-3
		2		
		3		
TRS $\hat{E}_s/N_{oc}$	dB	1	-Infinity	-3
		2		
		3		
TRS-RSRP Note 3	dBm/SCS kHz	1	-Infinity	-101
		2	-Infinity	-101
		3	-Infinity	-98
Io	dBm/9.36 MHz	1	N/A	-68.28
	dBm/9.36 MHz	2		-68.28
	dBm/38.16 MHz	3		-62.19
Propagation Condition		1, 2, 3	AWGN	

Note 1: The resources for uplink transmission are assigned to the UE prior to the start of time period T2.
Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for N_{oc} to be fulfilled.
Note 3: TRS-RSRP levels have been derived from other parameters for information purposes. They are not settable parameters themselves.

The UE Rx-Tx time difference measurement time fulfils the requirements specified in clause 6.6.21.0. The UE shall be able to report the Rx-Tx time difference measurement results no later than TBD ms from the beginning of T2.

The UE Rx-Tx time difference measurement time fulfils the UE Rx-Tx measurement accuracy requirements specified in clause 6.6.21.0.

For the test to pass, the ratio of successful reported values shall be more than 90% with a confidence level of 95%.

NOTE: The actual overall delays measured in the test may be up to $2xTTI_{DCCH}$ higher than the measurement reporting delays above because of TTI insertion uncertainty of the measurement report in DCCH.

6.7 Measurement performance requirements

6.7.1 SS-RSRP

6.7.1.0 Minimum conformance requirements

6.7.1.0.1 Intra-frequency absolute SS-RSRP measurement accuracy requirements

Same as in clause 4.7.1.0.1.

6.7.1.0.2 Intra-frequency relative SS-RSRP measurement accuracy requirements

Same as in clause 4.7.1.0.2.

6.7.1.0.3 Inter-frequency absolute SS-RSRP measurement accuracy requirements

Same as in clause 4.7.1.0.3.

6.7.1.0.4 Inter-frequency relative SS-RSRP measurement accuracy requirements

Same as in clause 4.7.1.0.4.

6.7.1.1 Intra-frequency measurements

6.7.1.1.1 NR SA FR1 SS-RSRP absolute measurement accuracy

6.7.1.1.1.1 Test purpose

The purpose of this test is to verify that the intra-frequency SS-RSRP absolute measurement accuracy is within the specified limits for all bands.

6.7.1.1.1.2 Test applicability

This test applies to all types of NR UE from Release 15 onwards.

6.7.1.1.1.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 6.7.1.0.1.

The normative reference for this requirement is TS 38.133 [6] clause A.6.7.1.1.

6.7.1.1.1.4 Test description

6.7.1.1.1.4.1 Initial conditions

This test shall be tested using any of the test configurations in Table 6.7.1.1.1.4.1-1.

Table 6.7.1.1.1.4.1-1: NR SA FR1 SS-RSRP measurement accuracy supported test configurations

Test Case ID	Description
6.7.1.1.1-1	NR: 15 kHz SSB SCS, 10MHz bandwidth, FDD
6.7.1.1.1-2	NR: 15 kHz SSB SCS, 10MHz bandwidth, TDD
6.7.1.1.1-3	NR: 30 kHz SSB SCS, 40MHz bandwidth, TDD
Note: The UE is only required to be tested in one of the supported test configurations	

Configure the test equipment and the DUT according to the parameters in Table 6.7.1.1.1.4.1-2.

Table 6.7.1.1.1.4.1-2: Initial conditions for SS-RSRP intra frequency absolute accuracy in FR1

Parameter	Value		Comment
Test environment	NC, TL/VL, TL/VH, TH/VL, TH/VH		As specified in TS 38.508-1 [14] clause 4.1.
Test frequencies	As specified in Annex E, Table E.4-1 and TS 38.508-1 [14] clause 4.3.1.		
Channel bandwidth	As specified by the test configuration selected from Table 6.7.1.1.1.4.1-1.		
Propagation conditions	AWGN		As specified in Annex C.2.2.
Connection Diagram	TE Part 2Rx	A.3.1.8.2 with n = 2 and φ_1 = 5 Hz	As specified in TS 38.508-1 [14] Annex A.
	TE Part 4Rx	A.3.1.8.5 with n = 2 and $\varphi_{1,1}$ = 5 Hz, $\varphi_{1,2}$ = 10 Hz, $\varphi_{1,3}$ = 15 Hz	
	DUT Part 2Rx	A.3.2.3.4	
	DUT Part 4Rx	A.3.2.5.2	
Exceptions to connection diagram	- Without LTE link		

1. Message contents are defined in clause 6.7.1.1.1.4.3.

2. Cell 1 is the NR FR1 serving cell (PCell) and Cell 2 is the NR neighbour in the same frequency and the target cell for SS-RSRP measurements. The connection setup is done according to the settings in Annex C.1.1 and C.1.2.

6.7.1.1.1.4.2 Test procedure

1. Ensure the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity *NR*, Connected without release *On* and Test Mode *On* according to TS 38.508-1 [14] clause 4.5.

2. Set the parameters according to Table 6.7.1.1.1.5-1 as appropriate.

3. The SS shall transmit an RRCReconfiguration message on Cell 1.

4. The UE shall transmit an RRCReconfigurationComplete message.

5. The UE shall transmit periodically MeasurementReport messages.

6. After 10s wait from Step 3, the SS shall check the SS-RSRP reported values in the periodic MeasurementReport. The SS-RSRP value of Cell 2 reported by the UE is compared to the expected SS-RSRP. If the value is outside the limits in Table 6.7.1.1.1.5-2 or the UE fails to report the measurement value for Cell 2, the number of failed iterations is increased by one. Otherwise, the number of passed iterations is increased by one.

7. The SS shall continue checking the MeasurementReport messages transmitted by the UE until the confidence level according to Table G.2.3-1 in Annex G is achieved.

8. Set the parameters according to each sub-test in Table 6.7.1.1.1.5-1 as appropriate and repeat steps 5-7.

6.7.1.1.1.4.3 Message contents

Message contents are according to TS 38.508-1 [14] clause 7.3 with the following exceptions:

Table 6.7.1.1.1.4.3-1: Common Exception messages for NR SA FR1 SS-RSRP absolute measurement accuracy

Default Message Contents	
Common contents of system information blocks exceptions	
Default RRC messages and information elements contents exceptions	Table H.3.1-1 Table H.3.1-2 Table H.3.1-5 Table H.3.1-7
Specific message contents exceptions for Test Configuration 6.7.1.1.1-1	Table H.3.1-3 with Condition SSB.1 FR1 Table 7.3.1-3 in TS 38.508-1 [14] with condition SMTC.2
Specific message contents exceptions for Test Configuration 6.7.1.1.1-2	Table H.3.1-3 with Condition SSB.1 FR1 and Synchronous cells Table 7.3.1-3 in TS 38.508-1 [14] with condition SMTC.1
Specific message contents exceptions for Test Configuration 6.7.1.1.1-3	Table H.3.1-3 with Condition SSB.2 FR1 and Synchronous cells Table 7.3.1-3 in TS 38.508-1 [14] with condition SMTC.1

Table 6.7.1.1.1.4.3-2: ReportConfigNR-DEFAULT(Periodical) for NR SA FR1 SS-RSRP Accuracy

Derivation Path: 38.508-1 [14] Table 4.6.3-142 with condition PERIODICAL			
Information Element	**Value/remark**	**Comment**	**Condition**
ReportConfigNR::= SEQUENCE {			
reportType CHOICE {			
periodical SEQUENCE {			PERIODICAL
reportQuantityCell SEQUENCE {			
rsrq	false		
sinr	false		
}			
maxReportCells	2		
}			
}			
}			

6.7.1.1.1.5 Test requirement

Table 6.7.1.1.1.5-1 defines the primary level settings including test tolerances for all tests.

Each SS-RSRP measurement report for each of the tests in Table 6.7.1.1.1.5-1 shall meet the corresponding absolute accuracy requirements in Table 6.7.1.1.1.5-2 for test configurations 1 and 2, and the corresponding absolute accuracy requirements in Table 6.7.1.1.1.5-3 for test configuration 3.

Table 6.7.1.1.1.5-1: NR SA FR1 SS-RSRP measurement accuracy test parameters

Parameter		Unit	Test 1		Test 2		Test 3	
			Cell 1	Cell 2	Cell 1	Cell 2	Cell 1	Cell 2
Physical cell ID			489	0	489	0	489	0
SSB ARFCN			freq1		freq1		freq1	
Duplex mode	Config 1		FDD					
	Config 2,3		TDD					
TDD configuration	Config 1		Not Applicable					
	Config 2		TDDConf.1.1					
	Config 3		TDDConf.2.1					
$BW_{channel}$	Config 1	MHz	10: $N_{RB,c}$ = 52					
	Config 2		10: $N_{RB,c}$ = 52					
	Config 3		40: $N_{RB,c}$ = 106					
BWP BW	Config 1		10: $N_{RB,c}$ = 52					
	Config 2		10: $N_{RB,c}$ = 52					
	Config 3		40: $N_{RB,c}$ = 106					
Downlink initial BWP configuration			DLBWP.0.1					
Downlink dedicated BWP configuration			DLBWP.1.1					
Uplink initial BWP configuration			ULBWP.0.1					
Uplink dedicated BWP configuration			ULBWP.1.1					
DRx Cycle		ms	Not Applicable					
TRS Configuration	Config 1		TRS.1.1 FDD	-	TRS.1.1 FDD	-	TRS.1.1 FDD	-
	Config 2		TRS.1.1 TDD		TRS.1.1 TDD		TRS.1.1 TDD	
	Config 3		TRS.1.2 TDD		TRS.1.2 TDD		TRS.1.2 TDD	
PDSCH Reference measurement channel	Config 1		SR.1.1 FDD	-	SR.1.1 FDD	-	SR.1.1 FDD	-
	Config 2		SR.1.1 TDD		SR.1.1 TDD		SR.1.1 TDD	
	Config 3		SR2.1 TDD		SR2.1 TDD		SR2.1 TDD	
RMSI CORESET Reference Channel	Config 1		CR.1.1 FDD	-	CR.1.1 FDD	-	CR.1.1 FDD	-
	Config 2		CR.1.1 TDD		CR.1.1 TDD		CR.1.1 TDD	
	Config 3		CR2.1 TDD		CR2.1 TDD		CR2.1 TDD	
Control Channel RMC	Config 1		CCR.1.1 FDD	-	CCR.1.1 FDD	-	CCR.1.1 FDD	-
	Config 2		CCR.1.1 TDD		CCR.1.1 TDD		CCR.1.1 TDD	
	Config 3		CR2.1 TDD		CCR2.1 TDD		CCR2.1 TDD	
SSB configuration	Config 1		SSB 1.FR1	SSB.1 FR1	SSB 1.FR1	SSB.1 FR1	SSB 1.FR1	SSB.1 FR1

	Config 2			SSB 1.FR1	SSB.1 FR1	SSB 1.FR1	SSB.1 FR1	SSB 1.FR1	SSB.1 FR1
	Config 3			SSB 2.FR1	SSB.2 FR1	SSB 2.FR1	SSB.2 FR1	SSB 2.FR1	SSB.2 FR1
Time offset with Cell 2	Config 1		ms	-	3	-	3	-	3
	Config 2,3		µs	-	3	-	3	-	3
SMTC Configuration	Config 1			SMTC.2					
	Config 2,3			SMTC.1					
OCNG Patterns				OP.1					
PDSCH/PDCCH subcarrier spacing	Config 1,2		kHz	15 kHz					
	Config 3			30kHz					
EPRE ratio of PSS to SSS EPRE ratio of PBCH DMRS to SSS EPRE ratio of PBCH to PBCH DMRS EPRE ratio of PDCCH DMRS to SSS EPRE ratio of PDCCH to PDCCH DMRS EPRE ratio of PDSCH DMRS to SSS EPRE ratio of PDSCH to PDSCH EPRE ratio of OCNG DMRS to SSS(Note 1) EPRE ratio of OCNG to OCNG DMRS (Note 1)			dB	0	0	0	0	0	0
N_{oc} Note2	Config 1,2	Depending on band group	dBm/15KhZ	-107.5		-88		-116 + Δ_{BG_offset}	
	Config 3	Depending on band group		N/A Note 6		-94		-116 + Δ_{BG_offset}	
N_{oc} Note2	Config 1,2		dBm/SCS	-107.4		-88		Same as Noc/15kHz	
	Config 3	Depending on band group		N/A Note 6		-91		-113 + Δ_{BG_offset}	
$\hat{E}_s/I_{ot}$			dB	1.88	-5.57	1.88	-5.57	0.09	-5.56
$\hat{E}_s/N_{oc}$			dB	6	1.4	6	1.4	3	-0.8
SS-RSRP Note3	Config 1,2	Depending on band group	dBm/SCS	-101.5	-106.1	-82	-86.6	-113 + Δ_{BG_offset}	-116.8 + Δ_{BG_offset}
	Config 3	Depending on band group		N/A Note 6	N/A Note 6	-85	-89.6	-110+ Δ_{BG_offset}	-113.8+ Δ_{BG_offset}
Io Note3	Config 1,2	Depending on band group	dBm/ 9.36MHz	-71.68		-52.18		-82.39+ Δ_{BG_offset}	
	Config 3	Depending on band group	dBm/ 38.16MHz	N/A Note 6		-51.91		-76.12 + Δ_{BG_offset}	
Propagation condition			-	AWGN					
Antenna configuration				1x2					

Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.

Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for N_{oc} to be fulfilled.

Note 3: SS-RSRP and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.

Note 4: SS-RSRP minimum requirements are specified assuming independent interference and noise at each receiver antenna port.

Note 5: Δ_{BG_offset} is defined in clause 3A.4, Table 3A.4.1-2.

Note 6: Subtest 1 is not used when testing with 30kHz SSB SCS.

Table 6.7.1.1.1.5-2: SS-RSRP Intra frequency absolute accuracy requirements for the reported values for test configurations 1 and 2

Normal Conditions	Test 1 All bands	Test 2 All bands	Test 3

Lowest reported value (Cell 2)	44	60	Bands NR_FDD_FR1_A, NR_TDD_FR1_A	34
			Bands NR_FDD_FR1_B	34
			Bands NR_TDD_FR1_C	35
			Bands NR_FDD_FR1_D, NR_TDD_FR1_D	35
			Bands NR_FDD_FR1_E, Bands NR_TDD_FR1_E	36
			Bands NR_FDD_FR1_G	37
			Bands NR_FDD_FR1_H	37
Highest reported value (Cell 2)	56	79	NR_FDD_FR1_A, NR_TDD_FR1_A	46
			NR_FDD_FR1_B	46
			NR_TDD_FR1_C	47
			NR_FDD_FR1_D, NR_TDD_FR1_D	47
			NR_FDD_FR1_E, NR_TDD_FR1_E	48
			NR_FDD_FR1_G	49
			NR_FDD_FR1_H	49
Extreme Conditions	**Test 1 All bands**	**Test 2 All bands**	**Test 3**	
Lowest reported value (Cell 2)	40	57	Bands NR_FDD_FR1_A, NR_TDD_FR1_A	29
			Bands NR_FDD_FR1_B	30
			Bands NR_TDD_FR1_C	30
			Bands NR_FDD_FR1_D, NR_TDD_FR1_D	31
			Bands NR_FDD_FR1_E, Bands NR_TDD_FR1_E	31
			Bands NR_FDD_FR1_G	33
			Bands NR_FDD_FR1_H	34
Highest reported value (Cell 2)	61	82	Bands NR_FDD_FR1_A, NR_TDD_FR1_A	50
			Bands NR_FDD_FR1_B	51
			Bands NR_TDD_FR1_C	51
			Bands NR_FDD_FR1_D, NR_TDD_FR1_D	52
			Bands NR_FDD_FR1_E, Bands NR_TDD_FR1_E	52
			Bands NR_FDD_FR1_G	53
			Bands NR_FDD_FR1_H	54
Note 1: NR operating band groups are as defined in Section 3A.4.1.				

Table 6.7.1.1.1.5-3: SS-RSRP Intra frequency absolute accuracy requirements for the reported values for test configuration 3

Normal Conditions	**Test 1 All bands**	**Test 2 All bands**	**Test 3**	
Lowest reported value (Cell 2)	N/A	57	Bands NR_FDD_FR1_A, NR_TDD_FR1_A	37
			Bands NR_FDD_FR1_B	37
			Bands NR_TDD_FR1_C	38
			Bands NR_FDD_FR1_D, NR_TDD_FR1_D	38
			Bands NR_FDD_FR1_E, Bands NR_TDD_FR1_E	39
			Bands NR_FDD_FR1_G	40
			Bands NR_FDD_FR1_H	40
Highest reported value (Cell 2)	N/A	76	Bands NR_FDD_FR1_A, NR_TDD_FR1_A	49
			Bands NR_FDD_FR1_B	49
			Bands NR_TDD_FR1_C	50
			Bands NR_FDD_FR1_D, NR_TDD_FR1_D	50

			Bands NR_FDD_FR1_E, Bands NR_TDD_FR1_E	51
			Bands NR_FDD_FR1_G	52
			Bands NR_FDD_FR1_H	52
Extreme Conditions	**Test 1 All bands**	**Test 2 All bands**	**Test 3**	
Lowest reported value (Cell 2)	N/A	54	Bands NR_FDD_FR1_A, NR_TDD_FR1_A	32
			Bands NR_FDD_FR1_B	33
			Bands NR_TDD_FR1_C	33
			Bands NR_FDD_FR1_D, NR_TDD_FR1_D	34
			Bands NR_FDD_FR1_E, Bands NR_TDD_FR1_E	34
			Bands NR_FDD_FR1_G	35
			Bands NR_FDD_FR1_H	36
Highest reported value (Cell 2)	N/A	79	Bands NR_FDD_FR1_A, NR_TDD_FR1_A	53
			Bands NR_FDD_FR1_B	54
			Bands NR_TDD_FR1_C	54
			Bands NR_FDD_FR1_D, NR_TDD_FR1_D	55
			Bands NR_FDD_FR1_E, Bands NR_TDD_FR1_E	55
			Bands NR_FDD_FR1_G	56
			Bands NR_FDD_FR1_H	57
Note 1: NR operating band groups are as defined in Section 3A.4.1.				

For the test to pass, the ratio of successful reported values in each test shall be more than 90% with a confidence level of 95%.

6.7.1.1.2 NR SA FR1 SS-RSRP relative measurement accuracy

6.7.1.1.2.1 Test purpose

The purpose of this test is to verify that the intra-frequency SS-RSRP relative measurement accuracy is within the specified limits for all bands.

6.7.1.1.2.2 Test applicability

This test applies to all types of NR UE from Release 15 onwards.

6.7.1.1.2.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 6.7.1.0.2.

The normative reference for this requirement is TS 38.133 [6] clause A.6.7.1.1.

6.7.1.1.2.4 Test description

6.7.1.1.2.4.1 Initial conditions

This test shall be tested using any of the test configurations in Table 6.7.1.1.2.4.1-1.

Table 6.7.1.1.2.4.1-1: NR SA FR1 SS-RSRP measurement accuracy supported test configurations

Test Case ID	Description
6.7.1.1.2-1	NR: 15 kHz SSB SCS, 10MHz bandwidth, FDD
6.7.1.1.2-2	NR: 15 kHz SSB SCS, 10MHz bandwidth, TDD
6.7.1.1.2-3	NR: 30 kHz SSB SCS, 40MHz bandwidth, TDD
Note: The UE is only required to be tested in one of the supported test configurations	

Configure the test equipment and the DUT according to the parameters in Table 6.7.1.1.2.4.1-2.

Table 6.7.1.1.2.4.1-2: Initial conditions for SS-RSRP intra frequency relative accuracy in FR1

Parameter	Value		Comment
Test environment	NC, TL/VL, TL/VH, TH/VL, TH/VH		As specified in TS 38.508-1 [14] clause 4.1.
Test frequencies	As specified in Annex E, Table E.4-1 and TS 38.508-1 [14] clause 4.3.1.		
Channel bandwidth	As specified by the test configuration selected from Table 6.7.1.1.2.4.1-1.		
Propagation conditions	AWGN		As specified in Annex C.2.2.
Connection Diagram	TE Part 2Rx	A.3.1.8.2 with n = 2 and φ_1 = 5 Hz	As specified in TS 38.508-1 [14] Annex A.
	TE Part 4Rx	A.3.1.8.5 with n = 2 and $\varphi_{1,1}$ = 5 Hz, $\varphi_{1,2}$ = 10 Hz, $\varphi_{1,3}$ = 15 Hz	
	DUT Part 2Rx	A.3.2.3.4	
	DUT Part 4Rx	A.3.2.5.2	
Exceptions to connection diagram	- Without LTE link		

1. Message contents are defined in clause 6.7.1.1.2.4.3.

2. Cell 1 is the NR FR1 serving cell (PCell) and Cell 2 is the NR neighbour in the same frequency and the target cell for SS-RSRP measurements. The connection setup is done according to the settings in Annex C.1.1 and C.1.2.

6.7.1.1.2.4.2 Test procedure

1. Ensure the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity *NR* Connected without release *On* and Test Mode *On* according to TS 38.508-1 [14] clause 4.5.

2. Set the parameters according to Table 6.7.1.1.2.5-1 as appropriate.

3. The SS shall transmit an RRCReconfiguration message on Cell 1.

4. The UE shall transmit an RRCReconfigurationComplete message.

5. The UE shall transmit periodically MeasurementReport messages.

6. After 10s wait from Step 3, the SS shall check the SS-RSRP reported values of Cell 1 and Cell 2 in the periodic MeasurementReport. The SS-RSRP value of Cell 2 reported by the UE is compared to the reported SS-RSRP of Cell 1. If the resulting value is outside the limits in Table 6.7.1.1.2.5-2 or the UE fails to report the measurement value for Cell 1 or Cell 2, the number of failed iterations is increased by one. Otherwise, the number of passed iterations is increased by one.

7. The SS shall continue checking the MeasurementReport messages transmitted by the UE until the confidence level according to Table G.2.3-1 in Annex G is achieved.

8. Set the parameters according to each sub-test in Table 6.7.1.1.2.5-1 as appropriate and repeat steps 5-7.

6.7.1.1.2.4.3 Message contents

Message contents are same as in clause 6.7.1.1.1.4.3.

6.7.1.1.2.5 Test requirement

Table 6.7.1.1.2.5-1 defines the primary level settings including test tolerances for all tests.

Each SS-RSRP measurement report for each of the tests in Table 6.7.1.1.2.5-1 shall meet the corresponding absolute accuracy requirements in Table 6.7.1.1.2.5-2.

Table 6.7.1.1.2.5-1: Same as Table 6.7.1.1.1.5-1 with the following exceptions:

Parameter	Unit	Test 1		Test 2		Test 3	
		Cell 1	Cell 2	Cell 1	Cell 2	Cell 1	Cell 2

N_{oc} Note2	Config 1,2	Depending on band group	dBm/15KhZ	-106		-88		-116 + Δ_{BG_offset}	
	Config 3	Depending on band group		N/A Note 6		-94		-116 + Δ_{BG_offset}	
N_{oc} Note2	Config 1,2		dBm/SCS	Same as Noc/15kHz		Same as Noc/15kHz		Same as Noc/15kHz	
	Config 3,6	Depending on band group		N/A Note 6		-91		-113 + Δ_{BG_offset}	
$\hat{E}_s/I_{ot}$			dB	1.88	-4.97	1.88	-4.97	-0.01	-4.76
$\hat{E}_s/N_{oc}$			dB	6	2	6	2	3	0
SS-RSRP Note3	Config 1,2	Depending on band group	dBm/SCS	-100	-104	-82	-86	-113 + Δ_{BG_offset}	-116 + Δ_{BG_offset}
	Config 3	Depending on band group		N/A Note 6	N/A Note 6	-85	-89	-110 + Δ_{BG_offset}	-113 + Δ_{BG_offset}
Io Note3	Config 1,2	Depending on band group	dBm/ 9.36MHz	-70.05		-52.05		-82.20+ Δ_{BG_offset}	
	Config 3	Depending on band group	dBm/ 38.16MHz	N/A Note 6		-51.77		-75.93 + Δ_{BG_offset}	

Table 6.7.1.1.2.5-2: SS-RSRP Intra frequency relative accuracy requirements for the reported values

	Test 1	**Test 2**	**Test 3**
	All bands	All bands	All bands
Normal Conditions			
Lowest reported value (Cell 2)	RSRP_x - 8	RSRP_x - 8	RSRP_x - 7
Highest reported value (Cell 2)	RSRP_x - 1	RSRP_x - 1	RSRP_x + 1
Extreme Conditions			
Lowest reported value (Cell 2)	RSRP_x - 8	RSRP_x - 8	RSRP_x - 7
Highest reported value (Cell 2)	RSRP_x - 1	RSRP_x - 1	RSRP_x + 1
RSRP_x is the reported value of Cell 1			

For the test to pass, the ratio of successful reported values in each test shall be more than 90% with a confidence level of 95%.

6.7.1.2 Inter-frequency measurements

6.7.1.2.1 NR SA FR1-FR1 SS-RSRP absolute measurement accuracy

6.7.1.2.1.1 Test purpose

The purpose of this test is to verify that the inter-frequency SS-RSRP absolute measurement accuracy is within the specified limits for all bands.

6.7.1.2.1.2 Test applicability

This test applies to all types of NR UE from Release 15 onwards.

6.7.1.2.1.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 6.7.1.0.3.

The normative reference for this requirement is TS 38.133 [6] clause A.6.7.1.2.

6.7.1.2.1.4 Test description

6.7.1.2.1.4.1 Initial conditions

This test shall be tested using any of the test configurations in Table 6.7.1.2.1.4.1-1.

Table 6.7.1.2.1.4.1-1: NR SA FR1-FR1 SS-RSRP measurement accuracy supported test configurations

Test Case ID	Description
6.7.1.2.1-1	NR: 15 kHz SSB SCS, 10MHz bandwidth, FDD
6.7.1.2.1-2	NR: 15 kHz SSB SCS, 10MHz bandwidth, TDD
6.7.1.2.1-3	NR: 30 kHz SSB SCS, 40MHz bandwidth, TDD
Note: The UE is only required to be tested in one of the supported test configurations	

Configure the test equipment and the DUT according to the parameters in Table 6.7.1.2.1.4.1-2.

Table 6.7.1.2.1.4.1-2: Initial conditions for SS-RSRP inter frequency absolute accuracy in FR1

Parameter	Value		Comment
Test environment	NC, TL/VL, TL/VH, TH/VL, TH/VH		As specified in TS 38.508-1 [14] clause 4.1.
Test frequencies	As specified in Annex E, Table E.4-1 and TS 38.508-1 [14] sclause 4.3.1.		
Channel bandwidth	As specified by the test configuration selected from Table 6.7.1.2.1.4.1-1.		
Propagation conditions	AWGN		As specified in Annex C.2.2.
Connection Diagram	TE Part 2Rx	A.3.1.8.2 with n = 2 and φ_1 = 5 Hz	As specified in TS 38.508-1 [14] Annex A.
	TE Part 4Rx	A.3.1.8.5 with n = 2 and $\varphi_{1,1}$ = 5 Hz, $\varphi_{1,2}$ = 10 Hz, $\varphi_{1,3}$ = 15 Hz	
	DUT Part 2Rx	A.3.2.3.4	
	DUT Part 4Rx	A.3.2.5.2	
Exceptions to connection diagram	- Without the LTE link		

1. Message contents are defined in clause 6.7.1.2.1.4.3.
2. Cell 1 is the NR FR1 serving cell (PCell) and Cell 2 is the NR neighbour in a different FR1 frequency and the target cell for SS-RSRP measurements. The connection setup is done according to the settings in Annex C.1.1 and C.1.2.

6.7.1.2.1.4.2 Test procedure

Same as in clause 6.7.1.1.1.4.2 but replacing Table 6.7.1.1.1.5-1 and 6.7.1.1.1.5-2 with 6.7.1.2.1.5-1 and 6.7.1.2.1.5-2, respectively.

6.7.1.2.1.4.3 Message contents

Message contents are according to TS 38.508-1 [14] clause 7.3 with the following exceptions:

Table 6.7.1.2.1.4.3-1: Common Exception messages for NR SA FR1-FR1 SS-RSRP absolute measurement accuracy

Default Message Contents	
Common contents of system information blocks exceptions	
Default RRC messages and information elements contents exceptions	Table H.3.1-1 Table H.3.1-2 with condition INTER-FREQ and GAP NEEDED Table H.3.1-5 Table H.3.1-7 with condition INTER-FREQ Table H.3.1-6 with condition Pattern #0
Specific message contents exceptions for Test Configuration 6.7.1.2.1-1	Table H.3.1-3 with Conditions INTER-FREQ MO, SSB.1 FR1 Table 7.3.1-3 in TS 38.508-1 [14] with condition SMTC.2
Specific message contents exceptions for Test Configuration 6.7.1.2.1-2	Table H.3.1-3 with Conditions INTER-FREQ MO, SSB.1 FR1 and Synchronous cells Table 7.3.1-3 in TS 38.508-1 [14] with condition SMTC.1

Specific message contents exceptions for Test Configuration 6.7.1.2.1-3	Table H.3.1-3 with Conditions INTER-FREQ MO, SSB.2 FR1 and Synchronous cells Table 7.3.1-3 in TS 38.508-1 [14] with condition SMTC.1

Table 6.7.1.2.1.4.3-2: ReportConfigNR-DEFAULT(Periodical) for NR SA FR1 SS-RSRP Accuracy

Derivation Path: 38.508-1 [14] Table 4.6.3-142 with condition PERIODICAL			
Information Element	**Value/remark**	**Comment**	**Condition**
ReportConfigNR::= SEQUENCE {			
reportType CHOICE {			
periodical SEQUENCE {			PERIODICAL
reportQuantityCell SEQUENCE {			
rsrq	false		
sinr	false		
}			
maxReportCells	2		
}			
}			
}			

6.7.1.2.1.5 Test requirement

Table 6.7.1.2.1.5-1 defines the primary level settings including test tolerances for all tests.

Each SS-RSRP measurement report for each of the tests in Table 6.7.1.2.1.5-1 shall meet the corresponding absolute accuracy requirements in Table 6.7.1.2.1.5-2 for test configurations 1 and 2, and the corresponding absolute accuracy requirements in Table 6.7.1.2.1.5-3 for test configuration 3.

Table 6.7.1.2.1.5-1: SS-RSRP inter-frequency test parameters

Parameter	Config	Unit	Test 1		Test 2	
			Cell 1	Cell 2	Cell 1	Cell 2
SSB ARFCN	1~3		freq1	freq2	freq1	freq2
$BW_{channel}$	1	MHz	10: $N_{RB,c}$ = 52		10: $N_{RB,c}$ = 52	
	2		10: $N_{RB,c}$ = 52		10: $N_{RB,c}$ = 52	
	3		40: $N_{RB,c}$ = 106		40: $N_{RB,c}$ = 106	
Gap pattern ID			0		0	
Duplex mode	1		FDD		FDD	
	2		TDD		TDD	
	3		TDD		TDD	
TDD configuration	1		N/A		N/A	
	2		TDDConf.1.1		TDDConf.1.1	
	3		TDDConf.2.1		TDDConf.2.1	
PDSCH Reference measurement channel	1		SR.1.1 FDD	-	SR.1.1 FDD	-
	2		SR.1.1 TDD		SR.1.1 TDD	
	3		SR.2.1 TDD		SR.2.1 TDD	
RMSI CORESET Reference Channel	1		CR.1.1 FDD	-	CR.1.1 FDD	-
	2		CR.1.1 TDD	-	CR.1.1 TDD	-
	3		CR.2.1 TDD	-	CR.2.1 TDD	-
Dedicated CORESET Reference Channel	1		CCR.1.1 FDD	-	CCR.1.1 FDD	-
	2		CCR.1.1 TDD	-	CCR.1.1 TDD	-
	3		CCR.2.1 TDD	-	CCR.2.1 TDD	-
SSB configuration	1		SSB.1 FR1		SSB.1 FR1	
	2		SSB.1 FR1		SSB.1 FR1	
	3		SSB.2 FR1		SSB.2 FR1	
OCNG Patterns	1~3		OP.1		OP.1	
TRS configuration	1		TRS.1.1 FDD	-	TRS.1.1 FDD	-
	2		TRS.1.1 TDD		TRS.1.1 TDD	

		3		TRS.1.2 TDD		TRS.1.2 TDD	
Initial BWP Configuration		1~3		DLBWP.0.1 ULBWP.0.1		DLBWP.0.1 ULBWP.0.1	
Dedicated BWP configuration		1~3		DLBWP.1.1 ULBWP.1.1		DLBWP.1.1 ULBWP.1.1	
SMTC configuration		1		SMTC.2		SMTC.2	
		2,3		SMTC.1		SMTC.1	
Time offset between Cell 2 and Cell 3		1	ms	3		3	
		2,3	μs	3		3	
EPRE ratio of PSS to SSS EPRE ratio of PBCH DMRS to SSS EPRE ratio of PBCH to PBCH DMRS EPRE ratio of PDCCH DMRS to SSS EPRE ratio of PDCCH to PDCCH DMRS EPRE ratio of PDSCH DMRS to SSS EPRE ratio of PDSCH to PDSCH DMRS EPRE ratio of OCNG DMRS to SSS Note 1 EPRE ratio of OCNG to OCNG DMRS Note 1		1~3	dB	0	0	0	0
N_{oc} Note2	Depending on band group	1,2	dBm/15 kHz	-94.65	-94.65	(N_{oc} for Cell 2 +8dB) + Δ_{BG_offset}	-115+ Δ_{BG_offset}
N_{oc} Note2	Depending on band group	3	dBm/15 kHz	-96	-96	(N_{oc} for Cell 2 +8dB) + Δ_{BG_offset}	-115+ Δ_{BG_offset}
N_{oc} Note2	Depending on band group	1,2	dBm/SSB SCS	-94.65	-94.65	(N_{oc} for Cell 2 +8dB) + Δ_{BG_offset}	-115+ Δ_{BG_offset}
	Depending on band group	3		-93	-93	(N_{oc} for Cell 2 +8dB) + Δ_{BG_offset}	-112.00+ Δ_{BG_offset}
$\hat{E}_s/I_{ot}$		1~3	dB	10	10	13	-3
SS-RSRP Note3	Depending on band group	1,2,	dBm/SCS	-84.65	-84.65	(RSRP for Cell 2 +25dB) + Δ_{BG_offset}	-118.00+ Δ_{BG_offset}
	Depending on band group	3		-83	-83	(RSRP for Cell 2 +25dB) + Δ_{BG_offset}	-115.00+ Δ_{BG_offset}
Io Note3	Depending on band group	1,2	dBm/ 9.36MHz	56.28	56.28	(Io for Channel 2 +19.75dB) + Δ_{BG_offset}	-85.28+ Δ_{BG_offset}
	Depending on band group	3	dBm/ 38.16MHz	-51.53	-51.53	(Io for Channel 2 +19.75dB) + Δ_{BG_offset}	-79.19+ Δ_{BG_offset}
$\hat{E}_s/N_{oc}$		1~3	dB	10	10	13	-3
Propagation condition		1~3	-	AWGN		AWGN	
Antenna configuration				1x2		1x2	

Note 1:	OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.
Note 2:	Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for N_{oc} to be fulfilled.
Note 3:	RSRP and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.
Note 4:	RSRP minimum requirements are specified assuming independent interference and noise at each receiver antenna port.
Note 5	The test configuration excludes support for band n51 and it is not required to run this test on band n51 in this release of the specification.
Note 6:	Δ_{BG_offset} is defined in clause 3A.4, Table 3A.4.1-2.

Table 6.7.1.2.1.5-2: SS-RSRP Inter frequency absolute accuracy requirements for the reported values for test configurations 1, 2, 4 and 5

Normal Conditions	Test 1 All bands	Test 2	
Lowest reported value (Cell 2)	62	Bands NR_FDD_FR1_A, NR_TDD_FR1_A	32
		Bands NR_FDD_FR1_B	33
		Bands NR_TDD_FR1_C	33
		Bands NR_FDD_FR1_D, NR_TDD_FR1_D	34
		Bands NR_FDD_FR1_E, NR_TDD_FR1_E	34
		Bands NR_FDD_FR1_G	35
		Bands NR_FDD_FR1_H	36
Highest reported value (Cell 2)	81	Bands NR_FDD_FR1_A, NR_TDD_FR1_A	45
		Bands NR_FDD_FR1_B	45
		Bands NR_TDD_FR1_C	46
		Bands NR_FDD_FR1_D, NR_TDD_FR1_D	46
		Bands NR_FDD_FR1_E, NR_TDD_FR1_E	47
		Bands NR_FDD_FR1_G	48
		Bands NR_FDD_FR1_H	48
Extreme Conditions	**Test 1 All bands**	**Test 2**	
Lowest reported value (Cell 2)	59	Bands NR_FDD_FR1_A, NR_TDD_FR1_A	28
		Bands NR_FDD_FR1_B	28
		Bands NR_TDD_FR1_C	29
		Bands NR_FDD_FR1_D, NR_TDD_FR1_D	29
		Bands NR_FDD_FR1_E, NR_TDD_FR1_E	30
		Bands NR_FDD_FR1_G	31
		Bands NR_FDD_FR1_H	31
Highest reported value (Cell 2)	84	Bands NR_FDD_FR1_A, NR_TDD_FR1_A	49
		Bands NR_FDD_FR1_B	50
		Bands NR_TDD_FR1_C	50
		Bands NR_FDD_FR1_D, NR_TDD_FR1_D	51
		Bands NR_FDD_FR1_E, NR_TDD_FR1_E	51
		Bands NR_FDD_FR1_G	52
		Bands NR_FDD_FR1_H	53
Note 1: NR operating band groups are defined in clause 3A.4, Table 3A.4.1-2.			

Table 6.7.1.2.1.5-3: SS-RSRP Inter frequency absolute accuracy requirements for the reported values for test configurations 3 and 6

Normal Conditions	Test 1 All bands	Test 2	
Lowest reported value (Cell 2)	64	Bands NR_FDD_FR1_A, NR_TDD_FR1_A	35
		Bands NR_FDD_FR1_B	36
		Bands NR_TDD_FR1_C	36
		Bands NR_FDD_FR1_D, NR_TDD_FR1_D	37
		Bands NR_FDD_FR1_E, NR_TDD_FR1_E	37
		Bands NR_FDD_FR1_G	38
		Bands NR_FDD_FR1_H	39
Highest reported value (Cell 2)	83	Bands NR_FDD_FR1_A, NR_TDD_FR1_A	48
		Bands NR_FDD_FR1_B	48
		Bands NR_TDD_FR1_C	49
		Bands NR_FDD_FR1_D, NR_TDD_FR1_D	49
		Bands NR_FDD_FR1_E, NR_TDD_FR1_E	50
		Bands NR_FDD_FR1_G	51
		Bands NR_FDD_FR1_H	51
Extreme Conditions	**Test 1 All bands**	**Test 2**	
Lowest reported value (Cell 2)	61	Bands NR_FDD_FR1_A, NR_TDD_FR1_A	31
		Bands NR_FDD_FR1_B	31
		Bands NR_TDD_FR1_C	32
		Bands NR_FDD_FR1_D, NR_TDD_FR1_D	32
		Bands NR_FDD_FR1_E, NR_TDD_FR1_E	33
		Bands NR_FDD_FR1_G	34
		Bands NR_FDD_FR1_H	34
Highest reported value (Cell 2)	86	Bands NR_FDD_FR1_A, NR_TDD_FR1_A	52
		Bands NR_FDD_FR1_B	53
		Bands NR_TDD_FR1_C	53
		Bands NR_FDD_FR1_D, NR_TDD_FR1_D	54
		Bands NR_FDD_FR1_E, NR_TDD_FR1_E	54
		Bands NR_FDD_FR1_G	55
		Bands NR_FDD_FR1_H	56
Note 1: NR operating band groups are defined in clause 3A.4, Table 3A.4.1-2			

For the test to pass, the ratio of successful reported values in each test shall be more than 90% with a confidence level of 95%.

6.7.1.2.2 NR SA FR1-FR1 SS-RSRP relative measurement accuracy

6.7.1.2.2.1 Test purpose

The purpose of this test is to verify that the inter-frequency SS-RSRP absolute measurement accuracy is within the specified limits for all bands.

6.7.1.2.2.2 Test applicability

This test applies to all types of NR UE from Release 15 onwards.

6.7.1.2.2.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 6.7.1.0.4.

The normative reference for this requirement is TS 38.133 [6] clause A.6.7.1.2.

6.7.1.2.2.4 Test description

6.7.1.2.2.4.1 Initial conditions

This test shall be tested using any of the test configurations in Table 6.7.1.2.2.4.1-1.

Table 6.7.1.2.2.4.1-1: NR SA FR1-FR1 SS-RSRP relative measurement accuracy supported test configurations

Test Case ID	Description
6.7.1.2.2-1	NR: 15 kHz SSB SCS, 10MHz bandwidth, FDD
6.7.1.2.2-2	NR: 15 kHz SSB SCS, 10MHz bandwidth, TDD
6.7.1.2.2-3	NR: 30 kHz SSB SCS, 40MHz bandwidth, TDD
Note: The UE is only required to be tested in one of the supported test configurations	

Configure the test equipment and the DUT according to the parameters in Table 6.7.1.2.2.4.1-2.

Table 6.7.1.2.2.4.1-2: Initial conditions for SS-RSRP inter frequency relative accuracy in FR1

Parameter	Value		Comment
Test environment	NC, TL/VL, TL/VH, TH/VL, TH/VH		As specified in TS 38.508-1 [14] clause 4.1.
Test frequencies	As specified in Annex E, Table E.4-1 and TS 38.508-1 [14] clause 4.3.1.		
Channel bandwidth	As specified by the test configuration selected from Table 6.7.1.2.2.4.1-1.		
Propagation conditions	AWGN		As specified in Annex C.2.2.
Connection Diagram	TE Part 2Rx	A.3.1.8.2 with n = 2 and φ_1 = 5 Hz	As specified in TS 38.508-1 [14] Annex A.
	TE Part 4Rx	A.3.1.8.5 with n = 2 and $\varphi_{1,1}$ = 5 Hz, $\varphi_{1,2}$ = 10 Hz, $\varphi_{1,3}$ = 15 Hz	
	DUT Part 2Rx	A.3.2.3.4	
	DUT Part 4Rx	A.3.2.5.2	
Exceptions to connection diagram	- Without the LTE link		

1. Message contents are defined in clause 6.7.1.2.2.4.3.
2. Cell 1 is the NR FR1 serving cell (PCell) and Cell 2 is the NR neighbour in a different FR1 frequency and the target cell for SS-RSRP measurements. The connection setup is done according to the settings in Annex C.1.1 and C.1.2.

6.7.1.2.2.4.2 Test procedure

Same as in clause 6.7.1.1.2.4.2 but replacing Table 6.7.1.1.2.5-1 and 6.7.1.1.2.5-2 with 6.7.1.2.2.5-1 and 6.7.1.2.2.5-2, respectively.

6.7.1.2.2.4.3 Message contents

Message contents are same as in Clause 6.7.1.2.1.4.3.

6.7.1.2.2.5 Test requirement

Table 6.7.1.2.2.5-1 defines the primary level settings including test tolerances for all tests.

Each SS-RSRP measurement report for each of the tests in Table 6.7.1.2.2.5-1 shall meet the corresponding absolute accuracy requirements in Table 6.7.1.2.2.5-2.

Table 6.7.1.2.2.5-1: same as Table 6.7.1.2.1.5-1

Table 6.7.1.2.2.5-2: SS-RSRP Intra frequency relative accuracy requirements for the reported values

	Test 1	Test 2
	All bands	All bands
Normal Conditions		
Lowest reported value (Cell 2)	SS-RSRP_x - 7	SS-RSRP_x - 31
Highest reported value (Cell 2)	SS-RSRP_x + 7	SS-RSRP_x - 18
Extreme Conditions		
Lowest reported value (Cell 2)	SS-RSRP_x - 9	SS-RSRP_x - 33
Highest reported value (Cell 2)	SS-RSRP_x + 9	SS-RSRP_x - 17
SS-RSRP_x is the reported value of Cell 1		

For the test to pass, the ratio of successful reported values in each test shall be more than 90% with a confidence level of 95%.

6.7.2 SS-RSRQ

6.7.2.0 Minimum conformance requirements

6.7.2.0.1 Intra-frequency SS-RSRQ measurement accuracy requirements

Same as in clause 4.7.2.0.1.

6.7.2.0.2 Inter-frequency SS-RSRQ absolute measurement accuracy requirements

Same as in clause 4.7.2.0.2.

6.7.2.0.3 Inter-frequency SS-RSRQ relative measurement accuracy requirements

Same as in clause 4.7.2.0.3.

6.7.2.1 NR SA FR1 SS-RSRQ measurement accuracy

6.7.2.1.1 Test purpose

The purpose of this test is to verify that the intra-frequency SS-RSRQ measurement accuracy is within the specified limits for all bands.

6.7.2.1.2 Test applicability

This test applies to all types of NR UE from Release 15 onwards.

6.7.2.1.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 6.7.2.0.1.

The normative reference for this requirement is TS 38.133 [6] clause A.6.7.2.1.

6.7.2.1.4 Test description

6.7.2.1.4.1 Initial conditions

This test shall be tested using any of the test configurations in Table 6.7.2.1.4.1-1.

Table 6.7.2.1.4.1-1: NR SA FR1 SS-RSRQ measurement accuracy supported test configurations

Test Case ID	Description
6.7.2.1-1	NR: 15 kHz SSB SCS, 10MHz bandwidth, FDD
6.7.2.1-2	NR: 15 kHz SSB SCS, 10MHz bandwidth, TDD
6.7.2.1-3	NR: 30 kHz SSB SCS, 40MHz bandwidth, TDD
Note: The UE is only required to be tested in one of the supported test configurations	

Configure the test equipment and the DUT according to the parameters in Table 6.7.2.1.4.1-2.

Table 6.7.2.1.4.1-2: Initial conditions for SS-RSRQ intra frequency accuracy in FR1

Parameter	Value		Comment
Test environment	NC, TL/VL, TL/VH, TH/VL, TH/VH		As specified in TS 38.508-1 [14] clause 4.1.
Test frequencies	As specified in Annex E, Table E.4-1 and TS 38.508-1 [14] clause 4.3.1.		
Channel bandwidth	As specified by the test configuration selected from Table 6.7.2.1.4.1-1.		
Propagation conditions	AWGN		As specified in Annex C.2.2.
Connection Diagram	TE Part 2Rx	A.3.1.8.2 with n = 2 and φ_1 = 5 Hz	As specified in TS 38.508-1 [14] Annex A.
	TE Part 4Rx	A.3.1.8.5 with n = 2 and $\varphi_{1,1}$ = 5 Hz, $\varphi_{1,2}$ = 10 Hz, $\varphi_{1,3}$ = 15 Hz	
	DUT Part 2Rx	A.3.2.3.4	
	DUT Part 4Rx	A.3.2.5.2	
Exceptions to connection diagram	- Without the LTE link		

1. Message contents are defined in clause 6.7.2.1.4.3.

2. Cell 1 is the NR serving cell (PCell). The power levels and settings for Cell 1 are set according to Annex A.6. Cell 2 is an NR FR1 cell in the same frequency as Cell 1. Cell 2 is the target cell for SS-RSRQ measurements. The connection setup is done according to the settings in Annex C.1.3.

6.7.2.1.4.2 Test procedure

1. Ensure the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity *NR*, Connected without release *On* and Test Mode *On* according to TS 38.508-1 [14] clause 4.5.

2. Set the parameters according to Table 6.7.2.1.5-1 as appropriate.

3. The SS shall transmit an RRCReconfiguration message on Cell 1.

4. The UE shall transmit an RRCReconfigurationComplete message.

5. The UE shall transmit periodically MeasurementReport messages.

6. After 10s wait from Step 3, the SS shall check the SS-RSRQ reported values in the periodic MeasurementReport. The SS-RSRQ value of Cell 2 reported by the UE is compared to the expected SS-RSRQ. If the value is outside the limits in Table 6.7.2.1.5-2 or the UE fails to report the measurement value for Cell 2, the number of failed iterations is increased by one. Otherwise, the number of passed iterations is increased by one.

7. The SS shall continue checking the MeasurementReport messages transmitted by the UE until the confidence level according to Table G.2.3-1 in Annex G is achieved.

8. Set the parameters according to each sub-test in Table 6.7.2.1.5-1 as appropriate and repeat steps 5-7.

6.7.2.1.4.3 Message contents

Message contents are according to TS 38.508-1 [14] clause 7.3 with the following exceptions:

Table 6.7.2.1.4.3-1: Common Exception messages for NR SA FR1 SS-RSRQ measurement accuracy

Default Message Contents	
Common contents of system information blocks exceptions	
Default RRC messages and information elements contents exceptions	Table H.3.1-1 Table H.3.1-2 Table H.3.1-5 Table H.3.1-7

Specific message contents exceptions for Test Configuration 6.7.2.1-1	Table H.3.1-3 with Condition SSB.1 FR1 Table 7.3.1-3 in TS 38.508-1 [14] with condition SMTC.2
Specific message contents exceptions for Test Configuration 6.7.2.1-2	Table H.3.1-3 with Condition SSB.1 FR1 and Synchronous cells Table 7.3.1-3 in TS 38.508-1 [14] with condition SMTC.1
Specific message contents exceptions for Test Configuration 6.7.2.1-3	Table H.3.1-3 with Condition SSB.2 FR1 and Synchronous cells Table 7.3.1-3 in TS 38.508-1 [14] with condition SMTC.1

Table 6.7.2.1.4.3-2: ReportConfigNR-DEFAULT(Periodical) for NR SA FR1 SS-RSRQ Accuracy

Derivation Path: 38.508-1 [14] Table 4.6.3-142 with condition PERIODICAL			
Information Element	**Value/remark**	**Comment**	**Condition**
ReportConfigNR::= SEQUENCE {			
reportType CHOICE {			
periodical SEQUENCE {			PERIODICAL
reportQuantityCell SEQUENCE {			
rsrp	false		
sinr	false		
}			
maxReportCells	2		
}			
}			
}			

6.7.2.1.5 Test requirement

Table 6.7.2.1.5-1 defines the primary level settings including test tolerances for all tests.

Each SS-RSRQ measurement report for each of the tests in Table 6.7.2.1.5-1 shall meet the corresponding absolute accuracy requirements in Table 6.7.2.1.5-2.

Table 6.7.2.1.5-1: SS-RSRQ Intra frequency test parameters

Parameter		Unit	Test 1		Test 2		Test 3	
			Cell 1	Cell 2	Cell 1	Cell 2	Cell 1	Cell 2
SSB ARFCN			freq1		freq1		freq1	
Duplex mode	Config 1		FDD					
	Config 2,3		TDD					
TDD configuration	Config 1		Not Applicable					
	Config 2		TDDConf.1.1					
	Config 3		TDDConf.2.1					
$BW_{channel}$	Config 1	MHz	10: $N_{RB,c}$ = 52					
	Config 2		10: $N_{RB,c}$ = 52					
	Config 3		40: $N_{RB,c}$ = 106					
BWP configuration	Initial DL BWP		DLBWP.0.1					
	Dedicated DL BWP		DLBWP.1.1					
	Initial UL BWP		ULBWP.0.1					
	Dedicated UL BWP		ULBWP.1.1					
DRX Cycle		ms	Not Applicable					
PDSCH Reference measurement channel	Config 1		SR.1.1 FDD	-	SR.1.1 FDD	-	SR.1.1 FDD	-
	Config 2		SR.1.1 TDD		SR.1.1 TDD		SR.1.1 TDD	
	Config 3		SR2.1 TDD		SR2.1 TDD		SR2.1 TDD	
RMSI CORESET Reference Channel	Config 1		CR.1.1 FDD	-	CR.1.1 FDD	-	CR.1.1 FDD	
	Config 2		CR.1.1 TDD		CR.1.1 TDD		CR.1.1 TDD	
	Config 3		CR.2.1 TDD		CR.2.1 TDD		CR.2.1 TDD	

Control Channel RMC	Config 1		CCR.1.1 FDD	-	CCR.1.1 FDD	-	CCR.1.1 FDD	-
	Config 2		CCR.1.1 TDD		CCR.1.1 TDD		CCR.1.1 TDD	
	Config 3		CCR.2.1 TDD		CCR.2.1 TDD		CCR.2.1 TDD	
TRS Configuration	Config 1		TRS.1.1 FDD	-	TRS.1.1 FDD	-	TRS.1.1 FDD	-
	Config 2		TRS.1.1 TDD		TRS.1.1 TDD		TRS.1.1 TDD	
	Config 3		TRS.1.2 TDD		TRS.1.2 TDD		TRS.1.2 TDD	
OCNG Patterns			OP.1					
SS-RSSI-Measurement			Not Applicable					
Time offset with Cell 1	Config 2, 3	µs	-	3	-	3	-	3
	Config 1	ms	-	3	-	3	-	3
SMTC configuration	Config 2, 3		SMTC.1					
	Config 1		SMTC.2					
SSB configuration	Config 1,2		SSB.1 FR1					
	Config 3		SSB.2 FR1					
PDSCH/PDCCH subcarrier spacing	Config 1,2	kHz	15 kHz					
	Config 3		30kHz					
EPRE ratio of PSS to SSS EPRE ratio of PBCH DMRS to SSS EPRE ratio of PBCH to PBCH DMRS EPRE ratio of PDCCH DMRS to SSS EPRE ratio of PDCCH to PDCCH DMRS EPRE ratio of PDSCH DMRS to SSS EPRE ratio of PDSCH to PDSCH EPRE ratio of OCNG DMRS to SSS(Note 1) EPRE ratio of OCNG to OCNG DMRS (Note 1)		dB	0	0	0	0	0	0
N_{oc} Note2	Config 1,2	Depending on band group	dBm/15kHz	-86.5		-101		-114+ Δ_{BG_offset}	
	Config 3	Depending on band group		-92.6		-		-114+ Δ_{BG_offset}	
N_{oc} Note2	Config 1,2	Depending on band group	dBm/SCS	-86.5		-101		-114+ Δ_{BG_offset}	
	Config 3	Depending on band group		-89.6		-		-111+ Δ_{BG_offset}	
$\hat{E}_s/I_{ot}$			dB	-1.76		-4.7		-5.46	-5.46
$\hat{E}_s/N_{oc}$			dB	3	3	-2.9	-2.9	-4	-4
SS-RSRP Note3	Config 1,2	Depending on band group	dBm/SCS	-83.5	-83.5	-103.9	-103.9	-118+ Δ_{BG_offset}	-118+ Δ_{BG_offset}
	Config 3	Depending on band group		-86.6	-86.6	-	-	-115+ Δ_{BG_offset}	-115+ Δ_{BG_offset}
SS-RSRQ Note3			dB	-14.77	-14.77	-16.76	-16.76	-17.34	-17.34
Io Note3	Config 1,2	Depending on band group	dBm/9.36MHz	-51.57		-70		-83.28+ Δ_{BG_offset}	
	Config 3	Depending on band group	dBm/38.16MHz	-51.56		-		-76.67+ Δ_{BG_offset}	
Propagation condition			-	AWGN	AWGN	AWGN	AWGN	AWGN	AWGN
Antenna configuration				1x2	1x2	1x2	1x2	1x2	1x2

Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.

Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for N_{oc} to be fulfilled.

Note 3: SS-RSRQ, SS-RSRP, and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.

Note 4: SS-RSRQ, SS-RSRP minimum requirements are specified assuming independent interference and noise at each receiver antenna port.

Note 5:	Δ_{BG_offset} is defined in clause 3A.4, Table 3A.4.1-2.
Note 6:	Subtest 2 is not used when testing with 30kHz SSB SCS.
Note 7:	The test configuration excludes support for band n51 and it is not required to run this test on band n51 in this release of the specification.

Table 6.7.2.1.5-2: SS-RSRQ Intra frequency absolute accuracy requirements for the reported values

	Test 1	Test 2	Test 3
	All bands	All bands	All bands
Normal Conditions			
Lowest reported value (Cell 2)	SS-RSRQ_52	SS-RSRQ_46	SS-RSRQ_44
Highest reported value (Cell 2)	SS-RSRQ_62	SS-RSRQ_60	SS-RSRQ_59
Extreme Conditions			
Lowest reported value (Cell 2)	SS-RSRQ_49	SS-RSRQ_45	SS-RSRQ_43
Highest reported value (Cell 2)	SS-RSRQ_65	SS-RSRQ_61	SS-RSRQ_60

For the test to pass, the ratio of successful reported values in each test shall be more than 90% with a confidence level of 95%.

6.7.2.2 Inter-Frequency SS-RSRQ measurement accuracy

6.7.2.2.1 NR SA FR1-FR1 SS-RSRQ absolute measurement accuracy

6.7.2.2.1.1 Test purpose

The purpose of this test is to verify that the inter-frequency SS-RSRQ absolute measurement accuracy is within the specified limits for all bands.

6.7.2.2.1.2 Test applicability

This test applies to all types of NR UE from Release 15 onwards.

6.7.2.2.1.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 6.7.2.0.2.

The normative reference for this requirement is TS 38.133 [6] clause A.6.7.2.2.1.

6.7.2.2.1.4 Test description

6.7.2.2.1.4.1 Initial conditions

This test shall be tested using any of the test configurations in Table 6.7.2.2.1.4.1-1.

Table 6.7.2.2.1.4.1-1: NR SA FR1-FR1 SS-RSRQ measurement accuracy supported test configurations

Test Case ID	Description
6.7.2.2.1-1	NR: 15 kHz SSB SCS, 10MHz bandwidth, FDD
6.7.2.2.1-2	NR: 15 kHz SSB SCS, 10MHz bandwidth, TDD
6.7.2.2.1-3	NR: 30 kHz SSB SCS, 40MHz bandwidth, TDD
Note: The UE is only required to be tested in one of the supported test configurations	

Configure the test equipment and the DUT according to the parameters in Table 6.7.2.2.1.4.1-2.

Table 6.7.2.2.1.4.1-2: Initial conditions for SS-RSRQ inter frequency accuracy in FR1

Parameter	Value	Comment
Test environment	NC, TL/VL, TL/VH, TH/VL, TH/VH	As specified in TS 38.508-1 [14] clause 4.1.
Test frequencies	As specified in Annex E, Table E.4-1 and TS 38.508-1 [14] clause 4.3.1.	
Channel bandwidth	As specified by the test configuration selected from Table 6.7.2.2.1.4.1-1.	
Propagation conditions	AWGN	As specified in Annex C.2.2.

Connection Diagram	TE Part 2Rx	A.3.1.8.2 with n = 2 and φ_1 = 5 Hz	As specified in TS 38.508-1 [14] Annex A.
	TE Part 4Rx	A.3.1.8.5 with n = 2 and $\varphi_{1,1}$ = 5 Hz, $\varphi_{1,2}$ = 10 Hz, $\varphi_{1,3}$ = 15 Hz	
	DUT Part 2Rx	A.3.2.3.4	
	DUT Part 4Rx	A.3.2.5.2	
Exceptions to connection diagram	- Without the LTE link		

1. Message contents are defined in clause 6.7.2.2.1.4.3.

2. Cell 1 is the NR serving cell (PCell). The power levels and settings for Cell 1 are set according to Annex A.6. Cell 2 is an NR FR1 cell in the different frequency as Cell 1. Cell 2 is the target cell for SS-RSRQ measurements. The connection setup is done according to the settings in Annex C.1.1.

6.7.2.2.1.4.2 Test procedure

Same as in clause 6.7.2.1.1.4.2 but replacing Table 6.7.2.1.1.5-1 and 6.7.2.1.1.5-2 with 6.7.2.2.1.5-1 and 6.7.2.2.1.5-2, respectively.

6.7.2.2.1.4.3 Message contents

Message contents are according to TS 38.508-1 [14] clause 7.3 with the following exceptions:

Table 6.7.2.2.1.4.3-1: Common Exception messages for NR SA FR1-FR1 SS-RSRQ absolute measurement accuracy

Default Message Contents	
Common contents of system information blocks exceptions	
Default RRC messages and information elements contents exceptions	Table H.3.1-1 Table H.3.1-2 with condition INTER-FREQ and GAP NEEDED Table H.3.1-5 Table H.3.1-7 with condition INTER-FREQ Table H.3.1-6 with condition Pattern #0
Specific message contents exceptions for Test Configuration 6.7.2.2.1-1	Table H.3.1-3 with Conditions INTER-FREQ MO, SSB.1 FR1 Table 7.3.1-3 in TS 38.508-1 [14] with condition SMTC.2
Specific message contents exceptions for Test Configuration 6.7.2.2.1-2	Table H.3.1-3 with Conditions INTER-FREQ MO, SSB.1 FR1 and Synchronous cells Table 7.3.1-3 in TS 38.508-1 [14] with condition SMTC.1
Specific message contents exceptions for Test Configuration 6.7.2.2.1-3	Table H.3.1-3 with Conditions INTER-FREQ MO, SSB.2 FR1 and Synchronous cells Table 7.3.1-3 in TS 38.508-1 [14] with condition SMTC.1

Table 6.7.2.2.1.4.3-2: ReportConfigNR-DEFAULT(Periodical) for NR SA FR1 SS-RSRQ Accuracy

Derivation Path: 38.508-1 [14] Table 4.6.3-142 with condition PERIODICAL			
Information Element	**Value/remark**	**Comment**	**Condition**
ReportConfigNR::= SEQUENCE {			
reportType CHOICE {			
periodical SEQUENCE {			PERIODICAL
reportQuantityCell SEQUENCE {			
rsrp	false		
sinr	false		
}			
maxReportCells	2		
}			
}			
}			

6.7.2.2.1.5 Test requirement

Table 6.7.2.2.1.5-1 defines the primary level settings including test tolerances for all tests.

Each SS-RSRP measurement report for each of the tests in Table 6.7.2.2.1.5-1 shall meet the corresponding absolute accuracy requirements in Table 6.7.2.2.1.5-2.

Table 6.7.2.2.1.5-1: SS-RSRQ Inter frequency test parameters

Parameter		Unit	Test 1		Test 2		Test 3	
			Cell 1	Cell 2	Cell 1	Cell 2	Cell 1	Cell 2
SSB ARFCN			freq1	freq2	freq1	freq2	freq1	freq2
Duplex mode	Config 1		FDD					
	Config 2,3		TDD					
TDD configuration	Config 1		Not Applicable					
	Config 2		TDDConf.1.1					
	Config 3		TDDConf.2.1					
$BW_{channel}$	Config 1	MHz	10: $N_{RB,c}$ = 52					
	Config 2		10: $N_{RB,c}$ = 52					
	Config 3		40: $N_{RB,c}$ = 106					
Gap pattern ID			0					
BWP configuration	Initial DL BWP		DLBWP.0.1					
	Dedicated DL BWP		DLBWP.1.1					
	Initial UL BWP		ULBWP.0.1					
	Dedicated UL BWP		ULBWP.1.1					
DRX Cycle		ms	Not Applicable					
PDSCH Reference measurement channel	Config 1		SR.1.1 FDD	-	SR.1.1 FDD	-	SR.1.1 FDD	-
	Config 2		SR.1.1 TDD		SR.1.1 TDD		SR.1.1 TDD	
	Config 3		SR2.1 TDD		SR2.1 TDD		SR2.1 TDD	
RMSI CORESET Reference Channel	Config 1		CR.1.1 FDD	-	R.1.1 FDD	-	CR.1.1 FDD	
	Config 2		CR.1.1 TDD		CR.1.1 TDD		CR.1.1 TDD	
	Config 3		CR2.1 TDD		CR2.1 TDD		CR2.1 TDD	
Dedicated CORESET Reference Channel	Config 1		CCR.1.1 FDD	-	CCR.1.1 FDD	-	CCR.1.1 FDD	-
	Config 2		CCR.1.1 TDD		CCR.1.1 TDD		CCR.1.1 TDD	
	Config 3		CCR2.1 TDD		CCR2.1 TDD		CCR2.1 TDD	
TRS Configuration	Config 1		TRS.1.1 FDD	-	TRS.1.1 FDD	-	TRS.1.1 FDD	-
	Config 2		TRS.1.1 TDD		TRS.1.1 TDD		TRS.1.1 TDD	
	Config 3		TRS.1.2 TDD		TRS.1.2 TDD		TRS.1.2 TDD	
OCNG Patterns			OP.1					
Time offset with Cell 1	Config 2, 3	µs	3					
	Config 1	ms	3					
SMTC configuration	Config 2, 3		SMTC.1					
	Config 1		SMTC.2					

SSB configuration	Config 1,2			SSB.1 in FR1					
	Config 3			SSB.2 in FR1					
PDSCH/PDCCH subcarrier spacing	Config 1,2		kHz	15 kHz					
	Config 3			30 kHz					
EPRE ratio of PSS to SSS EPRE ratio of PBCH DMRS to SSS EPRE ratio of PBCH to PBCH DMRS EPRE ratio of PDCCH DMRS to SSS EPRE ratio of PDCCH to PDCCH DMRS EPRE ratio of PDSCH DMRS to SSS EPRE ratio of PDSCH to PDSCH EPRE ratio of OCNG DMRS to SSS(Note 1) EPRE ratio of OCNG to OCNG DMRS (Note 1)			dB	0	0	0	0	0	0
N_{oc} Note2	Config 1,2	Depending on band group	dBm/15kHz	-81.68	-81.68	-106	-106	-116 + Δ_{BG_offset}	-116 + Δ_{BG_offset}
N_{oc} Note2	Config 3	Depending on band group	dBm/15kHz	-87.80	-87.80	-113	-113	-116+ Δ_{BG_offset}	-116+ Δ_{BG_offset}
N_{oc} Note2	Config 1,2	Depending on band group	dBm/SCS	-81.68	-81.68	-106	-106	-116 + Δ_{BG_offset}	-116 + Δ_{BG_offset}
	Config 3	Depending on band group		-84.8	-84.8	-110	-110	-113+ Δ_{BG_offset}	-113+ Δ_{BG_offset}
$\hat{E}_s / I_{ot}$			dB	-1.75	-1.75	-1.75	-1.75	3	-1.75
$\hat{E}_s / N_{oc}$			dB	-1.75	-1.75	-1.75	-1.75	3	-1.75
SS-RSRP Note3	Config 1,2	Depending on band group	dBm/SCS	-83.43	-83.43	-107.75	-107.75	-113+ Δ_{BG_offset}	-117.75+ Δ_{BG_offset}
	Config 3	Depending on band group		-86.54	-86.54	-111.75	-111.75	-110+ Δ_{BG_offset}	-114.75+ Δ_{BG_offset}
SS-RSRQ Note3			dB	-14.76	-14.76	-14.76	-14.76	-12.56	-14.76
Io Note3	Config 1,2	Depending on band group	dBm/Ch BW	-51.51	-51.51	-75.83	-75.83	-83.28 + Δ_{BG_offset}	-85.83 + Δ_{BG_offset}
	Config 3	Depending on band group		-51.52	-51.52	-76.73	-76.73	-77.19 + Δ_{BG_offset}	-79.73 + Δ_{BG_offset}
Propagation condition			-	AWGN	AWGN	AWGN	AWGN	AWGN	AWGN
Antenna configuration				1x2	1x2	1x2	1x2	1x2	1x2

Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.

Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for N_{oc} to be fulfilled.

Note 3: SS-RSRQ, SS-RSRP, and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.

Note 4: SS-RSRQ, SS-RSRP minimum requirements are specified assuming independent interference and noise at each receiver antenna port.

Note 5: Δ_{BG_offset} is defined in clause 3A.4, Table 3A.4.1-2

Note 6: The test configuration excludes support for band n51 and it is not required to run this test on band n51 in this release of the specification.

Table 6.7.2.2.1.5-2: SS-RSRQ Intra frequency absolute accuracy requirements for the reported values

	Test 1	Test 2	Test 3
	All bands	All bands	All bands
Normal Conditions			
Lowest reported value (Cell 2)	SS-RSRQ_52	SS-RSRQ_52	SS-RSRQ_52
Highest reported value (Cell 2)	SS-RSRQ_62	SS-RSRQ_62	SS-RSRQ_62
Extreme Conditions			
Lowest reported value (Cell 2)	SS-RSRQ_49	SS-RSRQ_49	SS-RSRQ_49
Highest reported value (Cell 2)	SS-RSRQ_65	SS-RSRQ_65	SS-RSRQ_65

For the test to pass, the ratio of successful reported values in each test shall be more than 90% with a confidence level of 95%.

6.7.2.2.2 NR SA FR1-FR1 SS-RSRQ relative measurement accuracy

6.7.2.2.2.1 Test purpose

The purpose of this test is to verify that the inter-frequency SS-RSRQ relative measurement accuracy is within the specified limits for all bands.

6.7.2.2.2.2 Test applicability

This test applies to all types of NR UE from Release 15 onwards.

6.7.2.2.2.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 6.7.2.0.3.

The normative reference for this requirement is TS 38.133 [6] clause A.6.7.2.2.2.

6.7.2.2.2.4 Test description

6.7.2.2.2.4.1 Initial conditions

This test shall be tested using any of the test configurations in Table 6.7.2.2.2.4.1-1.

Table 6.7.2.2.2.4.1-1: NR SA FR1-FR1 SS-RSRQ measurement accuracy supported test configurations

Test Case ID	Description
6.7.2.2.2-1	NR: 15 kHz SSB SCS, 10MHz bandwidth, FDD
6.7.2.2.2-2	NR: 15 kHz SSB SCS, 10MHz bandwidth, TDD
6.7.2.2.2-3	NR: 30 kHz SSB SCS, 40MHz bandwidth, TDD
Note: The UE is only required to be tested in one of the supported test configurations	

Configure the test equipment and the DUT according to the parameters in Table 6.7.2.2.2.4.1-2.

Table 6.7.2.2.2.4.1-2: Initial conditions for SS-RSRQ inter frequency accuracy in FR1

Parameter	Value		Comment
Test environment	NC, TL/VL, TL/VH, TH/VL, TH/VH		As specified in TS 38.508-1 [14] clause 4.1.
Test frequencies	As specified in Annex E, Table E.4-1 and TS 38.508-1 [14] clause 4.3.1.		
Channel bandwidth	As specified by the test configuration selected from Table 6.7.2.2.2.4.1-1.		
Propagation conditions	AWGN		As specified in Annex C.2.2.
Connection Diagram	TE Part 2Rx	A.3.1.8.2 with n = 2 and φ_1 = 5 Hz	As specified in TS 38.508-1 [14] Annex A.
	TE Part 4Rx	A.3.1.8.5 with n = 2 and $\varphi_{1,1}$ = 5 Hz, $\varphi_{1,2}$ = 10 Hz, $\varphi_{1,3}$ = 15 Hz	
	DUT Part 2Rx	A.3.2.3.4	
	DUT Part 4Rx	A.3.2.5.2	

Exceptions to connection diagram	- Without the LTE link	

1. Message contents are defined in clause 6.7.2.2.2.4.3.

2. Cell 1 is the NR serving cell (PCell). The power levels and settings for Cell 1 are set according to Annex A.6. Cell 2 is an NR FR1 cell in the same frequency as Cell 1. Cell 2 is the target cell for SS-RSRQ measurements. The connection setup is done according to the settings in Annex C.1.1.

6.7.2.2.2.4.2 Test procedure

1. Ensure the UE is in state RRC_CONNECTED CONNECTED with generic procedure parameters Connectivity *NR*, Connected without release *On* and Test Mode *On* according to TS 38.508-1 [14] clause 4.5.

2. Set the parameters according to Table 6.7.2.2.2.5-1 as appropriate.

3. The SS shall transmit an RRCReconfiguration message on Cell 1.

4. The UE shall transmit an RRCReconfigurationComplete message.

5. The UE shall transmit periodically MeasurementReport messages.

6. After 10s wait from Step 3, the SS shall check the SS-RSRQ reported values in the periodic MeasurementReport. The SS-RSRQ value of Cell 2 reported by the UE is compared to the SS-RSRQ value of Cell 1 reported by the UE. If the difference between both values is outside the limits in Table 6.7.2.2.2.5-2 or the UE fails to report the measurement value for Cell 2 or Cell 1, the number of failed iterations is increased by one. Otherwise, the number of passed iterations is increased by one.

7. The SS shall continue checking the MeasurementReport messages transmitted by the UE until the confidence level according to Table G.2.3-1 in Annex G is achieved.

8. Set the parameters according to each sub-test in Table 6.7.2.2.2.5-1 as appropriate and repeat steps 5-7.

6.7.2.2.2.4.3 Message contents

Message contents are same as in Clause 6.7.2.2.1.4.3.

6.7.2.2.2.5 Test requirement

Table 6.7.2.2.2.5-1 defines the primary level settings including test tolerances for all tests.

Each SS-RSRQ measurement report for each of the tests in Table 6.7.2.2.2.5-1 shall meet the corresponding absolute accuracy requirements in Table 6.7.2.2.2.5-2.

Table 6.7.2.2.2.5-1: same as Table 6.7.2.2.1.5-1

Table 6.7.2.2.2.5-2: SS-RSRQ Inter frequency relative accuracy requirements for the reported values

	Test 1	**Test 2**	**Test 3**
	All bands	All bands	All bands
Normal Conditions			
Lowest reported value (Cell 2)	SS-RSRQ_x - 7	SS-RSRQ_x - 7	SS-RSRQ_x - 11
Highest reported value (Cell 2)	SS-RSRQ_x + 7	SS-RSRQ_x + 7	SS-RSRQ_x + 2
Extreme Conditions			
Lowest reported value (Cell 2)	SS-RSRQ_x - 9	SS-RSRQ_x - 9	SS-RSRQ_x – 13
Highest reported value (Cell 2)	SS-RSRQ_x + 9	SS-RSRQ_x + 9	SS-RSRQ_x + 4
RSRQ_x is the reported value of Cell 1			

For the test to pass, the ratio of successful reported values in each test shall be more than 90% with a confidence level of 95%.

6.7.3 SS-SINR

6.7.3.0 Minimum conformance requirements

6.7.3.0.1 Intra-frequency SS-SINR measurement accuracy requirements

Same as in clause 4.7.3.0.1.

6.7.3.0.2 Inter-frequency absolute SS-SINR measurement accuracy requirements

Same as in clause 4.7.3.0.2.

6.7.3.0.3 Inter-frequency relative SS-SINR measurement accuracy requirements

Same as in clause 4.7.3.0.3.

6.7.3.1 NR SA FR1 SS-SINR measurement accuracy

6.7.3.1.1 Test purpose

The purpose of this test is to verify that the intra-frequency SS-SINR measurement accuracy is within the specified limits for all bands.

6.7.3.1.2 Test applicability

This test applies to all types of NR UE from Release 15 onwards, which support ss-SINR-Meas.

6.7.3.1.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 6.7.3.0.1.

The normative reference for this requirement is TS 38.133 [6] clause A.6.7.3.1.

6.7.3.1.4 Test description

6.7.3.1.4.1 Initial conditions

This test shall be tested using any of the test configurations in Table 6.7.3.1.4.1-1.

Table 6.7.3.1.4.1-1: NR SA FR1 SS-SINR measurement accuracy supported test configurations

Test Case ID	Description
6.7.3.1-1	NR: 15 kHz SSB SCS, 10MHz bandwidth, FDD
6.7.3.1-2	NR: 15 kHz SSB SCS, 10MHz bandwidth, TDD
6.7.3.1-3	NR: 30 kHz SSB SCS, 40MHz bandwidth, TDD
Note: The UE is only required to be tested in one of the supported test configurations	

Configure the test equipment and the DUT according to the parameters in Table 6.7.3.1.4.1-2.

Table 6.7.3.1.4.1-2: Initial conditions for SS-SINR intra frequency accuracy in FR1

Parameter	Value		Comment
Test environment	NC, TL/VL, TL/VH, TH/VL, TH/VH		As specified in TS 38.508-1 [14] clause 4.1.
Test frequencies	As specified in Annex E, Table E.4-1 and TS 38.508-1 [14] clause 4.3.1.		
Channel bandwidth	As specified by the test configuration selected from Table 6.7.3.1.4.1-1.		
Propagation conditions	AWGN		As specified in Annex C.2.2.
Connection Diagram	TE Part 2Rx	A.3.1.8.2 with n = 2 and φ_1 = 5 Hz	As specified in TS 38.508-1 [14] Annex A.
	TE Part 4Rx	A.3.1.8.5 with n = 2 and $\varphi_{1,1}$ = 5 Hz, $\varphi_{1,2}$ = 10 Hz, $\varphi_{1,3}$ = 15 Hz	
	DUT Part 2Rx	A.3.2.3.4	
	DUT Part 4Rx	A.3.2.5.2	

Exceptions to connection diagram	- Without the LTE link	

1. Message contents are defined in clause 6.7.3.1.4.3.

2. Cell 1 is the NR serving cell (PCell). The power levels and settings for Cell 1 are set according to Annex A.6. Cell 2 is an NR FR1 cell in the same frequency as Cell 1. Cell 2 is the target cell for SS-SINR measurements. The connection setup is done according to the settings in Annex C.1.1.

6.7.3.1.4.2 Test procedure

1. Ensure the UE is in state RRC_CONNECTED CONNECTED with generic procedure parameters Connectivity *NR*, Connected without release *On* and Test Mode *On* according to TS 38.508-1 [14] clause 4.5.

2. Set the parameters according to Table 6.7.3.1.5-1 as appropriate.

3. The SS shall transmit an RRCReconfiguration message on Cell 1.

4. The UE shall transmit an RRCReconfigurationComplete message.

5. The UE shall transmit periodically MeasurementReport messages.

6. After 10s wait from Step 3, the SS shall check the SS-SINR reported values in the periodic MeasurementReport. The SS-SINR value of Cell 2 reported by the UE is compared to the expected SS-SINR. If the value is outside the limits in Table 6.7.3.1.5-2 or the UE fails to report the measurement value for Cell 2, the number of failed iterations is increased by one. Otherwise, the number of passed iterations is increased by one.

7. The SS shall continue checking the MeasurementReport messages transmitted by the UE until the confidence level according to Table G.2.3-1 in Annex G is achieved.

8. Set the parameters according to each sub-test in Table 6.7.3.1.5-1 as appropriate and repeat steps 5-7.

6.7.3.1.4.3 Message contents

Message contents are according to TS 38.508-1 [14] clause 7.3 with the following exceptions:

Table 6.7.3.1.4.3-1: Common Exception messages for NR SA FR1 SS-SINR measurement accuracy

Default Message Contents	
Common contents of system information blocks exceptions	
Default RRC messages and information elements contents exceptions	Table H.3.1-1 Table H.3.1-2 Table H.3.1-5 Table H.3.1-7
Specific message contents exceptions for Test Configuration 6.7.3.1-1	Table H.3.1-3 with Condition SS-SINR Table 7.3.1-3 in TS 38.508-1 [14] with condition SMTC.2
Specific message contents exceptions for Test Configuration 6.7.3.1-2	Table H.3.1-3 with Condition Synchronous cells and SS-SINR Table 7.3.1-3 in TS 38.508-1 [14] with condition SMTC.1
Specific message contents exceptions for Test Configuration 6.7.3.1-3	Table H.3.1-3 with Condition Synchronous cells and SS-SINR Table 7.3.1-3 in TS 38.508-1 [14] with condition SMTC.1

Table 6.7.3.1.4.3-2: ReportConfigNR-DEFAULT(Periodical) for NR SA FR1 SS-SINR Accuracy

Derivation Path: 38.508-1 [14] Table 4.6.3-142 with condition PERIODICAL			
Information Element	**Value/remark**	**Comment**	**Condition**
ReportConfigNR::= SEQUENCE {			
reportType CHOICE {			
periodical SEQUENCE {			PERIODICAL
reportQuantityCell SEQUENCE {			
rsrp	false		

rsrq	false		
sinr	true		
}			
maxReportCells	2		
}			
}			
}			

6.7.3.1.5 Test requirements

Table 6.7.3.1.5-1 defines the primary level settings including test tolerances for all tests.

Each SS-SINR measurement report for each of the tests in Table 6.7.3.1.5-1 shall meet the corresponding absolute accuracy requirements in Table 6.7.3.1.5-2

Table 6.7.3.1.5-1: SS-SINR Intra frequency test parameters

Parameter		Unit	Test 1		Test 2	
			Cell 1	Cell 2	Cell 1	Cell 2
SSB ARFCN			freq1		freq1	
Duplex mode	Config 1		FDD			
	Config 2,3		TDD			
TDD configuration	Config 1		Not Applicable			
	Config 2		TDDConf.1.1			
	Config 3		TDDConf.2.1			
Downlink initial BWP configuration			DLBWP.0.1			
Downlink dedicated BWP configuration			DLBWP.1.1			
Uplink initial BWP configuration			ULBWP.0.1			
Uplink dedicated BWP configuration			ULBWP.1.1			
DRX Cycle configuration		ms	Not Applicable			
TRS configuration	Config 1		TRS.1.1 FDD		TRS.1.1 FDD	
	Config 2		TRS.1.1 TDD	-	TRS.1.1 TDD	-
	Config 3		TRS.1.2 TDD		TRS.1.2 TDD	
PDSCH Reference measurement channel	Config 1		SR.1.1 FDD	-	SR.1.1 FDD	-
	Config 2		SR.1.1 TDD		SR.1.1 TDD	
	Config 3		SR.2.1 TDD		SR2.1 TDD	
RMSI CORESET Reference Channel	Config 1		CR.1.1 FDD	-	CR.1.1 FDD	
	Config 2		CR.1.1 TDD		CR.1.1 TDD	
	Config 3		CR.2.1 TDD		CR.2.1 TDD	
Dedicated CORESET Reference Channel	Config 1		CCR.1.1 FDD	-	CCR.1.1 FDD	-
	Config 2		CCR.1.1 TDD		CCR.1.1 TDD	
	Config 3		CCR.2.1 TDD		CCR.2.1 TDD	
OCNG Patterns			OP.1			
SS-RSSI-Measurement			Not Applicable			
Time offset with Cell 1	Config 2, 3	µs	-	3	-	3
	Config 1	ms	-	3	-	3
SMTC configuration	Config 2, 3		SMTC.1			
	Config 1		SMTC.2			
SSB configuration	Config 1,2		SSB.1 FR1			
	Config 3		SSB.2 FR1			
PDSCH/PDCCH subcarrier spacing	Config 1,2	kHz	15			
	Config 3		30			
EPRE ratio of PSS to SSS		dB	0	0	0	0
EPRE ratio of PBCH DMRS to SSS						
EPRE ratio of PBCH to PBCH DMRS						
EPRE ratio of PDCCH DMRS to SSS						

EPRE ratio of PDCCH to PDCCH DMRS EPRE ratio of PDSCH DMRS to SSS EPRE ratio of PDSCH to PDSCH EPRE ratio of OCNG DMRS to SSS(Note 1) EPRE ratio of OCNG to OCNG DMRS (Note 1)							
N_{oc} Note2		Depending on band group	dBm/15kHz	-93		-116+ Δ_{BG_offset}	
N_{oc} Note2	Config 1,2		dBm/SCS	-93.2		Same as Noc for 15kHz	
	Config 3	Depending on band group		-90.2		-113+ Δ_{BG_offset}	
$\hat{E}_s / I_{ot}$			dB	0	-3.19	-5.46	-5.46
$\hat{E}_s / N_{oc}$			dB	4.54	2.66	-3.5	-3.5
SS-RSRP Note3	Config 1,2	Depending on band group	dBm/SCS	-88.46	-90.34	-119.5+ Δ_{BG_offset}	-119.5+ Δ_{BG_offset}
	Config 3	Depending on band group		-85.65	-87.53	-116.5+ Δ_{BG_offset}	-116.5+ Δ_{BG_offset}
SS-SINR Note3			dB	0	-3.19	-5.1	-5.1
Io Note3	Config 1,2	Depending on band group	dBm/ 9.36MHz	-57.5		-85.28+ Δ_{BG_offset}	
	Config 3	Depending on band group	dBm/ 38.16MHz	-51.59		-79.17+ Δ_{BG_offset}	
Propagation condition			-	AWGN			
Antenna configuration			-	1x2			

Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.
Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for N_{oc} to be fulfilled.
Note 3: SS-SINR, SS-RSRP, and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.
Note 4: SS-SINR, SS-RSRP minimum requirements are specified assuming independent interference and noise at each receiver antenna port.
Note 5: Δ_{BG_offset} is defined in clause 3A.4, Table 3A.4.1-2
Note 6: The test configuration excludes support for band n51 and it is not required to run this test on band n51 in this release of the specification

Table 6.7.3.1.5-3: SS-SINR Intra frequency absolute accuracy requirements for the reported values

	Test 1	Test 2
	All bands	All bands
Normal Conditions		
Lowest reported value (Cell 2)	SS-SINR_31	SS-SINR_28
Highest reported value (Cell 2)	SS-SINR_49	SS-SINR_45
Extreme Conditions		
Lowest reported value (Cell 2)	SS-SINR_30	SS-SINR_27
Highest reported value (Cell 2)	SS-SINR_50	SS-SINR_46

For the test to pass, the ratio of successful reported values in each test shall be more than 90% with a confidence level of 95%.

6.7.3.2 Inter-Frequency SS-SINR measurement accuracy

6.7.3.2.1 NR SA FR1-FR1 SS-SINR absolute measurement accuracy

6.7.3.2.1.1 Test purpose

The purpose of this test is to verify that the inter-frequency SS-SINR absolute measurement accuracy is within the specified limits for all bands.

6.7.3.2.1.2 Test applicability

This test applies to all types of NR UE from Release 15 onwards, which support ss-SINR-Meas.

6.7.3.2.1.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 6.7.3.0.2.

The normative reference for this requirement is TS 38.133 [6] clause A.6.7.3.2.1.

6.7.3.2.1.4 Test description

6.7.3.2.1.4.1 Initial conditions

This test shall be tested using any of the test configurations in Table 6.7.3.2.1.4.1-1.

Table 6.7.3.2.1.4.1-1: NR SA FR1-FR1 SS-SINR measurement accuracy supported test configurations

Test Case ID	Description
6.7.3.2.1-1	NR: 15 kHz SSB SCS, 10MHz bandwidth, FDD
6.7.3.2.1-2	NR: 15 kHz SSB SCS, 10MHz bandwidth, TDD
6.7.3.2.1-3	NR: 30 kHz SSB SCS, 40MHz bandwidth, TDD
Note: The UE is only required to be tested in one of the supported test configurations	

Configure the test equipment and the DUT according to the parameters in Table 6.7.3.2.1.4.1-2.

Table 6.7.3.2.1.4.1-2: Initial conditions for SS-SINR inter frequency accuracy in FR1

Parameter	Value		Comment
Test environment	NC, TL/VL, TL/VH, TH/VL, TH/VH		As specified in TS 38.508-1 [14] clause 4.1.
Test frequencies	As specified in Annex E, Table E.4-1 and TS 38.508-1 [14] clause 4.3.1.		
Channel bandwidth	As specified by the test configuration selected from Table 6.7.3.2.1.4.1-1.		
Propagation conditions	AWGN		As specified in Annex C.2.2.
Connection Diagram	TE Part 2Rx	A.3.1.8.2 with n = 2 and φ_1 = 5 Hz	As specified in TS 38.508-1 [14] Annex A.
	TE Part 4Rx	A.3.1.8.5 with n = 2 and $\varphi_{1,1}$ = 5 Hz, $\varphi_{1,2}$ = 10 Hz, $\varphi_{1,3}$ = 15 Hz	
	DUT Part 2Rx	A.3.2.3.4	
	DUT Part 4Rx	A.3.2.5.2	
Exceptions to connection diagram	- Without the LTE link		

1. Message contents are defined in clause 6.7.3.2.1.4.3.

2. Cell 1 is the NR serving cell (PCell). The power levels and settings for Cell 1 are set according to Annex A.6. Cell 2 is an NR FR1 cell in the same frequency as Cell 1. Cell 2 is the target cell for SS-SINR measurements. The connection setup is done according to the settings in Annex C.1.1.

6.7.3.2.1.4.2 Test procedure

Same as in clause 6.7.3.1.4.2 but replacing Table 6.7.3.1.5-1 and 6.7.3.1.5-2 with 6.7.3.2.1.5-1 and 6.7.3.2.1.5-2, respectively.

6.7.3.2.1.4.3 Message contents

Message contents are according to TS 38.508-1 [14] clause 7.3 with the following exceptions:

Table 6.7.3.2.1.4.3-1: Common Exception messages for NR SA FR1-FR1 SS-SINR absolute measurement accuracy

Default Message Contents

Common contents of system information blocks exceptions	
Default RRC messages and information elements contents exceptions	Table H.3.1-1 Table H.3.1-2 with condition INTER-FREQ and GAP NEEDED Table H.3.1-5 Table H.3.1-7 with condition INTER-FREQ Table H.3.1-6 with condition Pattern #0
Specific message contents exceptions for Test Configuration 6.7.3.2.1-1	Table H.3.1-3 with Conditions INTER-FREQ MO and SS-SINR Table 7.3.1-3 in TS 38.508-1 [14] with condition SMTC.2
Specific message contents exceptions for Test Configuration 6.7.3.2.1-2	Table H.3.1-3 with Conditions INTER-FREQ MO, and Synchronous cells and SS-SINR Table 7.3.1-3 in TS 38.508-1 [14] with condition SMTC.1
Specific message contents exceptions for Test Configuration 6.7.3.2.1-3	Table H.3.1-3 with Conditions INTER-FREQ MO, and Synchronous cells and SS-SINR Table 7.3.1-3 in TS 38.508-1 [14] with condition SMTC.1

Table 6.7.3.2.1.4.3-2: ReportConfigNR-DEFAULT(Periodical) for NR SA FR1 SS-SINR Accuracy

Derivation Path: 38.508-1 [14] Table 4.6.3-142 with condition PERIODICAL			
Information Element	**Value/remark**	**Comment**	**Condition**
ReportConfigNR::= SEQUENCE {			
reportType CHOICE {			
periodical SEQUENCE {			PERIODICAL
reportQuantityCell SEQUENCE {			
rsrp	false		
rsrq	false		
sinr	true		
}			
maxReportCells	2		
}			
}			
}			

6.7.3.2.1.5 Test requirements

Table 6.7.3.2.1.5-1 defines the primary level settings including test tolerances for all tests.

Each SS-SINR measurement report for each of the tests in Table 6.7.3.2.1.5-1 shall meet the corresponding absolute accuracy requirements in Table 6.7.3.2.1.5-2.

Table 6.7.3.2.1.5-1: SS-SINR Inter frequency test parameters

Parameter		Unit	Test 1		Test 2		Test 3	
			Cell 1	Cell 2	Cell 1	Cell 2	Cell 1	Cell 2
SSB ARFCN			freq1	freq2	freq1	freq2	freq1	freq2
Duplex mode	Config 1		FDD					
	Config 2,3		TDD					
TDD configuration	Config 1		Not Applicable					
	Config 2		TDDConf.1.1					
	Config 3		TDDConf.2.1					
Downlink initial BWP configuration			DLBWP.0.1					
Downlink dedicated BWP configuration			DLBWP.1.1					
Uplink initial BWP configuration			ULBWP.0.1					
Uplink dedicated BWP configuration			ULBWP.1.1					
DRX Cycle configuration		ms	Not Applicable					
Gap pattern ID			0	-	0	-	0	-
TRS configuration	Config 1		TRS.1.1 FDD		TRS.1.1 FDD		TRS.1.1 FDD	

	Config 2		TRS.1.1 TDD	-	TRS.1.1 TDD	-	TRS.1.1 TDD	-
	Config 3		TRS.1.2 TDD		TRS.1.2 TDD		TRS.1.2 TDD	
PDSCH Reference measurement channel	Config 1		SR.1.1 FDD	-	SR.1.1 FDD	-	SR.1.1 FDD	-
	Config 2		SR.1.1 TDD		SR.1.1 TDD		SR.1.1 TDD	
	Config 3		SR.2.1 TDD		SR.2.1 TDD		SR.2.1 TDD	
RMSI CORESET Reference Channel	Config 1		CR.1.1 FDD	-	CR.1.1 FDD	-	CR.1.1 FDD	-
	Config 2		CR.1.1 TDD		CR.1.1 TDD		CR.1.1 TDD	
	Config 3		CR.2.1 TDD		CR.2.1 TDD		CR.2.1 TDD	
Dedicated CORESET Reference Channel	Config 1		CCR.1.1 FDD	-	CCR.1.1 FDD	-	CCR.1.1 FDD	-
	Config 2		CCR.1.1 TDD		CCR.1.1 TDD		CCR.1.1 TDD	
	Config 3		CCR.2.1 TDD		CCR.2.1 TDD		CCR.2.1 TDD	
OCNG Patterns			OP.1					
SS-RSSI-Measurement			Not Applicable					
Time offset with Cell 1	Config 2, 3	µs	-	3	-	3	-	3
	Config 1	ms	-	3	-	3	-	3
SMTC configuration	Config 2, 3		SMTC.1					
	Config 1		SMTC.2					
SSB configuration	Config 1,2		SSB.1 FR1					
	Config 3		SSB.2 FR1					
PDSCH/PDCCH subcarrier spacing	Config 1,2	kHz	15					
	Config 3		30					
EPRE ratio of PSS to SSS EPRE ratio of PBCH DMRS to SSS EPRE ratio of PBCH to PBCH DMRS EPRE ratio of PDCCH DMRS to SSS EPRE ratio of PDCCH to PDCCH DMRS EPRE ratio of PDSCH DMRS to SSS EPRE ratio of PDSCH to PDSCH EPRE ratio of OCNG DMRS to SSS(Note 1) EPRE ratio of OCNG to OCNG DMRS (Note 1)		dB	0	0	0	0	0	0
N_{oc} Note2	Config 1,2	Depending on band group	dBm/15kHz	-88	-88	-108.5	-108.5	-119.5+ Δ_{BG_offset}	-119.5+ Δ_{BG_offset}
N_{oc} Note2	Config 1,2		dBm/SCS	-88	-88	-108.5	-108.5	Same as Noc for 15kHz	Same as Noc for 15kHz
	Config 3	Depending on band group		-85	-85	-105.5	-105.5	-116.5+ Δ_{BG_offset}	116.5+ Δ_{BG_offset}
$\hat{E}_s / I_{ot}$			dB	-1.75	-1.75	20	20	-3.2	-3.2
$\hat{E}_s / N_{oc}$			dB	-1.75	-1.75	20	20	-3.2	-3.2
SS-RSRP Note3	Config 1,2	Depending on band group	dBm/SCS	-89.75	-89.75	-88.5	-88.5	-122.7+ Δ_{BG_offset}	-122.7+ Δ_{BG_offset}

	Config 3	Depending on band group		-86.75	-86.75	-85.5	-85.5	-119.7+ Δ_{BG_offset}	-119.7+ Δ_{BG_offset}
SS-SINR Note3			dB	-1.75	-1.75	20	20	-3.2	-3.2
Io Note3	Config 1,2	Depending on band group	dBm/ 9.36MHz	-57.83	-57.83	-60.5	-60.5	-89.85+ Δ_{BG_offset}	-89.85+ Δ_{BG_offset}
	Config 3	Depending on band group	dBm/ 38.16MHz	-51.73	-51.73	-54.41	-54.41	-83.75+ Δ_{BG_offset}	-83.75+ Δ_{BG_offset}
Propagation condition			-	AWGN					
Antenna configuration			-	1x2					

Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.

Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for N_{oc} to be fulfilled.

Note 3: SS-SINR, SS-RSRP, and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.

Note 4: SS-SINR, SS-RSRP minimum requirements are specified assuming independent interference and noise at each receiver antenna port.

Note 5: Δ_{BG_offset} is defined in clause 3A.4, Table 3A.4.1-2

Note 6: The test configuration excludes support for band n51 and it is not required to run this test on band n51 in this release of the specification

Table 6.7.3.2.1.5-2: SS-SINR Inter frequency absolute accuracy requirements for the reported values

	Test 1	**Test 2**	**Test 3**
	All bands	All bands	All bands
Normal Conditions			
Lowest reported value (Cell 2)	SS-SINR_35	SS-SINR_79	SS-SINR_32
Highest reported value (Cell 2)	SS-SINR_51	SS-SINR_94	SS-SINR_49
Extreme Conditions			
Lowest reported value (Cell 2)	SS-SINR_33	SS-SINR_77	SS-SINR_31
Highest reported value (Cell 2)	SS-SINR_53	SS-SINR_96	SS-SINR_50

For the test to pass, the ratio of successful reported values in each test shall be more than 90% with a confidence level of 95%.

6.7.3.2.2 NR SA FR1-FR1 SS-SINR relative measurement accuracy

6.7.3.2.2.1 Test purpose

The purpose of this test is to verify that the inter-frequency SS-SINR relative measurement accuracy is within the specified limits for all bands.

6.7.3.2.2.2 Test applicability

This test applies to all types of NR UE from Release 15 onwards, which support ss-SINR-Meas.

6.7.3.2.2.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 6.7.2.0.3.

The normative reference for this requirement is TS 38.133 [6] clause A.6.7.3.2.2.

6.7.3.2.2.4 Test description

6.7.3.2.2.4.1 Initial conditions

This test shall be tested using any of the test configurations in Table 6.7.3.2.2.4.1-1.

Table 6.7.3.2.2.4.1-1: NR SA FR1-FR1 SS-SINR measurement accuracy supported test configurations

Test Case ID	**Description**
6.7.3.2.2-1	NR: 15 kHz SSB SCS, 10MHz bandwidth, FDD

6.7.3.2.2-2	NR: 15 kHz SSB SCS, 10MHz bandwidth, TDD
6.7.3.2.2-3	NR: 30 kHz SSB SCS, 40MHz bandwidth, TDD
Note: The UE is only required to be tested in one of the supported test configurations	

Configure the test equipment and the DUT according to the parameters in Table 6.7.3.2.2.4.1-2.

Table 6.7.3.2.2.4.1-2: Initial conditions for SS-SINR inter frequency accuracy in FR1

Parameter	Value		Comment
Test environment	NC, TL/VL, TL/VH, TH/VL, TH/VH		As specified in TS 38.508-1 [14] clause 4.1.
Test frequencies	As specified in Annex E, Table E.4-1 and TS 38.508-1 [14] clause 4.3.1.		
Channel bandwidth	As specified by the test configuration selected from Table 6.7.3.2.2.4.1-1.		
Propagation conditions	AWGN		As specified in Annex C.2.2.
Connection Diagram	TE Part 2Rx	A.3.1.8.2 with n = 2 and φ_1 = 5 Hz	As specified in TS 38.508-1 [14] Annex A.
	TE Part 4Rx	A.3.1.8.5 with n = 2 and $\varphi_{1,1}$ = 5 Hz, $\varphi_{1,2}$ = 10 Hz, $\varphi_{1,3}$ = 15 Hz	
	DUT Part 2Rx	A.3.2.3.4	
	DUT Part 4Rx	A.3.2.5.2	
Exceptions to connection diagram	- Without the LTE link		

1. Message contents are defined in clause 6.7.3.2.2.4.3.

2. Cell 1 is the NR serving cell (PCell). The power levels and settings for Cell 1 are set according to Annex A.6. Cell 2 is an NR FR1 cell in the same frequency as Cell 1. Cell 2 is the target cell for SS-SINR measurements. The connection setup is done according to the settings in Annex C.1.1.

6.7.3.2.2.4.2 Test procedure

1. Ensure the UE is in state RRC_CONNECTED CONNECTED with generic procedure parameters Connectivity *NR*, Connected without release *On* and Test Mode *On* according to TS 38.508-1 [14] clause 4.5.

2. Set the parameters according to Table 6.7.3.2.2.5-1 as appropriate.

3. The SS shall transmit an RRCReconfiguration message on Cell 1.

4. The UE shall transmit an RRCReconfigurationComplete message.

5. The UE shall transmit periodically MeasurementReport messages.

6. After 10s wait from Step 3, the SS shall check the SS-SINR reported values in the periodic MeasurementReport. The SS- SINR value of Cell 2 reported by the UE is compared to the SS- SINR value of Cell 1 reported by the UE. If the difference between both values is outside the limits in Table 6.7.3.2.2.5-2 or the UE fails to report the measurement value for Cell 2 or Cell 1, the number of failed iterations is increased by one. Otherwise, the number of passed iterations is increased by one.

7. The SS shall continue checking the MeasurementReport messages transmitted by the UE until the confidence level according to Table G.2.3-1 in Annex G is achieved.

8. Set the parameters according to each sub-test in Table 6.7.3.2.2.5-1 as appropriate and repeat steps 5-7.

6.7.3.2.2.4.3 Message contents

Message contents are same as in Clause 6.7.3.2.1.4.3.

6.7.3.2.2.5 Test requirements

Table 6.7.3.2.2.5-1 defines the primary level settings including test tolerances for all tests.

Each SS-SINR measurement report for each of the tests in Table 6.7.3.2.2.5-1 shall meet the corresponding relative accuracy requirements in Table 6.7.3.2.2.5-2

Table 6.7.3.2.2.2.5-1: same as Table 6.7.3.2.2.1.5-1

Table 6.7.3.2.2.5-2: SS-SINR Inter frequency relative accuracy requirements for the reported values

	Test 1	Test 2	Test 3
	All bands	All bands	All bands
Normal Conditions			
Lowest reported value (Cell 2)	SS-SINR_x - 10	SS-SINR_x - 10	SS-SINR_x - 11
Highest reported value (Cell 2)	SS-SINR_x + 10	SS-SINR_x + 10	SS-SINR_x + 11
Extreme Conditions			
Lowest reported value (Cell 2)	SS-SINR_x - 12	SS-SINR_x - 12	SS-SINR_x - 12
Highest reported value (Cell 2)	SS-SINR_x + 12	SS-SINR_x + 12	SS-SINR_x + 12
RSRQ_x is the reported value of Cell 1			

For the test to pass, the ratio of successful reported values in each test shall be more than 90% with a confidence level of 95%.

6.7.4 L1-RSRP

6.7.4.0 Minimum conformance requirements

6.7.4.0.1 SSB based absolute L1-RSRP measurement accuracy requirements

Same as 4.7.4.0.1.

6.7.4.0.2 SSB based relative L1-RSRP measurement accuracy requirements

Same as 4.7.4.0.2.

6.7.4.0.3 CSI-RS based absolute L1-RSRP measurement accuracy requirements

Same as 4.7.4.0.3.

6.7.4.0.4 CSI-RS based relative L1-RSRP measurement accuracy requirements

Same as 4.7.4.0.4.

6.7.4.1 SSB based L1-RSRP measurements

6.7.4.1.1 NR SA FR1 SSB based L1-RSRP absolute measurement accuracy

6.7.4.1.1.1 Test purpose

The purpose of this test is to verify that the SSB based L1-RSRP absolute measurement accuracy is within the specified limits for all bands.

6.7.4.1.1.2 Test applicability

This test applies to all types of NR UE from Release 15 onwards.

6.7.4.1.1.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 6.7.4.0.1.

The normative reference for this requirement is TS 38.133 [6] clause A.6.7.4.1.

6.7.4.1.1.4 Test description

6.7.4.1.1.4.1 Initial conditions

This test shall be tested using any of the test configurations in Table 6.7.4.1.1.4.1-1.

Table 6.7.4.1.1.4.1-1: NR SA FR1 SSB based L1-RSRP absolute measurement accuracy supported test configurations

Test Case ID	Description
6.7.4.1.1-1	NR: 15 kHz SSB SCS, 10MHz bandwidth, FDD
6.7.4.1.1-2	NR: 15 kHz SSB SCS, 10MHz bandwidth, TDD
6.7.4.1.1-3	NR: 30 kHz SSB SCS, 40MHz bandwidth, TDD
Note: The UE is only required to be tested in one of the supported test configurations	

Configure the test equipment and the DUT according to the parameters in Table 6.7.4.1.1.4.1-2.

Table 6.7.4.1.1.4.1-2: Initial conditions for SSB based L1-RSRP absolute accuracy in FR1

Parameter	Value		Comment
Test environment	NC, TL/VL, TL/VH, TH/VL, TH/VH		As specified in TS 38.508-1 [14] clause 4.1.
Test frequencies	As specified in Annex E, Table E.4-1 and TS 38.508-1 [14] clause 4.3.1.		
Channel bandwidth	As specified by the test configuration selected from Table 6.7.4.1.1.4.1-1.		
Propagation conditions	AWGN		As specified in Annex C.2.2.
Connection Diagram	TE Part 2Rx	A.3.1.8.2 with n = 1	As specified in TS 38.508-1 [14] Annex A.
	TE Part 4Rx	A.3.1.8.5 with n = 1	
	DUT Part 2Rx	A.3.2.3.4	
	DUT Part 4Rx	A.3.2.5.2	
Exceptions to connection diagram	N/A		

1. Message contents are defined in clause 6.7.4.1.1.4.3.

2. Cell 1 is the NR FR1 cell. Cell 1 is the target for SSB-based L1-RSRP measurements. The UE is configured to perform RLM, BFD and L1-RSRP measurement based on the SSBs. The connection setup is done according to the settings in Annex C.1.1.

6.7.4.1.1.4.2 Test procedure

The UE shall be configured for periodic CSI reporting in PUCCH [format 2] with a reporting periodicity as mentioned in the above table 6.7.4.1.1.4.1-2.

1. Ensure the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity NR SA, Connected without release *On* and Test Mode *On*, according to TS 38.508-1 [14] clause 4.5 and general test parameters set according to Table 6.7.4.1.1.4.1-2.

2. Set the parameters according to T1 in Table 6.7.4.1.1.5-1.

3. The UE shall start sending L1-RSRP report including results of both SSB#0 and SSB#1 every 80 slots.

4. The SS shall check the L1-RSRP reported values of SSB#0 or SSB#1 in the periodic L1-RSRP reports. If the value for the strongest SSB is within the limits in Table 6.7.4.1.1.5-2 or Table 6.7.4.1.1.5-3 (depending on the test configuration), the number of passed iterations is increased by one, otherwise the number of failed iterations is increased by one.

5. The SS shall continue checking the L1-RSRP report messages transmitted by the UE until the confidence level according to Table G.2.3-1 in Annex G is achieved.

6. Set the parameters according to each sub-test in Table 6.7.4.1.1.5-1 as appropriate and repeat steps 3-5.

6.7.4.1.1.4.3 Message contents

Message contents are according to TS 38.508-1 [14] clause 7.3 with the following exceptions:

Table 6.7.4.1.1.4.3-1: Common Exception messages NR SA SSB based L1-RSRP measurement

Default Message Contents	
Common contents of system information blocks exceptions	
Default RRC messages and information elements contents exceptions	Table H.3.6-2 with conditions PERIODIC and SS-RSRP Table H.3.6-3 with conditions SSB and PERIODIC Table H.3.5-8 Table 7.3.1-3 in TS 38.508-1 [14] with condition SMTC.1

Table 6.7.4.1.1.4.3-2: RadioLinkMonitoringConfig

Derivation Path: TS 38.508-1 [14], Table 4.6.3-133			
Information Element	**Value/remark**	**Comment**	**Condition**
RadioLinkMonitoringConfig ::= SEQUENCE {			
failureDetectionResourcesToAddModList SEQUENCE (SIZE(1..maxNrofFailureDetectionResources)) OF SEQUENCE {	1 entry		
purpose	both	UE is configured to perform RLM and BFD based on the SSBs.	
detectionResource CHOICE {			
ssb-Index	0		
}			
}			
}			

6.7.4.1.1.5 Test requirement

Table 6.7.4.1.1.5-1 defines the primary level settings including test tolerances for all tests.

Each L1-RSRP measurement report for each of the tests in Table 6.7.4.1.1.5-1 shall meet the corresponding absolute accuracy requirements in Table 6.7.4.1.1.5-2 for test configurations 1 and 2, and the corresponding absolute accuracy requirements in Table 6.7.4.1.1.5-3 for test configuration 3.

Table 6.7.4.1.1.5-1: L1-RSRP test parameters

Parameter	Config	Unit	Test 1	Test 2
SSB GSCN	1~3		freq1	freq1
Duplex mode	1		FDD	FDD
	2		TDD	TDD
	3		TDD	TDD
TDD Configuration	1		N/A	N/A
	2		TDDConf.1.1	TDDConf.1.1
	3		TDDConf.2.1	TDDConf.2.1
$BW_{channel}$	1	MHz	10: $N_{RB,c}$ = 52	10: $N_{RB,c}$ = 52
	2		10: $N_{RB,c}$ = 52	10: $N_{RB,c}$ = 52
	3		40: $N_{RB,c}$ = 106	40: $N_{RB,c}$ = 106
PDSCH Reference measurement channel	1		SR.1.1 FDD	SR.1.1 FDD
	2		SR.1.1 TDD	SR.1.1 TDD
	3		SR.2.1 TDD	SR.2.1 TDD
RMSI CORESET Reference Channel	1		CR.1.1 FDD	CR.1.1 FDD
	2		CR.1.1 TDD	CR.1.1 TDD
	3		CR.2.1 TDD	CR.2.1 TDD
Dedicated CORESET Reference Channel	1		CCR.1.1 FDD	CCR.1.1 FDD
	2		CCR.1.1 TDD	CCR.1.1 TDD
	3		CCR.2.1 TDD	CCR.2.1 TDD
SSB configuration	1		SSB.3 FR1	SSB.3 FR1
	2		SSB.3 FR1	SSB.3 FR1

		3		SSB.4 FR1	SSB.4 FR1
OCNG Patterns		1~3		OP.1	OP.1
TRS configuration		1		TRS.1.1 FDD	TRS.1.1 FDD
		2		TRS.1.1 TDD	TRS.1.1 TDD
		3		TRS.1.2 TDD	TRS.1.2 TDD
Initial BWP Configuration		1~3		DLBWP.0.1 ULBWP.0.1	DLBWP.0.1 ULBWP.0.1
Dedicated BWP configuration		1~3		DLBWP.1.1 ULBWP.1.1	DLBWP.1.1 ULBWP.1.1
SMTC configuration		1~3		SMTC.1	SMTC.1
reportConfigType		1~3		periodic	periodic
reportQuantity		1~3		ssb-Index-RSRP	ssb-Index-RSRP
Number of reported RS		1~3		2	2
L1-RSRP reporting period		1~3		slot80	slot80
EPRE ratio of PSS to SSS EPRE ratio of PBCH DMRS to SSS EPRE ratio of PBCH to PBCH DMRS EPRE ratio of PDCCH DMRS to SSS EPRE ratio of PDCCH to PDCCH DMRS EPRE ratio of PDSCH DMRS to SSS EPRE ratio of PDSCH to PDSCH DMRS EPRE ratio of OCNG DMRS to SSS Note 1 EPRE ratio of OCNG to OCNG DMRS Note 1		1~3	dB	0	0
N_{oc} Note2	Depending on band group	1,2	dBm/15kHz	-94.65	-117+ Δ_{BG_offset}
		3		-96.00	117+ Δ_{BG_offset}
N_{oc} Note2		1,2	dBm/SSB SCS	-94.65	-117+ Δ_{BG_offset}
		3		-93.00	-114+ Δ_{BG_offset}
$\hat{E}_s / I_{ot}$		1~3	dB	10	-2.2
SSB RSRP Note3	Depending on band group	1,2	dBm/SSB SCS	-84.65	-119.2 + Δ_{BG_offset}
		3		-83.00	-116.2 + Δ_{BG_offset}
Io Note3	Depending on band group	1,2	dBm/9.36 MHz	-56.28	-87.00 + Δ_{BG_offset}
		3	dBm/38.16 MHz	-51.53	-80.90 + Δ_{BG_offset}
$\hat{E}_s / N_{oc}$		1~3	dB	10	-2.2
Propagation condition		1~3		AWGN	AWGN
Antenna configuration		1~3		1x2	1x2

Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.
Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for N_{oc} to be fulfilled.
Note 3: RSRP and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.
Note 4: RSRP minimum requirements are specified assuming independent interference and noise at each receiver antenna port.

Note 5:	The test configuration excludes support for band n51 and it is not required to run this test on band n51 in this release of the specification

Table 6.7.4.1.1.5-2: L1-RSRP absolute accuracy requirements for the reported values for test configurations 1 and 2

Normal Conditions	Test 1 All bands	Test 2	
Lowest reported value (Cell 1)	62	Bands NR_FDD_FR1_A, NR_TDD_FR1_A	31
		Bands NR_FDD_FR1_B	31
		Bands NR_TDD_FR1_C	32
		Bands NR_FDD_FR1_D, NR_TDD_FR1_D	32
		Bands NR_FDD_FR1_E, NR_TDD_FR1_E	33
		Bands NR_FDD_FR1_G	34
		Bands NR_FDD_FR1_H	34
Highest reported value (Cell 1)	82	Bands NR_FDD_FR1_A, NR_TDD_FR1_A	44
		Bands NR_FDD_FR1_B	45
		Bands NR_TDD_FR1_C	45
		Bands NR_FDD_FR1_D, NR_TDD_FR1_D	46
		Bands NR_FDD_FR1_E, NR_TDD_FR1_E	46
		Bands NR_FDD_FR1_G	47
		Bands NR_FDD_FR1_H	48
Extreme Conditions	**Test 1 All bands**	**Test 2**	
Lowest reported value (Cell 1)	61	Bands NR_FDD_FR1_A, NR_TDD_FR1_A	30
		Bands NR_FDD_FR1_B	30
		Bands NR_TDD_FR1_C	31
		Bands NR_FDD_FR1_D, NR_TDD_FR1_D	31
		Bands NR_FDD_FR1_E, NR_TDD_FR1_E	32
		Bands NR_FDD_FR1_G	33
		Bands NR_FDD_FR1_H	33
Highest reported value (Cell 1)	83	Bands NR_FDD_FR1_A, NR_TDD_FR1_A	45
		Bands NR_FDD_FR1_B	46
		Bands NR_TDD_FR1_C	46
		Bands NR_FDD_FR1_D, NR_TDD_FR1_D	47
		Bands NR_FDD_FR1_E, NR_TDD_FR1_E	47
		Bands NR_FDD_FR1_G	48
		Bands NR_FDD_FR1_H	49
Note 1: NR operating band groups are defined in clause 3A.4, Table 3A.4.1-2.			

Table 6.7.4.1.1.5-3: L1-RSRP absolute accuracy requirements for the reported values for test configuration 3

Normal Conditions	Test 1 All bands	Test 2	
Lowest reported value (Cell 1)	63	Bands NR_FDD_FR1_A, NR_TDD_FR1_A	34
		Bands NR_FDD_FR1_B	34
		Bands NR_TDD_FR1_C	35
		Bands NR_FDD_FR1_D, NR_TDD_FR1_D	35

		Bands NR_FDD_FR1_E, NR_TDD_FR1_E	36
		Bands NR_FDD_FR1_G	37
		Bands NR_FDD_FR1_H	37
Highest reported value (Cell 1)	84	Bands NR_FDD_FR1_A, NR_TDD_FR1_A	47
		Bands NR_FDD_FR1_B	48
		Bands NR_TDD_FR1_C	48
		Bands NR_FDD_FR1_D, NR_TDD_FR1_D	49
		Bands NR_FDD_FR1_E, NR_TDD_FR1_E	49
		Bands NR_FDD_FR1_G	50
		Bands NR_FDD_FR1_H	51
Extreme Conditions	**Test 1 All bands**	**Test 2**	
Lowest reported value (Cell 1)	62	Bands NR_FDD_FR1_A, NR_TDD_FR1_A	33
		Bands NR_FDD_FR1_B	33
		Bands NR_TDD_FR1_C	34
		Bands NR_FDD_FR1_D, NR_TDD_FR1_D	34
		Bands NR_FDD_FR1_E, NR_TDD_FR1_E	35
		Bands NR_FDD_FR1_G	36
		Bands NR_FDD_FR1_H	36
Highest reported value (Cell 1)	85	Bands NR_FDD_FR1_A, NR_TDD_FR1_A	48
		Bands NR_FDD_FR1_B	49
		Bands NR_TDD_FR1_C	49
		Bands NR_FDD_FR1_D, NR_TDD_FR1_D	50
		Bands NR_FDD_FR1_E, NR_TDD_FR1_E	50
		Bands NR_FDD_FR1_G	51
		Bands NR_FDD_FR1_H	52
Note 1: NR operating band groups are defined in clause 3A.4, Table 3A.4.1-2			

For the test to pass, the ratio of successful reported values in each test shall be more than 90% with a confidence level of 95%.

6.7.4.1.2 NR SA FR1 SSB based L1-RSRP relative measurement accuracy

6.7.4.1.2.1 Test purpose

The purpose of this test is to verify that the SSB based L1-RSRP relative measurement accuracy is within the specified limits for all bands.

6.7.4.1.2.2 Test applicability

This test applies to all types of NR UE from Release 15 onwards.

6.7.4.1.2.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 6.7.4.0.2.

The normative reference for this requirement is TS 38.133 [6] clause A.6.7.4.1.

6.7.4.1.2.4 Test description

6.7.4.1.2.4.1 Initial conditions

This test shall be tested using any of the test configurations in Table 6.7.4.1.2.4.1-1.

Table 6.7.4.1.2.4.1-1: NR SA FR1 SSB based L1-RSRP relative measurement accuracy supported test configurations

Test Case ID	Description
6.7.4.1.2-1	NR: 15 kHz SSB SCS, 10MHz bandwidth, FDD
6.7.4.1.2-2	NR: 15 kHz SSB SCS, 10MHz bandwidth, TDD
6.7.4.1.2-3	NR: 30 kHz SSB SCS, 40MHz bandwidth, TDD
Note: The UE is only required to be tested in one of the supported test configurations	

Configure the test equipment and the DUT according to the parameters in Table 6.7.4.1.2.4.1-2.

Table 6.7.4.1.2.4.1-2: Initial conditions for SSB based L1-RSRP relative accuracy in FR1

Parameter	Value		Comment
Test environment	NC, TL/VL, TL/VH, TH/VL, TH/VH		As specified in TS 38.508-1 [14] clause 4.1.
Test frequencies	As specified in Annex E, Table E.4-1 and TS 38.508-1 [14] clause 4.3.1.		
Channel bandwidth	As specified by the test configuration selected from Table 6.7.4.1.2.4.1-1.		
Propagation conditions	AWGN		As specified in Annex C.2.2.
Connection Diagram	TE Part 2Rx	A.3.1.8.2 with n = 1	As specified in TS 38.508-1 [14] Annex A.
	TE Part 4Rx	A.3.1.8.5 with n = 1	
	DUT Part 2Rx	A.3.2.3.4	
	DUT Part 4Rx	A.3.2.5.2	
Exceptions to connection diagram	N/A		

1. Message contents are defined in clause 6.7.4.1.2.4.3.

2. Cell 1 is the NR FR1 cell. Cell 1 is the target for SSB-based L1-RSRP measurements. The UE is configured to perform RLM, BFD and L1-RSRP measurement based on the SSBs. The connection setup is done according to the settings in Annex C.1.1.

6.7.4.1.2.4.2 Test procedure

The UE shall be configured for periodic CSI reporting in PUCCH [format 2] with a reporting periodicity as mentioned in the above table 6.7.4.1.2.4.1-2.

1. Ensure the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity NR SA, Connected without release *On* and Test Mode *On*, according to TS 38.508-1 [14] clause 4.5 and general test parameters set according to Table 6.7.4.1.2.4.1-2.

2. Set the parameters according to T1 in Table 6.7.4.1.2.5-1.

3. The UE shall start sending L1-RSRP report including results of both SSB#0 and SSB#1 every 80 slots.

4. The SS shall check the L1-RSRP reported values of SSB#0 and SSB#1 in the periodic L1-RSRP reports. The DIFF-RSRP value of SSB#0 or SSB#1 reported by the UE is compared to the expected DIFF-. If the DIFF-RSRP value is within the limits in Table 6.7.4.1.2.5-2, the number of passed iterations is increased by one, otherwise the number of failed iterations is increased by one.

5. The SS shall continue checking the L1-RSRP report messages transmitted by the UE until the confidence level according to Table G.2.3-1 in Annex G is achieved.

6. Set the parameters according to each sub-test in Table 6.7.4.1.2.5-1 as appropriate and repeat steps 3-5.

6.7.4.1.2.4.3 Message contents

Message contents are same as in Clause 6.7.4.1.1.4.3.

6.7.4.1.2.5 Test requirement

Table 6.7.4.1.2.5-1 defines the primary level settings including test tolerances for all tests.

Each L1-RSRP measurement report for each of the tests in Table 6.7.4.1.2.5-1 shall meet the corresponding absolute accuracy requirements in Table 6.7.4.1.2.5-2.

Table 6.7.4.1.2.5-1: Same as Table 6.7.4.1.1.5-1

Table 6.7.4.1.2.5-2: L1-RSRP relative accuracy requirements for the reported values

	Test 1	Test 2
	All bands	All bands
Normal Conditions		
Lowest DIFF RSRP reported value	0	0
Highest DIFF RSRP reported value	+3	+3
Extreme Conditions		
Lowest DIFF RSRP reported value	0	0
Highest DIFF RSRP reported value	+4	+4

For the test to pass, the ratio of successful reported values in each test shall be more than 90% with a confidence level of 95%.

6.7.4.2 CSI-RS based L1-RSRP measurements

6.7.4.2.1 NR SA FR1 CSI-RS based L1-RSRP absolute measurement accuracy

6.7.4.2.1.1 Test purpose

The purpose of this test is to verify that the CSI-RS based L1-RSRP absolute measurement accuracy is within the specified limits for all bands.

6.7.4.2.1.2 Test applicability

This test applies to all types of NR UE from Release 15 onwards.

6.7.4.2.1.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 6.7.4.0.3.

The normative reference for this requirement is TS 38.133 [6] clause A.6.7.4.2.

6.7.4.2.1.4 Test description

6.7.4.2.1.4.1 Initial conditions

This test shall be tested using any of the test configurations in Table 6.7.4.2.1.4.1-1.

Table 6.7.4.2.1.4.1-1: NR SA FR1 CSI-RS based L1-RSRP absolute measurement accuracy supported test configurations

Test Case ID	Description
6.7.4.2.1-1	NR: 15 kHz SSB SCS, 10MHz bandwidth, FDD
6.7.4.2.1-2	NR: 15 kHz SSB SCS, 10MHz bandwidth, TDD
6.7.4.2.1-3	NR: 30 kHz SSB SCS, 40MHz bandwidth, TDD
Note: The UE is only required to be tested in one of the supported test configurations	

Configure the test equipment and the DUT according to the parameters in Table 6.7.4.2.1.4.1-2.

Table 6.7.4.2.1.4.1-2: Initial conditions for CSI-RS based L1-RSRP absolute accuracy in FR1

Parameter	Value		Comment
Test environment	NC, TL/VL, TL/VH, TH/VL, TH/VH		As specified in TS 38.508-1 [14] clause 4.1.
Test frequencies	As specified in Annex E, Table E.4-1 and TS 38.508-1 [14] clause 4.3.1.		
Channel bandwidth	As specified by the test configuration selected from Table 6.7.4.2.1.4.1-1.		
Propagation conditions	AWGN		As specified in Annex C.2.2.
Connection Diagram	TE Part 2Rx	A.3.1.8.2 with n = 1	As specified in TS 38.508-1 [14] Annex A.
	TE Part 4Rx	A.3.1.8.5 with n = 1	
	DUT Part 2Rx	A.3.2.3.4	
	DUT Part 4Rx	A.3.2.5.2	
Exceptions to connection diagram	N/A		

1. Message contents are defined in clause 6.7.4.2.1.4.3.

2. Cell 1 is the NR FR1 cell. Cell 1 is the target for CSI-RS based L1-RSRP measurements. The UE is configured to perform RLM and BFD measurement based on the SSB. The connection setup is done according to the settings in Annex C.1.1.

6.7.4.2.1.4.2 Test procedure

The UE shall be configured for periodic CSI reporting in PUCCH [format 2] with a reporting periodicity as mentioned in the above table 6.7.4.2.1.4.1-2.

1. Ensure the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity NR SA, Connected without release *On* and Test Mode *On*, according to TS 38.508-1 [14] clause 4.5 and general test parameters set according to Table 6.7.4.2.1.4.1-2.

2. Set the parameters according to T1 in Table 6.7.4.2.1.5-1.

3. The UE shall start sending L1-RSRP report including results of both CSI-RS#0 and CSI-RS#1 every 80 slots.

4. The SS shall check the L1-RSRP reported values of CSI-RS#0 or CSI-RS#1 in the periodic L1-RSRP reports. If the value for the strongestCSI-RS is within the limits in Table 6.7.4.2.1.5-2 or Table 6.7.4.2.1.5-3 (depending on the test configuration), the number of passed iterations is increased by one, otherwise the number of failed iterations is increased by one.

5. The SS shall continue checking the L1-RSRP report messages transmitted by the UE until the confidence level according to Table G.2.3-1 in Annex G is achieved.

6. Set the parameters according to each sub-test in Table 6.7.4.2.1.5-1 as appropriate and repeat steps 3-5.

6.7.4.2.1.4.3 Message contents

Message contents are according to TS 38.508-1 [14] clause 7.3 with the following exceptions:

Table 6.7.4.2.1.4.3-1: Common Exception messages EN-DC CSI-RS-based L1-RSRP measurement

Default Message Contents	
Common contents of system information blocks exceptions	
Default RRC messages and information elements contents exceptions	Table H.3.6-2 with conditions PERIODIC and CSI-RSRP Table H.3.6-3 with conditions CSI-RS and PERIODIC Table 7.3.1-3 in TS 38.508-1 [14] with condition SMTC.1

Table 6.7.4.2.1.4.3-2: RadioLinkMonitoringConfig

Derivation Path: TS 38.508-1 [14], Table 4.6.3-133			
Information Element	**Value/remark**	**Comment**	**Condition**
RadioLinkMonitoringConfig ::= SEQUENCE {			
failureDetectionResourcesToAddModList SEQUENCE (SIZE(1..maxNrofFailureDetectionResources)) OF SEQUENCE {	1 entry		
purpose	both	UE is configured to perform RLM and BFD based on the SSB.	
detectionResource CHOICE {			
ssb-Index	0		
}			
}			
}			

6.7.4.2.1.5 Test requirement

Table 6.7.4.2.1.5-1 defines the primary level settings including test tolerances for all tests.

Each L1-RSRP measurement report for each of the tests in Table 6.7.4.2.1.5-1 shall meet the corresponding absolute accuracy requirements in Table 6.7.4.2.1.5-2 for test configurations 1 and 2, and the corresponding absolute accuracy requirements in Table 6.7.4.2.1.5-3 for test configuration 3.

Table 6.7.4.2.1.5-1: L1-RSRP test parameters

Parameter	Config	Unit	Test 1	Test 2
SSB GSCN	1~3		freq1	freq1
Duplex mode	1		FDD	FDD
	2		TDD	TDD
	3		TDD	TDD
TDD Configuration	1		N/A	N/A
	2		TDDConf.1.1	TDDConf.1.1
	3		TDDConf.2.1	TDDConf.2.1
$BW_{channel}$	1	MHz	10: $N_{RB,c}$ = 52	10: $N_{RB,c}$ = 52
	2		10: $N_{RB,c}$ = 52	10: $N_{RB,c}$ = 52
	3		40: $N_{RB,c}$ = 106	40: $N_{RB,c}$ = 106
PDSCH Reference measurement channel	1		SR.1.1 FDD	SR.1.1 FDD
	2		SR.1.1 TDD	SR.1.1 TDD
	3		SR.2.1 TDD	SR.2.1 TDD
RMSI CORESET Reference Channel	1		CR.1.1 FDD	CR.1.1 FDD
	2		CR.1.1 TDD	CR.1.1 TDD
	3		CR.2.1 TDD	CR.2.1 TDD
Dedicated CORESET Reference Channel	1		CCR.1.1 FDD	CCR.1.1 FDD
	2		CCR.1.1 TDD	CCR.1.1 TDD
	3		CCR.2.1 TDD	CCR.2.1 TDD
SSB configuration	1		SSB.3 FR1	SSB.3 FR1
	2		SSB.3 FR1	SSB.3 FR1
	3		SSB.4 FR1	SSB.4 FR1
OCNG Patterns	1~3		OP.1	OP.1
TRS configuration	1		TRS.1.1 FDD	TRS.1.1 FDD
	2		TRS.1.1 TDD	TRS.1.1 TDD
	3		TRS.1.2 TDD	TRS.1.2 TDD
Initial BWP Configuration	1~3		DLBWP.0.1 ULBWP.0.1	DLBWP.0.1 ULBWP.0.1
Dedicated BWP configuration	1~3		DLBWP.1.1 ULBWP.1.1	DLBWP.1.1 ULBWP.1.1
SMTC configuration	1~3		SMTC.1	SMTC.1
CSI-RS	1,4		CSI-RS 1.2 FDD	CSI-RS 1.2 FDD

		2,5		CSI-RS 1.2 TDD	CSI-RS 1.2 TDD
		3,6		CSI-RS 2.2 TDD	CSI-RS 2.2 FDD
reportConfigType		1~3		periodic	periodic
reportQuantity		1~3		cri-RSRP	cri-RSRP
Number of reported RS		1~3		2	2
L1-RSRP reporting period		1~3		slot80	slot80
EPRE ratio of PSS to SSS EPRE ratio of PBCH DMRS to SSS EPRE ratio of PBCH to PBCH DMRS EPRE ratio of PDCCH DMRS to SSS EPRE ratio of PDCCH to PDCCH DMRS EPRE ratio of PDSCH DMRS to SSS EPRE ratio of PDSCH to PDSCH DMRS EPRE ratio of OCNG DMRS to SSS Note 1 EPRE ratio of OCNG to OCNG DMRS Note 1		1~3	dB	0	0
N_{oc} Note2	Depending on band group	1,2	dBm/15kHz	-94.65	-117+ Δ_{BG_offset}
		3		-96.00	117+ Δ_{BG_offset}
N_{oc} Note2	Depending on band group	1,2	dBm/CSI-RS SCS	-94.65	-117+ Δ_{BG_offset}
		3		-93.00	-114+ Δ_{BG_offset}
$\hat{E}_s / I_{ot}$		1~3	dB	10	-2.2
CSI-RSRP Note3	Depending on band group	1,2	dBm/CSI-RS SCS	-84.65	-119.2 + Δ_{BG_offset}
		3		-83.00	-116.2 + Δ_{BG_offset}
Io Note3	Depending on band group	1,2	dBm/9.36 MHz	-56.28	-87.00 + Δ_{BG_offset}
		3	dBm/38.16 MHz	-51.53	-80.90 + Δ_{BG_offset}
$\hat{E}_s / N_{oc}$		1~3	dB	10	-2.2
Propagation condition		1~3		AWGN	AWGN
Antenna configuration		1~3		1x2	1x2

Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.
Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for N_{oc} to be fulfilled.
Note 3: RSRP and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.
Note 4: RSRP minimum requirements are specified assuming independent interference and noise at each receiver antenna port.
Note 5: The test configuration excludes support for band n51 and it is not required to run this test on band n51 in this release of the specification

Table 6.7.4.2.1.5-2: Same as Table 6.7.4.1.1.5-2

Table 6.7.4.2.1.5-3: Same as Table 6.7.4.1.1.5-3

For the test to pass, the ratio of successful reported values in each test shall be more than 90% with a confidence level of 95%.

6.7.4.2.2 NR SA FR1 CSI-RS based L1-RSRP relative measurement accuracy

6.7.4.2.2.1 Test purpose

The purpose of this test is to verify that the CSI-RS based L1-RSRP relative measurement accuracy is within the specified limits for all bands.

6.7.4.2.2.2 Test applicability

This test applies to all types of NR UE from Release 15 onwards.

6.7.4.2.2.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 6.7.4.0.4.

The normative reference for this requirement is TS 38.133 [6] clause A.6.7.4.2.

6.7.4.2.2.4 Test description

6.7.4.2.2.4.1 Initial conditions

This test shall be tested using any of the test configurations in Table 6.7.4.2.2.4.1-1.

Table 6.7.4.2.2.4.1-1: NR SA FR1 CSI-RS based L1-RSRP relative measurement accuracy supported test configurations

Test Case ID	Description
6.7.4.2.2-1	NR: 15 kHz SSB SCS, 10MHz bandwidth, FDD
6.7.4.2.2-2	NR: 15 kHz SSB SCS, 10MHz bandwidth, TDD
6.7.4.2.2-3	NR: 30 kHz SSB SCS, 40MHz bandwidth, TDD
Note: The UE is only required to be tested in one of the supported test configurations	

Configure the test equipment and the DUT according to the parameters in Table 6.7.4.2.2.4.1-2.

Table 6.7.4.2.2.4.1-2: Initial conditions for CSI-RS based L1-RSRP relative accuracy in FR1

Parameter	Value		Comment
Test environment	NC, TL/VL, TL/VH, TH/VL, TH/VH		As specified in TS 38.508-1 [14] clause 4.1.
Test frequencies	As specified in Annex E, Table E.4-1 and TS 38.508-1 [14] clause 4.3.1.		
Channel bandwidth	As specified by the test configuration selected from Table 6.7.4.2.2.4.1-1.		
Propagation conditions	AWGN		As specified in Annex C.2.2.
Connection Diagram	TE Part 2Rx	A.3.1.8.2 with n = 1	As specified in TS 38.508-1 [14] Annex A.
	TE Part 4Rx	A.3.1.8.5 with n = 1	
	DUT Part 2Rx	A.3.2.3.4	
	DUT Part 4Rx	A.3.2.5.2	
Exceptions to connection diagram	N/A		

1. Message contents are defined in clause 6.7.4.2.2.4.3.

2. Cell 1 is the NR FR1 cell. Cell 1 is the target for CSI-RS based L1-RSRP measurements. The UE is configured to perform RLM and BFD measurement based on the SSB. The connection setup is done according to the settings in Annex C.1.1.

6.7.4.2.2.4.2 Test procedure

The UE shall be configured for periodic CSI reporting in PUCCH [format 2] with a reporting periodicity as mentioned in the above table 6.7.4.2.2.4.1-2.

1. Ensure the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity NR SA, Connected without release *On* and Test Mode *On*, according to TS 38.508-1 [14] clause 4.5 and general test parameters set according to Table 6.7.4.2.2.4.1-2.

2. Set the parameters according to T1 in Table 6.7.4.2.2.5-1.

3. The UE shall start sending L1-RSRP report including results of both CSI-RS#0 and CSI-RS#1 every 80 slots.

4. The SS shall check the L1-RSRP reported values of CSI-RS#0 and CSI-RS#1 in the periodic L1-RSRP reports. The DIFF-RSRP value of CSI-RS#0 or CSI-RS#1 reported by the UE is compared to the expected DIFF-. If the DIFF-RSRP value is within the limits in Table 6.7.4.2.2.5-2, the number of passed iterations is increased by one, otherwise the number of failed iterations is increased by one.

5. The SS shall continue checking the L1-RSRP report messages transmitted by the UE until the confidence level according to Table G.2.3-1 in Annex G is achieved.

6. Set the parameters according to each sub-test in Table 6.7.4.2.2.5-1 as appropriate and repeat steps 3-5.

6.7.4.2.2.4.3 Message contents

Message contents are same as in Clause 6.7.4.2.1.4.3.

6.7.4.2.2.5 Test requirement

Table 6.7.4.2.2.5-1 defines the primary level settings including test tolerances for all tests.

Each L1-RSRP measurement report for each of the tests in Table 6.7.4.2.2.5-1 shall meet the corresponding absolute accuracy requirements in Table 6.7.4.2.2.5-2.

Table 6.7.4.2.2.5-1: Same as Table 6.7.4.2.1.5-1

Table 6.7.4.2.2.5-2: Same as Table 6.7.4.1.2.5-2

For the test to pass, the ratio of successful reported values in each test shall be more than 90% with a confidence level of 95%.

6.7.5 E-UTRAN RSRP

6.7.5.0 Minimum conformance requirements

6.7.5.0.1 E-UTRAN RSRP absolute accuracy

The measurement period of E-UTRA RSRP in RRC_CONNECTED state is specified in clause 9.4.2 and 9.4.3 of TS 38.133 [6].

The accuracy requirements of E-UTRA RSRP measurements in RRC_CONNECTED state and the corresponding side conditions shall be the same as the inter-frequency RSRP Accuracy Requirements in clause 9.1.3 of TS 36.133 [23]:

The requirements for absolute accuracy of RSRP in this clause apply to a cell that has different carrier frequency from the serving cell.

The accuracy requirements in Table 6.7.5.0.1-1 are valid under the following conditions:

Cell specific reference signals are transmitted either from one, two or four antenna ports.

Conditions defined in 36.101 [27] Clause 7.3 for reference sensitivity are fulfilled.

RSRP|dBm according to Annex B.3.3 of TS 36.133 [23] for a corresponding Band.

Table 6.7.5.0.1-1: RSRP Inter frequency absolute accuracy

Accuracy		Conditions			
			Io Note 1 range		
Normal condition	Extreme condition	Ês/Iot	E-UTRA operating band groups Note 3	Minimum Io		Maximum Io
dB	dB	dB		dBm/15kHz Note 2	dBm/BW$_{Channel}$	dBm/BW$_{Channel}$
±4.5	±9	≥-6 dB	FDD_A, TDD_A	-121	N/A	-70
			FDD_B1, FDD_B2	-120.5	N/A	-70
			FDD_C, TDD_C	-120	N/A	-70
			FDD_D	-119.5	N/A	-70
			FDD_E, TDD_E	-119	N/A	-70
			FDD_F	-118.5	N/A	-70
			FDD_G	-118	N/A	-70
			FDD_H	-117.5	N/A	-70
			FDD_N	-114.5	N/A	-70
±8	±11	≥-6 dB	FDD_A, TDD_A, FDD_B1, FDD_B2, FDD_C, TDD_C, FDD_D, FDD_E, TDD_E, FDD_F, FDD_G, FDD_H, FDD_N	N/A	-70	-50

NOTE 1: Io is assumed to have constant EPRE across the bandwidth.
NOTE 2: The condition level is increased by Δ>0, when applicable, as described in Sections B.4.2 and B.4.3 of TS 36.133 [23].
NOTE 3: E-UTRA operating band groups are as defined in Section 3.5 of TS 36.133 [23].

The reporting range and mapping specified for RSRP measurements in clause 9.1.4 of TS 36.133 [23] shall apply:

The reporting range of RSRP is defined from -156 dBm to -44 dBm with 1 dB resolution.

The mapping of measured quantity is defined in Table 6.7.5.0.1-2. The range in the signalling may be larger than the guaranteed accuracy range.

Table 6.7.5.0.1-2: RSRP measurement report mapping

Reported value	Measured quantity value	Unit
RSRP_-17	RSRP< -156	dBm
RSRP_-16	-156 ≤ RSRP< -155	dBm
…	…	…
RSRP_-03	-143 ≤ RSRP< -142	dBm
RSRP_-02	-142 ≤ RSRP< -141	dBm
RSRP_-01	-141 ≤ RSRP< -140	dBm
RSRP_00	RSRP < -140	dBm
RSRP_01	-140 ≤ RSRP < -139	dBm
RSRP_02	-139 ≤ RSRP < -138	dBm
…	…	…
RSRP_95	-46 ≤ RSRP < -45	dBm
RSRP_96	-45 ≤ RSRP < -44	dBm
RSRP_97	-44 ≤ RSRP	dBm

6.7.5.1 NR SA FR1 – E-UTRAN RSRP absolute measurement accuracy

6.7.5.1.1 Test purpose

The purpose of this test is to verify that the inter-RAT E-UTRAN RSRP absolute measurement accuracy is within the specified limits for all bands, when the serving cell is NR FR1 and the target cell is E-UTRA.

6.7.5.1.2 Test applicability

This test applies to all types of NR UE from Release 15 onwards supporting E-UTRA.

6.7.5.1.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 6.7.5.0.1.

The normative reference for this requirement is TS 38.133 [6] clause A.6.7.5.1.

6.7.5.1.4 Test description

6.7.5.1.4.1 Initial conditions

This test shall be tested using any of the test configurations in Table 6.7.5.1.4.1-1.

Table 6.7.5.1.4.1-1: test configurations

Test Case ID	Description
6.7.5.1-1	NR: 15 kHz SSB SCS, 10MHz bandwidth, FDD, E-UTRAN: FDD
6.7.5.1-2	NR: 15 kHz SSB SCS, 10MHz bandwidth, TDD, E-UTRAN: FDD
6.7.5.1-3	NR: 30 kHz SSB SCS, 40MHz bandwidth, TDD, E-UTRAN: FDD
6.7.5.1-4	NR: 15 kHz SSB SCS, 10MHz bandwidth, FDD, E-UTRAN: TDD
6.7.5.1-5	NR: 15 kHz SSB SCS, 10MHz bandwidth, TDD, E-UTRAN: TDD
6.7.5.1-6	NR: 30 kHz SSB SCS, 40MHz bandwidth, TDD, E-UTRAN: TDD
Note: The UE is only required to be tested in one of the supported test configurations	

Configure the test equipment and the DUT according to the parameters in Table 6.7.5.1.4.1-2.

Table 6.7.5.1.4.1-2: initial conditions

Parameter	Value		Comment
Test environment	NC, TL/VL, TL/VH, TH/VL, TH/VH		As specified in TS 38.508-1 [14] clause 4.1.
Test frequencies	As specified in Annex E, Table E.4-2 and TS 38.508-1 [14] clause 4.3.1.		
Channel bandwidth	As specified by the test configuration selected from Table 6.7.5.1.4.1-1.		
Propagation conditions	AWGN		As specified in Annex C.2.2.
Connection Diagram	TE Part 2Rx	A.3.1.7.2	As specified in TS 38.508-1 [14] Annex A.
	TE Part 4Rx	A.3.1.7.3	
	DUT Part 2Rx	A.3.2.3.4	
	DUT Part 4Rx	A.3.2.5.2	
Exceptions to connection diagram	N/A		

1. Message contents are defined in clause 6.7.5.1.4.3.

2. There are two carriers and two cells specified in the test, where NR Cell 1 is the NR PCell on the NR carrier and Cell 2 is the E-UTRA neighbour cell on the E-UTRA carrier and the target for the measurements.

6.7.5.1.4.2 Test procedure

1. Ensure the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity *NR*, Connected without release *On* and Test Mode *On* according to TS 38.508-1 [14] clause 4.5.

2. Set the parameters according to Table 6.7.5.1.5-1 and Table 6.7.5.1.5-2 as appropriate.

3. The SS shall transmit an RRCReconfiguration message on Cell 1.

4. The UE shall transmit an RRCReconfigurationComplete message.

5. The UE shall transmit periodically MeasurementReport messages.

6. After 10s wait from Step 3, the SS shall check the RSRP reported values in the periodic MeasurementReport. The RSRP value of Cell 2 reported by the UE is compared to the expected RSRP. If the value is outside the limits in Table 6.7.5.1.5-2 or the UE fails to report the measurement value for Cell 2, the number of failed iterations is increased by one. Otherwise, the number of passed iterations is increased by one.

7. The SS shall continue checking the MeasurementReport messages transmitted by the UE until the confidence level according to Table G.2.3-1 in Annex G is achieved.

8. Set the parameters according to each sub-test in Table 6.7.5.1.5-2 as appropriate and repeat steps 5-7.

6.7.5.1.4.3 Message contents

Message contents are according to TS 38.508-1 [14] clause 7.3 with the following exceptions:

Table 6.7.5.1.4.3-1: Common Exception messages

Default Message Contents	
Common contents of system information blocks exceptions	
Default RRC messages and information elements contents exceptions	Table H.3.1-1 Table H.3.1-2 with condition INTER-RAT and GAP NEEDED Table H.3.1-3 Table H.3.1-3a Table H.3.1-7 with condition INTER-RAT Table 7.3.1-3 in TS 38.508-1 [14] with condition SMTC.1

Table 6.7.5.1.4.3-1A: MeasConfig (Test procedure step 3)

Derivation path: Table H.3.1-2 with condition INTER-RAT and GAP NEEDED			
Information Element	**Value/Remark**	**Comment**	**Condition**
measConfig ::= SEQUENCE {			
reportConfigToAddModList SEQUENCE(SIZE (1..maxReportConfigId)) OF ReportConfigToAddMod {	2 entries		
ReportConfigToAddMod[1] SEQUENCE {		entry 1	
reportConfigId	1		
reportConfig CHOICE {			
reportConfigInterRAT	ReportConfigE-UTRA-DEFAULT(Periodical)	Table 6.7.5.1.4.3-2	
}			
}			
ReportConfigToAddMod[2] SEQUENCE {		entry 2	
reportConfigId	2		
reportConfig CHOICE {			
reportConfigInterRAT	ReportConfigInterRAT-EVENT	Table 6.7.5.1.4.3-1B	
}			
}			
}			
measIdToAddModList SEQUENCE (SIZE (1..maxNrofMeasId)) OF MeasIdToAddMod {	2 entries		
MeasIdToAddMod[1] SEQUENCE {		entry 1	
measId	1		
measObjectId	2		
reportConfigId	1		
}			
MeasIdToAddMod[2] SEQUENCE {		entry 2	
measId	2		
measObjectId	2		
reportConfigId	2		
}			
}			
}			

Table 6.7.5.1.4.3-1B: ReportConfigInterRAT-EVENT (Table 6.7.5.1.4.3-1A)

Derivation Path: TS 38.508-1 [14] Table 4.6.3-141 with condition EVENT_B1			
Information Element	**Value/remark**	**Comment**	**Condition**
ReportConfigInterRAT ::= SEQUENCE {			
reportType CHOICE {			
eventTriggered SEQUENCE {			

eventId CHOICE {			
eventB1 SEQUENCE {			
b1-ThresholdEUTRA CHOICE {			
rsrp	97	Set threshold to -44dBm to ensure measId 2 will never be triggered	
}			
}			
}			
}			
}			
}			

Table 6.7.5.1.4.3-2: ReportConfigE-UTRA-DEFAULT(Periodical)

Derivation Path: 38.508-1 [14] Table 4.6.3-141 with Condition PERIODICAL			
Information Element	**Value/remark**	**Comment**	**Condition**
ReportConfigInterRAT::= SEQUENCE {			
reportType CHOICE {			
periodical SEQUENCE {			
reportQuantityCell SEQUENCE {			
rsrq	false		
}			
maxReportCells	2		
}			
}			
}			

6.7.5.1.5 Test requirement

Table 6.7.5.1.5-1 defines the primary level settings including test tolerances for all tests.

Each SS-RSRP measurement report for each of the tests in Tables 6.7.5.1.5-1 and 6.7.5.1.5-2 shall meet the corresponding absolute accuracy requirements in Table 6.7.5.1.5-3.

Table 6.7.5.1.5-1: NR Cell specific test parameters for SA Inter-RAT E-UTRAN RSRP test parameters

Parameter		Unit	Cell 1
NR RF channel number			1
Duplex mode	Config 1, 4		FDD
	Config 2, 3, 5, 6		TDD
TDD Configuration	Config 1, 4		N/A
	Config 2, 5		TDDConf.1.1
	Config 3, 6		TDDConf.2.1
$BW_{channel}$	Config 1, 4	MHz	10: $N_{RB,c}$ = 52 (FDD)
	Config 2, 5		10: $N_{RB,c}$ = 52 (TDD)
	Config 3, 6		40: $N_{RB,c}$ = 106 (TDD)
Gap pattern Id			0
PDSCH reference measurement channel	Config 1, 4		SR.1.1 FDD
	Config 2, 5		SR.1.1 TDD
	Config 3, 6		SR.2.1 TDD
RMSI CORSET reference channel	Config 1, 4		CR.1.1 FDD
	Config 2, 5		CR.1.1 TDD
	Config 3, 6		CR.2.1 TDD
Dedicated CORSET reference channel	Config 1, 4		CCR.1.1 FDD
	Config 2, 5		CCR.1.1 TDD
	Config 3, 6		CCR.2.1 TDD
CSI-RS for tracking	Config 1, 4		TRS.1.1 FDD
	Config 2, 5		TRS.1.1 TDD
	Config 3, 6		TRS.1.2 TDD
BWP configurations	Initial DL BWP		DLBWP.0.1
	Dedicated DL BWP		DLBWP.1.1
	Initial UL BWP		ULBWP.0.1

	Dedicated UL BWP		ULBWP.1.1
OCNG pattern[Note1]			OP.1
SMTC configuration			SMTC.1
SSB configuration	Config 1, 2, 4, 5		SSB.1 FR1
	Config 3, 6		SSB.2 FR1
EPRE ratio of PSS to SSS		dB	0
EPRE ratio of PBCH_DMRS to SSS			
EPRE ratio of PBCH to PBCH_DMRS			
EPRE ratio of PDCCH_DMRS to SSS			
EPRE ratio of PDCCH to PDCCH_DMRS			
EPRE ratio of PDSCH_DMRS to SSS			
EPRE ratio of PDSCH to PDSCH_DMRS			
EPRE ratio of OCNG DMRS to SSS			
EPRE ratio of OCNG to OCNG DMRS			
N_{oc}[Note2]		dBm/15 kHz	-104
N_{oc}[Note2]	Config 1, 2, 4, 5	dBm/SCS	-104
	Config 3, 6		-101
$\hat{E}_s/N_{oc}$		dB	17
$\hat{E}_s/I_{ot}$[Note3]		dB	17
SS-RSRP[Note3]	Config 1, 2, 4, 5	dBm/SCS	-87
	Config 3, 6		-84
SSB_RP[Note3]	Config 1, 2, 4, 5	dBm/SCS	-87
	Config 3, 6		-84
Io[Note3]	Config 1, 2, 4, 5	dBm/9.36 MHz	-58.96
	Config 3, 6	dBm/38.16 MHz	-52.87
Propagation condition			AWGN
Antenna Configuration and Correlation Matrix			1x2

Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.

Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for N_{oc} to be fulfilled.

Note 3: $\hat{E}_s/I_{ot}$, SS-RSRP, SSB_RP and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.

Table 6.7.5.1.5-2: E-UTRAN Cell specific test parameters for SA Inter-RAT E-UTRAN RSRP test parameters

Parameter		Unit	Cell 2	
			Test 1	Test 2
E-UTRA RF channel number			1	
Duplex mode	Config 1, 2, 3		FDD	
	Config 4, 5, 6		TDD	
TDD special subframe configuration[Note1]	Config 1, 2, 3		N/A	
	Config 4, 5, 6		6	
TDD uplink-downlink configuration[Note1]	Config 1, 2, 3		N/A	
	Config 4, 5, 6		1	
$BW_{channel}$		MHz	5 MHz: $N_{RB,c}$ = 25 10 MHz: $N_{RB,c}$ = 50 20 MHz: $N_{RB,c}$ = 100	
PDSCH parameters: DL Reference Measurement Channel[Note2]			-	
PCFICH/PDCCH/PHICH parameters: DL Reference Measurement Channel[Note2]	Config 1, 2, 3		5 MHz: R.11 FDD 10 MHz: R.6 FDD 20 MHz: R.10 FDD	
	Config 4, 5, 6		5 MHz: R.11 TDD 10 MHz: R.6 TDD 20 MHz: R.10 TDD	
OCNG Patterns[Note2]	Config 1, 2, 3		5 MHz: OP.19 FDD 10 MHz: OP.6 FDD 20 MHz: OP.14 FDD	
	Config 4, 5, 6		5 MHz: OP.10 TDD 10 MHz: OP.2 TDD 20 MHz: OP.8 TDD	
PBCH_RA		dB	0	
PBCH_RB				

PSS_RA				
SSS_RA				
PCFICH_RB				
PHICH_RA				
PHICH_RB				
PDCCH_RA				
PDCCH_RB				
PDSCH_RA				
PDSCH_RB				
OCNG_RA Note3				
OCNG_RB Note3				
N_{oc} Note4	Depending on band group	dBm/15kHz	-91.65	-117 + Δ_{BG_offset}
$\hat{E}_s/N_{oc}$		dB	10	-3.2
$\hat{E}_s/I_{ot}$ Note5		dB	10	-3.2
RSRP Note5	Depending on band group	dBm/15kHz	-81.65	-120.2+ Δ_{BG_offset}
SCH_RP Note5	Depending on band group	dBm/15kHz	-81.65	-120.2+ Δ_{BG_offset}
Io Note5	Depending on band group	dBm/Ch BW	-53.45 + 10log($N_{RB,c}$/50)	-87.52+ Δ_{BG_offset} + 10log($N_{RB,c}$/50)
Propagation Condition			AWGN	
Antenna Configuration and Correlation Matrix			1x2	

Note 1: Special subframe and uplink-downlink configurations are specified in table 4.2-1 in TS 36.211 [24].
Note 2: DL RMCs and OCNG patterns are specified in clauses A 3.1 and A 3.2 of TS 36.133 [23] respectively.
Note 3: OCNG shall be used such that all cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.
Note 4: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for N_{oc} to be fulfilled.
Note 5: $\hat{E}_s/I_{ot}$, RSRP, SCH_RP and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.
Note 6: E-UTRA operating band groups are as defined in clause 3.5 of TS 36.133 [23].
Note 7: Void
Note 8: Void.
Note 9: Void
Note 10: Void
Note 11: Δ_{BG_offset} for LTE band group is defined in TS 36.521-3 [26] clause 3.5.1, Table 3.5.1-1A.

Table 6.7.5.1.5-3: SS-RSRP Intra frequency absolute accuracy requirements for the reported values

Normal Conditions	**Test 1 All bands**	**Test 2**	
Lowest reported value (Cell 2)	48	FDD_A, TDD_A	14
		FDD_B	15
		TDD_C	15
		FDD_D, TDD_D	16
		FDD_E, TDD_E	16
		FDD_G	17
		FDD_H	18
Highest reported value (Cell 2)	70	FDD_A, TDD_A	27
		FDD_B	27
		TDD_C	28
		FDD_D, TDD_D	28
		FDD_E, TDD_E	29
		FDD_G	30
		FDD_H	30
Extreme Conditions	**Test 1 All bands**	**Test 2**	
Lowest reported value (Cell 2)	46	FDD_A, TDD_A	11
		FDD_B	11
		TDD_C	12
		FDD_D, TDD_D	12
		FDD_E, TDD_E	13
		FDD_G	14
		FDD_H	14

Highest reported value (Cell 2)	72	FDD_A, TDD_A	30
		FDD_B	31
		TDD_C	31
		FDD_D, TDD_D	32
		FDD_E, TDD_E	32
		FDD_G	33
		FDD_H	34
Note 1: E-UTRA operating band groups are as defined in TS 36.521-3 [26] clause 3.5.1			

For the test to pass, the ratio of successful reported values in each test shall be more than 90% with a confidence level of 95%.

6.7.6 E-UTRAN RSRQ

6.7.6.0 Minimum conformance requirements

6.7.6.0.1 E-UTRAN RSRQ absolute accuracy

The measurement period of E-UTRA RSRQ in RRC_CONNECTED state is specified in clause 9.4.2 and 9.4.3 on TS 38.133 [6].

The accuracy requirements of E-UTRA RSRQ measurements in RRC_CONNECTED state and the corresponding side conditions shall be the same as the inter-frequency RSRQ Accuracy Requirements in clause 9.1.6 of TS 36.133 [23]:

The requirements for absolute accuracy of RSRQ in this clause apply to a cell that has different carrier frequency from the serving cell.

The accuracy requirements in Table 6.7.6.0.1-1 are valid under the following conditions:

Cell specific reference signals are transmitted either from one, two or four antenna ports.

Conditions defined in 36.101 [27] Clause 7.3 for reference sensitivity are fulfilled.

RSRP|dBm according to Annex B.3.3 of TS 36.133 [23] for a corresponding Band

Table 6.7.6.0.1-1: RSRQ Inter frequency absolute accuracy

Accuracy		**Conditions**			
			Io Note 1 **range**		
Normal condition	**Extreme condition**	**Ês/Iot**	**E-UTRA operating band groups** Note 4	**Minimum Io**	**Maximum Io**
dB	**dB**	**dB**		**dBm/15kHz** Note 3	**dBm/BW$_{Channel}$**
±2.5	±4	≥-3 dB	FDD_A, TDD_A	-121	-50
			FDD_B1, FDD_B2	-120.5	-50
			FDD_C, TDD_C	-120	-50
			FDD_D	-119.5	-50
			FDD_E, TDD_E	-119	-50
			FDD_F	-118.5	-50
			FDD_G	-118	-50
			FDD_H	-117.5	-50
			FDD_N	-114.5	-50
±3.5	±4	≥-6 dB	Note 2	Note 2	Note 2
NOTE 1: Io is assumed to have constant EPRE across the bandwidth. NOTE 2: The same bands and the same Io conditions for each band apply for this requirement as for the corresponding highest accuracy requirement. NOTE 3: The condition level is increased by Δ>0, when applicable, as described in Sections B.4.2 and B.4.3 of TS 36.133 [23]. NOTE 4: E-UTRA operating band groups are as defined in Section 3.5 of TS 36.133 [23].					

The reporting range and mapping specified for RSRQ measurements in clause 9.1.7 of TS 36.133 [23] shall apply:

The reporting range of RSRQ is defined from -34 dB to 2.5 dB with 0.5 dB resolution.

The mapping of measured quantity is defined in table 6.7.6.0.1-2. The range in the signalling may be larger than the guaranteed accuracy range.

Table 6.7.6.0.1-2: RSRQ measurement report mapping

Reported value	Measured quantity value	Unit
RSRQ_-30	RSRQ < -34	dB
RSRQ_-29	-34 ≤ RSRQ < -33.5	dB
…	…	…
RSRQ_-02	-20.5 ≤ RSRQ < -20	dB
RSRQ_-01	-20 ≤ RSRQ < -19.5	dB
RSRQ_00	RSRQ < -19.5	dB
RSRQ_01	-19.5 ≤ RSRQ < -19	dB
RSRQ_02	-19 ≤ RSRQ < -18.5	dB
…	…	…
RSRQ_32	-4 ≤ RSRQ < -3.5	dB
RSRQ_33	-3.5 ≤ RSRQ < -3	dB
RSRQ_34	-3 ≤ RSRQ	dB
RSRQ_35	-3 ≤ RSRQ < -2.5	dB
RSRQ_36	-2.5 ≤ RSRQ < -2	dB
…	…	…
RSRQ_45	2 ≤ RSRQ < 2.5	dB
RSRQ_46	2.5 ≤ RSRQ	dB

Note: The ranges from RSRQ_-30 to RSRQ_-01 and from RSRQ_35 to RSRQ_46 apply for the UE who can support extended RSRQ range.

6.7.6.1 NR SA FR1 – E-UTRAN RSRQ absolute measurement accuracy

6.7.6.1.1 Test purpose

The purpose of this test is to verify that the inter-RAT E-UTRAN RSRQ absolute measurement accuracy is within the specified limits for all bands, when the serving cell is NR FR1 and the target cell is E-UTRA.

6.7.6.1.2 Test applicability

This test applies to all types of NR UE from Release 15 onwards supporting E-UTRA.

6.7.6.1.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 6.7.6.0.1.

The normative reference for this requirement is TS 38.133 [6] clause A.6.7.6.1.

6.7.6.1.4 Test description

6.7.6.1.4.1 Initial conditions

This test shall be tested using any of the test configurations in Table 6.7.6.1.4.1-1.

Table 6.7.6.1.4.1-1: test configurations

Test Case ID	Description
6.7.6.1-1	NR: 15 kHz SSB SCS, 10MHz bandwidth, FDD, E-UTRAN: FDD
6.7.6.1-2	NR: 15 kHz SSB SCS, 10MHz bandwidth, TDD, E-UTRAN: FDD
6.7.6.1-3	NR: 30 kHz SSB SCS, 40MHz bandwidth, TDD, E-UTRAN: FDD
6.7.6.1-4	NR: 15 kHz SSB SCS, 10MHz bandwidth, FDD, E-UTRAN: TDD
6.7.6.1-5	NR: 15 kHz SSB SCS, 10MHz bandwidth, TDD, E-UTRAN: TDD
6.7.6.1-6	NR: 30 kHz SSB SCS, 40MHz bandwidth, TDD, E-UTRAN: TDD
Note: The UE is only required to be tested in one of the supported test configurations	

Configure the test equipment and the DUT according to the parameters in Table 6.7.6.1.4.1-2.

Table 6.7.6.1.4.1-2: initial conditions

Parameter	Value		Comment
Test environment	NC, TL/VL, TL/VH, TH/VL, TH/VH		As specified in TS 38.508-1 [14] clause 4.1.
Test frequencies	As specified in Annex E, Table E.4-2 and TS 38.508-1 [14] clause 4.3.1.		
Channel bandwidth	As specified by the test configuration selected from Table 6.7.6.1.4.1-1.		
Propagation conditions	AWGN		As specified in Annex C.2.2.
Connection Diagram	TE Part 2Rx	A.3.1.7.2	As specified in TS 38.508-1 [14] Annex A.
	TE Part 4Rx	A.3.1.7.3	
	DUT Part 2Rx	A.3.2.3.4	
	DUT Part 4Rx	A.3.2.5.2	
Exceptions to connection diagram	N/A		

1. Message contents are defined in clause 6.7.6.1.4.3.

2. There are two carriers and two cells specified in the test, where NR Cell 1 is the NR PCell on the NR carrier and Cell 2 is the E-UTRA neighbour cell on the E-UTRA carrier and the target for the measurements.

6.7.6.1.4.2 Test procedure

1. Ensure the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity *NR*, Connected without release *On* and Test Mode *On* according to TS 38.508-1 [14] clause 4.5.

2. Set the parameters according to Table 6.7.6.1.5-1 and Table 6.7.6.1.5-2 as appropriate.

3. The SS shall transmit an RRCReconfiguration message on Cell 1.

4. The UE shall transmit an RRCReconfigurationComplete message.

5. The UE shall transmit periodically MeasurementReport messages.

6. After 10s wait from Step 3, the SS shall check the RSRQ reported values in the periodic MeasurementReport. The RSRQ value of Cell 2 reported by the UE is compared to the expected RSRQ. If the value is outside the limits in Table 6.7.6.1.5-2 or the UE fails to report the measurement value for Cell 2, the number of failed iterations is increased by one. Otherwise, the number of passed iterations is increased by one.

7. The SS shall continue checking the MeasurementReport messages transmitted by the UE until the confidence level according to Table G.2.3-1 in Annex G is achieved.

8. Set the parameters according to each sub-test in Table 6.7.6.1.5-2 as appropriate and repeat steps 5-7.

6.7.6.1.4.3 Message contents

Message contents are according to TS 38.508-1 [14] clause 7.3 with the following exceptions:

Table 6.7.6.1.4.3-1: Common Exception messages

Default Message Contents	
Common contents of system information blocks exceptions	
Default RRC messages and information elements contents exceptions	Table H.3.1-1 Table H.3.1-2 with condition INTER-RAT and GAP NEEDED Table H.3.1-3 Table H.3.1-3a Table H.3.1-7 with condition INTER-RAT Table 7.3.1-3 in TS 38.508-1 [14] with condition SMTC.1

Table 6.7.6.1.4.3-1A: MeasConfig (Test procedure step 3)

Derivation path: Table H.3.1-2 with condition INTER-RAT and GAP NEEDED

Information Element	Value/Remark	Comment	Condition
measConfig ::= SEQUENCE {			
reportConfigToAddModList SEQUENCE(SIZE (1..maxReportConfigId)) OF ReportConfigToAddMod {	2 entries		
ReportConfigToAddMod[1] SEQUENCE {		entry 1	
reportConfigId	1		
reportConfig CHOICE {			
reportConfigInterRAT	ReportConfigE-UTRA-DEFAULT(Periodical)	Table 6.7.6.1.4.3-2	
}			
}			
ReportConfigToAddMod[2] SEQUENCE {		entry 2	
reportConfigId	2		
reportConfig CHOICE {			
reportConfigInterRAT	ReportConfigInterRAT-EVENT	Table 6.7.6.1.4.3-1B	
}			
}			
}			
measIdToAddModList SEQUENCE (SIZE (1..maxNrofMeasId)) OF MeasIdToAddMod {	2 entries		
MeasIdToAddMod[1] SEQUENCE {		entry 1	
measId	1		
measObjectId	2		
reportConfigId	1		
}			
MeasIdToAddMod[2] SEQUENCE {		entry 2	
measId	2		
measObjectId	2		
reportConfigId	2		
}			
}			
}			

Table 6.7.6.1.4.3-1B: ReportConfigInterRAT-EVENT (Table 6.7.6.1.4.3-1A)

Derivation Path: TS 38.508-1 [14] Table 4.6.3-141 with condition EVENT_B1			
Information Element	**Value/remark**	**Comment**	**Condition**
ReportConfigInterRAT ::= SEQUENCE {			
reportType CHOICE {			
eventTriggered SEQUENCE {			
eventId CHOICE {			
eventB1 SEQUENCE {			
b1-ThresholdEUTRA CHOICE {			
rsrq	34	Set threshold to -3dB to ensure measId 2 will never be triggered	
}			
}			
}			
}			
}			

Table 6.7.6.1.4.3-2: ReportConfigE-UTRA-DEFAULT(Periodical)

Derivation Path: 38.508-1 [14] Table 4.6.3-141 with Condition PERIODICAL			
Information Element	**Value/remark**	**Comment**	**Condition**
ReportConfigInterRAT::= SEQUENCE {			
reportType CHOICE {			
periodical SEQUENCE {			
reportQuantityCell SEQUENCE {			
rsrp	false		

}			
maxReportCells	2		
}			
}			
}			

6.7.6.1.5 Test requirement

Table 6.7.6.1.5-1 defines the primary level settings including test tolerances for all tests.

Each SS-RSRP measurement report for each of the tests in Tables 6.7.6.1.5-1 and 6.7.6.1.5-2 shall meet the corresponding absolute accuracy requirements in Table 6.7.6.1.5-3.

Table 6.7.6.1.5-1: NR Cell specific test parameters for SA Inter-RAT E-UTRAN RSRQ test parameters

Parameter		Unit	Cell 1
NR RF channel number			1
Duplex mode	Config 1, 4		FDD
	Config 2, 3, 5, 6		TDD
TDD Configuration	Config 1, 4		N/A
	Config 2, 5		TDDConf.1.1
	Config 3, 6		TDDConf.2.1
$BW_{channel}$	Config 1, 4	MHz	10: $N_{RB,c}$ = 52 (FDD)
	Config 2, 5		10: $N_{RB,c}$ = 52 (TDD)
	Config 3, 6		40: $N_{RB,c}$ = 106 (TDD)
Gap pattern Id			0
PDSCH reference measurement channel	Config 1, 4		SR.1.1 FDD
	Config 2, 5		SR.1.1 TDD
	Config 3, 6		SR.2.1 TDD
RMSI CORSET reference channel	Config 1, 4		CR.1.1 FDD
	Config 2, 5		CR.1.1 TDD
	Config 3, 6		CR.2.1 TDD
Dedicated CORSET reference channel	Config 1, 4		CCR.1.1 FDD
	Config 2, 5		CCR.1.1 TDD
	Config 3, 6		CCR.2.1 TDD
CSI-RS for tracking	Config 1, 4		TRS.1.1 FDD
	Config 2, 5		TRS.1.1 TDD
	Config 3, 6		TRS.1.2 TDD
BWP configurations	Initial DL BWP		DLBWP.0.1
	Dedicated DL BWP		DLBWP.1.1
	Initial UL BWP		ULBWP.0.1
	Dedicated UL BWP		ULBWP.1.1
OCNG pattern[Note1]			OP.1
SMTC configuration			SMTC.1
SSB configuration	Config 1, 2, 4, 5		SSB.1 FR1
	Config 3, 6		SSB.2 FR1
EPRE ratio of PSS to SSS		dB	0
EPRE ratio of PBCH_DMRS to SSS			
EPRE ratio of PBCH to PBCH_DMRS			
EPRE ratio of PDCCH_DMRS to SSS			
EPRE ratio of PDCCH to PDCCH_DMRS			
EPRE ratio of PDSCH_DMRS to SSS			
EPRE ratio of PDSCH to PDSCH_DMRS			
EPRE ratio of OCNG DMRS to SSS			
EPRE ratio of OCNG to OCNG DMRS			
N_{oc}[Note2]		dBm/15 kHz	-104
N_{oc}[Note2]	Config 1, 2, 4, 5	dBm/SCS	-104
	Config 3, 6		-101
$\hat{E}_s/N_{oc}$		dB	17
$\hat{E}_s/I_{ot}$[Note3]		dB	17
SS-RSRP[Note3]	Config 1, 2, 4, 5	dBm/SCS	-87
	Config 3, 6		-84
SSB_RP[Note3]	Config 1, 2, 4, 5	dBm/SCS	-87

	Config 3, 6		-84
Io[Note3]	Config 1, 2, 4, 5	dBm/9.36 MHz	-58.96
	Config 3, 6	dBm/38.16 MHz	-52.87
Propagation condition			AWGN
Antenna Configuration and Correlation Matrix			1x2

Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.

Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for N_{oc} to be fulfilled.

Note 3: $\hat{E}_s/I_{ot}$, SS-RSRP, SSB_RP and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.

Table 6.7.6.1.5-2: E-UTRAN Cell specific test parameters for SA Inter-RAT E-UTRAN RSRQ test parameters

Parameter		Unit	Cell 2		
			Test 1	Test 2	Test 3
E-UTRA RF channel number			1		
Duplex mode	Config 1, 2, 3		FDD		
	Config 4, 5, 6		TDD		
TDD special subframe configuration[Note1]	Config 1, 2, 3		N/A		
	Config 4, 5, 6		6		
TDD uplink-downlink configuration[Note1]	Config 1, 2, 3		N/A		
	Config 4, 5, 6		1		
$BW_{channel}$		MHz	5 MHz: $N_{RB,c}$ = 25 10 MHz: $N_{RB,c}$ = 50 20 MHz: $N_{RB,c}$ = 100		
PDSCH parameters: DL Reference Measurement Channel[Note2]			-		
PCFICH/PDCCH/PHICH parameters: DL Reference Measurement Channel[Note2]	Config 1, 2, 3		5 MHz: R.11 FDD 10 MHz: R.6 FDD 20 MHz: R.10 FDD		
	Config 4, 5, 6		5 MHz: R.11 TDD 10 MHz: R.6 TDD 20 MHz: R.10 TDD		
OCNG Patterns[Note2]	Config 1, 2, 3		5 MHz: OP.19 FDD 10 MHz: OP.6 FDD 20 MHz: OP.14 FDD		
	Config 4, 5, 6		5 MHz: OP.10 TDD 10 MHz: OP.2 TDD 20 MHz: OP.8 TDD		
PBCH_RA		dB	0		
PBCH_RB					
PSS_RA					
SSS_RA					
PCFICH_RB					
PHICH_RA					
PHICH_RB					
PDCCH_RA					
PDCCH_RB					
PDSCH_RA					
PDSCH_RB					
OCNG_RA[Note3]					
OCNG_RB[Note3]					
N_{oc}[Note4]	Depending on band group	dBm/15kHz	-83	-104.70	-119.5+ Δ_{BG_offset}
$\hat{E}_s/N_{oc}$		dB	-1.75	-3.2	-3.2
$\hat{E}_s/I_{ot}$[Note5]		dB	-1.75	-3.2	-3.2
RSRP[Note5]	Depending on band group	dBm/15kHz	-84.75	-107.90	-122.7+ Δ_{BG_offset}
RSRQ[Note5]	Depending on band group	dB	-14.76	-15.69	-15.69

Io^{Note5}	Depending on band group	dBm/Ch BW	-53 + 10log($N_{RB,c}$ /50)	-75.22 + 10log($N_{RB,c}$ /50)	-90.02+ Δ_{BG_offset} + 10log($N_{RB,c}$ /50)
Propagation Condition			AWGN		
Antenna Configuration and Correlation Matrix			1x2		

Note 1: Special subframe and uplink-downlink configurations are specified in table 4.2-1 in TS 36.211 [24].
Note 2: DL RMCs and OCNG patterns are specified in clauses A 3.1 and A 3.2 of TS 36.133 [23] respectively.
Note 3: OCNG shall be used such that all cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.
Note 4: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for N_{oc} to be fulfilled.
Note 5: $\hat{E}_s/I_{ot}$, RSRP, RSRQ and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.
Note 6: E-UTRA operating band groups are as defined in clause 3.5 of TS 36.133 [23].
Note 7: Void
Note 8: Void
Note 9: Void
Note 10: Void
Note 11: Δ_{BG_offset} for LTE band group is defined in TS 36.521-3 [26] clause 3.5.1, Table 3.5.1-1A.

Table 6.7.6.1.5-3: SS-RSRQ Intra frequency absolute accuracy requirements for the reported values

Normal Conditions	**Test 1 All bands**	**Test 2 All bands**	**Test 3 All bands**
Lowest reported value (Cell 2)	4	0	0
Highest reported value (Cell 2)	16	16	16
Extreme Conditions	**Test 1 All bands**	**Test 2 All bands**	**Test 3 All bands**
Lowest reported value (Cell 2)	1	0	0
Highest reported value (Cell 2)	19	17	17

For the test to pass, the ratio of successful reported values in each test shall be more than 90% with a confidence level of 95%.

6.7.7 E-UTRAN RS-SINR

6.7.7.0 Minimum conformance requirements

6.7.7.0.1 E-UTRAN RS-SINR absolute accuracy

The measurement period of E-UTRA RS-SINR in RRC_CONNECTED state is specified in clause 9.4.2 and 9.4.3 of TS 38.133 [6].

The accuracy requirements of E-UTRA RS-SINR measurements in RRC_CONNECTED state and the corresponding side conditions shall be the same as the inter-frequency RS-SINR Accuracy Requirements in clause 9.1.17.3 of TS 36.133 [23]:

The reporting range and mapping for E-UTRA RS-SINR measurements shall be the same as specified for RS-SINR measurements in clause 9.1.17.1 of TS 36.133 [23]:

The requirements for absolute accuracy of intra-frequency RS-SINR in this clause apply to a cell on the same frequency as that of the serving cell.

The accuracy requirements in Table 6.7.7.0.1-1 are valid under the following conditions:

Cell specific reference signals are transmitted either from one, two or four antenna ports.

Conditions defined in 36.101 [27] Clause 7.3 for reference sensitivity are fulfilled.

RSRP|dBm according to Annex B.3.18 of TS 36.133 [23] for a corresponding Band.

Table 6.7.7.0.1-1: Intra-frequency RS-SINR absolute accuracy

Accuracy		Conditions			
			Io Note 1 range		
Normal condition	Extreme condition	Ês/Iot	E-UTRA operating band groups Note 4	Minimum Io	Maximum Io
dB	dB	dB		dBm/15kHz Note 3	dBm/$BW_{Channel}$
±3.0	±4	≥-3 dB Note 5	FDD_A, TDD_A	-121	-50
			FDD_B1, FDD_B2	-120.5	-50
			FDD_C, TDD_C	-120	-50
			FDD_D	-119.5	-50
			FDD_E, TDD_E	-119	-50
			FDD_F	-118.5	-50
			FDD_G	-118	-50
			FDD_H	-117.5	-50
			FDD_N	-114.5	-50
±3.5	±4	≥-6 dB	Note 2	Note 2	Note 2

NOTE 1: Io is assumed to have constant EPRE across the bandwidth.
NOTE 2: The same bands and the same Io conditions for each band apply for this requirement as for the corresponding highest accuracy requirement.
NOTE 3: The condition level is increased by Δ>0, when applicable, as described in Sections B.4.2 and B.4.3 of TS 36.133 [23].
NOTE 4: E-UTRA operating band groups are as defined in Section 3.5 of TS 36.133 [23].
NOTE 5: The requirements apply for Ês/Iot ≤ 25 dB.

The reporting range of RS-SINR measurement is defined from -23 dB to 40 dB with 0.5 dB resolution.

The mapping of the measured quantity is defined in table 6.7.7.0.1-2. The range in the signalling may be larger than the guaranteed accuracy range.

Table 6.7.7.0.1-2: RS-SINR measurement report mapping

Reported Value	Measured Quantity Value	Unit
RS-SINR_000	RS-SINR < -23	dB
RS-SINR_001	-23 ≤ RS-SINR < -22.5	dB
…	…	…
RS-SINR_126	39.5 ≤ RS-SINR < 40	dB
RS-SINR_127	40 ≤ RS-SINR	dB

6.7.7.1 NR SA FR1 – E-UTRAN RS-SINR absolute measurement accuracy

6.7.7.1.1 Test purpose

The purpose of this test is to verify that the inter-RAT E-UTRAN RS-SINR absolute measurement accuracy is within the specified limits for all bands, when the serving cell is NR FR1 and the target cell is E-UTRA.

6.7.7.1.2 Test applicability

This test applies to all types of NR UE from Release 15 onwards supporting E-UTRA and *rs-SINR-MeasEUTRA*.

6.7.7.1.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 6.7.7.0.1.

The normative reference for this requirement is TS 38.133 [6] clause A.6.7.7.1.

6.7.7.1.1.4 Test description

6.7.7.1.1.4.1 Initial conditions

This test shall be tested using any of the test configurations in Table 6.7.7.1.4.1-1.

Table 6.7.7.1.4.1-1: test configurations

Test Case ID	Description
6.7.7.1-1	NR: 15 kHz SSB SCS, 10MHz bandwidth, FDD, E-UTRAN: FDD
6.7.7.1-2	NR: 15 kHz SSB SCS, 10MHz bandwidth, TDD, E-UTRAN: FDD
6.7.7.1-3	NR: 30 kHz SSB SCS, 40MHz bandwidth, TDD, E-UTRAN: FDD
6.7.7.1-4	NR: 15 kHz SSB SCS, 10MHz bandwidth, FDD, E-UTRAN: TDD
6.7.7.1-5	NR: 15 kHz SSB SCS, 10MHz bandwidth, TDD, E-UTRAN: TDD
6.7.7.1-6	NR: 30 kHz SSB SCS, 40MHz bandwidth, TDD, E-UTRAN: TDD
Note: The UE is only required to be tested in one of the supported test configurations	

Configure the test equipment and the DUT according to the parameters in Table 6.7.7.1.4.1-2.

Table 6.7.7.1.4.1-2: initial conditions

Parameter	Value		Comment
Test environment	NC, TL/VL, TL/VH, TH/VL, TH/VH		As specified in TS 38.508-1 [14] clause 4.1.
Test frequencies	As specified in Annex E, Table E.4-2 and TS 38.508-1 [14] clause 4.3.1.		
Channel bandwidth	As specified by the test configuration selected from Table 6.7.7.1.4.1-1.		
Propagation conditions	AWGN		As specified in Annex C.2.2.
Connection Diagram	TE Part 2Rx	A.3.1.7.2	As specified in TS 38.508-1 [14] Annex A.
	TE Part 4Rx	A.3.1.7.3	
	DUT Part 2Rx	A.3.2.3.4	
	DUT Part 4Rx	A.3.2.5.2	
Exceptions to connection diagram	N/A		

1. Message contents are defined in clause 6.7.7.1.4.3.

2. There are two carriers and two cells specified in the test, where NR Cell 1 is the NR PCell on the NR carrier and Cell 2 is the E-UTRA neighbour cell on the E-UTRA carrier and the target for the measurements.

6.7.7.1.4.2 Test procedure

1. Ensure the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity *NR*, Connected without release *On* and Test Mode *On* according to TS 38.508-1 [14] clause 4.5.

2. Set the parameters according to Table 6.7.7.1.5-1 and Table 6.7.7.1.5-2 as appropriate.

3. The SS shall transmit an RRCReconfiguration message on Cell 1.

4. The UE shall transmit an RRCReconfigurationComplete message.

5. The UE shall transmit periodically MeasurementReport messages.

6. After 10s wait from Step 3, the SS shall check the RS-SINR reported values in the periodic MeasurementReport. The RS-SINR value of Cell 2 reported by the UE is compared to the expected RS-SINR. If the value is outside the limits in Table 6.7.7.1.5-2 or the UE fails to report the measurement value for Cell 2, the number of failed iterations is increased by one. Otherwise, the number of passed iterations is increased by one.

7. The SS shall continue checking the MeasurementReport messages transmitted by the UE until the confidence level according to Table G.2.3-1 in Annex G is achieved.

8. Set the parameters according to each sub-test in Table 6.7.7.1.5-2 as appropriate and repeat steps 5-7.

6.7.7.1.4.3 Message contents

Message contents are according to TS 38.508-1 [14] clause 7.3 with the following exceptions:

Table 6.7.7.1.4.3-1: Common Exception messages

Default Message Contents	
Common contents of system information blocks exceptions	
Default RRC messages and information elements contents exceptions	Table H.3.1-1 Table H.3.1-2 with condition INTER-RAT and GAP NEEDED Table H.3.1-3 Table H.3.1-3a Table H.3.1-7 with condition INTER-RAT Table 7.3.1-3 in TS 38.508-1 [14] with condition SMTC.1

Table 6.7.7.1.4.3-1A: MeasConfig (Test procedure step 3)

Derivation path: Table H.3.1-2 with condition INTER-RAT and GAP NEEDED			
Information Element	**Value/Remark**	**Comment**	**Condition**
measConfig ::= SEQUENCE {			
reportConfigToAddModList SEQUENCE(SIZE (1..maxReportConfigId)) OF ReportConfigToAddMod {	2 entries		
ReportConfigToAddMod[1] SEQUENCE {		entry 1	
reportConfigId	1		
reportConfig CHOICE {			
reportConfigInterRAT	ReportConfigE-UTRA-DEFAULT(Periodical)	Table 6.7.7.1.4.3-2	
}			
}			
ReportConfigToAddMod[2] SEQUENCE {		entry 2	
reportConfigId	2		
reportConfig CHOICE {			
reportConfigInterRAT	ReportConfigInterRAT-EVENT	Table 6.7.7.1.4.3-1B	
}			
}			
}			
measIdToAddModList SEQUENCE (SIZE (1..maxNrofMeasId)) OF MeasIdToAddMod {	2 entries		
MeasIdToAddMod[1] SEQUENCE {		entry 1	
measId	1		
measObjectId	2		
reportConfigId	1		
}			
MeasIdToAddMod[2] SEQUENCE {		entry 2	
measId	2		
measObjectId	2		
reportConfigId	2		
}			
}			
}			

Table 6.7.7.1.4.3-1B: ReportConfigInterRAT-EVENT (Table 6.7.7.1.4.3-1A)

Derivation Path: TS 38.508-1 [14] Table 4.6.3-141 with condition EVENT_B1			
Information Element	**Value/remark**	**Comment**	**Condition**
ReportConfigInterRAT ::= SEQUENCE {			
reportType CHOICE {			
eventTriggered SEQUENCE {			
eventId CHOICE {			
eventB1 SEQUENCE {			
b1-ThresholdEUTRA CHOICE {			

sinr	127	Set threshold to 40dB to ensure measId 2 will never be triggered	
}			
}			
}			
}			
}			
}			

Table 6.7.7.1.4.3-2: ReportConfigE-UTRA-DEFAULT(Periodical)

Derivation Path: 38.508-1 [14] Table 4.6.3-141 with Condition PERIODICAL			
Information Element	**Value/remark**	**Comment**	**Condition**
ReportConfigInterRAT::= SEQUENCE {			
reportType CHOICE {			
periodical SEQUENCE {			
reportQuantityCell SEQUENCE {			
rsrp	false		
rsrq	false		
sinr	true		
}			
maxReportCells	2		
}			
}			
}			

6.7.7.1.5 Test requirement

Table 6.7.7.1.5-1 defines the primary level settings including test tolerances for all tests.

Each SS-RSRP measurement report for each of the tests in Tables 6.7.7.1.5-1 and 6.7.7.1.5-2 shall meet the corresponding absolute accuracy requirements in Table 6.7.7.1.5-3.

Table 6.7.7.1.5-1: NR Cell specific test parameters for SA Inter-RAT E-UTRAN RS-SINR test parameters

Parameter		**Unit**	**Cell 1**
NR RF channel number			1
Duplex mode	Config 1, 4		FDD
	Config 2, 3, 5, 6		TDD
TDD Configuration	Config 1, 4		N/A
	Config 2, 5		TDDConf.1.1
	Config 3, 6		TDDConf.2.1
$BW_{channel}$	Config 1, 4	MHz	10: $N_{RB,c}$ = 52 (FDD)
	Config 2, 5		10: $N_{RB,c}$ = 52 (TDD)
	Config 3, 6		40: $N_{RB,c}$ = 106 (TDD)
Gap pattern Id			0
PDSCH reference measurement channel	Config 1, 4		SR.1.1 FDD
	Config 2, 5		SR.1.1 TDD
	Config 3, 6		SR.2.1 TDD
RMSI CORSET reference channel	Config 1, 4		CR.1.1 FDD
	Config 2, 5		CR.1.1 TDD
	Config 3, 6		CR.2.1 TDD
Dedicated CORSET reference channel	Config 1, 4		CCR.1.1 FDD
	Config 2, 5		CCR.1.1 TDD
	Config 3, 6		CCR.2.1 TDD
CSI-RS for tracking	Config 1, 4		TRS.1.1 FDD
	Config 2, 5		TRS.1.1 TDD
	Config 3, 6		TRS.1.2 TDD
BWP configurations	Initial DL BWP		DLBWP.0.1
	Dedicated DL BWP		DLBWP.1.1
	Initial UL BWP		ULBWP.0.1

	Dedicated UL BWP		ULBWP.1.1
OCNG pattern[Note1]			OP.1
SMTC configuration			SMTC.1
SSB configuration	Config 1, 2, 4, 5		SSB.1 FR1
	Config 3, 6		SSB.2 FR1
EPRE ratio of PSS to SSS		dB	0
EPRE ratio of PBCH_DMRS to SSS			
EPRE ratio of PBCH to PBCH_DMRS			
EPRE ratio of PDCCH_DMRS to SSS			
EPRE ratio of PDCCH to PDCCH_DMRS			
EPRE ratio of PDSCH_DMRS to SSS			
EPRE ratio of PDSCH to PDSCH_DMRS			
EPRE ratio of OCNG DMRS to SSS			
EPRE ratio of OCNG to OCNG DMRS			
N_{oc}[Note2]		dBm/15 kHz	-104
N_{oc}[Note2]	Config 1, 2, 4, 5	dBm/SCS	-104
	Config 3, 6		-101
$\hat{E}_s/N_{oc}$		dB	17
$\hat{E}_s/I_{ot}$[Note3]		dB	17
SS-RSRP[Note3]	Config 1, 2, 4, 5	dBm/SCS	-87
	Config 3, 6		-84
SSB_RP[Note3]	Config 1, 2, 4, 5	dBm/SCS	-87
	Config 3, 6		-84
Io[Note3]	Config 1, 2, 4, 5	dBm/9.36 MHz	-58.96
	Config 3, 6	dBm/38.16 MHz	-52.87
Propagation condition			AWGN
Antenna Configuration and Correlation Matrix			1x2

Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.

Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for N_{oc} to be fulfilled.

Note 3: $\hat{E}_s/I_{ot}$, SS-RSRP, SSB_RP and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.

Table 6.7.7.1.5-2: E-UTRAN Cell specific test parameters for SA Inter-RAT E-UTRAN RS-SINR test parameters

Parameter		Unit	Cell 2		
			Test 1	Test 2	Test 3
E-UTRA RF channel number			1		
Duplex mode	Config 1, 2, 3		FDD		
	Config 4, 5, 6		TDD		
TDD special subframe configuration[Note1]	Config 1, 2, 3		N/A		
	Config 4, 5, 6		6		
TDD uplink-downlink configuration[Note1]	Config 1, 2, 3		N/A		
	Config 4, 5, 6		1		
$BW_{channel}$		MHz	5 MHz: NRB,c = 25 10 MHz: NRB,c = 50 20 MHz: $N_{RB,c}$ = 100		
PDSCH parameters: DL Reference Measurement Channel[Note2]			-		
PCFICH/PDCCH/PHICH parameters: DL Reference Measurement Channel[Note2]	Config 1, 2, 3		5 MHz: R.11 FDD 10 MHz: R.6 FDD 20 MHz: R.10 FDD		
	Config 4, 5, 6		5 MHz: R.11 TDD 10 MHz: R.6 TDD 20 MHz: R.10 TDD		
OCNG Patterns[Note2]	Config 1, 2, 3		5 MHz: OP.19 FDD 10 MHz: OP.6 FDD 20 MHz: OP.14 FDD		
	Config 4, 5, 6		5 MHz: OP.10 TDD 10 MHz: OP.2 TDD 20 MHz: OP.8 TDD		
PBCH_RA		dB	0		

PBCH_RB					
PSS_RA					
SSS_RA					
PCFICH_RB					
PHICH_RA					
PHICH_RB					
PDCCH_RA					
PDCCH_RB					
PDSCH_RA					
PDSCH_RB					
OCNG_RA[Note3]					
OCNG_RB[Note3]					
N_{oc1}[Note4]	Depending on band group	dBm/15kHz	-88	-108.50	-119.5+ Δ_{BG_offset}
CRS $\hat{E}_s/N_{oc1}$		dB	-1.75	20.0	-3.2
CRS $\hat{E}_s/I_{ot}$[Note5]		dB	-1.75	20.0	-3.2
RSRP[Note5]	Depending on band group	dBm/15kHz	-89.75	-88.50	-122.7+ Δ_{BG_offset}
RS-SINR[Note5]		dB	-1.75	20	-3.2
Io[Note5]	Depending on band group	dBm/Ch BW	-58.00 + 10log($N_{RB,c}$ /50)	-60.68 + 10log($N_{RB,c}$ /50)	-90.02+ Δ_{BG_offset} + 10log($N_{RB,c}$ /50)
Propagation Condition			AWGN		
Antenna Configuration and Correlation Matrix			1x2		

Note 1: Special subframe and uplink-downlink configurations are specified in table 4.2-1 in TS 36.211 [24].
Note 2: DL RMCs and OCNG patterns are specified in clauses A 3.1 and A 3.2 of TS 36.133 [23] respectively.
Note 3: OCNG shall be used such that all cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.
Note 4: Interference from other cells and noise sources not specified in the test is assumed to be constant over CRS subcarriers and time and shall be modelled as AWGN of appropriate power for N_{oc1} to be fulfilled.
Note 4a: Void
Note 5: CRS $\hat{E}_s/I_{ot}$, RSRP, RS-SINR and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.
Note 6: E-UTRA operating band groups are as defined in clause 3.5 of TS 36.133 [23].
Note 7: Void
Note 8: Void
Note 9: Void
Note 10: Void
Note 11: Δ_{BG_offset} for LTE band group is defined in TS 36.521-3 [26] clause 3.5.1, Table 3.5.1-1A.

Table 6.7.7.1.5-3: RS-SINR Intra frequency absolute accuracy requirements for the reported values

Normal Conditions	**Test 1 All bands**	**Test 2 All bands**	**Test 3 All bands**
Lowest reported value (Cell 2)	35	79	32
Highest reported value (Cell 2)	51	94	49
Extreme Conditions	**Test 1 All bands**	**Test 2 All bands**	**Test 3 All bands**
Lowest reported value (Cell 2)	33	77	31
Highest reported value (Cell 2)	53	96	50

For the test to pass, the ratio of successful reported values in each test shall be more than 90% with a confidence level of 95%.

6.7.8 CLI Measurements

6.7.8.1 NR SA FR1 SRS-RSRP measurement accuracy

Editor's Note: This test case is incomplete in following aspects:

- Message contents are missing.
- TT analysis is missing.
- Test Procedure is FFS.
- Test applicability needs to be updated

6.7.8.1.1 Test purpose

The purpose of this test is to verify that the SRS-RSRP measurement accuracy is within the specified limits with SRS-RSRP measurement requirements in TS 38.133 [6] clause 10.1.22.1.1.

6.7.8.1.2 Test applicability

FFS

6.7.8.1.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 4.7.6.0.1.

The normative reference for this requirement is TS 38.133 [6] clause A.6.7.8.1.

6.7.8.1.4 Test description

6.7.8.1.4.1 Initial conditions

This test shall be tested using any of the test configurations in Table 6.7.8.1.4.1-1. Test environment parameters are given in Table 4.7.6.2.4.1-2.

Table 6.7.8.1.4.1-1: Applicable NR configurations for FR1 SRS-RSRP accuracy test

Config	Description
1	15kHz SRS SCS, 10 MHz bandwidth, TDD duplex mode
2	30kHz SRS SCS, 40 MHz bandwidth, TDD duplex mode
Note: The UE is only required to be tested in one of the supported test configurations in each supported band	

Table 6.7.8.1.4.1-2: SRS Configuration parameters for EN-DC SRS-RSRP accuracy

Parameter	Value		Comment
Test environment	NC		As specified in TS 38.508-1 [14] clause 4.1.
Test frequencies	As specified in Annex E, Table E.2-1 and TS 38.508-1 [14] clause 4.3.1 and 4.4.2.		
Channel bandwidth	As specified by the test configuration selected from Table 4.7.6.2.4.1-1.		
Propagation conditions	AWGN		As specified in Annex C.2.2.
Connection Diagram	TE Part	A.3.1.7.1	As specified in TS 38.508-1 [14] Annex A.
	DUT Part	A.3.2.3.4	
Exceptions to connection diagram	For 4Rx capable UEs without any 2 Rx RF bands use A.3.2.5.2 for DUT part and A.3.1.8.4 for TE Part		

1. Message contents are defined in clause 6.7.8.1.4.3.
2. Cell 1 is the E-UTRA serving cell (PCell) for the EN-DC setup. The power levels and settings for Cell 1 are set according to Annex A.6. Cell 2 is NR FR1 cell (PSCell). Cell 2 is the target for SRS-RSRP measurements. Before the test UE is configured to perform SRS-RSRP measurement. During the test, the test system transmits

SRS resources for measurement in the DL slots according to the SRS configuration in Table 6.7.8.1.5-3. There is no measurement gap configured in the test. During the test, the test system does not transmit PDCCH/PDSCH/OCNG on SRS symbol to be transmitted and on 1 data symbol before SRS to be transmitted.

6.7.8.1.4.2 Test procedure

FFS

6.7.8.1.4.3 Message contents

Message contents are according to TS 38.508-1 [14] clause 7.3 with the following exceptions:

FFS

6.7.8.1.5 Test requirement

Table 6.7.8.1.5-1 defines the primary level settings including test tolerances for all tests.

Table 6.7.8.1.5-1: FR1 test parameters for SRS-RSRP accuracy for PCell

Parameter	Config	Unit	Test 1	Test 2	Test 3
SSB GSCN	1~2		freq1	freq1	freq1
Duplex mode	1~2		TDD	TDD	TDD
TDD configuration	1		TDDConf.1.1	TDDConf.1.1	TDDConf.1.1
	2		TDDConf.2.1	TDDConf.2.1	TDDConf.2.1
$BW_{channel}$	1	MHz	10: $N_{RB,c}$ = 52	10: $N_{RB,c}$ = 52	10: $N_{RB,c}$ = 52
	2		40: $N_{RB,c}$ = 106	40: $N_{RB,c}$ = 106	40: $N_{RB,c}$ = 106
PDSCH Reference measurement channel	1		SR.1.1 TDD	SR.1.1 TDD	SR.1.1 TDD
	2		SR.2.1 TDD	SR.2.1 TDD	SR.2.1 TDD
RMSI CORESET Reference Channel	1		CR.1.1 TDD	CR.1.1 TDD	CR.1.1 TDD
	2		CR.2.1 TDD	CR.2.1 TDD	CR.2.1 TDD
Dedicated CORESET Reference Channel	1		CCR.1.1 TDD	CCR.1.1 TDD	CCR.1.1 TDD
	2		CCR.2.1 TDD	CCR.2.1 TDD	CCR.2.1 TDD
SSB configuration	1		SSB.1 FR1	SSB.1 FR1	SSB.1 FR1
	2		SSB.2 FR1	SSB.2 FR1	SSB.2 FR1
OCNG Patterns	1~2		OP.1	OP.1	OP.1
TRS configuration	1		TRS.1.1 TDD	TRS.1.1 TDD	TRS.1.1 TDD
	2		TRS.1.2 TDD	TRS.1.2 TDD	TRS.1.2 TDD
Initial BWP Configuration	1~2		DLBWP.0.1 ULBWP.0.1	DLBWP.0.1 ULBWP.0.1	DLBWP.0.1 ULBWP.0.1
Dedicated BWP configuration	1~2		DLBWP.1.1 ULBWP.1.1	DLBWP.1.1 ULBWP.1.1	DLBWP.1.1 ULBWP.1.1
SMTC configuration	1~2		SMTC.1	SMTC.1	SMTC.1
Time offset between DL from serving cell and SRS from test system	1~2	µs	17.67	17.67	17.67
EPRE ratio of PSS to SSS	1~2	dB	0	0	0
EPRE ratio of PBCH DMRS to SSS					
EPRE ratio of PBCH to PBCH DMRS					
EPRE ratio of PDCCH DMRS to SSS					
EPRE ratio of PDCCH to PDCCH DMRS					
EPRE ratio of PDSCH DMRS to SSS					
EPRE ratio of PDSCH to PDSCH DMRS					
EPRE ratio of OCNG DMRS to SSS Note 1					
EPRE ratio of OCNG to OCNG DMRS Note 1					

N_{oc} Note2	NR_TDD_FR1_A NOTE 3	1	dBm/15kHz	-106	-88	-114
	NR_TDD_FR1_C					-113
	NR_TDD_FR1_D					-112.5
	NR_TDD_FR1_E					-112
	NR_TDD_FR1_A NOTE 5	2		Not applicable Note 4	-91	-114
	NR_TDD_FR1_C					-113
	NR_TDD_FR1_D					-112.5
	NR_TDD_FR1_E					-112
N_{oc} Note2	NR_TDD_FR1_A NOTE 3	1	dBm/SRS SCS	-106	-88	-114
	NR_TDD_FR1_C					-113
	NR_TDD_FR1_D					-112.5
	NR_TDD_FR1_E					-112
	NR_TDD_FR1_A NOTE 3	2		Not applicable Note 4	-88	-111
	NR_TDD_FR1_C					-110
	NR_TDD_FR1_D					-109.5
	NR_TDD_FR1_E					-109
Note 1: OCNG shall be used such that a constant total transmitted power spectral density is achieved for all OFDM symbols.						
Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for N_{oc} to be fulfilled.						
Note 3: The test configuration excludes support for band n51 and it is not required to run this test on band n51 in this release of the specification						
Note 4: Test 1 is not used when testing with 30kHz SSB SCS						

Table 6.7.8.1.5-2: FR1 test parameters for SRS-RSRP accuracy for neighbour cell UE

Parameter		Config	Unit	Test 1	Test 2	Test 3
N_{oc} Note2	NR_TDD_FR1_A NOTE 5	1	dBm/15kHz	-106	-88	-114
	NR_TDD_FR1_C					-113
	NR_TDD_FR1_D					-112.5
	NR_TDD_FR1_E					-112
	NR_TDD_FR1_A NOTE 5	2		Not applicable Note 6	-91	-114
	NR_TDD_FR1_C					-113
	NR_TDD_FR1_D					-112.5
	NR_TDD_FR1_E					-112
N_{oc} Note2	NR_TDD_FR1_A NOTE 5	1	dBm/SRS SCS	-106	-88	-114
	NR_TDD_FR1_C					-113
	NR_TDD_FR1_D					-112.5
	NR_TDD_FR1_E					-112
	NR_TDD_FR1_A NOTE 5	2		Not applicable Note 6	-88	-111
	NR_TDD_FR1_C					-110
	NR_TDD_FR1_D					-109.5
	NR_TDD_FR1_E					-109
$\hat{E}_s/I_{ot}$ on SRS		1~2	dB	1	1	1
SRS RSRP Note3	NR_TDD_FR1_A NOTE 5	1	dBm/SRS SCS	-105+TT	-87+TT	-113+TT
	NR_TDD_FR1_C					-112+TT
	NR_TDD_FR1_D					-111.5+TT
	NR_TDD_FR1_E					-111+TT
	NR_TDD_FR1_A NOTE 5	2		Not applicable Note 6	-87	-110

	NR_TDD_FR1_C					-109
	NR_TDD_FR1_D					-108.5
	NR_TDD_FR1_E					-108
Io Note3	NR_TDD_FR1_A NOTE 5	1	dBm/9.36 MHz	-74.51	-56.51	-82.51
	NR_TDD_FR1_C					-81.51
	NR_TDD_FR1_D					-81.01
	NR_TDD_FR1_E					-79.51
	NR_TDD_FR1_A NOTE 5	2	dBm/38.16 MHz	Not applicable Note 6	-53.42	-76.42
	NR_TDD_FR1_C					-75.42
	NR_TDD_FR1_D					-74.92
	NR_TDD_FR1_E					-74.42
$\hat{E}_s / N_{oc}$ on SRS		1~2	dB	1+TT	1+TT	1+TT
Propagation condition		1~2		AWGN	AWGN	AWGN
Antenna configuration		1~2		1x2	1x2	1x2
SRS configuration		1		SRSConf.1	SRSConf.1	SRSConf.1
		2		SRSConf.2	SRSConf.2	SRSConf.2

Note 1: The resources for uplink transmission are assigned to the UE prior to the start of the test.
Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for N_{oc} to be fulfilled.
Note 3: RSRP and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.
Note 4: RSRP minimum requirements are specified assuming independent interference and noise at each receiver antenna port.
Note 5: The test configuration excludes support for band n51 and it is not required to run this test on band n51 in this release of the specification
Note 6: Test 1 is not used when testing with 30kHz SSB SCS

Table 6.7.8.1.5-3: SRS configuration parameters for FR1 SRS-RSRP accuracy

	Field	SRSConf.1	SRSConf.2
SRS-ResourceSet	srs-ResourceSetId	0	0
	srs-ResourceIdList	0	0
	resourceType	Periodic	Periodic
	Usage	Codebook	Codebook
SRS-Resource	SRS-ResourceId	0	0
	nrofSRS-Ports	Port1	Port1
	transmissionComb	n2	n2
	combOffset-n2	0	0
	cyclicShift-n2	0	0
	resourceMapping startPosition	0	0
	resourceMapping nrofSymbols	n1	n1
	resourceMapping repetitionFactor	n1	n1
	freqDomainPosition	0	0
	freqDomainShift	0	0
	freqHopping c-SRS	12	12
	freqHopping b-SRS	0	0
	freqHopping b-hop	0	0
	groupOrSequenceHopping	Neither	Neither
	resourceType	Periodic	Periodic
	periodicityAndOffset-p	sl20, 9	sl40, 19
	sequenceId	0	0

For the test to pass, the ratio of successful reported values in each test shall be more than 90% with a confidence level of 95%.

6.7.9 L1-SINR measurement for beam reporting

6.7.9.0 Minimum conformance requirements

6.7.9.0.1 Minimum conformance requirements for CSI-RS based CMR and no dedicated IMR configured and CSI-RS resource set with repetition off

The UE shall be capable of performing L1-SINR measurements with the CSI-RS configured as CMR and no dedicated resource configured as IMR for L1-SINR computation, and the UE physical layer shall be capable of reporting L1-SINR measured over the measurement period of $T_{L1\text{-}SINR_Measurement_Period_CSI\text{-}RS_CMR_Only}$.

The value of $T_{L1\text{-}SINR_Measurement_Period_CSI\text{-}RS_CMR_Only}$ is defined in Table 6.7.9.0.1-1 for FR1 and in Table 6.7.9.0.1-2 for FR2, where

For the value of M,

- For periodic and semi-persistent CSI-RS resources as CMR, M=1 if higher layer parameter *timeRestrictionForChannelMeasurement* is configured, and M=3 otherwise;
- For aperiodic CSI-RS resources as CMR, M=1.

For the value of N in FR2

- For periodic CSI-RS resources as CMR in a resource set configured with higher layer parameter *repetition* set to OFF, N=1. The requirements apply if *qcl-InfoPeriodicCSI-RS* is configured for all the resources in the resource set and for each resource one RS has QCL-TypeD with
  - SSB for L1-RSRP or L1-SINR measurement, or
  - another CSI-RS in resource set configured with repetition ON.
- For periodic CSI-RS resources as CMR in a resource set configured with higher layer parameter *repetition* set to ON, N=ceil(*maxNumberRxBeam* / $N_{res_per_set}$), where $N_{res_per_set}$ is number of resources in the resource set. The requirements apply provided *qcl-InfoPeriodicCSI-RS* is configured for all resources in the resource set.
- For semi-persistent CSI-RS resources as CMR in a resource set configured with higher layer parameter *repetition* set to OFF, N=1. The requirements apply provided TCI state is provided for all resources in the resource set in the MAC CE activating the resource set and for each resource has QCL-TypeD with
  - SSB for L1-RSRP or L1-SINR measurement, or
  - another CSI-RS in resource set configured with repetition ON.
- For semi-persistent CSI-RS resources as CMR in a resource set configured with higher layer parameter *repetition* set to ON, N=ceil(*maxNumberRxBeam* / $N_{res_per_set}$), where $N_{res_per_set}$ is number of resources in the resource set. The requirements apply provided TCI state is provided for all resources in the resource set in the MAC CE activating the resource set.
- For aperiodic CSI-RS resources as CMR in a resource set configured with higher layer parameter *repetition* set to OFF, N=1. The requirements apply provided *qcl-info* is configured for all resources in the resource set and for each resource has QCL-TypeD with
  - SSB for L1-RSRP or L1-SINR measurement, or
  - another CSI-RS in resource set configured with repetition ON.

- For aperiodic CSI-RS resources as CMR in a resource set configured with higher layer parameter *repetition* set to ON, N=1. UE is not required to meet the accuracy requirements in clause 10.1.28.1 and 10.1.28.3 of TS 38.133 [6] if number of resources in the resource set is smaller than *maxNumberRxBeam*. The requirements apply provided *qcl-info* is configured for all resources in the resource set.

For the value of P in FR1,

- $P=\frac{1}{1-\frac{T_{CSI-RS}}{MRGP}}$, when in the monitored cell there are measurement gaps configured for intra-frequency, inter-frequency or inter-RAT measurements, which are overlapping with some but not all occasions of the CSI-RS; and

- P=1 when in the monitored cell there are no measurement gaps overlapping with any occasion of the CSI-RS.

For the value of P in FR2,

- P=1, when CSI-RS is not overlapped with measurement gap and also not overlapped with SMTC occasion.

- $P=\frac{1}{1-\frac{T_{CSI-RS}}{MRGP}}$, when CSI-RS is partially overlapped with measurement gap and CSI-RS is not overlapped with SMTC occasion (T_{CSI-RS} < MGRP)

- $P=\frac{1}{1-\frac{T_{CSI-RS}}{T_{SMTCperiod}}}$, when CSI-RS is not overlapped with measurement gap and CSI-RS is partially overlapped with SMTC occasion ($T_{CSI-RS} < T_{SMTCperiod}$).

- P=3, when CSI-RS is not overlapped with measurement gap and CSI-RS is fully overlapped with SMTC occasion ($T_{CSI-RS} = T_{SMTCperiod}$).

- $P=\frac{1}{1-\frac{T_{CSI-RS}}{MRGP}-\frac{T_{CSI-RS}}{T_{SMTCperiod}}}$, when CSI-RS is partially overlapped with measurement gap and CSI-RS is partially overlapped with SMTC occasion ($T_{CSI-RS} < T_{SMTCperiod}$) and SMTC occasion is not overlapped with measurement gap and

  - $T_{SMTCperiod} \neq$ MGRP or

  - $T_{SMTCperiod}$ = MGRP and $T_{CSI-RS} < 0.5*T_{SMTCperiod}$

- $P=\frac{3}{1-\frac{T_{CSI-RS}}{MRGP}}$, when CSI-RS is partially overlapped with measurement gap and CSI-RS is partially overlapped with SMTC occasion ($T_{CSI-RS} < T_{SMTCperiod}$) and SMTC occasion is not overlapped with measurement gap and $T_{SMTCperiod}$ = MGRP and $T_{CSI-RS} = 0.5*T_{SMTCperiod}$

- $P=\frac{1}{1-\frac{T_{CSI-RS}}{\min(T_{SMTCperiod},MGRP)}}$, when CSI-RS is partially overlapped with measurement gap (T_{CSI-RS} < MGRP) and CSI-RS is partially overlapped with SMTC occasion ($T_{CSI-RS} < T_{SMTCperiod}$) and SMTC occasion is partially or fully overlapped with measurement gap.

- $P=\frac{3}{1-\frac{T_{CSI-RS}}{MRGP}}$, when CSI-RS is partially overlapped with measurement gap and CSI-RS is fully overlapped with SMTC occasion ($T_{CSI-RS} = T_{SMTCperiod}$) and SMTC occasion is partially overlapped with measurement gap ($T_{SMTCperiod}$ < MGRP)

Where:

$T_{SMTCperiod}$ = the configured SMTC1 period or SMTC2 period if configured.

T_{CSI-RS} = the periodicity of CSI-RS configured for L1-SINR measurement

If the high layer in TS 38.331 [2] signalling of *smtc2* is configured, $T_{SMTCperiod}$ corresponds to the value of higher layer parameter *smtc2*; Otherwise $T_{SMTCperiod}$ corresponds to the value of higher layer parameter *smtc1*.

Note: The overlap between CSI-RS for L1-SINR measurement and SMTC means that CSI-RS for L1-SINR measurement is within the SMTC window duration.

Longer evaluation period would be expected if the combination of CSI-RS, SMTC occasion and measurement gap configurations does not meet pervious conditions.

Table 6.7.9.0.1-1: Measurement period $T_{L1\text{-}SINR_Measurement_Period_CSI\text{-}RS_CMR_Only}$ for FR1

Configuration	$T_{L1\text{-}SINR_Measurement_Period_CSI\text{-}RS_CMR_Only}$ (ms)
non-DRX	$\max(T_{Report}, \text{ceil}(M*P)*T_{CSI\text{-}RS})$
DRX cycle ≤ 320ms	$\max(T_{Report}, \text{ceil}(1.5*M*P)*\max(T_{DRX},T_{CSI\text{-}RS}))$
DRX cycle > 320ms	$\text{ceil}(M*P)*T_{DRX}$
Note 1: $T_{CSI\text{-}RS}$ is the periodicity of CSI-RS configured for L1-SINR measurement. T_{DRX} is the DRX cycle length. T_{Report} is configured periodicity for reporting.	
Note 2: the requirements are applicable provided that the CSI-RS resource configured for L1-SINR measurement is transmitted with Density = 3.	

Table 6.7.9.0.1-2: Measurement period $T_{L1\text{-}SINR_Measurement_Period_CSI\text{-}RS_CMR_Only}$ for FR2

Configuration	$T_{L1\text{-}SINR_Measurement_Period_CSI\text{-}RS_CMR_Only}$ (ms)
non-DRX	$\max(T_{Report}, \text{ceil}(M*P*N)*T_{CSI\text{-}RS})$
DRX cycle ≤ 320ms	$\max(T_{Report}, \text{ceil}(1.5*M*P*N)*\max(T_{DRX},T_{CSI\text{-}RS}))$
DRX cycle > 320ms	$\text{ceil}(M*P*N)*T_{DRX}$
Note 1: $T_{CSI\text{-}RS}$ is the periodicity of CSI-RS configured for L1-SINR measurement. T_{DRX} is the DRX cycle length. T_{Report} is configured periodicity for reporting.	
Note 2: the requirements are applicable provided that the CSI-RS resource configured for L1-SINR measurement is transmitted with Density = 3.	

The accuracy requirements in Table 6.7.9.0.1-3 are valid under the following conditions:

- Conditions defined in clause 7.3 of TS 38.101-1 [18] for reference sensitivity are fulfilled.
- Conditions for L1-SINR measurements are fulfilled according to Annex B.2.8.1 for a corresponding Band for each relevant CSI-RS based CMR.
- The bandwidth of CSI-RS as CMR is 48 PRBs and the density is 3.
- AWGN radio propagation conditions.

The performance with larger bandwidth of CSI-RS as CMR is equal to or better than the accuracy requirements in Table 6.7.9.0.1-3.

Table 6.7.9.0.1-3: L1-SINR absolute accuracy for CSI-RS based CMR only in FR1

Accuracy		Conditions						
Normal condition	Extreme condition	CSI-RS CMR Ês/Iot	Io [Note 1] range					
			NR operating band groups [Note 2]	Minimum Io				Maximum Io
dB	dB	dB		dBm / $SCS_{CSI\text{-}RS}$			dBm/BW Channel	$dBm/BW_{Channel}$
				$SCS_{CSI\text{-}RS}$ = 15 kHz	$SCS_{CSI\text{-}RS}$ = 30 kHz	$SCS_{CSI\text{-}RS}$ = 60 kHz		
±5.5	±6.5	≥-3	NR_FDD_FR1_A, NR_TDD_FR1_A, NR_SDL_FR1_A	-121	-118	-115	N/A	-50
			NR_FDD_FR1_B	-120.5	-117.5	-114.5	N/A	-50
			NR_TDD_FR1_C	-120	-117	-114	N/A	-50
			NR_FDD_FR1_D, NR_TDD_FR1_D	-119.5	-116.5	-113.5	N/A	-50
			NR_FDD_FR1_E, NR_TDD_FR1_E	-119	-116	-113	N/A	-50
			NR_FDD_FR1_F	-118.5	-115.5	-112.5	N/A	-50
			NR_FDD_FR1_G	-118	-115	-112	N/A	-50

			NR_FDD_FR1_H	-117.5	-114.5	-111.5	N/A	-50
NOTE 1: Io is assumed to have constant EPRE across the bandwidth. NOTE 2: NR operating band groups in FR1 are as defined in clause 3.5.2.								

The normative reference for this requirement is TS 38.133 [6] clauses 9.8.4.1 and 10.1.27.1.

6.7.9.0.2 Minimum conformance requirements for SSB based CMR and dedicated IMR

The UE shall be capable of performing L1-SINR measurements with the SSB configured as CMR and dedicated resource configured as IMR for L1-SINR computation, in which the NZP-CSI-RS or CSI-IM resource configured as dedicated IMR shall be 1-to-1 mapped to SSB configured as CMR, with the same periodicity. The UE physical layer shall be capable of reporting L1-SINR measured over the measurement period of $T_{L1\text{-}SINR_Measurement_Period_SSB_CMR_IMR}$.

The requirements in this clause are not applicable if NZP-CSI-RS or CSI-IM resource configured as dedicated IMR is scheduled with different periodicity as SSB configured as CMR.

The value of $T_{L1\text{-}SINR_Measurement_Period_SSB_CMR_IMR}$ is defined in Table 6.7.9.0.2-1 for FR1 and in Table 6.7.9.0.2-2 for FR2, where

For the value of M

- For periodic or semi-persistent NZP CSI-RS or CSI-IM resource as dedicated IMR, M=1 if the higher layer parameters *timeRestrictionForChannelMeasurements* and/or *timeRestrictionForInterferenceMeasurements* are configured, and M=3 otherwise;

For the value of N in FR2

- N = 8.

P is defined as the maximum value between P_{CMR} and P_{IMR}, i.e., $P = \max(P_{CMR}, P_{IMR})$, where

- the value of P_{CMR} shall be derived in the same way as the value of P used for SSB based L1-RSRP measurement in clause 9.5.4.1 of TS 38.133 [6], in which the occasions and period of the SSB for CMR shall be used instead.

- the value of P_{IMR} shall be derived in the same way as the value of P used for CSI-RS based L1-RSRP measurement in clause 9.5.4.2 of TS 38.133 [6], in which the occasions and period of the NZP CSI-RS for NZP-IMR or CSI-IM for ZP-IMR shall be used instead.

Longer evaluation period would be expected if the combination of SSB, SMTC occasion and measurement gap configurations does not meet pervious conditions.

For L1-SINR measurement with SSB as CMR and CSI-RS or CSI-IM as IMR, the requirement shall apply if the CSI-RS is configured as IMR with repetition field as “repetition = OFF” or CSI-IM is configured as IMR.

For L1-SINR measurement with SSB as CMR and CSI-RS/CSI-IM as IMR, no requirement shall apply if SSB occasions for CMR or CSI-RS/CSI-IM occasions for IMR are fully overlapped with the configured measurement gap

Table 6.7.9.0.2-1: Measurement period $T_{L1\text{-}SINR_Measurement_Period_SSB_CMR_IMR}$ for FR1

Configuration	$T_{L1\text{-}SINR_Measurement_Period_SSB_CMR_IMR}$ (ms)
non-DRX	$\max(T_{Report}, \text{ceil}(M*P)*T_{SSB})$
DRX cycle ≤ 320ms	$\max(T_{Report}, \text{ceil}(1.5*M*P)*\max(T_{DRX},T_{SSB}))$
DRX cycle > 320ms	$\text{ceil}(M*P)*T_{DRX}$
Note 1: T_{SSB} = ssb-periodicityServingCell is the periodicity of the SSB-Index configured for L1-SINR channel measurement. T_{DRX} is the DRX cycle length. T_{Report} is configured periodicity for reporting. Note 2: The requirements are applicable provided that the CSI-RS resource configured for interference measurement shall be 1-to-1 mapped to SSB configured for channel measurement, with the same periodicity.	

Table 6.7.9.0.2-2: Measurement period $T_{L1\text{-}SINR_Measurement_Period_SSB_CMR_IMR}$ for FR2

Configuration	$T_{L1\text{-}SINR_Measurement_Period_SSB_CMR_IMR}$ (ms)
non-DRX	$\max(T_{Report}, \text{ceil}(M*P*N)*T_{SSB})$
DRX cycle ≤ 320ms	$\max(T_{Report}, \text{ceil}(1.5*M*P*N)*\max(T_{DRX},T_{SSB}))$

DRX cycle > 320ms	ceil(1.5*M*P*N)*T_{DRX}
Note 1:	T_{SSB} = ssb-periodicityServingCell is the periodicity of the SSB-Index configured for L1-SINR measurement. T_{DRX} is the DRX cycle length. T_{Report} is configured periodicity for reporting.
Note 2:	The requirements are applicable provided that the CSI-RS resource configured for interference measurement shall be 1-to-1 mapped to SSB configured for channel measurement, with the same periodicity.

The accuracy requirements in Tables 6.7.9.0.2-3 and 6.7.9.0.2-4 are valid under the following conditions:

- Conditions defined in clause 7.3 of TS 38.101-1 [18] for reference sensitivity are fulfilled.
- Conditions for L1-SINR measurements are fulfilled according to Annex B.2.8.2 for a corresponding Band for each relevant SSB based CMR and IMR.
- The bandwidth of NZP-IMR and ZP-IMR is 48 PRBs and the density is 3.
- AWGN radio propagation conditions.

The performance with larger bandwidth of NZP-IMR and ZP-IMR is equal to or better than the accuracy requirements in Tables 6.7.9.0.2-3 and 6.7.9.0.2-4.

Table 6.7.9.0.2-3: L1-SINR absolute accuracy for SSB based CMR and NZP-IMR in FR1

Accuracy		**Conditions**						
Normal condition	**Extreme condition**	**SSB-CMR Ês/Iot**	**NZP-IMR Ês/Iot**	**Io [Note 1] range**				
				NR operating band groups [Note 2]	**Minimum Io**			**Maximum Io**
dB	**dB**	**dB**	**dB**		**dBm / SCS_{SSB}**		**dBm/$BW_{Channel}$**	**dBm/$BW_{Channel}$**
					SCS_{SSB} = 15 kHz	**SCS_{SSB} = 30 kHz**		
±4.0	±5.0	≥0	≥0	NR_FDD_FR1_A, NR_TDD_FR1_A, NR_SDL_FR1_A	-121	-118	N/A	-50
				NR_FDD_FR1_B	-120.5	-117.5	N/A	-50
				NR_TDD_FR1_C	-120	-117	N/A	-50
				NR_FDD_FR1_D, NR_TDD_FR1_D	-119.5	-116.5	N/A	-50
				NR_FDD_FR1_E, NR_TDD_FR1_E	-119	-116	N/A	-50
				NR_FDD_FR1_F	-118.5	-115.5	N/A	-50
				NR_FDD_FR1_G	-118	-115	N/A	-50
				NR_FDD_FR1_H	-117.5	-114.5	N/A	-50
NOTE 1: Io is assumed to have constant EPRE across the bandwidth. NOTE 2: NR operating band groups in FR1 are as defined in clause 3.5.2.								

Table 6.7.9.0.2-4: L1-SINR absolute accuracy for SSB based CMR and ZP-IMR in FR1

Accuracy		**Conditions**					
Normal condition	**Extreme condition**	**SSB-CMR Ês/Iot**	**Io [Note 1] range**				
			NR operating band groups [Note 2]	**Minimum Io**			**Maximum Io**
dB	**dB**	**dB**		**dBm / SCS_{SSB}**		**dBm/$BW_{Channel}$**	**dBm/$BW_{Channel}$**
				SCS_{SSB} = 15 kHz	**SCS_{SSB} = 30 kHz**		
			NR_FDD_FR1_A, NR_TDD_FR1_A, NR_SDL_FR1_A	-121	-118	N/A	-50

±4.5	±5.5	≥-3	NR_FDD_FR1_B	-120.5	-117.5	N/A	-50
			NR_TDD_FR1_C	-120	-117	N/A	-50
			NR_FDD_FR1_D, NR_TDD_FR1_D	-119.5	-116.5	N/A	-50
			NR_FDD_FR1_E, NR_TDD_FR1_E	-119	-116	N/A	-50
			NR_FDD_FR1_F	-118.5	-115.5	N/A	-50
			NR_FDD_FR1_G	-118	-115	N/A	-50
			NR_FDD_FR1_H	-117.5	-114.5	N/A	-50
NOTE 1: Io is assumed to have constant EPRE across the bandwidth. NOTE 2: NR operating band groups in FR1 are as defined in clause 3.5.2.							

The normative reference for this requirement is TS 38.133 [6] clauses 9.8.4.2 and 10.1.27.2.

6.7.9.0.3 Minimum conformance requirements for CSI-RS based CMR and dedicated IMR

The UE shall be capable of performing L1-SINR measurements with the CSI-RS resource configured as CMR and dedicated resource configured as IMR for L1-SINR computation, in which the NZP-CSI-RS or CSI-IM resource configured as dedicated IMR shall be 1-to-1 mapped to CSI-RS resource configured as CMR, with the same periodicity. The UE physical layer shall be capable of reporting L1-SINR measured over the measurement period of $T_{L1\text{-}SINR_Measurement_Period_CSI\text{-}RS_CMR_IMR}$.

The requirements in this clause are not applicable if NZP-CSI-RS or CSI-IM resource configured as dedicated IMR is scheduled with different periodicity as CSI-RS resource configured as CMR.

The value of $T_{L1\text{-}SINR_Measurement_Period_CSI\text{-}RS_CMR_IMR}$ is defined in Table 6.7.9.0.3-1 for FR1 and in Table 6.7.9.0.3-2 for FR2, where

For the value of M,

- M=1 shall be applied if
  - aperiodic NZP-CSI-RS as CMR or dedicated IMR, or
  - aperiodic CSI-IMR as dedicated IMR, or
  - periodic and semi-persistent NZP-CSI-RS as CMR or dedicated IMR and the higher layer parameters *timeRestrictionForChannelMeasurement* and/or *timeRestrictionForInterferenceMeasurements* are configured, or
  - periodic and semi-persistent CSI-IM as dedicated IMR and the higher layer parameters *timeRestrictionForChannelMeasurement* and/or *timeRestrictionForInterferenceMeasurements* are configured;
- M=3 otherwise.

For the value of N in FR2

- For periodic CSI-RS resources as CMR in a resource set configured with higher layer parameter *repetition* set to OFF, N=1. The requirements apply if *qcl-InfoPeriodicCSI-RS* is configured for all the resources in the resource set and for each resource one RS has QCL-TypeD with
  - SSB for L1-RSRP or L1-SINR measurement, or
  - another CSI-RS in resource set configured with repetition ON.
- For periodic CSI-RS resources as CMR in a resource set configured with higher layer parameter *repetition* set to ON, N=ceil(*maxNumberRxBeam* / $N_{res_per_set}$), where $N_{res_per_set}$ is number of resources in the resource set. The requirements apply provided *qcl-InfoPeriodicCSI-RS* is configured for all resources in the resource set.
- For semi-persistent CSI-RS resources as CMR in a resource set configured with higher layer parameter *repetition* set to OFF, N=1. The requirements apply provided TCI state is provided for all resources in the resource set in the MAC CE activating the resource set and for each resource has QCL-TypeD with
  - SSB for L1-RSRP or L1-SINR measurement, or

- another CSI-RS in resource set configured with repetition ON.

- For semi-persistent CSI-RS resources as CMR in a resource set configured with higher layer parameter *repetition* set to ON, N=ceil(*maxNumberRxBeam* / $N_{res_per_set}$), where $N_{res_per_set}$ is number of resources in the resource set. The requirements apply provided TCI state is provided for all resources in the resource set in the MAC CE activating the resource set.

- For aperiodic CSI-RS resources as CMR in a resource set configured with higher layer parameter *repetition* set to OFF, N=1. The requirements apply provided *qcl-info* is configured for all resources in the resource set and for each resource has QCL-TypeD with

  - SSB for L1-RSRP or L1-SINR measurement, or

  - another CSI-RS in resource set configured with repetition ON.

- For aperiodic CSI-RS resources as CMR in a resource set configured with higher layer parameter *repetition* set to ON, N=1. UE is not required to meet the accuracy requirements in clause 10.1.28.1 and 10.1.28.3 of TS 38.133 [6] if number of resources in the resource set is smaller than *maxNumberRxBeam*. The requirements apply provided *qcl-info* is configured for all resources in the resource set.

P is defined as the maximum value between P_{CMR} and P_{IMR}, i.e., $P = \max(P_{CMR}, P_{IMR})$, where

- The value of P_{CMR} and P_{IMR} shall be derived in the same way as the value of P used for CSI-RS based L1-RSRP measurement in clause 9.5.4.2 of TS 38.133 [6], in which the occasions and period of the CSI-RS for CMR and NZP CSI-RS for NZP-IMR or CSI-IM for ZP-IMR shall be used instead respectively.

Longer evaluation period would be expected if the combination of CSI-RS, SMTC occasion and measurement gap configurations does not meet pervious conditions.

For L1-SINR measurement with CSI-RS as CMR and CSI-RS as IMR, the requirement shall apply only if CSI-RS resources as CMR and IMR are configured with the same repetition field and the number of CSI-RS resources in the resource sets for CMR and IMR are same.

For L1-SINR measurement with CSI-RS as CMR and CSI-IM as IMR, the requirement shall apply only if the number of CSI-RS resources in the resource set for CMR and the number of CSI-IM resources in the resource set for IMR are same.

For L1-SINR measurement with CSI-RS as CMR and CSI-RS/CSI-IM as IMR, no requirement shall apply if CSI-RS occasions for CMR or CSI-RS/CSI-IM occasions for IMR are fully overlapped with the configured measurement gap.

Table 6.7.9.0.3-1: Measurement period $T_{L1\text{-}SINR_Measurement_Period_CSI\text{-}RS_CMR_IMR}$ for FR1

Configuration	$T_{L1\text{-}SINR_Measurement_Period_CSI\text{-}RS_CMR_IMR}$ (ms)
non-DRX	$\max(T_{Report}, \text{ceil}(M*P)*T_{CSI\text{-}RS})$
DRX cycle ≤ 320ms	$\max(T_{Report}, \text{ceil}(1.5*M*P)*\max(T_{DRX},T_{CSI\text{-}RS}))$
DRX cycle > 320ms	$\text{ceil}(M*P)*T_{DRX}$
Note 1: $T_{CSI\text{-}RS}$ is the periodicity of CSI-RS configured for L1-SINR measurement. T_{DRX} is the DRX cycle length. T_{Report} is configured periodicity for reporting. Note 2: the requirements are applicable provided that the CSI-RS resource configured for L1-SINR measurement is transmitted with Density = 3. Note 3: The requirements are applicable provided that the CSI-RS resource configured for interference measurement shall be 1-to-1 mapped to CSI-RS configured for channel measurement, with the same periodicity.	

Table 6.7.9.0.3-2: Measurement period $T_{L1\text{-}SINR_Measurement_Period_CSI\text{-}RS_CMR_IMR}$ for FR2

Configuration	$T_{L1\text{-}SINR_Measurement_Period_CSI\text{-}RS_CMR_IMR}$ (ms)
non-DRX	$\max(T_{Report}, \text{ceil}(M*P*N)*T_{CSI\text{-}RS})$
DRX cycle ≤ 320ms	$\max(T_{Report}, \text{ceil}(1.5*M*P*N)*\max(T_{DRX},T_{CSI\text{-}RS}))$
DRX cycle > 320ms	$\text{ceil}(M*P*N)*T_{DRX}$
Note 1: $T_{CSI\text{-}RS}$ is the periodicity of CSI-RS configured for L1-SINR measurement. T_{DRX} is the DRX cycle length. T_{Report} is configured periodicity for reporting.	

Note 2:	the requirements are applicable provided that the CSI-RS resource configured for L1-SINR measurement is transmitted with Density = 3.
Note 3:	The requirements are applicable provided that the CSI-RS resource configured for interference measurement shall be 1-to-1 mapped to CSI-RS configured for channel measurement, with the same periodicity.

The accuracy requirements in Tables 6.7.9.0.3-3 and 6.7.9.0.3-4 are valid under the following conditions:

- Conditions defined in clause 7.3 of TS 38.101-1 [18] for reference sensitivity are fulfilled.
- Conditions for L1-SINR measurements are fulfilled according to Annex B.2.8.3 for a corresponding Band for each relevant CSI-RS based CMR and IMR.
- The bandwidth of CSI-RS as CMR, NZP-IMR and ZP-IMR is 48 PRBs and the density is 3.
- AWGN radio propagation conditions.

The performance with larger bandwidth of CSI-RS as CMR, NZP-IMR and ZP-IMR is equal to or better than the accuracy requirements in Tables 6.7.9.0.3-3 and 6.7.9.0.3-4.

Table 6.7.9.0.3-3: L1-SINR absolute accuracy for CSI-RS based CMR and NZP-IMR in FR1

Accuracy		Conditions							
Normal condition	Extreme condition	CSI-RS CMR Ês/Iot	NZP-IMR Ês/Iot	Io [Note 1] range					
				NR operating band groups [Note 2]	Minimum Io				Maximum Io
dB	dB	dB	dB		dBm / SCS_{CSI-RS}			dBm/$BW_{Channel}$	dBm/$BW_{Channel}$
					SCS_{CSI-RS} = 15 kHz	SCS_{CSI-RS} = 30 kHz	SCS_{CSI-RS} = 60 kHz		
±4.0	±5.0	≥0	≥0	NR_FDD_FR1_A, NR_TDD_FR1_A, NR_SDL_FR1_A	-121	-118	-115	N/A	-50
				NR_FDD_FR1_B	-120.5	-117.5	-114.5	N/A	-50
				NR_TDD_FR1_C	-120	-117	-114	N/A	-50
				NR_FDD_FR1_D, NR_TDD_FR1_D	-119.5	-116.5	-113.5	N/A	-50
				NR_FDD_FR1_E, NR_TDD_FR1_E	-119	-116	-113	N/A	-50
				NR_FDD_FR1_F	-118.5	-115.5	-112.5	N/A	-50
				NR_FDD_FR1_G	-118	-115	-112	N/A	-50
				NR_FDD_FR1_H	-117.5	-114.5	-111.5	N/A	-50
NOTE 1: Io is assumed to have constant EPRE across the bandwidth.									
NOTE 2: NR operating band groups in FR1 are as defined in clause 3.5.2.									

Table 6.7.9.0.3-4: L1-SINR absolute accuracy for CSI-RS based CMR and ZP-IMR in FR1

Accuracy		Conditions				
Normal condition	Extreme condition	CSI-RS CMR Ês/Iot	Io [Note 1] range			
			NR operating band groups [Note 2]	Minimum Io		Maximum Io
dB	dB	dB		dBm / SCS_{CSI-RS}	dBm/$BW_{Channel}$	dBm/$BW_{Channel}$

				SCS_{CSI-RS} = 15 kHz	**SCS_{CSI-RS} = 30 kHz**	**SCS_{CSI-RS} = 60 kHz**		
±4.5	±5.5	≥-3	NR_FDD_FR1_A, NR_TDD_FR1_A, NR_SDL_FR1_A	-121	-118	-115	N/A	-50
			NR_FDD_FR1_B	-120.5	-117.5	-114.5	N/A	-50
			NR_TDD_FR1_C	-120	-117	-114	N/A	-50
			NR_FDD_FR1_D, NR_TDD_FR1_D	-119.5	-116.5	-113.5	N/A	-50
			NR_FDD_FR1_E, NR_TDD_FR1_E	-119	-116	-113	N/A	-50
			NR_FDD_FR1_F	-118.5	-115.5	-112.5	N/A	-50
			NR_FDD_FR1_G	-118	-115	-112	N/A	-50
			NR_FDD_FR1_H	-117.5	-114.5	-111.5	N/A	-50
NOTE 1: Io is assumed to have constant EPRE across the bandwidth. NOTE 2: NR operating band groups in FR1 are as defined in clause 3.5.2.								

The normative reference for this requirement is TS 38.133 [6] clauses 9.8.4.3 and 10.1.27.3.

6.7.9.1 NR SA FR1 CSI-RS based CMR and no dedicated IMR configured and CSI-RS resource set with repetition off L1-SINR measurement

6.7.9.1.1 NR SA FR1 CSI-RS based CMR and no dedicated IMR configured and CSI-RS resource set with repetition off L1-SINR absolute measurement accuracy

6.7.9.1.1.1 Test purpose

The purpose of this test is to verify that the L1-SINR measurement accuracy is within the specified limits.

6.7.9.1.1.2 Test applicability

This test applies to all types of NR UE from Release 16 onwards. Applicability requires support of L1-SINR measurements.

6.7.9.1.1.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 6.7.9.0.1.

The normative reference for this requirement is TS 38.133 [6] clause A.6.7.9.1.

6.7.9.1.1.4 Test description

6.7.9.1.1.4.1 Initial conditions

This test shall be tested using any of the test configurations in Table 6.7.9.1.1.4.1-1.

Table 6.7.9.1.1.4.1-1: Applicable NR configurations for FR1 L1-SINR test with CSI-RS based CMR and no dedicated IMR configured

Config	Description
1	NR 15 kHz CSI-RS SCS, 10 MHz bandwidth, FDD duplex mode
2	NR 15 kHz CSI-RS SCS, 10 MHz bandwidth, TDD duplex mode
3	NR 30kHz CSI-RS SCS, 40 MHz bandwidth, TDD duplex mode
Note: The UE is only required to be tested in one of the supported test configurations in each supported band	

Configure the test equipment and the DUT according to the parameters in Table 6.7.9.1.1.4.1-2.

Table 6.7.9.1.1.4.1-2: Initial conditions for CSI-RS based L1-SINR absolute accuracy in FR1

Parameter	Value	Comment
Test environment	NC, TL/VL, TL/VH, TH/VL, TH/VH	As specified in TS 38.508-1 [14] clause 4.1.
Test frequencies	As specified in Annex E, Table E.4-1 and TS 38.508-1 [14] clause 4.3.1.	

Channel bandwidth	As specified by the test configuration selected from Table 6.7.9.1.1.4.1-1.		
Propagation conditions	AWGN		As specified in Annex C.2.2.
Connection Diagram	TE Part 2Rx	A.3.1.8.2 with n = 1	As specified in TS 38.508-1 [14] Annex A.
	TE Part 4Rx	A.3.1.8.5 with n = 1	
	DUT Part 2Rx	A.3.2.3.4	
	DUT Part 4Rx	A.3.2.5.2	
Exceptions to connection diagram	N/A		

1. Message contents are defined in clause 6.7.9.1.1.4.3.

2. Cell 1 is the NR FR1 cell. Cell 1 is the target for CSI-RS based L1-SINR measurements. The UE is configured one CSI-RS resource set with two CSI-RS resources. UE is configured to perform RLM and BFD based on SSB 0 and 1. CSI-RS is not transmitted in the same OFDM symbols as SSB. The connection setup is done according to the settings in Annex C.1.1.

6.7.9.1.1.4.2 Test procedure

The UE shall be configured for periodic CSI reporting in PUCCH [format 2] with a reporting periodicity as mentioned in the above table 6.7.9.1.1.4.1-2.

1. Ensure the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity NR SA, Connected without release *On* and Test Mode *On*, according to TS 38.508-1 [14] clause 4.5 and general test parameters set according to Table 6.7.9.1.1.4.1-2.

2. Set the parameters according to T1 in Table 6.7.9.1.1.5-1.

3. The UE shall start sending L1-SINR report including results of both CSI-RS#0 and CSI-RS#1 every 80 slots.

4. The SS shall check the L1-SINR reported values of CSI-RS#0 and CSI-RS#1 in the periodic L1-RSRP reports. If the value for both CSI-RSs is within the limits in Table 6.7.9.1.1.5-2 or Table 6.7.9.1.1.5-3 (depending on the test configuration), the number of passed iterations is increased by one, otherwise the number of failed iterations is increased by one.

5. The SS shall continue checking the L1-SINR report messages transmitted by the UE until the confidence level according to Table G.2.3-1 in Annex G is achieved.

6. Set the parameters according to each sub-test in Table 6.7.9.1.1.5-1 as appropriate and repeat steps 3-5.

6.7.9.1.1.4.3 Message contents

Message contents are according to TS 38.508-1 [14] clause 7.3 with the following exceptions:

Table 6.7.9.1.1.4.3-1: Common Exception messages NR SA CSI-RS-based L1-RSRP measurement

Default Message Contents	
Common contents of system information blocks exceptions	
Default RRC messages and information elements contents exceptions	Table H.3.6A-1 with conditions PERIODIC and CSI-SINR Table H.3.6A-2 with conditions CSI-RS and PERIODIC Table H.3.6A-3 with condition PERIODIC Table 7.3.1-3 in TS 38.508-1 [14] with condition SMTC.1

Table 6.7.9.1.1.4.3-2: RadioLinkMonitoringConfig

Derivation Path: TS 38.508-1 [14], Table 4.6.3-133			
Information Element	**Value/remark**	**Comment**	**Condition**
RadioLinkMonitoringConfig ::= SEQUENCE {			

failureDetectionResourcesToAddModList SEQUENCE (SIZE(1..maxNrofFailureDetectionResources)) OF SEQUENCE {	1 entry		
purpose	both	UE is configured to perform RLM and BFD based on the SSB.	
}			
}			

6.7.9.1.1.5 Test requirement

Table 6.7.9.1.1.5-1 defines the primary level settings excluding test tolerances for all tests.

Each L1-SINR measurement report for each of the tests in Table 6.7.9.1.1.5-1 shall meet the corresponding absolute accuracy requirements in Table 6.7.9.1.1.5-2 for test configurations 1 and 2, and the corresponding absolute accuracy requirements in Table 6.7.9.1.1.5-3 for test configuration 3.

Table 6.7.9.1.1.5-1: FR1 CSI-RS based L1-SINR test parameters

Parameter	Config	Unit	Test 1	Test 2
SSB GSCN	1~3		freq1	freq1
Duplex mode	1		FDD	FDD
	2		TDD	TDD
	3		TDD	TDD
TDD Configuration	1		N/A	N/A
	2		TDDConf.1.1	TDDConf.1.1
	3		TDDConf.2.1	TDDConf.2.1
$BW_{channel}$	1	MHz	10: $N_{RB,c}$ = 52	10: $N_{RB,c}$ = 52
	2		10: $N_{RB,c}$ = 52	10: $N_{RB,c}$ = 52
	3		40: $N_{RB,c}$ = 106	40: $N_{RB,c}$ = 106
PDSCH Reference measurement channel	1		SR.1.1 FDD	SR.1.1 FDD
	2		SR.1.1 TDD	SR.1.1 TDD
	3		SR.2.1 TDD	SR.2.1 TDD
RMSI CORESET Reference Channel	1		CR.1.1 FDD	CR.1.1 FDD
	2		CR.1.1 TDD	CR.1.1 TDD
	3		CR.2.1 TDD	CR.2.1 TDD
Dedicated CORESET Reference Channel	1		CCR.1.1 FDD	CCR.1.1 FDD
	2		CCR.1.1 TDD	CCR.1.1 TDD
	3		CCR.2.1 TDD	CCR.2.1 TDD
SSB configuration	1		SSB.1 FR1	SSB.1 FR1
	2		SSB.1 FR1	SSB.1 FR1
	3		SSB.2 FR1	SSB.2 FR1
OCNG Patterns	1~3		OP.1	OP.1
TRS configuration	1		TRS.1.1 FDD	TRS.1.1 FDD
	2		TRS.1.1 TDD	TRS.1.1 TDD
	3		TRS.1.2 TDD	TRS.1.2 TDD
Initial BWP Configuration	1~3		DLBWP.0.1 ULBWP.0.1	DLBWP.0.1 ULBWP.0.1
Dedicated BWP configuration	1~3		DLBWP.1.1 ULBWP.1.1	DLBWP.1.1 ULBWP.1.1
SMTC configuration	1~3		SMTC.1	SMTC.1
CSI-RS	1		CSI-RS 1.2 FDD	CSI-RS 1.2 FDD
	2		CSI-RS 1.2 TDD	CSI-RS 1.2 TDD
	3		CSI-RS 2.2 TDD	CSI-RS 2.2 FDD
reportConfigType	1~3		periodic	periodic
reportQuantity-r16	1~3		cri-SINR-r16	cri-SINR-r16
nrofReportedRS	1~3		2	2
L1-SINR reporting period	1~3		slot80	slot80
EPRE ratio of PSS to SSS	1~3	dB	0	0
EPRE ratio of PBCH DMRS to SSS				

EPRE ratio of PBCH to PBCH DMRS					
EPRE ratio of PDCCH DMRS to SSS					
EPRE ratio of PDCCH to PDCCH DMRS					
EPRE ratio of PDSCH DMRS to SSS					
EPRE ratio of PDSCH to PDSCH DMRS					
EPRE ratio of OCNG DMRS to SSS Note 1					
EPRE ratio of OCNG to OCNG DMRS Note 1					
N_{oc} Note2	Depending on band group	1,2	dBm/15kHz	-94.65	-117+ Δ_{BG_offset}
		3		-96.00	-117+ Δ_{BG_offset}
N_{oc} Note2		1,2	dBm/SSB SCS	-94.65	-117+ Δ_{BG_offset}
		3		-93.00	-114+ Δ_{BG_offset}
$\hat{E}_s/I_{ot}$		1~3	dB	10	-2.2
SSB RSRP Note3	Depending on band group	1,2	dBm/SSB SCS	-84.65	-119.2 + Δ_{BG_offset}
		3		-83.00	-116.2 + Δ_{BG_offset}
Io Note3	Depending on band group	1,2	dBm/9.36 MHz	-56.28	-87.00 + Δ_{BG_offset}
		3	dBm/38.16 MHz	-51.53	-80.90 + Δ_{BG_offset}
$\hat{E}_s/N_{oc}$		1~3	dB	10	-2.2
Propagation condition		1~3		AWGN	AWGN
Antenna configuration		1~3		1x2	1x2

Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.
Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for N_{oc} to be fulfilled.
Note 3: RSRP and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.
Note 4: RSRP minimum requirements are specified assuming independent interference and noise at each receiver antenna port.
Note 5: The test configuration excludes support for band n51 and it is not required to run this test on band n51 in this release of the specification.

Table 6.7.9.1.1.5-2: Same as Table Table 4.7.7.1.1.5-2

Table 6.7.9.1.1.5-3: Same as Table Table 4.7.7.1.1.5-3

For the test to pass, the ratio of successful reported values in each test shall be more than 90% with a confidence level of 95%.

6.7.9.1.2 NR SA FR1 CSI-RS based CMR and no dedicated IMR configured and CSI-RS resource set with repetition off L1-SINR relative measurement accuracy

6.7.9.1.2.1 Test purpose

The purpose of this test is to verify that the L1-SINR relative measurement accuracy is within the specified limits.

6.7.9.1.2.2 Test applicability

This test applies to all types of NR UE from Release 16 onwards. Applicability requires support of L1-SINR measurements.

6.7.9.1.2.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 4.7.7.0.1.

The normative reference for this requirement is TS 38.133 [6] clause A.4.7.7.1.

6.7.9.1.2.4 Test description

6.7.9.1.2.4.1 Initial conditions

This test shall be tested using any of the test configurations in Table 6.7.9.1.2.4.1-1. Configure the test equipment and the DUT according to the parameters in Table 6.7.9.1.2.4.1-2.

Table 6.7.9.1.2.4.1-1: Applicable NR configurations for FR1 L1-SINR test with CSI-RS based CMR and no dedicated IMR configured

Config	Description
1	NR 15 kHz CSI-RS SCS, 10 MHz bandwidth, FDD duplex mode
2	NR 15 kHz CSI-RS SCS, 10 MHz bandwidth, TDD duplex mode
3	NR 30kHz CSI-RS SCS, 40 MHz bandwidth, TDD duplex mode
Note: The UE is only required to be tested in one of the supported test configurations in each supported band	

Table 6.7.9.1.2.4.1-2: Initial conditions for CSI-RS based L1-SINR absolute accuracy in FR1

Parameter	Value		Comment
Test environment	NC, TL/VL, TL/VH, TH/VL, TH/VH		As specified in TS 38.508-1 [14] clause 4.1.
Test frequencies	As specified in Annex E, Table E.4-1 and TS 38.508-1 [14] clause 4.3.1.		
Channel bandwidth	As specified by the test configuration selected from Table 6.7.9.1.2.4.1-1.		
Propagation conditions	AWGN		As specified in Annex C.2.2.
Connection Diagram	TE Part 2Rx	A.3.1.8.2 with n = 1	As specified in TS 38.508-1 [14] Annex A.
	TE Part 4Rx	A.3.1.8.5 with n = 1	
	DUT Part 2Rx	A.3.2.3.4	
	DUT Part 4Rx	A.3.2.5.2	
Exceptions to connection diagram	N/A		

1. Message contents are defined in clause 6.7.9.1.2.4.3.

2. Cell 1 is the NR FR1 cell. Cell 1 is the target for CSI-RS based L1-SINR measurements. The UE is configured one CSI-RS resource set with two CSI-RS resources. UE is configured to perform RLM and BFD based on SSB 0 and 1. CSI-RS is not transmitted in the same OFDM symbols as SSB. The connection setup is done according to the settings in Annex C.1.1.

6.7.9.1.2.4.2 Test procedure

The UE shall be configured for periodic CSI reporting in PUCCH [format 2] with a reporting periodicity as mentioned in the above table 6.7.9.1.2.4.1-2.

1. Ensure the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity NR SA, Connected without release *On* and Test Mode *On*, according to TS 38.508-1 [14] clause 4.5 and general test parameters set according to Table 6.7.9.1.2.4.1-2.

2. Set the parameters according to T1 in Table 6.7.9.1.1.5-1.

3. The UE shall start sending L1-SINR report including results of both CSI-RS#0 and CSI-RS #1 every 80 slots.

4. The SS shall check the L1-SINR reported values of CSI-RS #0 and CSI-RS #1 in the periodic L1-SINR reports. The L1-SINR value for CSI-RS #1 is compared to the L1-SINR value for CSI-RS #0. If the difference is within

the limits in Table 6.7.9.1.2.5-2 (depending on the test configuration), the number of passed iterations is increased by one, otherwise the number of failed iterations is increased by one.

5. The SS shall continue checking the L1-SINR report messages transmitted by the UE until the confidence level according to Table G.2.3-1 in Annex G is achieved.

6. Set the parameters according to each sub-test in Table 6.7.9.1.1.5-1 as appropriate and repeat steps 3-5.

6.7.9.1.2.4.3 Message contents

Same message contents as described in section 6.7.9.1.1.4.3

6.7.9.1.2.5 Test requirement

Table 6.7.9.1.1.5-1 defines the primary level settings including test tolerances for all tests.

Each L1-SINR measurement report for each of the tests in Table 6.7.9.1.2.5-1 shall meet the corresponding relative accuracy requirements in Table 6.7.9.1.2.5-2.

Table 6.7.9.1.2.5-1: Same as Table 4.7.7.1.2.5-1

Table 6.7.9.1.2.5-2: Same as Table 4.7.7.1.2.5-2

For the test to pass, the ratio of successful reported values in each test shall be more than 90% with a confidence level of 95%.

6.7.9.2 NR SA FR1 SSB based CMR and dedicated IMR L1-SINR absolute measurement accuracy

6.7.9.2.1 Test purpose

The purpose of this test is to verify that the L1-SINR measurement accuracy is within the specified limits.

6.7.9.2.2 Test applicability

This test applies to all types of NR UE from Release 16 onwards. Applicability requires support for L1-SINR measurements on the NR PSCell.

6.7.9.2.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 6.7.9.0.2.

The normative reference for this requirement is TS 38.133 [6] clause A.6.7.9.2.

6.7.9.2.4 Test description

6.7.9.2.4.1 Initial conditions

This test shall be tested using any of the test configurations in Table 6.7.9.2.4.1-1.

Table 6.7.9.2.4.1-1: Applicable NR configurations for FR1 L1-SINR measurement test with SSB based CMR and CSI-RS based IMR

Config	Description
1	NR 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode
2	NR 15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode
3	NR 30kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode
Note: The UE is only required to be tested in one of the supported test configurations in each supported band	

Configure the test equipment and the DUT according to the parameters in Table 6.7.9.2.4.1-2.

Table 6.7.9.2.4.1-2: Initial conditions for SSB based and CSI-RS based L1-SINR absolute accuracy in FR1

Parameter	Value	Comment
Test environment	NC, TL/VL, TL/VH, TH/VL, TH/VH	As specified in TS 38.508-1 [14] clause 4.1.

Test frequencies	As specified in Annex E, Table E.4-1 and TS 38.508-1 [14] clause 4.3.1.		
Channel bandwidth	As specified by the test configuration selected from Table 6.7.9.2.4.1-1.		
Propagation conditions	AWGN		As specified in Annex C.2.2.
Connection Diagram	TE Part 2Rx	A.3.1.8.2 with n = 1	As specified in TS 38.508-1 [14] Annex A.
	TE Part 4Rx	A.3.1.8.5 with n = 1	
	DUT Part 2Rx	A.3.2.3.4	
	DUT Part 4Rx	A.3.2.5.2	
Exceptions to connection diagram	N/A		

1. Message contents are defined in clause 6.7.9.2.4.3.

2. Cell 1 is the NR FR1 cell. Cell 1 is the target for SSB-based L1-RSRP measurements. The UE is configured one SSB resource set with two SSB resources and one CSI-RS resource set with two CSI-RS resource. UE is configured to perform RLM and BFD measurement based on the SSB resources 0 and 1. UE is configured to perform L1-SINR measurement based on the SSBs as CMR and the CSI-RS resources as IMR. The connection setup is done according to the settings in Annex C.1.2 and C.1.3.

6.7.9.2.4.2 Test procedure

Prior to the start of the time duration T1, the UE shall be fully synchronized to PSCell. The UE shall be configured for periodic CSI reporting in PUCCH [format 2] with a reporting periodicity as mentioned in the above table 6.7.9.2.4.1-2.

1. Ensure the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity NR SA, Connected without release *On* and Test Mode *On*, according to TS 38.508-1 [14] clause 4.5 and general test parameters set according to Table 6.7.9.2.4.1-2.

2. Set the parameters according to T1 in Table 6.7.9.2.5-1. SS transmits CSI-RS as IMR with a periodicity of 20 slots.

3. The UE shall start sending L1-SINR report including results of both SSB#0 and SSB#1 every 80 slots.

4. The SS shall check the L1-SINR reported values of SSB#0+CSI-IM#0 and SSB#1+CSI-IM#1 in the periodic L1-RSRP reports. If the value for both SSB#0+CSI-IM#0 and SSB#1+CSI-IM#1 is within the limits in Table 6.7.9.2.5-2 and Table 6.7.9.2.5-3 (depending on the test configuration), the number of passed iterations is increased by one, otherwise the number of failed iterations is increased by one.

5. The SS shall continue checking the L1-SINR report messages transmitted by the UE until the confidence level according to Table G.2.3-1 in Annex G is achieved.

6. Set the parameters according to each sub-test in Table 6.7.9.2.5-1 as appropriate and repeat steps 3-5.

6.7.9.2.4.3 Message contents

Message contents are according to TS 38.508-1 [14] clause 7.3 with the following exceptions:

Table 6.7.4.1.1.4.3-1: Common Exception messages NR SA SSB based L1-RSRP measurement

Default Message Contents	
Common contents of system information blocks exceptions	
Default RRC messages and information elements contents exceptions	Table H.3.6A-1 with conditions PERIODIC and SS-SINR and CSI-RS_IMR Table H.3.6A-2 with conditions SSB and PERIODIC Table H.3.6A-3 with condition PERIODIC Table 7.3.1-3 in TS 38.508-1 [14] with condition SMTC.1

Table 6.7.4.1.1.4.3-2: RadioLinkMonitoringConfig

Derivation Path: TS 38.508-1 [14], Table 4.6.3-133			
Information Element	**Value/remark**	**Comment**	**Condition**
RadioLinkMonitoringConfig ::= SEQUENCE {			
failureDetectionResourcesToAddModList SEQUENCE (SIZE(1..maxNrofFailureDetectionResources)) OF SEQUENCE {	1 entry		
purpose	both	UE is configured to perform RLM and BFD based on the SSBs.	
detectionResource CHOICE {			
ssb-Index	0		
}			
}			
}			

6.7.9.2.5 Test requirement

Table 6.7.9.2.5-1 defines the primary level settings including test tolerances for all tests.

Each L1-RSRP measurement report for each of the tests in Table 6.7.9.2.5-1 shall meet the corresponding absolute accuracy requirements in Table 6.7.9.2.5-2 for test configurations 1 and 2, and the corresponding absolute accuracy requirements in Table 6.7.9.2.5-3 for test configuration 3.

Table 6.7.9.2.5-1: FR1 SSB based L1-SINR test parameters

Parameter	Config	Unit	Test 1	Test 2
SSB GSCN	1~3		freq1	freq1
Duplex mode	1		FDD	FDD
	2		TDD	TDD
	3		TDD	TDD
TDD Configuration	1		N/A	N/A
	2		TDDConf.1.1	TDDConf.1.1
	3		TDDConf.2.1	TDDConf.2.1
$BW_{channel}$	1	MHz	10: $N_{RB,c}$ = 52	10: $N_{RB,c}$ = 52
	2		10: $N_{RB,c}$ = 52	10: $N_{RB,c}$ = 52
	3		40: $N_{RB,c}$ = 106	40: $N_{RB,c}$ = 106
PDSCH Reference measurement channel	1		SR.1.1 FDD	SR.1.1 FDD
	2		SR.1.1 TDD	SR.1.1 TDD
	3		SR.2.1 TDD	SR.2.1 TDD
RMSI CORESET Reference Channel	1		CR.1.1 FDD	CR.1.1 FDD
	2		CR.1.1 TDD	CR.1.1 TDD
	3		CR.2.1 TDD	CR.2.1 TDD
Dedicated CORESET Reference Channel	1		CCR.1.1 FDD	CCR.1.1 FDD
	2		CCR.1.1 TDD	CCR.1.1 TDD
	3		CCR.2.1 TDD	CCR.2.1 TDD
SSB configuration	1		SSB.3 FR1	SSB.3 FR1
	2		SSB.3 FR1	SSB.3 FR1
	3		SSB.4 FR1	SSB.4 FR1
CSI-RS configuration	1		CSI-RS 1.1A FDD	CSI-RS 1.1A FDD
	2		CSI-RS 1.1A TDD	CSI-RS 1.1A TDD
	3		CSI-RS 2.1A TDD	CSI-RS 2.1A TDD
OCNG Patterns	1~3		OP.1	OP.1
Initial BWP Configuration	1~3		DLBWP.0.1 ULBWP.0.1	DLBWP.0.1 ULBWP.0.1
TRS configuration	1		TRS.1.1 FDD	TRS.1.1 FDD
	2		TRS.1.1 TDD	TRS.1.1 TDD
	3		TRS.1.2 TDD	TRS.1.2 TDD
Dedicated BWP configuration	1~3		DLBWP.1.1 ULBWP.1.1	DLBWP.1.1 ULBWP.1.1

SMTC configuration		1~3		SMTC.1	SMTC.1
reportConfigType		1~3		periodic	periodic
reportQuantity-r16		1~3		ssb-Index-SINR-r16	ssb-Index-SINR-r16
Number of reported RS		1~3		2	2
L1-SINR reporting period		1~3		slot80	slot80
EPRE ratio of PSS to SSS		1~3	dB	0	0
EPRE ratio of PBCH DMRS to SSS					
EPRE ratio of PBCH to PBCH DMRS					
EPRE ratio of PDCCH DMRS to SSS					
EPRE ratio of PDCCH to PDCCH DMRS					
EPRE ratio of PDSCH DMRS to SSS					
EPRE ratio of PDSCH to PDSCH DMRS					
EPRE ratio of OCNG DMRS to SSS Note 1					
EPRE ratio of OCNG to OCNG DMRS Note 1					
N_{oc} Note2	Depending on band group	1,2	dBm/15kHz	-94.65	-117+ Δ_{BG_offset}
		3		-96.00	-117+ Δ_{BG_offset}
N_{oc} Note2		1,2	dBm/SSB SCS	-94.65	-117+ Δ_{BG_offset}
		3		-93.00	-114+ Δ_{BG_offset}
$\hat{E}_s/I_{ot}$		1~3	dB	10	-2.2
SSB RSRP Note3	Depending on band group	1,2	dBm/SSB SCS	-84.65	-119.2 + Δ_{BG_offset}
		3		-83.00	-116.2 + Δ_{BG_offset}
Io Note3	Depending on band group	1,2	dBm/9.36 MHz	-56.28	-87.00 + Δ_{BG_offset}
		3	dBm/38.16 MHz	-51.53	-80.90 + Δ_{BG_offset}
Propagation condition		1~3		AWGN	AWGN
Antenna configuration		1~3		1x2	1x2

Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.
Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for N_{oc} to be fulfilled.
Note 3: RSRP and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.
Note 4: RSRP minimum requirements are specified assuming independent interference and noise at each receiver antenna port.
Note 5: The test configuration excludes support for band n51 and it is not required to run this test on band n51 in this release of the specification.

Table 6.7.9.2.5-2: Same as Table 4.7.7.2.5-2

Table 6.7.9.2.5-3: Same as Table 4.7.7.2.5-3

For the test to pass, the ratio of successful reported values in each test shall be more than 90% with a confidence level of 95%.

6.7.9.3 NR SA FR1 CSI-RS based CMR and dedicated IMR L1-SINR measurement accuracy

6.7.9.3.1 NR SA FR1 CSI-RS based CMR and dedicated IMR L1-SINR absolute measurement accuracy

6.7.9.3.1.1 Test purpose

The purpose of this test is to verify that the L1-SINR measurement accuracy is within the specified limits.

6.7.9.3.1.2 Test applicability

This test applies to all types of NR UE from Release 16 onwards. Applicability requires support of L1-SINR measurements.

6.7.9.3.1.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 6.7.9.0.3.

The normative reference for this requirement is TS 38.133 [6] clause A.6.7.9.3.

6.7.9.3.1.4 Test description

6.7.9.3.1.4.1 Initial conditions

This test shall be tested using any of the test configurations in Table 6.7.9.3.1.4.1-1.

Table 6.7.9.3.1.4.1-1: Applicable NR configurations for FR1 L1-SINR measurement test with CSI-RS based CMR and CSI-IM based IMR

Config	Description
1	NR 15 kHz CSI-RS SCS, 10 MHz bandwidth, FDD duplex mode
2	NR 15 kHz CSI-RS SCS, 10 MHz bandwidth, TDD duplex mode
3	NR 30kHz CSI-RS SCS, 40 MHz bandwidth, TDD duplex mode
Note: The UE is only required to be tested in one of the supported test configurations in each supported band	

Configure the test equipment and the DUT according to the parameters in Table 6.7.9.3.1.4.1-2.

Table 6.7.9.3.1.4.1-2: Initial conditions for CSI-RS based CMR and CSI-IM based IMR absolute accuracy in FR1

Parameter	Value		Comment
Test environment	NC, TL/VL, TL/VH, TH/VL, TH/VH		As specified in TS 38.508-1 [14] clause 4.1.
Test frequencies	As specified in Annex E, Table E.4-1 and TS 38.508-1 [14] clause 4.3.1.		
Channel bandwidth	As specified by the test configuration selected from Table 6.7.9.3.1.4.1-1.		
Propagation conditions	AWGN		As specified in Annex C.2.2.
Connection Diagram	TE Part 2Rx	A.3.1.8.2 with n = 1	As specified in TS 38.508-1 [14] Annex A.
	TE Part 4Rx	A.3.1.8.5 with n = 1	
	DUT Part 2Rx	A.3.2.3.4	
	DUT Part 4Rx	A.3.2.5.2	
Exceptions to connection diagram	N/A		

1. Message contents are defined in clause 6.7.9.3.1.4.3.

2. Cell 1 is the NR FR1 cell. Cell 1 is the target for CSI-RS based CMR and CSI-IM based IMR measurements. The UE is configured one CSI-RS resource set with two CSI-RS resources and one CSI-IM resource set with two CSI-IM resources. UE is configured to perform RLM and BFD based on SSB 0 and 1. CSI-RS is not transmitted in the same OFDM symbols as SSB. UE is configured to perform L1-SINR measurement based on the configured CSI-RS as CMR and CSI-IM as IMR. The connection setup is done according to the settings in Annex C.1.1.

6.7.9.3.1.4.2 Test procedure

Prior to the start of the time duration T1, the UE shall be fully synchronized to PSCell. The UE shall be configured for periodic CSI reporting in PUCCH [format 2] with a reporting periodicity as mentioned in the above table 6.7.9.3.1.4.1-2.

1. Ensure the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity NR SA, Connected without release *On* and Test Mode *On*, according to TS 38.508-1 [14] clause 4.5 and general test parameters set according to Table 6.7.9.3.1.4.1-2.

2. Set the parameters according to T1 in Table 6.7.9.3.1.5-1. SS transmits CSI-RS as IMR with a periodicity of 20 slots.

3. The UE shall start sending L1-SINR report including results of both SSB#0 and SSB#1 every 80 slots.

4. The SS shall check the L1-SINR reported values of CSI-RS#0+CSI-IM#0 and CSI-RS#1+CSI-IM#1 in the periodic L1-SINR reports. If the value for both CSI-RSs is within the limits in Table 6.7.9.3.1.5-2 and Table 6.7.9.3.1.5-3 (depending on the test configuration), the number of passed iterations is increased by one, otherwise the number of failed iterations is increased by one.

5. The SS shall continue checking the L1-SINR report messages transmitted by the UE until the confidence level according to Table G.2.3-1 in Annex G is achieved.

6. Set the parameters according to each sub-test in Table 6.7.9.3.1.5-1 as appropriate and repeat steps 3-5.

6.7.9.3.1.4.3 Message contents

Same message content as in subclause 6.7.9.1.4.3 with the following exception:

Message contents are according to TS 38.508-1 [14] clause 7.3 with the following exceptions:

Table 6.7.9.3.1.4.3-1: Common Exception messages NR SA CSI-RS based CMR and dedicated IMR L1-SINR measurement

Default Message Contents	
Common contents of system information blocks exceptions	
Default RRC messages and information elements contents exceptions	Table H.3.6A-1 with conditions PERIODIC and CSI-SINR and CSI-IM_IMR Table H.3.6A-2 with conditions CSI-RS and PERIODIC Table H.3.6A-3 with condition PERIODIC Table 7.3.1-3 in TS 38.508-1 [14] with condition SMTC.1

Table 6.7.9.3.1.4.3-2: RadioLinkMonitoringConfig

Derivation Path: TS 38.508-1 [14], Table 4.6.3-133			
Information Element	**Value/remark**	**Comment**	**Condition**
RadioLinkMonitoringConfig ::= SEQUENCE {			
failureDetectionResourcesToAddModList SEQUENCE (SIZE(1..maxNrofFailureDetectionResources)) OF SEQUENCE {	1 entry		
purpose	both	UE is configured to perform RLM and BFD based on the SSBs.	
}			
}			

6.7.9.3.1.5 Test requirement

Table 6.7.9.3.1.5-1 defines the primary level settings including test tolerances for all tests.

Each L1-SINR measurement report for each of the tests in Table 6.7.9.3.1.5-1 shall meet the corresponding absolute accuracy requirements in Table 6.7.9.3.1.5-2 for test configurations 1 and 2, and the corresponding absolute accuracy requirements in Table 6.7.9.3.1.5-3 for test configuration 3.

Table 6.7.9.3.5-1: FR1 CSI-RS based L1-SINR test parameters

Parameter	Config	Unit	Test 1	Test 2
SSB GSCN	1~3		freq1	freq1
Duplex mode	1		FDD	FDD
	2		TDD	TDD
	3		TDD	TDD
TDD Configuration	1		N/A	N/A
	2		TDDConf.1.1	TDDConf.1.1
	3		TDDConf.2.1	TDDConf.2.1
$BW_{channel}$	1	MHz	10: $N_{RB,c}$ = 52	10: $N_{RB,c}$ = 52
	2		10: $N_{RB,c}$ = 52	10: $N_{RB,c}$ = 52
	3		40: $N_{RB,c}$ = 106	40: $N_{RB,c}$ = 106
PDSCH Reference measurement channel	1		SR.1.1 FDD	SR.1.1 FDD
	2		SR.1.1 TDD	SR.1.1 TDD
	3		SR.2.1 TDD	SR.2.1 TDD
RMSI CORESET Reference Channel	1		CR.1.1 FDD	CR.1.1 FDD
	2		CR.1.1 TDD	CR.1.1 TDD
	3		CR.2.1 TDD	CR.2.1 TDD
Dedicated CORESET Reference Channel	1		CCR.1.1 FDD	CCR.1.1 FDD
	2		CCR.1.1 TDD	CCR.1.1 TDD
	3		CCR.2.1 TDD	CCR.2.1 TDD
SSB configuration	1		SSB.1 FR1	SSB.1 FR1
	2		SSB.1 FR1	SSB.1 FR1
	3		SSB.2 FR1	SSB.2 FR1
OCNG Patterns	1~3		OP.1	OP.1
TRS configuration	1		TRS.1.1 FDD	TRS.1.1 FDD
	2		TRS.1.1 TDD	TRS.1.1 TDD
	3		TRS.1.2 TDD	TRS.1.2 TDD
Initial BWP Configuration	1~3		DLBWP.0.1 ULBWP.0.1	DLBWP.0.1 ULBWP.0.1
Dedicated BWP configuration	1~3		DLBWP.1.1 ULBWP.1.1	DLBWP.1.1 ULBWP.1.1
SMTC configuration	1~3		SMTC.1	SMTC.1
CSI-RS	1		CSI-RS 1.2 FDD	CSI-RS 1.2 FDD
	2		CSI-RS 1.2 TDD	CSI-RS 1.2 TDD
	3		CSI-RS 2.2 TDD	CSI-RS 2.2 FDD
reportConfigType	1~3		periodic	periodic
reportQuantity-r16	1~3		cri-SINR-r16	cri-SINR-r16
nrofReportedRS	1~3		2	2
L1-SINR reporting period	1~3		slot80	slot80
EPRE ratio of PSS to SSS	1~3	dB	0	0
EPRE ratio of PBCH DMRS to SSS				
EPRE ratio of PBCH to PBCH DMRS				
EPRE ratio of PDCCH DMRS to SSS				
EPRE ratio of PDCCH to PDCCH DMRS				
EPRE ratio of PDSCH DMRS to SSS				
EPRE ratio of PDSCH to PDSCH DMRS				
EPRE ratio of OCNG DMRS to SSS Note 1				
EPRE ratio of OCNG to OCNG DMRS Note 1				
N_{oc} Note2 Depending on band group	1,2	dBm/15kHz	-94.65	-117+ Δ_{BG_offset}
	3		-96.00	-117+ Δ_{BG_offset}

N_{oc} Note2		1,2	dBm/SSB SCS	-94.65	-117+ Δ_{BG_offset}
		3		-93.00	-114+ Δ_{BG_offset}
$\hat{E}_s/I_{ot}$		1~3	dB	10	-2.2
SSB RSRP Note3	Depending on band group	1,2	dBm/SSB SCS	-84.65	-119.2 + Δ_{BG_offset}
		3		-83.00	-116.2 + Δ_{BG_offset}
Io Note3	Depending on band group	1,2	dBm/9.36 MHz	-56.28	-87.00 + Δ_{BG_offset}
		3	dBm/38.16 MHz	-51.53	-80.90 + Δ_{BG_offset}
$\hat{E}_s/N_{oc}$		1~3	dB	10	-2.2
Propagation condition		1~3		AWGN	AWGN
Antenna configuration		1~3		1x2	1x2

Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.
Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for N_{oc} to be fulfilled.
Note 3: RSRP and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.
Note 4: RSRP minimum requirements are specified assuming independent interference and noise at each receiver antenna port.
Note 5: The test configuration excludes support for band n51 and it is not required to run this test on band n51 in this release of the specification.

Table 6.7.9.3.5-2: Same as Table 4.7.7.3.5-2

Table 6.7.9.3.5-3: Same as Table 4.7.7.3.5-3

For the test to pass, the ratio of successful reported values in each test shall be more than 90% with a confidence level of 95%.

6.7.9.3.2 NR SA FR1 CSI-RS based CMR and dedicated IMR L1-SINR relative measurement accuracy

6.7.9.3.2.1 Test purpose

The purpose of this test is to verify that the L1-SINR relative measurement accuracy is within the specified limits.

6.7.9.3.2.2 Test applicability

This test applies to all types of NR UE from Release 16 onwards. Applicability requires support of L1-SINR measurements.

6.7.9.3.2.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 6.7.7.9.0.3.

The normative reference for this requirement is TS 38.133 [6] clause A.6.7.9.3.

6.7.9.3.2.4 Test description

6.7.9.3.2.4.1 Initial conditions

This test shall be tested using any of the test configurations in Table 6.7.9.3.2.4.1-1. Configure the test equipment and the DUT according to the parameters in Table 6.7.9.3.2.4.1-2.

Table 6.7.9.3.2.4.1-1: Applicable NR configurations for FR1 L1-SINR measurement test with CSI-RS based CMR and CSI-IM based IMR

Config	Description
1	NR 15 kHz CSI-RS SCS, 10 MHz bandwidth, FDD duplex mode
2	NR 15 kHz CSI-RS SCS, 10 MHz bandwidth, TDD duplex mode
3	NR 30kHz CSI-RS SCS, 40 MHz bandwidth, TDD duplex mode
Note: The UE is only required to be tested in one of the supported test configurations in each supported band	

Configure the test equipment and the DUT according to the parameters in Table 6.7.9.3.2.4.1-2.

Table 6.7.9.3.2.4.1-2: Initial conditions for CSI-RS based CMR and CSI-IM based IMR absolute accuracy in FR1

Parameter	Value		Comment
Test environment	NC, TL/VL, TL/VH, TH/VL, TH/VH		As specified in TS 38.508-1 [14] clause 4.1.
Test frequencies	As specified in Annex E, Table E.4-1 and TS 38.508-1 [14] clause 4.3.1.		
Channel bandwidth	As specified by the test configuration selected from Table 6.7.9.3.2.4.1-1.		
Propagation conditions	AWGN		As specified in Annex C.2.2.
Connection Diagram	TE Part 2Rx	A.3.1.8.2 with n = 1	As specified in TS 38.508-1 [14] Annex A.
	TE Part 4Rx	A.3.1.8.5 with n = 1	
	DUT Part 2Rx	A.3.2.3.4	
	DUT Part 4Rx	A.3.2.5.2	
Exceptions to connection diagram	N/A		

1. Message contents are defined in clause 6.7.9.3.2.4.3.

2. Cell 1 is the NR FR1 cell. Cell 1 is the target for CSI-RS based CMR and CSI-IM based IMR measurements. The UE is configured one CSI-RS resource set with two CSI-RS resources and one CSI-IM resource set with two CSI-IM resources. UE is configured to perform RLM and BFD based on SSB 0 and 1. CSI-RS is not transmitted in the same OFDM symbols as SSB. UE is configured to perform L1-SINR measurement based on the configured CSI-RS as CMR and CSI-IM as IMR. The connection setup is done according to the settings in Annex C.1.1.

6.7.9.3.2.4.2 Test procedure

Prior to the start of the time duration T1, the UE shall be fully synchronized to PSCell. The UE shall be configured for periodic CSI reporting in PUCCH [format 2] with a reporting periodicity as mentioned in the above table 6.7.9.3.2.4.1-2.

1. Ensure the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity NR SA, Connected without release *On* and Test Mode *On*, according to TS 38.508-1 [14] clause 4.5 and general test parameters set according to Table 6.7.9.3.2.4.1-2.

2. Set the parameters according to T1 in Table 6.7.9.3.2.5-1.

3. The UE shall start sending L1-SINR report including results of both CSI-RS#0 and CSI-RS #1 every 80 slots.

4. The SS shall check the L1-SINR reported values of CSI-RS #0 and CSI-RS #1 in the periodic L1-SINR reports. The L1-SINR value for CSI-RS #1 is compared to the L1-SINR value for CSI-RS #0. If the difference is within the limits in Table 6.7.9.3.2.5-2 (depending on the test configuration), the number of passed iterations is increased by one, otherwise the number of failed iterations is increased by one.

5. The SS shall continue checking the L1-SINR report messages transmitted by the UE until the confidence level according to Table G.2.3-1 in Annex G is achieved.

6. Set the parameters according to each sub-test in Table 6.7.9.3.2.5-1 as appropriate and repeat steps 3-5.

6.7.9.3.2.4.3 Message contents

Same message contents as described in section 6.7.9.3.1.4.3

6.7.9.3.2.5 Test requirement

Table 6.7.9.3.2.5-1 defines the primary level settings including test tolerances for all tests.

Each L1-SINR measurement report for each of the tests in Table 6.7.9.3.2.5-1 shall meet the corresponding relative accuracy requirements in Table 6.7.9.3.2.5-2.

Table 6.7.9.3.2.5-1: Same as Table 6.7.9.3.1.5-1

Table 6.7.9.3.2.5-2: Same as Table 4.7.7.3.2.5-2

For the test to pass, the ratio of successful reported values in each test shall be more than 90% with a confidence level of 95%.

7 NR standalone with at least one NR cell in FR2

7.0 General

This section contains test scenarios for NR standalone. This configuration is also known as NR/5GC. At least one NR cell is in Frequency Range 2.

For conformance testing involving FR2 test cases in this specification, the UE under test shall be pre-configured with UL Tx diversity schemes disabled to account for single polarization System Simulator (SS) in the test environment. The UE under test may transmit with dual polarization.

7.1 RRC_IDLE state mobility

7.1.1 NR cell re-selection

7.1.1.0 Minimum conformance requirements

7.1.1.0.1 Minimum conformance requirements for intra-frequency cell re-selection

The cell re-selection delay shall be less than $T_{evaluate\ NR_Intra} + T_{SI\text{-}NR}$ in RRC_IDLE state.

The UE shall be able to identify new intra-frequency cells and perform SS-RSRP and SS-RSRQ measurements of the identified intra-frequency cells without an explicit intra-frequency neighbour list containing physical layer cell identities.

The UE shall be able to evaluate whether a newly detectable intra-frequency cell meets the reselection criteria defined in TS38.304 [30] within T_{detect,NR_Intra} as defined in table 4.2.2.3-1 of TS 38.133 [6] when that Treselection= 0. An intra frequency cell is considered to be detectable according to the conditions defined in Annex B.1.2 of TS 38.133 [6] for a corresponding Band.

The UE shall measure SS-RSRP and SS-RSRQ at least every $T_{measure,NR_Intra}$ (see table 4.2.2.3-1 of TS 38.133 [6]) for intra-frequency cells that are identified and measured according to the measurement rules.

The UE shall filter SS-RSRP and SS-RSRQ measurements of each measured intra-frequency cell using at least 2 measurements. Within the set of measurements used for the filtering, at least two measurements shall be spaced by at least $T_{measure,NR_Intra}/2$.

The UE shall not consider a NR neighbour cell in cell reselection, if it is indicated as not allowed in the measurement control system information of the serving cell.

For an intra-frequency cell that has been already detected, but that has not been reselected to, the filtering shall be such that the UE shall be capable of evaluating that the intra-frequency cell has met reselection criterion defined within $T_{evaluate,NR_Intra}$ when $T_{reselection} = 0$ as specified in table 4.2.2.3-1 of TS 38.133 [6] provided that the cell has at least [3]dB better ranked.

When evaluating cells for reselection, the SSB side conditions apply to both serving and non-serving intra-frequency cells.

If $T_{reselection}$ timer has a non-zero value and non-zeroa-frequency cell is satisfied with the reselection criteria which are defined in TS38.304 [30], the UE shall evaluate this intra-frequency cell for the $T_{reselection}$ time. If this cell remains satisfied with the reselection criteria within this duration, then the UE shall reselect that cell.

The normative reference for this requirement is TS 38.133 [6] clause 4.2.2.2 and 4.2.2.3.

7.1.1.0.2 Minimum conformance requirements for inter-frequency cell re-selection

The cell re-selection delay shall be less than $T_{evaluate\ NR_Intra} + T_{SI\text{-}NR}$ in RRC_IDLE state.

The UE shall be able to identify new inter-frequency cells and perform SS-RSRP or SS-RSRQ measurements of identified inter-frequency cells if carrier frequency information is provided by the serving cell, even if no explicit neighbour list with physical layer cell identities is provided.

If Srxlev > $S_{nonIntraSearchP}$ and Squal > $S_{nonIntraSearchQ}$ then the UE shall search for inter-frequency layers of higher priority at least every $T_{higher_priority_search}$ where $T_{higher_priority_search}$ is described in clause 4.2.2.7 of TS 38.133 [6].

If Srxlev ≤ $S_{nonIntraSearchP}$ or Squal ≤ $S_{nonIntraSearchQ}$ then the UE shall search for and measure inter-frequency layers of higher, equal or lower priority in preparation for possible reselection. In this scenario, the minimum rate at which the UE is required to search for and measure higher priority layers shall be the same as that defined below in this subclause.

The UE shall be able to evaluate whether a newly detectable inter-frequency cell meets the reselection criteria defined in TS38.304 [30] within $K_{carrier}$ * T_{detect,NR_Inter} if at least carrier frequency information is provided for inter-frequency neighbour cells by the serving cells when $T_{reselection}$ = 0 provided that the reselection criteria is met by a margin of at least [5] dB for reselections based on ranking or [6]dB for SS-RSRP reselections based on absolute priorities or [4]dB for SS-RSRQ reselections based on absolute priorities. The parameter $K_{carrier}$ is the number of NR inter-frequency carriers indicated by the serving cell. An inter-frequency cell is considered to be detectable according to the conditions defined in Annex B.1.3 of TS 38.133 [6] for a corresponding Band.

When higher priority cells are found by the higher priority search, they shall be measured at least every $T_{measure,NR_Inter}$. If, after detecting a cell in a higher priority search, it is determined that reselection has not occurred then the UE is not required to continuously measure the detected cell to evaluate the ongoing possibility of reselection. However, the minimum measurement filtering requirements specified later in this section shall still be met by the UE before it makes any determination that it may stop measuring the cell. If the UE detects on a NR carrier a cell whose physical identity is indicated as not allowed for that carrier in the measurement control system information of the serving cell, the UE is not required to perform measurements on that cell.

The UE shall measure SS-RSRP or SS-RSRQ at least every $K_{carrier}$ * $T_{measure,NR_Inter}$ (see table 4.2.2.4-1 of TS 38.133 [6]) for identified lower or equal priority inter-frequency cells. If the UE detects on a NR carrier a cell whose physical identity is indicated as not allowed for that carrier in the measurement control system information of the serving cell, the UE is not required to perform measurements on that cell.

The UE shall filter SS-RSRP or SS-RSRQ measurements of each measured higher, lower and equal priority inter-frequency cell using at least 2 measurements. Within the set of measurements used for the filtering, at least two measurements shall be spaced by at least $T_{measure,NR_Inter}$/2.

The UE shall not consider a NR neighbour cell in cell reselection, if it is indicated as not allowed in the measurement control system information of the serving cell.

For an inter-frequency cell that has been already detected, but that has not been reselected to, the filtering shall be such that the UE shall be capable of evaluating that the inter-frequency cell has met reselection criterion defined TS 38.304 [30] within $K_{carrier}$ * $T_{evaluate,NR_Inter}$ when $T_{reselection}$ = 0 as specified in table 4.2.2.4-1 of TS 38.133 [6] provided that the reselection criteria is met by

- the condition when performing equal priority reselection and the cell has at least [5]dB better ranked
- [6]dB for SS-RSRP reselections based on absolute priorities or
- [4]dB for SS-RSRQ reselections based on absolute priorities.

When evaluating cells for reselection, the SSB side conditions apply to both serving and inter-frequency cells.

If $T_{reselection}$ timer has a non-zero value and the inter-frequency cell is satisfied with the reselection criteria, the UE shall evaluate this inter-frequency cell for the $T_{reselection}$ time. If this cell remains satisfied with the reselection criteria within this duration, then the UE shall reselect that cell.

The UE is not expected to meet the measurement requirements for an inter-frequency carrier under DRX cycle=320 ms defined in Table 4.2.2.4-1 of TS 38.133 [6] under the following conditions:

- T_{SMTC_intra} = T_{SMTC_inter} = 160 ms; where T_{SMTC_intra} and T_{SMTC_inter} are periodicities of the SMTC occasions configured for the intra-frequency carrier and the inter-frequency carrier respectively,
- SMTC occasions configured for the inter-frequency carrier occur up to TBD ms before the start or up to TBD ms after the end of the SMTC occasions configured for the intra-frequency carrier and
- SMTC occasions configured for the intra-frequency carrier and for the inter-frequency carrier occur up to TBD ms before the start or up to TBD ms after the end of the paging occasion [1].

The normative reference for this requirement is TS 38.133 [6] clause 4.2.2.4.

7.1.1.0.3 Minimum conformance requirements for intra-frequency cell re-selection for UE configured with relaxed measurement criterion

The cell re-selection delay shall be less than $T_{evaluate\ NR_Intra} + T_{SI\text{-}NR}$ in RRC_IDLE state.

7.1.1.0.3.1 Introduction

This clause contains the requirements for measurements on intra-frequency NR cells when Srxlev $\leq S_{IntraSearchP}$ or Squal $\leq S_{IntraSearchQ}$ and when the UE is configured any of the following relaxed measurement critera:

- Relaxed measurement criterion for UE with low mobility defined in clause 5.2.4.9.1 in TS 38.304 [30],
- Relaxed measurement criterion for UE not-at-cell edge defined in clause 5.2.4.9.2 in TS 38.304 [30],
- Both low mobility criterion and not-at-cell edge criterion as defined in clauses 5.2.4.9.1 and 5.2.4.9.2 in TS 38.304 [30] respectively.

7.1.1.0.3.2 Measurements for UE fulfilling low mobility criterion

This clause contains requirements for measurements on intra-frequency NR cells provided that:

- UE is configured with *lowMobilityEvaluation* [13] criterion and UE has fulfilled, or
- UE is configured with both *lowMobilityEvaluation* [13] criterion and *cellEdgeEvaluation* [13] criterion and *combineRelaxedMeasCondition* [13] not configured, and UE has fulfilled only the *lowMobilityEvaluation* [13] criterion.

The requirements defined in clause 7.1.1.0.1 apply for this clause except that:

- T_{detect,NR_Intra} as specified in Table 4.2.2.9.2-1 in TS 38.133 [6].
- $T_{measure,NR_Intra}$ as specified in Table 4.2.2.9.2-1 in TS 38.133 [6].
- $T_{evaluate,NR_Intra}$ as specified in Table 4.2.2.9.2-1 in TS 38.133 [6].

7.1.1.0.3.3 Measurements for UE fulfilling not-at-cell edge criterion

This clause contains requirements for measurements on intra-frequency NR cells provided that:

- UE is configured with *cellEdgeEvaluation* [13] criterion and UE has fulfilled, or
- UE is configured with both *lowMobilityEvaluation* [13] criterion and *cellEdgeEvaluation* [13] criteria and *combineRelaxedMeasCondition* [13] not configured, and UE has fulfilled only the *cellEdgeEvaluation* [13] criterion.

The requirements defined in clause 7.1.1.0.1 apply for this clause except that:

- T_{detect,NR_Intra} as specified in Table 4.2.2.9.3-1 in TS 38.133 [6].
- $T_{measure,NR_Intra}$ as specified in Table 4.2.2.9.3-1 in TS 38.133 [6].
- $T_{evaluate,NR_Intra}$ as specified in Table 4.2.2.9.3-1 in TS 38.133 [6].

7.1.1.0.3.4 Measurements for UE fulfilling low mobility and not-at-cell edge criteria

This clause contains requirements for measurements on intra-frequency NR cells provided that:

- UE is configured with both *lowMobilityEvaluation* [13] criterion and *cellEdgeEvaluation* [13] criterion, and
- has also fulfilled both criteria, and
- less than 1 hour have passed since measurements for cell reselection were last performed

In this case the UE is not required to meet $T_{detect,NR_Intra,}$ $T_{measure,NR_Intra}$ and $T_{evaluate,NR_Intra}$ as defined in Table 4.2.2.3-1 of TS 38.133[6].

The normative reference for this requirement is TS 38.133 [6] clause 4.2.2.9.

7.1.1.0.4 Minimum conformance requirements for inter-frequency cell re-selection for UE configured with relaxed measurement criterion

The cell re-selection delay shall be less than $T_{evaluate\ NR_Inter} + T_{SI\text{-}NR}$ in RRC_IDLE state.

7.1.1.0.4.1 Introduction

This clause contains the requirements for measurements on inter-frequency NR cells when the UE is configured with any of following relaxed measurement criteria:

- Relaxed measurement criterion for UE with low mobility defined in clause 5.2.4.9.1 in TS 38.304 [30],
- Relaxed measurement criterion for UE not-at-cell edge defined in clause 5.2.4. 9.2 in TS 38.304 [30],
- Both low mobility criterion and not-at-cell edge criterion as defined in clauses 5.2.4. 9.1 and 5.2.4.9.2 in TS 38.304 [30] respectively.

7.1.1.0.4.2 Measurements for UE fulfilling low mobility criterion

This clause contains requirements for measurements on inter-frequency NR cells provided that:

- T331 timer is not running for EMR measurements on inter-frequency NR carrier, and
- UE is configured with *lowMobilityEvaluation* [13] criterion and UE has fulfilled, or
- UE is configured with both *lowMobilityEvaluation* [13] and *cellEdgeEvaluation* [13] criterion and *combineRelaxedMeasCondition* [13] not configured, and UE has fulfilled only the *lowMobilityEvaluation* [13] criterion.

When $Srxlev \leq S_{nonIntraSearchP}$ or $Squal \leq S_{nonIntraSearchQ}$ then the requirements defined in clause 4.2.2.4 apply for this clause except that:

- T_{detect,NR_Inter} as specified in Table 4.2.2.10.2-1 in TS 38.133 [6].
- $T_{measure,NR_Inter}$ as specified in Table 4.2.2.10.2-1 in TS 38.133 [6].
- $T_{evaluate,NR_Inter}$ as specified in Table 4.2.2.10.2-1 in TS 38.133 [6].

When $Srxlev > S_{nonIntraSearchP}$ and $Squal > S_{nonIntraSearchQ}$ and the UE is configured with *highPriorityMeasRelax* [13] then the UE shall search for inter-frequency layers of higher priority at least every $K2*T_{higher_priority_search}$ where $T_{higher_priority_search}$ is described in clause 4.2.2.7 and, K2 = 60. Otherwise if the UE is not configured with *highPriorityMeasRelax* [13] then the UE shall search for inter-frequency layers of higher priority at least every $T_{higher_priority_search}$ where $T_{higher_priority_search}$ is described in clause 4.2.2.7 of TS 38.133[6].

7.1.1.0.4.3 Measurements for UE fulfilling not-at-cell edge criterion

This clause contains requirements for measurements on inter-frequency NR cells provided that:

- T331 timer is not running for EMR measurements on inter-frequency NR carrier, and
- UE is configured with *cellEdgeEvaluation* [13] criterion, and UE has fulfilled or
- UE is configured with both *lowMobilityEvaluation* [13] criterion and *cellEdgeEvaluation* [13] criterion and *combineRelaxedMeasCondition* [13] not configured, and UE has fulfilled only the *cellEdgeEvaluation* [13] criterion.

When $Srxlev \leq S_{nonIntraSearchP}$ or $Squal \leq S_{nonIntraSearchQ}$ then te requirements defined in clause 4.2.2.4 apply for this clause except that:

- T_{detect,NR_Inter} as specified in Table 4.2.2.10.3-1 in TS 38.133 [6].
- $T_{measure,NR_Inter}$ as specified in Table 4.2.2.10.3-1 in TS 38.133 [6].
- $T_{evaluate,NR_Inter}$ as specified in Table 4.2.2.10.3-1 in TS 38.133 [6].

When Srxlev > SnonIntraSearchP and Squal > SnonIntraSearchQ and regardless of whether the UE is configured with *highPriorityMeasRelax* [13] or not, the UE shall search for inter-frequency layers of higher priority at least every $T_{higher_priority}$_search where $T_{higher_priority_search}$ is described in clause 4.2.2.7

7.1.1.0.4.4 Measurements for UE fulfilling low mobility and not-at-cell edge criterion

This clause contains requirements for measurements on inter-frequency NR cells provided that:

- T331 timer is not running for EMR measurements on inter-frequency NR carrier, and
- UE is configured with both *lowMobilityEvaluation* [13] criterion and *cellEdgeEvaluation* [13] criterion, and
- Has also fulfilled both criteria, and
- less than 1 hour have passed since measurements for cell reselection were last performed

In this case the UE is not required to meet T_{detect,NR_Inter}, $T_{measure,NR_Inter}$ and $T_{evaluate,NR_Inter}$ as defined in Table 4.2.2.4-1 of TS 38.133[6].

The normative reference for this requirement is TS 38.133 [6] clause 4.2.2.10.

7.1.1.1 NR SA FR2 cell re-selection

Editor's Note: This test case is complete for the following configurations:

- Test frequency f ≤ 40.8 GHz.
- UE PC3

This test case is incomplete for Test frequency f > 40.8 GHz

This test case is incomplete for UE power class other than PC3.

7.1.1.1.1 Test purpose

The purpose of this test is to verify the requirement for the intra frequency NR cell reselection requirements specified in TS 38.133 clause 4.2.2.3.

7.1.1.1.2 Test applicability

This test applies to all types of NR UE from Release 15 onwards.

7.1.1.1.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 7.1.1.0.1.

The normative reference for this requirement is TS 38.133 [6] clause A.7.1.1.1.

7.1.1.1.4 Test description

7.1.1.1.4.1 Initial conditions

This test shall be run in one of the configurations defined in Table 7.1.1.1.4.1-1.

Table 7.1.1.1.4.1-1: Supported test configurations for NR SA FR2 cell re-selection

Configuration	Description
7.1.1.1-1	120 kHz SSB SCS, 100 MHz bandwidth, TDD duplex mode
7.1.1.1-2	240 kHz SSB SCS, 100 MHz bandwidth, TDD duplex mode
Note: The UE is only required to be tested in one of the supported test configurations.	

Configure the test equipment and the DUT according to the parameters in Table 7.1.1.1.4.1-2.

Table 7.1.1.1.4.1-2: Initial conditions for NR SA FR2 cell re-selection

Parameter	Value	Comment
Test environment	NC	As specified in TS 38.508-1 [14] clause 4.1.

Test frequencies	As specified in Annex E, table E.4-1 and TS 38.508-1 [14] clause 4.3.1.		
Channel bandwidth	As specified by the test configuration selected from Table 7.1.1.1.4.1-1.		
Propagation conditions	AWGN		As specified in Annex C.2.2.
Connection Diagram	TE Part	A.3.3.3.1	As specified in TS 38.508-1 [14] Annex A.
	DUT Part	A.3.4.1.1	
Exceptions to connection diagram	N/A		

1. The general test parameter settings are set up according to Table 7.1.1.1.4.1-3.

2. Message contents are defined in clause 7.1.1.1.4.3.

3. There is one NR carrier and 2 NR Cells specified in the test. Cell 1 is the PCell and Cell 2 is the neighbour cell. Cell 1 and Cell 2 are configured according to Annex C.1.1 and C.1.2.

Table 7.1.1.1.4.1-3: General test parameters for NR SA FR2 cell re-selection

Parameter		Unit	Test configuration	Value	Comment
Initial condition	Active cell		1, 2	Cell1	
T2 end condition	Active cell		1, 2	Cell2	
	Neighbour cells		1, 2	Cell1	
Final condition	Active cell		1, 2	Cell1	
	Neighbour cell		1, 2	Cell2	
RF Channel Number			1, 2	1	
Time offset between cells			1, 2	3 μs	Synchronous cells
Access Barring Information		-	1, 2	Not Sent	No additional delays in random access procedure.
SMTC configuration			1, 2	SMTC.1	
DRX cycle length		s	1, 2	1.28	The value shall be used for all cells in the test.
PRACH configuration index			1, 2	190	The detailed configuration is specified in TS 38.211 clause 6.3.3.2
rangeToBestCell			1, 2	Not configured	
T1		s	1, 2	>7	During T1, Cell 2 shall be powered off, and during the off time the physical cell identity shall be changed, The intention is to ensure that Cell 2 has not been detected by the UE prior to the start of period T2
T2		s	1, 2	135	T2 needs to be defined so that cell re-selection reaction time is taken into account.
T3		s	1, 2	35	T3 needs to be defined so that cell re-selection reaction time is taken into account.

7.1.1.1.4.2 Test procedure

Two cells are deployed in the test, which are one FR2 NR PCell (Cell 1) and an NR neighbour cell (Cell 2) on the same frequency. The test consists of 3 successive time periods, with time duration of T1, T2, and T3 respectively. Only cell 1 is already identified by the UE prior to the start of the test. Cell 1 and cell 2 belong to different tracking areas. Furthermore, UE has not registered with network for the tracking area containing cell 2.

In the following test procedure “UE responds” means “UE starts transmitting preamble on PRACH for sending the RRC SETUP REQUEST message to perform a Registration procedure for mobility.

1. Ensure the UE is in state RRC_IDLE with generic procedure parameters connectivity *NR*, connected without release *On* and Test Mode *On* according to TS 38.508-1 [14] clause 4.5 on Cell 1. Set Cell 2 physical cell identity = initial Cell 2 physical cell identity.

2. Set the parameters according to T1 in Table 7.1.1.1.5-1. T1 starts.

3. Set Cell 2 physical cell identity = ((current Cell 2 physical cell identity + 1) mod 1008) for one iteration of the test procedure loop.

4. When T1 expires, the SS shall switch the power setting from T1 to T2 as specified in Table 7.1.1.1.5-1.

5. The SS waits for random access requests information from the UE to perform cell re-selection to a newly detectable cell, Cell 2.

6. If the UE responds on the newly detectable cell, Cell 2 during time duration T2 within 130 seconds from the beginning of time period T2, then count a success for the event “Re-select newly detected Cell 2”. Otherwise count a fail for the event “Re-select newly detected Cell 2”.

7. If the UE has re-selected Cell 2 within T2, after the re-selection or when T2 expires, continue with step 7a. Otherwise, if T2 expires and the UE has not yet re-selected Cell 2, the TE shall switch off and on the UE and skip to step 12.

7a. The SS shall send an *RRCRelease* message to ensure that the UE is in state RRC_IDLE on Cell 2.

8. The SS shall switch the power setting from T2 to T3 as specified in Table 7.1.1.1.5-1.

9. The SS waits for random access requests information from the UE to perform cell re-selection to an already detected cell, Cell 1.

10. If the UE responds on the already detected cell, Cell 1 during time duration T3 within 27 seconds from the beginning of time period T3, then count a success for the event “Re-select already detected Cell 1”. Otherwise count a fail for the event “Re-select already detected Cell 1”.

11. If the UE has re-selected Cell 1 within T3, after the re-selection or when T3 expires, continues with step 11a. Otherwise, if T3 expires and the UE has not yet re-selected Cell 1, the TE shall switch off and on the UE and skip to step 12.

11a. The SS shall send an *RRCRelease* message to ensure that the UE is in state RRC_IDLE on Cell 1.

12. Ensure the UE is in state RRC_IDLE with generic procedure parameters connectivity *NR*, connected without release *On* and Test Mode *On* according to TS 38.508-1 [14] clause 4.5 on Cell 1.

13. Repeat step 2-12 until a test verdict has been achieved.
Each of the events “Re-select newly detected Cell 2” and “Re-select already detected Cell 1” is evaluated independently for the statistic, resulting in an event verdict: pass or fail. Each event is evaluated only until the confidence level according to Table G.2.3-1 in Annex G clause G.2 is achieved. Different events may require different times for a verdict.
If both events pass, the test passes. If one event fails, the test fails.

7.1.1.1.4.3 Message contents

Message contents are according to TS 38.508-1 [14] clause 7.3 with the following exceptions:

Table 7.1.1.1.4.3-1: Common Exception messages

Default Message Contents	
Common contents of system information blocks exceptions	Table H.2.1-2
Default RRC messages and information elements contents exceptions	

Table 7.1.1.1.4.3-1A: SIB1 (Cell 1 and Cell 2)

Derivation Path: Table H.2.1-3			
Information Element	**Value/remark**	**Comment**	**Condition**

SIB1 ::= SEQUENCE {			
cellSelectionInfo SEQUENCE {			
q-RxLevMin	-60	Actual value is -60*2 = -120dBm	7.1.1.1-1
	-58	Actual value is -58*2 = -116dBm	7.1.1.1-2
}			
}			

Table 7.1.1.1.4.3-1B: SIB2 (Cell 1 and Cell 2)

Derivation Path: Table H.2.1-1 with condition SMTC.1 and Synchronous cells			
Information Element	**Value/remark**	**Comment**	**Condition**
SIB2 ::= SEQUENCE {			
intraFreqCellReselectionInfo SEQUENCE {			
q-RxLevMin	-60	Actual value is -60*2 = -120dBm	7.1.1.1-1
	-58	Actual value is -58*2 = -116dBm	7.1.1.1-2
s-IntraSearchP	25	Actual value is 25*2 = 50dB	
}			
}			

Table 7.1.1.1.4.3-2: *RACH-ConfigGeneric*: NR cell re-selection

Derivation Path: TS 38.508-1 [14], Table 4.6.3-130			
Information Element	**Value/remark**	**Comment**	**Condition**
RACH-ConfigGeneric ::= SEQUENCE {			
prach-ConfigurationIndex	190		
}			

7.1.1.1.5 Test requirement

Tables 7.1.1.1.4.1-3 and 7.1.1.1.5-1 define the primary level settings including test tolerances for intra frequency NR cell re-selection test case.

Table 7.1.1.1.5-1: Cell specific test parameters for NR SA FR2 cell re-selection

Parameter	**Unit**	**Test config.**	**Cell 1**			**Cell 2**		
			T1	**T2**	**T3**	**T1**	**T2**	**T3**
TDD configuration		1, 2	TDDConf.3.1			TDDConf.3.1		
PDSCH RMC configuration		1	SR.3.1 TDD			SR.3.1 TDD		
		2	SR.3.1 TDD			SR.3.1 TDD		
RMSI CORESET RMC configuration		1	CR.3.1 TDD			CR.3.1 TDD		
		2	CR.3.1 TDD			CR.3.1 TDD		
Dedicated CORESET RMC configuration		1	CCR.3.1 TDD			CCR.3.1 TDD		
		2	CCR.3.1 TDD			CCR.3.1 TDD		
SSB configuration		1	SSB.3 FR2			SSB.7 FR2		
		2	SSB.4 FR2			SSB.8 FR2		
OCNG Pattern		1, 2	OP.4			OP.4		
Initial DL BWP configuration		1, 2	DLBWP.0.1			DLBWP.0.1		
BWchannel	MHz	1, 2	100: NRB,c = 66			100: NRB,c = 66		
Data RBs allocated		1, 2	66			66		
Initial UL BWP configuration		1, 2	ULBWP.0.1			ULBWP.0.1		
RLM-RS		1, 2	SSB			SSB		
Qrxlevmin	dBm/SCS	1	-120 Note 6			-120 Note 6		
		2	-117 Note 6			-117 Note 6		
Pcompensation	dB	1, 2	0			0		
$Qhyst_s$	dB	1, 2	0			0		
$Qoffset_{s,n}$	dB	1, 2	0			0		
Cell_selection_and_ reselection_quality_measurement		1, 2	SS-RSRP			SS-RSRP		

AoA setup		1, 2	Setup 1 defined in A. 9.1			Setup 1 defined in A. 9.1		
Beam assumption Note 4		1,2	Rough					
$\hat{E}_s/I_{ot\ \mathrm{BB}}$ Note 5	dB	1	7.56	-3.34	1.61	-infinity	1.61	-3.34
		2						
N_{oc} Note2	dBm/SCS	1	-93					
		2	-90					
N_{oc} Note2	dBm/15 kHz	1	-102					
		2						
$\hat{E}_s/N_{oc}$	dB	1	8	-2.9 Note 6	2.05 Note 6	-infinity	2.05 Note 6	-2.9 Note 6
		2						
SS-RSRP Note3	dBm/SCS	1	-85	-95.9	-90.9	-infinity	-90.9	-95.9
		2	-82	-92.9	-87.9	-infinity	-87.9	-92.9
Io	dBm/95.04 MHz	1	-60.53	-67.37	-65.01	-69.17	-65.01	-67.37
		2	-57.52	-64.39	-62.33	-66.16	-62.33	-64.39
Treselection	s	1, 2	0	0	0	0	0	0
SintrasearchP	dB	1, 2	50			50		
Propagation Condition		1, 2	AWGN					

Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.

Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for N_{oc} to be fulfilled.

Note 3: SS-RSRP levels have been derived from other parameters for information purposes. They are not settable parameters themselves.

Note 4: Information about types of UE beam is given in B.2.1.3, and does not limit UE implementation or test system implementation

Note 5: Calculation of Es/Iot$_{BB}$ includes the effect of UE internal noise up to the value assumed for the associated Refsens requirement in clause 7.3.2 of TS 38.101-2 [19], and an allowance of 1dB for UE multi-band relaxation factor ΔMB_P from TS 38.101-2 [19] Table 6.2.1.3-4.

Note 6: Including the test tolerance given in Annex F.

The cell re-selection delay to a newly detectable cell is defined as the time from the beginning of time period T2, to the moment when the UE camps on Cell 2, and starts to send preambles on the PRACH for sending the RRC SETUP REQUEST message to perform a Registration procedure for mobility on Cell 2.

The cell re-selection delay to a newly detectable cell test requirement in this case is expressed as:

Cell re-selection delay to a newly detectable cell = $T_{detect,NR_Intra} + T_{SI\text{-}NR}$

T_{detect,NR_Intra} = 128 s; as specified in TS 38.133 [6] clause 4.2.2.3.

$T_{SI\text{-}NR}$ = 1280 ms; maximum repetition period of relevant system info blocks that needs to be received by the UE to camp on a cell is assumed in this test.

The cell re-selection delay to a newly detectable cell shall be less than a total of 129.28 seconds in this test case (note: this gives a total of 129.28 seconds but the test allows 130 seconds).

The cell re-selection delay to an already detected cell is defined as the time from the beginning of time period T3, to the moment when the UE camps on Cell 1, and starts to send preambles on the PRACH for sending the RRC SETUP REQUEST message to perform a Registration procedure for mobility on Cell 1.

The cell re-selection delay to an already detected cell test requirement in this case is expressed as:

Cell re-selection to an already detected cell delay = $T_{evaluate,NR_Intra} + T_{SI\text{-}NR}$

$T_{evaluate,NR_Intra}$ = 25.6 s; as specified in TS 38.133 [6] clause 4.2.2.3.

T_{SI-NR} = 1280 ms; maximum repetition period of relevant system info blocks that needs to be received by the UE to camp on a cell is assumed in this test.

The cell re-selection delay to an already detected cell shall be less than a total of 26.88 seconds in this test case (note: this gives a total of 26.88 seconds but the test allows 27 seconds).

For the test to pass, both events above shall pass.

The statistical pass/ fail decisions are done separated for each event. For an event to pass, the total number of successful loops shall be more than 90% of the cases with a confidence level of 95%.

7.1.1.2 NR SA FR2-FR2 cell re-selection

Editor's Note: This test case is complete for the following configurations:

- Test frequency f ≤ 40.8 GHz.
- UE PC3

This test case is incomplete for Test frequency f > 40.8 GHz

This test case is incomplete for UE power class other than PC3.

7.1.1.2.1 Test purpose

The purpose of this test is to verify the requirement for the inter frequency NR cell reselection requirements specified in TS 38.133 clause 4.2.2.4.

7.1.1.2.2 Test applicability

This test applies to all types of NR UE from Release 15 onwards.

7.1.1.2.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 7.1.1.0.2.

The normative reference for this requirement is TS 38.133 [6] clause A.7.1.1.2.

7.1.1.2.4 Test description

7.1.1.2.4.1 Initial conditions

This test shall be run in one of the configurations defined in Table 7.1.1.2.4.1-1.

Table 7.1.1.2.4.1-1: Supported test configurations for NR SA FR2-FR2 cell re-selection

Configuration	Description for serving cell	Description for target cell
7.1.1.2-1	120 kHz SSB SCS, 100 MHz bandwidth, TDD duplex mode	120 kHz SSB SCS, 100 MHz bandwidth, TDD duplex mode
7.1.1.2-2	240 kHz SSB SCS, 100 MHz bandwidth, TDD duplex mode	240 kHz SSB SCS, 100 MHz bandwidth, TDD duplex mode
Note: The UE is only required to be tested in one of the supported test configurations.		

Configure the test equipment and the DUT according to the parameters in Table 7.1.1.2.4.1-2.

Table 7.1.1.2.4.1-2: Initial conditions for NR SA FR2-FR2 cell re-selection

Parameter	Value		Comment
Test environment	NC		As specified in TS 38.508-1 [14] clause 4.1.
Test frequencies	As specified in Annex E, table E.4-1 and TS 38.508-1 [14] clause 4.3.1.		
Channel bandwidth	As specified by the test configuration selected from Table 7.1.1.2.4.1-1.		
Propagation conditions	AWGN		As specified in Annex C.2.2.
Connection Diagram	TE Part	A.3.3.3.1	As specified in TS 38.508-1 [14] Annex A.
	DUT Part	A.3.4.1.1	

Exceptions to connection diagram	N/A	

1. The general test parameter settings are set up according to Table 7.1.1.2.4.1-3.

2. Message contents are defined in clause 7.1.1.2.4.3.

3. There is two NR carrier and 2 NR Cells specified in the test. Cell 2 is the PCell and Cell 1 is the neighbour cell in a different carrier than cell 2. Cell 1 and Cell 2 are configured according to Annex C.1.2.

Table 7.1.1.2.4.1-3: General test parameters for NR SA FR2-FR2 cell re-selection

Parameter		Unit	Test configuration	Value	Comment
Initial condition	Active cell		1, 2	Cell2	The UE camps on cell 2 in the initial phase and during T1 period the UE reselects to cell 1
	Neighbour cell		1, 2	Cell1	
T1 end condition	Active cell		1, 2	Cell1	The UE shall perform reselection to cell 1 during T1
	Neighbour cells		1, 2	Cell2	
T3 end condition	Active cell		1, 2	Cell2	The UE shall perform reselection to cell 2 with higher priority during T3
	Neighbour cell		1, 2	Cell1	
RF Channel Number			1, 2	1, 2	
Time offset between cells			1, 2	3 μs	Synchronous cells
Access Barring Information		-	1, 2	Not Sent	No additional delays in random access procedure.
SSB configuration			1	SSB.1 FR2	
			2	SSB.2 FR2	
SMTC configuration			1, 2	SMTC.1	
DRX cycle length		s	1, 2	1.28	The value shall be used for all cells in the test.
PRACH configuration index			1, 2	190	The detailed configuration is specified in TS 38.211 clause 6.3.3.2
rangeToBestCell			1, 2	Not configured	
T1		s	1, 2	35	T1 needs to be defined so that cell re-selection reaction time is taken into account.
T2		s	1, 2	>7	During T2, cell 2 shall be powered off, and during the off time the physical cell identity shall be changed. The intention is to ensure that cell 2 has not been detected by the UE prior to the start of period T3.
T3		s	1, 2	95	T3 needs to be defined so that cell re-selection reaction time is taken into account.

7.1.1.2.4.2 Test procedure

The test consists of one active cell and one neighbour cell. The UE is requested to monitor the neighbouring cell on one of the NR carriers. The test consists of three successive time periods, with time duration of T1, T2, and T3 respectively. Both cell 1 and cell 2 are already identified by the UE prior to the start of the test. Cell 1 and cell 2 belong to different tracking areas and cell 2 is of higher priority than cell 1. Furthermore, UE has not registered with network for the tracking area containing cell 1.

In the following test procedure “UE responds” means “UE starts transmitting preamble on PRACH for sending the RRC SETUP REQUEST message to perform a Registration procedure for mobility.

1. Ensure the UE is in state RRC_IDLE with generic procedure parameters connectivity *NR*, connected without release *On* and Test Mode *On* according to TS 38.508-1 [14] clause 4.5 on Cell 2.

2. Set the parameters according to T1 in Table 7.1.1.2.5-1. Propagation conditions are set according to Annex B clause B.1.1. T1 starts.

3. Void.

4. The SS waits for random access requests information from the UE to perform cell re-selection on the lower priority cell, Cell 1.

5. If the UE responds on lower priority cell, Cell 1 during time duration T1 within 27 seconds from the beginning of time period T1, then count a success for the event “Re-select lower priority Cell 1”. Otherwise count a fail for the event “Re-select lower priority Cell 1”.

6. If the UE has re-selected Cell 1 within T1, after the re-selection or when T1 expires, continue with step 6a. Otherwise, if T1 expires and the UE has not yet re-selected Cell 1, the TE shall switch off and on the UE and skip to step 12.

6a. The SS shall send an *RRCRelease* message to ensure that the UE is in state RRC_IDLE on Cell 1.

7. The SS shall switch the power setting from T1 to T2 as specified in Table 7.1.1.2.5-1. During time duration T2, Cell 2 shall be powered OFF and the physical cell identity = ((current Cell 2 physical cell identity + 1) mod 1008) shall be changed to ensure Cell 2 is not detected by the UE.

8. When T2 expires, the SS shall switch the power setting from T2 to T3 as specified in Table 7.1.1.2.5-1.

9. The SS waits for random access requests information from the UE to perform cell re-selection on the higher priority cell, Cell 2.

10. If the UE responds on higher priority cell, Cell 2 during time duration T3 within 87 seconds from the beginning of time period T3, then count a success for the event “Re-select higher priority Cell 2”. Otherwise count a fail for the event “Re-select higher priority Cell 2”.

11. If the UE has re-selected Cell 2 within T3, after the re-selection or when T3 expires, continues with step 11a. Otherwise, if T3 expires and the UE has not yet re-selected Cell 2, the TE shall switch off and on the UE and continue with step 12.

11a. The SS shall send an *RRCRelease* message to ensure that the UE is in state RRC_IDLE on Cell 2.

12. Ensure the UE is in state RRC_IDLE with generic procedure parameters connectivity *NR*, connected without release *On* and Test Mode *On* according to TS 38.508-1 [14] clause 4.5 on Cell 2.

13. Repeat step 3-12 until a test verdict has been achieved.
Each of the events “Re-select lower priority Cell 1” and “Re-select higher priority Cell 2” is evaluated independently for the statistic, resulting in an event verdict: pass or fail. Each event is evaluated only until the confidence level according to Table G.2.3-1 in Annex G clause G.2 is achieved. Different events may require different times for a verdict.
If both events pass, the test passes. If one event fails, the test fails.

7.1.1.2.4.3 Message contents

Message contents are according to TS 38.508-1 [14] clause 7.3 with the following exceptions:

Table 7.1.1.2.4.3-1: Common Exception messages

Default Message Contents	
Common contents of system information blocks exceptions	Table H.2.2-1 for NR Cell 1
Default RRC messages and information elements contents exceptions	

Table 7.1.1.2.4.3-2: *RACH-ConfigGeneric*: NR cell re-selection

Derivation Path: TS 38.508-1 [14], Table 4.6.3-130			
Information Element	**Value/remark**	**Comment**	**Condition**
RACH-ConfigGeneric ::= SEQUENCE {			
prach-ConfigurationIndex	190		

}			

Table 7.1.1.2.4.3-3: SIB1 (Cell 1 and Cell 2)

Derivation Path: Table H.2.2-3			
Information Element	**Value/remark**	**Comment**	**Condition**
SIB1 ::= SEQUENCE {			
cellSelectionInfo SEQUENCE {			
q-RxLevMin	-70	Actual value is -62*2 = -140dBm	7.1.1.2-1 and Cell 1
	-68	Actual value is -62*2 = -136dBm	7.1.1.2-2 and Cell 1
	-62	Actual value is -62*2 = -124dBm	7.1.1.2-1 and Cell 2
	-60	Actual value is -62*2 = -120dBm	7.1.1.2-2 and Cell 2
}			
}			

Table 7.1.1.2.4.3-4: SIB2(Cell2)

Derivation Path: Table H.2.2-1 with condition NR Cell 2			
Information Element	**Value/remark**	**Comment**	**Condition**
SIB2 ::= SEQUENCE {			
cellReselectionServingFreqInfo SEQUENCE {			
s-NonIntraSearchP	31	Actual value is 31*2 = 62dBm	
threshServingLowP	31	Actual value is 31*2 = 62dBm	
}			
}			

Table 7.1.1.2.4.3-5: SIB4 (Cell 1)

Derivation Path: Table H.2.2-2 with condition NR Cell 1, SMTC.1 and Synchronous cells			
Information Element	**Value/remark**	**Comment**	**Condition**
SIB4 ::= SEQUENCE {			
interFreqCarrierFreqList SEQUENCE (SIZE (1..maxFreq)) OF InterFreqCarrierFreqInfo {	1 Entry		
InterFreqCarrierFreqInfo[1] SEQUENCE {		Entry 1	
q-RxLevMin	-70	Actual value = -70*2 = -140dBm	7.1.1.2-1
	-68	Actual value = -68*2 = -136dBm	7.1.1.2-2
threshX-HighP	16	Actual value is 16*2 = 32dBm	
}			
}			
}			

Table 7.1.1.2.4.3-6: SIB4 (Cell 2)

Derivation Path: Table H.2.2-2 with condition NR Cell 2, SMTC.1 and Synchronous cells			
Information Element	**Value/remark**	**Comment**	**Condition**
SIB4 ::= SEQUENCE {			
interFreqCarrierFreqList SEQUENCE (SIZE (1..maxFreq)) OF InterFreqCarrierFreqInfo {	1 Entry		
InterFreqCarrierFreqInfo[1] SEQUENCE {		Entry 1	
q-RxLevMin	-62	Actual value = -62*2 = -124dBm	7.1.1.2-1
	-60	Actual value = -60*2 = -120dBm	7.1.1.2-2

threshX-LowP	9	Actual value = 9*2 = 18dBm	
}			
}			
}			

7.1.1.2.5 Test requirement

Tables 7.1.1.2.4.1-3 and 7.1.1.2.5-1 define the primary level settings including test tolerances for inter frequency NR cell re-selection test case.

Table 7.1.1.2.5-1: Cell specific test parameters for NR SA FR2-FR2 cell re-selection

Parameter	Unit	Test configuration	Cell 1			Cell 2		
			T1	T2	T3	T1	T2	T3
TDD configuration		1, 2	TDDConf.3.1			TDDConf.3.1		
PDSCH RMC configuration		1, 2	SR.3.1 TDD			SR.3.1 TDD		
RMSI CORESET parameters		1, 2	CR.3.1 TDD			CR.3.1 TDD		
RMSI CORESET RMC configuration		1, 2	CCR.3.1 TDD			CCR.3.1 TDD		
OCNG Pattern		1, 2	OP.1			OP.1		
Initial DL BWP configuration		1, 2	DLBWP.0.1			DLBWP.0.1		
BWchannel	MHz	1, 2	100: NRB,c = 66			100: NRB,c = 66		
Data RBs allocated		1, 2	66			66		
Initial UL BWP configuration		1, 2	ULBWP.0.1			ULBWP.0.1		
RLM-RS		1, 2	SSB			SSB		
Qrxlevmin	dBm/SCS	1	-140			-124 Note 6		
		2	-137			-121 Note 6		
Pcompensation	dB	1, 2	0			0		
$Qhyst_s$	dB	1, 2	0			0		
$Qoffset_{s,n}$	dB	1, 2	0			0		
Cell_selection_and_reselection_quality_measurement		1, 2	SS-RSRP			SS-RSRP		
AoA setup		1, 2	Setup 1 defined in A. 9.1			Setup 1 defined in A. 9.1		
Beam assumption Note 4		1,2	Rough					
$\hat{E}_s/I_{ot\ \mathrm{BB}}$ Note 5	dB	1	810.06	810.06	87.56	-3-3.34	-infinity	88.06
		2						
N_{oc} Note2	dBm/SCS	1	-93					
		2	-90					
N_{oc} Note2	dBm/15 kHz	1	-102					
		2						
$\hat{E}_s/N_{oc}$	dB	1	810.5	810.5	8	-3-2.9 Note 6	-infinity	88.5
		2						
SS-RSRP Note3	dBm/SCS	1	-85-82.5	-85-82.5	-85	-96-95.9	-infinity	-85-84.5
		2	-82-79.5	-82-79.5	-82	-93-92.9	-infinity	-82-91.5
Io	dBm/95.04 MHz	1	-55.37-53.11	-55.37-53.11	-55.37-55.34	-62.25-62.18	-infinity-63.98	-55.37-54.91
		2	-53.11-52.37	-53.11-52.37	-55.34-52.37	-62.18-59.25	-63.98-infinity	-54.91-52.37
Treselection	s	1, 2	0	0	0	0	0	0
SnonintrasearchP	dB	1, 2	50			62 Note 6		
$Thresh_{x,highP}$	dB	1, 2	32 Note 6			48		
$Thresh_{serving,lowP}$	dB	1, 2	44			62 Note 6		
$Thresh_{x,lowP}$	dB	1, 2	50			18 Note 6		
Propagation Condition		1, 2	AWGN					

Note 1:	OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.
Note 2:	Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for N_{oc} to be fulfilled.
Note 3:	SS-RSRP levels have been derived from other parameters for information purposes. They are not settable parameters themselves.
Note 4:	Information about types of UE beam is given in B.2.1.3, and does not limit UE implementation or test system implementation
Note 5:	Calculation of Es/Iot_{BB} includes the effect of UE internal noise up to the value assumed for the associated Refsens requirement in clause 7.3.2 of TS 38.101-2 [19], and an allowance of 1dB for UE multi-band relaxation factor ΔMB_P from TS 38.101-2 [19] Table 6.2.1.3-4.
Note 6:	Including the test tolerance given in Annex F.

The cell reselection delay to a higher priority cell is defined as the time from the beginning of time period T3, to the moment when the UE camps again on cell 2, and starts to send preambles on the PRACH for sending the RRC SETUP REQUEST message to perform a Registration procedure for mobility on cell 2.

The cell re-selection delay to a higher priority cell test requirement in this case is expressed as:

Cell re-selection delay to a higher priority cell = $T_{higher_priority_search} + T_{evaluate,\ NR_\ inter} + T_{SI\text{-}NR}$

$T_{higher_priority_search}$ = 60 s, as specified in TS 38.133 [6] clause 4.2.2.7;

$T_{evaluate,\ NR_\ inter}$ = 25.6 s, as specified in TS 38.133 [6] clause 4.2.2.4;

$T_{SI\text{-}NR}$ = 1280 ms; maximum repetition period of relevant system info blocks that needs to be received by the UE to camp on a cell is assumed in this test.

The cell re-selection delay to a higher priority cell shall be less than a total of 86.88 seconds in this test case (note: this gives a total of 86.88 seconds but this test allows 87 seconds)

The cell reselection delay to a lower priority cell is defined as the time from the beginning of time period T1, to the moment when the UE camps on cell 1, and starts to send preambles on the PRACH for sending the RRC SETUP REQUEST message to perform a Registration procedure for mobility on cell 1.

The cell re-selection delay to a lower priority cell test requirement in this case is expressed as:

Cell re-selection delay to a lower priority cell = $T_{evaluate,\ NR_\ inter} + T_{SI\text{-}NR}$

$T_{evaluate,\ NR_\ inter}$ = 25.6 s, as specified in TS 38.133 [6] clause 4.2.2.4;

$T_{SI\text{-}NR}$ = 1280 ms; maximum repetition period of relevant system info blocks that needs to be received by the UE to camp on a cell is assumed in this test.

The cell re-selection delay to a lower priority cell shall be less than a total of 26.88 seconds in this test case (note: this gives a total of 26.88 seconds but this test allows 27 seconds)

For the test to pass, both events above shall pass.

The statistical pass/fail decisions are done separated for each event. For an event to pass, the total number of successful loops shall be more than 90% of the cases with a confidence level of 95%.

7.1.1.3 NR SA FR2 cell re-selection for UE fulfilling low mobility relaxed measurement criterion

Editor's Note: This test case is complete for the following configurations:

- Test frequency f ≤ 40.8 GHz.
- UE PC3

This test case is incomplete for Test frequency f > 40.8 GHz

This test case is incomplete for UE power class other than PC3.

7.1.1.3.1 Test purpose

The purpose of this test is to verify the requirement for the intra frequency NR cell reselection requirements when UE fulfils the low mobility relaxed measurement criterion specified in TS 38.133 clause 4.2.2.9.

7.1.1.3.2 Test applicability

This test applies to all types of NR UE from Release 16 onwards supporting relaxed RRM measurement.

7.1.1.3.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 7.1.1.0.3.

The normative reference for this requirement is TS 38.133 [6] clause A.7.1.1.3.

7.1.1.3.4 Test description

7.1.1.3.4.1 Initial conditions

This test shall be run in one of the configurations defined in Table 7.1.1.3.4.1-1.

Table 7.1.1.3.4.1-1: Supported test configurations for NR SA FR2 cell re-selection for UE fulfilling low mobility relaxed measurement criterion

Configuration	Description
7.1.1.3-1	120 kHz SSB SCS, 100 MHz bandwidth, TDD duplex mode
7.1.1.3-2	240 kHz SSB SCS, 100 MHz bandwidth, TDD duplex mode
Note: The UE is only required to be tested in one of the supported test configurations.	

Configure the test equipment and the DUT according to the parameters in Table 7.1.1.3.4.1-2.

Table 7.1.1.3.4.1-2: Initial conditions for NR SA FR2 cell re-selection for UE fulfilling low mobility relaxed measurement criterion

Parameter	Value		Comment
Test environment	NC		As specified in TS 38.508-1 [14] clause 4.1.
Test frequencies	As specified in Annex E, table E.4-1 and TS 38.508-1 [14] clause 4.3.1.		
Channel bandwidth	As specified by the test configuration selected from Table 7.1.1.3.4.1-1.		
Propagation conditions	AWGN		As specified in Annex C.2.2.
Connection Diagram	TE Part	A.3.1.6.1	As specified in TS 38.508-1 [14] Annex A.
	DUT Part	A.3.2.3.2	
Exceptions to connection diagram	N/A		

1. The general test parameter settings are set up according to Table 7.1.1.3.4.1-3.

2. Message contents are defined in clause 7.1.1.3.4.3.

3. There is one NR carrier and 2 NR Cells specified in the test. Cell 1 is the PCell and Cell 2 is the neighbour cell. Cell 1 and Cell 2 are configured according to Annex C.1.1 and C.1.2.

Table 7.1.1.3.4.1-3: General test parameters for NR SA FR2 cell re-selection for UE fulfilling low mobility relaxed measurement criterion

Parameter		Unit	Test configuration	Value	Comment
Initial condition	Active cell		1, 2	Cell1	The UE camps on cell 1 in the initial phase
	Neighbour cells		1, 2	Cell2	
T1 end condition	Active cell		1, 2	Cell2	The UE reselects to cell 2 during T1 period

	Neighbour cells		1, 2	Cell1	
Final condition	Active cell		1, 2	Cell1	The UE reselects to cell 1 during T2 period
	Neighbour cells		1,2	Cell2	
RF Channel Number			1, 2	1	
Time offset between cells			1, 2	3 μs	Synchronous cells
Access Barring Information		-	1, 2	Not Sent	No additional delays in random access procedure.
SMTC configuration			1, 2	SMTC pattern 1	
DRX cycle length		s	1, 2	0.64	The value shall be used for all cells in the test.
PRACH configuration index			1, 2	190	The detailed configuration is specified in TS 38.211 clause 6.3.3.2
rangeToBestCell			1, 2	Not configured	
T1		s	1, 2	100	
T2		s	1, 2	100	

7.1.1.3.4.2 Test procedure

Two cells are deployed in the test, which are one FR2 NR PCell (Cell 1) and an NR neighbour cell (Cell 2) on the same frequency. The test consists of 2 successive time periods, with time duration of T1, T2 respectively. Both cell 1 and cell2 are already identified by the UE prior to the start of the test. Cell 1 and cell 2 belong to different tracking areas.

The UE is configured only low mobility criterion defined in clause 5.2.4.9.1 in TS 38.304 [30]. So, Cell 1 configures the UE as follows:

- *lowMobilityEvaluation* [2] is configured according to the parameters listed in Table 7.1.1.3.5-1;
- *cellEdgeEvaluation* [2] is not configured;
- *combineRelaxedMeasCondition* [2] is not configured

In the following test procedure “UE responds” means “UE starts transmitting preamble on PRACH for sending the RRC SETUP REQUEST message to perform a Registration procedure for mobility.

1. Ensure the UE is in state RRC_IDLE with generic procedure parameters Connectivity NR, Connected without release *On* and Test Mode *On* according to TS 38.508-1 [14] clause 4.5.
2. Set the parameters according to T1 in Table 7.1.1.3.5-1. T1 starts.
3. The SS waits for random access requests information from the UE to perform cell re-selection to Cell 2.
4. If the UE responds on Cell 2 during time duration T1 within 100 seconds from the beginning of time period T1, then count a success for cell reselection. Otherwise count a fail for cell reselection.
5. If the UE has re-selected Cell 2 within T1, after the re-selection or when T1 expires, continue with step 6. Otherwise, if T1 expires and the UE has not yet re-selected Cell 2, the TE shall switch off and on the UE and skip to step 10.

5a The SS shall send an RRCConnectionRelease to ensure that the UE is in state RRC_IDLE.

6. The SS shall switch the power setting from T1 to T2 as specified in Table 7.1.1.3.5-1. T2 starts.
7. The SS waits for random access requests information from the UE to perform cell re-selection to an already detected cell, Cell 1.
8. If the UE responds to Cell 1 during time duration T2 within 100 seconds from the beginning of time period T2, then count a success for cell reselection. Otherwise count a fail for cell reselection.
9. If the UE has re-selected Cell 1 within T2, after the re-selection or when T2 expires, continue with step 10. Otherwise, if T2 expires and the UE has not yet re-selected Cell 1, the TE shall switch off and on the UE and continue with step 10.

10. Ensure the UE is in state RRC_IDLE with generic procedure parameters Connectivity NR, Connected without release *On* and Test Mode *On* according to TS 38.508-1 [14] clause 4.5.

11. Repeat step 2-10 until the confidence level according to Tables G.2.3-1 in Annex G clause G.2 is achieved.

7.1.1.3.4.3 Message contents

Message contents are according to TS 38.508-1 [14] clause 7.3 with the following exceptions:

Table 7.1.1.3.4.3-1: Common Exception messages

Default Message Contents	
Common contents of system information blocks exceptions	Table H.2.1-2
Default RRC messages and information elements contents exceptions	

Table 7.1.1.3.4.3-2: *RACH-ConfigGeneric*: NR cell re-selection

Derivation Path: TS 38.508-1 [14], Table 4.6.3-130			
Information Element	**Value/remark**	**Comment**	**Condition**
RACH-ConfigGeneric ::= SEQUENCE {			
prach-ConfigurationIndex	190		
}			

Table 7.1.1.3.4.3-2A: SIB1 (Cell 1 and Cell 2)

Derivation Path: Table H.2.1-3			
Information Element	**Value/remark**	**Comment**	**Condition**
SIB1 ::= SEQUENCE {			
cellSelectionInfo SEQUENCE {			
q-RxLevMin	-60	Actual value is -60*2 = -120dBm	7.1.1.3-1
	-58	Actual value is -58*2 = -116dBm	7.1.1.3-2
}			
}			

Table 7.1.1.3.4.3-3: SIB2

Derivation Path: Table H.2.1-1 with condition SMTC.1 and Synchronous cells			
Information Element	**Value/remark**	**Comment**	**Condition**
SIB2 ::= SEQUENCE {			
intraFreqCellReselectionInfo SEQUENCE {			
q-RxLevMin	-60	Actual value is -60*2 = -120dBm	7.1.1.3-1
	-58	Actual value is -58*2 = -116dBm	7.1.1.3-2
s-IntraSearchP	25	Actual value is 25*2 = 50dB	
}			
relaxedMeasurement-r16 SEQUENCE {			
lowMobilityEvaluation-r16 SEQUENCE {			
s-SearchDeltaP-r16	dB6		
t-SearchDeltaP-r16	s5		
}			
cellEdgeEvaluation-r16	Not present		
combineRelaxedMeasCondition-r16	Not present		
highPriorityMeasRelax-r16	Not present		
}			
}			

7.1.1.3.5 Test requirement

Tables 7.1.1.3.4.1-3 and 7.1.1.3.5-1 define the primary level settings including test tolerances for intra frequency NR cell re-selection test case for UE fulfilling low mobility relaxed measurement criterion.

Table 7.1.1.3.5-1: Cell specific test parameters for NR SA FR2 cell re-selection for UE fulfilling low mobility relaxed measurement criterion

Parameter	Unit	Test configuration	Cell 1		Cell 2	
			T1	T2	T1	T2
TDD configuration		1, 2	TDDConf.3.1		TDDConf.3.1	
PDSCH RMC configuration		1	SR.3.1 TDD		SR.3.1 TDD	
		2	SR.3.1 TDD		SR.3.1 TDD	
RMSI CORESET RMC configuration		1	CR.3.1 TDD		CR.3.1 TDD	
		2	CR.3.1 TDD		CR.3.1 TDD	
Dedicated CORESET RMC configuration		1	CCR.3.1 TDD		CCR.3.1 TDD	
		2	CCR.3.1 TDD		CCR.3.1 TDD	
SSB configuration		1	SSB.3 FR2		SSB.7 FR2	
		2	SSB.4 FR2		SSB.8 FR2	
OCNG Pattern		1, 2	OP.4		OP.4	
$BW_{channel}$	MHz	1, 2	100: $N_{RB,c}$ = 66		100: $N_{RB,c}$ = 66	
Data RBs allocated		1, 2	66		66	
Initial DL BWP configuration		1, 2	DLBWP.0.1		DLBWP.0.1	
Initial UL BWP configuration		1, 2	ULBWP.0.1		ULBWP.0.1	
RLM-RS		1, 2	SSB		SSB	
Qrxlevmin	dBm/SCS	1	-120 Note 6		-120 Note 6	
		2	-117 Note 6		-117 Note 6	
$S_{SearchDeltaP}$	dB	1, 2	6		6	
$T_{SearchDeltaP}$	s	1,2	5		5	
Pcompensation	dB	1, 2	0		0	
$Qhyst_s$	dB	1, 2	0		0	
$Qoffset_{s,n}$	dB	1, 2	0		0	
Cell_selection_and_reselection_quality_measurement		1, 2	SS-RSRP		SS-RSRP	
AoA setup		1, 2	Setup 1 defined in A.3.15.1		Setup 1 defined in A.3.15.1	
Beam assumption Note 4		1,2	Rough		Rough	
$\hat{E}_s/I_{ot}$ BB Note 5	dB	1	-3.34	1.61	1.61	-3.64
		2				
N_{oc} Note2	dBm/SCS	1	-93			
		2	-90			
N_{oc} Note2	dBm/15 kHz	1	-102			
		2				
$\hat{E}_s/N_{oc}$	dB	1	-2.9 Note 6	2.05 Note 6	2.05 Note 6	-2.9 Note 6
		2				
SS-RSRP Note3	dBm/SCS	1	-95.9	-90.9	-90.9	-95.9
		2	-92.9	-87.9	-87.9	-92.9
Io on SSB symbols of each cell	dBm/95.04 MHz	1	-67.37	-65.01	-65.01	-67.37
		2	-64.36	-62.00	-62.00	-64.36
Treselection	s	1, 2	0	0	0	0
SintrasearchP	dB	1, 2	50		50	
Propagation Condition		1, 2	AWGN			

Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.
Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for N_{oc} to be fulfilled.
Note 3: SS-RSRP levels have been derived from other parameters for information purposes. They are not settable parameters themselves.
Note 4: Information about types of UE beam is given in B.2.1.3, and does not limit UE implementation or test system implementation
Note 5: Calculation of Es/Iot_{BB} includes the effect of UE internal noise up to the value assumed for the associated Refsens requirement in clause 7.3.2 of TS 38.101-2 [19], and an allowance of 1dB for UE multi-band relaxation factor ΔMB_P from TS 38.101-2 [19] Table 6.2.1.3-4.
Note 6: Including the test tolerance given in Annex F.

The cell reselection delay to an already detected cell for UE fulfilling low mobility relaxed criterion is defined as the time from the beginning of time period T1, to the moment when the UE camps on Cell 2, and starts to send preambles on the PRACH for sending the *RRCSetupRequest* message to perform a Tracking Area Update procedure on Cell 2.

The cell reselection delay to an already detected cell for UE fulfilling low mobility relaxed criterion is also defined as the time from the beginning of time period T2, to the moment when the UE camps on Cell 1, and starts to send preambles on the PRACH for sending the *RRCSetupRequest* message to perform a Tracking Area Update procedure on Cell 1.

The cell re-selection delay to an already detected cell shall be less than 79 s.

The rate of correct cell reselections observed during repeated tests shall be at least 90%.

The cell re-selection delay to an already detected cell test requirement in this case is expressed as:

Cell re-selection to an already detected cell delay = $T_{evaluate,NR_Intra} + T_{SI-NR}$

$T_{evaluate,NR_Intra}$ = 76.8 s; as specified in TS 38.133 [6] clause 4.2.2.9.

T_{SI-NR} = 1280 ms; maximum repetition period of relevant system info blocks that needs to be received by the UE to camp on a cell is assumed in this test.

This gives a total of 78.08 s, allow 79s for the cell re-selection delay to an already detected cell for UE fulfilling low mobility criterion in the test case.

7.1.1.4 NR SA FR2 cell re-selection for UE fulfilling not-at-cell edge relaxed measurement criterion

Editor's Note: This test case is complete for the following configurations:

- Test frequency f ≤ 40.8 GHz.
- UE PC3

This test case is incomplete for Test frequency f > 40.8 GHz

This test case is incomplete for UE power class other than PC3.

7.1.1.4.1 Test purpose

The purpose of this test is to verify the requirement for the intra frequency NR cell reselection requirements when UE fulfils the not-at-cell edge relaxed measurement criterion specified in TS 38.133 clause 4.2.2.9.

7.1.1.4.2 Test applicability

This test applies to all types of NR UE from Release 16 onwards supporting relaxed RRM measurement.

7.1.1.4.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 7.1.1.0.3.

The normative reference for this requirement is TS 38.133 [6] clause A.7.1.1.4.

7.1.1.4.4 Test description

7.1.1.4.4.1 Initial conditions

This test shall be run in one of the configurations defined in Table 7.1.1.4.4.1-1.

Table 7.1.1.4.4.1-1: Supported test configurations for NR SA FR2 cell re-selection for UE fulfilling not-at-cell edge relaxed measurement criterion

Configuration	Description
7.1.1.4-1	120 kHz SSB SCS, 100 MHz bandwidth, TDD duplex mode
7.1.1.4-2	240 kHz SSB SCS, 100 MHz bandwidth, TDD duplex mode
Note: The UE is only required to be tested in one of the supported test configurations.	

Configure the test equipment and the DUT according to the parameters in Table 7.1.1.4.4.1-2.

Table 7.1.1.4.4.1-2: Initial conditions for NR SA FR2 cell re-selection for UE fulfilling not-at-cell edge relaxed measurement criterion

Parameter	Value		Comment
Test environment	NC		As specified in TS 38.508-1 [14] clause 4.1.
Test frequencies	As specified in Annex E, table E.4-1 and TS 38.508-1 [14] clause 4.3.1.		
Channel bandwidth	As specified by the test configuration selected from Table 7.1.1.4.4.1-1.		
Propagation conditions	AWGN		As specified in Annex C.2.2.
Connection Diagram	TE Part	A.3.1.6.1	As specified in TS 38.508-1 [14] Annex A.
	DUT Part	A.3.2.3.2	
Exceptions to connection diagram	N/A		

1. The general test parameter settings are set up according to Table 7.1.1.4.4.1-3.
2. Message contents are defined in clause 7.1.1.4.4.3.
3. There is one NR carrier and 2 NR Cells specified in the test. Cell 1 is the PCell and Cell 2 is the neighbour cell. Cell 1 and Cell 2 are configured according to Annex C.1.1 and C.1.2.

Table 7.1.1.4.4.1-3: General test parameters for NR SA FR2 cell re-selection for UE fulfilling not-at-cell edge relaxed measurement criterion

Parameter		Unit	Test configuration	Value	Comment
Initial condition	Active cell		1, 2	Cell1	The UE camps on cell 1 in the initial phase
	Neighbour cells		1, 2	Cell2	
T1 end condition	Active cell		1, 2	Cell2	The UE reselects to cell 2 during T1 period
	Neighbour cells		1, 2	Cell1	
Final condition	Active cell		1, 2	Cell1	
	Neighbour cells		1,2	Cell2	
RF Channel Number			1, 2	1	
Time offset between cells			1, 2	3 μs	Synchronous cells
Access Barring Information		-	1, 2	Not Sent	No additional delays in random access procedure.
SMTC configuration			1, 2	SMTC pattern 1	
DRX cycle length		s	1, 2	0.64	The value shall be used for all cells in the test.

PRACH configuration index		1, 2	190	The detailed configuration is specified in TS 38.211 clause 6.3.3.2
rangeToBestCell		1, 2	Not configured	
T1	s	1, 2	100	
T2	s	1, 2	100	

7.1.1.4.4.2 Test procedure

Two cells are deployed in the test, which are one FR2 NR PCell (Cell 1) and an NR neighbour cell (Cell 2) on the same frequency. The test consists of 2 successive time periods, with time duration of T1, T2 respectively. Both cell 1 and cell2 are already identified by the UE prior to the start of the test. Cell 1 and cell 2 belong to different tracking areas.

The UE is configured only not-at-cell edge criterion defined in clause 5.2.4.9.1 in TS 38.304 [30]. So, Cell 1 configures the UE as follows:

- *lowMobilityEvaluation* [2] is not configured;
- *cellEdgeEvaluation* [2] is configured according to the parameters listed in Table 7.1.1.4.5-1;
- *combineRelaxedMeasCondition* [2] is not configured

In the following test procedure “UE responds” means “UE starts transmitting preamble on PRACH for sending the RRC SETUP REQUEST message to perform a Registration procedure for mobility.

1. Ensure the UE is in state RRC_IDLE with generic procedure parameters Connectivity NR, Connected without release *On* and Test Mode *On* according to TS 38.508-1 [14] clause 4.5.
2. Set the parameters according to T1 in Table 7.1.1.4.5-1. T1 starts.
3. The SS waits for random access requests information from the UE to perform cell re-selection to Cell 2.
4. If the UE responds on Cell 2 during time duration T1 within 100 seconds from the beginning of time period T1, then count a success for cell reselection. Otherwise count a fail for cell reselection.
5. If the UE has re-selected Cell 2 within T1, after the re-selection or when T1 expires, continue with step 6. Otherwise, if T1 expires and the UE has not yet re-selected Cell 2, the TE shall switch off and on the UE and skip to step 10.

5a The SS shall send an RRCConnectionRelease to ensure that the UE is in state RRC_IDLE.

6. The SS shall switch the power setting from T1 to T2 as specified in Table 7.1.1.4.5-1. T2 starts.
7. The SS waits for random access requests information from the UE to perform cell re-selection to an already detected cell, Cell 1.
8. If the UE responds to Cell 1 during time duration T2 within 100 seconds from the beginning of time period T2, then count a success for cell reselection. Otherwise count a fail for cell reselection.
9. If the UE has re-selected Cell 1 within T2, after the re-selection or when T2 expires, continue with step 10. Otherwise, if T2 expires and the UE has not yet re-selected Cell 1, the TE shall switch off and on the UE and continue with step 10.
10. Ensure the UE is in state RRC_IDLE with generic procedure parameters Connectivity NR, Connected without release *On* and Test Mode *On* according to TS 38.508-1 [14] clause 4.5.
11. Repeat step 2-10 until the confidence level according to Tables G.2.3-1 in Annex G clause G.2 is achieved.

7.1.1.4.4.3 Message contents

Message contents are according to TS 38.508-1 [14] clause 7.3 with the following exceptions:

Table 7.1.1.4.4.3-1: Common Exception messages

Default Message Contents

Common contents of system information blocks exceptions	Table H.2.1-2
Default RRC messages and information elements contents exceptions	

Table 7.1.1.4.4.3-2: *RACH-ConfigGeneric*: NR cell re-selection

Derivation Path: TS 38.508-1 [14], Table 4.6.3-130			
Information Element	**Value/remark**	**Comment**	**Condition**
RACH-ConfigGeneric ::= SEQUENCE {			
prach-ConfigurationIndex	190		
}			

Table 7.1.1.4.4.3-2A: SIB1 (Cell 1 and Cell 2)

Derivation Path: Table H.2.1-3			
Information Element	**Value/remark**	**Comment**	**Condition**
SIB1 ::= SEQUENCE {			
cellSelectionInfo SEQUENCE {			
q-RxLevMin	-60	Actual value is -60*2 = -120dBm	7.1.1.4-1
	-58	Actual value is -58*2 = -116dBm	7.1.1.4-2
}			
}			

Table 7.1.1.4.4.3-3: SIB2 (Cell 1 and Cell 2)

Derivation Path: Table H.2.1-1 with condition SMTC.1 and Synchronous cells			
Information Element	**Value/remark**	**Comment**	**Condition**
SIB2 ::= SEQUENCE {			
intraFreqCellReselectionInfo SEQUENCE {			
q-RxLevMin	-60	Actual value is -60*2 = -120dBm	7.1.1.4-1
	-58	Actual value is -58*2 = -116dBm	7.1.1.4-2
s-IntraSearchP	25	Actual value is 25*2 = 50dB	
relaxedMeasurement-r16 SEQUENCE {			
lowMobilityEvaluation-r16	Not present		
cellEdgeEvaluation-r16 SEQUENCE {			
s-SearchThresholdP-r16	4	Actual value is 4*2 = 8dBm	
}			
combineRelaxedMeasCondition-r16	Not present		
highPriorityMeasRelax-r16	Not present		
}			
}			

7.1.1.4.5 Test requirement

Tables 7.1.1.4.4.1-3 and 7.1.1.4.5-1 define the primary level settings including test tolerances for intra frequency NR cell re-selection test case for UE fulfilling not-at-cell edge relaxed measurement criterion.

Table 7.1.1.4.5-1: Cell specific test parameters for NR SA FR2 cell re-selection for UE fulfilling not-at-cell edge relaxed measurement criterion

Parameter	Unit	Test configuration	Cell 1	Cell 2

			T1	T2	T1	T2
TDD configuration		1, 2	TDDConf.3.1		TDDConf.3.1	
PDSCH RMC configuration		1	SR.3.1 TDD		SR.3.1 TDD	
		2	SR.3.1 TDD		SR.3.1 TDD	
RMSI CORESET RMC configuration		1	CR.3.1 TDD		CR.3.1 TDD	
		2	CR.3.1 TDD		CR.3.1 TDD	
Dedicated CORESET RMC configuration		1	CCR.3.1 TDD		CCR.3.1 TDD	
		2	CCR.3.1 TDD		CCR.3.1 TDD	
SSB configuration		1	SSB.3 FR2		SSB.7 FR2	
		2	SSB.4 FR2		SSB.8 FR2	
OCNG Pattern		1, 2	OP.4		OP.4	
$BW_{channel}$	MHz	1, 2	100: $N_{RB,c}$ = 66		100: $N_{RB,c}$ = 66	
Data RBs allocated		1, 2	66		66	
Initial DL BWP configuration		1, 2	DLBWP.0.1		DLBWP.0.1	
Initial UL BWP configuration		1, 2	ULBWP.0.1		ULBWP.0.1	
RLM-RS		1, 2	SSB		SSB	
Qrxlevmin	dBm/SCS	1	-120 Note 6		-120 Note 6	
		2	-117 Note 6		-117 Note 6	
Pcompensation	dB	1, 2	0		0	
$Qhyst_s$	dB	1, 2	0		0	
$Qoffset_{s,n}$	dB	1, 2	0		0	
Cell_selection_and_reselection_quality_measurement		1, 2	SS-RSRP		SS-RSRP	
AoA setup		1, 2	Setup 1 defined in A.3.15.1		Setup 1 defined in A.3.15.1	
Beam assumption Note 4		1,2	Rough		Rough	
$\hat{E}_s/I_{ot}$ BB Note 5	dB	1	-3.34	1.61	1.61	-3.34
		2				
N_{oc} Note2	dBm/SCS	1	-93			
		2	-90			
N_{oc} Note2	dBm/15 kHz	1	-102			
		2				
$\hat{E}_s/N_{oc}$	dB	1	-2.90 Note 6	2.05 Note 6	2.05 Note 6	-2.90 Note 6
		2				
SS-RSRP Note3	dBm/SCS	1	-95.9	-90.9	-90.9	-95.9
		2	-92.9	-87.9	-87.9	-92.9
Io on SSB symbols of each cell	dBm/95.04 MHz	1	-67.37	-65.01	-65.01	-67.37
		2	-64.36	-62.00	-62.00	-64.36
Treselection	s	1, 2	0	0	0	0
$S_{SearchThresholdP}$		1, 2	8 Note 6	8 Note 6	8 Note 6	8 Note 6
SintrasearchP	dB	1, 2	50		50	
Propagation Condition		1, 2	AWGN			

Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.
Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for N_{oc} to be fulfilled.
Note 3: SS-RSRP levels have been derived from other parameters for information purposes. They are not settable parameters themselves.
Note 4: Information about types of UE beam is given in B.2.1.3, and does not limit UE implementation or test system implementation
Note 5: Calculation of Es/Iot_{BB} includes the effect of UE internal noise up to the value assumed for the associated Refsens requirement in clause 7.3.2 of TS 38.101-2 [19], and an allowance of 1dB for UE multi-band relaxation factor ΔMB_P from TS 38.101-2 [19] Table 6.2.1.3-4.
Note 6: Including the test tolerance given in Annex F.

The cell reselection delay to an already detected cell for UE fulfilling not-at-cell edge relaxed criterion is defined as the time from the beginning of time period T1, to the moment when the UE camps on Cell 2, and starts to send preambles on the PRACH for sending the *RRCSetupRequest* message to perform a Tracking Area Update procedure on Cell 2.

The cell reselection delay to an already detected cell for UE fulfilling not-at-cell edge relaxed criterion is also defined as the time from the beginning of time period T2, to the moment when the UE camps on Cell 1, and starts to send preambles on the PRACH for sending the *RRCSetupRequest* message to perform a Tracking Area Update procedure on Cell 1.

The cell re-selection delay to an already detected cell shall be less than 79 s.

The rate of correct cell reselections observed during repeated tests shall be at least 90%.

The cell re-selection delay to an already detected cell test requirement in this case is expressed as:

Cell re-selection to an already detected cell delay = $T_{evaluate,NR_Intra} + T_{SI-NR}$

$T_{evaluate,NR_Intra}$ = 76.8 s; as specified in TS 38.133 [6] clause 4.2.2.9.

T_{SI-NR} = 1280 ms; maximum repetition period of relevant system info blocks that needs to be received by the UE to camp on a cell is assumed in this test.

This gives a total of 78.08 s, allow 79s for the cell re-selection delay to an already detected cell for UE fulfilling not-at-cell edge criterion in the test case.

7.1.1.5 NR SA FR2-FR2 cell re-selection for UE fulfilling low mobility relaxed measurement criterion

Editor's Note: This test case is complete for the following configurations:

- Test frequency f ≤ 40.8 GHz.
- UE PC3

This test case is incomplete for Test frequency f > 40.8 GHz

This test case is incomplete for UE power class other than PC3.

7.1.1.5.1 Test purpose

The purpose of this test is to verify the requirement for the inter frequency NR cell reselection requirements when UE fulfils the low mobility relaxed measurement criterion specified in TS 38.133 clause 4.2.2.10.

7.1.1.5.2 Test applicability

This test applies to all types of NR UE from Release 16 onwards supporting relaxed RRM measurement.

7.1.1.5.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 7.1.1.0.4.

The normative reference for this requirement is TS 38.133 [6] clause A.7.1.1.5.

7.1.1.5.4 Test description

7.1.1.5.4.1 Initial conditions

This test shall be run in one of the configurations defined in Table 7.1.1.5.4.1-1.

Table 7.1.1.5.4.1-1: Supported test configurations for NR SA FR2-FR2 cell re-selection for UE fulfilling low mobility relaxed measurement criterion

Configuration	Description
7.1.1.5-1	120 kHz SSB SCS, 100 MHz bandwidth, TDD duplex mode
7.1.1.5-2	240 kHz SSB SCS, 100 MHz bandwidth, TDD duplex mode
Note: The UE is only required to be tested in one of the supported test configurations.	

Configure the test equipment and the DUT according to the parameters in Table 7.1.1.5.4.1-2.

Table 7.1.1.5.4.1-2: Initial conditions for NR SA FR2-FR2 cell re-selection for UE fulfilling low mobility relaxed measurement criterion

Parameter	Value		Comment
Test environment	NC		As specified in TS 38.508-1 [14] clause 4.1.
Test frequencies	As specified in Annex E, table E.4-1 and TS 38.508-1 [14] clause 4.3.1.		
Channel bandwidth	As specified by the test configuration selected from Table 7.1.1.5.4.1-1.		
Propagation conditions	AWGN		As specified in Annex C.2.2.
Connection Diagram	TE Part	A.3.1.6.1	As specified in TS 38.508-1 [14] Annex A.
	DUT Part	A.3.2.3.2	
Exceptions to connection diagram	N/A		

1. The general test parameter settings are set up according to Table 7.1.1.5.4.1-3.
2. Message contents are defined in clause 7.1.1.5.4.3.
3. There is one NR carrier and 2 NR Cells specified in the test. Cell 1 is the PCell and Cell 2 is the neighbour cell. Cell 1 and Cell 2 are configured according to Annex C.1.1 and C.1.2.

Table 7.1.1.5.4.1-3: General test parameters for NR SA FR2-FR2 cell re-selection for UE fulfilling low mobility relaxed measurement criterion

Parameter		Unit	Test configuration	Value	Comment
Initial condition	Active cell		1, 2	Cell2	The UE camps on cell2 and fulfils low mobility (*lowMobilityEvalutation* [2]) criterion.
	Neighbour cell		1, 2	Cell1	
T1 final condition	Active cell		1, 2	Cell1	The UE reselects to low priority cell1 during T1
	Neighbour cell		1, 2	Cell2	
T2 final condition	Active cell		1, 2	Cell2	The UE reselects to high priority cell2 during T2
	Neighbour cell			Cell1	
RF Channel Number			1, 2	1, 2	
Time offset between cells			1, 2	3 μs	Synchronous cells
Access Barring Information		-	1, 2	Not Sent	No additional delays in random access procedure.
SSB configuration			1	SSB.1 FR2	

		2	SSB.2 FR2	
SMTC configuration		1, 2	SMTC pattern 1	
DRX cycle length	s	1, 2	0.64	The value shall be used for all cells in the test.
PRACH configuration index		1, 2	190	The detailed configuration is specified in TS 38.211 clause 6.3.3.2
rangeToBestCell		1, 2	Not configured	
T1	s	1, 2	85	T1 needs to be long enough to allow cell re-selection to already known cell1
T2	s	1, 2	85	T2 needs to be long enough to allow cell re-selection to already known cell2

7.1.1.5.4.2 Test procedure

The test consists of one active cell and one neighbour cell. The UE is requested to monitor the neighbouring cell on one of the NR carriers. The test consists of two successive time periods, with time duration of T1, T2 respectively. Both Cell 1 and Cell 2 are already identified by the UE prior to the start of the test. Cell 1 and Cell 2 belong to different tracking areas and Cell 2 is of higher priority than Cell 1.

The UE is configured only low mobility criterion defined in clause 5.2.4.9.1 in TS 38.304 [30]. So, Cell 1 configures the UE as follows:

- *lowMobilityEvaluation* [2] is configured according to the parameters listed in Table 7.1.1.5.5-1;
- *cellEdgeEvaluation* [2] is not configured;
- *combineRelaxedMeasCondition* [2] is not configured

In the following test procedure “UE responds” means “UE starts transmitting preamble on PRACH for sending the RRC SETUP REQUEST message to perform a Registration procedure for mobility.

1. Ensure the UE is in state RRC_IDLE with generic procedure parameters Connectivity NR, Connected without release *On* and Test Mode *On* according to TS 38.508-1 [14] clause 4.5.
2. Set the parameters according to T1 in Table 7.1.1.5.5-1. T1 starts.
3. The SS waits for random access requests information from the UE to perform cell re-selection to Cell 1.
4. If the UE responds on lower priority Cell 1 during time duration T1 within 85 seconds from the beginning of time period T1, then count a success for the event “Re-select lower priority Cell 1”. Otherwise count a fail for the event “Re-select lower priority Cell 1”
5. If the UE has re-selected Cell 1 within T1, after the re-selection or when T1 expires, continue with step 6. Otherwise, if T1 expires and the UE has not yet re-selected Cell 1, the TE shall switch off and on the UE and skip to step 10.

5a The SS shall send an RRCConnectionRelease to ensure that the UE is in state RRC_IDLE.

6. The SS shall switch the power setting from T1 to T2 as specified in Table 7.1.1.5.5-1. T2 starts.
7. The SS waits for random access requests information from the UE to perform cell re-selection to an already detected cell, Cell 2.
8. If the UE responds to higher priority Cell 2 during time duration T2 within 85 seconds from the beginning of time period T2, then count a success for the event “Re-select higher priority Cell 2”. Otherwise count a fail for the event “Re-select higher priority Cell 2”
9. If the UE has re-selected Cell 2 within T2, after the re-selection or when T2 expires, continue with step 10. Otherwise, if T2 expires and the UE has not yet re-selected Cell 2, the TE shall switch off and on the UE and continue with step 10.

10. Ensure the UE is in state RRC_IDLE with generic procedure parameters Connectivity NR, Connected without release *On* and Test Mode *On* according to TS 38.508-1 [14] clause 4.5.

11. Repeat step 2-10 until a test verdict has been achieved.
    Each of the events "Re-select lower priority Cell 1" and "Re-select higher priority Cell 2" is evaluated independently for the statistic, resulting in an event verdict: pass or fail. Each event is evaluated only until the confidence level according to Table G.2.3-1 in Annex G clause G.2 is achieved. Different events may require different times for a verdict.
    If both events pass, the test passes. If one event fails, the test fails.

7.1.1.5.4.3 Message contents

Message contents are according to TS 38.508-1 [14] clause 7.3 with the following exceptions:

Table 7.1.1.5.4.3-1: Common Exception messages

Default Message Contents	
Common contents of system information blocks exceptions	
Default RRC messages and information elements contents exceptions	

Table 7.1.1.5.4.3-2: *RACH-ConfigGeneric*: NR cell re-selection

Derivation Path: TS 38.508-1 [14], Table 4.6.3-130			
Information Element	**Value/remark**	**Comment**	**Condition**
RACH-ConfigGeneric ::= SEQUENCE {			
prach-ConfigurationIndex	190		
}			

Table 7.1.1.5.4.3-2A: SIB1 (Cell 1 and Cell 2)

Derivation Path: Table H.2.2-3			
Information Element	**Value/remark**	**Comment**	**Condition**
SIB1 ::= SEQUENCE {			
cellSelectionInfo SEQUENCE {			
q-RxLevMin	-70	Actual value is -62*2 = -140dBm	7.1.1.5-1 and Cell 1
	-68	Actual value is -62*2 = -136dBm	7.1.1.5-2 and Cell 1
	-62	Actual value is -62*2 = -124dBm	7.1.1.5-1 and Cell 2
	-60	Actual value is -62*2 = -120dBm	7.1.1.5-2 and Cell 2
}			
}			

Table 7.1.1.5.4.3-3: SIB2 (Cell 1 and Cell 2)

Derivation Path: Table H.2.2-1			
Information Element	**Value/remark**	**Comment**	**Condition**
SIB2 ::= SEQUENCE {			
cellReselectionServingFreqInfo SEQUENCE {			
s-NonIntraSearchP	31	Actual value is 31*2 = 62dBm	Cell 2
threshServingLowP	31	Actual value is 31*2 = 62dBm	Cell 2
cellReselectionPriority	4		Cell 1
	5		Cell 2
}			
relaxedMeasurement-r16 SEQUENCE {			
lowMobilityEvaluation-r16 SEQUENCE {			

s-SearchDeltaP-r16	dB12		
t-SearchDeltaP-r16	s5		
}			
cellEdgeEvaluation-r16	Not present		
combineRelaxedMeasCondition-r16	Not present		
highPriorityMeasRelax-r16	Not present		
}			
}			

Table 7.1.1.5.4.3-4: SIB4 (Cell 1)

Derivation Path: Table H.2.2-2 with condition NR Cell 1, SMTC.1 and Synchronous cells			
Information Element	**Value/remark**	**Comment**	**Condition**
SIB4 ::= SEQUENCE {			
interFreqCarrierFreqList SEQUENCE (SIZE (1..maxFreq)) OF InterFreqCarrierFreqInfo {	1 Entry		
InterFreqCarrierFreqInfo[1] SEQUENCE {		Entry 1	
q-RxLevMin	-70	Actual value = -70*2 = -140dBm	7.1.1.2-1
	-68	Actual value = -68*2 = -136dBm	7.1.1.2-2
threshX-HighP	16	Actual value is 16*2 = 32dBm	
}			
}			
}			

Table 7.1.1.5.4.3-5: SIB4 (Cell 2)

Derivation Path: Table H.2.2-2 with condition NR Cell 2, SMTC.1 and Synchronous cells			
Information Element	**Value/remark**	**Comment**	**Condition**
SIB4 ::= SEQUENCE {			
interFreqCarrierFreqList SEQUENCE (SIZE (1..maxFreq)) OF InterFreqCarrierFreqInfo {	1 Entry		
InterFreqCarrierFreqInfo[1] SEQUENCE {		Entry 1	
q-RxLevMin	-62	Actual value = -62*2 = -124dBm	7.1.1.2-1
	-60	Actual value = -60*2 = -120dBm	7.1.1.2-2
threshX-LowP	9	Actual value = 9*2 = 18dBm	
}			
}			
}			

7.1.1.5.5 Test requirement

Tables 7.1.1.5.4.1-3 and 7.1.1.5.5-1 define the primary level settings including test tolerances for inter frequency NR cell re-selection test case for UE fulfilling low mobility relaxed measurement criterion.

Table 7.1.1.5.5-1: Cell specific test parameters for NR SA FR2-FR2 cell re-selection for UE fulfilling low mobility relaxed measurement criterion

Parameter	Unit	Test configuration	Cell 1		Cell 2	
			T1	T2	T1	T2
TDD configuration		1, 2	TDDConf.3.1		TDDConf.3.1	
PDSCH RMC configuration		1, 2	SR.3.1 TDD		SR.3.1 TDD	
RMSI CORESET parameters		1, 2	CR.3.1 TDD		CR.3.1 TDD	

RMSI CORESET RMC configuration		1, 2	CCR.3.1 TDD		CCR.3.1 TDD	
OCNG Pattern		1, 2	OP.1 defined in A.3.2.1		OP.1 defined in A.3.2.1	
BWchannel	MHz	1, 2	100: NRB,c = 66		100: NRB,c = 66	
Data RBs allocated		1, 2	66		66	
Initial DL BWP configuration		1, 2	DLBWP.0.1		DLBWP.0.1	
Initial UL BWP configuration		1, 2	ULBWP.0.1		ULBWP.0.1	
RLM-RS		1, 2	SSB		SSB	
Qrxlevmin	dBm/SCS	1	-140		-124 Note6	
		2	-137		-121 Note6	
Pcompensation	dB	1, 2	0		0	
$Qhyst_s$	dB	1, 2	0		0	
$Qoffset_{s, n}$	dB	1, 2	0		0	
Cell_selection_and_reselection_quality_measurement		1, 2	SS-RSRP		SS-RSRP	
AoA setup		1, 2	Setup 1 defined in A.3.15.1		Setup 1 defined in A.3.15.1	
Beam assumption Note 4		1, 2	Rough		Rough	
$\hat{E}_s/I_{ot\ \mathrm{BB}}$ Note 5	dB	1, 2	10.06	[87.56	-3.34-3	8.06[8]
N_{oc} Note2	dBm/SCS	1	-93		-93	
		2	-90		-90	
N_{oc} Note2	dBm/15 kHz	1, 2	-102		-102	
$\hat{E}_s/N_{oc}$	dB	1, 2	10.58	8	-2.9 Note6	-3 8.58
SS-RSRP Note3	dBm/SCS	1	-82.5-85	-85-85	-95.9-96	-84.5-85
		2	-79.5-82	-82-82	-92.9-93	-81.5-82
Io	dBm/95.04 MHz	1	-53.11-55.37	-55.34-55.37	-62.18-62.25	-54.91-55.37
		2	-53.11-52.37	-55.34-52.37	-62.18-59.25	-54.91-52.37
TreselectionNR	s	1, 2	0		0	
SnonintrasearchP	dB	1, 2	50		Not sent	
$S_{SearchDeltaP}$	dB	1, 2	12 Note6		12 Note6	
$T_{SearchDeltaP}$	s	1, 2	5		5	
$Thresh_{x, high}$	dB	1, 2	32 Note6		48	
$Thresh_{serving, low}$	dB	1, 2	44		62 Note6	
$Thresh_{x, low}$	dB	1, 2	50		18 Note6	
Propagation Condition		1, 2	AWGN		AWGN	

Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.

Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for N_{oc} to be fulfilled.

Note 3: SS-RSRP levels have been derived from other parameters for information purposes. They are not settable parameters themselves.

Note 4: Information about types of UE beam is given in B.2.1.3, and does not limit UE implementation or test system implementation

Note 5: Calculation of Es/Iot_{BB} includes the effect of UE internal noise up to the value assumed for the associated Refsens requirement in clause 7.3.2 of TS 38.101-2 [19], and an allowance of 1dB for UE multi-band relaxation factor ΔMB_P from TS 38.101-2 [19] Table 6.2.1.3-4.

Note 6: Including the test tolerance given in Annex F.

The cell reselection delay to an already detected low priority cell (Cell 1) for UE fulfilling low mobility criterion is defined as the time from the beginning of time period T1, to the moment when the UE camps on Cell 1, and starts to send preambles on the PRACH for sending the *RRCSetupRequest* message to perform a Tracking Area Update procedure on Cell 1.

The cell re-selection delay to an already detected low priority cell, Cell 1, shall be less than 79 s.

The cell reselection delay to an already detected high priority cell (Cell 2) for UE fulfilling low mobility criterion is defined as the time from the beginning of time period T2, to the moment when the UE camps on Cell 2, and starts to send preambles on the PRACH for sending the *RRCSetupRequest* message to perform a Tracking Area Update procedure on Cell 2.

The cell re-selection delay to an already detected high priority cell, Cell 2, shall be less than 79 s.

NOTE 1: The cell re-selection delay to an already detected low priority cell can be expressed as: $T_{evaluate, NR_ inter}$ + T_{SI-NR}

NOTE 2: The cell re-selection delay to an already detected higher priority cell can be expressed as: $T_{evaluate, NR_ inter}$ + T_{SI-NR}

Where:

$T_{evaluate, NR_ inter}$ as speciied in TS 38.133 Table 4.2.2.10.2-1 in clause 4.2.2.10.2

T_{SI-NR} Maximum repetition period of relevant system info blocks that needs to be received by the UE to camp on a cell; 1280 ms is assumed in this test case.

This gives a total of 78.08 s, allow 79 s for the cell re-selection delay to an already detected low priority cell for UE fulfilling low mobility criterion in the test case.

This gives a total of 78.08 s, allow 79 s for the cell re-selection delay to an already detected high priority cell for UE fulfilling low mobility criterion in the test case.

For the test to pass, both events above shall pass.

The statistical pass/fail decisions are done separated for each event. For an event to pass, the total number of successful loops shall be more than 90% of the cases with a confidence level of 95%.

7.1.1.6 NR SA FR2-FR2 cell re-selection for UE fulfilling not-at-cell edge relaxed measurement criterion

Editor's Note: This test case is complete for the following configurations:

- Test frequency f ≤ 40.8 GHz.
- UE PC3

This test case is incomplete for Test frequency f > 40.8 GHz

This test case is incomplete for UE power class other than PC3.

7.1.1.6.1 Test purpose

The purpose of this test is to verify the requirement for the inter frequency NR cell reselection requirements when UE fulfils the not-at-cell edge relaxed measurement criterion specified in TS 38.133 clause 4.2.2.10.

7.1.1.6.2 Test applicability

This test applies to all types of NR UE from Release 16 onwards supporting relaxed RRM measurement.

7.1.1.6.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 7.1.1.0.4.

The normative reference for this requirement is TS 38.133 [6] clause A.7.1.1.6.

7.1.1.6.4 Test description

7.1.1.6.4.1 Initial conditions

This test shall be run in one of the configurations defined in Table 7.1.1.6.4.1-1.

Table 7.1.1.6.4.1-1: Supported test configurations for NR SA FR2-FR2 cell re-selection for UE fulfilling not-at-cell edge relaxed measurement criterion

Configuration	Description
7.1.1.6-1	120 kHz SSB SCS, 100 MHz bandwidth, TDD duplex mode
7.1.1.6-2	240 kHz SSB SCS, 100 MHz bandwidth, TDD duplex mode
Note: The UE is only required to be tested in one of the supported test configurations.	

Configure the test equipment and the DUT according to the parameters in Table 7.1.1.6.4.1-2.

Table 7.1.1.6.4.1-2: Initial conditions for NR SA FR2-FR2 cell re-selection for UE fulfilling not-at-cell edge relaxed measurement criterion

Parameter	Value		Comment
Test environment	NC		As specified in TS 38.508-1 [14] clause 4.1.
Test frequencies	As specified in Annex E, table E.4-1 and TS 38.508-1 [14] clause 4.3.1.		
Channel bandwidth	As specified by the test configuration selected from Table 7.1.1.6.4.1-1.		
Propagation conditions	AWGN		As specified in Annex C.2.2.
Connection Diagram	TE Part	A.3.1.6.1	As specified in TS 38.508-1 [14] Annex A.
	DUT Part	A.3.2.3.2	
Exceptions to connection diagram	N/A		

1. The general test parameter settings are set up according to Table 7.1.1.6.4.1-3.

2. Message contents are defined in clause 7.1.1.6.4.3.

3. There is one NR carrier and 2 NR Cells specified in the test. Cell 1 is the PCell and Cell 2 is the neighbour cell. Cell 1 and Cell 2 are configured according to Annex C.1.1 and C.1.2.

Table 7.1.1.6.4.1-3: General test parameters for NR SA FR2-FR2 cell re-selection for UE fulfilling not-at-cell edge relaxed measurement criterion

Parameter		Unit	Test configuration	Value	Comment
Initial condition	Active cell		1, 2	Cell2	The UE camps on cell2 and fulfils not-at-cell edge (*cellEdgeEvaluation* [2]) criterion.
	Neighbour cell		1, 2	Cell1	
T1 final condition	Active cell		1, 2	Cell1	The UE reselects to low priority cell1 during T1
	Neighbour cell		1, 2	Cell2	
T2 final condition	Active cell		1, 2	Cell2	The UE reselects to high priority cell2 during T2
	Neighbour cell		1, 2	Cell1	
RF Channel Number			1, 2	1, 2	
Time offset between cells			1, 2	3 μs	Synchronous cells
Access Barring Information		-	1, 2	Not Sent	No additional delays in random access procedure.
SSB configuration			1	SSB.1 FR2	
			2	SSB.2 FR2	
SMTC configuration			1, 2	SMTC pattern 1	
DRX cycle length		s	1, 2	0.64	The value shall be used for all cells in the test.
PRACH configuration index			1, 2	190	The detailed configuration is specified in TS 38.211 clause 6.3.3.2
rangeToBestCell			1, 2	Not configured	

T1	s	1, 2	85	T1 needs to be long enough to allow cell re-selection to already known cell.
T2	s	1, 2	85	T2 needs to be long enough to allow cell re-selection to already known cell.

7.1.1.6.4.2 Test procedure

The test consists of one active cell and one neighbour cell. The UE is requested to monitor the neighbouring cell on one of the NR carriers. The test consists of two successive time periods, with time duration of T1, T2 respectively. Both Cell 1 and Cell 2 are already identified by the UE prior to the start of the test. Cell 1 and Cell 2 belong to different tracking areas and Cell 2 is of higher priority than Cell 1.

The UE is configured only not-at-cell edge criterion defined in clause 5.2.4.9.1 in TS 38.304 [30]. So, Cell 1 configures the UE as follows:

- *lowMobilityEvaluation* [2] is not configured;
- *cellEdgeEvaluation* [2] is configured according to the parameters listed in Table 7.1.1.6.5-1;
- *combineRelaxedMeasCondition* [2] is not configured

In the following test procedure “UE responds” means “UE starts transmitting preamble on PRACH for sending the RRC SETUP REQUEST message to perform a Registration procedure for mobility.

1. Ensure the UE is in state RRC_IDLE with generic procedure parameters Connectivity NR, Connected without release *On* and Test Mode *On* according to TS 38.508-1 [14] clause 4.5.
2. Set the parameters according to T1 in Table 7.1.1.6.5-1. T1 starts.
3. The SS waits for random access requests information from the UE to perform cell re-selection to Cell 1.
4. If the UE responds on lower priority Cell 1 during time duration T1 within 85 seconds from the beginning of time period T1, then count a success for the event “Re-select lower priority Cell 1”. Otherwise count a fail for the event “Re-select lower priority Cell 1”
5. If the UE has re-selected Cell 1 within T1, after the re-selection or when T1 expires, continue with step 6. Otherwise, if T1 expires and the UE has not yet re-selected Cell 1, the TE shall switch off and on the UE and skip to step 10.

5a The SS shall send an RRCConnectionRelease to ensure that the UE is in state RRC_IDLE.

6. The SS shall switch the power setting from T1 to T2 as specified in Table 7.1.1.6.5-1. T2 starts.
7. The SS waits for random access requests information from the UE to perform cell re-selection to an already detected cell, Cell 2.
8. If the UE responds to higher priority Cell 2 during time duration T2 within 85 seconds from the beginning of time period T2, then count a success for the event “Re-select higher priority Cell 2”. Otherwise count a fail for the event “Re-select higher priority Cell 2”
9. If the UE has re-selected Cell 2 within T2, after the re-selection or when T2 expires, continue with step 10. Otherwise, if T2 expires and the UE has not yet re-selected Cell 2, the TE shall switch off and on the UE and continue with step 10.
10. Ensure the UE is in state RRC_IDLE with generic procedure parameters Connectivity NR, Connected without release *On* and Test Mode *On* according to TS 38.508-1 [14] clause 4.5.
11. Repeat step 2-10 until a test verdict has been achieved.
    Each of the events “Re-select lower priority Cell 1” and “Re-select higher priority Cell 2” is evaluated independently for the statistic, resulting in an event verdict: pass or fail. Each event is evaluated only until the confidence level according to Table G.2.3-1 in Annex G clause G.2 is achieved. Different events may require different times for a verdict.
    If both events pass, the test passes. If one event fails, the test fails.

7.1.1.6.4.3 Message contents

Message contents are according to TS 38.508-1 [14] clause 7.3 with the following exceptions:

Table 7.1.1.6.4.3-1: Common Exception messages

Default Message Contents	
Common contents of system information blocks exceptions	
Default RRC messages and information elements contents exceptions	

Table 7.1.1.6.4.3-2: *RACH-ConfigGeneric*: NR cell re-selection

Derivation Path: TS 38.508-1 [14], Table 4.6.3-130			
Information Element	**Value/remark**	**Comment**	**Condition**
RACH-ConfigGeneric ::= SEQUENCE {			
prach-ConfigurationIndex	190		
}			

Table 7.1.1.6.4.3-2A: SIB1 (Cell 1 and Cell 2)

Derivation Path: Table H.2.2-3			
Information Element	**Value/remark**	**Comment**	**Condition**
SIB1 ::= SEQUENCE {			
cellSelectionInfo SEQUENCE {			
q-RxLevMin	-70	Actual value is -62*2 = -140dBm	7.1.1.6-1 and Cell 1
	-68	Actual value is -62*2 = -136dBm	7.1.1.6-2 and Cell 1
	-62	Actual value is -62*2 = -124dBm	7.1.1.6-1 and Cell 2
	-60	Actual value is -62*2 = -120dBm	7.1.1.6-2 and Cell 2
}			
}			

Table 7.1.1.6.4.3-3: SIB2 (Cell 1 and Cell 2)

Derivation Path: Table H.2.2-1			
Information Element	**Value/remark**	**Comment**	**Condition**
SIB2 ::= SEQUENCE {			
cellReselectionServingFreqInfo SEQUENCE {			
s-NonIntraSearchP	31	Actual value is 31*2 = 62dBm	Cell 2
threshServingLowP	31	Actual value is 31*2 = 62dBm	Cell 2
cellReselectionPriority	4		Cell 1
	5		Cell 2
}			
relaxedMeasurement-r16 SEQUENCE {			
lowMobilityEvaluation-r16	Not present		
cellEdgeEvaluation-r16 SEQUENCE {			
s-SearchThresholdP-r16	18	Actual value = 18*2 = 36dB	Cell 1
	6	Actual value = 6*2 = 12dB	Cell 2
}			
combineRelaxedMeasCondition-r16	Not present		
highPriorityMeasRelax-r16	Not present		

}			
}			

Table 7.1.1.6.4.3-4: SIB4 (Cell 1)

Derivation Path: Table H.2.2-2 with condition NR Cell 1, SMTC.1 and Synchronous cells			
Information Element	**Value/remark**	**Comment**	**Condition**
SIB4 ::= SEQUENCE {			
interFreqCarrierFreqList SEQUENCE (SIZE (1..maxFreq)) OF InterFreqCarrierFreqInfo {	1 Entry		
InterFreqCarrierFreqInfo[1] SEQUENCE {		Entry 1	
q-RxLevMin	-70	Actual value = -70*2 = -140dBm	7.1.1.6-1
	-68	Actual value = -68*2 = -136dBm	7.1.1.6-2
threshX-HighP	16	Actual value is 16*2 = 32dBm	
}			
}			
}			

Table 7.1.1.6.4.3-5: SIB4 (Cell 2)

Derivation Path: Table H.2.2-2 with condition NR Cell 2, SMTC.1 and Synchronous cells			
Information Element	**Value/remark**	**Comment**	**Condition**
SIB4 ::= SEQUENCE {			
interFreqCarrierFreqList SEQUENCE (SIZE (1..maxFreq)) OF InterFreqCarrierFreqInfo {	1 Entry		
InterFreqCarrierFreqInfo[1] SEQUENCE {		Entry 1	
q-RxLevMin	-62	Actual value = -62*2 = -124dBm	7.1.1.6-1
	-60	Actual value = -60*2 = -120dBm	7.1.1.6-2
threshX-LowP	9	Actual value = 9*2 = 18dBm	
}			
}			
}			

7.1.1.6.5 Test requirement

Tables 7.1.1.6.4.1-3 and 7.1.1.6.5-1 define the primary level settings including test tolerances for inter frequency NR cell re-selection test case for UE fulfilling not-at-cell edge relaxed measurement criterion.

Table 7.1.1.6.5-1: Cell specific test parameters for NR SA FR2-FR2 cell re-selection for UE fulfilling not-at-cell edge relaxed measurement criterion

Parameter	**Unit**	**Test configuration**	**Cell 1**		**Cell 2**	
			T1	**T2**	**T1**	**T2**
TDD configuration		1, 2	TDDConf.3.1		TDDConf.3.1	
PDSCH RMC configuration		1, 2	SR.3.1 TDD		SR.3.1 TDD	
RMSI CORESET parameters		1, 2	CR.3.1 TDD		CR.3.1 TDD	
RMSI CORESET RMC configuration		1, 2	CCR.3.1 TDD		CCR.3.1 TDD	
OCNG Pattern		1, 2	OP.1 defined in A.3.2.1		OP.1 defined in A.3.2.1	
$BW_{channel}$	MHz	1, 2	100: $N_{RB,c}$ = 66		100: $N_{RB,c}$ = 66	
Data RBs allocated		1, 2	66		66	
Initial DL BWP configuration		1, 2	DLBWP.0.1		DLBWP.0.1	

Initial UL BWP configuration		1, 2	ULBWP.0.1		ULBWP.0.1	
RLM-RS		1, 2	SSB		SSB	
Qrxlevmin	dBm/SCS	1	-140		-124 Note 6	
		2	-137		-121 Note 6	
Pcompensation	dB	1, 2	0		0	
$Qhyst_s$	dB	1, 2	0		0	
$Qoffset_{s,n}$	dB	1, 2	0		0	
Cell_selection_and_reselection_quality_measurement		1, 2	SS-RSRP		SS-RSRP	
AoA setup		1, 2	Setup 1 defined in A.3.15.1		Setup 1 defined in A.3.15.1	
Beam assumption Note 4		1, 2	Rough		Rough	
$\hat{E}_s/I_{ot\ \mathrm{BB}}$ Note 5	dB	1, 2	10.06	7.56	-3.34	8.06
N_{oc} Note2	dBm/SCS	1	-93		-93	
		2	-90		-90	
N_{oc} Note2	dBm/15 kHz	1, 2	-102		-102	
$\hat{E}_s/N_{oc}$	dB	1, 2	10.5	8	-2.9 Note 6	8.5
SS-RSRP Note3	dBm/SCS	1	-82.5	-85	-95.9	-84.5
		2	-79.5	-82	-92.9	-81.5
Io	dBm/95.04 MHz	1	-53.11	-55.34	-62.18	-54.91
		2	-53.11	-55.34	-62.18	-54.91
$S_{SearchThresholdP}$		1, 2	35	35	12 Note 6	12 Note 6
TreselectionNR	s	1, 2	0		0	
SnonintrasearchP	dB	1, 2	50		Not sent	
$Thresh_{x,high}$	dB	1, 2	32 Note 6		48	
$Thresh_{serving,low}$	dB	1, 2	44		62 Note 6	
$Thresh_{x,low}$	dB	1, 2	50		18 Note 6	
Propagation Condition		1, 2	AWGN		AWGN	

Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.

Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for N_{oc} to be fulfilled.

Note 3: SS-RSRP levels have been derived from other parameters for information purposes. They are not settable parameters themselves.

Note 4: Information about types of UE beam is given in B.2.1.3, and does not limit UE implementation or test system implementation

Note 5: Calculation of Es/Iot_{BB} includes the effect of UE internal noise up to the value assumed for the associated Refsens requirement in clause 7.3.2 of TS 38.101-2 [19], and an allowance of 1dB for UE multi-band relaxation factor ΔMB_P from TS 38.101-2 [19] Table 6.2.1.3-4.

Note 6: Including the test tolerance given in Annex F.

The cell reselection delay to an already detected low priority cell (Cell 1) for UE fulfilling not-at-cell edge criterion is defined as the time from the beginning of time period T1, to the moment when the UE camps on Cell 1, and starts to send preambles on the PRACH for sending the *RRCSetupRequest* message to perform a Tracking Area Update procedure on Cell 1.

The cell re-selection delay to an already detected low priority cell, Cell 1, shall be less than 79 s.

The cell reselection delay to an already detected high priority cell (Cell 2) for UE fulfilling not-at-cell edge criterion is defined as the time from the beginning of time period T2, to the moment when the UE camps on Cell 2, and starts to send preambles on the PRACH for sending the *RRCSetupRequest* message to perform a Tracking Area Update procedure on Cell 2.

The cell re-selection delay to an already detected high priority cell, Cell 2, shall be less than 79 s.

NOTE 1: The cell re-selection delay to an already detected low priority cell can be expressed as: $T_{evaluate, NR_ inter}$ + T_{SI-NR}

NOTE 2: The cell re-selection delay to an already detected higher priority cell can be expressed as: $T_{evaluate, NR_ inter}$ + T_{SI-NR}

Where:

$T_{evaluate, NR_ inter}$ as speciied in TS 38.133 Table 4.2.2.10.2-1 in clause 4.2.2.10.2

T_{SI-NR} Maximum repetition period of relevant system info blocks that needs to be received by the UE to camp on a cell; 1280 ms is assumed in this test case.

This gives a total of 78.08 s, allow 79 s for the cell re-selection delay to an already detected low priority cell for UE fulfilling not-at-cell edge criterion in the test case.

This gives a total of 78.08 s, allow 79 s for the cell re-selection delay to an already detected high priority cell for UE fulfilling not-at-cell edge criterion in the test case.

For the test to pass, both events above shall pass.

The statistical pass/fail decisions are done separated for each event. For an event to pass, the total number of successful loops shall be more than 90% of the cases with a confidence level of 95%.

7.2 RRC_INACTIVE state mobility

7.2.1 Small Data Transmission

7.2.1.0 Minimum conformance requirements

7.2.1.0.1 Minimum conformance requirements for CG-SDT TA validation

The UE is allowed to transmit using the configured uplink resources provided that the UE is synchronized towards (i.e. using the timing derived using the latest available N_{TA} value as specified in subclause 7.1.2 of TS 38.133 [6]) the serving cell prior to transmission. If the UE is not able to obtain the synchronization towards the serving cell then the UE shall drop the small data transmission. The UE determines the small data transmission occasion according to the received CG-SDT configuration (see TS 38.331 [13]).

When *cg-SDT-RSRP-ChangeThreshold* (see TS 38.331 [13]) is configured for TA validation based on the RSRP change criterion according to clause 5.8.2 of TS 38.321 [12], the UE is allowed to transmit using CG-SDT using the timing derived using the latest available N_{TA} value as specified in subclause 7.1 of TS 38.133 [6] provided that

- the first RSRP ($RSRP_1$) measurement and the second RSRP ($RSRP_2$) measurements used in the TA validation are valid measurements and,
- timing alignment validation for transmission using CG-SDT is valid according to the validation criteria in clause 5.8.2 of TS 38.321 [12].

$RSRP_1$ and $RSRP_2$ are considered valid provided that the conditions in Table 7.2.1.0.1-1 are met for FR2-1.

Table 7.2.1.0.1-1 Valid measurement for FR2-1

Measurement	FR2-1
$RSRP_1$	(T1 – max(480ms, 8*SMTC periodicity)) ≤ T1' ≤ (T1 + max(480ms, 8*SMTC periodicity))
$RSRP_2$	(T2 – max(480ms, 8*SMTC periodicity)) ≤ T2' ≤ T2

If at least one of $RSRP_1$ and $RSRP_2$ is considered to be invalid based on the above conditions, then the UE shall not validate the CG-SDT using $RSRP_1$ and $RSRP_2$ and shall not transmit using CG-SDT. Additionally, the UE shall not transmit in an CG-SDT occasion that occurs more than 640 ms after T2.

Where:

- T1 is the time when

- *RRCRelease* with CG-SDT configuration (see TS 38.331 [13]) is received
- the latest TA is received if TA is received while in RRC_INACTIVE state.

- T1' is the time when the UE has completed $RSRP_1$.
- T2 is the time when the UE performs TA validation as defined in clause 5.27.2 of TS 38.321 [12] for transmission using CG-SDT.
- T2' is the time when the UE has completed $RSRP_2$.
- T_{DRX} is the DRX cycle length in ms.
- M1 is the scaling factor as defined in clause 4.2.2.2 of TS 38.133 [6].

The normative reference for this requirement is TS 38.133 [6] clause 5.5.2 and 5.5.3.

7.2.1.1 TA Validation for CG-SDT in FR2

Editor's note: This test case is incomplete. The following aspects are either missing or TBD

- Test procedure, some parameters are not complete in RAN4. In particular, timers T1, T2, T3, T4, T5, W1 and W2 are missing. The values of power levels P_0, P_1, P_2 and P_3 need to be explicitly defined.
- Message contents
- Test requirements are not completed in RAN4
- TT analysis is missing
- Test Applicability in TS38.522
- Annex F

7.2.1.1.1 Test Purpose

The purpose of this test is to verify that the UE correctly performs TA validation for CG-SDT. This test will partly verify the TA validation requirements in clause 5.5.3 of TS 38.133 [6].

7.2.1.1.2 Test Applicability

This test applies to all types of NR UE from Release 17 onwards that supports transmission of data and/or signalling over allowed radio bearers in RRC_INACTIVE state via configured grant type 1 (i.e., CG-SDT), as specified in TS 38.331 [13].

7.2.1.1.3 Minimum Conformance Requirements

The minimum conformance requirements are specified in clause 7.2.1.0.1.

The normative reference for this requirement is TS 38.133 [6] clause A.7.2.1.1.

7.2.1.1.4 Test Description

7.2.1.1.4.1 Initial conditions

This test can be run in the configuration defined in Table 7.2.1.1.4.1-1.

Table 7.2.1.1.4.1-1: Supported test configurations for FR2 PCell

Test Case ID	Test Config Index	Description
7.2.1.1-1	1	TDD, SSB SCS 120 KHz, data SCS 120KHz, BW 100 MHz

Configure the test equipment and the DUT according to the parameters in Table 7.2.1.1.4.1-2.

Table 7.2.1.1.4.1-2: Initial conditions for TA Validation for CG-SDT in FR2

Parameter	Value	Comment

Test environment	NC		As specified in TS 38.508-1 [14] clause 4.1.
Test frequencies	As specified in Annex E, Table E.5-1 and TS 38.508-1 [14] clause 4.3.1.		
Channel bandwidth	As specified by the test configuration from Table 7.2.1.1.4.1-1.		
Propagation conditions	AWGN		As specified in Annex C.2.2.
Connection Diagram	TE Part	A.3.3.3.1-1	As specified in TS 38.508-1 [14] Annex A.
	DUT Part	A.3.4.1.1	
Exceptions to connection diagram	N/A		

1. The general test parameter settings are set up according to Table 7.2.1.1.4.1-3.

2. Message contents are defined in clause 7.2.1.1.4.3.

3. There is only one NR Cell (Cell 1) specified in the test, configured as PCell in FR2. The Cell 1 is configured according to the settings in Annex C.1.1 and C.1.2.

Table 7.2.1.1.4.1-3: General test parameters for TA validation for CG-SDT in FR2

Parameter		Unit	Value
			Test 1
Active PCell			Cell 1
RF Channel Number			1
Duplex mode	Config 1		TDD
$BW_{channel}$	Config 1	MHz	100: $N_{RB,c}$ = 66
DL initial BWP configuration	Config 1		DLBWP.0.1
UL initial BWP configuration	Config 1		ULBWP.0.1
TDD Configuration	Config 1		TDDConf.3.1
RMSI CORESET Reference Channel	Config 1		CR.3.1 DD
SSB Configuration	Config 1		SSB.1 FR2
SMTC Configuration	Config 1		SMTC.1
PDSCH/PDCCH subcarrier spacing	Config 1		120 kHz
PRACH Configuration	Config 1		Table A.3.8.3.4 [6]
OCNG parameters			OP.5
CP length			Normal
Correlation Matrix and Antenna Configuration			2x2 Low
DRX		s	1.28
cg-SDT-RSRP-ChangeThreshold		dB	[8]
cg-SDT-TimeAlignmentTime			infinity
CG-SDT resource period		ms	40
T1		s	[TBD]
T2		s	[TBD]
T3		s	[TBD]
T4		s	[TBD]
T5		S	[TBD]

7.2.1.1.4.2 Test procedure

The test consists of a single cell (Cell 1), configured as PCell in FR2. The test consists of 5 successive time periods, with time duration of T1 to T5 respectively. Figure 7.2.1.1.4.2-1 shows the variation of the RSRP level in the active cell during the test.

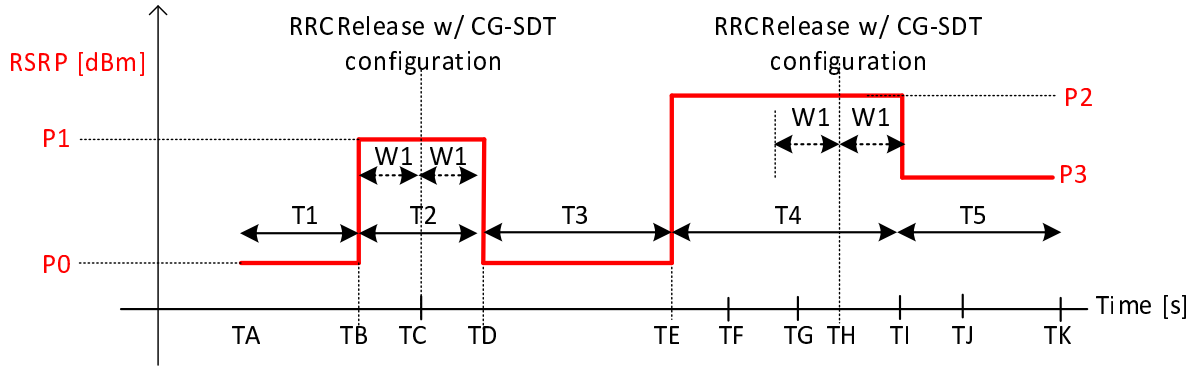


Figure 7.2.1.1.4.2-1: RSRP variation for TA validation for CG-SDT

Time-point TA is the starting point of the test. Prior to time point TA, the UE shall be fully synchronized and registered to PCell (Cell 1).

Time-point TB is T1 duration after TA, i.e., TB = TA + T1.

Time-point TC is the time when 'UE Test Loop Mode B' command (with 'T_delay_modeB' timer configured) and RRC Release message with CG-SDT configuration for 'Subtest 1' are received at the UE and is W1 duration after TB where W1 = max(480ms, 8*SMTC periodicity)), i.e., TC = TB + max(480ms, 8*SMTC periodicity)).

Time-point TD is W1 duration after TC or T2 duration after TB, i.e., TD = TC + max(480ms, 8*SMTC periodicity)) = TB + T2.

Time-point TE is T3 duration after TD, i.e., TE = TD + T3.

Time-point TF is the time when 'T_delay_modeB' timer expires which trigger UL data arrival at UE lower layer and is W2 duration after the time-point TE, i.e., TF = TC + T_delay_modeB = TE + W2 (In general, TE <= TF <= TE + max(480ms, 8*SMTC periodicity))).

Time-point TG is the time when UE transmits with CG-SDT.

Time-point TH is the time when second 'UE Test Loop Mode B' command (with 'T_delay_modeB' timer reconfigured) and second RRC Release message with CG-SDT configuration for 'Subtest 2' are received at the UE and is FFS in RAN4.

Time-point TI is T4 duration after TE and W1 duration after TH, i.e., TI = TE + T4 = TH + W1.

Time-point TJ is the time when 'T_delay_modeB' timer configured in second 'UE Test Loop Mode B' command expires which trigger UL data arrival at UE lower layer, i.e., TJ = TH + T_delay_modeB.

Time-point TK is the end point of the first iteration of the test and is T5 duration after TI, i.e., TK = TI + T5.

1. Ensure the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity *NR*, Connected without release *On* and Test Mode *On* (Test Loop Mode B) according to TS 38.508-1 [14] clause 4.5.

2. Set the parameters according to Table 7.2.1.1.5-1.

3. The test starts at time-point TA at which SS sets the transmit power to P_0.

4. At time-point TB, the SS changes the power level from P_0 to P_1.

5. At time point TC, the SS sends CLOSE UE TEST LOOP message (having a non-zero value of T_delay_modeB timer) and RRCRelease message with CG-SDT configuration to the UE, and the UE enters RRC_INACTIVE state.

6. At time-point TD, the SS changes the power level from P_1 to P_0.

7. At time-point TE, the SS changes the power level from P_0 to P_2.

8. At time-point TF, the T_delay_modeB timer expires which trigger UL data arrival at UE lower layer.

9. At time-point TG, the UE transmits with CG-SDT.
10. Check 1: If UE transmits with CG-SDT within 640ms + Z after TF, i.e., if TF <= TG <= 640 ms + Z, sub-test '1' is passed.
11. SS sends OPEN UE TEST LOOP message to UE.
12. UE sends OPEN UE TEST LOOP COMPLETE message to SS.
13. At time-point TH, the SS sends CLOSE UE TEST LOOP message (having a non-zero value of T_delay_modeB timer) and second RRCRelease message with CG-SDT configuration to UE, and the UE remains in RRC_INACTIVE state.
14. At time-point TI, the SS changes the power level from P_2 to P_3.
15. At time-point TJ, the T_delay_modeB timer expires which trigger UL data arrival at UE lower layer.
16. Check 2: If UE does not transmit with CG-SDT between TJ and TK, sub-test '2' is passed.
17. SS sends OPEN UE TEST LOOP message to UE.
18. UE sends OPEN UE TEST LOOP COMPLETE message to SS.
19. Verdict: If both sub-tests '1' and '2' passed, test passes. If any of the sub-test fail, the test fails.
20. The test ends at time-point TK.

7.2.1.1.4.3 Message contents

TBD

7.2.1.1.5 Test Requirements

Tables 7.2.1.1.4.1-3 and 7.2.1.1.5-1 define the general parameters and cell specific parameters for NR SA FR2 CG-SDT TA validation test.

Table 7.2.1.1.5-1: Cell specific test parameters TA validation for CG-SDT in FR2

Parameter		Unit	Test 1				
			T1	T2	T3	T4	T5
AoA setup			Setup 1 defined in A.9.1				
Assumption for UE beams Note 4			Rough				
EPRE ratio of PDCCH DMRS to SSS		dB	4				
EPRE ratio of PDCCH to PDCCH DMRS		dB	0				
EPRE ratio of PBCH DMRS to SSS		dB	0				
EPRE ratio of PBCH to PBCH DMRS		dB					
EPRE ratio of PSS to SSS		dB					
EPRE ratio of PDSCH DMRS to SSS		dB					
EPRE ratio of PDSCH to PDSCH DMRS		dB					
EPRE ratio of OCNG DMRS to SSS		dB					
EPRE ratio of OCNG to OCNG DMRS		dB					
N_{oc}	Config 1	dBm/15kHz	-100 + TT				
N_{oc}	Config 1	dBm/SCS	-100 + TT				
$\hat{E}_s / I_{ot}$	Config 1	dB	[0] + TT	[10.35] + TT	[0] +TT	[15.25] +TT	[6] +TT
$\hat{E}_s / N_{oc}$	Config 1	dB	[0] + TT	[10.35] + TT	[0] + TT	[15.25] + TT	[6] + TT
SS-RSRP	Config 1	dBm/SCS	[-100] + TT	[-89.65] + TT	[-100] + TT	[-84.75] + TT	[-96] + TT
Io	Config 1	dBm/95.04 MHz	[-69.04] + TT	[-61.31] + TT	[-69.04] + TT	[-56.67] + TT	[-65.07] + TT
Propagation condition			AWGN				

Note 1:	OCNG shall be used such that the resources in Cell 1 are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.
Note 2:	The signal contains PDCCH for UEs other than the device under test as part of OCNG.
Note 3:	SS-RSRP levels have been derived from other parameters for information purposes. They are not settable parameters themselves.
Note 4:	Information about types of UE beam is given in B.2.1.3 and does not limit UE implementation or test system implementation.

The UE behaviour in each test during time durations shall be as follows:

During T4, UE shall transmit UL data with CG-SDT within 640ms + Z after time point TF.

During T5, UE shall not transmit UL data with CG-SDT.

The rate of correct events observed during repeated tests shall be at least 90%.

7.3 RRC_CONNECTED state mobility

7.3.1 Handover

7.3.1.0 Minimum conformance requirements

7.3.1.0.1 Minimum conformance requirements for NR FR2 – NR FR2 handover

When the UE receives a RRC message implying handover the UE shall be ready to start the transmission of the new uplink PRACH channel within $D_{handover}$ ms from the end of the last TTI containing the RRC command:

$$D_{handover} = T_{RRC_procedure_delay} + T_{interruption}$$

Where:

$D_{handover}$ equals the maximum RRC procedure delay to be defined in clause 12 in TS 38.331 [13] plus the interruption time stated in clause 6.1.1.4.2 of 38.133 [6].

The interruption time is the time between end of the last TTI containing the RRC command on the old PDSCH and the time the UE starts transmission of the new PRACH, excluding the RRC procedure delay.

When intra-frequency or inter-frequency handover is commanded, the interruption time shall be less than $T_{interrupt}$

$$T_{interrupt} = T_{search} + T_{IU} + T_{processing} + T_{\Delta} + T_{margin} \text{ ms}$$

Where:

T_{search} is the time required to search the target cell when the handover command is received by the UE. If the target cell is a known cell, then T_{search} = 0 ms. If the target cell is an unknown intra-frequency cell and the target cell Es/Iot≥-2 dB, then T_{search} = N* T_{rs} ms. If the target cell is an unknown inter-frequency cell and the target cell Es/Iot≥-2 dB, then T_{search} = N*3* T_{rs} ms. N = 8 when the target cell is in FR2-1, and N = 12 when the target cell is in FR2-2. Regardless of whether DRX is in use by the UE, T_{search} shall still be based on non-DRX target cell search times.

$T_{processing}$ is time for UE processing. $T_{processing}$ can be up to 20ms.

T_{margin} is time for SSB post-processing. T_{margin} can be up to 2ms.

T_{Δ} is time for fine time tracking and acquiring full timing information of the target cell. T_{Δ} = T_{rs} for both known and unknown target cell.

T_{IU} is the interruption uncertainty in acquiring the first available PRACH occasion in the new cell. T_{IU} can be up to the summation of SSB to PRACH occasion association period and 10 ms. SSB to PRACH occasion associated period is defined in the table 8.1-1 of TS 38.213 [8].

T_{rs} is the SMTC periodicity of the target NR cell if the UE has been provided with an SMTC configuration for the target cell in the handover command, otherwise Trs is the SMTC configured in the measObjectNR having the same SSB frequency and subcarrier spacing. If such measObjectNRs configured by MN and SN have different SMTC, Trs is the periodicity of one of the SMTC which is up to UE implementation. If the UE is not provided SMTC configuration or

measurement object on this frequency, the requirement in this clause is applied with T_{rs}=5ms assuming the SSB transmission periodicity is 5ms. There is no requirement if the SSB transmission periodicity is not 5ms. If the UE has been provided with higher layer in TS 38.331 [13] signalling of *smtc2* prior to the handover command, T_{rs} follows *smtc1* or *smtc2* according to the physical cell ID of the target cell.

In FR2, the target cell is known if it has been meeting the following conditions:

- During the last 5 seconds before the reception of the handover command:
  - the UE has sent a valid measurement report for the target cell and
  - One of the SSBs measured from the NR target cell being configured remains detectable according to the cell identification conditions specified in clause 9.3 of 38.133 [6],
- One of the SSBs measured from the target cell also remains detectable during the handover delay according to the cell identification conditions specified in clause 9.3 of 38.133 [6].

otherwise it is unknown.

The normative reference for this requirement is TS 38.133 [6] clause 6.1.1.4.

7.3.1.0.2 Minimum conformance requirements for NR FR1 – NR FR2 handover

When the UE receives a RRC message implying handover the UE shall be ready to start the transmission of the new uplink PRACH channel within $D_{handover}$ ms from the end of the last TTI containing the RRC command:

$$D_{handover} = T_{RRC_procedure_delay} + T_{interruption}$$

Where:

$D_{handover}$ equals the maximum RRC procedure delay to be defined in clause 12 in TS 38.331 [13] plus the interruption time stated in clause 6.1.1.5.2 of 38.133 [6].

The interruption time is the time between end of the last TTI containing the RRC command on the old PDSCH and the time the UE starts transmission of the new PRACH, excluding the RRC procedure delay.

When in inter-frequency handover is commanded, the interruption time shall be less than $T_{interrupt}$

$$T_{interrupt} = T_{search} + T_{IU} + T_{processing} + T_{\Delta} + T_{margin} \text{ ms}$$

Where:

T_{search} is the time required to search the target cell when the handover command is received by the UE. If the target cell is a known cell, then T_{search} = 0 ms. If the target cell is an unknown inter-frequency cell and the target cell Es/Iot≥-2 dB, then T_{search} = N*3* T_{rs} ms. N = 8 when the target cell is in FR2-1, and N = 12 when the target cell is in FR2-2. Regardless of whether DRX is in use by the UE, T_{search} shall still be based on non-DRX target cell search times.

$T_{processing}$ is time for UE processing. $T_{processing}$ can be up 40ms.

T_{margin} is time for SSB post-processing. T_{margin} can be up to 2ms.

T_{Δ} is time for fine time tracking and acquiring full timing information of the target cell. T_{Δ} = T_{rs} for both known and unknown target cell.

T_{IU} is the interruption uncertainty in acquiring the first available PRACH occasion in the new cell. T_{IU} can be up to the summation of SSB to PRACH occasion association period and 10 ms. SSB to PRACH occasion associated period is defined in the table 8.1-1 of TS 38.213 [8].

T_{rs} is the SMTC periodicity of the target NR cell if the UE has been provided with an SMTC configuration for the target cell in the handover command, otherwise Trs is the SMTC configured in the measObjectNR having the same SSB frequency and subcarrier spacing. If such measObjectNRs configured by MN and SN have different SMTC, Trs is the periodicity of one of the SMTC which is up to UE implementation. If the UE is not provided SMTC configuration or measurement object on this frequency, the requirement in this clause is applied with T_{rs}=5ms assuming the SSB transmission periodicity is 5ms. There is no requirement if the SSB transmission periodicity is not 5ms.

In FR2, the target cell is known if it has been meeting the following conditions:

- During the last 5 seconds before the reception of the handover command:
  - the UE has sent a valid measurement report for the target cell and
  - One of the SSBs measured from the NR target cell being configured remains detectable according to the cell identification conditions specified in clause 9.3 of 38.133 [6],
- One of the SSBs measured from the target cell also remains detectable during the handover delay according to the cell identification conditions specified in clause 9.3 of 38.133 [6].

otherwise it is unknown.

The normative reference for this requirement is TS 38.133 [6] clause 6.1.1.5.

7.3.1.0.3 Minimum conformance requirements for NR FR1 – NR FR2 DAPS handover

An FR1-FR2 DAPS handover is synchronous if it meets the conditions in table 7.3.1.0.3-1, otherwise it is asynchronous

Table 7.3.1.0.3-1: Sync condition for FR1-FR2 DAPS handover

Frequency Range of the pair of carriers	Maximum receive timing difference between source and target cell (μs) for sync DAPS handover	Maximum transmit timing difference between source and target cell (μs)Note 1 sync DAPS handover
Between FR1 and FR2	25	26.1

Procedure delays for the procedure that can command a DAPS handover are specified in TS 38.331 [13].

When the UE receives a RRC message implying handover, the UE shall be ready to start the transmission of the new uplink PRACH channel within $D_{handover1}$ ms from the end of the last TTI containing the RRC command when UE is configured with dual active protocol stack handover.

$$D_{handover1} = T_{RRC_procedure} + T_{search} + T_{IU} + T_{processing} + T_{\Delta} + T_{margin} \text{ ms}$$

Where:

$T_{RRC_procedure}$ is the maximum RRC procedure delay as specified in clause 12 in TS 38.331 [13].

T_{search}, T_{IU}, $T_{processing}$, T_{Δ} and T_{margin} are defined in clause 6.1.1.5.2 of 38.133 [6].

After successful RACH procedure of the target cell, when the UE receives an RRC message implying source cell release command, the UE shall accomplish the release actions specified in TS 38.331 [13] within $D_{handover2}$.

$D_{handover2} = T_{RRC_procedure} + T_{interrupt2}$

Where:

$T_{RRC_procedure}$ is the RRC procedure delay as specified in clause 12 in TS 38.331 [13].

$T_{interrupt2}$ is defined in clause 6.1.3.4.2 of 38.133 [6].

During $D_{handover1}$, the UE is allowed an interruption of up to $T_{interrupt1}$ on source cell.

For FR1-to-FR2 inter-band handover, $T_{interrupt1}$ is specified in Table 7.3.1.0.3-2.

Table 7.3.1.0.3-2: $T_{interrupt1}$ for FR1-to-FR2 inter-band DAPS HO

μ	NR slot length (ms) of source cell	$T_{interrupt1}$ (slots)	
		Sync	Async
0	1	1	2
1	0.5	2	3
2	0.25	5	5

During $D_{handover2}$, the UE is allowed an interruption of up to $T_{interrupt2}$ on target cell.

For FR1-to-FR2 inter-band handover, $T_{interrupt2}$ is specified in Table 7.3.1.0.3-3.

Table 7.3.1.0.3-3: $T_{interrupt2}$ for FR1-to-FR2 inter-band DAPS HO

μ	NR slot length (ms) of target cell	$T_{interrupt2}$ (slots)	
		Sync	Async
2	0.25	5	5
3	0.125	9	9

The normative reference for this requirement is TS 38.133 [6] clause 6.1.3.4.

7.3.1.1 NR SA FR1-FR2 Inter-frequency handover; unknown target cell

Editor's Note:

- This test case is incomplete since FR1-FR2 OTA testability is still FFS.
- Test Tolerances are missing
- Connection diagram may require updates for FR1+FR2 scenarios

7.3.1.1.1 Test purpose

To verify the requirement for the NR FR1-NR FR2 inter frequency handover requirements specified in 38.133 [6] clause 6.1.1.5.

7.3.1.1.2 Test applicability

This test applies to all types of NR UE from Release 15 and onwards supporting SA FR1 and SA FR2.

7.3.1.1.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 7.3.1.0.2.

The normative reference for this requirement is TS 38.133 [6] clause A.7.3.1.1.

7.3.1.1.4 Test description

7.3.1.1.4.1 Initial conditions

Initial conditions are a set of test configurations the UE needs to be tested in and the steps for the SS to take with the UE to reach the correct measurement state.

This test shall be tested using any of the test configurations in Table 7.3.1.1.4.1-1.

Table 7.3.1.1.4.1-1: NR SA FR1-FR2 Test configurations for Inter-frequency handover

Config	Description
7.3.1.1-1	Source cell: NR 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode Target cell: NR 120 kHz SSB SCS, 100 MHz bandwidth, TDD duplex mode
7.3.1.1-2	Source cell: NR 15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode Target cell: NR 120 kHz SSB SCS, 100 MHz bandwidth, TDD duplex mode
7.3.1.1-3	Source cell: NR 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode Target cell: NR 120 kHz SSB SCS, 100 MHz bandwidth, TDD duplex mode
Note: The UE is only required to be tested in one of the supported test configurations	

Configure the test equipment and the DUT according to the parameters in Table 7.3.1.1.4.1-2

Table 7.3.1.1.4.1-2: NR SA FR1-FR2 Initial conditions for Inter-frequency handover

Parameter	Value	Comment
Test environment	NC	As specified in TS 38.508-1 [14] clause 4.1.
Test frequencies	As specified in Annex E.1.1, Table E.4-1 and TS 38.508-1 [14] clause 4.3.1.	
Channel bandwidth	As specified by the test configuration selected from Table 7.3.1.1.4.1-1	
Propagation conditions	AWGN	As specified in Annex C.2.2.

Connection Diagram	TE Part	[A.3.3.3.1-1]	As specified in TS 38.508-1 [14] Annex A.
	DUT Part	A.3.4.1.1	
Exceptions to connection diagram	N/A		

1. Message contents are defined in clause 7.3.1.1.4.3.

2. The power levels and settings for NR FR1 Cell 1 are set according to Annex C.1.2 and C.1.3. Cell 2 is NR FR2 target Cell, and its power levels and settings are also set according to Annex C.1.2 and C.1.3.

3. The test parameters are given in Table 7.3.1.1.4.1-3.

Table 7.3.1.1.4.1-3: NR SA FR1-FR2 General test parameters for Inter-frequency handover

Parameter		Unit	Value	Comment
Initial conditions	Active cell		Cell 1	
	Neighbouring cell		Cell 2	
Final condition	Active cell		Cell 2	
Access Barring Information		-	Not Sent	No additional delays in random access procedure.
Time offset between cells			3 μs	Synchronous cells
T1		s	5	
T2		s	≤10	

7.3.1.1.4.2 Test procedure

The test scenario comprises of two NR carriers each with one cell. NR Cell 1 is the source PCell on a FR1 carrier and NR Cell 2 is the target PCell on a FR2 carrier. General parameters for Cell 1 and Cell 2 are given in Table 7.3.1.1.4.1-3 and Table 7.3.1.1.5-1 respectively. No gap patterns are configured in the test case.

The test consists of two successive time periods, with time durations of T1, T2 respectively. At the start of time duration T1, the UE does not have any timing information of cell 2. Starting T2, cell 2 becomes detectable and the UE receives a RRC handover command from the network. The start of T2 is the instant when the last TTI containing the RRC message implying handover is sent to the UE.

The test sequence shall be carried out in RRC_CONNECTED for every test case. Unless otherwise stated, the downlink signal and noise are aligned to arrive in the UE Rx beam peak direction.

1. Ensure the UE is in State RRC_CONNECTED with generic procedure parameters Connectivity *NR*, Connected without release *On* according to TS 38.508-1 [14] clause 4.5. Establish SRB2 and DRB in the RRC Reconfiguration message. Cell 1 is the active cell. Set Cell 2 physical cell identity to the initial physical cell identity.

2. Set the parameters according to T1 in Table 7.3.1.1.5-1. Propagation conditions are set according to Annex C clause C.2.2. T1 starts.

3. SS shall transmit an *RRCReconfiguration* message implying handover to Cell 2.

4. The start of T2 is the instant when the last TTI containing the *RRCReconfiguration* message implying handover is sent to the UE, at that instant the SS shall switch the power settings from T1 to T2 as specified in Table 7.3.1.1.5-1. T2 starts.

5. The UE shall transmit *RRCReconfigurationComplete* message.

6. If the UE transmits the uplink PRACH channel to Cell 2 less than 572 ms from the beginning of time period T2 then the number of successful tests is increased by one. Otherwise, the number of failure tests is increased by one.

7. After T2 expires, cause UE handover back to Cell 1 (if the handover fails, switch off and then on the UE) or switch off and then on the UE. Then ensure the UE is in State RRC_CONNECTED with generic procedure parameters Connectivity *NR*, Connected without release *On* according to TS 38.508-1 [14] clause 4.5. Cell 1 is the active cell.

8. Set Cell 2 physical cell identity = ((current cell 2 physical cell identity + 1) mod 14 + 2) for next iteration of the test procedure loop.

9. Repeat step 2-8 until the confidence level according to Tables G.2.3-1 in Annex G clause G.2 is achieved.

7.3.1.1.4.3 Message contents

Message contents are according to TS 38.508-1 [14] clause 7.3 with the following exceptions:

Table 7.3.1.1.4.3-1: NR SA FR1-FR2 Common exception messages for Inter-frequency handover

Default Message Contents	
Common contents of system information blocks exceptions	
Default RRC messages and information elements contents exceptions	Table H.3.2-2 with Condition RBConfig_KeyChange

7.3.1.1.5 Test requirements

Table 7.3.1.1.5-1 defines the primary level settings including test tolerances for all tests.

Table 7.3.1.1.5-1: NR SA FR1-FR2 Cell specific test parameters for Inter-frequency handover

Parameter		Unit	Cell 1		Cell 2	
			T1	T2	T1	T2
Assumption for UE beams[Note 6]			N/A		Rough	
AoA setup			NA		Setup 1 as defined in A.9	
NR RF Channel Number			1		2	
Duplex mode	Config 1		FDD		TDD	
	Config 2,3		TDD		TDD	
TDD configuration	Config 1		Not Applicable		TDDConf.3.1	
	Config 2		TDDConf.1.1		TDDConf.3.1	
	Config 3		TDDConf.2.1		TDDConf.3.1	
$BW_{channel}$	Config 1	MHz	10: $N_{RB,c}$ = 52		100: $N_{RB,c}$ = 66	
	Config 2		10: $N_{RB,c}$ = 52		100: $N_{RB,c}$ = 66	
	Config 3		40: $N_{RB,c}$ = 106		100: $N_{RB,c}$ = 66	
BWP BW	Config 1	MHz	10: $N_{RB,c}$ = 52		100: $N_{RB,c}$ = 66	
	Config 2		10: $N_{RB,c}$ = 52		100: $N_{RB,c}$ = 66	
	Config 3		40: $N_{RB,c}$ = 106		100: $N_{RB,c}$ = 66	
Data RBs allocated	Config 1		52		66	
	Config 2		52		66	
	Config 3		106		66	
DRx Cycle		ms	Not Applicable			
PDSCH Reference measurement channel	Config 1		SR.1.1 FDD		SR.3.1 TDD	
	Config 2		SR.1.1 TDD		SR.3.1 TDD	
	Config 3		SR.2.1 TDD		SR.3.1 TDD	
RMSI CORESET Reference Channel	Config 1		CR.1.1 FDD		CR.3.1 TDD	
	Config 2		CR.1.1 TDD		CR.3.1 TDD	
	Config 3		CR.2.1 TDD		CR.3.1 TDD	
Control Channel RMC	Config 1		CCR.1.1 FDD		CCR.3.1 TDD	
	Config 2		CCR.1.1 TDD		CCR.3.1 TDD	
	Config 3		CCR.2.1 TDD		CCR.3.1 TDD	
OCNG Patterns			OP.1			
SSB configuration	Config 1,2		SSB.1 FR1		SSB.3 FR2	
	Config 3		SSB.2 FR1		SSB.3 FR2	
SMTC configuration	Config 1,2		SMTC.1		SMTC.1	
	Config 3		SMTC.2		SMTC.1	
SMTC configuration	Config 1,2		SMTC.1		SMTC.1	
	Config 3		SMTC.2		SMTC.1	
PDSCH/PDCCH subcarrier spacing	Config 1,2	kHz	15 kHz		120 kHz	
	Config 3		30 kHz		120 kHz	

PUCCH/PUSCH subcarrier spacing	Config 1,2	kHz	15 kHz	120 kHz	
	Config 3		30 kHz	120 kHz	
PRACH configuration			PRACH.1 FR1	PRACH.1 FR2	
TRS configuration	Config 1		TRS.1.1 FDD	TRS.2.1 TDD	
	Config 2		TRS.1.1 TDD	TRS.2.1 TDD	
	Config 3		TRS.1.2 TDD	TRS.2.1 TDD	
PDSCH/PDCCH TCI state			N/A	TCI.State.2	
BWP configuration	Initial DL BWP		DLBWP.0.1	DLBWP.0.1	
	Dedicated DL BWP		DLBWP.1.1	DLBWP.1.1	
	Initial UL BWP		ULBWP.0.1	ULBWP.0.1	
	Dedicated UL BWP		ULBWP.1.1	ULBWP.1.1	
EPRE ratio of PSS to SSS		dB	0	0	
EPRE ratio of PBCH DMRS to SSS					
EPRE ratio of PBCH to PBCH DMRS					
EPRE ratio of PDCCH DMRS to SSS					
EPRE ratio of PDCCH to PDCCH DMRS					
EPRE ratio of PDSCH DMRS to SSS					
EPRE ratio of PDSCH to PDSCH					
EPRE ratio of OCNG DMRS to SSS(Note 1)					
EPRE ratio of OCNG to OCNG DMRS (Note 1)					
N_{oc} Note2		dBm/15kHz	Link only, see clause A.6A	-104.7+TT	
N_{oc} Note2	Config 1,2	dBm/SCS		-95.7+TT	
	Config 3			-95.7+TT	
$\hat{E}_s / I_{ot}$		dB		-Infinity	10+TT
$\hat{E}_s / N_{oc}$		dB		-Infinity	10+TT
Io Note3	Config 1,2	dBm/ BW		-66.7+TT	-56.3+TT
	Config 3	dBm/ BW		-66.7+TT	-56.3+TT
Propagation condition		-		AWGN	

Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.
Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for N_{oc} to be fulfilled.
Note 3: Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.
Note 4: Equivalent power received by an antenna with 0 dBi gain at the centre of the quiet zone
Note 5: As observed with 0 dBi gain antenna at the centre of the quiet zone
Note 6: Information about types of UE beam is given in 38.133 [6] clause B.2.1.3, and does not limit UE implementation or test system implementation

The UE shall start to transmit the PRACH to Cell 2 less than 572 ms from the beginning of time period T2.

The rate of correct handovers observed during repeated tests shall be at least 90%.

NOTE: The handover delay can be expressed as: RRC procedure delay + $T_{interrupt}$, where:

RRC procedure delay = 10 ms and is specified in clause 12 in TS 38.331 [2].

$T_{interrupt}$ = 562 ms in the test. $T_{interrupt}$ is defined in clause 6.1.1.5.2 of 38.133 [6].

This gives a total of 572 ms.

7.3.1.2 NR SA FR2 Intra-frequency handover; unknown target cell

Editor's Note: This test case has been completed for the following configurations:

- Test frequency f ≤ 40.8 GHz

- UE PC3

- The test is incomplete for UE power classes other than PC3

- The test is incomplete for test frequencies > 40.8 GHz

7.3.1.2.1 Test purpose

To verify the requirement for the NR FR2 intra frequency handover requirements specified in 38.133 [6] clause 6.1.1.4.

7.3.1.2.2 Test applicability

This test applies to all types of NR UE from Release 15 and onwards supporting SA FR2.

7.3.1.2.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 7.3.1.0.1.

The normative reference for this requirement is TS 38.133 [6] clause A.7.3.1.2.

7.3.1.2.4 Test description

7.3.1.2.4.1 Initial conditions

Initial conditions are a set of test configurations the UE needs to be tested in and the steps for the SS to take with the UE to reach the correct measurement state.

This test shall be tested using any of the test configurations in Table 7.3.1.2.4.1-1.

Table 7.3.1.2.4.1-1: NR SA FR2 Test configurations for Intra-frequency handover

Config	Description
7.3.1.2-1	Source cell: NR 120 kHz SSB SCS, 100 MHz bandwidth, TDD duplex mode Target cell: NR 120 kHz SSB SCS, 100 MHz bandwidth, TDD duplex mode

Configure the test equipment and the DUT according to the parameters in Table 7.3.1.2.4.1-2

Table 7.3.1.2.4.1-2: NR SA FR2 Initial conditions for Intra-frequency handover

Parameter	Value		Comment
Test environment	NC		As specified in TS 38.508-1 [14] clause 4.1.
Test frequencies	As specified in Annex E.1.1, Table E.4-1 and TS 38.508-1 [14] clause 4.3.1.		
Channel bandwidth	As specified by the test configuration selected from Table 7.3.1.2.4.1-1		
Propagation conditions	AWGN		As specified in Annex C.2.2.
Connection Diagram	TE Part	A.3.3.3.1-1	As specified in TS 38.508-1 [14] Annex A.
	DUT Part	A.3.4.1.1	
Exceptions to connection diagram	N/A		

1. Message contents are defined in clause 7.3.1.2.4.3.

2. The power levels and settings for NR FR2 Cell 1 are set according to Annex C.1.2 and C.1.3. Cell 2 is NR FR2 target Cell, and its power levels and settings are also set according to Annex C.1.2 and C.1.3.

3. The test parameters are given in Table 7.3.1.2.4.1-3.

Table 7.3.1.2.4.1-3: NR SA FR2 General test parameters for Intra-frequency handover

Parameter		Unit	Value	Comment
Initial conditions	Active cell		Cell 1	
	Neighbouring cell		Cell 2	
Final condition	Active cell		Cell 2	

Access Barring Information	-	Not Sent	No additional delays in random access procedure.
Time offset between cells		3 μs	Synchronous cells
T1	s	5	
T2	s	≤10	

7.3.1.2.4.2 Test procedure

The test scenario comprises of one FR2 RF channel with two intra-frequency NR cells. NR Cell 1 is the source PCell and NR Cell 2 is the target Pcell. General parameters for Cell 1 and Cell 2 are given in Table 7.3.1.2.4.1-3 and Table 7.3.1.2.5-1 respectively. No gap patterns are configured in the test case.

The test consists of two successive time periods, with time durations of T1, T2 respectively. At the start of time duration T1, the UE does not have any timing information of cell 2. Starting T2, cell 2 becomes detectable and the UE receives a RRC handover command from the network. The start of T2 is the instant when the last TTI containing the RRC message implying handover is sent to the UE.

The test sequence shall be carried out in RRC_CONNECTED for every test case. Unless otherwise stated, the downlink signal and noise are aligned to arrive in the UE Rx beam peak direction.

1. Ensure the UE is in State RRC_CONNECTED with generic procedure parameters Connectivity *NR*, Connected without release *On* according to TS 38.508-1 [14] clause 4.5. Establish SRB2 and DRB in the RRC Reconfiguration message. Cell 1 is the active cell. Set Cell 2 physical cell identity to the initial physical cell identity.

2. Set the parameters according to T1 in Table 7.3.1.2.5-1. Propagation conditions are set according to Annex C clause C.2.2. T1 starts.

3. SS shall transmit an *RRCReconfiguration* message implying handover to Cell 2.

4. The start of T2 is the instant when the last TTI containing the *RRCReconfiguration* message implying handover is sent to the UE, at that instant the SS shall switch the power settings from T1 to T2 as specified in Table 7.3.1.2.5-1. T2 starts.

5. The UE shall transmit *RRCReconfigurationComplete* message.

6. If the UE transmits the uplink PRACH channel to Cell 2 less than 232 ms from the beginning of time period T2 then the number of successful tests is increased by one. Otherwise, the number of failure tests is increased by one.

7. After T2 expires, cause UE handover back to Cell 1 (if the handover fails, switch off and then on the UE) or switch off and then on the UE. Then ensure the UE is in State RRC_CONNECTED with generic procedure parameters Connectivity *NR*, Connected without release *On* according to TS 38.508-1 [14] clause 4.5. Cell 1 is the active cell.

8. Set Cell 2 physical cell identity = ((current cell 2 physical cell identity + 1) mod 14 + 2) for next iteration of the test procedure loop.

9. Repeat step 2-8 until the confidence level according to Tables G.2.3-1 in Annex G clause G.2 is achieved.

7.3.1.2.4.3 Message contents

Message contents are according to TS 38.508-1 [14] clause 7.3 with the following exceptions:

Table 7.3.1.2.4.3-1: NR SA FR2 Common exception messages for Intra-frequency handover

Default Message Contents	
Common contents of system information blocks exceptions	
Default RRC messages and information elements contents exceptions	Table H.3.2-2 with Condition RBConfig_KeyChange

7.3.1.2.5 Test requirements

Table 7.3.1.2.5-1 defines the primary level settings including test tolerances for all tests.

Table 7.3.1.2.5-1: NR SA FR2 Cell specific test parameters for Intra-frequency handover

Parameter		Unit	Cell 1		Cell 2	
			T1	T2	T1	T2
Assumption for UE beams[Note 6]			Rough		Rough	
AoA setup			Setup 1 as defined in A.9			
NR RF Channel Number			**1**		**1**	
Duplex mode			TDD			
TDD configuration			TDDConf.3.1			
$BW_{channel}$		MHz	100: $N_{RB,c}$ = 66			
BWP BW		MHz	100: $N_{RB,c}$ = 66			
Data RBs allocated			66			
DRx Cycle		ms	Not Applicable			
PDSCH Reference measurement channel			SR.3.1 TDD			
RMSI CORESET Reference Channel			CR.3.1 TDD			
Control Channel RMC			CCR.3.1 TDD			
OCNG Patterns			OP.1			
SMTC Configuration			SMTC pattern 1			
SSB Configuration			SSB.3 FR2			
PDSCH/PDCCH subcarrier spacing		kHz	120 kHz			
PUCCH/PUSCH subcarrier spacing		kHz	120 kHz			
PRACH configuration			PRACH.1 FR2			
TRS configuration			TRS.2.1 TDD			
PDSCH/PDCCH TCI state			TCI.State.2			
BWP configuration	Initial DL BWP		DLBWP.0.1			
	Dedicated DL BWP		DLBWP.1.1			
	Initial UL BWP		ULBWP.0.1			
	Dedicated UL BWP		ULBWP.1.1			
EPRE ratio of PSS to SSS		dB	0		0	
EPRE ratio of PBCH DMRS to SSS						
EPRE ratio of PBCH to PBCH DMRS						
EPRE ratio of PDCCH DMRS to SSS						
EPRE ratio of PDCCH to PDCCH DMRS						
EPRE ratio of PDSCH DMRS to SSS						
EPRE ratio of PDSCH to PDSCH						
EPRE ratio of OCNG DMRS to SSS(Note 1)						
EPRE ratio of OCNG to OCNG DMRS (Note 1)						
N_{oc} [Note2]		dBm/15kHz	-104.7			
N_{oc} [Note2]		dBm/SCS	-95.7			
$\hat{E}_s / I_{ot}$		dB	6	-1.8	-Infinity	0
$\hat{E}_s / N_{oc}$		dB	6	6	-Infinity	7
Io[Note3]		dBm/ BW	-59.7	-56.7	-59.7	-56.7
Propagation condition		-	AWGN		AWGN	

Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.
Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for N_{oc} to be fulfilled.
Note 3: Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.
Note 4: Equivalent power received by an antenna with 0 dBi gain at the centre of the quiet zone
Note 5: As observed with 0 dBi gain antenna at the centre of the quiet zone
Note 6: Information about types of UE beam is given in 38.133 [6] clause B.2.1.3, and does not limit UE implementation or test system implementation

The UE shall start to transmit the PRACH to Cell 2 less than 232 ms from the beginning of time period T2.

The rate of correct handovers observed during repeated tests shall be at least 90%.

NOTE: The handover delay can be expressed as: RRC procedure delay + $T_{interrupt}$, where:

RRC procedure delay = 10 ms and is specified in clause 12 in TS 38.331 [2].

$T_{interrupt}$ = 222 ms in the test. $T_{interrupt}$ is defined in clause 6.1.1.4.2 of 38.133 [6].

This gives a total of 232 ms.

7.3.1.3 NR SA FR2-FR2 Inter-frequency handover; unknown target cell

Editor's Note: This test case has been completed for the following configurations:

- Test frequency f ≤ 40.8 GHz

- UE PC3

- The test is incomplete for UE power classes other than PC3

- The test is incomplete for test frequencies > 40.8 GHz

7.3.1.3.1 Test purpose

To verify the requirement for the NR FR2-NR FR2 inter frequency handover requirements specified in 38.133 [6] clause 6.1.1.4.

7.3.1.3.2 Test applicability

This test applies to all types of NR UE from Release 15 and onwards supporting SA FR2.

7.3.1.3.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 7.3.1.0.1.

The normative reference for this requirement is TS 38.133 [6] clause A.7.3.1.3.

7.3.1.3.4 Test description

7.3.1.3.4.1 Initial conditions

Initial conditions are a set of test configurations the UE needs to be tested in and the steps for the SS to take with the UE to reach the correct measurement state.

This test shall be tested using any of the test configurations in Table 7.3.1.3.4.1-1.

Table 7.3.1.3.4.1-1: NR SA FR2-FR2 Test configurations for Inter-frequency handover

Config	Description
7.3.1.3-1	Source cell: NR 120 kHz SSB SCS, 100 MHz bandwidth, TDD duplex mode Target cell: NR 120 kHz SSB SCS, 100 MHz bandwidth, TDD duplex mode

Configure the test equipment and the DUT according to the parameters in Table 7.3.1.3.4.1-2

Table 7.3.1.3.4.1-2: NR SA FR2-FR2 Initial conditions for Inter-frequency handover

Parameter	Value		Comment
Test environment	NC		As specified in TS 38.508-1 [14] clause 4.1.
Test frequencies	As specified in Annex E.1.1, Table E.4-1 and TS 38.508-1 [14] clause 4.3.1.		
Channel bandwidth	As specified by the test configuration selected from Table 7.3.1.3.4.1-1		
Propagation conditions	AWGN		As specified in Annex C.2.2.
Connection Diagram	TE Part	A.3.3.3.1-1	As specified in TS 38.508-1 [14] Annex A.
	DUT Part	A.3.4.1.1	
Exceptions to connection diagram	N/A		

1. Message contents are defined in clause 7.3.1.3.4.3.

2. The power levels and settings for NR FR2 Cell 1 are set according to Annex C.1.2 and C.1.3. Cell 2 is NR FR2 target Cell, and its power levels and settings are also set according to Annex C.1.2 and C.1.3.

3. The test parameters are given in Table 7.3.1.3.4.1-3.

Table 7.3.1.3.4.1-3: NR SA FR2-FR2 General test parameters for Inter-frequency handover

Parameter		Unit	Value	Comment
Initial conditions	Active cell		Cell 1	
	Neighbouring cell		Cell 2	
Final condition	Active cell		Cell 2	
Access Barring Information		-	Not Sent	No additional delays in random access procedure.
Time offset between cells			3 μs	Synchronous cells
T1		s	5	
T2		s	≤10	

7.3.1.3.4.2 Test procedure

The test scenario comprises of two NR carriers each with one cell. NR Cell 1 is the source PCell on one FR2 carrier and NR Cell 2 is the target PCell on another FR2 carrier. General parameters for Cell 1 and Cell 2 are given in Table 7.3.1.3.4.1-3 and Table 7.3.1.3.5-1 respectively. No gap patterns are configured in the test case.

The test consists of two successive time periods, with time durations of T1, T2 respectively. At the start of time duration T1, the UE does not have any timing information of cell 2. Starting T2, cell 2 becomes detectable and the UE receives a RRC handover command from the network. The start of T2 is the instant when the last TTI containing the RRC message implying handover is sent to the UE.

The test sequence shall be carried out in RRC_CONNECTED for every test case. Unless otherwise stated, the downlink signal and noise are aligned to arrive in the UE Rx beam peak direction.

1. Ensure the UE is in State RRC_CONNECTED with generic procedure parameters Connectivity *NR*, Connected without release *On* according to TS 38.508-1 [14] clause 4.5. Establish SRB2 and DRB in the RRC Reconfiguration message. Cell 1 is the active cell. Set Cell 2 physical cell identity to the initial physical cell identity.

2. Set the parameters according to T1 in Table 7.3.1.3.5-1. Propagation conditions are set according to Annex C clause C.2.2. T1 starts.

3. SS shall transmit an *RRCReconfiguration* message implying handover to Cell 2.

4. The start of T2 is the instant when the last TTI containing the *RRCReconfiguration* message implying handover is sent to the UE, at that instant the SS shall switch the power settings from T1 to T2 as specified in Table 7.3.1.3.5-1. T2 starts.

5. The UE shall transmit *RRCReconfigurationComplete* message.

6. If the UE transmits the uplink PRACH channel to Cell 2 less than 552 ms from the beginning of time period T2 then the number of successful tests is increased by one. Otherwise, the number of failure tests is increased by one.

7. After T2 expires, cause UE handover back to Cell 1 (if the handover fails, switch off and then on the UE) or switch off and then on the UE. Then ensure the UE is in State RRC_CONNECTED with generic procedure parameters Connectivity *NR*, Connected without release *On* according to TS 38.508-1 [14] clause 4.5. Cell 1 is the active cell.

8. Set Cell 2 physical cell identity = ((current cell 2 physical cell identity + 1) mod 14 + 2) for next iteration of the test procedure loop.

9. Repeat step 2-8 until the confidence level according to Tables G.2.3-1 in Annex G clause G.2 is achieved.

7.3.1.3.4.3 Message contents

Message contents are according to TS 38.508-1 [14] clause 7.3 with the following exceptions:

Table 7.3.1.3.4.3-1: NR SA FR2-FR2 Common exception messages for Inter-frequency handover

Default Message Contents	
Common contents of system information blocks exceptions	
Default RRC messages and information elements contents exceptions	Table H.3.2-2 with Condition RBConfig_KeyChange

7.3.1.3.5 Test requirements

Table 7.3.1.3.5-1 defines the primary level settings including test tolerances for all tests.

Table 7.3.1.3.5-1: NR SA FR2-FR2 Cell specific test parameters for Inter-frequency handover

Parameter		Unit	Cell 1		Cell 2	
			T1	T2	T1	T2
Assumption for UE beams[Note 6]			Rough		Rough	
AoA setup			Setup 1 as defined in A.9			
NR RF Channel Number			1		2	
Duplex mode			TDD			
TDD configuration			TDDConf.3.1			
$BW_{channel}$		MHz	100: $N_{RB,c}$ = 66			
BWP BW		MHz	100: $N_{RB,c}$ = 66			
Data RBs allocated			66			
DRx Cycle		ms	Not Applicable			
PDSCH Reference measurement channel			SR.3.1 TDD			
RMSI CORESET Reference Channel			CR.3.1 TDD			
Control Channel RMC			CCR.3.1 TDD			
OCNG Patterns			OP.1			
SMTC Configuration			SMTC pattern 1			
SSB Configuration			SSB.3 FR2			
PDSCH/PDCCH subcarrier spacing		kHz	120 kHz			
PUCCH/PUSCH subcarrier spacing		kHz	120 kHz			
PRACH configuration			PRACH.1 FR2			
TRS configuration			TRS.2.1 TDD			
PDSCH/PDCCH TCI state			TCI.State.2			
BWP configuration	Initial DL BWP		DLBWP.0.1			
	Dedicated DL BWP		DLBWP.1.1			
	Initial UL BWP		ULBWP.0.1			
	Dedicated UL BWP		ULBWP.1.1			
EPRE ratio of PSS to SSS		dB	0		0	
EPRE ratio of PBCH DMRS to SSS						
EPRE ratio of PBCH to PBCH DMRS						
EPRE ratio of PDCCH DMRS to SSS						
EPRE ratio of PDCCH to PDCCH DMRS						
EPRE ratio of PDSCH DMRS to SSS						
EPRE ratio of PDSCH to PDSCH						
EPRE ratio of OCNG DMRS to SSS(Note 1)						
EPRE ratio of OCNG to OCNG DMRS (Note 1)						
N_{oc} [Note2]		dBm/15kHz	-104.7		-104.7	
N_{oc} [Note2]		dBm/SCS	-95.7		-95.7	
$\hat{E}_s / I_{ot}$		dB	5	5	-Infinity	5
$\hat{E}_s / N_{oc}$		dB	5	5	-Infinity	5
Io[Note3]	Config 1,2	dBm/BW	-60.5	-60.5	-66.7	-60.5
Propagation condition		-	AWGN		AWGN	
Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.						

Note 2:	Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for N_{oc} to be fulfilled.
Note 3:	Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.
Note 4:	Equivalent power received by an antenna with 0 dBi gain at the centre of the quiet zone
Note 5:	As observed with 0 dBi gain antenna at the centre of the quiet zone
Note 6:	Information about types of UE beam is given in 38.133 [6] clause B.2.1.3, and does not limit UE implementation or test system implementation

The UE shall start to transmit the PRACH to Cell 2 less than 552 ms from the beginning of time period T2.

The rate of correct handovers observed during repeated tests shall be at least 90%.

NOTE: The handover delay can be expressed as: RRC procedure delay + $T_{interrupt}$, where:

RRC procedure delay = 10 ms and is specified in clause 12 in TS 38.331 [2].

$T_{interrupt}$ = 542 ms in the test. $T_{interrupt}$ is defined in clause 6.1.1.4.2 of 38.133 [6].

This gives a total of 552 ms.

7.3.1.4 NR SA FR1-FR2 synchronous DAPS handover

Editor's Note:

- This test case is incomplete since FR1-FR2 OTA testability is still FFS.
- MU and TT analysis is complete for UE PC3 and test frequency f ≤ 40.8 GHz.
- MU and TT analysis is incomplete for test frequency f > 40.8 GHz
- Connection diagram may require updates for FR1+FR2 scenarios

MU and TT analysis is incomplete for UE power class other than PC3

7.3.1.4.1 Test purpose

To verify the requirement for the NR FR1-NR FR2 inter-band inter-frequency synchronous DAPS handover requirements in synchronous scenario specified in 38.133 [6] clause 6.1.3.4.

7.3.1.4.2 Test applicability

This test applies to all types of NR UE from Release 16 onwards and support inter-frequency DAPS handover.

7.3.1.4.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 7.3.1.0.3.

The normative reference for this requirement is TS 38.133 [6] clause A.7.3.1.4.

7.3.1.4.4 Test description

7.3.1.4.4.1 Initial conditions

Initial conditions are a set of test configurations the UE needs to be tested in and the steps for the SS to take with the UE to reach the correct measurement state.

This test shall be tested using any of the test configurations in Table 7.3.1.4.4.1-1.

Table 7.3.1.4.4.1-1: NR SA FR1-FR2 synchronous DAPS handover test configurations

Config	Description
7.3.1.4-1	Source cell: NR 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode Target cell: NR 120 kHz SSB SCS, 100 MHz bandwidth, TDD duplex mode
7.3.1.4-2	Source cell: NR 15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode Target cell: NR 120 kHz SSB SCS, 100 MHz bandwidth, TDD duplex mode
7.3.1.4-3	Source cell: NR 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode Target cell: NR 120 kHz SSB SCS, 100 MHz bandwidth, TDD duplex mode
Note: The UE is only required to be tested in one of the supported test configurations	

Configure the test equipment and the DUT according to the parameters in Table 7.3.1.4.4.1-2

Table 7.3.1.4.4.1-2: Initial conditions for NR SA FR1-FR2 synchronous DAPS handover

Parameter	Value		Comment
Test environment	NC		As specified in TS 38.508-1 [14] clause 4.1.
Test frequencies	As specified in Annex E.1.1, Table E.4-1 and TS 38.508-1 [14] clause 4.3.1.		
Channel bandwidth	As specified by the test configuration selected from Table 7.3.1.4.4.1-1		
Propagation conditions	AWGN		As specified in Annex C.2.2.
Connection Diagram	TE Part	[A.3.3.3.1-1]	As specified in TS 38.508-1 [14] Annex A.
	DUT Part	A.3.4.1.1	
Exceptions to connection diagram	N/A		

1. Message contents are defined in clause 7.3.1.4.4.3.
2. The power levels and settings for NR FR1 Cell 1 are set according to Annex C.1.2 and C.1.3. Cell 2 is NR FR2 target Cell, and its power levels and settings are also set according to Annex C.1.2 and C.1.3.
3. The test parameters are given in Table 7.3.1.4.4.1-3 below, with A4-Threshold modified by Test Tolerance.

Table 7.3.1.4.4.1-3: General test parameters for NR SA FR1-FR2 synchronous DAPS handover

Parameter		Unit	Value	Comment
Initial conditions	Active cell		Cell 1	
	Neighbouring cell		Cell 2	
Final condition	Active cell		Cell 2	
A4-Threshold		dBm	-120	
Hysteresis		dB	0	
Time To Trigger		s	0	
Filter coefficient			0	L3 filtering is not used
Access Barring Information		-	Not Sent	No additional delays in random access procedure.
Time offset between cells		μs	33	Synchronous cells
T1		s	5	
T2		s	<5	
T3		s	<0.5	
T4		ms	$10+T_{interrupt2}$	$T_{interrupt2}$ as defined in 38.133 [6] Table 6.1.3.4.2-2 for synchronous DAPS HO
T5		ms	100	

7.3.1.4.4.2 Test procedure

The test scenario comprises of two NR carriers each with one cell. NR Cell 1 is the source PCell on a FR1 carrier and NR Cell 2 is the target PCell on a FR2 carrier. General parameters for Cell 1 and Cell 2 are given in Table 7.3.1.4.4.1-3 and Table 7.3.1.4.4.1-4 respectively.

The test consists of five successive time periods, with time durations of T1, T2, T3, T4 and T5 respectively.

Before the start of T1, the UE is connected to the Cell 1 and not aware of the Cell 2. During T1, the UE does not have any timing information of the Cell 2.

Before the start of T2, the UE is configured with event A4 triggered measurement reporting on target carrier and measurement gaps (gap pattern ID # 0). From start of T2, the Cell 2 becomes detectable. The UE performs cell detection and measurements on the Cell 2 and shall send event report to the network. After receiving the event report A4, the network sends a RRC message implying DAPS handover command for target cell addition to the UE.

T3 starts from the instant when the test system receives the ACK of the PDSCH corresponding to the last TTI containing DAPS handover command for target cell addition sent to the UE. During T3, UE shall be able to perform random access, DL schedule and UL feedback to cell 1 shall be avoided when UE is required to perform DL reception or UL transmission in PRACH procedure in cell 2, except preamble transmission. After successful RACH procedure on the Cell 2, UE is scheduled with PDSCH from Cell 1 and Cell 2 in alternative TTIs. In the end of T3 the network sends a RRC message implying DAPS handover command for source cell release to the UE. During T3, the handover delay $D_{handover1}$ for target cell addition need to be verified.

T4 starts from the instant when the test system receives the ACK of the PDSCH corresponding to the last TTI containing DAPS handover command for source cell release sent to the UE. During T4, the UE shall accomplish the release actions within $D_{handover2}$

From start of T5, the UE shall stop sending periodical CSI report on Cell 1.

The test sequence shall be carried out in RRC_CONNECTED for every test case. Unless otherwise stated, the downlink signal and noise are aligned to arrive in the UE Rx beam peak direction.

1. Ensure the UE is in State RRC_CONNECTED with generic procedure parameters Connectivity *NR*, Connected without release *On* according to TS 38.508-1 [14] clause 4.5. Establish SRB2 and DRB in the RRC Reconfiguration message. Cell 1 is the active cell. Set Cell 2 physical cell identity to the initial physical cell identity.

2. Set the parameters according to T1 in Table 7.3.1.4.5-1 and Table 7.3.1.4.5-2 respectively. Propagation conditions are set according to Annex C clause C.2.2. T1 starts and the SS starts continuously scheduling the UE to perform DL reception in every DL slot on Cell 1 and monitoring corresponding ACK/NACK feedbacks sent by the UE.

3. Set Cell 2 physical cell identity = ((current cell 2 physical cell identity + 1) mod 14 + 2).

4. The SS shall transmit an *RRCReconfiguration* message to configure event A4 triggered measurement reporting on the inter-frequency carrier and periodical CSI reporting on Cell 1.

5. The UE shall transmit an *RRCReconfigurationComplete* message.

6. When T1 expires, the SS shall switch the power setting from T1 to T2 as specified in Table 7.3.1.4.5-1 and Table 7.3.1.4.5-2 respectively.

7. UE shall transmit a *MeasurementReport* message triggered by Event A4.

8. SS shall transmit an *RRCReconfiguration* with *reconfigurationWithSync* message which reconfiguring DRB as a DAPS radio bearer to the UE, at that instant the SS receives the ACK of the PDSCH corresponding to the *RRCReconfiguration* with *reconfigurationWithSync* message the SS shall switch the power settings from T2 to T3 as specified in Table 7.3.1.4.5-1 and Table 7.3.1.4.5-2. T3 starts and the SS stops scheduling the UE to perform DL reception on Cell 1.

9. If the UE transmits PRACH preamble to Cell 2 within $D_{handover1}$ from the beginning of time period T3 then the number of successful tests is increased by one, continue to step 10. Otherwise, the number of failure tests is increased by one, go to step 17. where:

   - $D_{handover1}$ = 92 ms.

10. The UE transmits an *RRCReconfigurationComplete* message on Cell 2.

11. Upon receiving *RRCReconfigurationComplete* message sent by UE, the SS immediately starts scheduling UE to perform DL reception in Cell 1 and Cell 2 in an alternative manner, and monitoring corresponding ACK/NACK feedbacks sent by the UE.

12. Upon T3 expiring, the SS immediately transmit an *RRCReconfiguration* with *daps-SourceRelease-r16 = true* on Cell 2 to the UE. T4 starts when the SS receives the ACK of the PDSCH corresponding to the *RRCReconfiguration* with *daps-SourceRelease-r16 = true*.

13. The UE transmits an *RRCReconfigurationComplete* message on Cell 2.

14. When T4 expires, T5 starts.

15. If

a) The UE can report ACK/NACK from the first DL reception scheduled on Cell 2 after the beginning of time period T5,

and

b) The UE doesn't send periodical CSI report during entire time period T5.

then the number of successful tests is increased by one. Otherwise, the number of failure tests is increased by one.

16. After T5 expires, the SS sends an *RRCReconfiguration* with *reconfigurationWithSync* to cause UE handover back to Cell 1.

17. If UE is not in state RRC_CONNECTED with generic procedure parameters Connectivity *NR*, Connected without release *On* according to TS 38.508-1 [14] clause 4.5 on Cell 1, switch off and on the UE. Then ensure the UE is in State RRC_CONNECTED with generic procedure parameters Connectivity *NR*, Connected without release *On* according to TS 38.508-1 [14] clause 4.5 on Cell 1.

18. Repeat steps 2-17 until the confidence level according to Tables G.2.3-1 in Annex G clause G.2 is achieved.

7.3.1.4.4.3 Message contents

Message contents are according to TS 38.508-1 [14] clause 7.3 with the following exceptions:

Table 7.3.1.4.4.3-1: RRCReconfiguration (Step 4)

Derivation Path: TS 38.508-1 [14], 4.6.1-13 with condition NR_MEAS			
Information Element	**Value/remark**	**Comment**	**Condition**
RRCReconfiguration ::= SEQUENCE {			
criticalExtensions CHOICE {			
rrcReconfiguration SEQUENCE {			
measConfig	MeasConfig	Table 7.3.1.4.4.3-3	
nonCriticalExtension SEQUENCE {			
masterCellGroup SEQUENCE {			
spCellConfigDedicated	ServingCellConfig	Table 7.3.1.4.4.3-2	
}			
}			
}			
}			
}			

Table 7.3.1.4.4.3-2: ServingCellConfig (Table 7.3.1.4.4.3-1)

Derivation Path: TS 38.508-1 [14], Table 4.6.3-167 with condition MEAS			
Information Element	**Value/remark**	**Comment**	**Condition**
ServingCellConfig ::= SEQUENCE {			
csi-MeasConfig	CSI-MeasConfig for RRM Specified in TS 38.508-1 [14] Table 7.3.1-6		
}			

Table 7.3.1.4.4.3-3: MeasConfig (Table 7.3.1.4.4.3-1)

Derivation path: Table H.3.1-2 with condition INTER-FREQ			
Information Element	**Value/Remark**	**Comment**	**Condition**
measConfig ::= SEQUENCE {			
reportConfigToAddModList SEQUENCE(SIZE (1..maxReportConfigId)) OF SEQUENCE {	1 entry		
reportConfig[1] CHOICE {			
reportConfigNR	ReportConfigNR(-120) specified in Table H.3.1-4AA	Acutal value of A4-threshold is -120dBm	
}			

}			
}			

Table 7.3.1.4.4.3-4: MeasurementReport (Step 7)

Derivation Path: TS 38.508-1 [14], Table 4.6.1-5A			
Information Element	**Value/remark**	**Comment**	**Condition**
MeasurementReport ::= SEQUENCE {			
criticalExtensions CHOICE {			
measurementReport SEQUENCE {			
measResults	MeasResults specified in Table H.3.1-7 with condition INTER-FREQ		
}			
}			
}			

Table 7.3.1.4.4.3-5: RRCReconfiguration (Step 8)

Derivation Path: TS 38.508-1 [4], Table 4.8.1-1A with Condition RBConfig_NoKeyChange			
Information Element	**Value/remark**	**Comment**	**Condition**
RRCReconfiguration ::= SEQUENCE {			
criticalExtensions CHOICE {			
rrcReconfiguration SEQUENCE {			
radioBearerConfig	RadioBearerConfig	Table 7.3.1.4.4.3-6	
nonCriticalExtension SEQUENCE{			
masterCellGroup	CellGroupConfig	Table 7.3.1.4.4.3-7	
}			
}			
}			
}			

Table 7.3.1.4.4.3-6: RadioBearerConfig (Table 7.3.1.4.4.3-5)

Derivation Path: TS 38.508-1 [14], Table 4.6.3-132 with condition DRB1			
Information Element	**Value/remark**	**Comment**	**Condition**
RadioBearerConfig ::= SEQUENCE {			
drb-ToAddModList SEQUENCE (SIZE (1..maxDRB)) OF DRB-ToAddMod {	1 entry		
DRB-ToAddMod[1] SEQUENCE {		entry 1	
drb-Identity	DRB-Identity using condition DRBn	DRB #n is a DRB established before DAPS HO. Actual value of n is left to TE implementation	
daps-Config-r16	true		
}			
}			
securityConfig	Not present		
}			

Table 7.3.1.4.4.3-7: CellGroupConfig (Table 7.3.1.4.4.3-6)

Derivation Path: TS 38.508-1 [14], Table 4.6.3-19 with condition PCell_change			
Information Element	**Value/remark**	**Comment**	**Condition**
CellGroupConfig ::= SEQUENCE {			
rlc-BearerToAddModList	Not present		
spCellConfig SEQUENCE {			
reconfigurationWithSync SEQUENCE {			

spCellConfigCommon SEQUENCE {			
physCellId	PhysCellId for Cell 2		
}			
}			
}			
}			

Table 7.3.1.4.4.3-8: RRCReconfiguration (Step 12)

Derivation Path: TS 38.508-1 [14], Table 4.6.1-13 with condition DAPS_HO_ReleaseSource

7.3.1.4.5 Test requirements

Table 7.3.1.4.5-1 and Table 7.3.1.4.5-2 defines the primary level settings including test tolerances for all tests.

Table 7.3.1.4.5-1: Cell specific test parameters for NR SA FR1-FR2 synchronous DAPS handover (Cell 1 in FR1)

Parameter		Unit	Cell 1				
			T1	T2	T3	T4	T5
NR RF Channel Number			1				
Duplex mode	Config 1		FDD				
	Config 2,3		TDD				
TDD configuration	Config 1		Not Applicable				
	Config 2		TDDConf.1.1				
	Config 3		TDDConf.2.1				
$BW_{channel}$	Config 1	MHz	10: $N_{RB,c}$ = 52				
	Config 2		10: $N_{RB,c}$ = 52				
	Config 3		40: $N_{RB,c}$ = 106				
BWP BW	Config 1	MHz	10: $N_{RB,c}$ = 52				
	Config 2		10: $N_{RB,c}$ = 52				
	Config 3		40: $N_{RB,c}$ = 106				
TRS configuration	Config 1		TRS.1.1 FDD				
	Config 2		TRS.1.1 TDD				
	Config 3		TRS.1.2 TDD				
DRx Cycle		ms	Not Applicable				
PDSCH Reference measurement channel	Config 1		SR.1.1 FDD				
	Config 2		SR.1.1 TDD				
	Config 3		SR2.1 TDD				
CORESET Reference Channel	Config 1		CR.1.1 FDD				
	Config 2		CR.1.1 TDD				
	Config 3		CR2.1 TDD				
OCNG Patterns			OP.1				
CSI-RS configuration for CSI reporting	Config 1		CSI-RS.1.1 FDD				
	Config 2		CSI-RS.1.1 TDD				
	Config 3		CSI-RS.2.1 TDD				
reportConfigType			periodic				
reportQuantity			cri-RI-PMI-CQI				
CSI reporting periodicity	Config 1,2	slot	5				
	Config 3		10				
CSI reporting offset	Config 1,2	slot	3				
	Config 3		5				
SSB Configuration	Config 1,2		SSB.1 FR1				
	Config 3		SSB.2 FR1				
SMTC Configuration	Config 1,2		SMTC.1				
	Config 3		SMTC.2				
PDSCH/PDCCH subcarrier spacing	Config 1,2	kHz	15 kHz				
	Config 3		30 kHz				
PUCCH/PUSCH subcarrier spacing	Config 1,2	kHz	15 kHz				
	Config 3		30 kHz				
PRACH configuration			FR1 PRACH configuration 2				
BWP	Initial DL BWP		DLBWP.0.1				

	Dedicated DL BWP		DLBWP.1.3
	Initial UL BWP		ULBWP.0.1
	Dedicated UL BWP		ULBWP.1.3
EPRE ratio of PSS to SSS		dB	0
EPRE ratio of PBCH DMRS to SSS			
EPRE ratio of PBCH to PBCH DMRS			
EPRE ratio of PDCCH DMRS to SSS			
EPRE ratio of PDCCH to PDCCH DMRS			
EPRE ratio of PDSCH DMRS to SSS			
EPRE ratio of PDSCH to PDSCH			
EPRE ratio of OCNG DMRS to SSS(Note 1)			
EPRE ratio of OCNG to OCNG DMRS (Note 1)			
N_{oc} Note2		dBm/15kHz	NA Link only, see clause A.3.7A
N_{oc} Note2	Config 1,2	dBm/SCS	
	Config 3		
$\hat{E}_s / I_{ot}$		dB	
$\hat{E}_s / N_{oc}$		dB	
Io Note3	Config 1,2	dBm/ 9.36MHz	
	Config 3	dBm/ 38.16MHz	
Propagation condition		-	AWGN

Note 1: OCNG shall be used such that the cell is fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.

Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for N_{oc} to be fulfilled.

Note 3: Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.

Table 7.3.1.4.5-2: Cell specific test parameters for NR SA FR1-FR2 synchronous DAPS handover (Cell 2 in FR2)

Parameter		Unit	Cell 2	
			T1	T2 - T5
Assumption for UE beams Note 6			Rough	
AoA setup			Setup 1 as defined in A.3.15	
NR RF Channel Number			2	
Duplex mode	Config 1,2,3		TDD	
TDD configuration	Config 1,2,3		TDDConf.3.1	
$BW_{channel}$	Config 1,2,3	MHz	100: $N_{RB,c}$ = 66	
BWP BW	Config 1,2,3	MHz	100: $N_{RB,c}$ = 66	
TRS configuration	Config 1,2,3		TRS.2.1 TDD	
DRX Cycle		ms	Not Applicable	
PDSCH Reference measurement channel	Config 1,2,3		SR3.1 TDD	
CORESET Reference Channel	Config 1,2,3		CR3.1 TDD	
OCNG Patterns			OCNG pattern 1	
SSB Configuration	Config 1,2,3		SSB.1 FR2	
CSI-RS configuration for CSI reporting	Config 1,2,3		CSI-RS.3.1 TDD	
SMTC Configuration			SMTC.1	
PDSCH/PDCCH subcarrier spacing	Config 1,2,3	kHz	120 kHz	
PUCCH/PUSCH subcarrier spacing	Config 1,2,3	kHz	120 kHz	

PRACH configuration			FR2 PRACH configuration 2	
TCI configuration			CSI-RS.Config.0	
BWP	Initial DL BWP		DLBWP.0.1	
	Dedicated DL BWP		DLBWP.1.3	
	Initial UL BWP		ULBWP.0.1	
	Dedicated UL BWP		ULBWP.1.3	
EPRE ratio of PSS to SSS		dB	0	
EPRE ratio of PBCH DMRS to SSS				
EPRE ratio of PBCH to PBCH DMRS				
EPRE ratio of PDCCH DMRS to SSS				
EPRE ratio of PDCCH to PDCCH DMRS				
EPRE ratio of PDSCH DMRS to SSS				
EPRE ratio of PDSCH to PDSCH				
EPRE ratio of OCNG DMRS to SSS(Note 1)				
EPRE ratio of OCNG to OCNG DMRS (Note 1)				
N_{oc} Note2		dBm/15kHz	-104.7	-104.7
N_{oc} Note2		dBm/SCS	-95.7	-95.7
$\hat{E}_s / I_{ot}$		dB	-Infinity	10
$\hat{E}_s / N_{oc}$		dB	-Infinity	10
Io Note3		dBm/ 95.04MHz	-66.7	-55.4
Propagation condition		-	AWGN	

Note 1: OCNG shall be used such that the cell is fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.

Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for N_{oc} to be fulfilled.

Note 3: Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.

Note 4: Equivalent power received by an antenna with 0 dBi gain at the centre of the quiet zone

Note 5: As observed with 0 dBi gain antenna at the centre of the quiet zone.

Note 6: Information about types of UE beam is given in 38.133 [6] B.2.1.3, and does not limit UE implementation or test system implementation.

The UE shall start to transmit the PRACH to Cell 2 less than $D_{handover1}$ from the beginning of time period T3. The interruption on Cell 1 shall not exceed $T_{interrupt1}$ as defined in TS 38.133 [6] Table 6.1.3.4.2-1 for synchronous DAPS HO. The rate of correct handovers observed during repeated tests shall be at least 90%, where:

$D_{handover1} = T_{RRC_procedure} + T_{search} + T_{IU} + T_{processing} + T_{\Delta} + T_{margin}$

- $T_{RRC_procedure}$= 10 ms, is the RRC procedure delay specified in 38.331 [13] clause 12;

- T_{search} = 0 ms for known target cell, is the the time required to search the target cell specified in 38.133 [6] clause 6.1.1.2.2;

  T_{IU} = 20 ms, is the interruption uncertainty in acquiring the first available PRACH occasion in the new cell specified in 38.133 [6] clause 6.1.1.2.2.

- $T_{processing}$ = 40 ms, is the time for UE processing specified in 38.133 [6] clause 6.1.1.2.2.

- T_{Δ} = 20 ms, is the time for fine time tracking and acquiring full timing information of the target cell specified in 38.133 [6] clause 6.1.1.2.2.

- T_{margin} = 2 ms, is the time for SSB post-processing specified in 38.133 [6] clause 6.1.1.2.2.

This gives a total of 92 ms.

After successful RACH to cell 2 and until the start of time period T4, UE shall be able to receive PDSCH alternatively from Cell 1 and Cell 2. UE is not expected to transmit UL to both cell 1 and cell 2 in the same TTI.

The UE shall release Cell 1 less than $D_{handover2}$ from the beginning of time period T4, where:

$D_{handover2}$= $T_{RRC_procedure}$ + $T_{interrupt2}$

- $T_{RRC_procedure}$= 10 ms, is the RRC procedure delay specified in 38.331 [13] clause 12;

- $T_{interrupt2}$ = 1.125 ms for sync intra-frequency DAPS handover, is the allowed interruption length during $D_{handover2}$ as in 38.133 [13] clause 6.1.1.2.2;

This gives a total of 11.125 ms.

UE shall not report CSI to Cell 1 during T5.

7.3.1.5 NR SA FR1-FR2 asynchronous DAPS handover

Editor's Note:

- This test case is incomplete since FR1-FR2 OTA testability is still FFS.
- MU and TT analysis is complete for UE PC3 and test frequency f ≤ 40.8 GHz.
- MU and TT analysis is incomplete for test frequency f > 40.8 GHz
- MU and TT analysis is incomplete for UE power class other than PC3.
- Connection diagram may require updates for FR1+FR2 scenarios

7.3.1.5.1 Test purpose

To verify the requirement for the NR FR1-NR FR2 inter-band inter-frequency asynchronous DAPS handover requirements in synchronous scenario specified in 38.133 [6] clause 6.1.3.4.

7.3.1.5.2 Test applicability

This test applies to all types of NR UE from Release 16 onwards and supporting inter-frequency asynchronous DAPS handover and supporting different SCSs in source PCell and inter-frequency target PCell in DAPS handover.

7.3.1.5.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 7.3.1.0.3.

The normative reference for this requirement is TS 38.133 [6] clause A.7.3.1.5.

7.3.1.5.4 Test description

7.3.1.5.4.1 Initial conditions

Initial conditions are a set of test configurations the UE needs to be tested in and the steps for the SS to take with the UE to reach the correct measurement state.

This test shall be tested using any of the test configurations in Table 7.3.1.5.4.1-1.

Table 7.3.1.5.4.1-1: NR SA FR1-FR2 asynchronous DAPS handover test configurations

Config	Description
7.3.1.5-1	Source cell: NR 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode Target cell: NR 120 kHz SSB SCS, 100 MHz bandwidth, TDD duplex mode
7.3.1.5-2	Source cell: NR 15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode Target cell: NR 120 kHz SSB SCS, 100 MHz bandwidth, TDD duplex mode
7.3.1.5-3	Source cell: NR 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode Target cell: NR 120 kHz SSB SCS, 100 MHz bandwidth, TDD duplex mode
Note: The UE is only required to be tested in one of the supported test configurations	

Configure the test equipment and the DUT according to the parameters in Table 7.3.1.5.4.1-2

Table 7.3.1.5.4.1-2: Initial conditions for NR SA FR1-FR2 asynchronous DAPS handover

Parameter	Value		Comment
Test environment	NC		As specified in TS 38.508-1 [14] clause 4.1.
Test frequencies	As specified in Annex E.1.1, Table E.4-1 and TS 38.508-1 [14] clause 4.3.1.		
Channel bandwidth	As specified by the test configuration selected from Table 7.3.1.5.4.1-1		
Propagation conditions	AWGN		As specified in Annex C.2.2.
Connection Diagram	TE Part	[A.3.3.3.1-1]	As specified in TS 38.508-1 [14] Annex A.
	DUT Part	A.3.4.1.1	
Exceptions to connection diagram	N/A		

1. Message contents are defined in clause 7.3.1.5.4.3.
2. The power levels and settings for NR FR1 Cell 1 are set according to Annex C.1.2 and C.1.3. Cell 2 is NR FR2 target Cell, and its power levels and settings are also set according to Annex C.1.2 and C.1.3.
3. The test parameters are given in Table 7.3.1.5.4.1-3 below, with A4-Threshold modified by Test Tolerance.

Table 7.3.1.5.4.1-3: General test parameters for NR SA FR1-FR2 asynchronous DAPS handover

Parameter		Unit	Value	Comment
Initial conditions	Active cell		Cell 1	
	Neighbouring cell		Cell 2	
Final condition	Active cell		Cell 2	
A4-Threshold		dBm	-120	
Hysteresis		dB	0	
Time To Trigger		s	0	
Filter coefficient			0	L3 filtering is not used
Access Barring Information		-	Not Sent	No additional delays in random access procedure.
Time offset between cells		µs	62.5	Asynchronous cells
T1		s	5	
T2		s	<5	
T3		s	<0.5	
T4		ms	$10+T_{interrupt2}$	$T_{interrupt2}$ as defined in Table 6.1.3.4.2-2 for asynchronous DAPS HO.
T5		ms	100	

7.3.1.5.4.2 Test procedure

Same test procedure as described in clause 7.3.1.4.4.2.

7.3.1.5.4.3 Message contents

Same message contents as described in clause 7.3.1.4.4.3.

7.3.1.5.5 Test requirements

Table 7.3.1.5.5-1 and Table 7.3.1.5.5-2 defines the primary level settings including test tolerances for all tests.

Table 7.3.1.5.5-1: Cell specific test parameters for NR SA FR1-FR2 asynchronous DAPS handover (Cell 1 in FR1)

Parameter		Unit	Cell 1	
			T1	T2 - T5
NR RF Channel Number			1	
Duplex mode	Config 1		FDD	
	Config 2,3		TDD	
TDD configuration	Config 1		Not Applicable	
	Config 2		TDDConf.1.1	

	Config 3		TDDConf.2.1
$BW_{channel}$	Config 1	MHz	10: $N_{RB,c}$ = 52
	Config 2		10: $N_{RB,c}$ = 52
	Config 3		40: $N_{RB,c}$ = 106
BWP BW	Config 1	MHz	10: $N_{RB,c}$ = 52
	Config 2		10: $N_{RB,c}$ = 52
	Config 3		40: $N_{RB,c}$ = 106
TRS configuration	Config 1		TRS.1.1 FDD
	Config 2		TRS.1.1 TDD
	Config 3		TRS.1.2 TDD
DRX Cycle		ms	Not Applicable
PDSCH Reference measurement channel	Config 1		SR.1.1 FDD
	Config 2		SR.1.1 TDD
	Config 3		SR.2.1 TDD
CORESET Reference Channel	Config 1		CR.1.1 FDD
	Config 2		CR.1.1 TDD
	Config 3		CR.2.1 TDD
OCNG Patterns			OP.1
CSI-RS configuration for CSI reporting	Config 1		CSI-RS.1.1 FDD
	Config 2		CSI-RS.1.1 TDD
	Config 3		CSI-RS.2.1 TDD
reportConfigType			periodic
reportQuantity			cri-RI-PMI-CQI
CSI reporting periodicity	Config 1,2	slot	5
	Config 3		10
CSI reporting offset	Config 1,2	slot	3
	Config 3		5
SSB Configuration	Config 1,2		SSB.1 FR1
	Config 3		SSB.2 FR1
SMTC Configuration	Config 1,2		SMTC.1
	Config 3		SMTC.2
PDSCH/PDCCH subcarrier spacing	Config 1,2	kHz	15 kHz
	Config 3		30 kHz
PUCCH/PUSCH subcarrier spacing	Config 1,2	kHz	15 kHz
	Config 3		30 kHz
PRACH configuration			FR1 PRACH configuration 2
BWP	Initial DL BWP		DLBWP.0.1
	Dedicated DL BWP		DLBWP.1.3
	Initial UL BWP		ULBWP.0.1
	Dedicated UL BWP		ULBWP.1.3
EPRE ratio of PSS to SSS		dB	0
EPRE ratio of PBCH DMRS to SSS			
EPRE ratio of PBCH to PBCH DMRS			
EPRE ratio of PDCCH DMRS to SSS			
EPRE ratio of PDCCH to PDCCH DMRS			
EPRE ratio of PDSCH DMRS to SSS			
EPRE ratio of PDSCH to PDSCH			
EPRE ratio of OCNG DMRS to SSS Note 1			
EPRE ratio of OCNG to OCNG DMRS Note 1			
N_{oc} Note2		dBm/15kHz	NA Link only, see clause A.3.7A
N_{oc} Note2	Config 1,2	dBm/SCS	
	Config 3		
$\hat{E}_s / I_{ot}$		dB	
$\hat{E}_s / N_{oc}$		dB	
Io Note3	Config 1,2	dBm/ 9.36MHz	

	Config 3	dBm/ 38.16MHz	
Propagation condition		-	AWGN

Note 1: OCNG shall be used such that the cell is fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.

Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for N_{oc} to be fulfilled.

Note 3: Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.

Table 7.3.1.5.5-2: Cell specific test parameters for NR SA FR1-FR2 asynchronous DAPS handover (Cell 2 in FR2)

Parameter		Unit	Cell 2	
			T1	T2 - T5
Assumption for UE beams Note 6			Rough	
AoA setup			Setup 1 as defined in A.3.15	
NR RF Channel Number			2	
Duplex mode	Config 1,2,3		TDD	
TDD configuration	Config 1,2,3		TDDConf.3.1	
$BW_{channel}$	Config 1,2,3	MHz	100: $N_{RB,c}$ = 66	
BWP BW	Config 1,2,3	MHz	100: $N_{RB,c}$ = 66	
TRS configuration	Config 1,2,3		TRS.2.1 TDD	
DRX Cycle		ms	Not Applicable	
PDSCH Reference measurement channel	Config 1,2,3		SR.3.1 TDD	
CORESET Reference Channel	Config 1,2,3		CR.3.1 TDD	
OCNG Patterns			OP.1	
CSI-RS configuration for CSI reporting	Config 1,2,3		CSI-RS.3.1 TDD	
SSB Configuration	Config 1,2,3		SSB.1 FR2	
SMTC Configuration			SMTC.1	
PDSCH/PDCCH subcarrier spacing	Config 1,2,3	kHz	120 kHz	
PUCCH/PUSCH subcarrier spacing	Config 1,2,3	kHz	120 kHz	
PRACH configuration			FR2 PRACH configuration 2	
TCI configuration			CSI-RS.Config.0	
BWP	Initial DL BWP		DLBWP.0.1	
	Dedicated DL BWP		DLBWP.1.3	
	Initial UL BWP		ULBWP.0.1	
	Dedicated UL BWP		ULBWP.1.3	
EPRE ratio of PSS to SSS		dB	0	
EPRE ratio of PBCH DMRS to SSS				
EPRE ratio of PBCH to PBCH DMRS				
EPRE ratio of PDCCH DMRS to SSS				
EPRE ratio of PDCCH to PDCCH DMRS				
EPRE ratio of PDSCH DMRS to SSS				
EPRE ratio of PDSCH to PDSCH				
EPRE ratio of OCNG DMRS to SSS Note 1				
EPRE ratio of OCNG to OCNG DMRS Note 1				
N_{oc} Note2		dBm/15kHz	-104.7	-104.7
N_{oc} Note2		dBm/SCS	-95.7	-95.7
$\hat{E}_s / I_{ot}$		dB	-Infinity	10
$\hat{E}_s / N_{oc}$		dB	-Infinity	10
Io Note3		dBm/ 95.04MHz	-66.7	-55.4
Propagation condition		-	AWGN	

Note 1:	OCNG shall be used such that the cell is fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.
Note 2:	Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for N_{oc} to be fulfilled.
Note 3:	Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.
Note 4:	Equivalent power received by an antenna with 0 dBi gain at the centre of the quiet zone
Note 5:	As observed with 0 dBi gain antenna at the centre of the quiet zone.
Note 6:	Information about types of UE beam is given in B.2.1.3, and does not limit UE implementation or test system implementation.

Same Test requirements as described in clause 7.3.1.4.5.

7.3.2 RRC connection mobility control

7.3.2.1 RRC re-establishment

7.3.2.1.0 Minimum conformance requirements

In RRC_CONNECTED state the UE shall be capable of sending *RRCReestablishmentRequest* message within $T_{re\text{-}establish_delay}$ seconds from the moment it detects a loss in RRC connection. The total RRC connection delay ($T_{re\text{-}establish_delay}$) shall be less than:

$$T_{re\text{-}establish_delay} = T_{UE_re\text{-}establish_delay} + T_{UL_grant}$$

T_{UL_grant}: It is the time required to acquire and process uplink grant from the target PCell. The uplink grant is required to transmit *RRCReestablishmentRequest* message.

The UE re-establishment delay ($T_{UE_re\text{-}establish_delay}$) is the time between the moments when any of the conditions requiring RRC re-establishment as defined in clause 5.3.7 in TS 38.331 [2] is detected by the UE and when the UE sends PRACH to the target PCell. The UE re-establishment delay ($T_{UE_re\text{-}establish_delay}$) requirement shall be less than:

$$T_{UE_re\text{-}establish_delay} = 50ms + T_{identify_intra_NR} + \sum_{i=1}^{N_{freq}-1} T_{identify_inter_NR,i} + T_{SI\text{-}NR} + T_{PRACH}$$

The intra-frequency target NR cell shall be considered detectable when for each relevant SSB can satisfy that:

- SS-RSRP related side conditions given in Section 10.1.2 and 10.1.3 are fulfilled for a corresponding NR Band for FR1 and FR2, respectively,
- the conditions of SSB_RP and SSB Ês/Iot according to Annex B.2.2 for a corresponding NR Band are fulfilled.

The inter-frequency target NR cell shall be considered detectable when for each relevant SSB:

- SS-RSRP related side conditions given in Section 10.1.4 and 10.1.5 are fulfilled for a corresponding NR Band for FR1 and FR2, respectively,
- the conditions of SSB_RP and SSB Ês/Iot according to Annex B.2.2 for a corresponding NR Band are fulfilled.

$T_{identify_intra_NR}$: It is the time to identify the target intra-frequency NR cell and it depends on whether the target NR cell is known cell or unknown cell and on the frequency range (FR) of the target NR cell. If the UE is not configured with intra-frequency NR carrier for RRC re-establishment then $T_{identify_intra_NR}$=0; otherwise $T_{identify_intra_NR}$ shall not exceed the values defined in table 6.2.1.2.1-1.

$T_{identify_inter_NR,i}$: It is the time to identify the target inter-frequency NR cell on inter-frequency carrier *i* configured for RRC re-establishment and it depends on whether the target NR cell is known cell or unknown cell and on the frequency range (FR) of the target NR cell. $T_{identify_inter_NR,i}$ shall not exceed the values defined in table 6.2.1.2.1-2.

T_{SMTC}: It is the periodicity of the SMTC occasion configured for the intra-frequency carrier. If the UE has been provided with higher layer in TS 38.331 [2] signalling of *smtc2*, T_{smtc} follows *smtc1* or *smtc2* according to the physical cell ID of the target cell.

$T_{SMTC,i}$: It is the periodicity of the SMTC occasion configured for the inter-frequency carrier *i*. If it is not configured, the UE may assume that the target SSB periodicity is no larger than 20 ms.

T_{SI-NR} = It is the time required for receiving all the relevant system information according to the reception procedure and the RRC procedure delay of system information blocks defined in TS 38.331 [2] for the target NR cell.

T_{PRACH} = It is the delay uncertainty in acquiring the first available PRACH occasion in the target NR cell. T_{PRACH} can be up to the summation of SSB to PRACH occasion association period and 10 ms. SSB to PRACH occasion associated period is defined in the table 8.1-1 of TS 38.213 [3].

N_{freq}: It is the total number of NR frequencies to be monitored for RRC re-establishment; N_{freq} = 1 if the target intra-frequency NR cell is known, else N_{freq} = 2 and $T_{identify_intra_NR}$ = 0 if the target inter-frequency NR cell is known.

There is no requirement if the target cell does not contain the UE context.

Table 6.2.1.2.1-1: Time to identify target NR cell for RRC connection re-establishment to NR intra-frequency cell

Serving cell SSB Ês/Iot (dB)	Frequency range (FR) of target NR cell	$T_{identify_intra_NR}$ (ms)	
		Known NR cell	Unknown NR cell
≥ -8	FR1	MAX (200 ms, 5 x T_{SMTC})	MAX (800 ms, 10 x T_{SMTC})
≥ -8	FR2	N/A	MAX (1000 ms, 80 x T_{SMTC}))
< -8	FR1	N/A	800[Note1]
< -8	FR2	N/A	3520[Note1]
Note 1: The UE is not required to successfully identify a cell on any NR frequency layer when T_{SMTC} > 20 ms and serving cell SSB Ês/Iot < [-8] dB.			

Table 6.2.1.2.1-2: Time to identify target NR cell for RRC connection re-establishment to NR inter-frequency cell

Serving cell SSB Ês/Iot (dB)	Frequency range (FR) of target NR cell	$T_{identify_inter_NR,\ i}$ (ms)	
		Known NR cell	Unknown NR cell
≥ -8	FR1	MAX (200 ms, 6 x $T_{SMTC,\ i}$)	MAX (800 ms, 13 x $T_{SMTC,\ i}$)
≥ -8	FR2	N/A	MAX (1000 ms, 104 x $T_{SMTC,\ i}$))
< -8	FR1	N/A	800[Note1]
< -8	FR2	N/A	4000[Note1]
Note 1: The UE is not required to successfully identify a cell on any NR frequency layer when $T_{SMTC,i}$ > 20 ms and serving cell SSB Ês/Iot < -8 dB.			

The normative reference for this requirement is TS 38.133 [6] clause 6.2.1.

7.3.2.1.1 NR SA FR2 RRC re-establishment

Editor's Note: This test case has been completed for the following configurations:

- Test frequency f ≤ 40.8 GHz

- UE PC3

- The test is incomplete for UE power classes other than PC3

- The test is incomplete for test frequencies > 40.8 GHz

7.3.2.1.1.1 Test purpose

The purpose of this test is to verify that the NR intra-frequency RRC re-establishment delay in FR2 without known target cell is within the specified limits.

7.3.2.1.1.2 Test applicability

This test applies to all types of NR UE from Release 15 onwards.

7.3.2.1.1.3 Minimum conformance requirement

The minimum conformance requirements are specified in clause 7.3.2.1.0

The normative reference for this requirement is TS 38.133 [6] clause A.7.3.2.1.1

7.3.2.1.1.4 Test description

7.3.2.1.1.4.1 Initial conditions

This test shall be tested using any of the test configurations in Table 7.3.2.1.1.4.1-1. Configure the test equipment and the DUT according to the parameters in Table 7.3.2.1.1.4.1-2. Test environment parameters are given in Table 7.3.2.1.1.4.1-3.

Table 7.3.2.1.1.4.1-1: Intra-frequency RRC re-establishment in FR2 supported test configurations

Config	Description
1	NR 120 kHz SSB SCS, 100MHz bandwidth, TDD duplex mode
Note: The UE is only required to be tested in one of the supported test configurations depending on UE capability	

Table 7.3.2.1.1.4.1-2: General test parameters for Intra-frequency RRC re-establishment in FR2

Parameter		Unit	Test configuration	Value	Comment
Initial condition	Active cell		1	Cell1	
	Neighbour cells		1	Cell2	
Final condition	Active cell		1	Cell2	
RF Channel Number			1	1	
Time offset between cells			1	3 μs	Synchronous cells
N310		-	1	1	Maximum consecutive out-of-sync indications from lower layers
N311		-	1	1	Minimum consecutive in-sync indications from lower layers
T310		ms	1	0	Radio link failure timer; T310 is disabled
T311		ms	1	5000	RRC re-establishment timer
Access Barring Information		-	1	Not Sent	No additional delays in random access procedure.
SSB configuration			1	SSB.1 FR2	
SMTC configuration			1	SMTC.1	
DRX cycle length		s	1	OFF	
PRACH configuration			1	PRACH.1 FR2	As specified in Annex A.7
T1		s	1	5	
T2		s	1	4.84	Time for the UE to detect RLF (Summation of $T_{Evaluate_out_SSB}$ defined in clause 8.1 in TS 38.133, T310 and the period for UE turns off transmitter defined in clause 8.1.5 in TS 38.133)
T3		s	1	5	

Table 7.3.2.1.1.4.1-3: Test Environment Intra-frequency RRC re-establishment in FR2

Parameter	Value		Comment
Test environment	NC		As specified in TS 38.508-1 [14] clause 4.1.
Test frequencies	As specified in Annex E, Table E.5.1 and TS 38.508-1 [14] clause 4.3.1 and 4.4.2		
Channel bandwidth	As specified by the test configuration selected from Table 7.3.2.1.1.4.1-1		
Propagation conditions	AWGN		As specified in Annex C.2.2.
Connection Diagram	TE Part	A.3.3.3.1	As specified in TS 38.508-1 [14] Annex A.
	DUT Part	A.3.4.1.1	

Exceptions to connection diagram		

1. Message contents are defined in clause 7.3.2.1.1.4.3.
2. There is one NR carrier and two cells specified in the test. Cell 1 is the cell used for registration with the power level set according to Annex C.1.1 and C.1.2 for this test.
3. The AoA setup for this test is Setup 1 as defined in clause A.9

7.3.2.1.1.4.2 Test procedure

The test consists of 3 successive time periods, with time duration of T1, T2 and T3 respectively. At the start of time period T2, cell 1, which is the active cell, becomes inactive. The time period T3 starts after the occurrence of the radio link failure.

1. Ensure the UE is in RRC_CONNECTED state with generic procedure parameters Connectivity *NR*, Connected without release *On* according to TS 38.508-1 [14] clause 4.5.
2. Set the parameters according to T1 in Table 7.3.2.1.1.5-1. T1 starts.
3. SS shall transmit an RRCReconfiguration message.
4. The UE shall transmit RRCReconfigurationComplete message.
5. When T1 expires, the SS shall switch the power setting from T1 to T2 as specified in Table 7.3.2.1.1.5-1. T2 starts
6. When T2 expires, the SS shall switch the power setting from T2 to T3 as specified in Table 7.3.2.1.1.5-1. T3 starts
7. If the UE starts to send PRACH preambles to cell 2 for sending the *RRCReestablishmentRequest* message to cell 2 within 3 s from the beginning of time period T3, then the number of successful tests is increased by one. Otherwise, the number of failure tests is increased by one.
8. After T3 expires, cause UE handover back to Cell 1 (if the handover fails, switch off the UE) or switch off the UE. Then ensure the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity *NR*, Connected without release *On* according to TS 38.508-1 [14] clause 4.5. Cell 1 is the active cell.
9. Set cell 2 physical cell identity = ((current cell 2 physical cell identity + 1) mod 1008) for next iteration of the test procedure loop.
10. Repeat step 2-9 until the confidence level according to Table G.2.3-1 in Annex G clause G.2 is achieved.

7.3.2.1.1.4.3 Message contents

Message contents are according to TS 38.508-1 [14] clause 7.3 with the following exceptions:

Table 7.3.2.1.1.4.3-1: Common Exception messages for NR intra-frequency RRC re-establishment test case in FR2

Default Message Contents	
Common contents of system information blocks exceptions	
Default RRC messages and information elements contents exceptions	Table H.3.5-9 with condition SSB RLM

Table 7.3.2.1.1.4.3-2: *RLF-TimersAndConstants* for intra-frequency RRC re-establishment

Derivation Path: TS 38.508-1 [14], Table 4.6.3-150			
Information Element	**Value/remark**	**Comment**	**Condition**
RLF-TimersAndConstants ::= SEQUENCE {			
t310	ms0		

t311	ms5000		
}			

Table 7.3.2.1.1.4.3-3: *MeasConfig* for intra-frequency RRC re-establishment

Derivation Path: TS 38.508-1 [14], Table 4.6.3-69			
Information Element	**Value/remark**	**Comment**	**Condition**
MeasConfig::= SEQUENCE {			
reportConfigToAddModList	Not present		
measIdToAddModList	Not present		
quantityConfig	Not present		
}			

7.3.2.1.1.5 Test requirement

Table 7.3.2.1.1.5-1 defines the primary level settings including test tolerances for all tests.

Table 7.3.2.1.1.5-1: Cell specific test parameters for NR intra-frequency RRC re-establishment test case in FR2

Parameter	Unit	Test configuration	Cell 1			Cell 2		
			T1	T2	T3	T1	T2	T3
Assumption for UE beams Note 4			Rough			Rough		
TDD configuration		1	TDDConf.3.1			TDDConf.3.1		
$BW_{channel}$	MHz	1	100: $N_{RB,c}$ = 66			100: $N_{RB,c}$ = 66		
Data RBs allocated		1	66			66		
PDSCH RMC configuration		1	SR.3.1 TDD			N/A		
RMSI CORESET RMC configuration		1	CR.3.1 FDD			CR.3.1 FDD		
Dedicated CORESET RMC configuration		1	CCR.3.1 FDD			CCR.3.1 FDD		
TRS configuration		1	TRS.2.1 TDD			N/A		
PDSCH/PDCCH TCI state		1	TCI.State.2			N/A		
OCNG Pattern		1	OP.1			OP.1		
Initial DL BWP configuration		1	DLBWP.0.1			DLBWP.0.1		
Initial UL BWP configuration		1	ULBWP.0.1			ULBWP.0.1		
RLM-RS		1	SSB			SSB		
AoA setup		1	Setup 1			Setup 1		
$\hat{E}_s / I_{ot}$	dB	1	-0.12	-infinity	-infinity	-3.46	2	2
N_{oc} Note2	dBm/SCS	1	-104.7					
N_{oc} Note2	dBm/15 kHz	1	-95.7					
$\hat{E}_s / N_{oc}$	dB	1	4	-infinity	-infinity	2	2	2
SS-RSRP Note3	dBm/SCS	1	-91.7	-infinity	-infinity	-93.7	-93.7	-93.7
Io	dBm/95.04 MHz	1	-59.64	-62.59	-62.59	-59.94	-62.59	-62.59
Propagation Condition		1	AWGN					

Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.

Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for N_{oc} to be fulfilled.

Note 3: SS-RSRP levels have been derived from other parameters for information purposes. They are not settable parameters themselves.

Note 4: Information about types of UE beam is given in TS 38.133 in Annex B.2.1.3, and does not limit UE implementation or test system implementation

The RRC re-establishment delay is defined as the time from the start of time period T3, to the moment when the UE starts to send PRACH preambles to cell 2 for sending the *RRCReestablishmentRequest* message to cell 2.

The RRC re-establishment delay to an unknown NR intra frequency cell shall be less than 5 s.

The rate of correct RRC re-establishments observed during repeated tests shall be at least 90% with a confidence level of 95%.

7.3.2.1.2 NR SA FR2 - FR2 RRC re-establishment

Editor's Note: This test case has been completed for the following configurations:

- Test frequency f ≤ 40.8 GHz

- UE PC3

- The test is incomplete for UE power classes other than PC3

- The test is incomplete for test frequencies > 40.8 GHz

7.3.2.1.2.1 Test purpose

The purpose of this test is to verify that the NR inter-frequency RRC re-establishment delay in FR2 without known target cell is within the specified limits.

7.3.2.1.2.2 Test applicability

This test applies to all types of NR UE from Release 15 onwards.

7.3.2.1.2.3 Minimum conformance requirement

The minimum conformance requirements are specified in clause 7.3.2.1.0

The normative reference for this requirement is TS 38.133 [6] clause A.7.3.2.1.2

7.3.2.1.2.4 Test description

7.3.2.1.2.4.1 Initial conditions

This test shall be tested using any of the test configurations in Table 7.3.2.1.2.4.1-1. Configure the test equipment and the DUT according to the parameters in Table 7.3.2.1.2.4.1-2. Test environment parameters are given in Table 7.3.2.1.2.4.1-3.

Table 7.3.2.1.2.4.1-1: Inter-frequency RRC re-establishment in FR2 supported test configurations

Config	Description
1	NR 120 kHz SSB SCS, 100MHz bandwidth, TDD duplex mode
Note: The UE is only required to be tested in one of the supported test configurations depending on UE capability	

Table 7.3.2.1.2.4.1-2: General test parameters for Inter-frequency RRC re-establishment in FR2

Parameter		Unit	Test configuration	Value	Comment
Initial condition	Active cell		1	Cell1	
	Neighbour cells		1	Cell2	
Final condition	Active cell		1	Cell2	
RF Channel Number			1	1, 2	
Time offset between cells			1	3 µs	Synchronous cells
N310		-	1	1	Maximum consecutive out-of-sync indications from lower layers
N311		-	1	1	Minimum consecutive in-sync indications from lower layers
T310		ms	1	0	Radio link failure timer; T310 is disabled
T311		ms	1	5000	RRC re-establishment timer

Access Barring Information	-	1	Not Sent	No additional delays in random access procedure.
SSB configuration		1	SSB.1 FR2	
SMTC configuration		1	SMTC.1	
DRX cycle length	s	1	OFF	
PRACH configuration		1	PRACH.1 FR2	As specified in Annex A.7
T1	s	1	5	
T2	s	1	4.84	Time for the UE to detect RLF (Summation of $T_{Evaluate_out_SSB}$ defined in clause 8.1 in TS 38.133, T310 and the period for UE turns off transmitter defined in clause 8.1.5 in TS 38.133)
T3	s	1	6	

Table 7.3.2.1.2.4.1-3: Test Environment Inter-frequency RRC re-establishment in FR2

Parameter	Value		Comment
Test environment	NC		As specified in TS 38.508-1 [14] clause 4.1.
Test frequencies	As specified in Annex E, Table FFS and TS 38.508-1 [14] clause 4.3.1 and 4.4.2		
Channel bandwidth	As specified by the test configuration selected from Table 7.3.2.1.2.4.1-1		
Propagation conditions	AWGN		As specified in Annex C2.2
Connection Diagram	TE Part	A.3.3.3.1	As specified in TS 38.508-1 [14] Annex A.
	DUT Part	A.3.4.1.1	
Exceptions to connection diagram			

1. Message contents are defined in clause 7.3.2.1.2.4.3

2. There are two cells on two NR carriers specified in the test. Cell 1 is the cell used for registration with the power level set according to Annex C.1.1 and C.1.2 for this test.

3. The AoA setup for this test is Setup 1 as defined in clause A.9

7.3.2.1.2.4.2 Test procedure

The test consists of 3 successive time periods, with time duration of T1, T2 and T3 respectively. At the start of time period T2, cell 1, which is the active cell, becomes inactive. The time period T3 starts after the occurrence of the radio link failure. During T1, the UE shall be configured with the carrier frequency of cell 2 (with RF Channel Number #2) to ensure that the UE has the context of the carrier frequency of cell 2 by the end of T1.

1. Ensure the UE is in RRC_CONNECTED state with generic procedure parameters Connectivity *NR*, Connected without release *On* according to TS 38.508-1 [14] clause 4.5.

2. Set the parameters according to T1 in Table 7.3.2.1.2.5-1. T1 starts.

3. SS shall transmit an RRCReconfiguration message.

4. The UE shall transmit RRCReconfigurationComplete message.

5. When T1 expires, the SS shall switch the power setting from T1 to T2 as specified in Table 7.3.2.1.2.5-1. T2 starts

6. When T2 expires, the SS shall switch the power setting from T2 to T3 as specified in Table 7.3.2.1.2.5-1. T3 starts

7. If the UE starts to send PRACH preambles to cell 2 for sending the *RRCReestablishmentRequest* message to cell 2 within 6 seconds from the beginning of time period T3, then the number of successful tests is increased by one. Otherwise, the number of failure tests is increased by one.

8. After T3 expires, cause UE handover back to Cell 1 (if the handover fails, switch off the UE) or switch off the UE. Then ensure the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity *NR*, Connected without release *On* according to TS 38.508-1 [14] clause 4.5. Cell 1 is the active cell.

9. Set cell 2 physical cell identity = ((current cell 2 physical cell identity + 1) mod 1008) for next iteration of the test procedure loop.

10. Repeat step 2-9 until the confidence level according to Table G.2.3-1 in Annex G clause G.2 is achieved.

7.3.2.1.2.4.3 Message contents

Same message content as in 7.3.2.1.1.4.3. Table 7.3.2.1.2.4.3-1: Void

Table 7.3.2.1.2.4.3-2: *RLF-TimersAndConstants* for intra-frequency RRC re-establishment

Derivation Path: TS 38.508-1 [14], Table 4.6.3-150			
Information Element	**Value/remark**	**Comment**	**Condition**
RLF-TimersAndConstants ::= SEQUENCE {			
t310	ms0		
t311	ms5000		
}			

Table 7.3.2.1.2.4.3-3: *MeasConfig* for intra-frequency RRC re-establishment

Derivation Path: TS 38.508-1 [14], Table 4.6.3-69			
Information Element	**Value/remark**	**Comment**	**Condition**
MeasConfig::= SEQUENCE {			
reportConfigToAddModList	Not present		
measIdToAddModList	Not present		
quantityConfig	Not present		
}			

7.3.2.1.2.5 Test requirement

Table 7.3.2.1.2.5-1 defines the primary level settings including test tolerances for all tests.

Table 7.3.2.1.2.5-1: Cell specific test parameters for NR intra-frequency RRC re-establishment test case in FR2

Parameter	Unit	Test configuration	Cell 1			Cell 2		
			T1	T2	T3	T1	T2	T3
Assumption for UE beams[Note 4]			Rough			Rough		
AoA setup		1	Setup 3					
			AoA1			AoA2		
TDD configuration		1	TDDConf.3.1			TDDConf.3.1		
PDSCH RMC configuration		1	SR.3.1 TDD			N/A		
RMSI CORESET RMC configuration		1	CR.3.1 FDD			CR.3.1 FDD		
Dedicated CORESET RMC configuration		1	CCR.3.1 FDD			CCR.3.1 FDD		
TRS configuration		1	TRS.2.1 TDD			N/A		
PDSCH/PDCCH TCI state		1	TCI.State.2			N/A		
OCNG Pattern		1	OP.1			OP.1		
Initial DL BWP configuration		1	DLBWP.0.1			DLBWP.0.1		
Initial UL BWP configuration		1	ULBWP.0.1			ULBWP.0.1		
RLM-RS		1	SSB			SSB		
$\hat{E}_s / I_{ot}$	dB	1	5+TT	-infinity	-infinity	-infinity	-infinity	8+TT

N_{oc} Note2	dBm/SCS	1	-98+TT					
N_{oc} Note2	dBm/15 kHz	1	-89+TT					
$\hat{E}_s / N_{oc}$	dB	1	5+TT	-infinity	-infinity	-infinity	-infinity	8+TT
SS-RSRP Note3	dBm/SCS	1	-84+TT	-infinity	-infinity	-infinity	-infinity	-81+TT
Io	dBm/95.04 MHz	1	-53.82+TT	-infinity	-infinity	-infinity	-infinity	-51.37+TT
Propagation Condition		1	AWGN					

Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.
Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for N_{oc} to be fulfilled.
Note 3: SS-RSRP levels have been derived from other parameters for information purposes. They are not settable parameters themselves.
Note 4: Information about types of UE beam is given in B.2.1.3, and does not limit UE implementation or test system implementation

The RRC re-establishment delay is defined as the time from the start of time period T3, to the moment when the UE starts to send PRACH preambles to cell 2 for sending the *RRCReestablishmentRequest* message to cell 2.

The RRC re-establishment delay to an unknown NR inter frequency cell shall be less than 6 s.

The rate of correct RRC re-establishments observed during repeated tests shall be at least 90% with a confidence level of 95%.

7.3.2.1.3 NR SA FR2 RRC re-establishment without serving cell timing

Editor's note: This test case is incomplete. The following aspects are either missing or not yet determined:

-The test tolerances and test system uncertainties applicable to this test are undefined.

-Antenna diagram is TBD

-Message content is TBD

7.3.2.1.3.1 Test purpose

The purpose of this test is to verify that the NR intra-frequency RRC re-establishment delay in FR2 without serving cell timing is within the specified limits, and to verify the requirements in TS 38.133 [6] clause 6.2.1

7.3.2.1.3.2 Test applicability

This test applies to all types of NR UE from Release 15 onwards.

7.3.2.1.3.3 Minimum conformance requirement

The minimum conformance requirements are specified in clause 7.3.2.1.0

The normative reference for this requirement is TS 38.133 [6] clause A.7.3.2.1.3

7.3.2.1.3.4 Test description

7.3.2.1.3.4.1 Initial conditions

The test shall be tested using any of the test configuration in Table 7.3.2.1.3.4.1-1.

Table 7.3.2.1.3.4.1-1: Supported test configurations for NR SA FR2 - FR2 RRC re-establishment without serving cell timing

Config	Description
1	NR 120 kHz SSB SCS, 100MHz bandwidth, TDD duplex mode

Note:	The UE is only required to be tested in one of the supported test configurations depending on UE capability

Configure the test requirement and the DUT according to the parameters in Table 7.3.2.1.3.4.1-2.

Table 7.3.2.1.3.4.1-2: Initial conditions for NR SA FR2 - FR2 RRC re-establishment without serving cell timing

Parameter	Value		Comment
Test environment	NC		As specified in TS 38.508-1 [14] clause 4.1.
Test frequencies	As specified in Annex E, Table E.5.1 and TS 38.508-1 [14] clause 4.3.1 and 4.4.2		
Channel bandwidth	As specified by the test configuration selected from Table 7.3.2.1.3.4.1-1		
Propagation conditions	AWGN		As specified in Annex C.2.2.
Connection Diagram	TE Part	FFS	As specified in TS 38.508-1 [14] Annex A.
	DUT Part	FFS	
Exceptions to connection diagram			

1. The general test parameter settings are set up according to Table 7.3.2.1.3.4.1-3.
2. Message contents are defined in clause 7.3.2.1.3.4.3.

There is one NR carrier and two cells specified in the test. Cell 1 is the cell used for registration with the power level set according to Annex C.1.1 and C.1.2 for this test.

Table 7.3.2.1.3.4.1-3: General test parameters for NR SA FR2 - FR2 RRC re-establishment without serving cell timing

Parameter		Unit	Test configuration	Value	Comment
Initial condition	Active cell		1	Cell1	
	Neighbour cells		1	Cell2	
Final condition	Active cell		1	Cell2	
RF Channel Number			1	1	
Time offset between cells			1	3 μs	Synchronous cells
N310		-	1	1	Maximum consecutive out-of-sync indications from lower layers
N311		-	1	1	Minimum consecutive in-sync indications from lower layers
T310		ms	1	6000	Radio link failure timer configured by *RLF-TimersAndConstants*
T311		ms	1	5000	RRC re-establishment timer
Access Barring Information		-	1	Not Sent	No additional delays in random access procedure.
SSB configuration			1	SSB.1 FR2	
SMTC configuration			1	SMTC pattern 1	
DRX cycle length		s	1	OFF	
PRACH configuration index			1	PRACH.1 FR2	
T1		s	1	5	
T2		s	1	10.84	Time for the UE to detect RLF (Summation of TEvaluate_out_SSB defined in clause 8.1 in TS 38.133 [6], T310 and the period for UE turns off transmitter defined in clause 8.1.5 in TS 38.133 [6])
T3		s	1	5	

7.3.2.1.3.4.2 Test procedure

The test consists of 3 successive time periods, with time duration of T1, T2 and T3 respectively. At the start of time period T2, cell 1, which is the active cell, becomes inactive. The time period T3 starts after the occurrence of the radio link failure.

1. Ensure the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity *NR*, Connected without release *On* and Test Mode *On* according to TS 38.508-1 [14] clause 4.5.
2. Set the parameters according to T1 in Table 7.3.2.1.3.5-1. T1 starts.
3. SS shall transmit an RRCReconfiguration message.
4. The UE shall transmit RRCReconfigurationComplete message.
5. When T1 expires, the SS shall switch the power setting from T1 to T2 as specified in Table 7.3.2.1.3.5-1. T2 starts
6. When T2 expires, the SS shall switch the power setting from T2 to T3 as specified in Table 7.3.2.1.3.5-1. T3 starts
7. If the UE starts to send PRACH preambles to cell 2 for sending the *RRCReestablishmentRequest* message to cell 2 within 5 s from the beginning of time period T3, then the number of successful tests is increased by one. Otherwise, the number of failure tests is increased by one.
8. After T3 expires, cause UE handover back to Cell 1 (if the handover fails, switch off the UE) or switch off the UE. Then ensure the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity *NR*, Connected without release *On* and Test Mode *On* according to TS 38.508-1 [14] clause 4.5. Cell 1 is the active cell.
9. Set cell 2 physical cell identity = ((current cell 2 physical cell identity + 1) mod 14 + 2) for next iteration of the test procedure loop.
10. Repeat step 2-9 until the confidence level according to Table G.2.3-1 in Annex G clause G.2 is achieved.

7.3.2.1.3.4.3 Message contents

Message contents are according to TS 38.508-1 [14] clause 7.3 with the following exceptions:

Table 7.3.2.1.3.4.3-1: Common Exception messages for NR SA FR2 - FR2 RRC re-establishment without serving cell timing

Default Message Contents	
Common contents of system information blocks exceptions	FFS
Default RRC messages and information elements contents exceptions	FFS

7.3.2.1.3.5 Test requirement

Table 7.3.2.1.3.5-1 defines the primary level settings including test tolerances for NR SA FR2 - FR2 RRC re-establishment without serving cell timing tests.

Table 7.3.2.1.3.5-1: Cell specific test parameters for NR SA FR2 - FR2 RRC re-establishment without serving cell timing

Parameter	Unit	Test configuration	Cell 1			Cell 2		
			T1	T2	T3	T1	T2	T3
Assumption for UE beams[Note 4]			Rough			Rough		
TDD configuration		1	TDDConf.3.1			TDDConf.3.1		
PDSCH RMC configuration		1	SR.3.1 TDD			N/A		
RMSI CORESET RMC configuration		1	CR.3.1 FDD			CR.3.1 FDD		

Dedicated CORESET RMC configuration		1	CCR.3.1 FDD			CCR.3.1 FDD		
TRS configuration		1	TRS.2.1 TDD			N/A		
TCI state		1	CSI-RS.Config.0			N/A		
OCNG Pattern		1	OP.1 defined in A.2.1			OP.1 defined in A.2.1		
Initial DL BWP configuration		1	DLBWP.0.1			DLBWP.0.1		
Initial UL BWP configuration		1	ULBWP.0.1			ULBWP.0.1		
RLM-RS		1	SSB			SSB		
AoA setup		1	Setup 1 defined in A. 9			Setup 1 defined in A.9		
$\hat{E}_s/I_{ot}$	dB	1	5	-infinity	-infinity	-infinity	-infinity	5
N_{oc} Note2	dBm/SCS	1	-98					
N_{oc} Note2	dBm/15 kHz	1	-89					
$\hat{E}_s/N_{oc}$	dB	1	5	-infinity	-infinity	-infinity	-infinity	5
SS-RSRP Note3	dBm/SCS	1	-93	-infinity	-infinity	-infinity	-infinity	-93
Io	dBm/95.04 MHz	1	-62.82	-infinity	-infinity	-infinity	-infinity	-62.82
Propagation Condition		1	AWGN					

Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.

Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for N_{oc} to be fulfilled.

Note 3: SS-RSRP levels have been derived from other parameters for information purposes. They are not settable parameters themselves.

Note 4: Information about types of UE beam is given in TS 38.133 [6] clause B.2.1.3, and does not limit UE implementation or test system implementation

The RRC re-establishment delay is defined as the time from the start of time period T3, to the moment when the UE starts to send PRACH preambles to cell 2 for sending the *RRCReestablishmentRequest* message to cell 2.

The RRC re-establishment delay to an unknown NR intra frequency cell without serving cell timing shall be less than 5 s.

The rate of correct RRC re-establishments observed during repeated tests shall be at least 90% with a confidence level of 95%.

NOTE: The RRC re-establishment delay in the test is derived from the following expression:

$$T_{re\text{-}establish_delay} = T_{UL_grant} + T_{UE_re\text{-}establish_delay}.$$

Where:

T_{UL_grant} = It is the time required to acquire and process uplink grant from the target cell. The PRACH reception at the system simulator is used as a trigger for the completion of the test; hence T_{UL_grant} is not used.

$$T_{UE_re-establish_delay} = 50 + T_{identify_intra_NR} + \sum_{i=1}^{Nfreq-1} T_{identify_inter_NR,i} + T_{SI-NR} + T_{PRACH}$$

$N_{freq} = 1$

$T_{identify_intra_NR} = 3520$ ms

$T_{SI} = 1280$ ms; it is the time required for receiving all the relevant system information as defined in TS 38.331 for the target intra-frequency NR cell.

$T_{PRACH} = 15$ ms; it is the additional delay caused by the random access procedure.

This gives a total of 4865 ms, allow 5 s in the test case.

7.3.2.2 Random access

7.3.2.2.0 Minimum conformance requirements

7.3.2.2.0.1 Minimum conformance requirements for Contention based random access

The random access procedure is used when establishing the layer 1 communication between the UE and NG-RAN. The random access is as defined in TS 38.213 [8] clause 7.4 and the control of the RACH transmission is as defined in TS 38.321 [12] clause 5.1.

The UE shall have capability to calculate PRACH transmission power according to the PRACH power formula as defined in TS 38.213 [8] clause 7.4 and apply this power level at the first preamble or additional preambles. The absolute power applied to the first preamble shall have an accuracy as defined in TS 38.101-2 [3] Table 6.3.4.2-1. The relative power applied to additional preambles shall have an accuracy as specified in TS 38.101-2 [3] Tables 6.3.4.3-1 and 6.3.4.3-2.

The UE shall indicate a Random Access problem to upper layers if the maximum number of preamble transmission counter has been reached for the random access procedure on PCell or PSCell as specified in TS 38.321 [12] clause 5.1.4.

With the UE selected SSB with SS-RSRP above *rsrp-ThresholdSSB*, UE shall have the capability to select a Random Access Preamble randomly with equal probability from the Random Access Preambles associated with the selected SSB if the association between Random Access Preambles and SS blocks is configured, as specified in clause 5.1.2 in TS 38.321 [12].

With the UE selected SSB with SS-RSRP above *rsrp-ThresholdSSB*, UE shall have the capability to transmit Random Access Preamble on the next available PRACH occasion from the PRACH occasions corresponding to the selected SSB permitted by the restrictions given by the *ra-ssb-OccasionMaskIndex* if configured, if the association between PRACH occasions and SSBs is configured, and PRACH occasion shall be randomly selected with equal probability amongst the selected SSB associated PRACH occasions occurring simultaneously but on different subcarriers, as specified in clause 5.1.2 in TS 38.321 [12].

The UE may stop monitoring for Random Access Response(s) and shall transmit the msg3 if the Random Access Response contains a Random Access Preamble identifier corresponding to the transmitted Random Access Preamble.

The UE shall again perform the Random Access Resource selection procedure defined in clause 5.1.2 in TS 38.321 [12], and transmit with the calculated PRACH transmission power when the backoff time expires if all received Random Access Responses contain Random Access Preamble identifiers that do not match the transmitted Random Access Preamble.

The UE shall again perform the Random Access Resource selection procedure defined in clause 5.1.2 in TS 38.321 [12], and transmit with the calculated PRACH transmission power when the backoff time expires if no Random Access Response is received within the RA Response window defined in clause 5.1.4 in TS 38.321 [12].

The UE shall re-transmit the msg3 upon the reception of an UL grant for msg3 retransmission.

The UE shall send ACK if the Contention Resolution is successful.

The UE shall again perform the Random Access Resource selection procedure defined in clause 5.1.2 in TS 38.321 [12], and transmit with the calculated PRACH transmission power when the backoff time expires unless the received message includes a UE Contention Resolution Identity MAC control element and the UE Contention Resolution Identity included in the MAC control element matches the CCCH SDU transmitted in the uplink message.

The UE shall re-select a preamble and transmit with the calculated PRACH transmission power when the backoff time expires if the Contention Resolution Timer expires.

The normative reference for this requirement is TS 38.133 [6] clause 6.2.2.

7.3.2.2.0.2 Minimum conformance requirements for Non-Contention based random access

The random access procedure is used when establishing the layer 1 communication between the UE and NG-RAN. The random access is as defined in TS 38.213 [8] clause 7.4 and the control of the RACH transmission is as defined in TS 38.321 [12] clause 5.1.

The UE shall have capability to calculate PRACH transmission power according to the PRACH power formula as defined in TS 38.213 [8] clause 7.4 and apply this power level at the first preamble or additional preambles. The absolute power applied to the first preamble shall have an accuracy as defined in TS 38.101-2 [3] Table 6.3.4.2-1. The relative power applied to additional preambles shall have an accuracy as specified in TS 38.101-2 [3] Tables 6.3.4.3-1 and 6.3.4.3-2.

The UE shall indicate a Random Access problem to upper layers if the maximum number of preamble transmission counter has been reached for the random access procedure on PCell or PSCell as specified in TS 38.321 [12] clause 5.1.4.

If the contention-free Random Access Resources and the contention-free PRACH occasions associated with SSBs is configured, with the UE selected SSB with SS-RSRP above *rsrp-ThresholdSSB* amongst the associated SSBs, UE shall have the capability to select the Random Access Preamble corresponding to the selected SSB, and to transmit Random Access Preamble on the next available PRACH occasion from the PRACH occasions corresponding to the selected SSB permitted by the restrictions given by the *ra-ssb-OccasionMaskIndex* if configured, and PRACH occasion shall be randomly selected with equal probability amongst the selected SSB associated PRACH occasions occurring simultaneously but on different subcarriers, as specified in clause 5.1.2 in TS 38.321 [12].

If the contention-free Random Access Resources and the contention-free PRACH occasions associated with CSI-RSs is configured, with the UE selected CSI-RS with CSI-RSRP above *cfra-csirs-DedicatedRACH-Threshold* amongst the associated CSI-RSs, UE shall have the capability to select the Random Access Preamble corresponding to the selected CSI-RS, and to transmit Random Access Preamble on the next available PRACH occasion from the PRACH occasions in *ra-OccasionList* corresponding to the selected CSI-RS, and PRACH occasion shall be randomly selected with equal probability amongst the selected CSI-RS associated PRACH occasions occurring simultaneously but on different subcarriers, as specified in clause 5.1.2 in TS 38.321 [12].

The UE may stop monitoring for Random Access Response(s), if the Random Access Response contains a Random Access Preamble identifier corresponding to the transmitted Random Access Preamble, unless the random access procedure is initialized for Other SI request from UE.

The UE shall again perform the Random Access Resource selection procedure defined in clause 5.1.2 in TS 38.321 [12] for the next available PRACH occasion, and transmit the preamble with the calculated PRACH transmission power if all received Random Access Responses contain Random Access Preamble identifiers that do not match the transmitted Random Access Preamble.

The UE shall again perform the Random Access Resource selection procedure defined in clause 5.1.2 in TS 38.321 [12] for the next available PRACH occasion, and transmit the preamble with the calculated PRACH transmission power, if no Random Access Response is received within the RA Response window configured in *RACH-ConfigCommon* or if no PDCCH addressed to UE's C-RNTI is received within the RA Response window configured in *BeamFailureRecoveryConfig*, as defined in clause 5.1.4 in TS 38.321 [12].

The normative reference for this requirement is TS 38.133 [6] clause 6.2.2.

Non-contention based random access procedure is not initialized for Other SI requested from UE or for beam failure recovery, so the requirements related to those features are omitted.

7.3.2.2.1 NR SA FR2 contention based random access

Editor's note: This test case is incomplete. The following aspects are either missing or not yet determined:

- The settable window for first preamble uplink power and the uplink calibration process are FFS.
- The test requirement for absolute uplink power is FFS.
- The test requirement for relative uplink power is FFS.
- The uncertainty value and test requirement for PRACH timing are in [ ]
- The results of the TT analysis are provisional until the corresponding MU values are agreed
- Antenna diagram and any exceptions are FFS
- Connection setup in Annex C is FFS

7.3.2.2.1.1 Test purpose

The purpose of this test is to verify that the behaviour of the random access procedure is according to the requirements and that the PRACH power settings and timing are within specified limits.

7.3.2.2.1.2 Test applicability

This test applies to all types of NR UE from Release 15 onwards.

7.3.2.2.1.3 Minimum conformance requirement

The minimum conformance requirements are specified in clause 7.3.2.2.0.1.

The normative reference for this requirement is TS 38.133 [6] clause A.7.3.2.2.1.

7.3.2.2.1.4 Test description

7.3.2.2.1.4.1 Initial conditions

This test can be run in the configurations defined in Table 7.3.2.2.1.4.1-1.

Table 7.3.2.2.1.4.1-1: Contention based random access test in FR2 for NR standalone supported test configurations

Test Case ID	Test Config Index	Description
7.3.2.2.1-1	1	NR: 120 kHz SSB SCS, 100MHz bandwidth, TDD duplex mode
Note: The UE is only required to be tested in one of the supported test configurations depending on UE capability		

Before the test procedure, Downlink and Uplink calibrations are carried out to derive signalled parameter values. This is necessary to ensure that the test case operates within the specified ranges. The detail of the calibration process is implementation dependent, but shall derive the values of Δ_{DL} and Δ_{UL} according to the following principles:

With the UE configured to report SS-RSRP, the Δ_{DL} value is calculated as (RSRP_$_{REP}$ – RSRP_76), where RSRP_$_{REP}$ is the SS-RSRP Reported value according to TS 38.133 [6] Table 10.1.6.1-1 with -80.6dBm/SCS applied at the Reference point. For a Reported value RSRP_x, x is treated as a positive integer value.

With the UE configured to send a first PRACH preamble, Δ_{UL} value is calculated as -ROUND(PPRACH0 -1), where PPRACH0 is the measured first PRACH power with -80.6dBm/SCS applied at the Reference point, and with signalled values *preambleReceivedTargetPower* = -100dBm and *ss-PBCH-BlockPower* = 20dBm.

Configure the test equipment and the DUT according to the parameters in Table 7.3.2.2.1.4.1-2.

Table 7.3.2.2.1.4.1-2: Test Environment for Contention based random access test in FR2 for NR standalone

Parameter	Value		Comment
Test environment	NC		As specified in TS 38.508-1 [14] clause 4.1.
Test frequencies	As specified in Annex E, Table E.5-1 and TS 38.508-1 [14] subclause 4.3.1.		
Channel bandwidth	As specified by the test configuration selected from Table 7.3.2.2.1.4.1-1.		
Propagation conditions	No interference		As specified in Annex C.2.1.
Connection Diagram	TE Part	FFS	As specified in TS 38.508-1 [14] Annex A.
	DUT Part	FFS	
Exceptions to connection diagram	FFS		

1. Message contents are defined in clause 7.3.2.2.1.4.3.

2. Cell 1 is the NR FR2 serving cell (PCell). The connection setup is done according to the settings in FFS.

7.3.2.2.1.4.2 Test procedure

The test consists of a single cell, configured as PCell in FR2. The System Simulator shall not explicitly assign a random access preamble via dedicated signalling in the downlink.

1. Ensure the UE is in state RRC_IDLE with generic procedure parameters Connectivity *NR* and Test Mode *On* according to TS 38.508-1 [14] clause 4.5.

2. Set the parameters according to Tables 7.3.2.2.1.5-1 and 7.3.2.2.1.5-2.

3. The UE shall establish a connection setup with SS, the random access procedure within the connection setup is used in the test.

4. Test 1: Correct behaviour when transmitting Random Access Preamble

   4.1. The UE shall send a preamble to the System Simulator. The System Simulator shall check that the Random Access Preamble belongs to one of the Random Access Preambles associated with the SSB with index 0, which has SS-RSRP above the configured rsrp-ThresholdSSB.

5. Test 2: Correct behaviour when receiving Random Access Response

   5.1. Repeat steps 1-3.

   5.2. The UE shall send preambles to the System Simulator. In response to the first 2 preambles, the System Simulator shall transmit a Random Access Response containing Random Access Preamble identifiers that do not match the transmitted Random Access Preamble.

   5.3. As the received Random Access Responses contain Random Access Preamble identifiers that do not match the transmitted Random Access Preamble, the UE shall perform the Random Access Resource selection procedure specified in clause 5.1.2 in TS 38.321 [12], and transmit with the calculated PRACH transmission power when the backoff time expires.

   5.4. The System Simulator shall transmit a Random Access Response containing a Random Access Preamble identifier matching the transmitted Random Access Preamble after 3 preambles have been received by the System Simulator.

   5.5. As the received Random Access Response contains a Random Access Preamble identifier that matches the transmitted Random Access Preamble, the UE shall transmit the msg3.

   5.6. Measure the power and timing of the first preamble and it shall not exceed the values specified in 7.3.2.2.1.5. Measure the relative power and timing applied to additional preambles (last 2 preambles) and it shall not exceed the values specified in 7.3.2.2.1.5.

6. Test 3: Correct behaviour when not receiving Random Access Response

   6.1. Repeat steps 1-3.

   6.2. The UE shall send preambles to the System Simulator. The System Simulator shall not respond to the first 2 preambles.

   6.3. As no Random Access Response was received within the RA Response window, the UE shall perform the Random Access Resource selection procedure specified in clause 5.1.2 in TS 38.321 [12], and transmit with the calculated PRACH transmission power when the backoff time expires.

   6.4. The System Simulator shall transmit a Random Access Response containing a Random Access Preamble identifier matching the transmitted Random Access Preamble after 3 preambles have been received by the System Simulator.

   6.5. As the received Random Access Response contains a Random Access Preamble identifier that matches the transmitted Random Access Preamble, the UE shall transmit the msg3.

   6.6. Measure the power and timing of the first preamble and it shall not exceed the values specified in 7.3.2.2.1.5. Measure the relative power and timing applied to additional preambles (last 2 preambles) and it shall not exceed the values specified in 7.3.2.2.1.5.

7. Test 4: Correct behaviour when receiving an UL grant for msg3 retransmission

7.1. Repeat steps 1-3.

7.2. The UE shall send a preamble to the System Simulator. The System Simulator shall transmit a Random Access Response containing a Random Access Preamble identifier matching the transmitted Random Access Preamble.

7.3. As the received Random Access Response contains a Random Access Preamble identifier that matches the transmitted Random Access Preamble, the UE shall transmit the msg3.

7.4. The System Simulator shall send PDCCH addressed to the Temporary C-RNTI after receiving the msg3.

7.5. The UE shall re-transmit the msg3.

7.6. The System Simulator shall check if UE re-transmit the msg3.

8. Test 5: Correct behaviour when receiving an unsuccessful UE Contention Resolution

8.1. Repeat steps 1-3.

8.2. The UE shall send a preamble to the System Simulator. The System Simulator shall transmit a Random Access Response containing a Random Access Preamble identifier matching the transmitted Random Access Preamble.

8.3. As the received Random Access Response contains a Random Access Preamble identifier that matches the transmitted Random Access Preamble, the UE shall transmit the msg3.

8.4. The System Simulator shall send a message addressed to the temporary C-RNTI with a UE Contention Resolution Identity included in the MAC control element not matching the CCCH SDU transmitted in msg3 uplink message.

8.5. As the UE Contention Resolution Identity included in the MAC control element did not match the CCCH SDU transmitted in the uplink message, the UE shall perform the Random Access Resource selection procedure specified in clause 5.1.2 in TS 38.321 [12], and transmit with the calculated PRACH transmission power when the backoff time expires.

8.6. Measure the power and timing of the first preamble and it shall not exceed the values specified in 7.3.2.2.1.5.

9. Test 6: Correct behaviour when receiving a successful UE Contention Resolution

9.1. Repeat steps 1-3.

9.2. The UE shall send a preamble to the System Simulator. The System Simulator shall transmit a Random Access Response containing a Random Access Preamble identifier matching the transmitted Random Access Preamble.

9.3. As the received Random Access Response contains a Random Access Preamble identifier that matches the transmitted Random Access Preamble, the UE shall transmit the msg3.

9.4. The System Simulator shall send a message addressed to the temporary C-RNTI with a UE Contention Resolution Identity included in the MAC control element matching the CCCH SDU transmitted in msg3 uplink message.

9.5. As the UE Contention Resolution Identity included in the MAC control element matches the CCCH SDU, the Contention Resolution is successful and the UE shall send ACK.

10. Test 7: Correct behaviour when contention Resolution timer expires

10.1. Repeat steps 1-3.

10.2. The UE shall send a preamble to the System Simulator. The System Simulator shall transmit a Random Access Response containing a Random Access Preamble identifier matching the transmitted Random Access Preamble.

10.3. As the received Random Access Response contains a Random Access Preamble identifier that matches the transmitted Random Access Preamble, the UE shall transmit the msg3.

10.4. The System Simulator shall not send a response.

10.5. As there was no response, the UE shall perform the Random Access Resource selection procedure specified in clause 5.1.2 in TS 38.321 [12], and transmit with the calculated PRACH transmission power when the Contention Resolution Timer expires and then after the backoff timer expires.

10.6. Measure the power and timing of the first preamble and it shall not exceed the values specified in 7.3.2.2.1.5.

7.3.2.2.1.4.3 Message contents

Message contents are according to TS 38.508-1 [14] clause 4.6 with the following exceptions:

Table 7.3.2.2.1.4.3-1: *FrequencyInfoUL-SIB* for Contention Based Random Access

Derivation Path: TS 38.508-1 [14], table 4.6.3-62			
Information Element	**Value/remark**	**Comment**	**Condition**
FrequencyInfoUL-SIB SEQUENCE {			
p-Max	23	23 dBm	
}			

Table 7.3.2.2.1.4.3-2: RACH-ConfigCommon for Contention Based Random Access

Derivation Path: TS 38.508-1 [14], table 4.6.3-128			
Information Element	**Value/remark**	**Comment**	**Condition**
RACH-ConfigCommon::= SEQUENCE {			
rach-ConfigGeneric	RACH-ConfigGeneric		
totalNumberOfRA-Preambles	48		
ssb-perRACH-OccasionAndCB-PreamblesPerSSB CHOICE {			
oneFourth	n48		FR2
}			
groupBconfigured SEQUENCE {			
numberOfRA-PreamblesGroupA	48		
}			
ra-ContentionResolutionTimer	sf48		
rsrp-ThresholdSSB	RSRP_69 +Δ_{DL}	Δ_{DL} is derived from the downlink calibration process	
prach-RootSequenceIndex CHOICE {			
0			
}			
msg1-SubcarrierSpacing	kHz 120		
}			

Table 7.3.2.2.1.4.3-3: RACH-ConfigGeneric for Contention Based Random Access

Derivation Path: TS 38.508-1 [14], table 4.6.3-130			
Information Element	**Value/remark**	**Comment**	**Condition**
RACH-ConfigGeneric ::= SEQUENCE {			
prach-ConfigurationIndex	190		FR2
msg1-FDM	one		FR2
zeroCorrelationZoneConfig	11		
preambleReceivedTargetPower	-100		
preambleTransMax	n6		
powerRampingStep	dB2		
ra-ResponseWindow	sl10		
}			

Table 7.3.2.2.1.4.3-4: *ServingCellConfigCommonSIB* for Contention Based Random Access

Derivation Path: TS 38.508-1 [14], table 4.6.3-169			
Information Element	**Value/remark**	**Comment**	**Condition**
ServingCellConfigCommonSIB ::= SEQUENCE {			
ssb-PositionsInBurst SEQUENCE {			
inOneGroup	'1100 0000'B		
}			
ss-PBCH-BlockPower	20 +Δ_{UL}	Δ_{UL} is derived from the uplink calibration process	
}			

7.3.2.2.1.5 Test requirement

Table 7.3.2.2.1.5-2 defines the primary level settings for contention based random access test in FR2 for NR Standalone. Tables 7.3.2.2.1.5-3, 7.3.2.2.1.5-4 and 7.3.2.2.1.5-5 define the Absolute power limits, Relative power limits and uplink timing error limits respectively, and all include test tolerances.

Table 7.3.2.2.1.5-1: General test parameters for contention based random access test in FR2 for NR Standalone

Parameter		Unit	Test-1	Comments
SSB Configuration	Config 1		SSB.1 FR2	As defined in A.3.2
Duplex Mode for Cell 1	Config 1		TDD	
TDD Configuration	Config 1		TDDConf.3.1	As defined in A.1.5
$BW_{channel}$	Config 1	MHz	100: $N_{RB,c}$ = 24	
OCNG Pattern Note 1			OP.3	As defined in A.2.1
PDSCH Reference Channel Note 2	Config 1		SR.3.1 TDD	As defined in A.1.1
RMSI CORESET Reference Channel	Config 1		CR.3.1 TDD	As defined in A.1.2
NR RF Channel Number			1	
EPRE ratio of PSS to SSS		dB	0	
EPRE ratio of PBCH_DMRS to SSS		dB		
EPRE ratio of PBCH to PBCH_DMRS		dB		
EPRE ratio of PDCCH_DMRS to SSS		dB		
EPRE ratio of PDCCH to PDCCH_DMRS		dB		
EPRE ratio of PDSCH_DMRS to SSS		dB		
EPRE ratio of PDSCH to PDSCH_DMRS		dB		
ss-PBCH-BlockPower		dBm/ SCS	+20 +Δ_{UL}	As defined in TS 38.331 [13]. Δ_{UL} is derived from the uplink calibration process Note 3
Configured UE transmitted power ($P_{CMAX,\ f,\ c}$)		dBm	maximum value configurable for certain power class	As defined in clause 6.2.4 of TS 38.101-2 [3]
PRACH Configuration			PRACH.1 FR2	As defined in A.7.2, with exceptions as defined below
rsrp-ThresholdSSB		dBm	RSRP_69 +Δ_{DL}	RSRP_69 corresponds to -88dBm. Δ_{DL} is derived from the downlink calibration process Note 4
preambleReceivedTargetPower		dBm	-100	As defined in TS 38.331 [13]

Note 1: OCNG shall be used such that a constant total transmitted power spectral density is achieved for all OFDM symbols. The OCNG pattern is chosen during the test according to the presence of a DL reference measurement channel.

Note 2: The DL PDSCH reference measurement channel is used in the test only when a downlink transmission dedicated to the UE under test is required.

Note 3: The Δ_{UL} value is calculated as -ROUND(P_{PRACH0} -1), where P_{PRACH0} is the measured first PRACH power with -80.6dBm/SCS applied, *preambleReceivedTargetPower* = -100dBm and *ss-PBCH-BlockPower* =

	20dBm. These values are used during the uplink calibration process carried out before the test case is run, with the UE configured to send PRACH.
Note 4:	The Δ_{DL} value is calculated as (RSRP_$_{REP}$ – RSRP_76), where RSRP_$_{REP}$ is the SS-RSRP Reported value in Table 10.1.6.1-1 with -80.6dBm/SCS applied. These values are used during the downlink calibration process carried out before the test case is run, with the UE configured to report SS-RSRP. For a Reported value RSRP_x, x is treated as a positive integer value.

Table 7.3.2.2.1.5-2: OTA-related test parameters for contention based random access test in FR2 for NR Standalone

Parameter		Unit	Test-1	Comments
AoA setup			Setup 1	As defined in A.9.1
Assumption for UE beams[Note 2]			Rough	
SSB with index 0	Es [Note1]	dBm/SCS	-80.6	Power of SSB with index 0 is set to be above configured *rsrp-ThresholdSSB*
	SSB_RP	dBm/SCS	-80.6	
	Es/Iot_{BB}	dB	21.09	
	Io	dBm/95.04 MHz	-56.01	Io in symbols containing SSB index 0
SSB with index 1	Es [Note1]	dBm/SCS	-95.0	Power of SSB with index 1 is set to be below configured *rsrp-ThresholdSSB*
	SSB_RP	dBm/SCS	-95.0	
	Es/Iot_{BB}	dB	6.69	
	Io	dBm/95.04 MHz	-70.41	Io in symbols containing SSB index 1
Propagation Condition		-	AWGN	
Note 1: No artificial noise is applied in this test. Note 2: Information about types of UE beam is given in TS 38.133 [6] clause B.2.1.3, and does not limit UE implementation or test system implementation				

Test 1: Correct behaviour when transmitting Random Access Preamble

- The Random Access Preamble shall be one of the Random Access Preambles associated with SSB index 0.

Test 2: Correct behaviour when receiving Random Access Response

- The power of the first preamble shall be 0.6 dBm within the accuracy specified in Table 7.3.2.2.1.5-3.
- The relative power for preamble ramping step shall be 2 dB within the accuracy specified in Table 7.3.2.2.1.5-4.
- The transmit timing of all PRACH transmissions shall be within the accuracy specified in Table 7.3.2.2.1.5-5.

Test 3: Correct behaviour when not receiving Random Access Response

- The power of the first preamble shall be 0.6 dBm within the accuracy specified in Table 7.3.2.2.1.5-3.
- The relative power for preamble ramping step shall be 2 dB within the accuracy specified in Table 7.3.2.2.1.5-4.
- The transmit timing of all PRACH transmissions shall be within the accuracy specified in Table 7.3.2.2.1.5-5.

Test 4: Correct behaviour when receiving an UL grant for msg3 retransmission

- The UE shall re-transmit the msg3 upon the reception of an UL grant for msg3 retransmission.

Test 5: Correct behaviour when receiving an incorrect message over Temporary C-RNTI

- The UE shall re-select a preamble and transmit with the calculated PRACH transmission power when the back off time expires.
- The power of the first preamble shall be 0.6 dBm within the accuracy specified in Table 7.3.2.2.1.5-3.
- The transmit timing of the PRACH transmission shall be within the accuracy specified in Table 7.3.2.2.1.5-5.

Test 6: Correct behaviour when receiving a correct message over Temporary C-RNTI

- The UE shall send ACK if the contention resolution is successful.

Test 7: Correct behaviour when contention resolution timer expires

- The UE shall re-select a preamble and transmit with the calculated PRACH transmission power when the back off time expires if the contention resolution timer expires.
- The power of the first preamble shall be 0.6 dBm within the accuracy specified in Table 7.3.2.2.1.5-3.
- The transmit timing of the PRACH transmission shall be within the accuracy specified in Table 7.3.2.2.1.5-5.

Table 7.3.2.2.1.5-3: Absolute power tolerance Test requirements

Conditions	Tolerance
Normal	± FFS dB

Table 7.3.2.2.1.5-4: Relative power tolerance Test requirements

Measured power	Power step ΔP (dB)	PRACH (dB)
Measured power of both PRACHs being compared > (P_{max} Note1 – 6dB)	2 ≤ ΔP < 3	± (4+FFS).
Measured power of either PRACHs being compared ≤ (P_{max} Note1 – 6dB)		± (6+FFS)
Note 1: P_{max} is the Min peak EIRP defined in clause 6.2.1 of TS 38.101-2 [3], selected according to power class and operating band.		

Table 7.3.2.2.1.5-5: T_e Timing error Test requirements

Frequency Range	SCS of SSB signals (kHz)	SCS of uplink signals s(KHz)	T_e
2	120	120	224+[48]*T_c
Note 1: T_c is the basic timing unit defined in TS 38.211 [7]			

7.3.2.2.2 NR SA FR2 non-contention based random access

Editor's note: This test case is incomplete. The following aspects are either missing or not yet determined:

- The settable window for first preamble uplink power and the uplink calibration process are FFS.
- The test requirement for absolute uplink power is FFS.
- The test requirement for relative uplink power is FFS.
- The uncertainty value and test requirement for PRACH timing are in [ ]
- The results of the TT analysis are provisional until the corresponding MU values are agreed
- Antenna diagram and any exceptions are FFS
- Connection setup in Annex C is FFS

7.3.2.2.2.1 Test purpose

The purpose of this test is to verify that the behaviour of the random access procedure is according to the requirements and that the PRACH power settings and timing are within specified limits.

7.3.2.2.2.2 Test applicability

This test applies to all types of NR UE from Release 15 onwards. Additionally Test 2 is applicable to UE that supports CSI-RS based Random Access Preamble.

7.3.2.2.2.3 Minimum conformance requirement

The minimum conformance requirements are specified in clause 7.3.2.2.0.2.

The normative reference for this requirement is TS 38.133 [6] clause A.7.3.2.2.2.

7.3.2.2.2.4 Test description

7.3.2.2.2.4.1 Initial conditions

This test can be run in the configurations defined in Table 7.3.2.2.2.4.1-1.

Table 7.3.2.2.2.4.1-1: Non-Contention based random access test in FR2 for NR standalone supported test configurations

Test Case ID	Test Config Index	Description
7.3.2.2.2-1	1	NR: 120 kHz SSB SCS, 100MHz bandwidth, TDD duplex mode
Note: The UE is only required to be tested in one of the supported test configurations		

Before the test procedure, Downlink and Uplink calibrations are carried out to derive signalled parameter values. This is necessary to ensure that the test case operates within the specified ranges. The detail of the calibration process is implementation dependent, but shall derive the values of Δ_{DL} and Δ_{UL} according to the following principles:

With the UE configured to report SS-RSRP, the Δ_{DL} value is calculated as (RSRP_$_{REP}$ – RSRP_76), where RSRP_$_{REP}$ is the SS-RSRP Reported value according to TS 38.133 [6] Table 10.1.6.1-1 with -80.6dBm/SCS applied at the Reference point. For a Reported value RSRP_x, x is treated as a positive integer value.

With the UE configured to send a first PRACH preamble, Δ_{UL} value is calculated as -ROUND(PPRACH0 -1), where PPRACH0 is the measured first PRACH power with -80.6dBm/SCS applied at the Reference point, and with signalled values *preambleReceivedTargetPower* = -100dBm and *ss-PBCH-BlockPower* = 20dBm.

Configure the test equipment and the DUT according to the parameters in Table 7.3.2.2.2.4.1-2.

Table 7.3.2.2.2.4.1-2: Test Environment for Non-Contention based random access test in FR2 for NR standalone

Parameter	Value		Comment
Test environment	NC		As specified in TS 38.508-1 [14] clause 4.1.
Test frequencies	As specified in Annex E, Table E.5-1 and TS 38.508-1 [14] subclause 4.3.1.		
Channel bandwidth	As specified by the test configuration selected from Table 7.3.2.2.2.4.1-1.		
Propagation conditions	No interference		As specified in Annex C.2.1.
Connection Diagram	TE Part	FFS	As specified in TS 38.508-1 [14] Annex A.
	DUT Part	FFS	
Exceptions to connection diagram	FFS		

1. Message contents are defined in clause 7.3.2.2.2.4.3.

2. Cell 1 is the NR FR2 serving cell (PCell). The connection setup is done according to the settings in FFS.

7.3.2.2.2.4.2 Test procedure

The test consists of a single cell, configured as PCell in FR2. The System Simulator shall explicitly assign a random access preamble via dedicated signalling in the downlink. There are two subtests, to test both SSB-based non-contention based random access (subtest 1) and CSI-RS-based non-contention based random access (subtest 2).

1. Ensure the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity *NR*, Connected without release *On* and Test Mode *On* according to TS 38.508-1 [14] clause 4.5.

2. Set the parameters according to Table 7.3.2.2.2.5-1 Subtest 1.

3. The SS shall signal a Random Access Preamble ID via a PDCCH order to the UE and initiate a Non-contention based Random Access procedure.

4. Test 1: Correct behaviour when transmitting SSB-based Random Access Preamble

   4.1. The UE shall send a preamble to the System Simulator. The System Simulator shall check that the Random Access Preamble has the Preamble Index associated with the SSB with index 0, that it arrives on a PRACH occasion which belongs to the PRACH occasions corresponding to the SSB with index 0, and that the selected PRACH occasion belongs to the PRACH occasions permitted by the restrictions given by the *ra-ssb-OccasionMaskIndex*.

5. Test 2: Correct behaviour when transmitting CSI-RS-based Random Access Preamble

   5.1. Set the parameters according to Table 7.3.2.2.2.5-1 Subtest 2.

   5.2. Repeat steps 1-3

   5.3. The UE shall send a preamble to the System Simulator. The System Simulator shall check that the Random Access Preamble has the Preamble Index associated with the CSI-RS configured, that it arrives on a PRACH occasion which belongs to the PRACH occasions corresponding to the CSI-RS configured, and that the selected PRACH occasion belongs to the PRACH occasions permitted by the restrictions given by the *ra-OccasionList*.

6. Test 3: Correct behaviour when receiving Random Access Response

   6.1. Repeat steps 1-3

   6.2. The UE shall send preambles to the System Simulator. In response to the first 2 preambles, the System Simulator shall transmit a Random Access Response containing Random Access Preamble identifiers that do not match the transmitted Random Access Preamble.

   6.3. As the received Random Access Responses contain Random Access Preamble identifiers that do not match the transmitted Random Access Preamble, the UE shall perform the Random Access Resource selection procedure specified in clause 5.1.2 in TS 38.321 [12], and transmit with the calculated PRACH transmission power.

   6.4. The System Simulator shall transmit a Random Access Response containing a Random Access Preamble identifier matching the transmitted Random Access Preamble after 3 preambles have been received by the System Simulator.

   6.5. As the received Random Access Response contains a Random Access Preamble identifier that matches the transmitted Random Access Preamble, the UE may stop monitoring for Random Access Response(s).

   6.6. Measure the power and timing of the first preamble and it shall not exceed the values specified in 7.3.2.2.2.5. Measure the relative power and timing applied to additional preambles (last 2 preambles) and it shall not exceed the values specified in 7.3.2.2.2.5.

7. Test 4: Correct behaviour when not receiving Random Access Response

   7.1. Repeat steps 1-3.

   7.2. The UE shall send preambles to the System Simulator. The System Simulator shall not respond to the first 2 preambles.

   7.3. As no Random Access Response was received within the RA Response window configured in *RACH-ConfigCommon*, the UE shall perform the Random Access Resource selection procedure specified in clause 5.1.2 in TS 38.321 [12], and transmit with the calculated PRACH transmission power.

   7.4. The System Simulator shall transmit a Random Access Response containing a Random Access Preamble identifier matching the transmitted Random Access Preamble after 3 preambles have been received by the System Simulator.

   7.5. As the received Random Access Response contains a Random Access Preamble identifier that matches the transmitted Random Access Preamble, the UE may stop monitoring for Random Access Response(s).

7.6. Measure the power and timing of the first preamble and it shall not exceed the values specified in 7.3.2.2.2.5. Measure the relative power and timing applied to additional preambles (last 2 preambles) and it shall not exceed the values specified in 7.3.2.2.2.5.

7.3.2.2.2.4.3 Message contents

Message contents are according to TS 38.508-1 [14] clause 4.6 with the following exceptions:

Table 7.3.2.2.2.4.3-1: *FrequencyInfoUL-SIB* for Non-Contention Based Random Access

Derivation Path: TS 38.508-1 [14], table 4.6.3-62			
Information Element	**Value/remark**	**Comment**	**Condition**
FrequencyInfoUL-SIB SEQUENCE {			
p-Max	23	23 dBm	
}			

Table 7.3.2.2.2.4.3-2: RACH-ConfigCommon for Non-Contention Based Random Access

Derivation Path: TS 38.508-1 [14], table 4.6.3-128			
Information Element	**Value/remark**	**Comment**	**Condition**
RACH-ConfigCommon::= SEQUENCE {			
rach-ConfigGeneric	RACH-ConfigGeneric		
totalNumberOfRA-Preambles	48		
groupBconfigured SEQUENCE {			
numberOfRA-PreamblesGroupA	48		
}			
ra-ContentionResolutionTimer	Not present		
rsrp-ThresholdSSB	RSRP_69 +Δ_{DL}	Δ_{DL} is derived from the downlink calibration process	Subtest 1
prach-RootSequenceIndex CHOICE {			
0			
}			
msg1-SubcarrierSpacing	kHz 120		
}			

Table 7.3.2.2.2.4.3-3: RACH-ConfigDedicated for Non-Contention Based Random Access

Derivation Path: TS 38.508-1 [14], table 4.6.3-129			
Information Element	**Value/remark**	**Comment**	**Condition**
RACH-ConfigDedicated::= SEQUENCE {			
cfra SEQUENCE {			
occasions SEQUENCE {			
ssb-perRACH-Occasion	oneFourth		
}			
resources CHOICE {			
ssb SEQUENCE {			
ssb-ResourceList SEQUENCE (SIZE(1..maxRA-SSB-Resources)) OF {	2 entries		
ssb[1]	0		
ssb[2]	1		
ra-PreambleIndex[1]	50		Subtest 1
}			
ra-ssb-OccasionMaskIndex	1		Subtest 1
}			
csirs SEQUENCE {			
csirs-ResourceList SEQUENCE (SIZE(1..maxRA- CSIRS -Resources)) OF {			
ra-OccasionList	1		Subtest 2
ra-PreambleIndex[1]	50		Subtest 2
}			

rsrp-ThresholdCSI-RS	RSRP_69 +Δ_{DL}	Δ_{DL} is derived from the downlink calibration process	Subtest 2
}			
}			
}			
}			

Table 7.3.2.2.2.4.3-4: RACH-ConfigGeneric for Non-Contention Based Random Access

Derivation Path: TS 38.508-1 [14], table 4.6.3-130			
Information Element	**Value/remark**	**Comment**	**Condition**
RACH-ConfigGeneric ::= SEQUENCE {			
prach-ConfigurationIndex	190		FR2
msg1-FDM	one		FR2
zeroCorrelationZoneConfig	11		
preambleReceivedTargetPower	-100		
preambleTransMax	n6		
powerRampingStep	dB2		
ra-ResponseWindow	sl10		
}			

Table 7.3.2.2.2.4.3-5: *ServingCellConfigCommonSIB* for Non-Contention Based Random Access

Derivation Path: TS 38.508-1 [14], table 4.6.3-169			
Information Element	**Value/remark**	**Comment**	**Condition**
ServingCellConfigCommonSIB ::= SEQUENCE {			
ssb-PositionsInBurst SEQUENCE {			
inOneGroup	'1100 0000'B		
}			
ss-PBCH-BlockPower	20 +Δ_{UL}	Δ_{UL} is derived from the uplink calibration process	
}			

7.3.2.2.2.5 Test requirement

Table 7.3.2.2.2.5-2 defines the primary level settings for non-contention based random access test in FR2 for NR Standalone. Tables 7.3.2.2.2.5-3, 7.3.2.2.2.5-4 and 7.3.2.2.2.5-5 define the Absolute power limits, Relative power limits and uplink timing error limits respectively, and all include test tolerances.

Table 7.3.2.2.2.5-1: General test parameters for non-contention based random access test in FR2 for NR Standalone

Parameter		Unit	Test-1	Test-2	Comments
SSB Configuration	Config 1		SSB.1 FR2	SSB.1 FR2	As defined in A.3.2
CSI-RS Configuration	Config 1		N/A	CSI-RS.3.1 TDD	As defined in A.1.4
Duplex Mode for Cell 2	Config 1		TDD	TDD	
TDD Configuration	Config 1		TDDConf.3.1	TDDConf.3.1	As defined in A.1.5
$BW_{channel}$	Config 1	MHz	100: $N_{RB,c}$ = 24	100: $N_{RB,c}$ = 24	
OCNG Pattern Note 1			OP.3	OP.3	As defined in A.2.1.
PDSCH Reference Channel Note 2	Config 1		SR3.1 TDD	SR3.1 TDD	As defined in A.1.1.
RMSI CORESET Reference Channel	Config 1		CR.3.1 TDD	CR.3.1 TDD	As defined in A.1.2
NR RF Channel Number			1	1	
EPRE ratio of PSS to SSS		dB	0	0	
EPRE ratio of PBCH_DMRS to SSS		dB			

EPRE ratio of PBCH to PBCH_DMRS	dB			
EPRE ratio of PDCCH_DMRS to SSS	dB			
EPRE ratio of PDCCH to PDCCH_DMRS	dB			
EPRE ratio of PDSCH_DMRS to SSS	dB			
EPRE ratio of PDSCH to PDSCH_DMRS	dB			
ss-PBCH-BlockPower	dBm/ SCS	+20 +Δ_{UL}	+20 +Δ_{UL}	As defined in TS 38.331 [13]. Δ_{UL} is derived from the uplink calibration process Note 3
Configured UE transmitted power ($P_{CMAX,\ f,\ c}$)	dBm	maximum value configurable for certain power class	maximum value configurable for certain power class	As defined in clause 6.2.4 in TS 38.101-2 [3]
PRACH Configuration		PRACH.2 FR2	PRACH.3 FR2	As defined in A.7.2, with exceptions as defined below.
rsrp-ThresholdSSB	dBm	RSRP_69 +Δ_{DL}	RSRP_69 +Δ_{DL}	RSRP_69 corresponds to -88dBm. Δ_{DL} is derived from the downlink calibration process Note 4
preambleReceivedTargetPower	dBm	-100	-100	As defined in TS 38.331 [13]

Note 1: OCNG shall be used such that a constant total transmitted power spectral density is achieved for all OFDM symbols. The OCNG pattern is chosen during the test according to the presence of a DL reference measurement channel.

Note 2: The DL PDSCH reference measurement channel is used in the test only when a downlink transmission dedicated to the UE under test is required.

Note 3: The Δ_{UL} value is calculated as -ROUND(P_{PRACH0} -1), where P_{PRACH0} is the measured first PRACH power with -80.6dBm/SCS applied, *preambleReceivedTargetPower* = -100dBm and *ss-PBCH-BlockPower* = 20dBm. These values are used during the uplink calibration process carried out before the test case is run, with the UE configured to send PRACH.

Note 4: The Δ_{DL} value is calculated as (RSRP_$_{REP}$ – RSRP_76), where RSRP_$_{REP}$ is the SS-RSRP Reported value in Table 10.1.6.1-1 with -80.6dBm/SCS applied. These values are used during the downlink calibration process carried out before the test case is run, with the UE configured to report SS-RSRP. For a Reported value RSRP_x, x is treated as a positive integer value.

Table 7.3.2.2.2.5-2: OTA-related test parameters for non-contention based random access test in FR2 for NR Standalone

Parameter		Unit	Test-1	Test-2	Comments
AoA setup			Setup 1	Setup 1	As defined in A.9.1
Assumption for UE beams Note 2			Rough	Rough	
SSB with index 0	Es Note1	dBm/SCS	-80.6	-80.6	Power of SSB with index 0 is set to be above configured *rsrp-ThresholdSSB*
	SSB_RP	dBm/SCS	-80.6	-80.6	
	Es/Iot$_{BB}$	dB	21.09	21.09	
	Io	dBm/95.04 MHz	-56.01	-56.01	Io in symbols containing SSB index 0
SSB with index 1	Es Note1	dBm/SCS	-95.0	-95.0	Power of SSB with index 1 is set to be below configured *rsrp-ThresholdSSB*
	SSB_RP	dBm/SCS	-95.0	-95.0	
	Es/Iot$_{BB}$	dB	6.69	6.69	
	Io	dBm/95.04 MHz	-70.41	-70.41	Io in symbols containing SSB index 1
Propagation Condition		-	AWGN	AWGN	

Note 1: No artificial noise is applied in this test.

Note 2:	Information about types of UE beam is given in TS 38.133 [6] clause B.2.1.3, and does not limit UE implementation or test system implementation

Test 1: Correct behaviour when transmitting SSB-based Random Access Preamble

- The Random Access Preamble shall be one of the Random Access Preambles associated with SSB index 0.
- The Random Access Preamble shall arrive on a PRACH occasion which belongs to the PRACH occasions corresponding to the SSB with index 0.
- The selected PRACH occasion shall belong to the PRACH occasions permitted by the restrictions given by the *ra-ssb-OccasionMaskIndex*.

Test 2: Correct behaviour when transmitting CSI-RS-based Random Access Preamble

- The Random Access Preamble shall have the Preamble Index associated with the CSI-RS configured.
- The Random Access Preamble shall arrive on a PRACH occasion which belongs to the PRACH occasions corresponding to the CSI-RS configured.
- The selected PRACH occasion belongs to the PRACH occasions permitted by the restrictions given by the *ra-OccasionList*.

Test 3: Correct behaviour when receiving Random Access Response

- The power of the first preamble shall be 0.6 dBm within the accuracy specified in Table 7.3.2.2.2.5-3.
- The relative power for preamble ramping step shall be 2 dB within the accuracy specified in Table 7.3.2.2.2.5-4.
- The transmit timing of all PRACH transmissions shall be within the accuracy specified in Table 7.3.2.2.2.5-5.

Test 4: Correct behaviour when not receiving Random Access Response

- The power of the first preamble shall be 0.6 dBm within the accuracy specified in Table 7.3.2.2.2.5-3.
- The relative power for preamble ramping step shall be 2 dB within the accuracy specified in Table 7.3.2.2.2.5-4.
- The transmit timing of all PRACH transmissions shall be within the accuracy specified in Table 7.3.2.2.2.5-5.

Table 7.3.2.2.2.5-3: Absolute power tolerance Test requirements

Conditions	Tolerance
Normal	± FFS dB

Table 7.3.2.2.2.5-4: Relative power tolerance Test requirements

Measured power	Power step ΔP (dB)	PRACH (dB)
Measured power of both PRACHs being compared > (P_{max} Note1 – 6dB)	2 ≤ ΔP < 3	± (4+FFS).
Measured power of either PRACHs being compared ≤ (P_{max} Note1 – 6dB)		± (6+FFS)
Note 1: P_{max} is the Min peak EIRP defined in clause 6.2.1 of TS 38.101-2 [3], selected according to power class and operating band.		

Table 7.3.2.2.2.5-5: T_e Timing error Test requirements

Frequency Range	SCS of SSB signals (kHz)	SCS of uplink signals s(KHz)	T_e
2	120	120	224+[48]*T_c
Note 1: T_c is the basic timing unit defined in TS 38.211 [7]			

7.3.2.2.3 NR SA FR2 2-step contention based random access

Editor's note: This test case is incomplete. The following aspects are either missing or not yet determined:

- The settable window for first preamble uplink power and the uplink calibration process are FFS.
- The test requirement for absolute uplink power is FFS.
- The test requirement for relative uplink power is FFS.
- The uncertainty value and test requirement for T_e Timing error are in [ ]
- TT analysis is missing
- Antenna diagram and any exceptions are FFS
- Connection setup in Annex C is FFS

7.3.2.2.3.1 Test purpose

The purpose of this test is to verify that the behaviour of the 2-step RA type random access procedure is according to the requirements and that the MsgA PRACH and MsgA PUSCH power settings and timing are within specified limits.

7.3.2.2.3.2 Test applicability

This test applies to all types of NR UE supporting 2-step RA type from Release 16 onwards.

7.3.2.2.3.3 Minimum conformance requirement

The minimum conformance requirements are specified in clause 7.3.2.2.0.1.

The normative reference for this requirement is TS 38.133 [6] clause A.7.3.2.2.3.

7.3.2.2.3.4 Test description

7.3.2.2.3.4.1 Initial conditions

This test can be run in the configurations defined in Table 7.3.2.2.3.4.1-1.

Table 7.3.2.2.3.4.1-1: 2-step contention based random access test in FR2 for NR standalone supported test configurations

Test Case ID	Test Config Index	Description
7.3.2.2.3-1	1	NR: 120 kHz SSB SCS, 100MHz bandwidth, TDD duplex mode
Note: The UE is only required to be tested in one of the supported test configurations depending on UE capability		

Before the test procedure, Downlink and Uplink calibrations are carried out to derive signalled parameter values. This is necessary to ensure that the test case operates within the specified ranges. The detail of the calibration process is implementation dependent, but shall derive the values of Δ_{DL} and Δ_{UL} according to the following principles:

With the UE configured to report SS-RSRP, the Δ_{DL} value is calculated as ($RSRP_{REP}$ – RSRP_76), where $RSRP_{REP}$ is the SS-RSRP Reported value according to TS 38.133 [6] Table 10.1.6.1-1 with -80.6dBm/SCS applied at the Reference point. For a Reported value RSRP_x, x is treated as a positive integer value.

With the UE configured to send a first PRACH preamble, Δ_{UL} value is calculated as -ROUND(PPRACH0 -1), where PPRACH0 is the measured first PRACH power with -80.6dBm/SCS applied at the Reference point, and with signalled values *preambleReceivedTargetPower* = -100dBm and *ss-PBCH-BlockPower* = 20dBm.

Configure the test equipment and the DUT according to the parameters in Table 7.3.2.2.3.4.1-2.

Table 7.3.2.2.3.4.1-2: Test Environment for 2-step RACH contention based random access test in FR2 for NR standalone

Parameter	Value	Comment

Test environment	NC		As specified in TS 38.508-1 [14] clause 4.1.
Test frequencies	As specified in Annex E, Table E.5-1 and TS 38.508-1 [14] subclause 4.3.1.		
Channel bandwidth	As specified by the test configuration selected from Table 7.3.2.2.3.4.1-1.		
Propagation conditions	No interference		As specified in Annex C.2.1.
Connection Diagram	TE Part	FFS	As specified in TS 38.508-1 [14] Annex A.
	DUT Part	FFS	
Exceptions to connection diagram	FFS		

1. Message contents are defined in clause 7.3.2.2.3.4.3.

2. Cell 1 is the NR FR2 serving cell (PCell). The connection setup is done according to the settings in FFS.

7.3.2.2.3.4.2 Test procedure

The test consists of a single cell, configured as PCell in FR2. The System Simulator shall not explicitly assign a random access preamble via dedicated signalling in the downlink.

1. Ensure the UE is in state RRC_IDLE with generic procedure parameters Connectivity *NR* and Test Mode *On* according to TS 38.508-1 [14] clause 4.5.

2. Set the parameters according to Tables 7.3.2.2.3.5-1 and 7.3.2.2.3.5-2.

3. The UE shall establish a connection setup with SS, the random access procedure within the connection setup is used in the test.

4. Test 1: Correct behaviour when transmitting MsgA

   4.1. The UE shall send the MsgA PRACH and MsgA PUSCH to the System Simulator with a preamble which belongs to one of the Random Access Preambles associated with the SSB with index 0, which has SS-RSRP above the configured *msgA-RSRP-ThresholdSSB*. The UE shall send the MsgA PUSCH on the MsgA PUSCH occasion that is associated with the chosen preamble.

5. Test 2: Correct behaviour when receiving MsgB

   5.1. Repeat steps 1-3.

   5.2. The UE shall send preambles to the System Simulator. In response to the first 2 preambles, the System Simulator shall transmit a MsgB *not* corresponding to the transmitted Random Access Preamble.

   5.3. The UE shall again perform the Random Access Resource selection procedure specified in clause 5.1.2a in TS 38.321 [20], and transmit MsgA with the calculated MsgA PRACH and MsgA PUSCH transmission power when the backoff time expires if all received MsgB's contain Random Access Preamble identifiers that do not match the transmitted Random Access Preamble of MsgA.

   5.4 The System Simulator shall transmit a MsgB containing fallbackRAR message with a Random Access Preamble identifier matching the transmitted MsgA PRACH after 3 MsgA transmissions have been received by the System Simulator.

   5.5 As the received Random Access Response MsgB with a fallbackRAR contains Random Access Preamble identifier corresponding to the transmitted Random Access Preamble, the UE may stop monitoring for MsgB(s) and shall transmit the msg3 on the indicated PUSCH resources.

   5.6. Measure the power and timing of the first preamble and it shall not exceed the values specified in 7.3.2.2.3.5. Measure the relative power and timing applied to additional preambles (last 2 preambles) and it shall not exceed the values specified in 7.3.2.2.3.5.

6. Test 3: Correct behaviour when not receiving MsgB

   6.1. Repeat steps 1-3.

6.2. The UE shall send preambles to the System Simulator. The System Simulator shall not respond to the first 2 preambles.

6.3. The UE shall again perform the Random Access Resource selection procedure specified in clause 5.1.2a in TS 38.321 [20], and transmit with the calculated MsgA PRACH and MsgA PUSCH transmission power when the backoff time expires if no MsgB is received within the MsgB Response window.

6.4. Measure the power and timing of the first preamble and it shall not exceed the values specified in 7.3.2.2.3.5. Measure the relative power and timing applied to additional preambles (last 2 preambles) and it shall not exceed the values specified in 7.3.2.2.3.5.

7.3.2.2.3.4.3 Message contents

Message contents are according to TS 38.508-1 [14] clause 4.6 with the following exceptions:

Table 7.3.2.2.3.4.3-1: *FrequencyInfoUL-SIB* for 2-step contention Based Random Access

Derivation Path: TS 38.508-1 [14], table 4.6.3-62			
Information Element	**Value/remark**	**Comment**	**Condition**
FrequencyInfoUL-SIB SEQUENCE {			
p-Max	23	23 dBm	
}			

Table 7.3.2.2.3.4.3-2: RACH-ConfigCommon for 2-step contention Based Random Access

Derivation Path: TS 38.508-1 [14], table 4.6.3-128A			
Information Element	**Value/remark**	**Comment**	**Condition**
RACH-ConfigCommonTwoStepRA-r16 ::= SEQUENCE {			
rach-ConfigGenericTwoStepRA-r16	RACH-ConfigGenericTwoStepRA		
msgA-TotalNumberOfRA-Preambles-r16	48		
msgA-SSB-PerRACH-OccasionAndCB-PreamblesPerSSB-r16 CHOICE {	oneFourth, n48		
one	n4		FR2
}			
msgA-CB-PreamblesPerSSB-PerSharedRO-r16	oneFourth, n48		
msgA-SSB-SharedRO-MaskIndex-r16	Not present		
groupB-ConfiguredTwoStepRA-r16	Not present		
msgA-PRACH-RootSequenceIndex-r16 CHOICE {}	Not present		
msgA-TransMax-r16	N8		
msgA-RSRP-Threshold-r16	RSRP_69 +Δ_{DL}		
msgA-RSRP-ThresholdSSB-r16	RSRP_69 +Δ_{DL}		
msgA-SubcarrierSpacing-r16	120 kHz		
msgA-RestrictedSetConfig-r16	Not present		
ra-PrioritizationForAccessIdentityTwoStep-r16 SEQUENCE {			
ra-Prioritization-r16	RA-Prioritization		
ra-PrioritizationForAI-r16	'10'B		
}			
ra-ContentionResolutionTimer-r16	sf32		
}			

Table 7.3.2.2.3.4.3-3: RACH-ConfigGeneric for 2-step contention Based Random Access

Derivation Path: TS 38.508-1 [14], table 4.6.3-130A			
Information Element	**Value/remark**	**Comment**	**Condition**
RACH-ConfigGenericTwoStepRA-r16 ::= SEQUENCE {			
msgA-PRACH-ConfigurationIndex-r16	190		
msgA-RO-FDM-r16	four		
msgA-RO-FrequencyStart-r16	0		
msgA-ZeroCorrelationZoneConfig-r16	11		

msgA-PreamblePowerRampingStep-r16	dB2		
msgA-PreambleReceivedTargetPower-r16	-100		
msgB-ResponseWindow-r16	sl10		
preambleTransMax-r16	n10		
}			

Table 7.3.2.2.3.4.3-4: *ServingCellConfigCommonSIB* for 2-step contention Based Random Access

Derivation Path: TS 38.508-1 [14], table 4.6.3-169			
Information Element	**Value/remark**	**Comment**	**Condition**
ServingCellConfigCommonSIB ::= SEQUENCE {			
ssb-PositionsInBurst SEQUENCE {			
inOneGroup	'1100 0000'B		
}			
ss-PBCH-BlockPower	20 +Δ_{UL}	Δ_{UL} is derived from the uplink calibration process	
}			

Table 7.3.2.2.3.4.3-5: MsgA-PUSCH-Config for 2-step contention Based Random Access

Derivation Path: TS 38.508-1 [14], table 4.6.3-81B			
Information Element	**Value/remark**	**Comment**	**Condition**
MsgA-PUSCH-Resource-r16 ::= SEQUENCE {			
msgA-MCS	1		
nrofSlotsMsgA-PUSCH	1		
nrofMsgA-PO-PerSlot	1		
msgA-PUSCH-TimeDomainOffset	1		
msgA-PUSCH-TimeDomainAllocation-r16	3	Equivalent to PUSCH start symbol = 0 and allocation length = 10	
mappingTypeMsgA-PUSCH	typeA		
nrofPRBs-PerMsgA-PO	2		
nrofMsgA-PO-FDM	One		
msgA-DMRS-AdditionalPosition	pos1		
msgA-PUSCH-NrofPorts	1		
msgA-DeltaPreamble	3		
msgA-Alpha	alpha1		
deltaMCS	Disabled		
}			

7.3.2.2.3.5 Test requirement

Table 7.3.2.2.3.5-2 defines the primary level settings for 2-step contention based random access test in FR2 for NR Standalone. Tables 7.3.2.2.3.5-3, 7.3.2.2.3.5-4 and 7.3.2.2.3.5-5 define the Absolute power limits, Relative power limits and uplink timing error limits respectively, and all include test tolerances.

Table 7.3.2.2.3.5-1: General test parameters for 2-step contention based random access test in FR2 for NR Standalone

Parameter		Unit	Test-1	Comments
SSB Configuration	Config 1		SSB.1 FR2	As defined in A.3.2
Duplex Mode for Cell 1	Config 1		TDD	
TDD Configuration	Config 1		TDDConf.3.1	As defined in A.1.5
$BW_{channel}$	Config 1	MHz	100: $N_{RB,c}$ = 24	
OCNG Pattern Note 1			OCNG pattern 1	As defined in A.2.1
PDSCH Reference Channel Note 2	Config 1		SR.3.1 TDD	As defined in A.1.1
RMSI CORESET Reference Channel	Config 1		CR.3.1 TDD	As defined in A.1.2

NR RF Channel Number		1	
EPRE ratio of PSS to SSS	dB	0	
EPRE ratio of PBCH_DMRS to SSS	dB		
EPRE ratio of PBCH to PBCH_DMRS	dB		
EPRE ratio of PDCCH_DMRS to SSS	dB		
EPRE ratio of PDCCH to PDCCH_DMRS	dB		
EPRE ratio of PDSCH_DMRS to SSS	dB		
EPRE ratio of PDSCH to PDSCH_DMRS	dB		
ss-PBCH-BlockPower	dBm/ SCS	+20 +Δ_{UL}	As defined in TS 38.331 [13]. Δ_{UL} is derived from the uplink calibration process Note 3
Configured UE transmitted power ($P_{CMAX,\ f,\ c}$)	dBm	maximum value configurable for certain power class	As defined in clause 6.2.4 in TS 38.101-2 [3]
MsgA Configuration		FR2 MsgA configuration 1	As defined in A.7.2, with exceptions as defined below
msgA-RSRP-ThresholdSSB	dBm	RSRP_69 +Δ_{DL}	RSRP_69 corresponds to -88dBm. Δ_{DL} is derived from the downlink calibration process Note 4
preambleReceivedTargetPower	dBm	-100	As defined in TS 38.331 [13]

Note 1: OCNG shall be used such that a constant total transmitted power spectral density is achieved for all OFDM symbols. The OCNG pattern is chosen during the test according to the presence of a DL reference measurement channel.
Note 2: The DL PDSCH reference measurement channel is used in the test only when a downlink transmission dedicated to the UE under test is required.
Note 3: The Δ_{UL} value is calculated as -ROUND(PMsgA0 -1), where PMsgA0 is the measured first MsgA PRACH power with -80.6dBm/SCS applied, *msgA-PreambleReceivedTargetPower* = -100dBm and *ss-PBCH-BlockPower* = 20dBm. These values are used during the uplink calibration process carried out before the test case is run, with the UE configured to send MsgA.
Note 4: The Δ_{DL} value is calculated as (RSRP_$_{REP}$ – RSRP_76), where RSRP_$_{REP}$ is the SS-RSRP Reported value in Table 10.1.6.1-1 with -80.6dBm/SCS applied. These values are used during the downlink calibration process carried out before the test case is run, with the UE configured to report SS-RSRP. For a Reported value RSRP_x, x is treated as a positive integer value.

Table 7.3.2.2.3.5-2: OTA-related test parameters for 2-step contention based random access test in FR2 for NR Standalone

Parameter		Unit	Test-1	Comments
AoA setup			Setup 2b	As defined in A.9.2.2
Assumption for UE beams Note 2			Rough	
SSB with index 0	Es Note1	dBm/SCS	-80.6	Power of SSB with index 0 is set to be above configured *rsrp-ThresholdSSB*
	SSB_RP	dBm/SCS	-80.6	
	Es/Iot$_{BB}$	dB	21.09	
	Io	dBm/95.04 MHz	-56.01	Io in symbols containing SSB index 0
SSB with index 1	Es Note1	dBm/SCS	-95.0	Power of SSB with index 1 is set to be below configured *rsrp-ThresholdSSB*
	SSB_RP	dBm/SCS	-95.0	
	Es/Iot$_{BB}$	dB	6.69	
	Io	dBm/95.04 MHz	-70.41	Io in symbols containing SSB index 1
Propagation Condition		-	AWGN	

Note 1: No artificial noise is applied in this test.
Note 2: Information about types of UE beam is given in TS 38.133 [6] clause B.2.1.3, and does not limit UE implementation or test system implementation

Test 1: Correct behaviour when transmitting MsgA

- The MsgA with preamble shall be one of the Random Access Preambles associated with SSB index 0.

Test 2: Correct behaviour when receiving MsgB

- The power of the first MsgA PRACH preamble shall be 0.6 dBm within the accuracy specified in Table 7.3.2.2.3.5-3.

- The power of the first MsgA PUSCH transmission shall be $0.6 + 3(\mu + 2)$ dBm with an accuracy specified in clause 6.3.4.2 of TS 38.101-2 [8], where μ indicates the MsgA PUSCH numerology.

- The relative power for MsgA ramping step shall be 2 dB within the accuracy specified in Table 7.3.2.2.3.5-4.

- The transmit timing of all MsgA transmissions shall be within the accuracy specified in Table 7.3.2.2.3.5-5.

Test 3: Correct behaviour when not receiving MsgB

- The power of the first MsgA PRACH preamble shall be 0.6 dBm within the accuracy specified in Table 7.3.2.2.3.5-3.

- The power of the first MsgA PUSCH transmission shall be $0.6 + 3(\mu + 2)$ dBm with an accuracy specified in clause 6.3.4.2 of TS 38.101-2 [8], where μ indicates the MsgA PUSCH numerology.

- The relative power for MsgA ramping step shall be 2 dB within the accuracy specified in Table 7.3.2.2.3.5-4.

- The transmit timing of all MsgA transmissions shall be within the accuracy specified in Table 7.3.2.2.3.5-5.

Table 7.3.2.2.3.5-3: Absolute power tolerance Test requirements

Conditions	Tolerance
Normal	± FFS dB

Table 7.3.2.2.3.5-4: Relative power tolerance Test requirements

Measured power	Power step ΔP (dB)	MsgA (dB)
Measured power of both MsgAs being compared > (P_{max} Note1 – 6dB)	2 ≤ ΔP < 3	± (4+FFS).
Measured power of either MsgAs being compared ≤ (P_{max} Note1 – 6dB)		± (6+FFS)
Note 1: P_{max} is the Min peak EIRP defined in clause 6.2.1 of TS 38.101-2 [3], selected according to power class and operating band.		

Table 7.3.2.2.3.5-5: T_e Timing error Test requirements

Frequency Range	SCS of SSB signals (kHz)	SCS of uplink signals s(KHz)	T_e
2	120	120	224+[48]*T_c
Note 1: T_c is the basic timing unit defined in TS 38.211 [7]			

7.3.2.2.4 NR SA FR2 2-step non-contention based random access

Editor's note: This test case is incomplete. The following aspects are either missing or TBD

- The settable window for first preamble uplink power and the uplink calibration process are FFS.
- The test requirement for absolute uplink power is FFS.
- The test requirement for relative uplink power is FFS.
- The uncertainty value and test requirement for T_e Timing error are in [ ]
- TT analysis is missing

- Antenna diagram and any exceptions are FFS
- Connection setup in Annex C is FFS

7.3.2.2.4.1 Test purpose

The purpose of this test is to verify that the behaviour of the random access procedure is according to the requirements and that the MsgA PRACH and MsgA PUSCH power settings and timing are within specified limits.

7.3.2.2.4.2 Test applicability

This test applies to all types of NR SA FR2 UE from Release 16 onwards.

7.3.2.2.4.3 Minimum conformance requirement

Same as in clause 4.3.2.2.4.3.

The normative reference for this requirement is TS 38.133 [6] clause 6.2.2 and A.7.3.2.2.4.

7.3.2.2.4.4 Test description

7.3.2.2.4.4.1 Initial conditions

This test can be run in the configurations defined in Table 7.3.2.2.4.4.1-1.

Table 7.3.2.2.4.4.1-1: 2-step non-contention based random access test in FR2 for NR standalone supported test configurations

Test Case ID	Test Config Index	Description
7.3.2.2.4-1	1	NR: 120 kHz SSB SCS, 100MHz bandwidth, TDD duplex mode
Note: The UE is only required to be tested in one of the supported test configurations depending on UE capability		

Before the test procedure, Downlink and Uplink calibrations are carried out to derive signalled parameter values. This is necessary to ensure that the test case operates within the specified ranges. The detail of the calibration process is implementation dependent, but shall derive the values of Δ_{DL} and Δ_{UL} according to the following principles:

With the UE configured to report SS-RSRP, the Δ_{DL} value is calculated as ($RSRP_{_REP}$ – RSRP_76), where $RSRP_{_REP}$ is the SS-RSRP Reported value according to TS 38.133 [6] Table 10.1.6.1-1 with -80.6dBm/SCS applied at the Reference point. For a Reported value RSRP_x, x is treated as a positive integer value.

With the UE configured to send a first PRACH preamble, Δ_{UL} value is calculated as -ROUND(PPRACH0 -1), where PPRACH0 is the measured first PRACH power with -80.6dBm/SCS applied at the Reference point, and with signalled values *preambleReceivedTargetPower* = -100dBm and *ss-PBCH-BlockPower* = 20dBm.

Configure the test equipment and the DUT according to the parameters in Table 7.3.2.2.4.4.1-2.

Table 7.3.2.2.4.4.1-2: Test Environment for 2-step RACH non-dsscontention based random access test in FR2 for NR standalone

Parameter	Value		Comment
Test environment	NC		As specified in TS 38.508-1 [14] clause 4.1.
Test frequencies	As specified in Annex E, Table E.5-1 and TS 38.508-1 [14] clause 4.3.1.		
Channel bandwidth	As specified by the test configuration selected from Table 7.3.2.2.4.4.1-1.		
Propagation conditions	No interference		As specified in Annex C.2.1.
Connection Diagram	TE Part	FFS	As specified in TS 38.508-1 [14] Annex A.
	DUT Part	FFS	
Exceptions to connection diagram	FFS		

1. Message contents are defined in clause 7.3.2.2.4.4.3.

2. Cell 1 is the NR FR2 serving cell (PCell). The connection setup is done according to the settings in FFS.

7.3.2.2.4.4.2 Test procedure

The test consists of a single cell, configured as PCell in FR2. The System Simulator shall explicitly assign a random access preamble via dedicated signalling in the downlink.

1. Ensure the UE is in state RRC_IDLE with generic procedure parameters Connectivity *NR* and Test Mode *On* according to TS 38.508-1 [14] clause 4.5.

2. Set the parameters according to Table 7.3.2.2.4.5-1 and 7.3.2.2.4.5-2.

3. The UE shall establish a connection setup with SS, the random access procedure within the connection setup is used in the test.

4. Test 1: Correct behaviour when transmitting MsgA:

   4.1. The UE shall send the MsgA PRACH and MsgA PUSCH to the System Simulator with a preamble which belongs to one of the Random Access Preambles associated with the SSB with index 0, which has SS-RSRP above the configured *msgA-RSRP-ThresholdSSB*. The UE shall send the MsgA PUSCH on the MsgA PUSCH occasion that is associated with the chosen preamble.

5. Test 2: Correct behaviour when receiving MsgB:

   5.1. Repeat steps 1-3.

   5.2. The UE shall send preambles to the System Simulator. In response to the first 2 preambles, the System Simulator shall transmit a MsgB containing identifiers that do not match the transmitted Random Access Preamble.

   5.3. As the received MsgB contain Random Access Preamble identifiers that do not match the transmitted Random Access Preamble, the UE shall perform the Random Access Resource selection procedure specified in clause 5.1.2a in TS 38.321 [12], and transmit with the calculated MsgA PRACH transmission power when the backoff time expires.

   5.4. The System Simulator shall transmit a MsgB containing containing fallbackRAR with a Random Access Preamble identifier matching the transmitted Random Access Preamble after 3 MsgA transmissions have been received by the System Simulator.

   5.5. As the received MsgB contains a Random Access Preamble identifier that matches the transmitted Random Access Preamble, the UE may stop monitoring for MsgB(s) and shall transmit the msg3 on the indicated PUSCH resources.

   5.6. Measure the power and timing of the first preamble and it shall not exceed the values specified in clause 7.3.2.2.4.5. Measure the relative power and timing applied to additional preambles (last 2 preambles) and it shall not exceed the values specified in clause 7.3.2.2.4.5.

6. Test 3: Correct behaviour when not receiving MsgB:

   6.1. Repeat steps 1-3.

   6.2. The UE shall send preambles to the System Simulator. The System Simulator shall not respond to the first 2 preambles.

   6.3. The UE shall again perform the Random Access Resource selection procedure specified in clause 5.1.2a in TS 38.321 [20], and transmit with the calculated MsgA PRACH and MsgA PUSCH transmission power when the backoff time expires if no MsgB is received within the MsgB Response window in RACH-ConfigGenericTwoStepRA.

   6.4. Measure the power and timing of the first preamble and it shall not exceed the values specified in 7.3.2.2.4.5. Measure the relative power and timing applied to additional preambles (last 2 preambles) and it shall not exceed the values specified in 7.3.2.2.4.5.

7.3.2.2.4.4.3 Message contents

Message contents are according to TS 38.508-1 [14] clause 4.6 with the following exceptions:

Table 7.3.2.2.4.4.3-1: *FrequencyInfoUL-SIB* for 2-step non-contention Based Random Access

Derivation Path: TS 38.508-1 [14], table 4.6.3-62			
Information Element	**Value/remark**	**Comment**	**Condition**
FrequencyInfoUL-SIB SEQUENCE {			
p-Max	23	23 dBm	
}			

Table 7.3.2.2.4.4.3-2: RACH-ConfigCommon for 2-step non-contention Based Random Access

Derivation Path: TS 38.508-1 [14], table 4.6.3-128A			
Information Element	**Value/remark**	**Comment**	**Condition**
RACH-ConfigCommonTwoStepRA-r16 ::= SEQUENCE {			
rach-ConfigGenericTwoStepRA-r16	RACH-ConfigGenericTwoStepRA		
msgA-TotalNumberOfRA-Preambles-r16	48		
msgA-SSB-SharedRO-MaskIndex-r16	Not present		
groupB-ConfiguredTwoStepRA-r16	Not present		
msgA-PRACH-RootSequenceIndex-r16 CHOICE {}	Not present		
msgA-TransMax-r16	N8		
msgA-RSRP-Threshold-r16	RSRP_69 +Δ_{DL}		
msgA-RSRP-ThresholdSSB-r16	RSRP_69 +Δ_{DL}		
msgA-SubcarrierSpacing-r16	120 kHz		
msgA-RestrictedSetConfig-r16	Not present		
ra-PrioritizationForAccessIdentityTwoStep-r16 SEQUENCE {			
ra-Prioritization-r16	RA-Prioritization		
ra-PrioritizationForAI-r16	'10'B		
}			
ra-ContentionResolutionTimer-r16	Not present		
}			

Table 7.3.2.2.2.4.3-3: RACH-ConfigDedicated for Non-Contention Based Random Access

Derivation Path: TS 38.508-1 [14], table 4.6.3-129			
Information Element	**Value/remark**	**Comment**	**Condition**
RACH-ConfigDedicated::= SEQUENCE {			
cfra SEQUENCE {			
occasions SEQUENCE {			
ssb-perRACH-Occasion	oneFourth		
}			
resources CHOICE {			
ssb SEQUENCE {			
ssb-ResourceList SEQUENCE (SIZE(1..maxRA-SSB-Resources)) OF {	2 entries		
ssb[1]	0		
ssb[2]	1		
ra-PreambleIndex[1]	50		Subtest 1
}			
ra-ssb-OccasionMaskIndex	1		Subtest 1
}			
csirs SEQUENCE {			
csirs-ResourceList SEQUENCE (SIZE(1..maxRA- CSIRS -Resources)) OF {			
ra-OccasionList	1		Subtest 2
ra-PreambleIndex[1]	50		Subtest 2
}			
rsrp-ThresholdCSI-RS	RSRP_69 +Δ_{DL}	Δ_{DL} is derived from the downlink calibration process	Subtest 2

}			
}			
}			
}			

Table 7.3.2.2.4.4.3-3: RACH-ConfigGeneric for 2-step non-contention Based Random Access

Derivation Path: TS 38.508-1 [14], table 4.6.3-130A			
Information Element	**Value/remark**	**Comment**	**Condition**
RACH-ConfigGenericTwoStepRA-r16 ::= SEQUENCE {			
msgA-PRACH-ConfigurationIndex-r16	190		
msgA-RO-FDM-r16	four		
msgA-RO-FrequencyStart-r16	0		
msgA-ZeroCorrelationZoneConfig-r16	11		
msgA-PreamblePowerRampingStep-r16	dB2		
msgA-PreambleReceivedTargetPower-r16	-100		
msgB-ResponseWindow-r16	sl10		
preambleTransMax-r16	n10		
}			

Table 7.3.2.2.4.4.3-4: *ServingCellConfigCommonSIB* for 2-step non-contention Based Random Access

Derivation Path: TS 38.508-1 [14], table 4.6.3-169			
Information Element	**Value/remark**	**Comment**	**Condition**
ServingCellConfigCommonSIB ::= SEQUENCE {			
ssb-PositionsInBurst SEQUENCE {			
inOneGroup	'1100 0000'B		
}			
ss-PBCH-BlockPower	20 +Δ_{UL}	Δ_{UL} is derived from the uplink calibration process	
}			

Table 7.3.2.2.4.4.3-5: MsgA-PUSCH-Config for 2-step non-contention Based Random Access

Derivation Path: TS 38.508-1 [14], table 4.6.3-81B			
Information Element	**Value/remark**	**Comment**	**Condition**
MsgA-PUSCH-Resource-r16 ::= SEQUENCE {			
msgA-MCS	1		
nrofSlotsMsgA-PUSCH	1		
nrofMsgA-PO-PerSlot	1		
msgA-PUSCH-TimeDomainOffset	1		
msgA-PUSCH-TimeDomainAllocation-r16	3	Equivalent to PUSCH start symbol = 0 and allocation length = 10	
mappingTypeMsgA-PUSCH	typeA		
nrofPRBs-PerMsgA-PO	2		
nrofMsgA-PO-FDM	One		
msgA-DMRS-AdditionalPosition	pos1		
msgA-PUSCH-NrofPorts	1		
msgA-DeltaPreamble	3		
msgA-Alpha	alpha1		
deltaMCS	Disabled		
}			

7.3.2.2.4.5 Test requirement

Table 7.3.2.2.4.5-2 defines the primary level settings for 2-step non-contention based random access test in FR2 for NR Standalone. Tables 7.3.2.2.4.5-3, 7.3.2.2.4.5-4 and 7.3.2.2.4.5-5 define the Absolute power limits, Relative power limits and uplink timing error limits respectively, and all include test tolerances.

Table 7.3.2.2.4.5-1: General test parameters for non-contention based random access test for 2-step RA type in FR2 for NR Standalone

Parameter		Unit	Test-1	Comments
SSB Configuration	Config 1		SSB.1 FR2	As defined in A.3.10
Duplex Mode for Cell 1	Config 1		TDD	
TDD Configuration	Config 1		TDDConf.3.1	
$BW_{channel}$	Config 1	MHz	100: $N_{RB,c}$ = 24	
OCNG Pattern Note 1			OP.3	As defined in A.3.2.1.
PDSCH Reference Channel Note 2	Config 1		SR3.1 TDD	As defined in A.3.1.1.
NR RF Channel Number			1	
EPRE ratio of PSS to SSS		dB	0	
EPRE ratio of PBCH_DMRS to SSS		dB		
EPRE ratio of PBCH to PBCH_DMRS		dB		
EPRE ratio of PDCCH_DMRS to SSS		dB		
EPRE ratio of PDCCH to PDCCH_DMRS		dB		
EPRE ratio of PDSCH_DMRS to SSS		dB		
EPRE ratio of PDSCH to PDSCH_DMRS		dB		
ss-PBCH-BlockPower		dBm/ SCS	+20 +Δ_{UL}	As defined in TS 38.331 [2]. Δ_{UL} is derived from the uplink calibration process Note 3
Configured UE transmitted power ($P_{CMAX,f,c}$)		dBm	maximum value configurable for certain power class	As defined in clause 6.2.4 in TS 38.101-2 [19]
MsgA Configuration			FR2 MsgA configuration 2	As defined in A.3.20.3, with exceptions as defined below.
msgA-RSRP-ThresholdSSB		dBm	RSRP_69 +Δ_{DL}	RSRP_69 corresponds to -88dBm. Δ_{DL} is derived from the downlink calibration process Note 4
msgA-PreambleReceivedTargetPower		dBm	-100	As defined in TS 38.331 [2]

Note 1: OCNG shall be used such that a constant total transmitted power spectral density is achieved for all OFDM symbols. The OCNG pattern is chosen during the test according to the presence of a DL reference measurement channel.

Note 2: The DL PDSCH reference measurement channel is used in the test only when a downlink transmission dedicated to the UE under test is required.

Note 3: The Δ_{UL} value is calculated as -ROUND(P_{MsgA0} -1), where P_{MsgA0} is the measured first MsgA PRACH power with -80.6dBm/SCS applied, *msgA-PreambleReceivedTargetPower* = -100dBm and *ss-PBCH-BlockPower* = 20dBm. These values are used during the uplink calibration process carried out before the test case is run, with the UE configured to send MsgA.

Note 4: The Δ_{DL} value is calculated as ($RSRP_{REP}$ – RSRP_76), where $RSRP_{REP}$ is the SS-RSRP Reported value in Table 10.1.6.1-1 with -80.6dBm/SCS applied. These values are used during the downlink calibration process carried out before the test case is run, with the UE configured to report SS-RSRP. For a Reported value RSRP_x, x is treated as a positive integer value.

Table 7.3.2.2.4.5-2 OTA-related test parameters for non-contention based random access test for 2-step RA type in FR2 for NR Standalone

Parameter		Unit	Test-1	Comments
AoA setup			Setup 1	As defined in A.3.15.1
Assumption for UE beams Note 2			Rough	
SSB with index 0	Es Note1	dBm/SCS	-80.6	Power of SSB with index 0 is set to be above configured *msgA-RSRP-ThresholdSSB*
	SSB_RP	dBm/SCS	-80.6	
	Es/Iot_{BB}	dB	21.09	
	Io	dBm/95.04 MHz	-56.01	Io in symbols containing SSB index 0
SSB with index 1	Es Note1	dBm/SCS	-95.0	Power of SSB with index 1 is set to be below configured *msgA-RSRP-ThresholdSSB*
	SSB_RP	dBm/SCS	-95.0	
	Es/Iot_{BB}	dB	6.69	
	Io	dBm/95.04 MHz	-70.41	Io in symbols containing SSB index 1
Propagation Condition		-	AWGN	
Note 1: No artificial noise is applied in this test. Note 2: Information about types of UE beam is given in B.2.1.3, and does not limit UE implementation or test system implementation				

Test 1: Correct behaviour when transmitting MsgA

- The MsgA with preamble shall be one of the Random Access Preambles associated with SSB index 0.

Test 2: Correct behaviour when receiving MsgB

- The power of the first MsgA PRACH preamble shall be 0.6 dBm within the accuracy specified in Table 7.3.2.2.4.5-3.

- The power of the first MsgA PUSCH transmission shall be $0.6 + 3(\mu + 2)$ dBm with an accuracy specified in clause 6.3.4.2 of TS 38.101-2 [8], where μ indicates the MsgA PUSCH numerology.

- The relative power for MsgA ramping step shall be 2 dB within the accuracy specified in Table 7.3.2.2.4.5-4.

- The transmit timing of all MsgA transmissions shall be within the accuracy specified in Table 7.3.2.2.4.5-5.

Test 3: Correct behaviour when not receiving MsgB

- The power of the first MsgA PRACH preamble shall be 0.6 dBm within the accuracy specified in Table 7.3.2.2.4.5-3.

- The power of the first MsgA PUSCH transmission shall be $0.6 + 3(\mu + 2)$ dBm with an accuracy specified in clause 6.3.4.2 of TS 38.101-2 [8], where μ indicates the MsgA PUSCH numerology.

- The relative power for MsgA ramping step shall be 2 dB within the accuracy specified in Table 7.3.2.2.4.5-4.

- The transmit timing of all MsgA transmissions shall be within the accuracy specified in Table 7.3.2.2.4.5-5.

Table 7.3.2.2.4.5-3: Absolute power tolerance Test requirements

Conditions	Tolerance
Normal	± FFS dB

Table 7.3.2.2.4.5-4: Relative power tolerance Test requirements

Measured power	Power step ΔP (dB)	MsgA (dB)
Measured power of both MsgAs being compared > (P_{max} Note1 – 6dB)	2 ≤ ΔP < 3	± (4+FFS).

Measured power of either MsgAs being compared ≤ (P_{max}^{Note1} – 6dB)		± (6+FFS)
Note 1: P_{max} is the Min peak EIRP defined in clause 6.2.1 of TS 38.101-2 [3], selected according to power class and operating band.		

Table 7.3.2.2.4.5-5: T_e Timing error Test requirements

Frequency Range	SCS of SSB signals (kHz)	SCS of uplink signals s(KHz)	T_e
2	120	120	224+[48]*T_c
Note 1: T_c is the basic timing unit defined in TS 38.211 [7]			

7.3.2.3 RRC connection release with redirection

7.3.2.3.0 Minimum conformance requirements

7.3.2.3.0.1 Minimum conformance requirements for FR2-FR2 RRC connection release with redirection

The UE shall be capable of performing the RRC connection release with redirection to the target NR cell within $T_{connection_release_redirect_NR}$.

The time delay ($T_{connection_release_redirect_NR}$) is the time between the end of the last slot containing the RRC command, "*RRCRelease*" (TS 38.331 [13]) on the NR PDSCH and the time the UE starts to send random access to the target NR cell. The time delay ($T_{connection_release_redirect_NR}$) shall be less than:

$$T_{connection_release_redirect_NR} = T_{RRC_procedure_delay} + T_{identify\text{-}NR} + T_{SI\text{-}NR} + T_{RACH}$$

The target NR cell shall be considered detectable when for each relevant SSB, the side conditions should be met that,

- SSB_RP and SSB Ês/Iot according to 38.133 [6] Annex B.2.5 for a corresponding NR Band.

$T_{RRC_procedure_delay}$: It is the RRC procedure delay for processing the received message "*RRCRelease*" as defined in clause 6.2.2 of TS 38.331 [13].

$T_{identify\text{-}NR}$: It is the time to identify the target NR cell and depend on the frequency range (FR) of the target NR cell. It is defined in table 7.3.2.3.0.1-1. Note that $T_{identify\text{-}NR} = T_{PSS/SSS\text{-}sync} + T_{meas}$, in which $T_{PSS/SSS\text{-}sync}$ is the cell search time and T_{meas} is the measurement time due to cell selection criteria evaluation.

$T_{SI\text{-}NR}$: It is the time required for acquiring all the relevant system information of the target NR cell. This time depends upon whether the UE is provided with the relevant system information of the target NR cell or not by the old NR cell before the RRC connection is released. $T_{SI\text{-}NR}$ = 0 provided the UE is provided with the SI (including MIB and all relevant SIBs) of the target NR cell before the RRC connection is released by the old NR cell.

T_{RACH}: It is the delay caused due to the random access procedure when sending random access to the target NR cell. This delay depends on the PRACH configuration defined in TS 38.211 [7] Table 6.3.3.2-4 for FR2.

T_{rs} is the SMTC periodicity of the target NR cell if the UE has been provided with an SMTC configuration for the target cell in the redirection command, otherwise T_{rs} is the SMTC configured in the measObjectNR having the same SSB frequency and subcarrier spacing configured for the RRC connection release with redirection. If the UE is not provided with SMTC configuration or measurement object for the frequency which is also configured for the RRC connection release with redirection then:

- the requirement in this section is applied with T_{rs} = 20 ms assuming the SSB transmission periodicity is not larger than 20 ms,
- there is no requirement if the SSB transmission periodicity is larger than 20ms.

Table 7.3.2.3.0.1-1: Time to identify target NR cell for RRC connection release with redirection to NR

Frequency range (FR) of target NR cell	$T_{identify\text{-}NR}$
FR1	MAX (680 ms, [11] x T_{rs})

FR2	MAX (880 ms, 8x[11] x T_{rs})
Note : If the UE has been provided with higher layer in TS 38.331 [13] signalling of *smtc2* prior to the redirection command, SMTC follows *smtc1* or *smtc2* according to the physical cell ID of the target cell.	

The normative reference for this requirement is TS 38.133 [6] clause 6.2.3.2.1.

7.3.2.3.1 NR SA FR2-FR2 RRC connection release with redirection

Editor's Note: This test case has been completed for the following configurations:

- Test frequency f ≤ 40.8 GHz

- UE PC3

- The test is incomplete for UE power classes other than PC3

- The test is incomplete for test frequencies > 40.8 GHz

7.3.2.3.1.1 Test purpose

This test is to verify RRC connection release with redirection from NR-to-NR requirements specified in clause 7.2.3.2.0.

7.3.2.3.1.2 Test applicability

This test applies to all types of NR UE from Release 15 onwards supporting SA FR2.

7.3.2.3.1.3 Minimum conformance requirement

The minimum conformance requirements are specified in clause 7.3.2.3.0.1.

The normative reference for this requirement is TS 38.133 [6] A.7.3.2.3.1.

7.3.2.3.1.4 Test description

7.3.2.3.1.4.1 Initial conditions

This test can be run in the configurations defined in Table 7.3.2.3.1.4.1-1.

Table 7.3.2.3.1.4.1-1: Test configurations for NR SA FR2-FR2 RRC connection release with redirection

Configuration	Description
7.3.2.3.1-1	Source cell: NR 120 kHz SSB SCS, 100 MHz bandwidth, TDD duplex mode Target cell: NR 120 kHz SSB SCS, 100 MHz bandwidth, TDD duplex mode

Configure the test equipment and the DUT according to the parameters in Table 7.3.2.3.1.4.1-2.

Table 7.3.2.3.1.4.1-2: Initial conditions for NR SA FR2-FR2 RRC connection release with redirection

Parameter	Value		Comment
Test environment	NC		As specified in TS 38.508-1 [14] clause 4.1.
Test frequencies	As specified in Annex E.5 and TS 38.508-1 [14] clause 4.3.1 and 7.2.3.		
Channel bandwidth	As specified by the test configuration selected from Table 7.3.2.3.1.4.1-1		
Propagation conditions	AWGN		As specified in Annex C.2.2.
Connection Diagram	TE Part	A.3.3.3.1-1	As specified in TS 38.508-1 [14] Annex A.
	DUT Part	A.3.4.1.1	
Exceptions to connection diagram	N/A		

1. Message contents are defined in clause 7.3.2.3.1.4.3.

2. The power levels and settings for NR FR2 Cell 1 are set according to Annex C.1.2 and C.1.3. Cell 2 is NR FR2 target Cell, and its power levels and settings are also set according to Annex C.1.2 and C.1.3.

3. The test parameters are given in Table 7.3.2.3.1.4.1-3.

Table 7.3.2.3.1.4.1-3: General test parameters for NR SA FR2-FR2 RRC connection release with redirection

Parameter		Unit	Value	Comment
Initial conditions	Active cell		Cell 1	
	Neighbouring cell		Cell 2	
Final condition	Active cell		Cell 2	
Filter coefficient			0	L3 filtering is not used
Access Barring Information		-	Not Sent	No additional delays in random access procedure.
Time offset between cells			3 µs	Synchronous cells
T1		s	5	
T2		s	3.2	

7.3.2.3.1.4.2 Test procedure

The test consists of two successive time periods, with time duration of T1, and T2 respectively. The *RRCRelease* message shall be sent to the UE during period T1 and the start of T2 is the instant in which the last TTI containing the RRC message is sent to the UE. Prior to time duration T2, the UE shall not have any timing information of Cell 2. Cell 2 is powered up at the beginning of the T2.

Unless otherwise stated, the downlink signal and noise are aligned to arrive in the UE Rx beam peak direction.

1. Ensure the UE is in State RRC_CONNECTED with generic procedure parameters Connectivity *NR*, Connected without release *On* according to TS 38.508-1 [14] clause 4.5. Cell 1 is the active cell. Set Cell 2 physical cell identity to the initial physical cell identity.

2. Set the parameters according to T1 in Table 7.3.2.3.1.5-1. Propagation conditions are set according to Annex C clause C.2.2. T1 starts.

3. SS shall transmit an *RRCRelease* during period T1.

4. The SS shall switch the power setting from T1 to T2 as specified in Table 7.3.2.3.1.5-1. When the last TTI containing the *RRCRelease* message is sent to UE, T2 starts.

5. If the UE transmits the PRACH to Cell 2 less than 3160 ms from the beginning of time period T2 then the number of successful tests is increased by one. Otherwise, the number of failure tests is increased by one.

6. After T2 expires, the UE shall be switched off. The SS shall then set Cell 2 physical cell identity = ((current cell 2 physical cell identity + 1) mod 1008) for the next iteration of the test procedure loop. Afterwards the UE shall be switched on. Go to step 1.

7. Repeat step 2-6 until the confidence level according to Table G.2.3-1 in Annex G clause G.2 is achieved.

7.3.2.3.1.4.3 Message contents

Message contents are according to TS 38.508-1 [14] clause 7.3 with the following exceptions:

Table 7.3.2.3.1.4.3-1: RRCRelease (step 3)

Derivation Path: TS 38.508-1 [14], Table 4.6.1-16			
Information Element	**Value/remark**	**Comment**	**Condition**
RRCRelease ::= SEQUENCE {			
criticalExtensions CHOICE {			
rrcRelease SEQUENCE {			
redirectedCarrierInfo CHOICE {			
nr SEQUENCE {			
carrierFreq	ARFCN-ValueNR	Frequency of Cell 2	
ssbSubcarrierSpacing	kHz120		
smtc SEQUENCE {			
duration	sf1		SMTC.1

}			
}			
}			
}			
}			
}			

Table 7.3.2.3.1.4.3-2: SIB2

Derivation Path: TS 38.508-1 [14], Table 4.6.2-1			
Information Element	**Value/remark**	**Comment**	**Condition**
SIB2 ::= SEQUENCE {			
cellReselectionInfoCommon SEQUENCE {			
rangeToBestCell	Not present		
}			

7.3.2.3.1.5 Test requirement

Table 7.3.2.3.1.5-1 defines the primary level settings for NR SA FR2-FR2 RRC connection release with redirection.

Table 7.3.2.3.1.5-1: Cell specific test parameters for NR SA FR2-FR2 RRC connection release with redirection

Parameter		Unit	Cell 1		Cell 2	
			T1	T2	T1	T2
Assumption for UE beams Note 6			Rough		Rough	
AoA setup			Setup 1 as defined in A.9			
NR RF Channel Number			1		2	
Duplex mode			TDD			
TDD configuration			TDDConf.3.1			
$BW_{channel}$		MHz	100: $N_{RB,c}$ = 66			
BWP BW		MHz	100: $N_{RB,c}$ = 66			
Data RBs allocated			66			
DRx Cycle		ms	Not Applicable			
PDSCH Reference measurement channel			SR.3.1 TDD			
RMSI CORESET Reference Channel			CR.3.1 TDD			
Control Channel RMC			CCR.3.1 TDD			
OCNG Patterns			OP.1			
SMTC configuration			SMTC.1 FR2			
SSB Configuration			SSB.3 FR2			
PDSCH/PDCCH subcarrier spacing		kHz	120 kHz			
PUCCH/PUSCH subcarrier spacing		kHz	120 kHz			
PRACH configuration			PRACH.1 FR2			
TRS configuration			TRS.2.1 TDD			
PDSCH/PDCCH TCI state			TCI.State.2			
BWP configuration	Initial DL BWP		DLBWP.0.1			
	Dedicated DL BWP		DLBWP.1.1			
	Initial UL BWP		ULBWP.0.1			
	Dedicated UL BWP		ULBWP.1.1			
EPRE ratio of PSS to SSS		dB	0		0	
EPRE ratio of PBCH DMRS to SSS						
EPRE ratio of PBCH to PBCH DMRS						
EPRE ratio of PDCCH DMRS to SSS						
EPRE ratio of PDCCH to PDCCH DMRS						
EPRE ratio of PDSCH DMRS to SSS						
EPRE ratio of PDSCH to PDSCH						
EPRE ratio of OCNG DMRS to SSS(Note 1)						
EPRE ratio of OCNG to OCNG DMRS (Note 1)						
N_{oc} Note2		dBm/15kHz	-104.7		-104.7	
N_{oc} Note2		dBm/SCS	-95.7		-95.7	

$\hat{E}_s/I_{ot}$		dB	5	5	-Infinity	5
$\hat{E}_s/N_{oc}$		dB	5	5	-Infinity	5
Io[Note3]		dBm/BW	-60.5	-60.5	-66.7	-60.5
Propagation condition		-	AWGN		AWGN	

Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.
Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for N_{oc} to be fulfilled.
Note 3: Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.
Note 4: Equivalent power received by an antenna with 0 dBi gain at the centre of the quiet zone
Note 5: As observed with 0 dBi gain antenna at the centre of the quiet zone
Note 6: Information about types of UE beam is given in 38.133 [6] clause B.2.1.3, and does not limit UE implementation or test system implementation

The UE shall start to transmit the PRACH to Cell 2 less than 3160 ms from the beginning of time period T2.

The rate of correct RRC connection release redirection to NR observed during repeated tests shall be at least 90%.

NOTE: The redirection delay can be expressed as:

$$T_{connection_release_redirect_NR} = T_{RRC_procedure_delay} + T_{identify\text{-}NR} + T_{SI\text{-}NR} + T_{RACH},$$

where:

$T_{RRC_procedure_delay}$ = 110 ms in the test.

$T_{identify\text{-}NR}$ = 1760 ms in the test.

$T_{SI\text{-}NR}$ = 1280 ms, it is the time required for receiving all the relevant system information as defined in TS 38.331 [13] for the target NR cell.

T_{RACH} = 10 ms in the test.

This gives a total of 3160 ms.

7.3.3 Conditional handover

7.3.3.0 Minimum conformance requirements

7.3.3.0.1 Minimum conformance requirements for NR FR2 intra-frequency conditional handover

[TS 38.133, clause 6.1.4.4.1]

Procedure delays for all procedures that can command a conditional handover are specified in TS 38.331 [13].

When the UE receives a RRC message implying conditional handover the UE shall be ready to start the transmission of the new uplink PRACH channel within $D_{handover}$ seconds from the end of the last TTI containing the RRC command.

$$D_{CHO} = T_{RRC} + T_{Event_DU} + T_{measure} + T_{interrupt} + T_{CHO_execution}$$

Where:

T_{RRC} is the RRC procedure delay defined in clause 12 in TS 38.331 [13].

T_{Event_DU} is the delay uncertainty which is the time from when the UE successfully decodes a conditional handover command until a condition exists at the measurement reference point which will trigger the conditional handover.

$T_{measure}$ is the measurements time stated in TS 38.133 [6] clause 6.1.4.4.2.

$T_{CHO_execution}$ is the conditional execution preparation time in TS 38.133 [6] clause 6.1.4.4.3.

$T_{interrupt}$ is the interruption time stated in TS 38.133 [6] clause 6.1.4.4.4.

[TS 38.133, clause 6.1.4.4.2]

The measurement time delay is defined from the end of T_{Event_DU} until UE executes a handover to a target cell and interruption time starts.

For intra-frequency handover, the measurement time delay measured without Time To Trigger (TTT) and L3 filtering shall be less than $T_{identify\ intra\ with\ index}$ or $T_{identify_intra_without_index}$ defined in TS 38.133 [6] clause 9.2.5.1 or clause 9.2.6.2.

When TTT or L3 filtering is used an additional delay can be expected.

A cell is detectable only if at least one SSB measured from the cell being configured remains detectable during the time period $T_{identify_intra_without_index}$ or $T_{identify_intra_with_index}$ for intra-frequency handover or $T_{identify_inter_without_index}$ for inter-frequency handover. If a cell which has been detectable at least for the time period $T_{identify_intra_without_index}$ or $T_{identify_intra_with_index}$ for intra-frequency handover or $T_{identify_inter_without_index}$ for inter-frequency handover becomes undetectable for a period and then the cell becomes detectable again and triggers a handover, the measurement time delay shall be less than $T_{SSB_measurement_period_intra}$ or $T_{SSB_measurement_period_inter}$ provided the timing to that cell has not changed more than ± 3200 Tc while the measurement gap has not been available and the L3 filter has not been used. When L3 filtering is used, an additional delay can be expected.

[TS 38.133, clause 6.1.4.4.3]

$T_{CHO_execution}$ is the UE execution preparation time for conditional handover, and starts after UE realizes the condition of CHO is met and identity of the target cell is determined. $T_{CHO_execution}$ can be up to 10ms.

[TS 38.133, clause 6.1.4.4.4]

The interruption time is the time between when the UE starts to execute the conditional handover to the target cell and the time the UE starts transmission of the new PRACH.

For intra-frequency or inter-frequency conditional conditional handover, the measurment time shall be less than

$$T_{interrupt} = T_{processing} + T_{IU} + T_{\Delta} + T_{margin}\ \text{ms}$$

Where:

$T_{processing}$ is time for UE processing. $T_{processing}$ can be up to 20ms.

T_{IU} is the interruption uncertainty in acquiring the first available PRACH occasion in the new cell. T_{IU} can be up to the summation of SSB to PRACH occasion association period and 10 ms. SSB to PRACH occasion associated period is defined in the table 8.1-1 of TS 38.213 [8]

T_{Δ} is time for fine time tracking and acquiring full timing information of the target cell. $T_{\Delta} = T_{rs}$.

T_{margin} is time for SSB post-processing. T_{margin} can be up to 2ms.

T_{rs} is the SMTC periodicity of the target NR cell if the UE has been provided with an SMTC configuration for the target cellin the handover command, otherwise Trs is the SMTC configured in the measObjectNR having the same SSB frequency and subcarrier spacing. If the UE is not provided SMTC configuration or measurement object on this frequency, the requirement in this clause is applied with T_{rs}=5ms assuming the SSB transmission periodicity is 5ms. There is no requirement if the SSB transmission periodicity is not 5ms. If the UE has been provided with higher layer in TS 38.331 [13] signalling of *smtc2* prior to the handover command, T_{rs} follows *smtc1* or *smtc2* according to the physical cell ID of the target cell.

NOTE 1: The actual value of T_{IU} shall depend upon the PRACH configuration used in the target cell.[TS 38.133, clause 9.2.2]

The requirements in TS 38.133 [6] clause 9.2 apply, provided:

- The cell being identified or measured is detectable.

An intra-frequency cell shall be considered detectable when for each relevant SSB:

- SS-RSRP related side conditions given in TS 38.133 [6] clauses 10.1.3 for FR2, for a corresponding Band,
- SSB_RP and SSB Ês/Iot according to TS 38.133 [6] Annex B.2.2 for a corresponding Band.

[TS 38.133, clause 9.2.5.1]

The UE shall be able to identify a new detectable intra-frequency cell within $T_{identify_intra_without_index}$ if the UE is not indicated to report SSB based RRM measurement result with the associated SSB index(*reportQuantityRsIndexes* or *maxNrofRSIndexesToReport* is not configured), or the UE is indicated that the neighbour cell is synchronous with the serving cell (*deriveSSB-IndexFromCell* is enabled). Otherwise UE shall be able to identify a new detectable intra frequency cell within $T_{identify_intra_with_index}$. The UE shall be able to identify a new detectable intra frequency SS block of an already detected cell within $T_{identify_intra_without_index.}$ It is assumed that *deriveSSB-IndexFromCell* is always enabled for FR1 TDD and FR2.

$$T_{identify_intra_without_index} = (T_{PSS/SSS_sync_intra} + T_{SSB_measurement_period_intra})\ ms$$

Where:

T_{PSS/SSS_sync_intra}: it is the time period used in PSS/SSS detection given in TS38.133 [6] Table 9.2.5.1-2

$T_{SSB_measurement_period_intra}$: equal to a measurement period of SSB based measurement given in TS38.133 [6] Table 9.2.5.2-2

$CSSF_{intra}$: it is a carrier specific scaling factor and is determined

according to $CSSF_{outside_gap,i}$ in clause 9.1.5.1 for measurement conducted outside measurement gaps, i.e. when intra-frequency SMTC is fully non overlapping or partially overlapping with measurement gaps.

$M_{pss/sss_sync_w/o_gaps}$: For a UE supporting FR2 power class 1, $M_{pss/sss_sync_w/o_gaps}$ =40. For a UE supporting power class 2, $M_{pss/sss_sync_w/o_gaps}$ =24. For a UE supporting FR2 power class 3, $M_{pss/sss_sync_w/o_gaps}$ =24. For a UE supporting FR2 power class 4, $M_{pss/sss_sync_w/o_gaps}$ =24

$M_{meas_period_w/o_gaps}$: For a UE supporting power class 1, $M_{meas_period_w/o_gaps}$ =40. For a UE supporting FR2 power class 2, $M_{meas_period_w/o_gaps}$ =24. For a UE supporting power class 3, $M_{meas_period_w/o_gaps}$ =24. For a UE supporting power class 4, $M_{meas_period_w/o_gaps}$ =24.

When intra-frequency SMTC is fully non overlapping with measurement gaps or intra-frequency SMTC is fully overlapping with MGs, Kp=1

For FR2,

$K_{layer1_measurement}$=1,

- if all of the reference signals configured for RLM, BFD, CBD or L1-RSRP for beam reporting on any FR2 serving frequency in the same band outside measurement gap are not fully overlapped by intra-frequency SMTC occasions

Table 9.2.5.1-2: Time period for PSS/SSS detection, (Frequency range FR2)

DRX cycle	T_{PSS/SSS_sync_intra}
No DRX	max(600ms, ceil($M_{pss/sss_sync_w/o_gaps}$ x K_p x $K_{layer1_measurement}$) x SMTC period)[Note 1] x $CSSF_{intra}$
DRX cycle≤ 320ms	max(600ms, ceil(1.5 x $M_{pss/sss_sync_w/o_gaps}$ x K_p x $K_{layer1_measurement}$) x max(SMTC period,DRX cycle)) x $CSSF_{intra}$
DRX cycle>320ms	ceil($M_{pss/sss_sync_w/o_gaps}$ x K_p x $K_{layer1_measurement}$) x DRX cycle x $CSSF_{intra}$
NOTE 1: If different SMTC periodicities are configured for different cells, the SMTC period in the requirement is the one used by the cell being identified	

[TS 38.133, clause 9.2.5.1]

The measurement period for intra-frequency measurements without gaps is as shown in 38.133 [6] Table 9.2.5.2-2.

For FR2, a longer measurement period is allowed, if aperiodic CSI-RS resource is measured for L1-RSRP measurement on any FR2 serving frequency in the same band, and the CSI-RS resource is outside measurement gap and overlapped with any of the SSB symbols and the RSSI symbols, and 1 symbol before each consecutive SSB symbols and the RSSI symbols, and 1 symbol after each consecutive SSB symbols and the RSSI symbols. If *SSB-ToMeasure* or *SS-RSSI-Measurement* is configured, the SSB symbols are indicated by the union set of *SSB-ToMeasure* from all the configured

measurement objects on the same band which can be merged and the RSSI symbols are indicated by *SS-RSSI-Measurement*.

Table 9.2.5.2-2: Measurement period for intra-frequency measurements without gaps(FR2)

DRX cycle	$T_{SSB_measurement_period_intra}$
No DRX	max(400ms, ceil($M_{meas_period_w/o_gaps}$ x K_p x $K_{layer1_measurement}$) x SMTC period)[Note 1] x $CSSF_{intra}$
DRX cycle≤ 320ms	max(400ms, ceil(1.5x $M_{meas_period_w/o_gaps}$ x K_p x $K_{layer1_measurement}$) x max(SMTC period,DRX cycle)) x $CSSF_{intra}$
DRX cycle>320ms	ceil($M_{meas_period_w/o_gaps}$ xK_p x $K_{layer1_measurement}$) x DRX cycle x $CSSF_{intra}$
NOTE 1: If different SMTC periodicities are configured for different cells, the SMTC period in the requirement is the one used by the cell being identified	

[TS 38.133, clause 10.1.3.1.1]

Unless otherwise specified, the requirements for absolute accuracy of SS-RSRP in this clause apply to a cell on the same frequency as that of the serving cell in FR2.

The accuracy requirements in TS 38.133 [6] Table 10.1.3.1.1-1 are valid under the following conditions:

- Conditions defined in clause 7.3 of TS 38.101-2 [3] for reference sensitivity are fulfilled.
- Conditions for intra-frequency measurements are fulfilled according to Annex B.2.2 for a corresponding Band for each relevant SSB.
- The measured signals are in the directions covered by the percentile EIS spherical coverage of the UE, defined in clause 7.3.4 of TS 38.101-2 [3].

Table 10.1.3.1.1-1: SS-RSRP Intra frequency absolute accuracy in FR2

Accuracy		Conditions			
Normal condition	Extreme condition	SSB Ês/Iot	Io [Note 2] range		
			Minimum Io		Maximum Io
dB	dB	dB	dBm / SCS_{SSB} [Note 1]	dBm/$BW_{Channel}$	dBm/$BW_{Channel}$
			SCS_{SSB} = 120kHz / SCS_{SSB} = 240kHz		
±6	±9	≥-6	Same value as SSB_RP in TS 38.133 [6] Table B.2.2-2, according to UE Power class, operating band and angle of arrival	N/A	-70
±8	±11		N/A	-70	-50
Note 1: Values based on Refsens and EIS spherical coverage as defined in clauses 7.3.2 and 7.3.4 of TS 38.101-2 [3]. Applicable side condition selected depending on angle of arrival. Note 2: Io specified at the Reference point, and assumed to have constant EPRE across the bandwidth. Note 3: In the test cases, the SSB Ês/Iot and related parameters may need to be adjusted to ensure Ês/Iot at UE baseband is above the value defined in this table.					

[TS 38.133, annex B.2.2]

This clause defines the following conditions for NR intra-frequency measurements and corresponding procedures performed based on SSBs: SSB_RP and SSB Ês/Iot, applicable for a corresponding operating band.

The conditions are defined in TS 38.133 [6] Table B.2.2-2 for FR2 NR cells.

Table B.2.2-2: Conditions for intra-frequency measurements in FR2

Parameter	Angle of arrival	NR operating bands	Minimum SSB_RP [Note 2, Note 3]	SSB Ês/Iot
			dBm / SCS_{SSB}	dB

			SCS_{SSB} = 120 kHz					SCS_{SSB} = 240 kHz	
			UE Power class					UE Power class	
			1	2	3	4	5	1, 2, 3, 4, 5	
Conditions	Rx Beam Peak	n257	-128.3+Y_1	-113.8	-112.1	-127.8+Y_4	-123.4+Y_5	(Value for SCS_{SSB} = 120 kHz) +3dB	≥-6
		n258	-128.3+Y_1	-113.8	-112.1	-127.8+Y_4	-123.6+Y_5		
		n260	-125.3+Y_1		-109.5	-125.8+Y_4			
		n261	-128.3+Y_1	-113.8	-112.1	-127.8+Y_4			
		n262	-123.3+Y_1	-108,6	-106.6	-121.8+Y_4			
	Spherical coverage Note 1	n257	-120.3+Z_1	-102.8	-101.2	-118.8+Z_4	-115.4+Z_5	(Value for SCS_{SSB} = 120 kHz) +3dB	≥-6
		n258	-120.3+Z_1	-102.8	-101.2	-118.8+Z_4	-115.6+Z_5		
		n260	-117.3+Z_1		-96.9	-113.8+Z_4			
		n261	-120.3+Z_1	-102.8	-101.2	-118.8+Z_4			
		n262	-115.1+Z_1	-96.7	-93.5	-109.7+Z_4			

Note 1: Values based on EIS spherical coverage as defined in clause 7.3.4 of TS 38.101-2 [3]. Side condition applies for directions in which EIS spherical coverage requirement is met.
Note 2: Values specified at the Reference point to give minimum SSB Ês/Iot, with no applied noise.
Note 3: For UEs that support multiple FR2 bands, Rx Beam Peak values are increased by $\Delta MB_{P,n}$ and Spherical coverage values are increased by $\Delta MB_{S,n}$, the UE multi-band relaxation factor in dB specified in clause 6.2.1 of TS 38.101-2 [3].

7.3.3.0.2 Minimum conformance requirements for NR FR2 inter-frequency conditional handover

[TS 38.133, clause 6.1.4.4.1]

Procedure delays for all procedures that can command a conditional handover are specified in TS 38.331 [13].

When the UE receives a RRC message implying conditional handover the UE shall be ready to start the transmission of the new uplink PRACH channel within $D_{handover}$ seconds from the end of the last TTI containing the RRC command.

$$D_{CHO} = T_{RRC} + T_{Event_DU} + T_{measure} + T_{interrupt} + T_{CHO_execution}$$

Where:

T_{RRC} is the RRC procedure delay defined in clause 12 in TS 38.331 [13].

T_{Event_DU} is the delay uncertainty which is the time from when the UE successfully decodes a conditional handover command until a condition exists at the measurement reference point which will trigger the conditional handover.

$T_{measure}$ is the measurements time stated in TS 38.133 [6] clause 6.1.4.4.2.

$T_{CHO_execution}$ is the conditional execution preparation time in TS 38.133 [6] clause 6.1.4.4.3.

$T_{interrupt}$ is the interruption time stated in TS 38.133 [6] clause 6.1.4.4.4.

[TS 38.133, clause 6.1.4.4.2]

The measurement time delay is defined from the end of T_{Event_DU} until UE executes a handover to a target cell and interruption time starts.

For intra-frequency handover, the measurement time delay measured without Time To Trigger (TTT) and L3 filtering shall be less than $T_{identify\ intra\ with\ index}$ or $T_{identify_intra_without_index}$ defined in TS 38.133 [6] clause 9.2.5.1 or clause 9.2.6.2.

When TTT or L3 filtering is used an additional delay can be expected.

A cell is detectable only if at least one SSB measured from the cell being configured remains detectable during the time period $T_{identify_intra_without_index}$ or $T_{identify_intra_with_index}$ for intra-frequency handover or $T_{identify_inter_without_index}$ for inter-frequency handover. If a cell which has been detectable at least for the time period $T_{identify_intra_without_index}$ or $T_{identify_intra_with_index}$ for intra-frequency handover or $T_{identify_inter_without_index}$ for inter-frequency handover becomes undetectable for a period and then the cell becomes detectable again and triggers a handover, the measurement time delay shall be less than $T_{SSB_measurement_period_intra}$ or $T_{SSB_measurement_period_inter}$ provided the timing to that cell has not changed more than ± 3200 Tc while the measurement gap has not been available and the L3 filter has not been used. When L3 filtering is used, an additional delay can be expected.

[TS 38.133, clause 6.1.4.4.3]

$T_{CHO_execution}$ is the UE execution preparation time for conditional handover, and starts after UE realizes the condition of CHO is met and identity of the target cell is determined. $T_{CHO_execution}$ can be up to 10ms.

[TS 38.133, clause 6.1.4.4.4]

The interruption time is the time between when the UE starts to execute the conditional handover to the target cell and the time the UE starts transmission of the new PRACH.

For intra-frequency or inter-frequency conditional conditional handover, the measurment time shall be less than

$$T_{interrupt} = T_{processing} + T_{IU} + T_{\Delta} + T_{margin}\ \text{ms}$$

Where:

$T_{processing}$ is time for UE processing. $T_{processing}$ can be up to 20ms.

T_{IU} is the interruption uncertainty in acquiring the first available PRACH occasion in the new cell. T_{IU} can be up to the summation of SSB to PRACH occasion association period and 10 ms. SSB to PRACH occasion associated period is defined in the table 8.1-1 of TS 38.213 [8]

T_{Δ} is time for fine time tracking and acquiring full timing information of the target cell. $T_{\Delta} = T_{rs}$.

T_{margin} is time for SSB post-processing. T_{margin} can be up to 2ms.

T_{rs} is the SMTC periodicity of the target NR cell if the UE has been provided with an SMTC configuration for the target cellin the handover command, otherwise Trs is the SMTC configured in the measObjectNR having the same SSB frequency and subcarrier spacing. If the UE is not provided SMTC configuration or measurement object on this frequency, the requirement in this clause is applied with T_{rs}=5ms assuming the SSB transmission periodicity is 5ms. There is no requirement if the SSB transmission periodicity is not 5ms. If the UE has been provided with higher layer in TS 38.331 [13] signalling of *smtc2* prior to the handover command, T_{rs} follows *smtc1* or *smtc2* according to the physical cell ID of the target cell.

NOTE 1: The actual value of T_{IU} shall depend upon the PRACH configuration used in the target cell.

[TS 38.133, clause 9.3.2]

The requirements in clause 9.3 apply, provided:

- The cell being identified or measured is detectable.

An inter-frequency cell shall be considered detectable when for each relevant SSB:

- SS-RSRP related side conditions given in TS 38.133 [6] clauses 10.1.5 for FR2, for a corresponding Band,
- SSB_RP and SSB Ês/Iot according to TS 38.133 [6] Annex B.2.3 for a corresponding Band.

[TS 38.133, clause 9.3.4]

When measurement gaps are provided, or the UE supports capability of conducting such measurements without gaps, the UE shall be able to identify a new detectable inter frequency cell within $T_{identify_inter_without_index}$ if UE is not indicated to report SSB based RRM measurement result with the associated SSB index (*reportQuantityRsIndexes* or

maxNrofRSIndexesToReport is not configured). Otherwise UE shall be able to identify a new detectable inter frequency cell within $T_{identify_inter_with_index}$. The UE shall be able to identify a new detectable inter frequency SS block of an already detected cell within $T_{identify_inter_without_index}$.

$$T_{identify_inter_without_index} = (T_{PSS/SSS_sync_inter} + T_{SSB_measurement_period_inter}) \text{ ms}$$

$$T_{identify_inter_with_index} = (T_{PSS/SSS_sync_inter} + T_{SSB_measurement_period_inter} + T_{SSB_time_index_inter}) \text{ ms}$$

Where:

T_{PSS/SSS_sync_inter}: it is the time period used in PSS/SSS detection given in 38.133 [6] Table 9.3.4-2.

$T_{SSB_time_index_inter}$: it is the time period used to acquire the index of the SSB being measured given in 38.133 [6] Table 9.3.4-4.

$T_{SSB_measurement_period_inter}$: equal to a measurement period of SSB based measurement given in 38.133 [6] Table 9.3.5-2.

M_{pss/sss_sync_inter}: For a UE supporting FR2 power class 1, M_{pss/sss_sync_inter} = 64 samples. For a UE supporting FR2 power class 2, M_{pss/sss_sync_inter} = 40 samples. For a UE supporting FR2 power class 3, M_{pss/sss_sync_inter} = 40 samples. For a UE supporting FR2 power class 4, M_{pss/sss_sync_inter} = 40 samples.

$M_{SSB_index_inter}$: For a UE supporting FR2 power class 1, $M_{SSB_index_inter}$ = 40 samples. For a UE supporting FR2 power class 2, $M_{SSB_index_inter}$ = 24 samples. For a UE supporting FR2 power class 3, $M_{SSB_index_inter}$ = 24 samples. For a UE supporting FR2 power class 4, $M_{SSB_index_inter}$ = 24 samples.

$M_{meas_period_inter}$: For a UE supporting FR2 power class 1, $M_{meas_period_inter}$ =64 samples. For a UE supporting FR2 power class 2, $M_{meas_period_inter}$=40 samples. For a UE supporting FR2 power class 3, $M_{meas_period_inter}$ =40 samples. For a UE supporting FR2 power class 4, $M_{meas_period_inter}$ = 40 samples.

$CSSF_{inter}$: it is a carrier specific scaling factor and is determined according to $CSSF_{within_gap,i}$ in clause 9.1.5.2 for measurement conducted within measurement gaps.

Table 9.3.4-2: Time period for PSS/SSS detection, (Frequency range FR2)

Condition NOTE1,2	T_{PSS/SSS_sync_inter}
No DRX	$Max(600ms, M_{pss/sss_sync_inter} \times Max(MGRP, SMTC\ period)) \times CSSF_{inter}$
DRX cycle ≤ 320ms	$Max(600ms, (1.5 \times M_{pss/sss_sync_inter}) \times Max(MGRP, SMTC\ period, DRX\ cycle)) \times CSSF_{inter}$
DRX cycle > 320ms	$M_{pss/sss_sync_inter} \times DRX\ cycle \times CSSF_{inter}$
NOTE 1: DRX or non DRX requirements apply according to the conditions described in clause 3.6.1 NOTE 2: In EN-DC operation, the parameters, timers and scheduling requests referred to in clause 3.6.1 are for the secondary cell group. The DRX cycle is the DRX cycle of the secondary cell group.	

Table 9.3.4-4: Time period for time index detection (Frequency range FR2)

Condition NOTE1,2	$T_{SSB_time_index_inter}$
No DRX	$Max(200ms, M_{SSB_index_inter} \times Max(MGRP, SMTC\ period)) \times CSSF_{inter}$
DRX cycle ≤ 320ms	$Max(200ms, (1.5 \times M_{SSB_index_inter}) \times Max(MGRP, SMTC\ period, DRX\ cycle)) \times CSSF_{inter}$
DRX cycle > 320ms	$M_{SSB_index_inter} \times DRX\ cycle \times CSSF_{inter}$
NOTE 1: DRX or non DRX requirements apply according to the conditions described in clause 3.6.1 NOTE 2: In EN-DC operation, the parameters, timers and scheduling requests referred to in clause 3.6.1 are for the secondary cell group. The DRX cycle is the DRX cycle of the secondary cell group.	

[TS 38.133, clause 9.3.5]

When measurement gaps are provided for inter frequency measurements, or the UE supports capability of conducting such measurements without gaps, the UE physical layer shall be capable of reporting SS-RSRP, SS-RSRQ and SS-SINR measurements to higher layers with measurement accuracy as specified in TS 38.133 [6] clauses 10.1.4, 10.1.5, 10.1.9, 10.1.10, 10.1.14 and 10.1.15, respectively, as shown in TS 38.133 [6] Table and 9.3.5-2:

Table 9.3.5-2: Measurement period for inter-frequency measurements with gaps (Frequency FR2)

Condition NOTE1,2	$T_{SSB_measurement_period_inter}$
No DRX	$Max(400ms, M_{meas_period_inter} \times Max(MGRP, SMTC\ period)) \times CSSF_{inter}$
DRX cycle ≤ 320ms	$Max(400ms, (1.5 \times M_{meas_period_inter}) \times Max(MGRP, SMTC\ period, DRX\ cycle)) \times CSSF_{inter}$
DRX cycle > 320ms	$M_{meas_period_inter} \times DRX\ cycle \times CSSF_{inter}$
NOTE 1: DRX or non DRX requirements apply according to the conditions described in clause 3.6.1 NOTE 2: In EN-DC operation, the parameters, timers and scheduling requests referred to in clause 3.6.1 are for the secondary cell group. The DRX cycle is the DRX cycle of the secondary cell group.	

[TS 38.133, clause 10.1.5.1.1]

Unless otherwise specified, the requirements for absolute accuracy of SS-RSRP in this clause apply to a cell on a frequency in FR2 that is on a different frequency than the serving cell.

The accuracy requirements in TS 38.133 [6] Table 10.1.5.1.1-1 are valid under the following conditions:

- Conditions defined in clause 7.3 of TS 38.101-2 [3] for reference sensitivity are fulfilled.
- Conditions for inter-frequency measurements are fulfilled according to TS 38.133 [6] Annex B.2.3 for a corresponding Band for each relevant SSB.
- The measured signals are in the directions covered by the percentile EIS spherical coverage of the UE, defined in clause 7.3.4 of TS 38.101-2 [3].

Table 10.1.5.1.1-1: SS-RSRP Inter frequency absolute accuracy in FR2

Accuracy		Conditions			
Normal condition	Extreme condition	SSB Ês/Iot	Io Note 2 range		
			Minimum Io		Maximum Io
dB	dB	dB	dBm / SCS_{SSB} Note 1		$dBm/BW_{Channel}$
			SCS_{SSB} = 120kHz	SCS_{SSB} = 240kHz	
±6	±9	≥-4	Same value as SSB_RP in Table B.2.3-2, according to UE Power class, operating band and angle of arrival		N/A	-70
±8	±11		N/A		-70	-50
Note 1: Values based on Refsens and EIS spherical coverage as defined in clauses 7.3.2 and 7.3.4 of TS 38.101-2 [3]. Applicable side condition selected depending on angle of arrival. Note 2: Io specified at the Reference point, and assumed to have constant EPRE across the bandwidth. Note 3: In the test cases, the SSB Ês/Iot and related parameters may need to be adjusted to ensure Ês/Iot at UE baseband is above the value defined in this table.					

[TS 38.133, annex B.2.3]

This clause defines the following conditions for NR inter-frequency measurements and corresponding procedures performed based on SSBs: SSB_RP and SSB Ês/Iot, applicable for a corresponding operating band.

The conditions are defined in Table B.2.3-2 for FR2 NR cells.

Table B.2.3-2: Conditions for inter-frequency measurements in FR2

Parameter	Angle of arrival	NR operating bands	Minimum SSB_RP Note 2, Note 3						SSB Ês/Iot
			dBm / SCS_{SSB}						dB
			SCS_{SSB} = 120 kHz					SCS_{SSB} = 240 kHz	
			UE Power class					UE Power class	
			1	2	3	4	5	1, 2, 3, 4, 5	

Conditions	Rx Beam Peak	n257	-126.3+Y_1	-111.8	-110.1	-125.8+Y_4	-121.4+Y_5	(Value for SCS_{SSB} = 120 kHz) +3dB	≥-4
		n258	-126.3+Y_1	-111.8	-110.1	-125.8+Y_4	-121.6+Y_5		
		n260	-123.3+Y_1		-107.5	-123.8+Y_4			
		n261	-126.3+Y_1	-111.8	-110.1	-125.8+Y_4			
		n262	-121.3+Y_1	-106.6	-104.6	-119.8+Y_4			
	Spherical coverage Note 1	n257	-118.3+Z_1	-100.8	-99.2	-116.8+Z_4	-113.4+Z_5	(Value for SCS_{SSB} = 120 kHz) +3dB	≥-4
		n258	-118.3+Z_1	-100.8	-99.2	-116.8+Z_4	-113.6+Z_5		
		n260	-115.3+Z_1		-94.9	-111.8+Z_4			
		n261	-118.3+Z_1	-100.8	-99.2	-116.8+Z_4			
		n262	-113.1+Z_1	-94.7	-91.5	-107.7+Z_4			
NOTE 1: Values based on EIS spherical coverage as defined in clause 7.3.4 of TS 38.101-2 [3]. Side condition applies for directions in which EIS spherical coverage requirement is met. NOTE 2: Values specified at the Reference point to give minimum SSB Ês/Iot, with no applied noise. NOTE 3: For UEs that support multiple FR2 bands, Rx Beam Peak values are increased by $\Delta MB_{P,n}$ and Spherical coverage values are increased by $\Delta MB_{S,n}$, the UE multi-band relaxation factor in dB specified in clause 6.2.1 of TS 38.101-2 [3].									

7.3.3.1 NR SA FR2 conditional handover

Editor's Note: This test case is complete for the following configurations:

- Test frequency f ≤ 40.8 GHz.
- UE PC3

This test case is incomplete for Test frequency f > 40.8 GHz

This test case is incomplete for UE power class other than PC3.

7.3.3.1.1 Test purpose

To verify the requirement for the NR FR2 intra frequency conditional handover requirements specified in 38.133 [6] clause 6.1.4.4.

7.3.3.1.2 Test applicability

This test applies to all types of NR UE from Release 16 onwards and supporting conditional handover.

7.3.3.1.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 7.3.3.0.1.

The normative reference for this requirement is TS 38.133 [6] clause A.7.3.3.1.

7.3.3.1.4 Test description

7.3.3.1.4.1 Initial conditions

Initial conditions are a set of test configurations the UE needs to be tested in and the steps for the SS to take with the UE to reach the correct measurement state.

This test shall be tested using any of the test configurations in Table 7.3.3.1.4.1-1.

Table 7.3.3.1.4.1-1: NR SA FR2 conditional handover test configurations

Config	Description
7.3.3.1-1	Source cell: NR 120 kHz SSB SCS, 100 MHz bandwidth, TDD duplex mode Target cell: NR 120 kHz SSB SCS, 100 MHz bandwidth, TDD duplex mode
Note: The UE is only required to be tested in one of the supported test configurations	

Configure the test equipment and the DUT according to the parameters in Table 7.3.3.1.4.1-2

Table 7.3.3.1.4.1-2: Initial conditions for NR SA FR2 conditional handover

Parameter	Value		Comment
Test environment	NC		As specified in TS 38.508-1 [14] clause 4.1.
Test frequencies	As specified in Annex E, table E.4-1 and TS 38.508-1 [14] clause 4.3.1.		
Channel bandwidth	As specified by the test configuration selected from Table 7.1.1.1.4.1-1.		
Propagation conditions	AWGN		As specified in Annex C.2.2.
Connection Diagram	TE Part	A.3.3.3.1	As specified in TS 38.508-1 [14] Annex A.
	DUT Part	A.3.4.1.1	
Exceptions to connection diagram	N/A		

1. Message contents are defined in clause 7.3.3.1.4.3.
2. The power levels and settings for NR Cell 1 are set according to Annex C.1.2 and C.1.3. Cell 2 is NR FR2 target Cell, and its power levels and settings are also set according to Annex C.1.2 and C.1.3.
3. The test parameters are given in Table 7.3.3.1.4.1-3 below, with A3-Offset modified by Test Tolerance.

Table 7.3.3.1.4.1-3: General test parameters for NR SA FR2 conditional handover

Parameter		Unit	Value	Comment
Initial conditions	Active cell		Cell 1	
	Neighbouring cell		Cell 2	
Final condition	Active cell		Cell 2	
A3-Offset for condition		dBm	-2 Note 1	Trigger HO to cell which may be measured as -1dB relative to cell 1. Actual SS-RSRP is 5dB stronger.
Hysteresis		dB	0	
Time To Trigger		s	0	
Filter coefficient			0	L3 filtering is not used
Access Barring Information		-	Not Sent	No additional delays in random access procedure.
Time offset between cells			3 μs	Synchronous cells
T1		s	5	
T2		s	≤2	
Note 1: Including test tolerance given in Annex F.1.3.2				

7.3.3.1.4.2 Test procedure

The test scenario comprises of 1 NR carrier and two cells, Cell 1 and Cell 2, on this carrier. General parameters and Cell-specific parameters for Cell 1 and Cell 2 are given in Table 7.3.3.1.4.1-3 and 7.3.3.1.5-1 respectively. No measurement gap is configured in the test case.

The test consists of two successive time periods, with time durations of T1 and T2 respectively.

At the start of time duration T1, the UE may not have any timing information of cell 2. The UE is configured with a condition implying handover to Cell 2 at a time earlier than T_{RRC} ms before the beginning of T2. No interruption shall be observed in time period T1. where,

- T_{RRC} = 10ms, is the RRC procedure delay defined in clause 12 in TS 38.331 [13].

From start of T2, the Cell 2 becomes detectable and handover condition is satisfied. During T2, the UE performs measurement on Cell 2 and evaluates the execution condition, and starts handover procedure when execution condition is satisifed. The UE shall sent PRACH to Cell 2 less than $T_{measure} + T_{CHO_execution} + T_{interrupt}$ ms from the start of T2. The Interruption length $T_{interrupt}$ shall also be verified in T2.

1. Ensure the UE is in State RRC_CONNECTED with generic procedure parameters Connectivity *NR*, Connected without release *On* according to TS 38.508-1 [14] clause 4.5. Establish SRB2 and DRB in the *RRCReconfiguration* message. Cell 1 is the active cell. Set Cell 2 physical cell identity to the initial physical cell identity.

2. Set the parameters according to T1 in Table 7.3.3.1.5-1. Propagation conditions are set according to Annex C clause C.2.2. T1 starts. The SS starts continuously scheduling the UE to perform DL reception in every DL slot on Cell 1 and monitoring corresponding ACK/NACK feedbacks sent by the UE.

3. Set Cell 2 physical cell identity = ((current cell 2 physical cell identity + 1) mod 14 + 2).

4. The SS shall transmit an *RRCReconfiguration* message with *conditionalReconfiguration* on Cell 1 to configure CHO execution condition for the UE.

5. The UE shall transmit an *RRCReconfigurationComplete* message.

6. When T1 expires, the SS shall switch the power setting from T1 to T2 as specified in Table 7.3.3.1.5-1. T2 starts.

7. If

   a) the UE transmits the PRACH preambles to Cell 2 less than $T_{measure} + T_{CHO_execution} + T_{interrupt}$ ms from the beginning of time period T2,

   and

   b) no longer than X consecutive ACK/NACK DTXs are observed by the SS from the start of T2 to the instant the UE transmits the first PRACH preamble, where

   - $X = 8 \cdot T_{interrupt}$ for test configuration 7.3.3.1-1

   then the number of successful tests is increased by one. Otherwise, the number of failure tests is increased by one.

8. After T2 expires, the SS sends an *RRCReconfiguration* with *reconfigurationWithSync* to cause UE handover back to Cell 1.

9. If UE is not in state RRC_CONNECTED with generic procedure parameters Connectivity *NR*, Connected without release *On* according to TS 38.508-1 [14] clause 4.5 on Cell 1, switch off and on the UE. Then ensure the UE is in State RRC_CONNECTED with generic procedure parameters Connectivity *NR*, Connected without release *On* according to TS 38.508-1 [14] clause 4.5 on Cell 1.

10. Repeat steps 2-9 until the confidence level according to Tables G.2.3-1 in Annex G clause G.2 is achieved.

7.3.3.1.4.3 Message contents

Message contents are according to TS 38.508-1 [14] clause 7.3 with the following exceptions:

Table 7.3.3.1.4.3-1: RRCReconfiguration (Step 4)

Derivation Path: TS 38.508-1 [14], Table 4.6.1-13 with condition NR_MEAS and CHO			
Information Element	**Value/remark**	**Comment**	**Condition**
RRCReconfiguration ::= SEQUENCE {			
criticalExtensions CHOICE {			
rrcReconfiguration SEQUENCE {			
measConfig	MeasConfig	Table 7.3.3.1.4.3-2	
nonCriticalExtension SEQUENCE {			
nonCriticalExtension SEQUENCE {			
nonCriticalExtension SEQUENCE {			
nonCriticalExtension SEQUENCE {			
conditionalReconfiguration-r16	ConditionalReconfiguration	Table 7.3.3.1.4.3-5	
}			

}			
}			
}			
}			
}			
}			

Table 7.3.3.1.4.3-2: MeasConfig (Table 7.3.3.1.4.3-1)

Derivation Path: Table H.3.1-2			
Information Element	**Value/remark**	**Comment**	**Condition**
MeasConfig ::= SEQUENCE {			
measObjectToAddModList SEQUENCE (SIZE (1..maxNrofObjectId)) OF MeasObjectToAddMod {	1 entry		
MeasObjectToAddMod[1] SEQUENCE {		entry 1	
measObjectId	1		
measObject CHOICE {			
measObjectNR	MeasObjectNR	Table 7.3.3.1.4.3-3	
}			
}			
}			
reportConfigToAddModList SEQUENCE (SIZE (1..maxReportConfigId)) OF ReportConfigToAddMod {	1 entry		
ReportConfigToAddMod[1] SEQUENCE {		entry 1	
reportConfigId	1		
reportConfig CHOICE {			
reportConfigNR	ReportConfigNR	Table 7.3.3.1.4.3-4	
}			
}			
}			
measIdToAddModList SEQUENCE (SIZE (1..maxNrofMeasId)) OF MeasIdToAddMod {	1 entry		
MeasIdToAddMod[1] SEQUENCE {			
measId	1		
measObjectId	1		
reportConfigId	1		
}			
}			
quantityConfig	QuantityConfig specified in Table H.3.1-5		
}			

Table 7.3.3.1.4.3-3: MeasObjectNR (Table 7.3.3.1.4.3-2)

Derivation Path: TS 38.508-1[14], Table 4.6.3-76			
Information Element	**Value/remark**	**Comment**	**Condition**
MeasObjectNR ::= SEQUENCE {			
ssbFrequency	ARFCN-ValueNR for PCell		
smtc1	SSB-MTC specified in TS 38.508-1[14] Table 7.3.1-3 with condition SMTC.1		
referenceSignalConfig SEQUENCE {			
ssb-ConfigMobility SEQUENCE {			
ssb-ToMeasure	Not present		
}			
}			
absThreshSS-BlocksConsolidation	Not present		
}			

Table 7.3.3.1.4.3-4: ReportConfigNR (Table 7.3.3.1.4.3-2)

Derivation Path: TS 38.508-1[14], Table 4.6.3-142 with condition CHO			
Information Element	**Value/remark**	**Comment**	**Condition**
ReportConfigNR ::= SEQUENCE {			
reportType CHOICE {			
condTriggerConfig SEQUENCE {			
condEventId CHOICE {			
condEventA3 SEQUENCE {			
a3-Offset CHOICE {			
rsrp	-4	actuall value = -4*0.5 = -2dB	
}			
hysteresis	0	actuall value = 0*0.5 = 0dB	
timeToTrigger	ms0		
}			
}			
}			
}			
}			

Table 7.3.3.1.4.3-5: ConditionalReconfiguration (Table 7.3.3.1.4.3-1)

Derivation Path: TS 38.508-1[14], Table 4.6.3-25D			
Information Element	**Value/remark**	**Comment**	**Condition**
ConditionalReconfiguration-r16::= SEQUENCE {			
condReconfigToAddModList-r16 SEQUENCE (SIZE (1.. maxNrofCondCells-r16)) OF CondReconfigToAddMod-r16 {	1 entry		
CondReconfigToAddMod-r16 [1] SEQUENCE {		entry 1	
condReconfigId-r16	1		
condExecutionCond-r16 SEQUENCE (SIZE (1..2)) OF MeasId {	1 entry		
MeasId[1]	1	The MeasId configured in Table 7.3.3.1.4.3-2	
}			
condRRCReconfig-r16	OCTET STRING (CONTAINING RRCReconfiguration Specified in Table 4.8.1-1A with condition RBConfig_NoKeyChange)		
}			
}			
}			

7.3.3.1.5 Test requirements

Table 7.3.3.1.5-1 defines the primary level settings including test tolerances for all tests.

Table 7.3.3.1.5-1: Cell specific test parameters for NR SA FR2 conditional handover

Parameter	Unit	Cell 1		Cell 2	
		T1	T2	T1	T2
NR RF Channel Number		1		1	
AoA setup		Setup 1 as defined in A.3.15			
Assumption for UE beams[Note 6]		Rough			
Duplex mode		TDD			
TDD configuration		TDDConf.3.1			
$BW_{channel}$	MHz	100: $N_{RB,c}$ = 66			
BWP BW	MHz	100: $N_{RB,c}$ = 66			

DRx Cycle		ms	Not Applicable			
PDSCH Reference measurement channel			SR3.1 TDD			
CORESET Reference Channel			CR3.1 TDD			
OCNG Patterns			OCNG pattern 1			
SMTC Configuration			SMTC pattern 1			
SSB Configuration			SSB.1 FR2			
PDSCH/PDCCH subcarrier spacing		kHz	120 kHz			
PUCCH/PUSCH subcarrier spacing		kHz	120 kHz			
PRACH configuration			FR2 PRACH configuration 1			
TRS configuration			TRS.2.1 TDD			
TCI configuration			CSI-RS.Config.0			
BWP configuration	Initial DL BWP		DLBWP.0.1			
	Dedicated DL BWP		DLBWP.1.1			
	Initial UL BWP		ULBWP.0.1			
	Dedicated UL BWP		ULBWP.1.1			
EPRE ratio of PSS to SSS		dB	0		0	
EPRE ratio of PBCH DMRS to SSS						
EPRE ratio of PBCH to PBCH DMRS						
EPRE ratio of PDCCH DMRS to SSS						
EPRE ratio of PDCCH to PDCCH DMRS						
EPRE ratio of PDSCH DMRS to SSS						
EPRE ratio of PDSCH to PDSCH						
EPRE ratio of OCNG DMRS to SSS(Note 1)						
EPRE ratio of OCNG to OCNG DMRS (Note 1)						
N_{oc} Note2		dBm/15kHz	-106.2 Note 7		-106.2 Note 7	
N_{oc} Note2	Config 1	dBm/SCS	-97.2		-97.2	
Ês/Iot$_{BB}$ Note9		dB	4.69	-5.44	-Infinity	3.73
$\hat{E}_s / N_{oc}$		dB	6	6	-Infinity	11
Io Note3	Config 1	dBm/BW	-61.21	-55.73	-61.21	-55.73
Propagation condition		-	AWGN			

Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.

Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for N_{oc} to be fulfilled.

Note 3: Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.

Note 4: Equivalent power received by an antenna with 0 dBi gain at the centre of the quiet zone

Note 5: As observed with 0 dBi gain antenna at the centre of the quiet zone

Note 6: Information about types of UE beam is given in B.2.1.3, and does not limit UE implementation or test system implementation

Note 7: Including test tolerance given in Annex F.1.3.2.

Note 8: Es/Iot, SSB_RP and Io levels have been derived from other parameters for infomation purposes. They are not settable parameters themseleves.

Note 9: Calculation of Es/Iot$_{BB}$ includes the effect of UE internal noise up to the value assumed for the associated REFSENS requirement in TS 38.101-2 [3] clause 7.3.2, and an allowance of 1dB for UE multi-band relaxation factor Δ_{MBS} specified in TS 38.101-2 [3] Table 6.2.1.3-4.

The rate of correct handovers observed during repeated tests shall be at least 90%.

The test shall verify that there are no interruptions during T1.

The UE shall start to transmit the PRACH to Cell 2 less than $T_{measure} + T_{CHO_execution} + T_{interrupt}$ from the start of T2. where:

- $T_{measure}$ = 1600 ms for power class 1 UE and 1080ms for power class 2/3/4 UE, is the measurements time specified in 38.133 [6] clause 6.1.4.2.2.

- $T_{CHO_execution}$ = 10 ms, is the conditional execution preparation time specified in 38.133 [6] clause 6.1.4.2.2.

- $T_{interrupt} = T_{processing} + T_{IU} + T_{\Delta} + T_{margin}$ ms, is the interruption time specified in 38.133 [6] 6.1.4.2.4.

- $T_{processing}$ = 20 ms, is time for UE processing;
- T_{IU} = 20 ms, is the interruption uncertainty in acquiring the first available PRACH occasion in the new cell;
- T_{Δ} = 20 ms, is time for fine time tracking and acquiring full timing information of the target cell;
- T_{margin} = 2 ms, is time for SSB post-processing.

This gives a total of 1672 ms for power class 1 UE and 1152 ms for power class 2/3/4 UE.
The interruption during T2 shall not exceeed $T_{interrupt}$ = 62ms.

7.3.3.2 NR SA FR2-FR2 conditional handover

Editor's Note: This test case is incomplete in following aspects:

- TT analysis is missing.
- Some test parameters are still FFS

7.3.3.2.1 Test purpose

To verify the requirement for the NR FR2 inter-frequency conditional handover requirements specified in 38.133 [6] clause 6.1.4.4.

7.3.3.2.2 Test applicability

This test applies to all types of NR UE from Release 16 onwards and supporting conditional handover.

7.3.3.2.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 7.3.3.0.2.

The normative reference for this requirement is TS 38.133 [6] clause A.7.3.3.2.

7.3.3.2.4 Test description

7.3.3.2.4.1 Initial conditions

Initial conditions are a set of test configurations the UE needs to be tested in and the steps for the SS to take with the UE to reach the correct measurement state.

This test shall be tested using any of the test configurations in Table 7.3.3.2.4.1-1.

Table 7.3.3.2.4.1-1: NR SA FR2-FR2 conditional handover test configurations

Config	Description
7.3.3.2-1	Source cell: NR 120 kHz SSB SCS, 100 MHz bandwidth, TDD duplex mode Target cell: NR 120 kHz SSB SCS, 100 MHz bandwidth, TDD duplex mode
Note: The UE is only required to be tested in one of the supported test configurations	

Configure the test equipment and the DUT according to the parameters in Table 7.3.3.2.4.1-2

Table 7.3.3.2.4.1-2: Initial conditions for NR SA FR2-FR2 conditional handover

Parameter	Value		Comment
Test environment	NC		As specified in TS 38.508-1 [14] clause 4.1.
Test frequencies	As specified in Annex E, table E.4-1 and TS 38.508-1 [14] clause 4.3.1.		
Channel bandwidth	As specified by the test configuration selected from Table 7.1.1.1.4.1-1.		
Propagation conditions	AWGN		As specified in Annex C.2.2.
Connection Diagram	TE Part	A.3.3.3.1	As specified in TS 38.508-1 [14] Annex A.
	DUT Part	A.3.3.4.1	
Exceptions to connection diagram	N/A		

1. Message contents are defined in clause 7.3.3.2.4.3.

2. The power levels and settings for NR Cell 1 are set according to Annex C.1.2 and C.1.3. Cell 2 is NR FR2 target Cell, and its power levels and settings are also set according to Annex C.1.2 and C.1.3.

3. The test parameters are given in Table 7.3.3.2.4.1-3 below, with A3-Offset modified by Test Tolerance.

Table 7.3.3.2.4.1-3: General test parameters for NR SA FR2-FR2 conditional handover

Parameter		Unit	Value	Comment
Initial conditions	Active cell		Cell 1	
	Neighbouring cell		Cell 2	
Final condition	Active cell		Cell 2	
A3-Offset for handover condition		dB	FFS	
Hysteresis		dB	0	
Time To Trigger		s	0	
Filter coefficient			0	L3 filtering is not used
Access Barring Information		-	Not Sent	No additional delays in random access procedure.
Time offset between cells			3 μs	Synchronous cells
T1		s	5	
T2		s	≤7	

7.3.3.2.4.2 Test procedure

The test scenario comprises of 2 NR carriers and two cells, Cell 1 and Cell 2, on each carrier respectively. General parameters and Cell-specific parameters for Cell 1 and Cell 2 are given in Table 7.3.3.2.4.1-3 and 7.3.3.2.5-1 respectively. Measurement gap (gap pattern #0) is configured in the test case.

The test consists of two successive time periods, with time durations of T1 and T2 respectively.

At the start of time duration T1, the UE may not have any timing information of cell 2. The UE is configured with a condition implying handover to Cell 2 at a time earlier than T_{RRC} ms before the beginning of T2. No interruption shall be observed in time period T1. where,

- T_{RRC} = 10ms, is the RRC procedure delay defined in clause 12 in TS 38.331 [13].

From start of T2, the Cell 2 becomes detectable and handover condition is satisfied. During T2, the UE performs measurement on Cell 2 and evaluates the execution condition, and starts handover procedure when execution condition is satisifed. The UE shall sent PRACH to Cell 2 less than $T_{measure} + T_{CHO_execution} + T_{interrupt}$ ms from the start of T2. The Interruption length $T_{interrupt}$ shall also be verified in T2.

1. Ensure the UE is in State RRC_CONNECTED with generic procedure parameters Connectivity *NR*, Connected without release *On* according to TS 38.508-1 [14] clause 4.5. Establish SRB2 and DRB in the *RRCReconfiguration* message. Cell 1 is the active cell. Set Cell 2 physical cell identity to the initial physical cell identity.

2. Set the parameters according to T1 in Table 7.3.3.2.5-1. Propagation conditions are set according to Annex C clause C.2.2. T1 starts. The SS starts continuously scheduling the UE to perform DL reception in every DL slot on Cell 1 and monitoring corresponding ACK/NACK feedbacks sent by the UE.

3. Set Cell 2 physical cell identity = ((current cell 2 physical cell identity + 1) mod 14 + 2).

4. The SS shall transmit an *RRCReconfiguration* message with *conditionalReconfiguration* on Cell 1 to configure CHO execution condition and measurement gap pattern #0 for the UE.

5. The UE shall transmit an *RRCReconfigurationComplete* message.

6. When T1 expires, the SS shall switch the power setting from T1 to T2 as specified in Table 7.3.3.2.5-1. T2 starts.

7. If

   c) the UE transmits the PRACH preambles to Cell 2 less than $T_{measure} + T_{CHO_execution} + T_{interrupt}$ ms from the beginning of time period T2,

and

d) no longer than X consecutive ACK/NACK DTXs are observed by the SS from the start of T2 to the instant the UE transmits the first PRACH preamble, where

- $X = 8 \cdot T_{interrupt}$ for test configuration 7.3.3.2-1

then the number of successful tests is increased by one. Otherwise, the number of failure tests is increased by one.

8. After T2 expires, the SS sends an *RRCReconfiguration* with *reconfigurationWithSync* to cause UE handover back to Cell 1.

9. If UE is not in state RRC_CONNECTED with generic procedure parameters Connectivity *NR*, Connected without release *On* according to TS 38.508-1 [14] clause 4.5 on Cell 1, switch off and on the UE. Then ensure the UE is in State RRC_CONNECTED with generic procedure parameters Connectivity *NR*, Connected without release *On* according to TS 38.508-1 [14] clause 4.5 on Cell 1.

10. Repeat steps 2-9 until the confidence level according to Tables G.2.3-1 in Annex G clause G.2 is achieved.

7.3.3.2.4.3 Message contents

Message contents are according to TS 38.508-1 [14] clause 7.3 with the following exceptions:

Table 7.3.3.2.4.3-1: RRCReconfiguration (Step 4)

Derivation Path: TS 38.508-1 [14], Table 4.6.1-13 with condition NR_MEAS and CHO			
Information Element	**Value/remark**	**Comment**	**Condition**
RRCReconfiguration ::= SEQUENCE {			
criticalExtensions CHOICE {			
rrcReconfiguration SEQUENCE {			
measConfig	MeasConfig	Table 7.3.3.2.4.3-2	
nonCriticalExtension SEQUENCE {			
nonCriticalExtension SEQUENCE {			
nonCriticalExtension SEQUENCE {			
nonCriticalExtension SEQUENCE {			
conditionalReconfiguration-r16	ConditionalReconfiguration	Table 7.3.3.2.4.3-6	
}			
}			
}			
}			
}			
}			
}			

Table 7.3.3.2.4.3-2: MeasConfig (Table 7.3.3.2.4.3-1)

Derivation Path: Table H.3.1-2			
Information Element	**Value/remark**	**Comment**	**Condition**
MeasConfig ::= SEQUENCE {			
measObjectToAddModList SEQUENCE (SIZE (1..maxNrofObjectId)) OF MeasObjectToAddMod {	2 entry		
MeasObjectToAddMod[1] SEQUENCE {		entry 1	
measObjectId	1		
measObject CHOICE {			
measObjectNR	MeasObjectNR-f1	Table 7.3.3.2.4.3-3	
}			
}			
MeasObjectToAddMod[2] SEQUENCE {		entry 2	
measObjectId	2		
measObject CHOICE {			
measObjectNR	MeasObjectNR-f2	Table 7.3.3.2.4.3-4	
}			

} }			

reportConfigToAddModList SEQUENCE (SIZE (1..maxReportConfigId)) OF ReportConfigToAddMod {
ReportConfigToAddMod[1] SEQUENCE {
reportConfigId
reportConfig CHOICE {
reportConfigNR
}
}
}
	1 entry
	
	1
	
	ReportConfigNR
		
		entry 1
		
		Table 7.3.3.2.4.3-5	

measIdToAddModList SEQUENCE (SIZE (1..maxNrofMeasId)) OF MeasIdToAddMod {
MeasIdToAddMod[1] SEQUENCE {
measId
measObjectId
reportConfigId
}
}
	1 entry
	
	1
	2
	1		

measGapConfig	MeasGapConfig specified in Table H.3.1-6 with condition gapUE and Pattern #0		
quantityConfig	QuantityConfig specified in Table H.3.1-5		
}			

Table 7.3.3.2.4.3-3: MeasObjectNR-f1 (Table 7.3.3.2.4.3-2)

Derivation Path: TS 38.508-1[14], Table 4.6.3-76			
Information Element	**Value/remark**	**Comment**	**Condition**
MeasObjectNR ::= SEQUENCE {			
ssbFrequency	ARFCN-ValueNR for Cell 1		
smtc1	SSB-MTC specified in TS 38.508-1[14] Table 7.3.1-3 with condition SMTC.1		

referenceSignalConfig SEQUENCE {
ssb-ConfigMobility SEQUENCE {
ssb-ToMeasure
}
}
	
	Not present		

absThreshSS-BlocksConsolidation	Not present		
}			

Table 7.3.3.2.4.3-4: MeasObjectNR-f2 (Table 7.3.3.2.4.3-2)

Derivation Path: TS 38.508-1[14], Table 4.6.3-76			
Information Element	**Value/remark**	**Comment**	**Condition**
MeasObjectNR ::= SEQUENCE {			
ssbFrequency	ARFCN-ValueNR for Cell 2		
smtc1	SSB-MTC specified in TS 38.508-1[14] Table 7.3.1-3 with condition SMTC.1		

referenceSignalConfig SEQUENCE {
ssb-ConfigMobility SEQUENCE {
ssb-ToMeasure
}
}
	
	Not present		

absThreshSS-BlocksConsolidation	Not present		
}			

Table 7.3.3.2.4.3-5: ReportConfigNR (Table 7.3.3.2.4.3-2)

Derivation Path: TS 38.508-1[14], Table 4.6.3-142 with condition CHO			
Information Element	**Value/remark**	**Comment**	**Condition**
ReportConfigNR ::= SEQUENCE {			
reportType CHOICE {			
condTriggerConfig SEQUENCE {			
condEventId CHOICE {			
condEventA3 SEQUENCE {			
a3-Offset CHOICE {			
rsrp	FFS		
}			
hysteresis	0	actuall value = 0*0.5 = 0dB	
timeToTrigger	ms0		
}			
}			
}			
}			
}			

Table 7.3.3.2.4.3-6: ConditionalReconfiguration (Table 7.3.3.2.4.3-1)

Derivation Path: TS 38.508-1[14], Table 4.6.3-25D			
Information Element	**Value/remark**	**Comment**	**Condition**
ConditionalReconfiguration-r16::= SEQUENCE {			
condReconfigToAddModList-r16 SEQUENCE (SIZE (1.. maxNrofCondCells-r16)) OF CondReconfigToAddMod-r16 {	1 entry		
CondReconfigToAddMod-r16 [1] SEQUENCE {		entry 1	
condReconfigId-r16	1		
condExecutionCond-r16 SEQUENCE (SIZE (1..2)) OF MeasId {	1 entry		
MeasId[1]	1	The MeasId configured in Table 7.3.3.2.4.3-2	
}			
condRRCReconfig-r16	OCTET STRING (CONTAINING RRCReconfiguration Specified in Table 4.8.1-1A with condition RBConfig_NoKeyChange)		
}			
}			
}			

7.3.3.2.5 Test requirements

Table 7.3.3.2.5-1 defines the primary level settings including test tolerances for all tests.

Table 7.3.3.2.5-1: Cell specific test parameters for NR SA FR2-FR2 conditional handover

Parameter	Unit	Cell 1		Cell 2	
		T1	T2	T1	T2
NR RF Channel Number		1		2	
AoA setup		Setup 1 as defined in A.3.15			
Assumption for UE beams[Note 6]		Rough			
Duplex mode		TDD			
TDD configuration		TDDConf.3.1			
$BW_{channel}$	MHz	100: $N_{RB,c}$ = 66			
BWP BW	MHz	100: $N_{RB,c}$ = 66			

DRx Cycle		ms	Not Applicable			
Gap pattern ID			gp0			
PDSCH Reference measurement channel			SR3.1 TDD			
CORESET Reference Channel			CR3.1 TDD			
OCNG Patterns			OCNG pattern 1			
SMTC Configuration			SMTC pattern 1			
SSB Configuration			SSB.1 FR2			
PDSCH/PDCCH subcarrier spacing		kHz	120 kHz			
PUCCH/PUSCH subcarrier spacing		kHz	120 kHz			
PRACH configuration			FR2 PRACH configuration 1			
TRS configuration			TRS.2.1 TDD			
TCI configuration			CSI-RS.Config.0			
BWP configuration	Initial DL BWP		DLBWP.0.1			
	Dedicated DL BWP		DLBWP.1.1			
	Initial UL BWP		ULBWP.0.1			
	Dedicated UL BWP		ULBWP.1.1			
EPRE ratio of PSS to SSS		dB	0		0	
EPRE ratio of PBCH DMRS to SSS						
EPRE ratio of PBCH to PBCH DMRS						
EPRE ratio of PDCCH DMRS to SSS						
EPRE ratio of PDCCH to PDCCH DMRS						
EPRE ratio of PDSCH DMRS to SSS						
EPRE ratio of PDSCH to PDSCH						
EPRE ratio of OCNG DMRS to SSS(Note 1)						
EPRE ratio of OCNG to OCNG DMRS (Note 1)						
N_{oc} Note2		dBm/15kHz	-104.7		-104.7	
N_{oc} Note2	Config 1,2	dBm/SCS	-95.7		-95.7	
	Config 3		-95.7		-95.7	
$\hat{E}_s / I_{ot}$		dB	5	5	-Infinity	5
$\hat{E}_s / N_{oc}$		dB	5	5	-Infinity	5
Io Note3	Config 1,2	dBm/BW	-60.5	-60.5	-66.7	-60.5
	Config 3	dBm/BW	-60.5	-60.5	-66.7	-60.5
Propagation condition		-	AWGN			

Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.
Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for N_{oc} to be fulfilled.
Note 3: Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.
Note 4: Equivalent power received by an antenna with 0 dBi gain at the centre of the quiet zone
Note 5: As observed with 0 dBi gain antenna at the centre of the quiet zone
Note 6: Information about types of UE beam is given in B.2.1.3, and does not limit UE implementation or test system implementation

The rate of correct handovers observed during repeated tests shall be at least 90%.

The test shall verify that there are no interruptions during T1.

The UE shall start to transmit the PRACH to Cell 2 less than $T_{measure} + T_{CHO_execution} + T_{interrupt}$ from the start of T2. where:

- $T_{measure}$ = 6720 ms for power class 1 UE and 4160 ms for power class 2/3/4 UE, is the measurements time specified in 38.133 [6] clause 6.1.4.2.2.

- $T_{CHO_execution}$ = 10 ms, is the conditional execution preparation time specified in 38.133 [6] clause 6.1.4.2.2.

- $T_{interrupt} = T_{processing} + T_{IU} + T_{\Delta} + T_{margin}$ ms, is the interruption time specified in 38.133 [6] 6.1.4.2.4.

  - $T_{processing}$ = 20 ms, is time for UE processing;

- T_{IU} = 20 ms, is the interruption uncertainty in acquiring the first available PRACH occasion in the new cell;
- T_{Δ} = 20 ms, is time for fine time tracking and acquiring full timing information of the target cell;
- T_{margin} = 2 ms, is time for SSB post-processing.

This gives a total of 6792 ms for power class 1 UE and 4232 ms for power class 2/3/4 UE.

The interruption during T2 shall not exceeed $T_{interrupt}$ = 62ms.

7.4 Timing

7.4.1 UE transmit timing

7.4.1.0 Minimum Conformance Requirements

7.4.1.0.1 Minimum conformance requirements for UE transmit timing accuracy

The UE initial transmission timing error shall be less than or equal to $\pm T_e$ where the timing error limit value T_e is specified in Table 7.4.1.0.1-1. This requirement applies:

- when it is the first transmission in a DRX cycle for PUCCH, PUSCH and SRS or it is the PRACH transmission.

The UE shall meet the Te requirement for an initial transmission provided that at least one SSB is available at the UE during the last 160 ms. The reference point for the UE initial transmit timing control requirement shall be the downlink timing of the reference cell minus $(N_{\mathrm{TA}} + N_{\mathrm{TA\,offset}}) \times T_{\mathrm{c}}$. The downlink timing is defined as the time when the first detected path (in time) of the corresponding downlink frame is received from the reference cell. N_{TA} for PRACH is defined as 0.

$(N_{\mathrm{TA}} + N_{\mathrm{TA\,offset}}) \times T_{\mathrm{c}}$ (in T_c units) for other channels is the difference between UE transmission timing and the downlink timing immediately after when the last timing advance in TS 38.133 [6] clause 7.3 was applied. N_{TA} for other channels is not changed until next timing advance is received. The value of $N_{\mathrm{TA\,offset}}$ depends on the duplex mode of the cell in which the uplink transmission takes place and the frequency range (FR). $N_{\mathrm{TA\,offset}}$ is defined in Table 7.4.1.0.1-2.

Table 7.4.1.0.1-1: T_e Timing Error Limit

Frequency Range	SCS of SSB signals (KHz)	SCS of uplink signals (KHz)	T_e
1	15	15	12*64*T_c
		30	10*64*T_c
		60	10*64*T_c
	30	15	8*64*T_c
		30	8*64*T_c
		60	7*64*T_c
2	120	60	3.5*64*T_c
		120	3.5*64*T_c
	240	60	3*64*T_c
		120	3*64*T_c
NOTE 1: T_c is the basic timing unit defined in TS 38.211 [6]			

Table 7.4.1.0.1-2: The Value of $N_{\mathrm{TA\,offset}}$

Frequency range and band of cell used for uplink transmission	$N_{\mathrm{TA\,offset}}$ (Unit: T_C)
FR1 FDD band without LTE-NR coexistence case or FR1 TDD band without LTE-NR coexistence case	25600 (Note 1)
FR1 FDD band with LTE-NR coexistence case	0 (Note 1)
FR1 TDD band with LTE-NR coexistence case	39936 (Note 1)
FR2	13792

NOTE 1: The UE identifies $N_{\text{TA offset}}$ based on the information n-TimingAdvanceOffset according to [2]. If UE is not provided with the information n-TimingAdvanceOffset, the default value of $N_{\text{TA offset}}$ is set as 25600 for FR1 band. In case of multiple UL carriers in the same TAG, UE expects that the same value of n-TimingAdvanceOffset is provided for all the UL carriers according to clause 4.2 in [3] and the value 39936 of $N_{\text{TA offset}}$ can also be provided for a FDD serving cell.
NOTE 2: Void

When it is not the first transmission in a DRX cycle or there is no DRX cycle, and when it is the transmission for PUCCH, PUSCH and SRS transmission, the UE shall be capable of changing the transmission timing according to the received downlink frame of the reference cell except when the timing advance in TS 38.133 [6] clause 7.3 is applied.

When the transmission timing error between the UE and the reference timing exceeds $\pm T_e$, the UE is required to adjust its timing to within $\pm T_e$. The reference timing shall be $(N_{\text{TA}} + N_{\text{TA offset}}) \times T_c$ before the downlink timing of the reference cell. All adjustments made to the UE uplink timing shall follow these rules:

1) The maximum amount of the magnitude of the timing change in one adjustment shall be T_q.

2) The minimum aggregate adjustment rate shall be T_p per second.

3) The maximum aggregate adjustment rate shall be T_q per 200ms.

where the maximum autonomous time adjustment step T_q and the aggregate adjustment rate T_p are specified in Table 7.4.1.0.1-3.

Table 7.4.1.0.1-3: T_q Maximum Autonomous Time Adjustment Step and T_p Minimum Aggregate Adjustment rate

Frequency Range	SCS of uplink signals (KHz)	T_q	T_p
1	15	$5.5*64*T_c$	$5.5*64*T_c$
	30	$5.5*64*T_c$	$5.5*64*T_c$
	60	$5.5*64*T_c$	$5.5*64*T_c$
2	60	$2.5*64*T_c$	$2.5*64*T_c$
	120	$2.5*64*T_c$	$2.5*64*T_c$
NOTE: T_c is the basic timing unit defined in TS 38.211 [6]			

The normative reference for this requirement is TS.38.133 [6] clause 7.1.2.

7.4.1.1 NR SA FR2 UE transmit timing accuracy

Editor's Note: This test case has been completed for the following configurations:

- Test frequency f ≤ 40.8 GHz

- UE PC3

- The test is incomplete for UE power classes other than PC3

- The test is incomplete for test frequencies > 40.8 GHz

- Handling of PC6 devices via *HighSpeedMeasFlagFR2-r17* signalling is FFS

7.4.1.1.1 Test purpose

The purpose of this test is to verify that the UE can follow frame timing change of the connected gNB and that the UE initial transmit timing accuracy, maximum amount of timing change in one adjustment, minimum and maximum adjustment rate are within the specified limits. This test will verify the requirements in clause 7.1.2 of TS 38.133 [6].

7.4.1.1.2 Test applicability

This test applies to all types of E-UTRA UE release 15 and forward supporting SA FR2.

7.4.1.1.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 7.4.1.0.1.

The normative reference for this requirement is TS.38.133 [6] clause A.7.4.1.1

7.4.1.1.4 Test Description

7.4.1.1.4.1 Initial Conditions

This test can be run in one of the configurations defined in Table 7.4.1.1.4.1-1.

Table 7.4.1.1.4.1-1: Supported test configurations for FR2 PCell

Configuration	Description
1	NR TDD, SSB SCS 240 kHz, data SCS 120 kHz, BW 100 MHz

Configure the test equipment and the DUT according to the parameters in Table 7.4.1.1.4.1-2

Table 7.4.1.1.4.1-2: Initial conditions for NR SA FR2 transmit timing accuracy

Parameter	Value		Comment
Test environment	NC		As specified in TS 38.508-1 [14] clause 4.1.
Test frequencies	As specified in Annex E, Table E.5-1 and TS 38.508-1 [14] clause 4.3.1.		
Channel bandwidth	As specified by the test configuration selected from Table 7.4.1.1.4.1-1		
Propagation conditions	AWGN		As specified in clause C.2.2.
Connection Diagram	TE Part	A.3.3.1.1	As specified in TS 38.508-1 [14] Annex A.
	DUT Part	A.3.4.1.1	
Exceptions to connection diagram	N/A		

1. Message contents are defined in clause 7.4.1.1.4.3.
2. For this test a single NR FR2 PCell (Cell 1) is used. The connection setup is performed according to the settings and power levels defined in annex C.
3. The UE Rx beam peak direction has been obtained previously using one of the Rx Beam Peak Search procedures as described in Annex I.

7.4.1.1.4.2 Test procedure

The test consists of a single NR FR2 cell (PCell). The downlink timing of the PCell is changed and the changes in UE transmit timing are observed. The transmit timing is verified by the UE transmitting SRS used as a measurement reference facilitating the SS timing estimation.

The test sequence shall be carried out in RRC_CONNECTED for every test case. Unless otherwise stated, the downlink signal and noise are aligned to arrive in the UE Rx beam peak direction.

Following will be the test sequence for this test:

1. Ensure the UE is in state RRC_CONNECTED with generic procedure parameters *Connectivity* NR, Connected without release *On* and Test Mode *On* according to TS 38.508-1 [6] clause 4.5.
2. Setup NR PCell according to parameters given in Table 7.4.1.1.4.1-1.
3. The SS shall transmit an RRCConnectionReconfiguration message configuring the UE with the message content defined in clause 7.4.1.1.4.3.
4. The UE shall transmit RRCConnectionReconfigurationComplete message.
5. Set the UE in the Rx beam peak direction found with one of the Rx Beam Peak Search procedures described in Annex I. Allow at least BEAM_SELECT_WAIT_TIME (NOTE 1) for the UE Rx beam selection to complete.

6. After connection set up with the cell and during 2 seconds before DL timing adjustment, the test equipment shall monitor all SRS transmissions and verify that, for each received SRS, the timing of the NR cell is within $(N_{TA} + N_{TA_offset}) \times T_c \pm T_e$ of the first detected path of DL SSB.

   a. The N_{TA} offset value (in T_c units) is 13792 for FR2

   b. The T_e values depend on the DL and UL SCS for which the test is being run and are given in Table 7.4.1.1.5-4.

7. The test system shall adjust the timing of the DL path by values given in Table 7.4.1.1.4.2-1

Table 7.4.1.1.4.2-1: Adjustment Value for DL Timing

SCS of SSB signals (KHz)	Adjustment Value	
	Test1	Test2
240	+8*64Tc	+4*64Tc

8. The test system shall verify that the adjustment step size and the adjustment rate shall be according to requirements specified in Table 7.4.1.1.5-5. This will only be done for Test1. The test system samples the UE Transmit Timing once per SRS transmission (as per configured SRS periodicity). To check Rule 1, the SS shall check that the maximum time adjustment step size T_q between one SRS transmission to next consecutive SRS transmission of a valid UL slot is within Rule 1 as specified in clause 7.4.1.0.1 and Table 7.4.1.0.1-3. To check that the minimum adjustment rate is within Rule 2 as specified in clause 7.4.1.0.1 and Table 7.4.1.0.1-3, the SS shall measure the change in SRS transmission timing over a 1 + offset seconds sliding window (offset in ms to the next consecutive SRS transmission), with step size p (where p is the periodicity of SRS) , as long as the resulting slot is a valid UL slot. To check that the maximum adjustment rate is within Rule 3 as specified in clause 7.4.1.0.1 and Table 7.4.1.0.1-3, the SS shall measure the change in SRS transmission timing over a 200ms – offset sliding window of previous SRS transmission, with step size p (where p is the periodicity of SRS) , as long as the resulting slot is a valid UL slot. The three rules apply until the UE transmit timing offset is within the limits specified in 7.4.1.0.1 and Table 7.4.1.0.1-3 with respect to the first detected path (in time) of the corresponding downlink frame of Cell 1. The test system will wait till evaluation interval of T seconds is met to ensure UE transmit timing is stable at the end of the step, where T=DL_timing_change[Ts]/5.5Ts and DL_timing_change is specified in Table 7.4.1.1.4.2-1.

9. After the UE transmit timing is within the limits specified in step 7, and during 2 seconds, the test system shall monitor all SRS transmissions and verify that, for each received SRS, the UE transmit timing offset stays within $(N_{TA} + N_{TA_offset}) \times T_c \pm T_e$ of the first detected path of DL SSB. For Test 2 the UE transmit timing offset shall be verified for the first transmission in the DRX cycle immediately after DL timing adjustment.

NOTE: The BEAM_SELECT_WAIT_TIME default value is defined in Annex K.1.1 in TS 38.521-2 [3].

7.4.1.1.4.3 Message contents

Message contents are according to TS 38.508-1 [14] clause 7.3 with the following exceptions:

Table 7.4.1.1.4.3-0: Common Exception messages

Default Message Contents	
Common contents of system information blocks exceptions	
Specific message contents exceptions for Test Configuration 7.4.1.1-1	Table 7.3.1-3a in TS 38.508-1 [14] with condition SSB.4 FR2

Table 7.4.1.1.4.3-1: *SRS-Config* for UE transmit timing accuracy for NR SA FR2 UE

Derivation Path: TS 38.508-1 [14], Table 4.6.3-182			
Information Element	**Value/remark**	**Comment**	**Condition**
SRS-Config ::= SEQUENCE {			
srs-ResourceSetToAddModList SEQUENCE (SIZE(0..maxNrofSRS-ResourceSets)) OF SEQUENCE {			
SRS-ResourceSet[1] SEQUENCE {		entry 1	
resourceType CHOICE {			
periodic SEQUENCE {			

}			
}			
}			
}			
srs-ResourceToAddModList SEQUENCE (SIZE(1..maxNrofSRS-Resources)) OF SEQUENCE {			
SRS-Resource[1] SEQUENCE {		entry 1	
freqHopping SEQUENCE {			
c-SRS	17		
}			
groupOrSequenceHopping	Neither		
resourceType CHOICE {			
periodic SEQUENCE {			
periodicityAndOffset-p CHOICE {			
sl1	0		Test 1
sl2560	4		Test 2
}			
}			
}			
}			
}			
}			

Table 7.4.1.1.4.3-2: *DRX-Config* for UE transmit timing accuracy Test 2 for NR SA FR2

Derivation Path: TS 38.508-1 [14], Table 4.6.3-56			
Information Element	**Value/remark**	**Comment**	**Condition**
DRX-Config ::= CHOICE {			
drx-onDurationTimer CHOICE {			
milliSeconds	ms6		
}			
drx-InactivityTimer	ms1		
drx-HARQ-RTT-TimerDL	56		
drx-HARQ-RTT-TimerUL	56		
drx-RetransmissionTimerDL	sl1		
drx-RetransmissionTimerUL	sl1		
drx-LongCycleStartOffset CHOICE {			
ms320	0		
}			
shortDRX		NOT PRESENT	
}			

7.4.1.1.5 Test Requirements

The UE initial transmission timing error shall be less than or equal to $\pm T_e$ where the timing error limit value T_e is specified in Table 7.4.1.1.5-4.

The UE shall meet the Te requirement for an initial transmission provided that at least one SSB is available at the UE during the last 160 ms. The reference point for the UE initial transmit timing control requirement shall be the downlink timing of the reference cell minus $(N_{\mathrm{TA}} + N_{\mathrm{TA\ offset}}) \times T_{\mathrm{c}}$. The downlink timing is defined as the time when the first detected path (in time) of the corresponding downlink frame is received from the reference cell. N_{TA} for PRACH is defined as 0.

$(N_{\mathrm{TA}} + N_{\mathrm{TA\ offset}}) \times T_{\mathrm{c}}$ (in T_c units) for other channels is the difference between UE transmission timing and the downlink timing immediately after when the last timing advance was applied. N_{TA} for other channels is not changed until next timing advance is received. The value of $N_{\mathrm{TA\ offset}}$ depends on the duplex mode of the cell in which the uplink transmission takes place and the frequency range (FR). $N_{\mathrm{TA\ offset}}$ is defined in Table 7.4.1.1.5-5.

Table 7.4.1.1.5-1: Cell Specific Test Parameters for UL Transmit Timing test

Parameter	Unit	Config	Test1	Test2
SSB ARFCN		1	Freq1	Freq1

Duplex Mode		1	TDD	
TDD configuration		1	TDDConf.3.1	
$BW_{channel}$	MHz	1	100: $N_{RB,c}$ = 66	
Data RBs allocated		1	66	
Initial BWP Configuration		1	DLBWP.0.1 ULBWP.0.1	
Dedicated BWP Configuration		1	DLBWP.1.1 ULBWP.1.1	
TRS Configuration		1	TRS.2.1 TDD	
PDSCH/PDCCH TCI state		1	TCI.State.2	
DRx Cycle	ms	1	N/A	DRX.8[Note5]
PDSCH Reference measurement channel		1	SR.3.3 TDD	
RMSI CORESET Reference Channel		1	CR.3.2 TDD	
Dedicated CORESET Reference Channel		1	CCR.3.7 TDD	
OCNG Patterns		1	OP.1	
SSB Configuration		1	SSB.4 FR2	
SMTC Configuration		1	SMTC.1	
PDSCH/PDCCH subcarrier spacing	kHz	1	120	
EPRE ratio of PSS to SSS	dB	1	0	0
EPRE ratio of PBCH DMRS to SSS				
EPRE ratio of PBCH to PBCH DMRS				
EPRE ratio of PDCCH DMRS to SSS				
EPRE ratio of PDCCH to PDCCH DMRS				
EPRE ratio of PDSCH DMRS to SSS				
EPRE ratio of PDSCH to PDSCH				
EPRE ratio of OCNG DMRS to SSS(Note 1)				
EPRE ratio of OCNG to OCNG DMRS (Note 1)				
Propagation condition		1	AWGN	
SRS Config		1	SRSConf.1[Note6]	SRSConf.2[Note6]

Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.
Note 2: Void
Note 3: Void
Note 4: Void
Note 5: DRx related parameters are given in Table A.5-1
Note 6: SRS configs are given in Table A.7.4.1.1.5-2

Table 7.4.1.1.5-2: SRS Configuration for Timing Accuracy Test

	Field	SRSConf.1	SRSConf.2	Comments
SRS-ResourceSet	srs-ResourceSetId	0	0	
	srs-ResourceIdList	0	0	
	resourceType	Periodic	Periodic	
	Usage	Codebook	Codebook	
SRS-Resource	SRS-ResourceId	0	0	
	nrofSRS-Ports	Port1	Port1	
	transmissionComb	n2	n2	
	combOffset-n2	0	0	
	cyclicShift-n2	0	0	
	resourceMapping startPosition	0	0	
	resourceMapping	n1	n1	

	nrofSymbols			
	resourceMapping repetitionFactor	n1	n1	
	freqDomainPosition	0	0	
	freqDomainShift	0	0	
	freqHopping c-SRS	17	17	Matches $N_{RB,c}$
	freqHopping b-SRS	0	0	
	freqHopping b-hop	0	0	
	groupOrSequenceHopping	Neither	Neither	
	resourceType	Periodic	Periodic	
	periodicityAndOffset-p	sl1,0	sl2560,4	Offset to align with DRx periodicity
	sequenceId	0	0	Any 10 bit number

Table 7.4.1.1.5-3: OTA related test parameters

Parameter	Unit	Test 1	Test 2
Angle of arrival configuration		Setup 1 defined in A.9.1	
Assumption for UE beams Note 6		Fine	
N_{oc} Note1	dBm/15kHz Note4	-112	
N_{oc} Note1	dBm/SCS Note3	-100	
$\hat{E}_s / N_{oc}$	dB	4	
SS-RSRP Note2	dBm/SCS Note4	-96	
$\hat{E}_s / I_{ot}$	dB	4	
Io Note2	dBm/95.04 MHz Note4	-68.5	
NOTE 1: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for N_{oc} to be fulfilled.			
NOTE 2: SSB_RP and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.			
NOTE 3: Void			
NOTE 4: Equivalent power received by an antenna with 0dBi gain at the centre of the quiet zone			
NOTE 5: As observed with 0dBi gain antenna at the centre of the quiet zone			
NOTE 6: Information about types of UE beam is given in TS 38.133 [6] section B.2.1.3, and does not limit UE implementation or test system implementation			

Table 7.4.1.1.5-4: T_e Timing Error Limit

Frequency Range	SCS of SSB signals (kHz)	SCS of uplink signals (kHz)	T_e
2	120	60	N/A
		120	N/A
	240	60	N/A
		120	$3.75*64*T_c$
NOTE 1: T_c is the basic timing unit defined in TS 38.211 [6]			

Table 7.4.1.1.5-5: T_q Maximum Autonomous Time Adjustment Step and T_p Minimum Aggregate Adjustment rate

Frequency Range	SCS of uplink signals (KHz)	The Maximum timing change in one adjustment T_q	The Minimum aggregate adjustment rate T_p	The Maximum aggregate adjustment rate T_q
2	120	$3.125*64*T_c$	$-1.225*64*T_c$	$+3.725*64*T_c$
NOTE: T_c is the basic timing unit defined in TS 38.211 [6]				

Table 7.4.1.1.5-6: The Value of $N_{TA\ offset}$

Frequency range and band of cell used for uplink transmission	$N_{TA\ offset}$ (Unit: T_c)
FR2	13792
NOTE 1: The UE identifies $N_{TA\ offset}$ based on the information n-TimingAdvanceOffset as specified in TS 38.331 [2]. If UE is not provided with the information n-TimingAdvanceOffset, the default value of $N_{TA\ offset}$ is set as 25600 for FR1 band. In case of multiple UL carriers in the same TAG, UE expects that the same value of n-TimingAdvanceOffset is provided for all the UL carriers according to clause 4.2 in TS 38.213 [3] and the value 39936 of $N_{TA\ offset}$ can also be provided for a FDD serving cell.	
NOTE 2: Void	

7.4.2 UE timer accuracy

FFS.

7.4.3 Timing advance

7.4.3.0 Minimum conformance requirements

7.4.3.0.1 Minimum conformance requirements for timing advance adjustment accuracy

The timing advance is initiated from gNB with MAC message that implies and adjustment of the timing advance, as defined in clause 5.2 of TS 38.321 [12].

The UE shall adjust the timing of its transmissions with a relative accuracy better than or equal to the UE Timing Advance adjustment accuracy requirement in Table 7.4.3.0.3-1, to the signalled timing advance value compared to the timing of preceding uplink transmission. The timing advance command step is defined in TS38.213 [8].

Table 7.4.3.0.3-1: UE Timing Advance adjustment accuracy

Sub Carrier Spacing, SCS kHz	15	30	60	120
UE Timing Advance adjustment accuracy	±256 T_c	±256 T_c	±128 T_c	±32 T_c

The normative reference for this requirement is TS.38.133 [6] clause A.7.4.3.

7.4.3.1 NR SA FR2 timing advance adjustment accuracy

Editor's Note: This test case has been completed for the following configurations:

- Test frequency f ≤ 40.8 GHz

- UE PC3

- The test is incomplete for UE power classes other than PC3

- The test is incomplete for test frequencies > 40.8 GHz

7.4.3.1.1 Test purpose

The purpose of the test is to verify UE timing advance adjustment delay and accuracy requirement defined in clause 7.3 of TS 38.133 [6].

7.4.3.1.2 Test applicability

This test applies to all types of E-UTRA UE release 15 and forward, supporting SA FR2.

7.4.3.1.3 Minimum conformance requirement

The minimum conformance requirements are specified in clause 7.4.3.0.1.

The normative reference for this requirement is TS.38.133 [6] clause A.7.4.3.1.

7.4.3.1.4 Test description

7.4.3.1.4.1 Initial conditions

Initial conditions are a set of test configurations the UE needs to be tested in and the steps for the SS to take with the UE to reach the correct measurement state.

The initial test configurations consist of environmental conditions, test frequencies, test channel bandwidths and sub-carrier spacing based on NR operating bands specified in Table 5.3.5-1 of 38.521-2 [17].

This test shall be tested using any of the test configurations in Table 7.4.3.1.4.1-1.

Table 7.4.3.1.4.1-1: NR SA FR2 timing advance adjustment accuracy supported test configurations

Config	Description
1	NR 120 kHz SSB SCS, 100 MHz bandwidth, TDD duplex mode

Configure the test equipment and the DUT according to the parameters in Table 7.4.3.1.4.1-2

Table 7.4.3.1.4.1-2: Initial conditions for NR SA FR2 timing advance adjustment accuracy

Parameter	Value		Comment
Test environment	NC		As specified in TS 38.508-1 [14] clause 4.1.
Test frequencies	As specified in Annex E, Table E.5-1 and TS 38.508-1 [14] clause 4.3.1.		
Channel bandwidth	As specified by the test configuration selected from Table 7.4.3.1.4.1-1		
Propagation conditions	AWGN		As specified in clause C.2.2.
Connection Diagram	TE Part	A.3.3.1.1	As specified in TS 38.508-1 [14] Annex A.
	DUT Part	A.3.4.1.1	
Exceptions to connection diagram	N/A		

Table 7.4.3.1.4.1-3: General test parameters for timing advance

Parameter	Unit	Value	Comment
RF channel number		1	
Initial DL BWP		DLBWP.0.1	As specified in Table A.3.9.2.1-1 of TS 38.133 [6]
Dedicated DL BWP		DLBWP.1.1	As specified in Table A.3.9.2.2-1 of TS 38.133 [6]
Initial UL BWP		ULBWP.0.1	As specified in Table A.3.9.3.1-1 of TS 38.133 [6]
Dedicated UL BWP		ULBWP.1.1	As specified in Table A.3.9.3.2-1 of TS 38.133 [6]
Timing Advance Command (T_A) value during T1		31	$N_{TA_new} = N_{TA_old}$ for the purpose of establishing a reference value from which the timing advance adjustment accuracy can be measured during T2
Timing Advance Command (T_A) value during T2		39	For 120 kHz SCS $N_{TA_new} = N_{TA_old} + 1024*T_c$ (based on equation in clause 4.2 of TS 38.213 [3])
T1	s	5	
T2	s	5	

1. Message contents are defined in clause 7.4.3.1.4.3.

2. For this test a single NR FR2 PCell (Cell 1) is used. The connection setup is performed according to the settings and power levels defined in annex C.

3. The UE Rx beam peak direction has been obtained previously using one of the Rx Beam Peak Search procedures as described in Annex I.

7.4.3.1.4.2 Test Procedure

The test consists of a single NR FR2 cell, Cell 1, which is the PCell in the primary Timing Advance Group (pTAG). The test consists of two successive time periods, with time durations of T1 and T2 respectively. In each time period, timing advance commands for pTAG are sent to the UE and Sounding Reference Signals (SRS), as specified in Table 7.4.3.1.5-1 and Table 7.4.3.1.5-2, are sent from the UE and received by the test equipment. By measuring the reception of the SRS, the transmit timing, and hence the timing advance adjustment accuracy, can be measured for PCell in pTAG. The UE Time Alignment Timer (timeAlignmentTimer IE), described in Clause 5.2 in TS 38.321, shall be configured so that it does not expire in the duration of the test.

Unless otherwise stated, the downlink signal and noise are aligned to arrive in the UE Rx beam peak direction.

1. Ensure the UE is in state RRC_CONNECTED with generic procedure parameters *Connectivity* NR, Connected without release *On* and Test Mode *On* according to TS 38.508-1 [14] clause 4.5. Message contents are defined in clause 7.4.3.1.4.3.

2. Set the parameters according to values in Tables 7.4.3.1.4.1-3 and Table 7.4.3.1.5-1 as appropriate. Propagation conditions are set according to clause C.2.2.

3. SS shall transmit an RRCConnectionReconfiguration message.

4. The UE shall transmit RRCConnectionReconfigurationComplete message.

5. During time period T1, the test equipment shall send one message with a Timing Advance Command MAC Control Element for pTAG, as specified in Clause 6.1.3.4 in TS 38.321. The Timing Advance Command value shall be set to 31, which according to Clause 4.2 in TS 38.213 results in zero adjustment of the Timing Advance. In this way, a reference value for the timing advance for pTAG used by the UE is established.

6. During time period T2, the test equipment shall send a sequence of messages with Timing Advance Command MAC Control Elements for pTAG, with Timing Advance Command value of 39 as specified in table 7.4.3.1.4.1-3.

7. This value shall result in changes of the timing advance for pTAG used by the UE, and the accuracy of the change shall then be measured, using the SRS sent from the UE.

8. As specified in Clause 7.3.2.1 of TS 38.133 [6], the UE adjusts its uplink timing at slot n+k+1 for a timing advance command received in slot n. This delay shall be considered when measuring the timing advance adjustment accuracy, via the SRS sent from the UE.

9. The UE Time Alignment Timer, described in Clause 5.2 in TS 38.321, shall be configured so that it does not expire in the duration of the test.

10. The result from the SRS and adjustment of the timing advance in step 7) is used to measure that the UE adjusts the timing of its transmission with a relative accuracy better than or equal to value specified in Table 7.4.3.0.3-1 to the signalled timing advance value compared to the timing of preceding uplink transmission.

11. If the UE adjusts the timing of its transmission within a relative accuracy greater than or equal to value specified in Table 7.4.3.0.3-1 to the signalled timing advance value compared to the timing of preceding uplink transmission then the number of successful tests is increased by one. Otherwise, the number of failure tests is increased by one.

12. The SS shall transmit RRCRelease message to release the RRC connection which includes the release of the established radio bearers as well as all radio resources.

13. After the RRC connection release, the SS transmits a Paging message (including PagingRecord with ue-Identity) for the UE and ensures the UE is in State RRC_CONNECTED according to TS 38.508-1 [14] clause 4.5 or if the paging fails, switch off and on the UE and ensure the UE is in RRC_CONNECTED according to TS 38.508-1 [14] clause 4.5. Message contents are set as defined in clause 7.4.3.1.4.3.

14. Repeat steps 2-13 until the confidence level according to Tables G.2.3-1 in Annex G clause G.2 is achieved.

7.4.3.1.4.3 Message Contents

Message contents are according to TS 38.508-1 [14] clause 7.3, with the following exceptions:

Table 7.4.3.1.4.3-0: Common Exception messages

Default Message Contents	
Common contents of system information blocks exceptions	
Specific message contents exceptions for Test Configuration 7.4.1.1-1	Table 7.3.1-3a in TS 38.508-1 [14] with condition SSB.3 FR2

Table 7.4.3.1.4.3-1: SRS-Config for NR SA FR2 timing advance adjustment accuracy

Derivation Path: TS 38.508-1 [14], Table 4.6.3-182			
Information Element	**Value/remark**	**Comment**	**Condition**
SRS-Config ::= SEQUENCE {			
srs-ResourceSetToAddModList SEQUENCE (SIZE(0..maxNrofSRS-ResourceSets)) OF SEQUENCE {	1 entry		
SRS-ResourceSet[1] SEQUENCE {		entry 1	
resourceType CHOICE {			
periodic SEQUENCE {			
}			
}			
}			
srs-ResourceToAddModList SEQUENCE (SIZE(1..maxNrofSRS-Resources)) OF SEQUENCE {	1 entry		
SRS-Resource[1] SEQUENCE {		entry 1	
freqHopping SEQUENCE {			
c-SRS	16		
}			
groupOrSequenceHopping	Neither		
resourceType CHOICE {			
periodic SEQUENCE {	Periodic		
periodicityAndOffset-p CHOICE {			
sl5	4		
}			
}			
}			
}			
}			
}			

7.4.3.1.5 Test Requirement

The UE shall apply the signalled Timing Advance value for PCell in pTAG to the transmission timing at the designated activation time i.e. *k+1* slots after the reception of the timing advance command, where *k* = 11.

The Timing Advance adjustment accuracy for PCell in pTAG shall be within the limits specified in Table 7.4.3.1.5-3.

The rate of correct Timing Advance adjustments observed during repeated tests shall be at least 90% with a confidence level of 95%.

Table 7.4.3.1.5-1, Table 7.4.3.1.5-1a and Table 7.4.3.1.5-2 define the primary level settings.

Table 7.4.3.1.5-1: Cell specific test parameters for timing advance

Parameter	Unit	Test1	
		T1	T2
Duplex mode		TDD	
TDD configuration		TDDConf.3.1	
$BW_{channel}$	MHz	100: $N_{RB,c}$ = 66	
BWP BW	MHz	100: $N_{RB,c}$ = 66	
DRx Cycle	ms	Not Applicable	

PDSCH Reference measurement channel		SR.3.1 TDD
CORESET Reference Channel		CR.3.1 TDD
OCNG Patterns		OCNG pattern 1
TRS configuration		TRS.2.1 TDD
PDSCH/PDCCH TCI state		TCI.State.2
SMTC configuration		SMTC.1 FR2
SSB Configuration		SSB.3 FR2
PDSCH/PDCCH subcarrier spacing	kHz	120 kHz
PUCCH/PUSCH subcarrier spacing	kHz	120 kHz
EPRE ratio of PSS to SSS	dB	0
EPRE ratio of PBCH DMRS to SSS		
EPRE ratio of PBCH to PBCH DMRS		
EPRE ratio of PDCCH DMRS to SSS		
EPRE ratio of PDCCH to PDCCH DMRS		
EPRE ratio of PDSCH DMRS to SSS		
EPRE ratio of PDSCH to PDSCH		
EPRE ratio of OCNG DMRS to SSS(Note 1)		
EPRE ratio of OCNG to OCNG DMRS (Note 1)		
Propagation condition	-	AWGN

Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.
Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for N_{oc} to be fulfilled.
Note 3: Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.
Note 4: Equivalent power received by an antenna with 0 dBi gain at the centre of the quiet zone
Note 5: As observed with 0 dBi gain antenna at the centre of the quiet zone

Table 7.4.3.1.5-1a: OTA specific test parameters for timing advance

Parameter	Unit	Test 1	
		T1	T2
Angle of arrival configuration		Setup 1 as defined in A.9	
Assumption for UE beams[Note 6]		Fine	
N_{oc} [Note1]	dBm/15kHz[Note4]	-112	
N_{oc} [Note1]	dBm/SCS[Note3]	-103	
$\hat{E}_s / N_{oc}$	dB	4	
SS-RSRP[Note2]	dBm/SCS [Note4]	-99	
$\hat{E}_s / I_{ot}$	dB	4	
Io[Note2]	dBm/95.04 MHz [Note4]	-68.5	

NOTE 1: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for N_{oc} to be fulfilled.
NOTE 2: SS-RSRP and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.
NOTE 3: SS-RSRP minimum requirements are specified assuming independent interference and noise at each receiver antenna port.
NOTE 4: Equivalent power received by an antenna with 0dBi gain at the centre of the quiet zone
NOTE 5: As observed with 0dBi gain antenna at the centre of the quiet zone
NOTE 6: Information about types of UE beam is given in B.2.1.3 of TS 38.133 [6], and does not limit UE implementation or test system implementation

Table 7.4.3.1.5-2: Sounding Reference Symbol Configuration for timing advance

Field	Value	Comment
c-SRS	16	Frequency hopping is disabled

b-SRS	0	
b-hop	0	
freqDomainPosition	0	Frequency domain position of SRS
freqDomainShift	0	
groupOrSequenceHopping	neither	No group or sequence hopping
SRS-PeriodicityAndOffset	sl5=4	Once every 5 slots
pathlossReferenceRS	ssb-Index=0	SSB #0 is used for SRS path loss estimation
usage	Codebook	Codebook based UL transmission
startPosition	0	resourceMapping setting. SRS on last symbol of slot, and 1symbols for SRS without repetition.
nrofSymbols	n1	
repetitionFactor	n1	
combOffset-n2	0	transmissionComb setting
cyclicShift-n2	0	
nrofSRS-Ports	port1	Number of antenna ports used for SRS transmission
NOTE: For further information see clause 6.3.2 in TS 38.331 [13].		

Table 7.4.3.1.5-3: UE Timing Advance adjustment accuracy

UL Sub Carrier Spacing(kHz)	**60**	**120**
UE Timing Advance adjustment accuracy	±128 T_c	±72 T_c

For the test to pass, the total number of successful tests shall be more than 90% of the cases with a confidence level of 95%.

7.5 Signalling characteristics

7.5.1 Radio link monitoring

7.5.1.0 Minimum conformance requirements

7.5.1.0.1

7.5.1.0.2

7.5.1.0.3

7.5.1.0.4

7.5.1.0.5 Minimum conformance requirements for UE scheduling restrictions during radio link monitoring

[TS 38.133, clause 8.1.7.3]

The following scheduling restriction applies due to radio link monitoring on an FR2 serving PCell and/or PSCell.

- If the RLM-RS is CSI-RS which is type-D QCLed with active TCI state for PDCCH or PDSCH, and the CSI-RS is not in a CSI-RS resource set with repetition ON,
  - There are no scheduling restrictions due to radio link monitoring based on the CSI-RS.
- Otherwise
  - The UE is not expected to transmit PUCCH, PUSCH or SRS or receive PDCCH, PDSCH or CSI-RS for tracking or CSI-RS for CQI on RLM-RS symbols to be measured for radio link monitoring.

For FR2, if following conditions are met,

- UE has been notified about system information update through paging,

- The gap between UE's reception of PDCCH that UE monitors in the Type2-PDCCH CSS set and that notifies system information update, and the PDCCH that UE monitors in the Type0-PDCCH CSS set, is greater than 2 slots,

For the SSB for RLM and CORESET for RMSI scheduling multiplexing patterns 3, UE is expected to receive the PDCCH that UE monitors in the Type0-PDCCH CSS set, and the corresponding PDSCH, on SSB symbols to be measured for RLM; and

For the SSB for RLM and CORESET for RMSI scheduling multiplexing patterns 2, UE is expected to receive PDSCH that corresponds to the PDCCH that UE monitors in the Type0-PDCCH CSS set, on SSB symbols to be measured for RLM.

7.5.1.1 Radio Link Monitoring Out-of-sync Test for FR2 PCell configured with SSB-based RLM RS in non-DRX mode

Editor's Note: This test case has been completed for the following configurations:

- Test frequency f ≤ 40.8 GHz

- UE PC3

- Normal conditions

- The test is incomplete for UE power classes other than PC3

- The test is incomplete for test frequencies > 40.8 GHz

- The test is incomplete for extreme conditions

7.5.1.1.1 Test purpose

The purpose of this test is to verify that the UE properly detects the out of sync and in sync for the purpose of monitoring downlink radio link quality of the PCell. This test will partly verify the FR2 radio link monitoring requirements in TS 38.133 [6] clause 8.1.

7.5.1.1.2 Test applicability

This test applies to all types of NR UE from Release 15 onwards supporting 5GS NR SA FR2.

7.5.1.1.3 Minimum conformance requirement

The minimum conformance requirements are specified in clause 7.5.1.0.1.

The normative reference for this requirement is TS 38.133 [6] clause A.7.5.1.1.

7.5.1.1.4 Test description

In the test, UE is configured to perform RLM on SSB, with detectionResource included in RadioLinkMonitoringRS set to SSB#0 and SSB#1, and purpose set to 'rlf'. Supported test configurations are shown in table 7.5.1.1.4.1-1. The test parameters are given in Tables 7.5.1.1.4.1-3, 7.5.1.1.5-1, and 7.5.1.1.5-2 below. There is one cell (Cell 1), which is the active NR cell, in the test.

The test consists of three successive time periods, with time duration of T1, T2 and T3 respectively. Figure 7.5.1.1.4-1 shows the variation of the downlink SNR in the active cell to emulate out-of-sync and in-sync states, and Figure 7.5.1.1.4-2 shows the Time multiplexed downlink transmissions from each Angle of Arrival. Prior to the start of the time duration T1, the UE shall be fully synchronized to Cell 1. The UE shall be configured for periodic CSI reporting with a reporting periodicity of 5 ms. In addition to RLM-RS radio link monitoring using SSB index 0 and SSB index 1, the UE is configured to perform inter-frequency measurements using Gap Pattern ID #0 (40ms) in test 1.

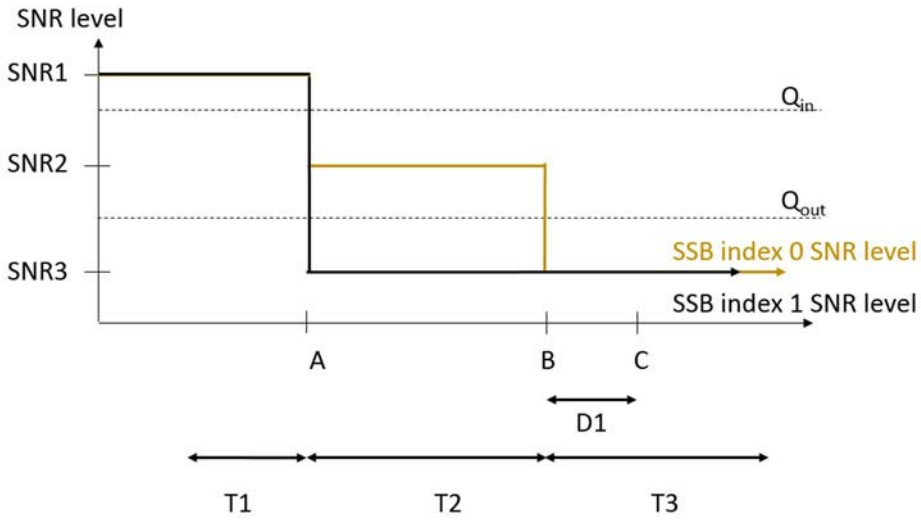


Figure 7.5.1.1.4-1: SNR variation for out-of-sync testing

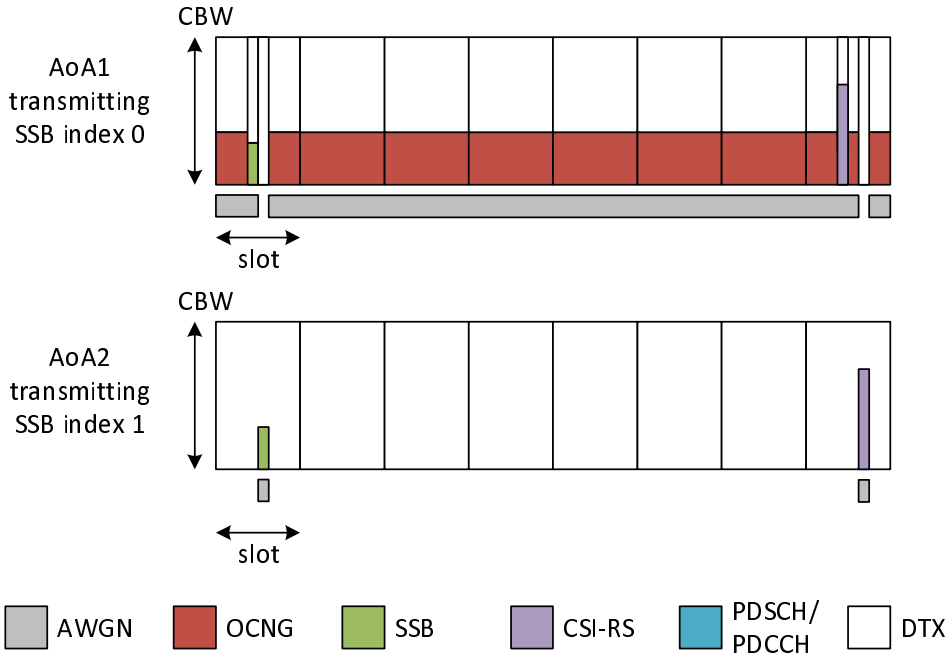


Figure 7.5.1.1.4-2: Time multiplexed downlink transmissions

7.5.1.1.4.1 Initial conditions

Initial conditions are a set of test configurations the UE needs to be tested in and the steps for the SS to take with the UE to reach the correct measurement state.

The initial test configurations consist of environmental conditions, test frequencies, test channel bandwidths and sub-carrier spacing based on NR operating bands specified in Table 5.3.5-1 of 38.521-2 [18].

This test shall be tested using any of the test configurations in Table 7.5.1.1.4.1-1.

Table 7.5.1.1.4.1-1: Radio Link Monitoring Out-of-sync Test for FR2 PCell configured with SSB-based RLM RS in non-DRX mode supported test configurations for FR2 PCell

Configuration	Description

7.5.1.1-1	TDD, SSB SCS 120 KHz, data SCS 120KHz, BW 100 MHz

Configure the test equipment and the DUT according to the parameters in Table 7.5.1.1.4.1-2

Table 7.5.1.1.4.1-2: Initial conditions for Radio Link Monitoring Out-of-sync Test for FR2 PCell configured with SSB-based RLM RS in non-DRX mode

Parameter	Value		Comment
Test environment	NC		As specified in TS 38.508-1 [14] clause 4.1.
Test frequencies	As specified in Annex E.1.2, Table E.4-1 and TS 38.508-1 [14] clause 4.3.1.		
Channel bandwidth	As specified by the test configuration selected from Table 7.5.1.1.4.1-1		
Propagation conditions	AWGN		As specified in Annex C.2.2.
Connection Diagram	TE Part	A.3.3.3.1	As specified in TS 38.508-1 [14] Annex A.
	DUT Part	A.3.3.4.1	
Exceptions to connection diagram	N/A		

1. The test parameters for PCell are given in Table 7.5.1.1.4.1-3

2. Message contents are defined in clause 7.5.1.1.4.3.

3. There is one carrier and one cell specified in the test. Cell 1 is the cell used for connection setup with the power level set according to Annex C.1.1 and C.1.2 for this test.

Table 7.5.1.1.4.1-3: General test parameters for FR2 out-of-sync testing in non-DRX mode

Parameter			Unit	Value
				Test 1
Active PCell				Cell 1
RF Channel Number				1
Duplex mode		Config 1		TDD
$BW_{channel}$		Config 1		100: $N_{RB,c}$ = 66
Data RBs allocated		Config 1		24
DL initial BWP configuration		Config 1		DLBWP.0.1
DL dedicated BWP configuration		Config 1		DLBWP.1.1
UL initial BWP configuration		Config 1		ULBWP.0.1
UL dedicated BWP configuration		Config 1		ULBWP.1.1
TDD Configuration		Config 1		TDDConf.3.1
RMSI CORESET Reference Channel		Config 1		CR.3.1 TDD
Dedicated CORESET Reference Channel		Config 1		CCR.3.4 TDD
SSB Configuration		Config 1		SSB.1 FR2
SMTC Configuration		Config 1		SMTC.1
PDSCH/PDCCH subcarrier spacing		Config 1		120 KHz
PRACH Configuration		Config 1		PRACH.1 FR2
SSB index assigned as RLM RS		Config 1		0,1
OCNG parameters				OP.5
CP length				Normal
Out of sync transmission parameters	DCI format			1-0
	Number of Control OFDM symbols			2
	Aggregation level		CCE	8
	Ratio of hypothetical PDCCH RE energy to average SSS RE energy		dB	4
	Ratio of hypothetical PDCCH DMRS energy to average SSS RE energy		dB	4
	DMRS precoder granularity			REG bundle size
	REG bundle size			6
DRX				*OFF*

Gap pattern ID			*gp0*
Layer 3 filtering			*Enabled*
T310 timer		ms	*0*
T311 timer		ms	1000
N310			1
N311			1
CSI-RS for CSI reporting	Config 1		CSI-RS.3.1 TDD
reportConfigType			periodic
reportQuantity			cri-RI-PMI-CQI
CSI reporting periodicity		slot	40
CSI reporting offset		slot	4
TCI states for PDCCH/PDSCH			TCI.State.2
CSI-RS for tracking	Config 1		TRS.2.1 TDD
T1		s	0.2
T2		s	9.68
T3		s	9.68
D1		s	9.64
Note 1: All configurations are assigned to the UE prior to the start of time period T1. Note 2: UE-specific PDCCH is not transmitted after T1 starts.			

7.5.1.1.4.2 Test Procedure

There is one cell (Cell 1), which is the active NR cell, in the test. Prior to the start of the time duration T1, the UE shall be fully synchronized to Cell 1 (PCell). The UE shall be configured for periodic CQI reporting in PUCCH [format 2] with a reporting periodicity as mentioned in the above table 7.5.1.1.4.1-3.

1. Ensure the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity NR, Connected without release On according to TS 38.508-1 [14] clause 4.5.

2. Set the parameters according to T1 in Table 7.5.1.1.5-1. Propagation conditions are set according to Annex C.2.2. T1 starts.

3. When T1 expires the SS shall change the SNR value to T2 as specified in Table 7.5.1.1.5-1. T2 starts.

4. When T2 expires the SS shall change the SNR value to T3 as specified in Table 7.5.1.1.5-1. T3 starts.

5. If the SS:

   a) detects uplink power in each subframe configured for CQI transmission (according to configured CQI periodicity on PUCCH [format 2]) during the period from time point A to time point B

   and

   b) does not detect any uplink power from time point C ([240] ms after the start of T3) until T3 expires,

   the number of successful tests is increased by one.

6. Otherwise the number of failed tests is increased by one and proceed to Step 10.

7. When T3 expires the SS shall change the SNR value to T1 as specified in Table 7.5.1.1.5-1.

8. If the UE has not re-established the connection in at least 1s, the SS shall transmit [FFS] according to [FFS] to add NR cell (PCell). The UE shall transmit RRCConnectionReconfigurationComplete message.

9. If the Reconfiguration fails, switch off and on the UE and ensure the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity NR, Connected without release On according to TS 38.508-1 [14] clause 4.5.

10. Repeat steps 2-9 until the confidence level according to Tables G.2.3-1 in Annex G clause G.2 is achieved.

7.5.1.1.4.3 Message Contents

Message contents are according to TS 38.508-1 [14] clause 7.3 with the following exceptions:

Table 7.5.1.1.4.3-1: Common Exception messages for Radio Link Monitoring Out-of-sync Test for FR2 PCell configured with SSB-based RLM RS in non-DRX mode

Default Message Contents	
Common contents of system information blocks exceptions	
Default RRC messages and information elements contents exceptions	Table H.3.1-1 Table H.3.1-2 with Condition INTER-FREQ, L3 FILTERING NEEDED Table H.3.1-3 with Condition INTER-FREQ MO (where ssbFrequency is set to the ARFCN value of carrier centre of Adjacent range) Table H.3.1-4 with A3-offset = 0 Table H.3.1-6 with Condition RLM Table H.3.1-7 Table H.3.5-4 Table H.3.5-9 with Condition SSB RLM Table 7.3.1-3 in TS 38.508-1 [14] with condition SMTC.1

Table 7.5.1.1.4.3-1: Void

Table 7.5.1.1.4.3-2: UE-TimersAndConstants

Derivation Path: TS 38.508-1 [14], Table 4.6.3-200			
Information Element	**Value/remark**	**Comment**	**Condition**
UE-TimersAndConstants ::= SEQUENCE {			
t310	ms0		
n310	n1		
t311	ms1000		
n311	n1		
}			

Table 7.5.1.1.4.3-3: Void

7.5.1.1.5 Test Requirement

Table 7.5.1.1.4.1-3 and 7.5.1.1.5-1 define the primary level settings including test tolerances for Radio Link Monitoring Out-of-sync Test for FR2 PCell configured with SSB-based RLM RS in non-DRX mode.

The UE behaviour in each test during time durations T1, T2 and T3 shall be as follows:

During the period from time point A to time point B the UE shall transmit uplink signal at least in all uplink slots configured for CSI transmission according to the configured periodic CSI reporting.

The UE shall stop transmitting uplink signal no later than time point C (D1 second after the start of the time duration T3).

The rate of correct events observed during repeated tests shall be at least 90%.

Table 7.5.1.1.5-1: OTA related cell specific test parameters for FR2 (Cell 1) for out-of-sync radio link monitoring tests in non-DRX mode

Parameter	Unit	Test 1					
		T1	T2	T3	T1	T2	T3
AoA setup		Setup 3 defined in A.9.3					
		AoA1			AoA2		
Assumption for UE beams Note 5		Rough			Rough		
EPRE ratio of PDCCH DMRS to SSS	dB	4			Not sent		
EPRE ratio of PDCCH to PDCCH DMRS	dB	0					
EPRE ratio of PBCH DMRS to SSS	dB						
EPRE ratio of PBCH to PBCH DMRS	dB						
EPRE ratio of PSS to SSS	dB						
EPRE ratio of PDSCH DMRS to SSS	dB						

EPRE ratio of PDSCH to PDSCH DMRS		dB						
EPRE ratio of OCNG DMRS to SSS		dB						
EPRE ratio of OCNG to OCNG DMRS		dB						
ssb-Index 0 SNR	Config 1	dB	4.1 Note 6	-3.9 Note 6	-15			
ssb-Index 1 SNR	Config 1		Not sent			4.1 Note 6	-15	-15
N_{oc}	Config 1	dBm/ 15kHz	-94.8			-94.8		
Time multiplexing of the downlink transmissions from each AoA			Defined in Figure 7.5.1.1.4-2					
Propagation condition			TDL-A 30ns 75Hz			TDL-A 30ns 75Hz		

Note 1: OCNG shall be used such a constant total transmitted power spectral density is achieved for all OFDM symbols.
Note 2: The signal contains PDCCH for UEs other than the device under test as part of OCNG.
Note 3: SNR levels correspond to the signal to noise ratio over the SSS REs.
Note 4: The SNR values are specified for testing a UE which supports 2RX on at least one band. For testing of a UE which supports 4RX on all bands, the SNR during T3 is 38.133 [6] A.3.6.
Note 5: Information about types of UE beam is given in B.2.1.3 and does not limit UE implementation or test system implementation.
Note 6: This value allows up to 1dB degradation from applied SNR to UE baseband

Table 7.5.1.1.5-2: Measurement gap configuration for out-of-sync tests in non-DRX mode

Field	Test 1
	Value
gapOffset	0

7.5.1.2 Radio Link Monitoring In-sync Test for FR2 PCell configured with SSB-based RLM RS in non-DRX mode

Editor's Note: This test case has been completed for the following configurations:

- Test frequency f ≤ 40.8 GHz
- UE PC3
- Normal conditions

- The test is incomplete for UE power classes other than PC3
- The test is incomplete for test frequencies > 40.8 GHz
- The test is incomplete for extreme conditions

7.5.1.2.1 Test purpose

The purpose of this test is to verify that the UE properly detects the out of sync and in sync for the purpose of monitoring downlink radio link quality of the PCell. This test will partly verify the FR2 radio link monitoring requirements in TS 38.133 [6] clause 8.1.

7.5.1.2.2 Test applicability

This test applies to all types of NR UE from Release 15 onwards supporting 5GS NR SA FR2.

7.5.1.2.3 Minimum conformance requirement

The minimum conformance requirements are specified in clause 7.5.1.0.1.

The normative reference for this requirement is TS 38.133 [6] clause A.7.5.1.2.

7.5.1.2.4 Test description

In the test, UE is configured to perform RLM on SSB, with detectionResource included in RadioLinkMonitoringRS set to SSB#0 and SSB#1, and purpose set to ‘rlf’. Supported test configurations are shown in table 7.5.1.2.4-1. The test

parameters are given in Tables 7.5.1.2.4.1-3 and 7.5.1.2.5-1 below. There is one cell (Cell 1), which is the active cell, in the test.

The test consists of five successive time periods, with time duration of T1, T2, T3, T4 and T5 respectively. Figure 7.5.1.2.4-1 shows the variation of the downlink SNR in the active cell to emulate out-of-sync and in-sync states, and Figure 7.5.1.2.4-2 shows the Time multiplexed downlink transmissions from each Angle of Arrival. Prior to the start of the time duration T1, the UE shall be fully synchronized to Cell 1. Prior to the start of the time duration T1, the UE shall be fully synchronized to Cell 1. The UE shall be configured for periodic CSI reporting with a reporting periodicity of 5 ms.

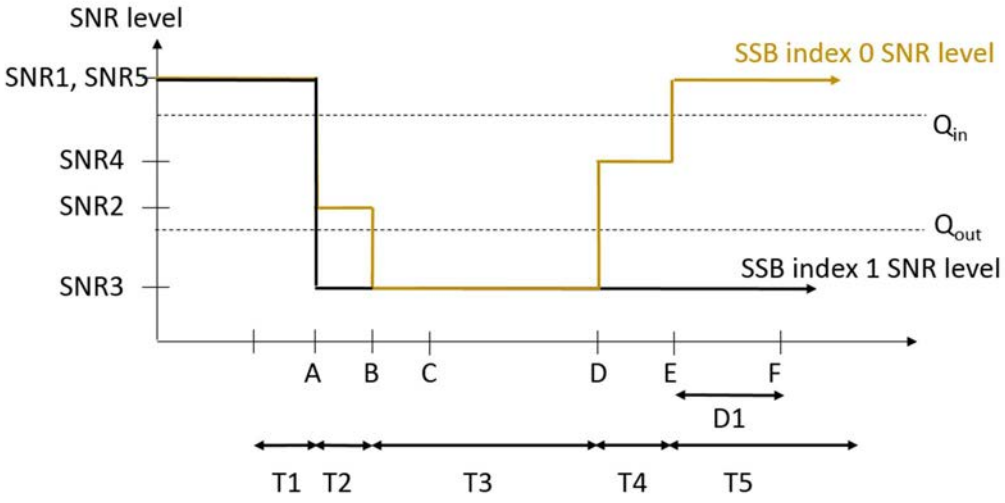


Figure 7.5.1.2.4-1: SNR variation for in-sync testing

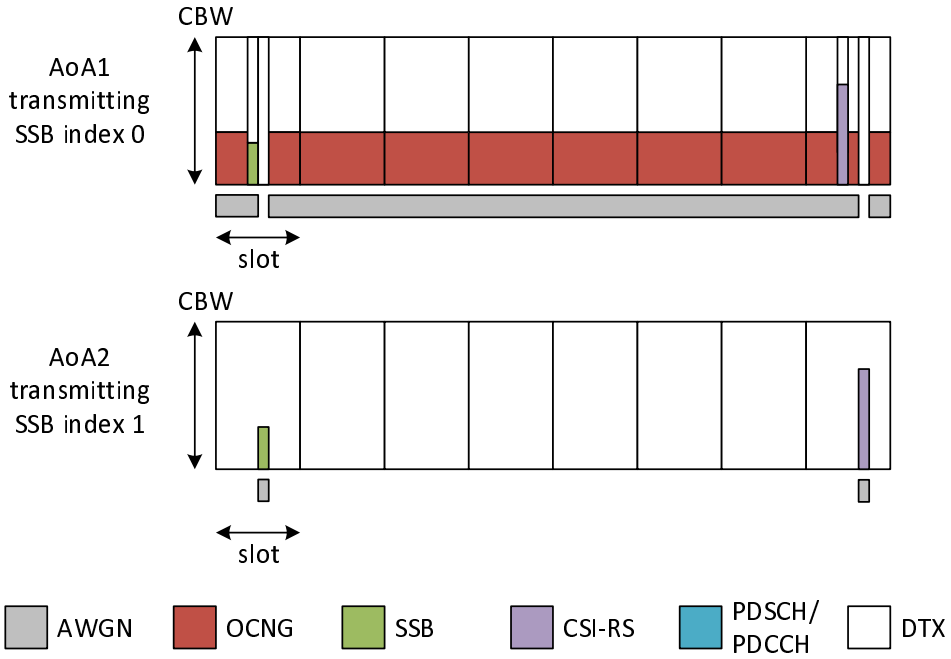


Figure 7.5.1.2.4-2: Time multiplexed downlink transmissions

7.5.1.2.4.1 Initial conditions

Initial conditions are a set of test configurations the UE needs to be tested in and the steps for the SS to take with the UE to reach the correct measurement state.

The initial test configurations consist of environmental conditions, test frequencies, test channel bandwidths and sub-carrier spacing based on NR operating bands specified in Table 5.3.5-1 of 38.521-2 [18].

This test shall be tested using any of the test configurations in Table 7.5.1.2.4.1-1.

Table 7.5.1.2.1-1: Radio Link Monitoring In-sync Test for FR2 PCell configured with SSB-based RLM RS in non-DRX mode supported test configurations for FR2 PCell

Configuration	Description
7.5.1.2-1	TDD, SSB SCS 120 KHz, data SCS 120KHz, BW 100 MHz

Configure the test equipment and the DUT according to the parameters in Table 7.5.1.2.4.1-2

Table 7.5.1.2.4.1-2: Initial conditions for Radio Link Monitoring In-sync Test for FR2 PCell configured with SSB-based RLM RS in non-DRX mode

Parameter	Value		Comment
Test environment	NC		As specified in TS 38.508-1 [14] clause 4.1.
Test frequencies	As specified in Annex E.1.2, Table E.4-1 and TS 38.508-1 [14] clause 4.3.1.		
Channel bandwidth	As specified by the test configuration selected from Table 7.5.1.2.4.1-1		
Propagation conditions	AWGN		As specified in Annex C.2.2.
Connection Diagram	TE Part	A.3.3.3.1	As specified in TS 38.508-1 [14] Annex A.
	DUT Part	A.3.3.4.1	
Exceptions to connection diagram	N/A		

1. The test parameters for PCell are given in Table 7.5.1.2.4.1-3

2. Message contents are defined in clause 7.5.1.2.4.3.

3. There is one carrier and one cell specified in the test. Cell 1 is the cell used for connection setup with the power level set according to Annex C.1.1 and C.1.2 for this test.

Table 7.5.1.2.4.1-3: General test parameters for FR2 in-sync testing in non-DRX mode

Parameter		Unit	Value
			Test 1
Active PCell			Cell 1
RF Channel Number			1
Duplex mode	Config 1		TDD
$BW_{channel}$	Config 1		100: $N_{RB,c}$ = 66
Data RBs allocated	Config 1		24
DL initial BWP configuration	Config 1		DLBWP.0.1
DL dedicated BWP configuration	Config 1		DLBWP.1.1
UL initial BWP configuration	Config 1		ULBWP.0.1
UL dedicated BWP configuration	Config 1		ULBWP.1.1
TDD Configuration	Config 1		TDDConf.3.1
RMSI CORESET Reference Channel	Config 1		CR.3.1 TDD
Dedicated CORESET Reference Channel	Config 1		CCR.3.1 TDD
SSB Configuration	Config 1		SSB.1 FR2
SMTC Configuration	Config 1		SMTC.3

PDSCH/PDCCH subcarrier spacing		Config 1		120 KHz
PRACH Configuration		Config 1		PRACH.1 FR2
SSB index assigned as RLM RS		Config 1		0,1
OCNG parameters				OP.5
CP length				Normal
In sync transmission parameters	DCI format			1-0
	Number of Control OFDM symbols			2
	Aggregation level		CCE	4
	Ratio of hypothetical PDCCH RE energy to average SSS RE energy		dB	0
	Ratio of hypothetical PDCCH DMRS energy to average SSS RE energy		dB	0
	DMRS precoder granularity			REG bundle size
	REG bundle size			6
Out of sync transmission parameters	DCI format			1-0
	Number of Control OFDM symbols			2
	Aggregation level		CCE	8
	Ratio of hypothetical PDCCH RE energy to average SSS RE energy		dB	4
	Ratio of hypothetical PDCCH DMRS energy to average SSS RE energy		dB	4
	DMRS precoder granularity			REG bundle size
	REG bundle size			6
DRX				*OFF*
Gap pattern ID				N.A.
Layer 3 filtering				*Enabled*
T310 timer			ms	4000
T311 timer			ms	1000
N310				1
N311				1
CSI-RS for CSI reporting		Config 1		CSI-RS.3.1 TDD
reportConfigType				periodic
reportQuantity				cri-RI-PMI-CQI
CSI reporting periodicity			slot	40
CSI reporting offset			slot	4
TCI states for PDCCH/PDSCH				TCI.State.2
CSI-RS for tracking		Config 1		TRS.2.1 TDD
T1			s	0.2
T2			s	0.2
T3			s	1.88
T4			s	0.2
T5			s	3.84
D1			s	3.8
Note 1: All configurations are assigned to the UE prior to the start of time period T1. Note 2: UE-specific PDCCH is not transmitted after T1 starts.				

7.5.1.2.4.2 Test Procedure

Editor's Note: Test procedure updates to ensure accurate FR2 test measurement state is TBD

There is one cell (Cell 1), which is the active NR cell, in the test. Prior to the start of the time duration T1, the UE shall be fully synchronized to Cell 1 (PCell). The UE shall be configured for periodic CQI reporting in PUCCH [format 2] with a reporting periodicity as mentioned in the above table 7.5.1.2.4.1-3.

1. Ensure the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity NR, Connected without release On according to TS 38.508-1 [14] clause 4.5.

2. Set the parameters according to T1 in Table 7.5.1.2.5-1. Propagation conditions are set according to Annex C.2.2. T1 starts.

3. When T1 expires the SS shall change the SNR value to T2 as specified in Table 7.5.1.2.5-1. T2 starts.

4. When T2 expires the SS shall change the SNR value to T3 as specified in Table 7.5.1.2.5-1. T3 starts.

5. When T3 expires, the SS shall change the SNR value to T4 as specified in Table 7.5.1.2.5-1. T4 starts.

6. When T4 expires, the SS shall change the SNR value to T5 as specified in Table 7.5.1.2.5-1. T5 starts.

7. If the SS detects uplink power in the On-duration part of every DRX cycle in the subframe according the configured CQI reporting mode (PUCCH 2-0) during the period from time point A to time point F ([1120] ms after the start of time duration T5) the number of successful tests is increased by one.

   Otherwise the number of failed tests is increased by one.

8. Repeat steps 2-7 for all subtests until the confidence level according to Tables G.2.3-1 in Annex G clause G.2 is achieved.

7.5.1.2.4.3 Message Contents

Message contents are according to TS 38.508-1 [14] clause 7.3 with the following exceptions:

Table 7.5.1.2.4.3-1: Common Exception messages for Radio Link Monitoring In-sync Test for FR2 PCell configured with SSB-based RLM RS in non-DRX mode

Default Message Contents	
Common contents of system information blocks exceptions	
Default RRC messages and information elements contents exceptions	Table H.3.1-1 Table H.3.1-2 with Condition INTER-FREQ, L3 FILTERING NEEDED Table H.3.1-3 with Condition INTER-FREQ MO (where ssbFrequency is set to the ARFCN value of carrier centre of Adjacent range) Table H.3.1-4 with A3-offset = 0 Table H.3.1-6 with Condition RLM Table H.3.1-7 Table H.3.5-4 Table H.3.5-9 with Condition SSB RLM Table 7.3.1-3 in TS 38.508-1 [14] with condition SMTC.3

Table 7.5.1.2.4.3-2: Void

Table 7.5.1.2.4.3-3: *RLF-TimersAndConstant*

Derivation Path: TS 38.508-1 [14], Table 4.6.3-150			
Information Element	**Value/remark**	**Comment**	**Condition**
RLF-TimersAndConstants ::= SEQUENCE {			
t310	ms4000		
n310	n1		
n311	n1		
t311-v1530	ms1000		
}			

Table 7.5.1.2.4.3-4: Void

7.5.1.2.5 Test Requirement

Table 7.5.1.2.4.1-3 and 7.5.1.2.5-1 define the primary level settings including test tolerances for Radio Link Monitoring In-sync Test for FR2 PCell configured with SSB-based RLM RS in non-DRX mode.

The UE behaviour in each test during time durations T1, T2, T3, T4 and T5 shall be as follows:

During the period from time point A to time point F (D1 second after the start of time duration T5) the UE shall transmit uplink signal at least in all uplink slots configured for CSI transmission according to the configured periodic CSI reporting.

The rate of correct events observed during repeated tests shall be at least 90%.

Table 7.5.1.2.5-1: OTA related cell specific test parameters for FR2 (Cell 1) for in-sync radio link monitoring tests in non-DRX mode

Parameter		Unit	Test 1									
			T1	T2	T3	T4	T5	T1	T2	T3	T4	T5
AoA setup			Setup 3 defined in A.9.3									
			AoA1					AoA2				
Assumption for UE beams Note 5			Rough					Rough				
EPRE ratio of PDCCH DMRS to SSS		dB	0					Not sent				
EPRE ratio of PDCCH to PDCCH DMRS		dB	0									
EPRE ratio of PBCH DMRS to SSS		dB										
EPRE ratio of PBCH to PBCH DMRS		dB										
EPRE ratio of PSS to SSS		dB										
EPRE ratio of PDSCH DMRS to SSS		dB										
EPRE ratio of PDSCH to PDSCH DMRS		dB										
EPRE ratio of OCNG DMRS to SSS		dB										
EPRE ratio of OCNG to OCNG DMRS		dB										
ssb-Index 0 SNR	Config 1	dB	4.1 Note 6	-3.9 Note 6	-15	-4.5	4.1 Note 6					
ssb-Index 1 SNR	Config 1		Not sent					4.1 Note 6	-15	-15	-15	-15
N_{oc}	Config 1	dBm/ 15kHz	-94.8					-94.8				
Time multiplexing of the downlink transmissions from each AoA			Defined in Figure 7.5.1.2.4-2									
Propagation condition			TDL-A 30ns 75Hz					TDL-A 30ns 75Hz				

Note 1: OCNG shall be used such that a constant total transmitted power spectral density is achieved for all OFDM symbols.
Note 2: The signal contains PDCCH for UEs other than the device under test as part of OCNG.
Note 3: SNR levels correspond to the signal to noise ratio over the SSS REs.
Note 4: The SNR values are specified for testing a UE which supports 2RX on at least one band. For testing of a UE which supports 4RX on all bands, the SNR during T3 is 38.133 [6] A.3.6.
Note 5: Information about types of UE beam is given in B.2.1.3 and does not limit UE implementation or test system implementation.
Note 6: This value allows up to 1dB degradation from applied SNR to UE baseband

7.5.1.3 Radio Link Monitoring Out-of-sync Test for FR2 PCell configured with SSB-based RLM RS in DRX mode

Editor's Note: This test case has been completed for the following configurations:

- Test frequency f ≤ 40.8 GHz
- UE PC3
- Normal conditions

- The test is incomplete for UE power classes other than PC3
- The test is incomplete for test frequencies > 40.8 GHz
- The test is incomplete for extreme conditions

7.5.1.3.1 Test purpose

The purpose of this test is to verify that the UE properly detects the out of sync and in sync for the purpose of monitoring downlink radio link quality of the PCell when DRX is used. This test will partly verify the FR2 radio link monitoring requirements in TS 38.133 [6] clause 8.1.

7.5.1.3.2 Test applicability

This test applies to all types of NR UE from Release 15 onwards supporting 5GS NR SA FR2 and long DRX cycle.

7.5.1.3.3 Minimum conformance requirement

The minimum conformance requirements are specified in clause 7.5.1.0.1.

The normative reference for this requirement is TS 38.133 [6] clause 7.5.1.3.

7.5.1.3.4 Test description

In the test, UE is configured to perform RLM on SSB, with *detectionResource* included in *RadioLinkMonitoringRS* set to SSB#0 and SSB#1, and *purpose* set to '*rlf*'. Supported test configurations are shown in table 7.5.1.3.4.1-1. The test parameters are given in Tables 7.5.1.3.4.1-3 and 7.5.1.3.5-1 below. There is one cell (Cell 1), which is the active NR cell, in the test.

The test consists of three successive time periods, with time duration of T1, T2 and T3 respectively. Figure 7.5.1.3.4-1 shows the variation of the downlink SNR in the active cell to emulate out-of-sync and in-sync states. Prior to the start of the time duration T1, the UE shall be fully synchronized to Cell 1. The UE shall be configured for periodic CSI reporting with a reporting periodicity of 5 ms. In the test, DRX configuration is enabled and DRX inactivity timer has already been expired, i.e. UE tries to decode PDCCH and to send periodic CSI during the period when On-duration timer is running. Time alignment timers shall be set to "infinity" so that UL timing alignment is maintained during the test.

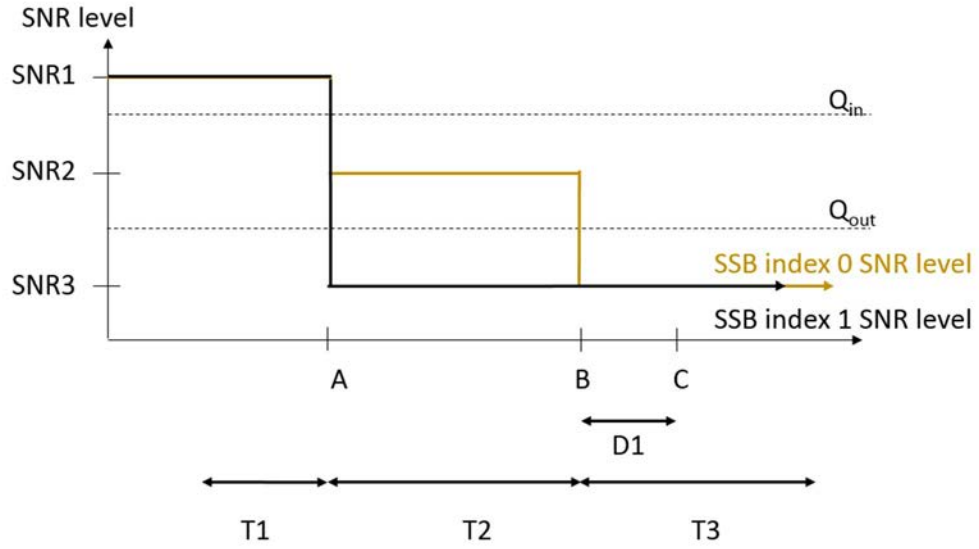


Figure 7.5.1.3.4-1: SNR variation for out-of-sync testing

7.5.1.3.4.1 Initial conditions

Initial conditions are a set of test configurations the UE needs to be tested in and the steps for the SS to take with the UE to reach the correct measurement state.

The initial test configurations consist of environmental conditions, test frequencies, test channel bandwidths and sub-carrier spacing based on NR operating bands specified in Table 5.3.5-1 of 38.521-2 [18].

This test shall be tested using any of the test configurations in Table 7.5.1.3.4.1-1.

Table 7.5.1.3.4.1-1: Radio Link Monitoring Out-of-sync Test for FR2 PCell configured with SSB-based RLM RS in DRX mode supported test configurations for FR2 PCell

Configuration	Description
7.5.1.3-1	TDD, SSB SCS 120 KHz, data SCS 120KHz, BW 100 MHz

Configure the test equipment and the DUT according to the parameters in Table 7.5.1.3.4.1-2

Table 7.5.1.3.4.1-2: Initial conditions for Radio Link Monitoring Out-of-sync Test for FR2 PCell configured with SSB-based RLM RS in DRX mode

Parameter	Value		Comment
Test environment	NC		As specified in TS 38.508-1 [14] clause 4.1.
Test frequencies	As specified in Annex E.1.2, Table E.4-1 and TS 38.508-1 [14] clause 4.3.1.		
Channel bandwidth	As specified by the test configuration selected from Table 7.5.1.3.4.1-1		
Propagation conditions	AWGN		As specified in Annex C.2.2.
Connection Diagram	TE Part	A.3.3.3.1	As specified in TS 38.508-1 [14] Annex A.
	DUT Part	A.3.3.4.1	
Exceptions to connection diagram	N/A		

1. The test parameters for PCell are given in Table 7.5.1.3.4.1-3

2. Message contents are defined in clause 7.5.1.3.4.3.

3. There is one carrier and one cell specified in the test. Cell 1 is the cell used for connection setup with the power level set according to Annex C.1.1 and C.1.2 for this test.

Table 7.5.1.3.4.1-3: General test parameters for FR2 out-of-sync testing in DRX mode

Parameter			Unit	Value
				Test 1
Active PCell				Cell 1
RF Channel Number				1
Duplex mode		Config 1		TDD
$BW_{channel}$		Config 1		100: $N_{RB,c}$ = 66
Data RBs allocated		Config 1		66
DL initial BWP configuration		Config 1		DLBWP.0.1
DL dedicated BWP configuration		Config 1		DLBWP.1.1
UL initial BWP configuration		Config 1		ULBWP.0.1
UL dedicated BWP configuration		Config 1		ULBWP.1.1
TDD Configuration		Config 1		TDDConf.3.1
RMSI CORESET Reference Channel		Config 1		CR.3.1 TDD
Dedicated CORESET Reference Channel		Config 1		CCR.3.4 TDD
SSB Configuration		Config 1		SSB.1 FR2
SMTC Configuration		Config 1		SMTC.1
PDSCH/PDCCH subcarrier spacing		Config 1		120 KHz
PRACH Configuration		Config 1		PRACH.1 FR2
SSB index assigned as RLM RS		Config 1		0,1
OCNG parameters				OP.1
CP length				Normal
Out of sync transmission parameters	DCI format			1-0
	Number of Control OFDM symbols			2
	Aggregation level		CCE	8
	Ratio of hypothetical PDCCH RE energy to average SSS RE energy		dB	4
	Ratio of hypothetical PDCCH DMRS energy to average SSS RE energy		dB	4
	DMRS precoder granularity			REG bundle size
	REG bundle size			6

DRX Configuration			DRX.3
Gap pattern ID			N.A.
Layer 3 filtering			*Enabled*
T310 timer		ms	*0*
T311 timer		ms	1000
N310			1
N311			1
CSI-RS for CSI reporting	Config 1		CSI-RS.3.1 TDD
reportConfigType			periodic
reportQuantity			cri-RI-PMI-CQI
CSI reporting periodicity		slot	40
CSI reporting offset		slot	4
TCI states for PDCCH/PDSCH			TCI.State.2
CSI-RS for tracking	Config 1		TRS.2.1 TDD
T1		s	0.2
T2		s	14.48
T3		s	14.48
D1		s	14.44
Note 1: All configurations are assigned to the UE prior to the start of time period T1. Note 2: UE-specific PDCCH is not transmitted after T1 starts.			

7.5.1.3.4.2 Test Procedure

There is one cell (Cell 1), which is the active NR cell, in the test. Prior to the start of the time duration T1, the UE shall be fully synchronized to Cell 1 (PCell). The UE shall be configured for periodic CQI reporting in PUCCH [format 2] with a reporting periodicity as mentioned in the above table 7.5.1.3.4.1-3.

1. Ensure the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity NR, Connected without release On according to TS 38.508-1 [14] clause 4.5.

2. Set the parameters according to T1 in Table 7.5.1.3.5-1. Propagation conditions are set according to Annex C.2.2. T1 starts.

3. When T1 expires the SS shall change the SNR value to T2 as specified in Table 7.5.1.3.5-1. T2 starts.

4. When T2 expires the SS shall change the SNR value to T3 as specified in Table 7.5.1.3.5-1. T3 starts.

5. If the SS:

   a) detects uplink power in each subframe configured for CQI transmission (according to configured CQI periodicity on PUCCH [format 2]) during the period from time point A to time point B

   and

   b) does not detect any uplink power from time point C ([240] ms after the start of T3) until T3 expires,

   the number of successful tests is increased by one.

6. Otherwise the number of failed tests is increased by one and proceed to Step 10.

7. When T3 expires the SS shall change the SNR value to T1 as specified in Table 7.5.1.3.5-1.

8. If the UE has not re-established the connection in at least 1s, the SS shall transmit [FFS] according to [FFS] to add NR cell (PCell). The UE shall transmit RRCConnectionReconfigurationComplete message.

9. If the Reconfiguration fails, switch off and on the UE and ensure the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity NR, Connected without release On according to TS 38.508-1 [14] clause 4.5.

10. Repeat steps 2-9 until the confidence level according to Tables G.2.3-1 in Annex G clause G.2 is achieved.

7.5.1.3.4.3 Message Contents

Message contents are according to TS 38.508-1 [14] clause 7.3 with the following exceptions:

Table 7.5.1.3.4.3-1: Common Exception messages for Radio Link Monitoring Out-of-sync Test for FR2 PCell configured with SSB-based RLM RS in DRX mode

Default Message Contents	
Common contents of system information blocks exceptions	
Default RRC messages and information elements contents exceptions	Table H.3.1-1 Table H.3.1-2 with Condition INTER-FREQ, L3 FILTERING NEEDED Table H.3.1-7 Table H.3.5-4 Table H.3.5-9 with Condition SSB RLM Table H.3.7-1 with condition DRX.3 Table 7.3.1-3 in TS 38.508-1 [14] with condition SMTC.1

Table 7.5.1.3.4.3-1: Void

Table 7.5.1.3.4.3-2: UE-TimersAndConstants

Derivation Path: TS 38.508-1 [14], Table 4.6.3-200			
Information Element	**Value/remark**	**Comment**	**Condition**
UE-TimersAndConstants ::= SEQUENCE {			
t310	ms0		
n310	n1		
t311	ms1000		
n311	n1		
}			

Table 7.5.1.3.4.3-3: Void

7.5.1.3.5 Test Requirement

Table 7.5.1.3.4.1-3 and 7.5.1.3.5-1 define the primary level settings including test tolerances for Radio Link Monitoring Out-of-sync Test for FR2 PCell configured with SSB-based RLM RS in DRX mode.

The UE behaviour in each test during time durations T1, T2 and T3 shall be as follows:

During the period from time point A to time point B the UE shall transmit uplink signal at least in all uplink slots configured for CSI transmission according to the configured periodic CSI reporting.

The UE shall stop transmitting uplink signal no later than time point C (D1 second after the start of the time duration T3).

The rate of correct events observed during repeated tests shall be at least 90%.

Table 7.5.1.3.1-3: OTA related cell specific test parameters for FR2 (Cell 1) for out-of-sync radio link monitoring tests in DRX mode

Parameter		Unit	Test 1		
			T1	T2	T3
AoA setup			Setup 1 defined in A.9.1		
Assumption for UE beams Note 5			Rough		
EPRE ratio of PDCCH DMRS to SSS		dB	4		
EPRE ratio of PDCCH to PDCCH DMRS		dB	0		
EPRE ratio of PBCH DMRS to SSS		dB	0		
EPRE ratio of PBCH to PBCH DMRS		dB			
EPRE ratio of PSS to SSS		dB			
EPRE ratio of PDSCH DMRS to SSS		dB			
EPRE ratio of PDSCH to PDSCH DMRS		dB			
EPRE ratio of OCNG DMRS to SSS		dB			
EPRE ratio of OCNG to OCNG DMRS		dB			
ssb-Index 0 SNR	Config 1	dB	3.3 Note 6	-4.7 Note 6	-15.4

ssb-Index 1 SNR	Config 1		3.3[Note 6]	-15.4	-15.4
N_{oc}	Config 1	dBm/15K Hz	-104.7dBm		
Propagation condition			TDL-A 30ns 75Hz		
Note 1: OCNG shall be used such that the resources in Cell 1 are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols. Note 2: The signal contains PDCCH for UEs other than the device under test as part of OCNG. Note 3: SNR levels correspond to the signal to noise ratio over the SSS REs. Note 4: The SNR values are specified for testing a UE which supports 2RX on at least one band. For testing of a UE which supports 4RX on all bands, the SNR during T3 is A.3.6. Note 5: Information about types of UE beam is given in B.2.1.3 and does not limit UE implementation or test system implementation. Note 6: This value allows up to 1dB degradation from applied SNR to UE baseband.					

7.5.1.4 Radio Link Monitoring In-sync Test for FR2 PCell configured with SSB-based RLM RS in DRX mode

Editor's Note: This test case has been completed for the following configurations:

- Test frequency f ≤ 40.8 GHz
- UE PC3
- Normal conditions

- The test is incomplete for UE power classes other than PC3
- The test is incomplete for test frequencies > 40.8 GHz
- The test is incomplete for extreme conditions

7.5.1.4.1 Test purpose

The purpose of this test is to verify that the UE properly detects the out of sync and in sync for the purpose of monitoring downlink radio link quality of the PCell when DRX is used. This test will partly verify the FR2 radio link monitoring requirements in TS 38.133 [6] clause 8.1.

7.5.1.4.2 Test applicability

This test applies to all types of NR UE from Release 15 onwards supporting 5GS NR SA FR2 and long DRX cycle.

7.5.1.4.3 Minimum conformance requirement

The minimum conformance requirements are specified in clause 7.5.1.0.1.

The normative reference for this requirement is TS 38.133 [6] clause 7.5.1.4.

7.5.1.4.4 Test description

In the test, UE is configured to perform RLM on SSB, with *detectionResource* included in *RadioLinkMonitoringRS* set to SSB#0 and SSB#1, and *purpose* set to '*rlf*'. Supported test configurations are shown in table A.7.5.1.4.1-1. The test parameters are given in Tables 7.5.1.4.4.1-3 and 7.5.1.4.5-1 below. There is one cell (Cell 1), which is the active NR cell, in the test.

The test consists of five successive time periods, with time duration of T1, T2, T3, T4 and T5 respectively. Figure 7.5.1.4.4-1 shows the variation of the downlink SNR in the active cell to emulate out-of-sync and in-sync states. Prior to the start of the time duration T1, the UE shall be fully synchronized to Cell 1. The UE shall be configured for periodic CSI reporting with a reporting periodicity of 5 ms. In the test, DRX configuration is enabled and DRX inactivity timer has already been expired, i.e. UE tries to decode PDCCH and to send periodic CSI during the period when On-duration timer is running. Time alignment timers shall be set to "infinity" so that UL timing alignment is maintained during the test.

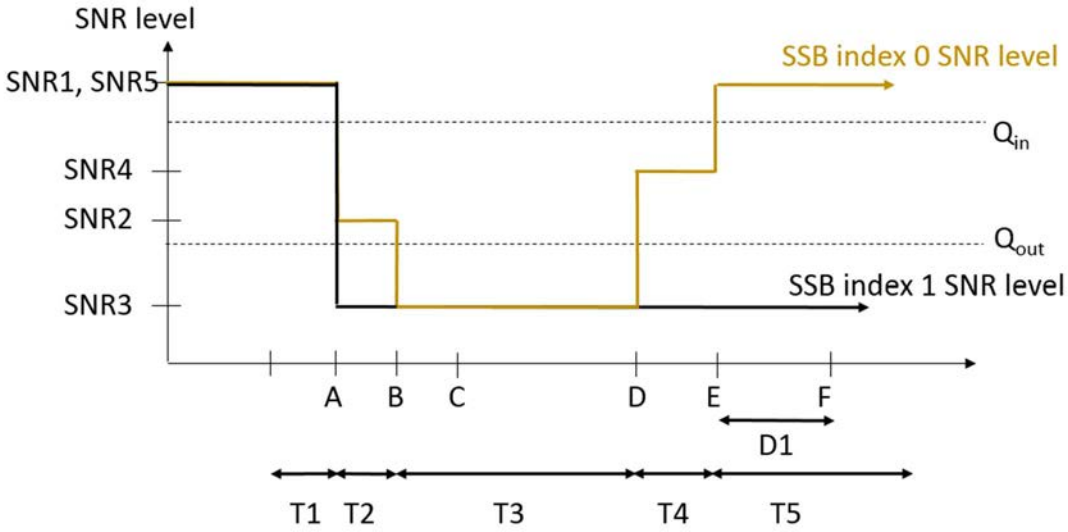


Figure 7.5.1.4.4-1: SNR variation for in-sync testing

7.5.1.4.4.1 Initial conditions

Initial conditions are a set of test configurations the UE needs to be tested in and the steps for the SS to take with the UE to reach the correct measurement state.

The initial test configurations consist of environmental conditions, test frequencies, test channel bandwidths and sub-carrier spacing based on NR operating bands specified in Table 5.3.5-1 of 38.521-2 [18].

This test shall be tested using any of the test configurations in Table 7.5.1.4.4.1-1.

Table 7.5.1.4.4.1-1: Radio Link Monitoring In-sync Test for FR2 PCell configured with SSB-based RLM RS in DRX mode supported test configurations for FR2 PCell

Configuration	Description
7.5.1.4-1	TDD, SSB SCS 120 KHz, data SCS 120KHz, BW 100 MHz

Configure the test equipment and the DUT according to the parameters in Table 7.5.1.4.4.1-2

Table 7.5.1.4.4.1-2: Initial conditions for Radio Link Monitoring In-sync Test for FR2 PCell configured with SSB-based RLM RS in DRX mode

Parameter	Value		Comment
Test environment	NC		As specified in TS 38.508-1 [14] clause 4.1.
Test frequencies	As specified in Annex E.1.2, Table E.4-1 and TS 38.508-1 [14] clause 4.3.1.		
Channel bandwidth	As specified by the test configuration selected from Table 7.5.1.4.4.1-1		
Propagation conditions	AWGN		As specified in Annex C.2.2.
Connection Diagram	TE Part	A.3.3.3.1	As specified in TS 38.508-1 [14] Annex A.
	DUT Part	A.3.3.4.1	
Exceptions to connection diagram	N/A		

1. The test parameters for PCell are given in Table 7.5.1.4.4.1-3
2. Message contents are defined in clause 7.5.1.4.4.3.

3. There is one carrier and one cell specified in the test. Cell 1 is the cell used for connection setup with the power level set according to Annex C.1.1 and C.1.2 for this test.

Table 7.5.1.4.4.1-3: General test parameters for FR2 in-sync testing in DRX mode

Parameter			Unit	Value
				Test 1
Active PCell				Cell 1
RF Channel Number				1
Duplex mode		Config 1		TDD
$BW_{channel}$		Config 1		100: $N_{RB,c}$ = 66
Data RBs allocated		Config 1		66
DL initial BWP configuration		Config 1		DLBWP.0.1
DL dedicated BWP configuration		Config 1		DLBWP.1.1
UL initial BWP configuration		Config 1		ULBWP.0.1
UL dedicated BWP configuration		Config 1		ULBWP.1.1
TDD Configuration		Config 1		TDDConf.3.1
RMSI CORESET Reference Channel		Config 1		CR.3.1 TDD
Dedicated CORESET Reference Channel		Config 1		CCR.3.1 TDD
SSB Configuration		Config 1		SSB.1 FR2
SMTC Configuration		Config 1		SMTC.3
PDSCH/PDCCH subcarrier spacing		Config 1		120 KHz
PRACH Configuration		Config 1		PRACH.1 FR2
SSB index assigned as RLM RS		Config 1		0,1
OCNG parameters				OP.1
CP length				Normal
In sync transmission parameters	DCI format			1-0
	Number of Control OFDM symbols			2
	Aggregation level		CCE	4
	Ratio of hypothetical PDCCH RE energy to average SSS RE energy		dB	0
	Ratio of hypothetical PDCCH DMRS energy to average SSS RE energy		dB	0
	DMRS precoder granularity			REG bundle size
	REG bundle size			6
Out of sync transmission parameters	DCI format			1-0
	Number of Control OFDM symbols			2
	Aggregation level		CCE	8
	Ratio of hypothetical PDCCH RE energy to average SSS RE energy		dB	4
	Ratio of hypothetical PDCCH DMRS energy to average SSS RE energy		dB	4
	DMRS precoder granularity			REG bundle size
	REG bundle size			6
DRX Configuration				DRX.11
Gap pattern ID				N.A.
Layer 3 filtering				*Enabled*
T310 timer			ms	4000
T311 timer			ms	1000
N310				1
N311				1
CSI-RS for CSI reporting		Config 1		CSI-RS.3.1 TDD
reportConfigType				periodic
reportQuantity				cri-RI-PMI-CQI
CSI reporting periodicity			slot	40
CSI reporting offset			slot	4
TCI states for PDCCH/PDSCH				TCI.State.2
CSI-RS for tracking		Config 1		TRS.2.1 TDD
T1			s	0.2
T2			s	0.2

T3	s	2.8
T4	s	0.2
T5	s	3.88
D1	s	3.84
Note 1: All configurations are assigned to the UE prior to the start of time period T1. Note 2: UE-specific PDCCH is not transmitted after T1 starts.		

7.5.1.4.4.2 Test Procedure

Editor's Note: Test procedure updates to ensure accurate FR2 test measurement state is TBD

There is one cell (Cell 1), which is the active NR cell, in the test. Prior to the start of the time duration T1, the UE shall be fully synchronized to Cell 1 (PCell). The UE shall be configured for periodic CQI reporting in PUCCH [format 2] with a reporting periodicity as mentioned in the above table 7.5.1.4.4.1-3.

1. Ensure the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity NR, Connected without release On according to TS 38.508-1 [14] clause 4.5.

2. Set the parameters according to T1 in Table 7.5.1.4.5-1. Propagation conditions are set according to Annex C.2.2. T1 starts.

3. When T1 expires the SS shall change the SNR value to T2 as specified in Table 7.5.1.4.5-1. T2 starts.

4. When T2 expires the SS shall change the SNR value to T3 as specified in Table 7.5.1.4.5-1. T3 starts.

5. When T3 expires, the SS shall change the SNR value to T4 as specified in Table 7.5.1.4.5-1. T4 starts.

6. When T4 expires, the SS shall change the SNR value to T5 as specified in Table 7.5.1.4.5-1. T5 starts.

7. If the SS detects uplink power in the On-duration part of every DRX cycle in the subframe according the configured CQI reporting mode (PUCCH 2-0) during the period from time point A to time point F ([1120] ms after the start of time duration T5) the number of successful tests is increased by one.

   Otherwise the number of failed tests is increased by one.

8. Repeat steps 2-7 for all subtests until the confidence level according to Tables G.2.3-1 in Annex G clause G.2 is achieved.

7.5.1.4.4.3 Message Contents

Message contents are according to TS 38.508-1 [14] clause 7.3 with the following exceptions:

Table 7.5.1.4.4.3-1: Common Exception messages for Radio Link Monitoring In-sync Test for FR2 PCell configured with SSB-based RLM RS in DRX mode

Default Message Contents	
Common contents of system information blocks exceptions	
Default RRC messages and information elements contents exceptions	Table H.3.1-1 Table H.3.1-2 with Condition INTER-FREQ, L3 FILTERING NEEDED Table H.3.1-7 Table H.3.5-4 Table H.3.5-9 with Condition SSB RLM Table H.3.7-1 with condition DRX.3 Table 7.3.1-3 in TS 38.508-1 [14] with condition SMTC.1

Table 7.5.1.4.4.3-2: Void

Table 7.5.1.4.4.3-3: *RLF-TimersAndConstant*

Derivation Path: TS 38.508-1 [14], Table 4.6.3-150			
Information Element	**Value/remark**	**Comment**	**Condition**
RLF-TimersAndConstants ::= SEQUENCE {			

t310	ms4000		
n310	n1		
n311	n1		
t311-v1530	ms1000		
}			

Table 7.5.1.4.4.3-4: Void

7.5.1.4.5 Test Requirement

Table 7.5.1.4.4.1-3 and 7.5.1.4.5-1 define the primary level settings including test tolerances for Radio Link Monitoring In-sync Test for FR2 PCell configured with SSB-based RLM RS in DRX mode.

The UE behaviour in each test during time durations T1, T2, T3, T4 and T5 shall be as follows:

During the period from time point A to time point F (D1 second after the start of time duration T5) the UE shall transmit uplink signal at least in all uplink slots configured for CSI transmission according to the configured periodic CSI reporting.

The rate of correct events observed during repeated tests shall be at least 90%.

Table 7.5.1.4.5-1: OTA related cell specific test parameters for FR2 (Cell 1) for in-sync radio link monitoring test in DRX mode

Parameter		Unit	Test 1				
			T1	T2	T3	T4	T5
AoA setup			Setup 1 defined in A.9.1				
Assumption for UE beams Note 5			Rough				
EPRE ratio of PDCCH DMRS to SSS		dB	0				
EPRE ratio of PDCCH to PDCCH DMRS		dB	0				
EPRE ratio of PBCH DMRS to SSS		dB	0				
EPRE ratio of PBCH to PBCH DMRS		dB					
EPRE ratio of PSS to SSS		dB					
EPRE ratio of PDSCH DMRS to SSS		dB					
EPRE ratio of PDSCH to PDSCH DMRS		dB					
EPRE ratio of OCNG DMRS to SSS		dB					
EPRE ratio of OCNG to OCNG DMRS		dB					
ssb-Index 0 SNR	Config 1	dB	3.3 Note 6	-4.7 Note 6	-15.4	-4.9	3.3 Note 6
ssb-Index 1 SNR	Config 1		3.3 Note 6	-15.4	-15.4	-15.4	-15.4
N_{oc}	Config 1	dBm/15 KHz	-104.7dBm				
Propagation condition			TDL-A 30ns 75Hz				

Note 1: OCNG shall be used such that the resources in Cell 1 are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.
Note 2: The signal contains PDCCH for UEs other than the device under test as part of OCNG.3
Note 3: SNR levels correspond to the signal to noise ratio over the SSS REs.
Note 4: The SNR values are specified for testing a UE which supports 2RX on at least one band. For testing of a UE which supports 4RX on all bands, the SNR during T3 is A.3.6.
Note 5: Information about types of UE beam is given in B.2.1.3 and does not limit UE implementation or test system implementation.
Note 6: This value allows up to 1dB degradation from applied SNR to UE baseband.

7.5.1.5 to 7.5.1.8

7.5.1.9 NR SA FR2 radio link monitoring UE scheduling restrictions

Editor's note: This test case is incomplete. The following aspects are either missing or not yet determined:

-The test tolerances and test system uncertainties applicable to this test are undefined.

-Message content is TBD

7.5.1.9.1 Test purpose

The purpose of this test is to verify that the NR UE correctly follows the RLM scheduling restrictions requirements defined in TS 38.133 [6] clause 8.1.7, and to verify that the UE correctly receive the PDCCH scheduled on the symbols right before the RLM SSB symbols without overlap so that it sends ACK/NACK correctly.

7.5.1.9.2 Test applicability

This test applies to all types of NR UE from Release 15 onwards.

This test is only applicable to UE which supports *pdcch-MonitoringAnyOccasions* or *pdcch-MonitoringAnyOccasionsWithSpanGap*.

7.5.1.9.3 Minimum conformance requirement

The minimum conformance requirements are specified in clause 7.5.1.0.5.

The normative reference for this requirement is TS 38.133 [6] clause A.7.5.1.9.

7.5.1.9.4 Test description

There is one cell (Cell 1), which is the active NR cell, in the test. The test consists of one time period with time duration of T1. Figure 5.5.1.9.4-1 shows the Time multiplexed downlink transmissions from each Angle of Arrival. The UE is required during time period T1 to transmit ACK/NACK correctly upon scheduling of PDSCH.

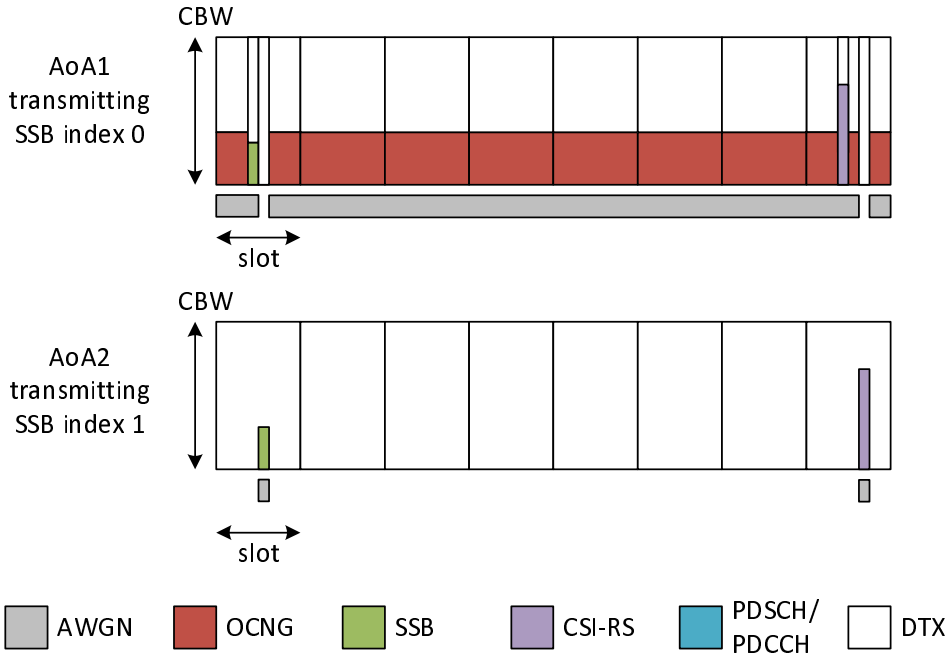


Figure 7.5.1.9.4-1: Time multiplexed downlink transmissions

7.5.1.9.4.1 Initial conditions

This test shall be tested using any of the test configurations in Table 7.5.1.9.4.1-1.

Table 7.5.1.9.4.1-1: Supported test configurations for NR SA FR2 radio link monitoring UE scheduling restrictions

Configuration	Description
7.5.1.9-1	120 kHz SSB SCS, 120 kHz RMC SCS, 100 MHz bandwidth, TDD duplex mode

Configure the test equipment and the DUT according to the parameters in Table 7.5.1.9.4.1-2

Table 7.5.1.9.4.1-2: Initial conditions for NR SA FR2 radio link monitoring UE scheduling restrictions

Parameter	Value		Comment
Test environment	NC		As specified in TS 38.508-1 [14] clause 4.1.
Test frequencies	As specified in Annex E.1.2, Table E.4-1 and TS 38.508-1 [14] clause 4.3.1.		
Channel bandwidth	As specified by the test configuration selected from Table 7.5.1.9.4.1-1		
Propagation conditions	AWGN		As specified in Annex C.2.2.
Connection Diagram	TE Part	A.3.3.3.1	As specified in TS 38.508-1 [14] Annex A.
	DUT Part	A.3.3.4.1	
Exceptions to connection diagram	N/A		

1. The test parameters for PCell are given in Table 7.5.1.9.4.1-3

2. Message contents are defined in clause 7.5.1.9.4.3.

3. There is one carrier and one cell specified in the test. Cell 1 is the cell used for connection setup with the power level set according to Annex C.1.1 and C.1.2 for this test.

Table 7.5.1.9.4.1-3: General test parameters for NR SA FR2 radio link monitoring UE scheduling restrictions

Parameter	Unit	Test configuration	Value	Comment
RF Channel Number		1	1	
SSB configuration		1	SSB.1 FR2	
SMTC configuration		1	SMTC pattern 1	
DRX cycle length	s	1	OFF	
T1	s	1	5	During T1 the UE is required to correctly transmit ACK/NACK

7.5.1.9.4.2 Test Procedure

There is one cell (Cell 1), which is the active NR cell, in the test. Prior to the start of the time duration T1, the UE shall be fully synchronized to PCell. During the test PDCCHs indicating new transmissions shall be sent continuously on PCell (Cell 1) to ensure that the UE would have ACK/NACK sending.

1. Set the parameters according to T1 in Table 7.5.1.9.4.4-1. Propagation conditions are set according to Annex C.2.2. T1 starts.

2. If the SS receives ACK/NACK on each UL transmission occasion scheduled by PDCCH which are not overlapped with SSBs configured for radio link monitoring during T1, the number of successful tests is increased by one. otherwise the number of failed tests is increased by one.

3. The UE is switched off and then on. Ensure the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity *NR*, Connected without release *On* according to TS 38.508-1 [10] clause 4.5.

4. Repeat steps 1-3 until the confidence level according to Tables G.2.3-1 in Annex G clause G.2 is achieved.

7.5.1.9.4.3 Message Contents

Message contents are according to TS 38.508-1 [14] clause 7.3 with the following exceptions:

Table 7.5.1.9.4.3-1: Common Exception messages for NR SA FR2 radio link monitoring UE scheduling restrictions

Default Message Contents

Common contents of system information blocks exceptions	TBD
Default RRC messages and information elements contents exceptions	TBD

7.5.1.9.5 Test Requirement

Table 7.5.1.9.4.1-3 and 7.5.1.9.5-1 define the primary level settings including test tolerances for NR SA FR2 radio link monitoring UE scheduling restrictions.

Table 7.5.1.9.5-1: Cell specific test parameters for NR SA FR2 radio link monitoring UE scheduling restrictions

Parameter	Unit	Test configuration	Cell 1	
AoA setup		1	Setup 3 defined in A.9.3	
			AoA1	AoA2
Assumption for UE beams Note 1			Rough	Rough
TDD configuration		1	TDDConf.3.1	
$BW_{channel}$	MHz	1	100: $N_{RB,c}$ = 66	
Data RBs allocated		1	24	
PDSCH Reference measurement channel		1	SR.3.2 TDD	Not sent
RMSI CORESET RMC configuration		1	CR.3.1 TDD	Not sent
Dedicated CORESET RMC configuration		1	CCR.3.2 TDD	Not sent
TRS configuration		1	TRS.2.1 TDD	TRS.2.2 TDD
PDCCH/PDSCH TCI state		1	TCI.State.2	N/A
OCNG Pattern		1	OP.5	Not sent
Initial DL BWP configuration		1	DLBWP.0.1	
Initial UL BWP configuration		1	ULBWP.0.1	
RLM-RS		1	SSB with index 0	SSB with index 1
N_{oc}	dBm/15kHz	1	-92.1	-92.1
N_{oc} Note2	dBm/SCS	1	-83.1	-83.1
$\hat{E}_s / N_{oc}$	dB	1	2	2
$\hat{E}_s / I_{ot}$ BB Note 4	dB	1	1	1
SSB_RP Note3	dBm/SCS	1	-81.1	-81.1
Io	dBm/95.04 MHz	1	-54.35	-54.35
Time multiplexing of the downlink transmissions from each AoA		1	Defined in Figure 7.5.1.9.4-1	
Propagation Condition		1	AWGN	AWGN

Note 1: Information about types of UE beam is given in TS 38.133 [6] B.2.1.3 and does not limit UE implementation or test system implementation.

Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for Noc to be fulfilled.

Note 3: Es/Iot, SSB_RP and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.

Note 4: Calculation of Es/Iot_{BB} includes the effect of UE internal noise up to the value assumed for the associated Refsens requirement in clause 7.3.2 of TS 38.101-2 [3], and an allowance of 1dB for UE multi-band relaxation factor ΔMB_S from TS 38.101-2 [3] Table 6.2.1.3-4.

The UE behaviour during time duration T1 follows the requirements defined in TS 38.133 [6] clause 8.1.7.3:

The UE is not expected to transmit PUCCH, PUSCH or SRS or receive PDCCH, PDSCH or CSI-RS for tracking or CSI-RS for CQI on RLM-RS symbols to be measured for radio link monitoring.

For the test to pass, the total number of successful tests shall be more than 90% of the cases with a confidence level of 95%.

7.5.2 Interruption

7.5.2.0 Minimum conformance requirements

7.5.2.0.1 Minimum conformance requirements for interruptions during measurements on deactivated NR SCC

[TS38.133, clause 8.2.2.2.3]

Interruptions on PCell due to measurements when an SCell is deactivated are allowed with up to 0.5% probability of missed ACK/NACK when the configured *measCycleSCell* [2] is 640 ms or longer. The UE is only allowed to cause interruptions immediately before and immediately after an SMTC. Each interruption shall not exceed requirement in Table 7.5.2.0.1-1 if the PCell is not in the same band as the deactivated SCell. Each interruption shall not exceed requirement in Table 7.5.2.0.1-2 if the PCell is in the same band as the deactivated SCell.

Interruptions on active SCell due to measurements when an SCell is deactivated are allowed with up to 0.5% probability of missed ACK/NACK when the configured *measCycleSCell* [2] is 640 ms or longer. The UE is only allowed to cause interruptions immediately before and immediately after an SMTC. Each interruption shall not exceed requirement in Table 7.5.2.0.1-1 if the active SCell is not in the same band as the deactivated SCell. Each interruption shall not exceed requirement in Table 7.5.2.0.1-2 if the active SCell is in the same band as the deactivated SCell.

[TS38.133, clause 8.2.2.2.2]

Table 7.5.2.0.1-1: Interruption duration for SCell activation/deactivation for inter-band CA

μ	NR Slot length (ms) of victim cell	Interruption length X2 (slots)	
0	1		1
1	0.5		1
2	0.25	Both aggressor cell and victim cell are on FR2	2
		Either aggressor cell or victim cell is on FR1	3
3	0.125	Aggressor cell is on FR2	4
		Aggressor cell is on FR1	5
5	0.03125	Aggressor cell is on FR1	17
6	0.015625	Aggressor cell is on FR1	33

Table 7.5.2.0.1-2: Interruption duration for SCell activation/deactivation for intra-band CA

μ	NR Slot length (ms)	Interruption length (slots)
0	1	1 + $T_{SMTC_duration} * N_{slot}^{subframe,\mu}$
1	0.5	1 + $T_{SMTC_duration} * N_{slot}^{subframe,\mu}$
2	0.25	2 + $T_{SMTC_duration} * N_{slot}^{subframe,\mu}$
3	0.125	4 + $T_{SMTC_duration} * N_{slot}^{subframe,\mu}$
5	0.03125	16+ $T_{SMTC_duration} * N_{slot}^{subframe,\mu}$
6	0.015625	32+ $T_{SMTC_duration} * N_{slot}^{subframe,\mu}$
NOTE 1: $T_{SMTC_duration}$ measured in subframes is - the longest SMTC duration among all above active serving cells and the SCell being activated when one SCell is activated. If SSB configuration (*absoluteFrequencySSB*) but no SMTC configuration is provided for the SCell being activated, the SSB transmission periodicity is assumed to be 5ms and $T_{SMTC\ duration}$ for the SCell being activated is x ms,		

	where x = the number of consecutive subframes containing all SSBs in one SSB burst transmitted by the SCell being activated. If no SSB configuration (*absoluteFrequencySSB*) nor SMTC configuration is provided for the SCell being activated, $T_{SMTC\ duration}$ for the SCell being activated is 0ms; - the longest SMTC duration among all active servingNOTE 2: $N_{slot}^{subframe,\mu}$ is as defined in TS 38.211 [6].

The normative reference for this requirement is TS 38.133 [6] clause 8.2.1.2.5.1.

7.5.2.1 NR SA FR2 interruptions during measurements on deactivated NR SCC

Editor's Note: This test case has been completed for the following configurations:

- Test frequency f ≤ 40.8 GHz

- UE PC3

- The test is incomplete for UE power classes other than PC3

- The test is incomplete for test frequencies > 40.8 GHz

7.5.2.1.1 Test purpose

The purpose of this test is to verify that the UE missed ACK/NACK rate does not exceed the limits at NR PCell interruptions during the measurement on the deactivated NR SCC. This test will verify the missed ACK/NACK rate for PCell in standalone NR specified in clause 7.5.2.0. Supported test configurations are shown in table 7.5.2.1.4.1-1.

7.5.2.1.2 Test applicability

This test applies to all types of E-UTRA UE release 15 and forward supporting SA FR2 and 2DL CA.

7.5.2.1.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 7.5.2.0.1.

The normative reference for this requirement is TS 38.133 [6] clause A.7.5.2.1.

7.5.2.1.4 Test description

7.5.2.1.4.1 Initial conditions

This test shall be run in one of the configurations defined in Table 7.5.2.1.4.1-1.

Table 7.5.2.1.4.1-1: Supported test configurations for NR SA FR2 interruptions during measurements on deactivated NR SCC

Configuration	Description
7.5.2.1-1	NR 120 kHz SSB SCS, 100 MHz bandwidth, TDD – TDD duplex mode

Configure the test equipment and the DUT according to the parameters in Table 7.5.2.1.4.1-2.

Table 7.5.2.1.4.1-2: Initial conditions for NR SA FR2 interruptions during measurements on deactivated NR SCC

Parameter	Value		Comment
Test environment	NC		As specified in TS 38.508-1 [14] clause 4.1.
Test frequencies	As specified in Annex E, Table E.5-1 and TS 38.508-1 [14] clause 4.3.1.		
Channel bandwidth	As specified by the test configuration selected from Table 7.4.3.1.4.1-1		
Propagation conditions	AWGN		As specified in clause C.2.2.
Connection Diagram	TE Part	A.3.3.1.1	As specified in TS 38.508-1 [14] Annex A.
	DUT Part	A.3.4.1.1	

Exceptions to connection diagram	N/A	

1. The general test parameter settings are set up according to Table 7.5.2.1.4.1-3.
2. Message contents are defined in clause 7.5.2.1.4.3.
3. There are two NR cells specified in the test. Cell 1 is the PCell on one NR carrier and Cell 2 is the SCell on the other NR carrier. Cell 1 and Cell 2 shall be initially configured according to annex C.

Table 7.5.2.1.4.1-3: General test parameters for NR SA FR2 interruptions during measurements on deactivated NR SCC

Parameter	Unit	Value	Comment
RF Channel Number		1, 2	Two NR RF channels
Active PCell		Cell1	PCell on NR RF channel number 1.
Configured deactivated SCell		Cell2	Deactivated SCell on NR RF channel number 2.
CP length		Normal	Applicable to Cell1 and Cell2
DRX		OFF	
Measurement gap pattern Id		OFF	
SCell measurement cycle (measCycleSCell)	ms	640	
T1	s	10	

7.5.2.1.4.2 Test procedure

The test consists of two cells: Cell1 and Cell2. Cell1 is NR PCell and Cell2 is the deactivated NR SCell. The test consists of one time period, with duration of T1. Prior to the start of the time duration T1, the UE shall be connected and fully synchronized to Cell1 and Cell2. The point in time at which the RRC message including *measCycleSCell* or *allowInterruptions* for the deactivated NR SCells is received at the UE antenna connector, defines the start of time period T1. During T1 the UE shall be continuously scheduled on the NR PCell DL.

Unless otherwise stated, the downlink signal and noise are aligned to arrive in the UE Rx beam peak direction.

1. Ensure the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity NR, Connected without release *On* according to TS 38.508-1 [14] clause 4.5. Message contents are defined in clause 7.5.2.1.4.3.
2. Set the parameters according to values in Table 7.5.2.1.4.1-3 as appropriate. Propagation conditions are set according to clause C.2.2.
3. The SS shall transmit an *RRCReconfiguration* message including *measCycleSCell* for the deactivated NR SCell.
4. The UE shall transmit *RRCReconfigurationComplete* message.
5. Set the parameters according to T1 in Table 7.5.2.1.5-1 and Table 7.5.2.1.5-2. Propagation conditions are set according to clause C.2.2.
6. SS schedules on PCell continuously and UE shall start sending ACK/NACK reports. T1 starts. During T1, the SS shall monitor ACK/NACK/DTX on PCell.
7. If more than 99.5% of uplink transmissions are received by SS then count a success for the event “ACK/NACK”. Otherwise count a fail for the event “ACK/NACK”.
8. If no longer than X consecutive DTXs are observed by the SS, then count a success for the event “DTX”. Otherwise count a fail for the event “DTX”, where,

   - X = 6 if the NR PSCell is not in the same band as the deactivated SCell, otherwise X = 16.

9. After T1 expires, the SS shall transmit an RRCRelease message to release the RRC connection which includes the release of the established radio bearers as well as all radio resources. After the RRC connection release, the SS shall:

9a. transmit in Cell 1 a Paging message (including PagingRecord with UE-Identity) for the UE, and go back to step 1 to prepare for the next iteration. If the paging fails, proceed as per step 9b.

or

9b. switch off and on the UE and go back to step 1 to prepare for the next iteration.

10. Repeat steps 1-9 until a test verdict has been achieved.

Each of the events "ACK/NACK" and "DTX" is evaluated independently for the statistic, resulting in an event verdict: pass or fail. Each event is evaluated only until the confidence level according to Table G.2.3-1 in Annex G.2 is achieved. Different events may require different times for a verdict.

If all events pass, the test passes. If one event fails, the test fails.

7.5.2.1.4.3 Message contents

Message contents are according to TS 38.508-1 [14] clause 4.6 with the following exceptions:

Table 7.5.2.1.4.3-1: Common Exception messages

Default Message Contents	
Common contents of system information blocks exceptions	
Specific message contents exceptions for Test Configuration 7.5.2.1-1	Table 7.3.1-3a in TS 38.508-1 [14] with condition SSB.1 FR2
Default RRC messages and information elements contents exceptions	Table H.3.1-1; Table H.3.1-2 with Condition Deactivated SCell; Table H.3.1-3 with Condition Deactivated SCell, SSB.1 FR2 and SMTC.1; Table H.3.1-4 with A3-offset = -6dB; Table H.3.1-7 with Condition Deactivated SCell;

7.5.2.1.5 Test requirement

Table 7.5.2.1.5-1 and Table 7.5.2.1.5-2 define the primary level settings including test tolerances for FR2 interruptions during measurements on deactivated NR SCC.

Table 7.5.2.1.5-1: NR cell specific test parameters for NR SA FR2 interruptions during measurements on deactivated NR SCC

Parameter		Unit	Cell1	Cell2
Frequency Range			FR2	
Duplex mode			TDD	
TDD configuration			TDDConf.3.1	
$BW_{channel}$			100 MHz: $N_{RB,c}$ = 66	
Data RBs allocated			66	
Initial DL BWP Configuration			DLBWP.0.2 Note4	
Initial UL BWP Configuration			ULBWP.0.2 Note6	
Downlink dedicated BWP Configuration			DLBWP.1.1	
Uplink dedicated BWP configuration			ULBWP.1.1	
PDSCH Reference measurement channel			SR.3.1 TDD	
RMSI CORESET parameters			CR.3.1 TDD	

Dedicated CORESET parameters			CCR.3.1 TDD	
OCNG Patterns			OP.1	
SMTC Configuration			SMTC.1	
SSB Configuration			SSB.1 FR2	
TCI State			TCI.State.0	
TRS Configuration			TRS.2.1 TDD	
Correlation Matrix and Antenna Configuration			1x2 Low	
EPRE ratio of PSS to SSS		dB	0	0
EPRE ratio of PBCH DMRS to SSS				
EPRE ratio of PBCH to PBCH DMRS				
EPRE ratio of PDCCH DMRS to SSS				
EPRE ratio of PDCCH to PDCCH DMRS				
EPRE ratio of PDSCH DMRS to SSS				
EPRE ratio of PDSCH to PDSCH				
EPRE ratio of OCNG DMRS to SSS(Note 1)				
EPRE ratio of OCNG to OCNG DMRS (Note 1)				
Time offset to Cell1 Note 3		µs	-	3
Propagation Condition			AWGN	

Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.
Note 2: Void
Note 3: Receive time difference between slot boundaries of signals received from the two cells at the UE antenna connector including time alignment error between the two cells.
Note 4: For unpaired spectrum, a DL BWP is linked with an UL BWP. DLBWP.0.2 is linked with ULBWP.0.2 defined in clause 12 of TS 38.213 [3].

Table 7.5.2.1.5-2: NR cell specific OTA related test parameters for NR SA FR2 interruptions during measurements on deactivated NR SCC

Parameter		Unit	Cell 1	Cell 2
Angle of arrival configuration			Setup1 according to table A.9	Setup 1according to table A.9
Assumption for UE beams Note 6			Rough	Rough
N_{oc} Note1	NR_TDD_FR2_A	dBm/15kHz	-104.7	-104.7
	NR_TDD_FR2_B			
	NR_TDD_FR2_F			
	NR_TDD_FR2_G			
	NR_TDD_FR2_T			
	NR_TDD_FR2_Y			
N_{oc} Note1	NR_TDD_FR2_A	dBm/SCS	-95.7	-95.7
	NR_TDD_FR2_B			
	NR_TDD_FR2_F			
	NR_TDD_FR2_G			
	NR_TDD_FR2_T			
	NR_TDD_FR2_Y			
SSB_RPNote2	NR_TDD_FR2_A	dBm/120KHz Note3	-88.7	-88.7
	NR_TDD_FR2_B			
	NR_TDD_FR2_F			
	NR_TDD_FR2_G			
	NR_TDD_FR2_T			
	NR_TDD_FR2_Y			
$\hat{E}_s / N_{oc}$		dB	7	7
$\hat{E}_s / I_{ot}$		dB	7	7

Io[Note2]	NR_TDD_FR2_A	dBm/95.04 MHz [Note4]	-58.92	-58.92
	NR_TDD_FR2_B			
	NR_TDD_FR2_F			
	NR_TDD_FR2_G			
	NR_TDD_FR2_T			
	NR_TDD_FR2_Y			

Note 1: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for N_{oc} to be fulfilled.
Note 2: SSB_RP and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.
Note 3: SSB_RP minimum requirements are specified assuming independent interference and noise at each receiver antenna port.
Note 4: Equivalent power received by an antenna with 0 dBi gain at the centre of the quiet zone
Note 5: As observed with 0 dBi gain antenna at the centre of the quiet zone
Note 6: Information about types of UE beam is given in 38.133 [6] clause B.2.1.3 and does not limit UE implementation or test system implementation.

The UE shall be continuously scheduled on PCell during the entire length of T1. During the time duration T1 the UE shall transmit at least 99.5% of ACK/NACK on PCell.

If the NR PCell is not in the same band as the deactivated SCell, the UE is only allowed to cause interruptions on NR PCell immediately before and immediately after an SMTC. Each interruption on NR PCell shall not exceed the value defined in Table 7.5.2.1.5-3.

If the NR PCell is in the same band as the deactivated SCell, the UE is only allowed to cause an interruption on PCell no earlier than 4 slots before an SMTC and no later than 4 slots after the SMTC. the interruption on NR PCell shall not exceed the value defined in Table 7.5.2.1.5-4.

Table 7.5.2.1.5-3: Interruption duration if the NR PSCell is not in the same band as the deactivated SCell

μ	NR Slot length (ms)	Interruption length (slot)
3	0.125	4

Table 7.5.2.1.5-4: Interruption duration if the NR PSCell is in the same band as the deactivated SCell

μ	NR Slot length (ms)	Interruption length (slot)
3	0.125	8 + SMTC duration

The rate of correct events observed during repeated tests shall be at least 90%.

7.5.3 SCell activation and deactivation delay

7.5.3.0 Minimum conformance requirements

7.5.3.0.1 Minimum conformance requirements for SCell activation delay for deactivated SCell

Upon receiving SCell activation command in slot *n*, the UE shall be capable to transmit valid CSI report and apply actions related to the activation command for the SCell being activated no later than in slot $n + \frac{T_{HARQ}+T_{activation_time}+T_{CSI_Reporting}}{NR\ slot\ length}$, where:

T_{HARQ} (in ms) is the timing between DL data transmission and acknowledgement as specified in TS 38.213 [8]

$T_{activation_time}$ is the SCell activation delay in millisecond.

If the SCell is known and belongs to FR1, $T_{activation_time}$ is:

- $T_{FirstSSB}$+ 5ms, if the SCell measurement cycle is equal to or smaller than 160ms.
- $T_{FirstSSB_MAX} + T_{rs}$ + 5ms, if the SCell measurement cycle is larger than 160ms.

If the SCell is unknown and belongs to FR1, provided that the side condition $\hat{E}s/Iot \geq$ -2 dB is fulfilled, $T_{activation_time}$ is:

- $T_{FirstSSB_MAX} + T_{SMTC_MAX} + 2*T_{rs}$ + 5ms.

If the SCell being activated belongs to FR2 and if there is at least one active serving cell on that FR2 band, then $T_{activation_time}$ is $T_{FirstSSB}$+ 5ms provided:

- The UE is provided with SMTC for the target SCell, and
- The SSBs in the serving cell(s) and the SSBs in the SCell fulfil the condition defined in TS 38.133 [6] clause 3.6.3,
- The parameter *ssb-PositionsInBurst* is same for the serving cell(s) and the SCell.

If the SCell being activated belongs to FR2 and if there is at least one active serving cell on that FR2 band, if the UE is not provided with any SMTC for the target SCell, $T_{activation_time}$ is 3 ms, provided

- the RS (s) of SCell being activated is (are) QCL-TypeD with RS (s) of one active serving cell on that FR2 band.

If the SCell being activated belongs to FR2 and if there is no active serving cell on that FR2 band provided that PCell or PSCell is FR1 or in FR2:

If the target SCell is known to UE and semi-persistent CSI-RS is used for CSI reporting, then $T_{activation_time}$ is:

- 3ms + max($T_{uncertainty_MAC} + T_{FineTiming}$ + 2ms, $T_{uncertainty_SP}$), where $T_{uncertainty_MAC}$=0 and $T_{uncertainty_SP}$=0 if UE receives the SCell activation command, semi-persistent CSI-RS activation command and TCI state activation command at the same time.

If the target SCell is known to UE and periodic CSI-RS is used for CSI reporting, then $T_{activation_time}$ is:

- max ($T_{uncertainty_MAC}$ + 5ms + $T_{FineTiming}$, $T_{uncertainty_RRC} + T_{RRC_delay}$-$T_{HARQ}$), where $T_{uncertainty_MAC}$=0 if UE receives the SCell activation command and TCI state activation commands at the same time.

If the PCell/PSCell and the target SCell are in a band pair with independent beam management and the target SCell is unknown to UE and semi-persistent CSI-RS is used for CSI reporting, provided that the side condition $\hat{E}s/Iot \geq$ -2dB is fulfilled, then $T_{activation_time}$ is:

- 6ms + $T_{FirstSSB_MAX}$ + 15*T_{SMTC_MAX} + 8*T_{rs} + $T_{L1\text{-}RSRP,\ measure}$ + $T_{L1\text{-}RSRP,\ report}$ + T_{HARQ} + max($T_{uncertainty_MAC}$ + $T_{FineTiming}$ + 2ms, $T_{uncertainty_SP}$).

If the PCell/PSCell and the target SCell are in a band pair with independent beam management and the target SCell is unknown to UE and periodic CSI-RS is used for CSI reporting, provided that the side condition $\hat{E}s/Iot \geq$ -2dB is fulfilled, then $T_{activation_time}$ is:

- 3ms + $T_{FirstSSB_MAX}$ + 15*T_{SMTC_MAX} + 8*T_{rs} + $T_{L1\text{-}RSRP,\ measure}$ + $T_{L1\text{-}RSRP,\ report}$ + {(T_{HARQ} + $T_{uncertainty_MAC}$ + 5ms + $T_{FineTiming}$), ($T_{uncertainty_RRC}$ + T_{RRC_delay})}.

Where,

T_{SMTC_MAX}:

- In FR1, in case of intra-band SCell activation, T_{SMTC_MAX} is the longer SMTC periodicity between active serving cells and SCell being activated provided the cell specific reference signals from the active serving cells and the SCells being activated or released are available in the same slot; in case of inter-band SCell activation, T_{SMTC_MAX} is the SMTC periodicity of SCell being activated.
- In FR2, T_{SMTC_MAX} is the longer SMTC periodicity between active serving cells and SCell being activated provided that in Rel-15 only support FR2 intra-band CA.

- T_{SMTC_MAX} is bounded to a minimum value of 10ms.

T_{rs} is the SMTC periodicity of the SCell being activated if the UE has been provided with an SMTC configuration for the SCell in SCell addition message, otherwise T_{rs} is the SMTC configured in the measObjectNR having the same SSB frequency and subcarrier spacing. If the UE is not provided SMTC configuration or measurement object on this frequency, the requirement which involves T_{rs} is applied with T_{rs} = 5ms assuming the SSB transmission periodicity is 5ms. There are no requirements if the SSB transmission periodicity is not 5ms

$T_{FirstSSB}$: is the time to the end of the first completed SSB burst indicated by the SMTC after slot n + $\frac{T_{HARQ}+3ms}{NR\ slot\ length}$

$T_{FirstSSB_MAX}$: Is the time to the end of the first completed SSB burst indicated by the SMTC after slot n + $\frac{T_{HARQ}+3ms}{NR\ slot\ length}$, further fulfilling:

- In FR1, in case of intra-band SCell activation, the occasion when all active serving cells and SCells being activated or released are transmitting SSB bursts in the same slot; in case of inter-band SCell activation, the first occasion when the SCell being activated is transmitting SSB burst.

- In FR2, the occasion when all active serving cells and SCells being activated or released are transmitting SSB bursts in the same slot.

$T_{FineTiming}$ is the time period between UE finish processing the last activation command for PDCCH TCI, PDSCH TCI (when applicable) and semi-persistent CSI-RS (when applicable) and the timing of first complete available SSB corresponding to the TCI state.

$T_{L1\text{-}RSRP,\ measure}$ is L1-RSRP measurement delay $T_{L1\text{-}RSRP_Measurement_Period_SSB}$ (ms) or $T_{L1\text{-}RSRP_Measurement_Period_CSI\text{-}RS}$ based on applicability as defined in TS 38.133 [6] clause 9.5 assuming M=1.

$T_{L1\text{-}RSRP,\ report}$ is delay of acquiring CSI reporting resources.

$T_{uncertainty_MAC}$ is the time period between reception of the last activation command for PDCCH TCI, PDSCH TCI (when applicable) and semi-persistent CSI-RS for CQI reporting (when applicable) relative to

- SCell activation command for known case;

- First valid L1-RSRP reporting for unknown case.

$T_{uncertainty_RRC}$ is the time period between reception of the RRC configuration message for TCI of periodic CSI-RS for CQI reporting (when applicable) relative to

- SCell activation command for known case;

- First valid L1-RSRP reporting for unknown case.

T_{RRC_delay} is the RRC procedure delay as specified in TS 38.331 [13].

Longer dekays for RRM measurement requirements, and in case of FR2 also SSB based RLM/BFD/CBD/L1-RSRP measurement requirements, can be expected during the cell detection time for unknown SCell activation.

$T_{CSI_reporting}$ is the delay (in ms) including uncertainty in acquiring the first available downlink CSI reference resource, UE processing time for CSI reporting and uncertainty in acquiring the first available CSI reporting resources as specified in TS 38.331 [13].

SCell in FR1 is known if it has been meeting the following conditions:

- During the period equal to max (5*measCycleSCell, 5*DRX cycles) for FR1 before the reception of the SCell activation command:

  - the UE has sent a valid measurement report for the SCell being activated and

  - the SSB measured remains detectable according to the cell identification conditions specified in TS 38.133 [6] clause 9.2 and 9.3.

- the SSB measured during the period equal to max (5*measCycleSCell, 5*DRX cycles) also remains detectable during the SCell activation delay according to the cell identification conditions specified in TS 38.133 [6] clause 9.2 and 9.3.

Otherwise SCell in FR1 is unknown.

For the first SCell activation in FR2 bands, the SCell is known if it has been meeting the following conditions:

- During the period equal to 4s for UE supporting power class1 and 3s for UE supporting power class 2/3/4 before UE receives the last activation command for PDCCH TCI, PDSCH TCI (when applicable) and semi-persistent CSI-RS for CQI reporting (when applicable):
  - the UE has sent a valid L3-RSRP measurement report with SSB index
  - SCell activation command is received after L3-RSRP reporting and no later than the time when UE receives MAC-CE command for TCI activation
- During the period from L3-RSRP reporting to the valid CQI reporting, the reported SSBs with indexes remain detectable according to the cell identification conditions specified in TS 38.133 [6] clauses 9.2 and 9.3, and the TCI state is selected based on one of the latest reported SSB indexes.

Otherwise, the first SCell in FR2 band is unknown. The requirement for unknown SCell applies provided that the activation commands for PDCCH TCI, PDSCH TCI (when applicable), semi-persistent CSI-RS for CQI reporting (when applicable), and configuration message for TCI of periodic CSI-RS for CQI reporting (when applicable) are based on the latest valid L1-RSRP reporting.

If the UE has been provided with higher layer in TS 38.331 [13] signalling of *smtc2* prior to the activation command, T_{SMTC_Scell} follows *smtc1* or *smtc2* according to the physical cell ID of the target cell being activated. T_{SMTC_MAX} follows *smtc1* or *smtc2* according to the physical cell IDs of the target cells being activated and the active serving cells.

In addition to CSI reporting defined above, UE shall also apply other actions related to the activation command specified in TS 38.331 [13] for a SCell at the first opportunities for the corresponding actions once the SCell is activated.

The interruption on PSCell or any activated SCell in SCG for EN-DC mode specified in TS 38.133 [6] clause 8.2 shall not occur before slot $n+1+\frac{T_{HARQ}}{NR\ slot\ length}$ and not occur after slot $n+1+\frac{T_{HARQ}+3+T_{SMTC_MAX}+T_{SMTC_duration}}{NR\ slot\ length}$.

The interruption on PCell or any activated SCell in MCG for NR standalone mode specified in TS 38.133 [6] clause 8.2 shall not occur before slot $n+1+\frac{T_{HARQ}}{NR\ slot\ length}$ and not occur after slot $n+1+\frac{T_{HARQ}+3+T_{SMTC_MAX}+T_{SMTC_duration}}{NR\ slot\ length}$.

Starting from the slot specified in TS 38.213 [8] clause 4.3 (timing for secondary Cell activation/deactivation) and until the UE has completed the SCell activation, the UE shall report out of range if the UE has available uplink resources to report CQI for the SCell.

Starting from the slot specified in TS 38.213 [8] clause 4.3 (timing for secondary Cell activation/deactivation) and until the UE has completed a first L1-RSRP measurement, the UE shall report lowest valid L1 SS-RSRP range if the UE has available uplink resources to report L1-RSRP for the SCell.

The normative reference for this requirement is TS 38.133 [6] clause 8.3.2.

7.5.3.0.2 Minimum conformance requirements for SCell deactivation delay for activated SCell

Upon receiving SCell deactivation command or upon expiry of the *sCellDeactivationTimer* in slot *n*, the UE shall accomplish the deactivation actions for the SCell being deactivated no later than in slot $n+\frac{T_{HARQ}+3ms}{NR\ slot\ length}$.

The interruption on PSCell or any activated SCell in SCG for EN-DC mode specified in TS 38.133 [6] clause 8.2 shall not occur before slot $n+1+[\frac{T_{HARQ}}{NR\ slot\ length}]$ and not occur after slot $n+1+\frac{T_{HARQ}+3ms}{NR\ slot\ length}$.

The interruption on PCell or any activated SCell in MCG for NR standalone mode specified in TS 38.133 [6] clause 8.2 shall not occur before slot $n+1+[\frac{T_{HARQ}}{NR\ slot\ length}]$ and not occur after slot $n+1+\frac{T_{HARQ}+3ms}{NR\ slot\ length}$.

The normative reference for this requirement is TS 38.133 [6] clause 8.3.3.

7.5.3.1 NR SA FR2-FR2 intra-band SCell activation and deactivation delay

Editor's note: This test case is incomplete. The following aspects are either missing or TBD

- Test procedure
- Connection diagram
- Message contents are not complete.
- TT analysis is missing.
- Test Applicability in TS38.522
- Annex F
- Cell configuration mapping in Annex E

7.5.3.1.1 Test purpose

The purpose of this test is:

- To verify the requirement for the SCell activation and deactivation times are within the requirements specified in TS 38.133 [6] clause 8.3, when the PCell and SCell are is in FR2 intra-band and SCell is known by the UE at the time of activation.

7.5.3.1.2 Test applicability

This test applies to all types of NR UE from Release 15 onwards and supporting 2DL CA.

7.5.3.1.3 Minimum conformance requirements

The minimum conformance requirements are specified in clauses 7.5.3.0.1 and 7.5.3.0.2.

The normative reference for this requirement is TS 38.133 [6] clause A.7.5.3.1.

7.5.3.1.4 Test description

7.5.3.1.4.1 Initial conditions

This test shall be run in one of the configurations defined in Table 7.5.3.1.4.1-1.

Table 7.5.3.1.4.1-1: Supported test configurations for NR SA FR2 SCell activation case

Configuration	Description
7.5.3.1-1	NR 120 kHz SSB SCS, 100MHz bandwidth, TDD duplex mode

Configure the test equipment and the DUT according to the parameters in Table 7.5.3.1.4.1-2.

Table 7.5.3.1.4.1-2: Initial conditions for NR SA FR2 SCell activation case

Parameter	Value		Comment
Test environment	NC		As specified in TS 38.508-1 [14] clause 4.1.
Test frequencies	As specified in Annex E, table E.4-1 and TS 38.508-1 [14] clause 4.3.1.		
Channel bandwidth	As specified by the test configuration selected from Table 7.5.3.1.4.1-1.		
Propagation conditions	AWGN		As specified in Annex C.2.2.
Connection Diagram	TE Part	TBD	As specified in TS 38.508-1 [14] Annex A.
	DUT Part	TBD	
Exceptions to connection diagram	N/A		

1. The general test parameter settings are set up according to Table 7.5.3.1.4.1-3.

2. Message contents are defined in clause 7.5.3.1.4.3.

3. There are two NR carriers and 2 NR Cells specified in the test. Cell 1 is the PCell and Cell 2 is SCell. Cell 1 and Cell 2 are configured according to Annex C.1.1 and C.1.2.

Table 7.5.3.1.4.1-3: General test parameters for NR SA FR2 SCell activation case

Parameter	Unit	Value	Comment
RF Channel Number		1,2	Two NR radio channels are used for this test, cell 1 and cell2 use RF channel 1 and 2, respectively.
Active PCell		Cell 1	Primary cell on NR RF channel number 1.
Configured deactivated SCell		Cell 2	Configured deactivated secondary cell on NR RF channel number 2
CP length		Normal	
DRX		OFF	Continuous monitoring of primary cell
Cell-individual offset for cells on NR channel number	dB	0	Individual offset for cells on primary component carrier.
SCell measurement cycle (measCycleSCell)	ms	160	
Cell2 timing offset to cell1	µs	0	
Time alignment error between cell2 and cell1	µs	≤ Time alignment error as specified in TS 38.104 [28] clause 6.5.3.1.	The value of time alignment error depends upon the type of carrier aggregation.
T1	s	7	During this time the PSCell shall be known and the SCell configured and detected.
T2	s	1	During this time the UE shall activate the SCell.
T3	s	1	During this time the UE shall deactivate the SCell.
T_{HARQ}	slot	k	k is a number of slots and is indicated by the PDSCH-to-HARQ-timing-indicator field in the DCI format, if present, or provided by *dl-DataToUL-ACK*, the value of k should be the minimum value defined in TS 38.213 [8] depends on UE's capability
$T_{CSI_Reporting}$	ms	15	the delay (in ms) including uncertainty in acquiring the first available downlink CSI reference resource, UE processing time for CSI reporting (clause 5.2.2.5 in TS 38.214) and uncertainty in acquiring the first available CSI reporting resources as specified in TS 38.331 [13].

7.5.3.1.4.2 Test procedure

TBD

7.5.3.1.4.3 Message contents

Message contents are according to TS 38.508-1 [14] clause 4.6 with the following exceptions:

Table 7.5.3.1.4.3-1: Common Exception messages

Default Message Contents	
Common contents of system information blocks exceptions	
Default RRC messages and information elements contents exceptions	FFS

7.5.3.1.5 Test requirement

TBD

7.5.3.2 NR SA FR1-FR2 inter-band SCell activation and deactivation delay

Editor's note: This test case is incomplete. The following aspects are either missing or TBD

- Test procedure
- Connection diagram
- Message contents are not complete.
- TT analysis is missing.
- Test Applicability in TS38.522
- Annex F
- Cell configuration mapping in Annex E
- NR FR1 - FR2 OTA testability is still FFS.

7.5.3.2.1 Test purpose

The purpose of this test is:

- To verify the requirement for the SCell activation and deactivation times are within the requirements specified in TS 38.133 [6] clause 8.3, when the PCell is in FR1 and SCell is in FR2 and SCell is known by the UE at the time of activation.

7.5.3.2.2 Test applicability

This test applies to all types of NR UE from Release 15 onwards and supporting 2DL CA.

7.5.3.2.3 Minimum conformance requirements

The minimum conformance requirements are specified in clauses 7.5.3.0.1 and 7.5.3.0.2.

The normative reference for this requirement is TS 38.133 [6] clause A.7.5.3.2.

7.5.3.2.4 Test description

7.5.3.2.4.1 Initial conditions

This test shall be run in one of the configurations defined in Table 7.5.3.2.4.1-1.

Table 7.5.3.2.4.1-1: Supported test configurations for NR SA FR2 SCell activation case

Configuration	Description
7.5.3.2-1	PCell: 15 kHz SSB SCS, 10MHz bandwidth, FDD duplex mode Target SCell: 120 kHz SSB SCS, 100MHz bandwidth, TDD duplex mode
7.5.3.2-2	PCell: 15 kHz SSB SCS, 10MHz bandwidth, TDD duplex mode Target SCell: 120 kHz SSB SCS, 100MHz bandwidth, TDD duplex mode
7.5.3.2-3	PCell: 30kHz SSB SCS, 40MHz bandwidth, TDD duplex mode Target SCell: 120 kHz SSB SCS, 100MHz bandwidth, TDD duplex mode
Note: The UE is only required to pass in one of the supported test configurations	

Configure the test equipment and the DUT according to the parameters in Table 7.5.3.2.4.1-2.

Table 7.5.3.2.4.1-2: Initial conditions for NR SA FR2 SCell activation case

Parameter	Value	Comment
Test environment	NC	As specified in TS 38.508-1 [14] clause 4.1.
Test frequencies	As specified in Annex E, table E.4-1 and TS 38.508-1 [14] clause 4.3.1.	

Channel bandwidth	As specified by the test configuration selected from Table 7.5.3.2.4.1-1.		
Propagation conditions	AWGN		As specified in Annex C.2.2.
Connection Diagram	TE Part	TBD	As specified in TS 38.508-1 [14] Annex A.
	DUT Part	TBD	
Exceptions to connection diagram	N/A		

1. The general test parameter settings are set up according to Table 7.5.3.2.4.1-3.

2. Message contents are defined in clause 7.5.3.2.4.3.

3. There are two NR carriers and 2 NR Cells specified in the test. Cell 1 is the PCell and Cell 2 is SCell. Cell 1 and Cell 2 are configured according to Annex C.1.1 and C.1.2.

Table 7.5.3.2.4.1-3: General test parameters for NR SA FR2 SCell activation case

Parameter	Unit	Value	Comment
RF Channel Number		1,2	Two NR radio channel (1, 2) are used for this test
Active PCell		Cell 1	Primary cell on NR RF channel number 1.
Configured deactivated SCell		Cell 2	Configured deactivated secondary cell on NR RF channel number 2
CP length		Normal	
DRX		OFF	Continuous monitoring of primary cell
Cell-individual offset for cells on NR channel number	dB	0	Individual offset for cells on primary component carrier.
SCell measurement cycle (measCycleSCell)	ms	160	
Cell2 timing offset to cell1	µs	0	
Time alignment error between cell2 and cell1	µs	≤ Time alignment error as specified in TS 38.104 [28] clause 6.5.3.1.	The value of time alignment error depends upon the type of carrier aggregation.
T1	s	7	During this time the PSCell shall be known and the SCell configured and detected.
T2	s	2	During this time the UE shall activate the SCell.
T3	s	1	During this time the UE shall deactivate the SCell.
T_{HARQ}	slot	k	k is a number of slots and is indicated by the PDSCH-to-HARQ-timing-indicator field in the DCI format, if present, or provided by *dl-DataToUL-ACK*, the value of k should be the minimum value defined in TS 38.213 [8] depends on UE's capability
$T_{CSI_Reporting}$	ms	15	the delay (in ms) including uncertainty in acquiring the first available downlink CSI reference resource, UE processing time for CSI reporting (clause 5.2.2.5 in TS 38.214) and uncertainty in acquiring the first available CSI reporting resources as specified in TS 38.331 [13].

7.5.3.2.4.2 Test procedure

TBD

7.5.3.2.4.3 Message contents

Message contents are according to TS 38.508-1 [14] clause 4.6 with the following exceptions:

Table 7.5.3.2.4.3-1: Common Exception messages

Default Message Contents	
Common contents of system information blocks exceptions	
Default RRC messages and information elements contents exceptions	FFS

7.5.3.2.5 Test requirement

TBD

7.5.3.4 Direct SCell activation at SCell addition of known SCell in FR2

Editor's note: This test case is incomplete. The following aspects are either missing or TBD

- Test procedure and test requirement are incomplete
- Connection diagram
- Message contents are not complete.
- TT analysis is missing
- Measurement uncertainty are missing
- Test Applicability in TS38.522 is FFS
- Cell configuration mapping in Annex E
- CSI-RS config is missing

7.5.3.4.1 Test Purpose

The purpose of this test is to verify that the delay and interruption for direct SCell activation delay at SCell addition are within the requirements stated in TS 38.133 [6] clause 8.3.4.

7.5.3.4.2 Test applicability

This test applies to all types of NR UE from Release 15 onwards and supporting 2DL CA.

7.5.3.4.3 Minimum conformance requirements

The minimum conformance requirements are specified in clauses 7.5.3.0.1 and 7.5.3.0.2.

The normative reference for this requirement is TS 38.133 [6] clause A.7.5.3.4.

7.5.3.4.4 Test description

7.5.3.4.4.1 Initial Conditions

This test shall be tested using the test configuration in Table 7.5.3.4.4.1-1.

Table 7.5.3.4.4.1-1: Supported test configurations for NR SA FR2 SCell activation case

Configuration	Description
7.5.3.4-1	NR 120 kHz SSB SCS, 100MHz bandwidth, TDD duplex mode

Configure the test equipment and the DUT according to the parameters in Table 7.5.3.4.4.1-2 and Table 7.5.3.4.4.1-3.

Table 7.5.3.4.4.1-2: Initial conditions for NR SA FR2 SCell activation case

Parameter	Value	Comment
Test environment	NC	As specified in TS 38.508-1 [14] clause 4.1.
Test frequencies	As specified in Annex E, table E.4-1 and TS 38.508-1 [14] clause 4.3.1.	

Channel bandwidth	As specified by the test configuration selected from Table 7.5.3.4.4.1-1.		
Propagation conditions	AWGN		As specified in Annex C.2.2.
Connection Diagram	TE Part	TBD	As specified in TS 38.508-1 [14] Annex A.
	DUT Part	TBD	
Exceptions to connection diagram	N/A		

Table 7.5.3.4.4.1-3: General test parameters for FR2 SCell activation case with FR2 PSCell

Parameter	Unit	Value	Comment
RF Channel Number		1,2	Two NR radio channels (1,2) in FR2 are used for this test
Active PCell		Cell 1	Primary cell on NR RF channel number 1.
Configured and activated SCell		Cell 2	Configured and activated SCell on NR RF channel number 2.
CP length		Normal	
DRX		OFF	Continuous monitoring of primary cell
SCell measurement cycle (measCycleSCell)	ms	160	
T1	s	7	During this time the measurement for Cell 2 is configured, and Cell 2 is detected.
T2	s	Ndirect	During this time the UE shall configure and activate Cell 2 as SCell.
T3	ms	100	During this time the UE shall report valid CQI for both PCell and SCell.
T_{HARQ}	ms	k_1*NR slot length	k1 is a number of slots and is indicated by the PDSCH-to-HARQ-timing-indicator field in the DCI format, if present, or provided by dl-DataToUL-ACK, the value of k should be the minimum value defined in TS 38.213 [8]
k	ms	$k_1 + 3 \cdot N_{\text{slot}}^{\text{subframe},\ \mu} + 1$	As specified in clause 4.3 of TS38.213 [8]

1.The general test parameter settings are set up according to Table 7.5.3.4.4.1-3.

2. Message contents are defined in clause 7.5.3.4.4.3.

3. There are 2 NR Cells specified in the test. Cell 1 is the PCell and Cell 2 is SCell. Cell 1 and Cell 2 are configured according to Annex C.1.1 and C.1.2.

7.5.3.4.4.2 Test Procedure

TBD

7.5.3.4.4.3 Message contents

Message contents are according to TS 38.508-1 [14] clause 4.6 with the following exceptions:

Table 7.5.3.4.4.3-1: Common Exception messages

Default Message Contents	
Common contents of system information blocks exceptions	
Default RRC messages and information elements contents exceptions	FFS

7.5.3.4.5 Test requirement

Table 7.5.3.4.5-1 defines the cell specific test parameters and Table 7.5.3.4.5-2 defines OTA related test parameters.

Table 7.5.3.4.5-1: Cell specific test parameters for FR2 SCell activation case with FR2 PCell

Parameter		Unit	Cell 1			Cell 2		
			T1	T2	T3	T1	T2	T3
SSB ARFCN			freq1			freq2		
Duplex mode	Config 1		TDD					
TDD configuration	Config 1		TDDConf.3.1					
$BW_{channel}$	Config 1	MHz	100: $N_{RB,c}$ = 66					
DL initial BWP configuration	Config 1		DLBWP.0.1					
DL dedicated BWP configuration	Config 1		DLBWP.1.1					
UL initial BWP configuration	Config 1		ULBWP.0.1					
UL dedicated BWP configuration	Config 1		ULBWP.1.1					
Timing offset to Cell 1		ms	Not Applicable			0		
PDSCH Reference measurement channel	Config 1		SR.3.1 TDD			SR.3.1 TDD		
RMSI CORESET Reference Channel	Config 1		CR.3.1 TDD			CR.3.1 TDD		
RMC CORESET Reference Channel	Config 1		CCR.3.1 TDD			CCR.3.1 TDD		
TRS configuration	Config 1		TRS.2.1 TDD			TRS.2.1 TDD		
CSI-RS configuration	Config 1		CSI-RS.3.1 TDD			CSI-RS.3.1 TDD		
CSI reporting periodicity	Config 1	ms	5			5		
OCNG Patterns			OP.1					
SMTC configuration			SMTC.1					
SSB configuration	Config 1		SSB.1 FR2			SSB.1 FR2		
EPRE ratio of PSS to SSS		dB	0					
EPRE ratio of PBCH DMRS to SSS								
EPRE ratio of PBCH to PBCH DMRS								
EPRE ratio of PDCCH DMRS to SSS								
EPRE ratio of PDCCH to PDCCH DMRS								
EPRE ratio of PDSCH DMRS to SSS								
EPRE ratio of PDSCH to PDSCH								
EPRE ratio of OCNG DMRS to SSS(Note 1)								
EPRE ratio of OCNG to OCNG DMRS (Note 1)								
Propagation condition		-	AWGN					
Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.								

Table 7.5.3.4.5-2: OTA related test parameters for FR2 SCell activation case with FR2 PSCell

Parameter[Note 6]	Unit	Cell 1			Cell 2		
		T1	T2	T3	T1	T2	T3
Angle of arrival configuration		Setup 1 according to A.3.15.1					
Assumption for UE beams[Note 7]		Rough			Rough		
N_{oc} [Note1]	dBm/15kHz[Note4]	-112			-112		
N_{oc} [Note1]	dBm/SCS[Note 3]	-102.97			-102.97		
$\hat{E}_s / N_{oc}$	dB	14			14		

SS-RSRP Note2	dBm/SCS Note4	-88.97	-88.97
$\hat{E}_s/I_{ot}$	dB	14	14
Io Note2	dBm/95.04 MHz Note4	-59.81	-59.81

Note 1: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for N_{oc} to be fulfilled.
Note 2: SS-RSRP and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.
Note 3: SS-RSRP minimum requirements are specified assuming independent interference and noise at each receiver antenna port.
Note 4: Equivalent power received by an antenna with 0dBi gain at the centre of the quiet zone
Note 5: As observed with 0dBi gain antenna at the centre of the quiet zone
Note 6: All parameters apply for configuration 1
Note 7: Information about types of UE beam is given in B.2.1.3, and does not limit UE implementation or test system implementation

7.5.3.5 Direct SCell activation at handover with known SCell in FR2

Editor's note: This test case is incomplete. The following aspects are either missing or TBD

- Test procedure and test requirements are incomplete
- Connection diagram
- Message contents are not complete.
- TT analysis is missing
- Measurement uncertainty are missing
- Test Applicability in TS38.522 is FFS
- CSI-RS config is missing
- Cell configuration mapping in Annex E

7.5.3.5.1 Test Purpose

This test is to verify the requirements specified in TS 38.133 [6] sub clause 8.3.5 for the FR2 handover with direct SCell activation.

7.5.3.5.2 Test applicability

This test applies to all types of NR UE from Release 15 onwards and supporting 2DL CA.

7.5.3.5.3 Minimum conformance requirements

The minimum conformance requirements are specified in clauses 7.5.3.0.1 and 7.5.3.0.2.

The normative reference for this requirement is TS 38.133 [6] clause A.7.5.3.5.

7.5.3.5.4 Test description

7.5.3.5.4.1 Initial Conditions

This test shall be tested using the test configuration in Table 7.5.3.5.4.1-1.

Table 7.5.3.5.4.1-1: Supported test configurations for FR2 handover with direct SCell activation case

Configuration	Description
7.5.3.5-1	SCell: NR 120 kHz SSB SCS, 100MHz bandwidth, TDD duplex mode Source cell: NR 120 kHz SSB SCS, 100 MHz bandwidth, TDD duplex mode Target cell: NR 120 kHz SSB SCS, 100 MHz bandwidth, TDD duplex mode

Configure the test equipment and the DUT according to the parameters in Table 7.5.3.5.4.1-2 and Table 7.5.3.5.4.1-3.

Table 7.5.3.5.4.1-2: Initial conditions for NR SA FR2 SCell activation case

Parameter	Value		Comment
Test environment	NC		As specified in TS 38.508-1 [14] clause 4.1.
Test frequencies	As specified in Annex E, table E.4-1 and TS 38.508-1 [14] clause 4.3.1.		
Channel bandwidth	As specified by the test configuration selected from Table 7.5.3.5.4.1-1.		
Propagation conditions	AWGN		As specified in Annex C.2.2.
Connection Diagram	TE Part	TBD	As specified in TS 38.508-1 [14] Annex A.
	DUT Part	TBD	
Exceptions to connection diagram	N/A		

Table 7.5.3.5.4.1-3: General test parameters for FR2 handover with direct SCell activation case

Parameter		Unit	Value	Comment
RF Channel Number			1, 2, 3	Three NR radio channels are used for this test, Cell 1, Cell2 and Cell 3 use RF channel 1, 2 and 3 respectively.
A4-Offset		dBm	-120	
Time offset between cells			3 μs	Synchronous cells
Initial conditions	Source cell		Cell 1	Source Cell
	Target cell		Cell 2	Neighbour cell
	SCell		Cell 3	SCell is not added and activated
Final condition	Source cell		Cell 2	Cell 2 is Source cell after handover
	Neighbour cell		Cell 1	Neighbour cell
	SCell		Cell 3	SCell is added and activated

1.The general test parameter settings are set up according to Table 7.5.3.5.4.1-3.

2. Message contents are defined in clause 7.5.3.5.4.3.

3. There are 3 NR Cells specified in the test. Cell 1 is the PCell and Cell 2 is SCell. Cell 1 and Cell 2 are configured according to Annex C.1.1 and C.1.2.

7.5.3.5.4.2 Test procedure

TBD

7.5.3.5.4.3 Message contents

Message contents are according to TS 38.508-1 [14] clause 4.6 with the following exceptions:

Table 7.5.3.5.4.3-1: Common Exception messages

Default Message Contents	
Common contents of system information blocks exceptions	
Default RRC messages and information elements contents exceptions	FFS

7.5.3.5.5 Test requirement

Table 7.5.3.5.5-1 defines the cell specific test parameters and Table 7.5.3.5.5-2 defines OTA related test parameters.

Table 7.5.3.5.5-1: Cell specific test parameters for FR2 SCell activation case with FR2 PCell

Parameter[Note 5]	Unit	T1			T2			T3		
		Cell 1	Cell 2	Cell 3	Cell 1	Cell 2	Cell 3	Cell 1	Cell 2	Cell 3
SSB ARFCN		freq1	freq2	freq 3	freq1	freq2	freq 3	freq1	freq2	freq3
Duplex mode		TDD			TDD			TDD		
TDD configuration		TDDConf.3.1			TDDConf.3.1			TDDConf.3.1		
Downlink initial BWP Configuration		DLBWP.0.1			DLBWP.0.1			DLBWP.0.1		
Downlink dedicated BWP Configuration		DLBWP.1.1			DLBWP.1.1			DLBWP.1.1		
Uplink initial BWP configuration		ULBWP.0.1			ULBWP.0.1			ULBWP.0.1		
Uplink dedicated BWP configuration		ULBWP.1.1			ULBWP.1.1			ULBWP.1.1		
TRS configuration		TRS.2.1 TDD			TRS.2.1 TDD			TRS.2.1 TDD		
TCI state		TCI.State.0			TCI.State.0			TCI.State.0		
$BW_{channel}$	MHz	100: $N_{RB,c}$ = 66			100: $N_{RB,c}$ = 66			100: $N_{RB,c}$ = 66		
PDSCH Reference measurement channel		SR.3.1 TDD		-	SR.3.1 TDD		-	SR.3.1 TDD		
RMSI CORESET Parameters		CR.3.1 TDD		-	CR.3.1 TDD		-	CR.3.1 TDD		
Dedicated CORESET Parameters		CCR.3.1 TDD		-	CCR.3.1 TDD		-	CCR.3.1 TDD		
OCNG Patterns		OP.1								
SSB Configuration		SSB.1 FR2								
SMTC Configuration		SMTC.1								
PRACH configuration		FR2 PRACH configuration 1								
EPRE ratio of PSS to SSS	dB	0								
EPRE ratio of PBCH_DMRS to SSS										
EPRE ratio of PBCH to PBCH_DMRS										
EPRE ratio of PDCCH_DMRS to SSS										
EPRE ratio of PDCCH to PDCCH_DMRS										
EPRE ratio of PDSCH_DMRS to SSS										
EPRE ratio of PDSCH to PDSCH_DMRS										
EPRE ratio of OCNG DMRS to SSS[Note 1]										
EPRE ratio of OCNG to OCNG DMRS [Note 1]										
Propagation conditions		AWGN								

Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.

Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for N_{oc} to be fulfilled.

Note 3: SS-RSRP and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.

Note 4: SS-RSRP minimum requirements are specified assuming independent interference and noise at each receiver antenna port.

Note 5: Void

Table 7.5.3.5.5-2: OTA related test parameters for FR2 SCell activation case with FR2 PSCell

Parameter[Note 6]	Unit	Cell 1			Cell 2		
		T1	T2	T3	T1	T2	T3
Angle of arrival configuration		Setup 1 according to A.3.15.1					
Assumption for UE beams[Note 7]		Rough			Rough		
N_{oc} [Note1]	dBm/15kHz[Note4]	-112			-112		

N_{oc} Note1	dBm/SCS Note 3	-102.97	-102.97
$\hat{E}_s / N_{oc}$	dB	14	14
SS-RSRP Note2	dBm/SCS Note4	-88.97	-88.97
$\hat{E}_s / I_{ot}$	dB	14	14
Io Note2	dBm/95.04 MHz Note4	-59.81	-59.81

Note 1: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for N_{oc} to be fulfilled.
Note 2: SS-RSRP and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.
Note 3: SS-RSRP minimum requirements are specified assuming independent interference and noise at each receiver antenna port.
Note 4: Equivalent power received by an antenna with 0dBi gain at the centre of the quiet zone
Note 5: As observed with 0dBi gain antenna at the centre of the quiet zone
Note 6: All parameters apply for configuration 1
Note 7: Information about types of UE beam is given in B.2.1.3, and does not limit UE implementation or test system implementation

7.5.4 Void

7.5.5 Link recovery procedures

7.5.5.0 Minimum conformance requirements

7.5.5.0.1 Minimum conformance requirements for SSB-based BFD and link recovery procedures

Same as in the clause 5.5.5.0.1.

7.5.5.0.2 Minimum conformance requirements for CSI-RS-based BFD and link recovery procedures

Same as in the clause 5.5.5.0.2.

7.5.5.0.3 Scheduling availability of UE during beam failure detection and candidate beam detection

Same as in the clause 5.5.5.0.3.

7.5.5.0.4 Requirements for Beam Failure Recovery in SCell

Same as in the clause 5.5.5.0.4.

7.5.5.1 NR SA FR2 SSB-based beam failure detection and link recovery in non-DRX

Editor's Note: This test case is complete for the following configurations:

- Test frequency f ≤ 40.8 GHz
- UE PC3

This test case is incomplete for Test frequency f > 40.8 GHz

This test case is incomplete for UE power class other than PC3.

7.5.5.1.1 Test purpose

The purpose of this test is to verify that the UE properly detects SSB-based beam failure in the set q_0 configured for a serving cell and that the UE performs correct SSB-based link recovery based on beam candidate set q_1, and to test the downlink monitoring for beam failure detection within the UEs active DL BWP, during the evaluation period, and link

recovery, when no DRX is used. This test will partly verify the SSB based beam failure detection and link recovery for an FR2 serving cell requirements in TS 38.133 [6] clause 8.5.

7.5.5.1.2 Test applicability

This test applies to all types of NR UE release 15 onwards.

7.5.5.1.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 7.5.5.0.1.

The normative reference for this requirement is TS 38.133 [6] clause A.7.5.5.1.

7.5.5.1.4 Test description

There is one NR serving cell configured in this test. This test consists of five successive time periods, with time duration of T1, T2, T3, T4 and T5 respectively. Figure 7.5.5.1.4-1 shows the five different time durations and the corresponding variation of the downlink SNR in the active cell to emulate SSB based beam failure. Figure 7.5.5.1.4-1 additionally shows the variation of the downlink L1-RSRP of the SSB in set q_1 of the candidate beam used for link recovery.

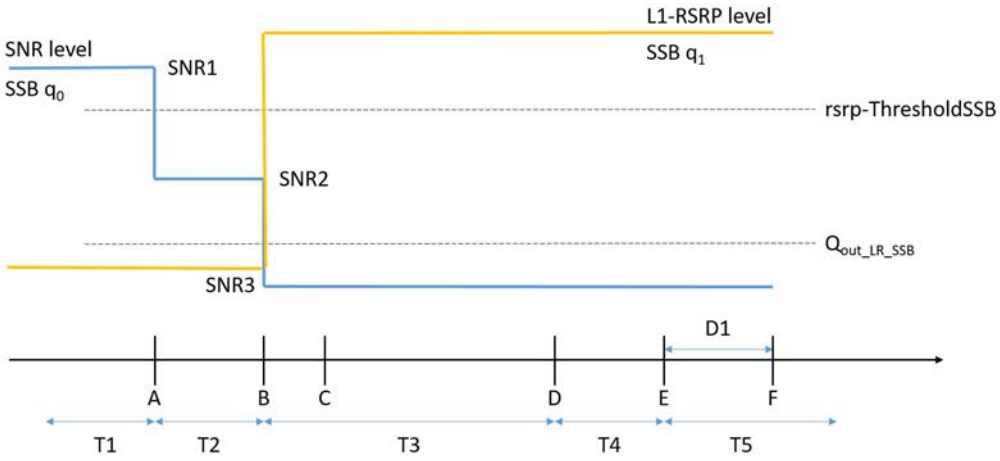


Figure 7.5.5.1.4-1: SNR and L1-RSRP variation for NR SA FR2 SSB-based beam failure detection and link recovery in non-DRX

7.5.5.1.4.1 Initial conditions

This test shall be tested using any of the test configurations in Table 7.5.5.1.4.1-1.

Table 7.5.5.1.4.1-1: Supported test configurations for NR SA FR2 SSB-based beam failure detection and link recovery in non-DRX

Configuration	Description
7.5.5.1-1	TDD duplex mode, 120 kHz SSB SCS, 100 MHz bandwidth
7.5.5.1-2	TDD duplex mode, 240 kHz SSB SCS, 100 MHz bandwidth
Note: The UE is only required to pass in one of the supported test configurations in FR2	

Configure the test equipment and the DUT according to the parameters in Table 7.5.5.1.4.1-2.

Table 7.5.5.1.4.1-2: Initial conditions for NR SA FR2 SSB-based beam failure detection and link recovery in non-DRX

Parameter	Value	Comment
Test environment	NC	As specified in TS 38.508-1 [14] clause 4.1.
Test frequencies	As specified in Annex E, table E.5-1 and TS 38.508-1 [14] clause 4.3.1 and 4.4.2.	

Channel bandwidth	As specified by the test configuration selected from Table 7.5.5.1.4.1-1.		
Propagation conditions	AWGN		As specified in Annex C.2.2.
Connection Diagram	TE Part	A.3.3.1.1	As specified in TS 38.508-1 [14] Annex A.
	DUT Part	A.3.4.1.1	
Exceptions to connection diagram	N/A		

1. The general test parameter settings are set up according to Table 7.5.5.1.4.1-3. The measurement gap configuration is according to Table 7.5.5.1.4.1-4.

2. Message contents are defined in clause 7.5.5.1.4.3.

3. There is one NR carrier and one NR cells specified in the test. Cell 1 is the NR cell used for connection setup with the power level set according to Annex C.1.1 and C.1.2 for this test.

Table 7.5.5.1.4.1-3: General test parameters for NR SA FR2 SSB-based beam failure detection and link recovery in non-DRX

Parameter		Test Config.	Unit	Value	Comment
				Test 1	
Active PCell		1-2		Cell 1	
RF Channel Number		1-2		1	
Duplex mode		1-2		TDD	
TDD Configuration		1-2		TDDConf.3.1	Table A.1.5-3
$BW_{channel}$		1-2	MHz	100: $N_{RB,c}$ = 66	
Data RBs allocated		1-2		66	
PDSCH/PDCCH subcarrier spacing		1-2	kHz	120	
DL initial BWP configuration		1-2		DLBWP.0.1	Table A.8.1-1
DL dedicated BWP configuration		1-2		DLBWP.1.1	Table A.8.1-2
UL initial BWP configuration		1-2		ULBWP.0.1	Table A.8.2-1
UL dedicated BWP configuration		1-2		ULBWP.1.1	Table A.8.2-2
PDSCH Reference Channel		1		SR.3.2 TDD	Table A.1.1.2-3
		2		SR.3.3 TDD	
RMSI CORESET Reference Channel		1		CR.3.1 TDD	Table A.1.2.2-3
		2		CR.3.2 TDD	
Dedicated CORESET Reference Channel		1		CCR.3.1 TDD	Table A.1.3.2-3
		2		CCR.3.7 TDD	
OCNG parameters		1-2		OP.1	Table A.2.1-1
CP length		1-2		Normal	
PDSCH/PDCCH TCI state		1-2		TCI.State.0	Table A.10.2-1
CSI-RS for tracking		1-2		TRS.2.1 TDD	Table A.1.4A.2.1-1
SSB Configuration		1		SSB.1 FR2	Table A.3.2-1
		2		SSB.2 FR2	
SMTC Configuration		1-2		SMTC.3	Table A.4-1
PRACH Configuration		1-2		PRACH.2 FR2	Table A.7.2-1
DRX configuration		1-2		OFF	
SSB index assigned as BFD RS (q_0)		1-2		0	
SSB index assigned as CBD RS (q_1)		1-2		1	
SSB index assigned as RLM RS		1-2		0,1	
Beam failure detection transmission parameters	DCI format	1-2		1-0	
	Number of Control OFDM symbols	1-2		2	
	Aggregation level	1-2	CCE	8	
	Ratio of hypothetical PDCCH RE energy to average SSS RE energy	1-2	dB	0	
	Ratio of hypothetical PDCCH DMRS energy to average SSS RE energy	1-2	dB	0	
	DMRS precoder granularity	1-2		REG bundle size	

	REG bundle size	1-2		6	
Gap pattern ID		1-2		gp0	
gapOffset		1-2	ms	0	
rlmInSyncOutOfSyncThreshold		1-2		absent	Value 0 is applied. (TS 38.133 [6] Table 8.1.1-1).
rsrp-ThresholdSSB		1	dBm/SCS	-109 Note 3	Threshold used for $Q_{in_LR_SSB}$
		2		-106 Note 3	
powerControlOffsetSS		1-2		db0	Used for deriving rsrp-ThresholdCSI-RS
beamFailureInstanceMaxCount		1-2		n1	see TS 38.321 [12], clause 5.17
beamFailureDetectionTimer		1-2		pbfd4	see TS 38.321 [12], clause 5.17
CSI-RS configuration for CSI reporting		1-2		CSI-RS.3.1 TDD	Table A.1.4.2-3
reportConfigType		1-2		periodic	
reportQuantity		1-2		cri-RI-PMI-CQI	
CSI reporting periodicity		1-2	slot	40	
CSI reporting offset		1-2	slot	4	
T310		1-2	ms	1000	
N310		1-2		2	
T1		1-2	s	1	The UE shall be fully synchronized to cell 1 during T1
T2		1-2	s	2.61	
T3		1-2	s	1.64	
T4		1-2	s	0	
T5		1-2	s	1.01	
D1		1-2	s	0.97	
Note 1: All configurations are assigned to the UE prior to the start of time period T1. Note 2: UE-specific PDCCH is not transmitted after T1 starts. Note 3: Including test tolerance given in Annex F.1.3.2.					

Table 7.5.5.1.4.1-4: Void

7.5.5.1.4.2 Test procedure

Prior to the start of the time duration T1, the UE shall be fully synchronized to NR Cell 1. The UE shall be configured for periodic CSI reporting with a reporting periodicity of 2 ms. In the test, DRX configuration is not enabled. The UE is configured to perform inter-frequency measurements using GP ID #0 (40ms).

1. Ensure the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity *NR*, Connected without release *On* according to TS 38.508-1 [14] clause 4.5.

2. Set the parameters of NR Cell 1 according to T1 in Table 7.5.5.1.5-1. Propagation conditions are set according to Annex C.2.3. T1 starts.

3. When T1 expires the SS shall change the SNR value to T2 as specified in Table 7.5.5.1.5-1. T2 starts.

4. When T2 expires the SS shall change the SNR value to T3 as specified in Table 7.5.5.1.5-1. T3 starts.

5. When T3 expires the SS shall change the SNR value to T4 as specified in Table 7.5.5.1.5-1. T4 starts.

6. When T4 expires the SS shall change the SNR value to T5 as specified in Table 7.5.5.1.5-1. T5 starts.

7. If the SS:

   a) detects uplink power on NR carrier in each slot configured for CQI transmission (according CQI reporting on PUCCH) during the period from time point A to time point B; and

   b) does not detect preamble on a beam associated with candidate beam set q_1 before time point B; and

c) detects preamble on a beam associated with candidate beam set q_1 before time point F (D1 after the start of T5),

the number of successful tests is increased by one Otherwise the number of failed tests is increased by one.

8. When T5 expires the SS shall change the SNR value to T1 as specified in Table 7.5.5.1.5-1.

9. Wait 1s for the UE to re-establish the connection or continue directly to step 10. If the UE re-establishes the connection within 1s continue to step 11. Otherwise continue to step 10.

10. Switch the UE on and off. Ensure the UE is in RRC_CONNECTED with generic procedure parameters Connectivity *NR*, Connected without release *On* according to TS 38.508-1 [14] clause 4.5.

11. Repeat steps 2-10 for until the confidence level according to Tables G.2.3-1 in Annex G clause G.2 is achieved.

7.5.5.1.4.3 Message contents

Message contents are according to TS 38.508-1 [14] clause 7.3 with the following exceptions:

Table 7.5.5.1.4.3-1: Common Exception messages for NR SA FR2 SSB-based beam failure detection and link recovery in non-DRX

Default Message Contents	
Common contents of system information blocks exceptions	
Default RRC messages and information elements contents exceptions	Table H.3.1-2 with condition INTER-FREQ and GAP NEEDED; Table H.3.1-3 with condition INTER-FREQ MO (where ssbFrequency is set to the ARFCN value of carrier centre of High range) Table H.3.1-4 with a3-offset = -6dB; Table H.3.1-6 with condition gapUE and BFD. Table H.3.1-8 with Condition SSB BFD Table H.3.1-10 with Condition SSB Table H.3.1-10A

7.5.5.1.5 Test requirement

Tables 7.5.5.1.4.1-3 and 7.5.5.1.5-1 define the primary level settings including test tolerances for NR SA FR2 SSB-based beam failure detection and link recovery in non-DRX.

Table 7.5.5.1.5-1: NR Cell specific test parameters for NR SA FR2 SSB-based beam failure detection and link recovery in non-DRX

Parameter	Unit	Test 1				
		T1	T2	T3	T4	T5
AoA setup		Setup 1 defined in A.9				
Assumption for UE beams Note 10		Rough				
EPRE ratio of PDCCH DMRS to SSS	dB	0				
EPRE ratio of PDCCH to PDCCH DMRS	dB					
EPRE ratio of PBCH DMRS to SSS	dB					
EPRE ratio of PBCH to PBCH DMRS	dB					
EPRE ratio of PSS to SSS	dB					
EPRE ratio of PDSCH DMRS to SSS	dB					
EPRE ratio of PDSCH to PDSCH DMRS	dB					
EPRE ratio of OCNG DMRS to SSS	dB					
EPRE ratio of OCNG to OCNG DMRS	dB					

SNR_SSB of set q_0	Config 1-2	dB	13.7 Note 11,12	5.7 Note 11,12	-12	-12	-12
SNR_SSB of set q_1	Config 1-2	dB	0.2	0.2	20 Note 12	20 Note 12	20 Note 12
SSB_RP of set q_1	Config 1	dBm/SCS	-104.5	-104.5	-84.7	-84.7	-84.7
	Config 2		-101.5	-101.5	-81.7	-81.7	-81.7
N_{oc}	Config 1	dBm/120 KHz	-104.7				
Propagation condition			TDL-A 30ns 75Hz				

Note 1: OCNG shall be used such that the resources in Cell 1 are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.
Note 2: The uplink resources for CSI reporting are assigned to the UE prior to the start of time period T1.
Note 3: NZP CSI-RS resource set configuration for CSI reporting are assigned to the UE prior to the start of time period T1.
Note 4: Measurement gap configuration is assigned to the UE prior to the start of time period T1.
Note 5: The timers and layer 3 filtering related parameters are configured prior to the start of time period T1.
Note 6: The signal contains PDCCH for UEs other than the device under test as part of OCNG.
Note 7: SNR levels correspond to the signal to noise ratio over the SSS REs.
Note 8: The SNR in time periods T1, T2, T3, T4 and T5 is denoted as SNR1, SNR2 and SNR3 respectively in figure 7.5.5.1.4-1.
Note 9: The SNR values are specified for testing a UE which supports 2RX on at least one band. For testing of a UE hich supports 4RX on all bands, the SNR during T3 is modified as specified in clause D.4.
Note 10: Information about types of UE beam is given in TS 38.133 [6] clause B.2.1.3 and does not limit UE implementation or test system implementation.
Note 11: This value allows up to 1dB degradation from applied SNR to UE baseband
Note 12: Including test tolerance given in Annex F.1.3.2

The UE behaviour during time durations T1, T2, T3, T4 and T5 shall be as follows:

During the time duration T1 and T2, the UE shall transmit uplink signal at least in all subframes configured for CSI transmission on Cell 1.

During the period from time point A to time point B the UE shall transmit uplink signal in Cell 1 in all uplink slots configured for CSI transmission according to the configured periodic CSI reporting for Cell 1.

During T3 the UE shall detect beam failure and initiate link recovery. During T4 and T5 the UE measures and evaluate beam candidate from beam candidate set q_1.

No later than time point F occurring no later than D1 = 960+10 ms after the start of T5, the UE shall transmit preamble on a beam associated with the candidate beam set q_1. The UE shall not transmit preamble on a beam associated with the candidate beam set q_1 earlier than time point B.

Test is concluded once the test equipment has received the initial preamble transmission from the UE. The rate of correct events observed during repeated tests shall be at least 90%.

7.5.5.2 NR SA FR2 SSB-based beam failure detection and link recovery in DRX

Editor's Note: This test case is complete for the following configurations:

- Test frequency f ≤ 40.8 GHz
- UE PC3

This test case is incomplete for Test frequency f > 40.8 GHz

This test case is incomplete for UE power class other than PC3.

7.5.5.2.1 Test purpose

The purpose of this test is to verify that the UE properly detects SSB-based beam failure in the set q_0 configured for a serving cell and that the UE performs correct SSB-based link recovery based on beam candidate set q_1, and to test the downlink monitoring for beam failure detection within the UEs active DL BWP, during the evaluation period, and link recovery, when DRX is used. This test will partly verify the SSB based beam failure detection and link recovery for an FR2 serving cell requirements in TS 38.133 [6] clause 8.5.

7.5.5.2.2 Test applicability

This test applies to all types of NR UE release 15 and forward supporting 5GS NR SA FR2 and long DRX cycle.

7.5.5.2.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 7.5.5.0.1.

The normative reference for this requirement is TS 38.133 [6] clause A.7.5.5.2.

7.5.5.2.4 Test description

There are one NR serving cell configured in this test. This test consists of five successive time periods, with time duration of T1, T2, T3, T4 and T5 respectively. Figure 7.5.5.2.4-1 shows the five different time durations and the corresponding variation of the downlink SNR in the active cell to emulate SSB based beam failure. Figure 7.5.5.2.4-1 additionally shows the variation of the downlink L1-RSRP of the SSB in set q_1 of the candidate beam used for link recovery.

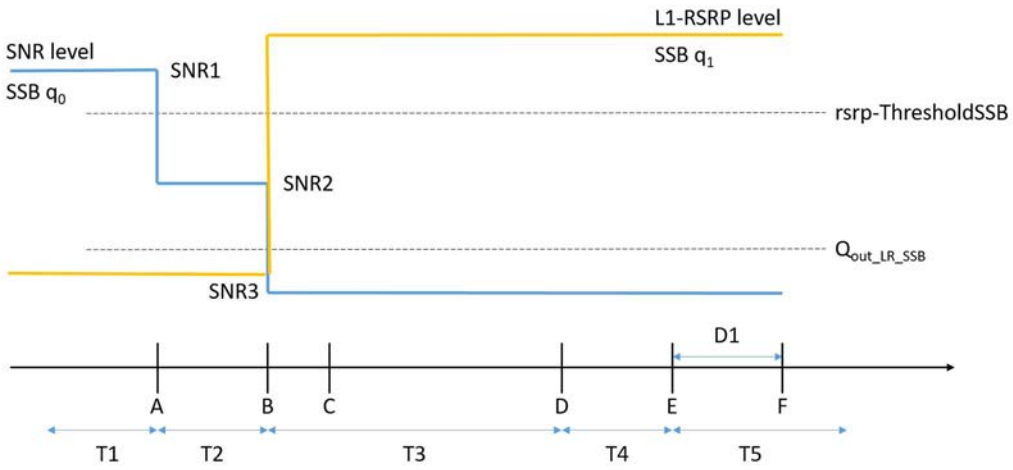


Figure 7.5.5.2.4-1: SNR and L1-RSRP variation for NR SA FR2 SSB-based beam failure detection and link recovery in DRX

7.5.5.2.4.1 Initial conditions

This test shall be tested using any of the test configurations in Table 7.5.5.2.4.1-1.

Table 7.5.5.2.4.1-1: Supported test configurations for NR SA FR2 SSB-based beam failure detection and link recovery in DRX

Configuration	Description
7.5.5.2-1	TDD duplex mode, 120 kHz SSB SCS, 100 MHz bandwidth
7.5.5.2-2	TDD duplex mode, 240 kHz SSB SCS, 100 MHz bandwidth
Note: The UE is only required to pass in one of the supported test configurations in FR2	

Configure the test equipment and the DUT according to the parameters in Table 7.5.5.2.4.1-2.

Table 7.5.5.2.4.1-2: Initial conditions for NR SA FR2 SSB-based beam failure detection and link recovery in DRX

Parameter	Value	Comment
Test environment	NC	As specified in TS 38.508-1 [14] clause 4.1.
Test frequencies	As specified in Annex E, table E.5-1 and TS 38.508-1 [14] clause 4.3.1 and 4.4.2.	
Channel bandwidth	As specified by the test configuration selected from Table 7.5.5.2.4.1-1.	

Propagation conditions	AWGN		As specified in Annex C.2.2.
Connection Diagram	TE Part	A.3.3.1.1	As specified in TS 38.508-1 [14] Annex A.
	DUT Part	A.3.4.1.1	
Exceptions to connection diagram	N/A		

1. The general test parameter settings are set up according to Table 7.5.5.2.4.1-3. The DRX configuration is according to Table 7.5.5.2.4.1-3. Time alignment timers shall be set to "infinity" so that UL timing alignment is maintained during the test.

2. Message contents are defined in clause 7.5.5.2.4.3.

3. There is one NR carrier and one NR cells specified in the test. Cell 1 is the NR cell used for connection setup with the power level set according to Annex C.1.1 and C.1.2 for this test.

Table 7.5.5.2.4.1-3: General test parameters for NR SA FR2 SSB-based beam failure detection and link recovery in DRX

Parameter		Test Config.	Unit	Value	Comment
				Test 1	
Active PCell		1-2		Cell 1	
RF Channel Number		1-2		1	
Duplex mode		1-2		TDD	
TDD Configuration		1-2		TDDConf.3.1	Table A.1.5-3
$BW_{channel}$		1-2	MHz	100: $N_{RB,c}$ = 66	
Data RBs allocated		1-2		66	
PDSCH/PDCCH subcarrier spacing		1-2	kHz	120	
DL initial BWP configuration		1-2		DLBWP.0.1	Table A.8.1-1
DL dedicated BWP configuration		1-2		DLBWP.1.1	Table A.8.1-2
UL initial BWP configuration		1-2		ULBWP.0.1	Table A.8.2-1
UL dedicated BWP configuration		1-2		ULBWP.1.1	Table A.8.2-2
PDSCH Reference Channel		1		SR.3.2 TDD	Table A.1.1.2-3
		2		SR.3.3 TDD	
RMSI CORESET Reference Channel		1		CR.3.1 TDD	Table A.1.2.2-3
		2		CR.3.2 TDD	
Dedicated CORESET Reference Channel		1		CCR.3.1 TDD	Table A.1.3.2-3
		2		CCR.3.7 TDD	
OCNG parameters		1-2		OP.1	Table A.2.1-1
CP length		1-2		Normal	
PDSCH/PDCCH TCI state		1-2		TCI.State.0	Table A.10.2-1
CSI-RS for tracking		1-2		TRS.2.1 TDD	Table A.1.4A.2.1-1
SSB Configuration		1		SSB.1 FR2	Table A.3.2-1
		2		SSB.2 FR2	
SMTC Configuration		1-2		SMTC.3	Table A.4-1
PRACH Configuration		1-2		PRACH.2 FR2	Table A.7.2-1
DRX configuration		1-2		DRX.3	Table A.5-1
SSB index assigned as BFD RS (q_0)		1-2		0	
SSB index assigned as CBD RS (q_1)		1-2		1	
SSB index assigned as RLM RS		1-2		0,1	
Beam failure detection transmission parameters	DCI format	1-2		1-0	
	Number of Control OFDM symbols	1-2		2	
	Aggregation level	1-2	CCE	8	
	Ratio of hypothetical PDCCH RE energy to average SSS RE energy	1-2	dB	0	
	Ratio of hypothetical PDCCH DMRS energy to average SSS RE energy	1-2	dB	0	
	DMRS precoder granularity	1-2		REG bundle size	
	REG bundle size	1-2		6	

Gap pattern ID	1-2		N/A	
rlmInSyncOutOfSyncThreshold	1-2		absent	Value 0 is applied. (TS 38.133 [6] Table 8.1.1-1).
rsrp-ThresholdSSB	1	dBm/SCS	-109 Note 3	Threshold used for $Q_{in_LR_SSB}$
	2		-106 Note 3	
powerControlOffsetSS	1-2		db0	Used for deriving rsrp-ThresholdCSI-RS
beamFailureInstanceMaxCount	1-2		n1	see TS 38.321 [12], clause 5.17
beamFailureDetectionTimer	1-2		pbfd4	see TS 38.321 [12], clause 5.17
CSI-RS configuration for CSI reporting	1-2		CSI-RS.3.1 TDD	Table A.1.4.2-3
reportConfigType	1-2		periodic	
reportQuantity	1-2		cri-RI-PMI-CQI	
CSI reporting periodicity	1-2	slot	40	
CSI reporting offset	1-2	slot	4	
T310	1-2	ms	1000	
N310	1-2		2	
T1	1-2	s	1	The UE shall be fully synchronized to cell 1 during T1
T2	1-2	s	3.37	
T3	1-2	s	2.8	
T4	1-2	s	0	
T5	1-2	s	0.61	
D1	1-2	s	0.57	
Note 1: All configurations are assigned to the UE prior to the start of time period T1. Note 2: UE-specific PDCCH is not transmitted after T1 starts. Note 3: Including test tolerance given in Annex F.1.3.2				

Table 7.5.5.2.4.1-4: Void

7.5.5.2.4.2 Test procedure

Prior to the start of the time duration T1, the UE shall be fully synchronized to NR Cell 1. The UE shall be configured for periodic CSI reporting with a reporting periodicity of 5 ms. In the test, DRX configuration is enabled.

1. Ensure the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity *NR*, Connected without release *On* according to TS 38.508-1 [14] clause 4.5.

2. Set the parameters of NR Cell 1 according to T1 in Table 7.5.5.2.5-1. Propagation conditions are set according to Annex C.2.3. T1 starts.

3. When T1 expires the SS shall change the SNR value to T2 as specified in Table 7.5.5.2.5-1. T2 starts.

4. When T2 expires the SS shall change the SNR value to T3 as specified in Table 7.5.5.2.5-1. T3 starts.

5. When T3 expires the SS shall change the SNR value to T4 as specified in Table 7.5.5.2.5-1. T4 starts.

6. When T4 expires the SS shall change the SNR value to T5 as specified in Table 7.5.5.2.5-1. T5 starts.

7. If the SS:

a) detects uplink power on NR carrier in each slot configured for CQI transmission (according CQI reporting on PUCCH) during the period from time point A to time point B; and

b) does not detect preamble on a beam associated with candidate beam set q_1 before time point B; and

c) detects preamble on a beam associated with candidate beam set q_1 before time point F (D1 after the start of T5),

the number of successful tests is increased by one. Otherwise the number of failed tests is increased by one.

8. When T5 expires the SS shall change the SNR value to T1 as specified in Table 7.5.5.2.5-1.

9. Wait 1s for the UE to re-establish the connection or continue directly to step 10. If the UE re-establishes the connection within 1s continue to step 11. Otherwise continue to step 10.

10. Switch the UE on and off. Ensure the UE is in RRC_CONNECTED with generic procedure parameters Connectivity *NR*, Connected without release *On* according to TS 38.508-1 [14] clause 4.5.

11. Repeat steps 2-10 until the confidence level according to Tables G.2.3-1 in Annex G clause G.2 is achieved.

7.5.5.2.4.3 Message contents

Message contents are according to TS 38.508-1 [14] clause 7.3 with the following exceptions:

Table 7.5.5.2.4.3-1: Common Exception messages for NR SA FR2 SSB-based beam failure detection and link recovery in DRX

Default Message Contents	
Common contents of system information blocks exceptions	
Default RRC messages and information elements contents exceptions	Table H.3.1-8 with Condition SSB BFD Table H.3.1-10 with Condition SSB Table H.3.1-10A Table H.3.7-1 with condition DRX.3

7.5.5.2.5 Test requirement

Tables 7.5.5.2.4.1-3 and 7.5.5.2.5-1 define the primary level settings including test tolerances for NR SA FR2 SSB-based beam failure detection and link recovery in DRX.

Table 7.5.5.2.5-1: NR Cell specific test parameters for NR SA FR2 SSB-based beam failure detection and link recovery in DRX

Parameter		Unit	Test 1				
			T1	T2	T3	T4	T5
AoA setup			Setup 1 defined in A.9				
Assumption for UE beams Note 10			Rough				
EPRE ratio of PDCCH DMRS to SSS		dB	0				
EPRE ratio of PDCCH to PDCCH DMRS		dB					
EPRE ratio of PBCH DMRS to SSS		dB					
EPRE ratio of PBCH to PBCH DMRS		dB					
EPRE ratio of PSS to SSS		dB					
EPRE ratio of PDSCH DMRS to SSS		dB					
EPRE ratio of PDSCH to PDSCH DMRS		dB					
EPRE ratio of OCNG DMRS to SSS		dB					
EPRE ratio of OCNG to OCNG DMRS		dB					
SNR_SSB of set q_0	Config 1-2	dB	13.7 Note 11,12	5.7 Note 11,12	-12	-12	-12
SNR_SSB of set q_1	Config 1-2	dB	0.2	0.2	20 Note 12	20 Note 12	20 Note 12
SSB_RP of set q_1	Config 1	dBm/SCS	-104.5	-104.5	-84.7	-84.7	-84.7
	Config 2		-101.5	-101.5	-81.7	-81.7	-81.7
N_{oc}	Config 1-2	dBm/120 KHz	-104.7				
Propagation condition			TDL-A 30ns 75Hz				

Note 1:	OCNG shall be used such that the resources in Cell 1 are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.
Note 2:	The uplink resources for CSI reporting are assigned to the UE prior to the start of time period T1.
Note 3:	NZP CSI-RS resource set configuration for CSI reporting are assigned to the UE prior to the start of time period T1.
Note 4:	Void
Note 5:	The timers and layer 3 filtering related parameters are configured prior to the start of time period T1.
Note 6:	The signal contains PDCCH for UEs other than the device under test as part of OCNG.
Note 7:	SNR levels correspond to the signal to noise ratio over the SSS REs.
Note 8:	The SNR in time periods T1, T2, T3, T4 and T5 is denoted as SNR1, SNR2 and SNR3 respectively in figure 7.5.5.2.4-1.
Note 9:	The SNR values are specified for testing a UE which supports 2RX on at least one band. For testing of a UE which supports 4RX on all bands, the SNR during T3 is modified as specified in clause D.4.
Note 10:	Information about types of UE beam is given in TS 38.133 [6] clause B.2.1.3 and does not limit UE implementation or test system implementation.
Note 11:	This value allows up to 1dB degradation from applied SNR to UE baseband.
Note 12:	Including test tolerance given in

The UE behaviour during time durations T1, T2, T3, T4 and T5 shall be as follows:

During the time duration T1 and T2, the UE shall transmit uplink signal at least in all subframes configured for CSI transmission on Cell 1.

During the period from time point A to time point B the UE shall transmit uplink signal in Cell 1 in all uplink slots configured for CSI transmission according to the configured periodic CSI reporting for Cell 1.

During T3 the UE shall detect beam failure and initiate link recovery. During T4 and T5 the UE measures and evaluate beam candidate from beam candidate set q_1.

No later than time point F occurring no later than D1 = 560+10 ms after the start of T5, the UE shall transmit preamble on a beam associated with the candidate beam set q_1. The UE shall not transmit preamble on a beam associated with the candidate beam set q_1 earlier than time point B.

Test is concluded once the test equipment has received the initial preamble transmission from the UE. The rate of correct events observed during repeated tests shall be at least 90%.

7.5.5.3 NR SA FR2 CSI-RS-based beam failure detection and link recovery in non-DRX

Editor's Note: This test case is complete for the following configurations:

- Test frequency f ≤ 40.8 GHz
- UE PC3

This test case is incomplete for Test frequency f > 40.8 GHz

This test case is incomplete for UE power class other than PC3.

7.5.5.3.1 Test purpose

The purpose of this test is to verify that the UE properly detects CSI-RS-based beam failure in the set q_0 configured for a serving cell and that the UE performs correct CSI-RS-based link recovery based on beam candidate set q_1, and to test the downlink monitoring for beam failure detection within the UEs active DL BWP, during the evaluation period, and link recovery, when no DRX is used. This test will partly verify the CSI-RS based beam failure detection and link recovery for an FR2 serving cell requirements in TS 38.133 [6] clause 8.5.

7.5.5.3.2 Test applicability

This test applies to all types of NR UE release 15 and forward supporting CSI-RS-based RLM and link recovery .

7.5.5.3.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 7.5.5.0.2.

The normative reference for this requirement is TS 38.133 [6] clause A.7.5.5.3.

7.5.5.3.4 Test description

There is one NR serving cell configured in this test. This test consists of five successive time periods, with time duration of T1, T2, T3, T4 and T5 respectively. Figure 7.5.5.3.4-1 shows the five different time durations and the corresponding variation of the downlink SNR in the active cell to emulate CSI-RS based beam failure. Figure 7.5.5.3.4-1 additionally shows the variation of the downlink L1-RSRP of the CSI-RS in set q_1 of the candidate beam used for link recovery.

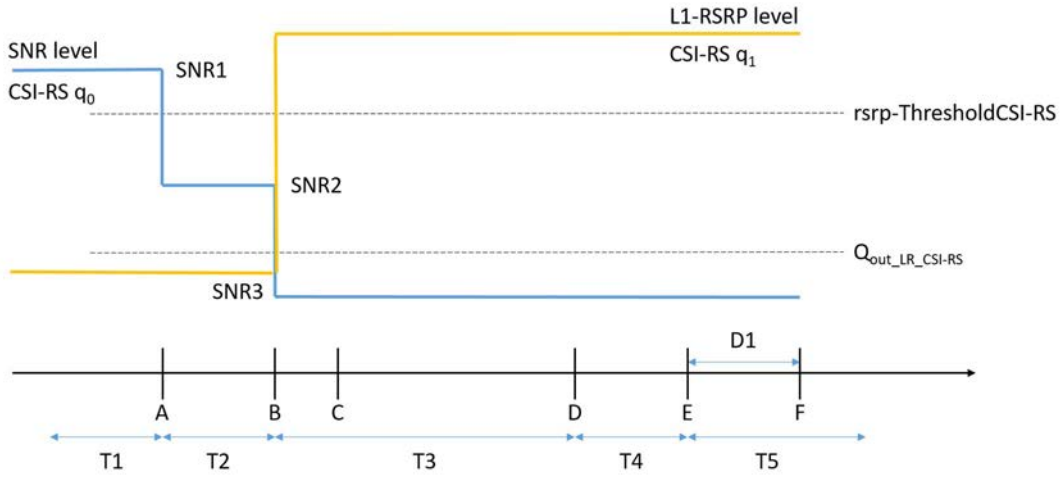


Figure 7.5.5.3.4-1: SNR and L1-RSRP variation for NR SA FR2 CSI-RS-based beam failure detection and link recovery in non-DRX

7.5.5.3.4.1 Initial conditions

This test shall be tested using any of the test configurations in Table 7.5.5.3.4.1-1.

Table 7.5.5.3.4.1-1: Supported test configurations for NR SA FR2 CSI-RS-based beam failure detection and link recovery in non-DRX

Configuration	Description
7.5.5.3-1	TDD duplex mode, 120 kHz SSB SCS, 100 MHz bandwidth

Configure the test equipment and the DUT according to the parameters in Table 7.5.5.3.4.1-2.

Table 7.5.5.3.4.1-2: Initial conditions for NR SA FR2 CSI-RS-based beam failure detection and link recovery in non-DRX

Parameter	Value		Comment
Test environment	NC		As specified in TS 38.508-1 [14] clause 4.1.
Test frequencies	As specified in Annex E, table E.5-1 and TS 38.508-1 [14] clause 4.3.1 and 4.4.2.		
Channel bandwidth	As specified by the test configuration selected from Table 7.5.5.3.4.1-1.		
Propagation conditions	AWGN		As specified in Annex C.2.2.
Connection Diagram	TE Part	A.3.3.1.1	As specified in TS 38.508-1 [14] Annex A.
	DUT Part	A.3.4.1.1	
Exceptions to connection diagram	N/A		

1. The general test parameter settings are set up according to Table 7.5.5.3.4.1-3. The NZP-CSI-RS configuration is according to Table 7.5.5.3.4.1-3.

2. Message contents are defined in clause 7.5.5.3.4.3.

3. There is one NR carrier and one NR cells specified in the test. Cell 1 is the NR cell used for connection setup with the power level set according to Annex C.1.1 and C.1.2 for this test.

Table 7.5.5.3.4.1-3: General test parameters for NR SA FR2 CSI-RS-based beam failure detection and link recovery in non-DRX

Parameter		Test Config.	Unit	Value	Comment
				Test 1	
Active PCell		1		Cell 1	
RF Channel Number		1		1	
Duplex mode		1		TDD	
TDD Configuration		1		TDDConf.3.1	Table A.1.5-3
$BW_{channel}$		1	MHz	100: $N_{RB,c}$ = 66	
Data RBs allocated		1		66	
PDSCH/PDCCH subcarrier spacing		1	kHz	120	
DL initial BWP configuration		1		DLBWP.0.1	Table A.8.1-1
DL dedicated BWP configuration		1		DLBWP.1.1	Table A.8.1-2
UL initial BWP configuration		1		ULBWP.0.1	Table A.8.2-1
UL dedicated BWP configuration		1		ULBWP.1.1	Table A.8.2-2
PDSCH Reference Channel		1		SR.3.2 TDD	Table A.1.1.2-3
RMSI CORESET Reference Channel		1		CR.3.1 TDD	Table A.1.2.2-3
Dedicated CORESET Reference Channel		1		CCR.3.1 TDD	Table A.1.3.2-3
OCNG parameters		1		OP.1	Table A.2.1-1
CP length		1		Normal	
PDSCH/PDCCH TCI state		1		TCI.State.0	Table A.10.2-1
CSI-RS for tracking		1		TRS.2.1 TDD	Table A.1.4A.2.1-1
SSB Configuration		1		SSB.1 FR2	Table A.3.2-1
SMTC Configuration		1		SMTC.3	Table A.4-1
PRACH Configuration		1		PRACH.4 FR2	Table A.7.2-1
DRX configuration		1		OFF	
CSI-RS configuration for BFD/CBD/RLM		1		CSI-RS.3.2 TDD	Table A.1.4.2-3
CSI-RS index assigned as BFD RS (q_0)		1		0	
CSI-RS index assigned as CBD RS (q_1)		1		1	
CSI-RS index assigned as RLM RS		1		0,1	
Beam failure detection transmission parameters	DCI format	1		1-0	
	Number of Control OFDM symbols	1		2	
	Aggregation level	1	CCE	8	
	Ratio of hypothetical PDCCH RE energy to average SSS RE energy	1	dB	0	
	Ratio of hypothetical PDCCH DMRS energy to average SSS RE energy	1	dB	0	
	DMRS precoder granularity	1		REG bundle size	
	REG bundle size	1		6	
Gap pattern ID		1		N/A	
rlmInSyncOutOfSyncThreshold		1		absent	Value 0 is applied. (TS 38.133 [6] Table 8.1.1-1).
rsrp-ThresholdSSB		1	dBm/SCS	-109 Note 2	Threshold used for $Q_{in_LR_SSB}$
powerControlOffsetSS		1		db0	Used for deriving rsrp-ThresholdCSI-RS
beamFailureInstanceMaxCount		1		n1	see TS 38.321 [12], clause 5.17
beamFailureDetectionTimer		1		pbfd4	see TS 38.321 [12], clause 5.17
CSI-RS configuration for CSI reporting		1		CSI-RS.3.1 TDD	Table A.1.4.2-3
reportConfigType		1		periodic	
reportQuantity		1		cri-RI-PMI-CQI	
CSI reporting periodicity		1	slot	40	

CSI reporting offset	1	slot	4	
T310	1	ms	1000	
N310	1		2	
T1	1	s	1	The UE shall be fully synchronized to cell 1 during T1
T2	1	s	1.17	
T3	1	s	0.9	
T4	1	s	0	
T5	1	s	0.31	
D1	1	s	0.27	
Note 1: UE-specific PDCCH is not transmitted after T1 starts. Note 2: Including test tolerance given in Annex F.1.3.2.				

7.5.5.3.4.2 Test procedure

Prior to the start of the time duration T1, the UE shall be fully synchronized to NR Cell 1. The UE shall be configured for periodic CSI reporting with a reporting periodicity of 5 ms. In the test, DRX configuration is not enabled.

1. Ensure the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity *NR*, Connected without release *On* according to TS 38.508-1 [14] clause 4.5.

2. Set the parameters of NR Cell 1 according to T1 in Table 7.5.5.3.5-1. Propagation conditions are set according to Annex C.2.3. T1 starts.

3. When T1 expires the SS shall change the SNR value to T2 as specified in Table 7.5.5.3.5-1. T2 starts.

4. When T2 expires the SS shall change the SNR value to T3 as specified in Table 7.5.5.3.5-1. T3 starts.

5. When T3 expires the SS shall change the SNR value to T4 as specified in Table 7.5.5.3.5-1. T4 starts.

6. When T4 expires the SS shall change the SNR value to T5 as specified in Table 7.5.5.3.5-1. T5 starts.

7. If the SS:

   a) detects uplink power on NR carrier in each slot configured for CQI transmission (according CQI reporting on PUCCH) during the period from time point A to time point B; and

   b) does not detect a preamble on a beam associated with candidate beam set q_1 before time point B; and

   c) detects preamble on a beam associated with candidate beam set q_1 beforetime point F (D1 after the start of T5),

   the number of successful tests is increased by one. Otherwise the number of failed tests is increased by one.

8. When T5 expires the SS shall change the SNR value to T1 as specified in Table 7.5.5.3.5-1.

9. Wait 1s for the UE to re-establish the connection or continue directly to step 10. If the UE re-establishes the connection within 1s continue to step 11. Otherwise continue to step 10.

10. Switch the UE on and off. Ensure the UE is in RRC_CONNECTED with generic procedure parameters Connectivity *NR*, Connected without release *On* according to TS 38.508-1 [14] clause 4.5.

11. Repeat steps 2-10 until the confidence level according to Tables G.2.3-1 in Annex G clause G.2 is achieved.

7.5.5.3.4.3 Message contents

Message contents are according to TS 38.508-1 [14] clause 4.6 with the following exceptions:

Table 7.5.5.3.4.3-1: Common Exception messages for NR SA FR2 CSI-RS-based beam failure detection and link recovery in non-DRX

Default Message Contents	
Common contents of system information blocks exceptions	

Default RRC messages and information elements contents exceptions	Table H.3.1-8 with Condition CSI-RS BFD Table H.3.1-10 with Condition CSI-RS Table H.3.1-10A

7.5.5.3.5 Test requirement

Tables 7.5.5.3.4.1-3 and 7.5.5.3.5-1 define the primary level settings including test tolerances for NR SA FR2 CSI-RS-based beam failure detection and link recovery in non-DRX.

Table 7.5.5.3.5-1: NR Cell specific test parameters for NR SA FR2 CSI-RS-based beam failure detection and link recovery in non-DRX

Parameter		Unit	Test 1				
			T1	T2	T3	T4	T5
AoA setup			Setup 1 defined in A.9				
Assumption for UE beams Note 10			Rough				
EPRE ratio of PDCCH DMRS to SSS		dB	0				
EPRE ratio of PDCCH to PDCCH DMRS		dB					
EPRE ratio of PBCH DMRS to SSS		dB					
EPRE ratio of PBCH to PBCH DMRS		dB					
EPRE ratio of PSS to SSS		dB					
EPRE ratio of PDSCH DMRS to SSS		dB					
EPRE ratio of PDSCH to PDSCH DMRS		dB					
EPRE ratio of OCNG DMRS to SSS		dB					
EPRE ratio of OCNG to OCNG DMRS		dB					
SNR_CSI-RS of set q_0	Config 1	dB	13.7 Note 11,12	13.7 Note 11,12	-12	-12	-12
SNR_CSI-RS of set q_1	Config 1	dB	0.2	0.2	20 Note 12	20 Note 12	20 Note 12
CSI-RS_RP of set q_1	Config 1	dBm/SCS	-104.5	-104.5	-84.7	-84.7	-84.7
N_{oc}	Config 1	dBm/120 KHz	-104.7				
Propagation condition			TDL-A 30ns 75Hz				

Note 1: OCNG shall be used such that the resources in Cell 1 are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.
Note 2: The uplink resources for CSI reporting are assigned to the UE prior to the start of time period T1.
Note 3: NZP CSI-RS resource set configuration for CSI reporting are assigned to the UE prior to the start of time period T1.
Note 4: Void
Note 5: The timers and layer 3 filtering related parameters are configured prior to the start of time period T1.
Note 6: The signal contains PDCCH for UEs other than the device under test as part of OCNG.
Note 7: SNR levels correspond to the signal to noise ratio over the REs carrying CSI-RS.
Note 8: The SNR in time periods T1, T2, T3, T4 and T5 is denoted as SNR1, SNR2 and SNR3 respectively in figure 7.5.5.3.4-1.
Note 9: The SNR values are specified for testing a UE which supports 2RX on at least one band. For testing of a UE which supports 4RX on all bands, the SNR during T3 is modified as specified in clause D.4.
Note 10: Information about types of UE beam is given in TS 38.133 [6] clause B.2.1.3 and does not limit UE implementation or test system implementation.
Note 11: This value allows up to 1dB degradation from applied SNR to UE baseband.
Note 12: Including test tolerance given in Annex F.1.3.2.

The UE behaviour during time durations T1, T2, T3, T4 and T5 shall be as follows:

During the time duration T1 and T2, the UE shall transmit uplink signal at least in all subframes configured for CSI transmission on Cell 1.

During the period from time point A to time point B the UE shall transmit uplink signal in Cell 1 in all uplink slots configured for CSI transmission according to the configured periodic CSI reporting for Cell 1.

During T3 the UE shall detect beam failure and initiate link recovery. During T4 and T5 the UE measures and evaluate beam candidate from beam candidate set q_1.

No later than time point F occurring no later than D1 =260+10 ms after the start of T5, the UE shall transmit preamble on a beam associated with the candidate beam set q_1. The UE shall not transmit preamble on a beam associated with the candidate beam set q_1 earlier than time point B.

Test is concluded once the test equipment has received the initial preamble transmission from the UE. The rate of correct events observed during repeated tests shall be at least 90%.

7.5.5.4 NR SA FR2 CSI-RS-based beam failure detection and link recovery in DRX

Editor's Note: This test case is complete for the following configurations:

- Test frequency f ≤ 40.8 GHz
- UE PC3

This test case is incomplete for Test frequency f > 40.8 GHz

This test case is incomplete for UE power class other than PC3.

7.5.5.4.1 Test purpose

The purpose of this test is to verify that the UE properly detects CSI-RS-based beam failure in the set q_0 configured for a serving cell and that the UE performs correct CSI-RS-based link recovery based on beam candidate set q_1, and to test the downlink monitoring for beam failure detection within the UEs active DL BWP, during the evaluation period, and link recovery, when DRX is used. This test will partly verify the CSI-RS based beam failure detection and link recovery for an FR2 serving cell requirements in TS 38.133 [6] clause 8.5.

7.5.5.4.2 Test applicability

This test applies to all types of NR UE release 15 and forward supporting 5GS NR SA FR2 and CSI-RS-based RLM and link recovery and long DRX cycle.

7.5.5.4.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 7.5.5.0.2.

The normative reference for this requirement is TS 38.133 [6] clause A.7.5.5.4.

7.5.5.4.4 Test description

There is one NR serving cell configured in this test. This test consists of five successive time periods, with time duration of T1, T2, T3, T4 and T5 respectively. Figure 7.5.5.4.4-1 shows the five different time durations and the corresponding variation of the downlink SNR in the active cell to emulate CSI-RS based beam failure. Figure 7.5.5.4.4-1 additionally shows the variation of the downlink L1-RSRP of the CSI-RS in set q_1 of the candidate beam used for link recovery.

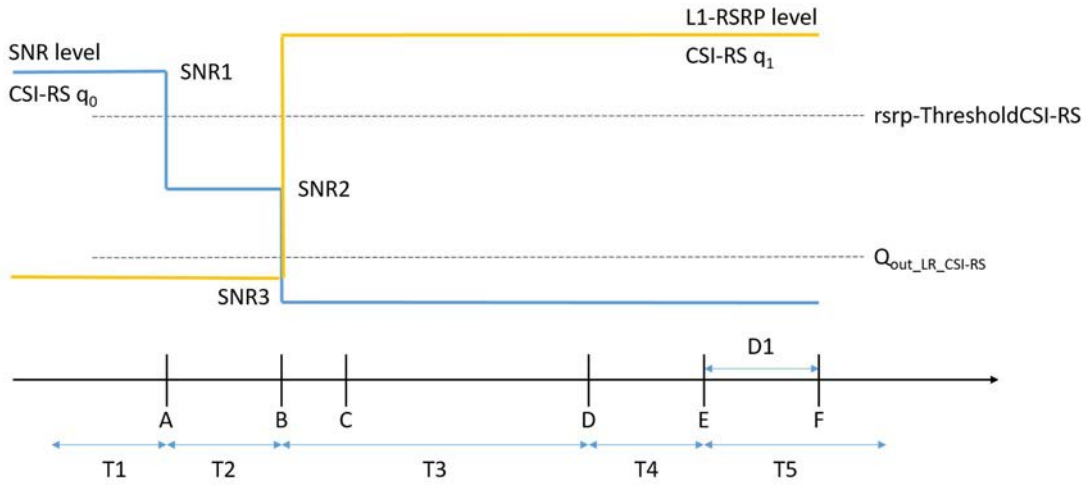


Figure 7.5.5.4.4-1: SNR and L1-RSRP variation for NR SA FR2 CSI-RS-based beam failure detection and link recovery in DRX

7.5.5.4.4.1 Initial conditions

This test shall be tested using any of the test configurations in Table 7.5.5.4.4.1-1.

Table 7.5.5.4.4.1-1: Supported test configurations for NR SA FR2 CSI-RS-based beam failure detection and link recovery in DRX

Configuration	Description
7.5.5.4-1	TDD duplex mode, 120 kHz SSB SCS, 100 MHz bandwidth

Configure the test equipment and the DUT according to the parameters in Table 7.5.5.4.4.1-2.

Table 7.5.5.4.4.1-2: Initial conditions for NR SA FR2 CSI-RS-based beam failure detection and link recovery in DRX

Parameter	Value		Comment
Test environment	NC		As specified in TS 38.508-1 [14] clause 4.1.
Test frequencies	As specified in Annex E, table E.5-1 and TS 38.508-1 [14] clause 4.3.1 and 4.4.2.		
Channel bandwidth	As specified by the test configuration selected from Table 6.5.5.3.4.1-1.		
Propagation conditions	AWGN		As specified in Annex C.2.2.
Connection Diagram	TE Part	A.3.3.1.1	As specified in TS 38.508-1 [14] Annex A.
	DUT Part	A.3.4.1.1	
Exceptions to connection diagram	N/A		

1. The general test parameter settings are set up according to Table 7.5.5.4.4.1-3. The NZP-CSI-RS configuration is according to Table 7.5.5.4.4.1-3. The DRX configuration for is according to Table 7.5.5.4.4.1-3. Time alignment timers shall be set to “infinity” so that UL timing alignment is maintained during the test.

2. Message contents are defined in clause 7.5.5.4.4.3.

3. There is one NR carrier and one NR cells specified in the test. Cell 1 is the NR cell used for connection setup with the power level set according to Annex C.1.1 and C.1.2 for this test.

Table 7.5.5.4.4.1-3: General test parameters for NR SA FR2 CSI-RS-based beam failure detection and link recovery in DRX

Parameter	Test Config.	Unit	Value	Comment
			Test 1	
Active PCell	1		Cell 1	
RF Channel Number	1		1	
Duplex mode	1		TDD	
TDD Configuration	1		TDDConf.3.1	Table A.1.5-3
$BW_{channel}$	1	MHz	100: $N_{RB,c}$ = 66	
Data RBs allocated	1		66	
PDSCH/PDCCH subcarrier spacing	1	kHz	120	
DL initial BWP configuration	1		DLBWP.0.1	Table A.8.1-1
DL dedicated BWP configuration	1		DLBWP.1.1	Table A.8.1-2
UL initial BWP configuration	1		ULBWP.0.1	Table A.8.2-1
UL dedicated BWP configuration	1		ULBWP.1.1	Table A.8.2-2
PDSCH Reference Channel	1		SR.3.2 TDD	Table A.1.1.2-3
RMSI CORESET Reference Channel	1		CR.3.1 TDD	Table A.1.2.2-3
Dedicated CORESET Reference Channel	1		CCR.3.1 TDD	Table A.1.3.2-3
OCNG parameters	1		OP.1	Table A.2.1-1
CP length	1		Normal	
PDSCH/PDCCH TCI state	1		TCI.State.0	Table A.10.2-1
CSI-RS for tracking	1		TRS.2.1 TDD	Table A.1.4A.2.1-1

SSB Configuration		1		SSB.1 FR2	Table A.3.2-1
SMTC Configuration		1		SMTC.3	Table A.4-1
PRACH Configuration		1		PRACH.4 FR2	Table A.7.2-1
DRX configuration		1		DRX.3	Table A.5-1
CSI-RS configuration for BFD/CBD/RLM		1		CSI-RS.3.2 TDD	Table A.1.4.2-3
CSI-RS index assigned as BFD RS (q_0)		1		0	
CSI-RS index assigned as CBD RS (q_1)		1		1	
CSI-RS index assigned as RLM RS		1		0,1	
Beam failure detection transmission parameters	DCI format	1		1-0	
	Number of Control OFDM symbols	1		2	
	Aggregation level	1	CCE	8	
	Ratio of hypothetical PDCCH RE energy to average SSS RE energy	1	dB	0	
	Ratio of hypothetical PDCCH DMRS energy to average SSS RE energy	1	dB	0	
	DMRS precoder granularity	1		REG bundle size	
	REG bundle size	1		6	
Gap pattern ID		1		N/A	
rlmInSyncOutOfSyncThreshold		1		absent	Value 0 is applied. (TS 38.133 [6] Table 8.1.1-1).
rsrp-ThresholdSSB		1	dBm/SCS	-109 Note 2	Threshold used for $Q_{in_LR_SSB}$
powerControlOffsetSS		1		db0	Used for deriving rsrp-ThresholdCSI-RS
beamFailureInstanceMaxCount		1		n1	see TS 38.321 [12], clause 5.17
beamFailureDetectionTimer		1		pbfd4	see TS 38.321 [12], clause 5.17
CSI-RS configuration for CSI reporting		1		CSI-RS.3.1 TDD	Table A.1.4.2-3
reportConfigType		1		periodic	
reportQuantity		1		cri-RI-PMI-CQI	
CSI reporting periodicity		1	slot	40	
CSI reporting offset		1	slot	4	
T310		1	ms	1000	
N310		1		2	
T1		1	s	1	The UE shall be fully synchronized to cell 1 during T1
T2		1	s	5.43	
T3		1	s	5.16	
T4		1	s	0	
T5		1	s	0.31	
D1		1	s	0.27	
Note 1: UE-specific PDCCH is not transmitted after T1 starts. Note 2: Including test tolerance given in Annex F.1.3.2					

Table 7.5.5.4.4.1-4: Void

7.5.5.4.4.2 Test procedure

Prior to the start of the time duration T1, the UE shall be fully synchronized to NR Cell 1. The UE shall be configured for periodic CSI reporting with a reporting periodicity of 5 ms. In the test, DRX configuration is enabled.

1. Ensure the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity *NR*, Connected without release *On* according to TS 38.508-1 [14] clause 4.5.

2. Set the parameters of NR Cell 1 according to T1 in Table 7.5.5.4.5-1. Propagation conditions are set according to Annex C.2.3. T1 starts.

3. When T1 expires the SS shall change the SNR value to T2 as specified in Table 7.5.5.4.5-1. T2 starts.

4. When T2 expires the SS shall change the SNR value to T3 as specified in Table 7.5.5.4.5-1. T3 starts.

5. When T3 expires the SS shall change the SNR value to T4 as specified in Table 7.5.5.4.5-1. T4 starts.

6. When T4 expires the SS shall change the SNR value to T5 as specified in Table 7.5.5.4.5-1. T5 starts.

7. If the SS:

a) detects uplink power on NR carrier in each slot configured for CQI transmission (according CQI reporting on PUCCH) during the period from time point A to time point B; and

b) does not detect preamble on a beam associated with candidate beam set q_1 before time point B; and

c) detects preamble on a beam associated with candidate beam set q_1 before time point F (D1 after the start of T5),

the number of successful tests is increased by one. Otherwise the number of failed tests is increased by one.

8. When T5 expires the SS shall change the SNR value to T1 as specified in Table 7.5.5.4.5-1.

9. Wait 1s for the UE to re-establish the connection or continue directly to step 10. If the UE re-establishes the connection within 1s continue to step 11. Otherwise continue to step 10.

10. Switch the UE on and off. Ensure the UE is in RRC_CONNECTED with generic procedure parameters Connectivity *NR*, Connected without release *On* according to TS 38.508-1 [14] clause 4.5.

11. Repeat steps 2-10 until the confidence level according to Tables G.2.3-1 in Annex G clause G.2 is achieved.

7.5.5.4.4.3 Message contents

Message contents are according to TS 38.508-1 [14] clause 7.3 with the following exceptions:

Table 7.5.5.4.4.3-1: Common Exception messages for NR SA FR2 CSI-RS-based beam failure detection and link recovery in DRX

Default Message Contents	
Common contents of system information blocks exceptions	
Default RRC messages and information elements contents exceptions	Table H.3.1-8 with Condition CSI-RS BFD Table H.3.1-10 with Condition CSI-RS Table H.3.1-10A Table H.3.7-1 with Condition DRX.3

7.5.5.4.5 Test requirement

Tables 7.5.5.4.4.1-3 and 7.5.5.4.5-1 define the primary level settings including test tolerances for NR SA FR2 CSI-RS-based beam failure detection and link recovery in DRX.

Table 7.5.5.4.5-1: NR Cell specific test parameters for NR SA FR2 CSI-RS-based beam failure detection and link recovery in DRX

Parameter	Unit	Test 1				
		T1	T2	T3	T4	T5
AoA setup		Setup 1 defined in A.9				
Assumption for UE beams Note 10		Rough				
EPRE ratio of PDCCH DMRS to SSS	dB	0				

EPRE ratio of PDCCH to PDCCH DMRS		dB					
EPRE ratio of PBCH DMRS to SSS		dB					
EPRE ratio of PBCH to PBCH DMRS		dB					
EPRE ratio of PSS to SSS		dB					
EPRE ratio of PDSCH DMRS to SSS		dB					
EPRE ratio of PDSCH to PDSCH DMRS		dB					
EPRE ratio of OCNG DMRS to SSS		dB					
EPRE ratio of OCNG to OCNG DMRS		dB					
SNR_CSI-RS of set q_0	Config 1	dB	13.7 Note 11,12	5.7 Note 11,12	-12	-12	-12
SNR_CSI-RS of set q_1	Config 1	dB	0.2	0.2	20 Note 12	20 Note 12	20 Note 12
CSI-RS_RP of set q_1	Config 1	dBm/SCS	-104.5	-104.5	-84.7	-84.7	-84.7
N_{oc}	Config 1	dBm/120 KHz	-104.7				
Propagation condition			TDL-A 30ns 75Hz				

Note 1: OCNG shall be used such that the resources in Cell 1 are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.
Note 2: The uplink resources for CSI reporting are assigned to the UE prior to the start of time period T1.
Note 3: NZP CSI-RS resource set configuration for CSI reporting are assigned to the UE prior to the start of time period T1.
Note 4: Void
Note 5: The timers and layer 3 filtering related parameters are configured prior to the start of time period T1.
Note 6: The signal contains PDCCH for UEs other than the device under test as part of OCNG.
Note 7: SNR levels correspond to the signal to noise ratio over the REs carrying CSI-RS.
Note 8: The SNR in time periods T1, T2, T3, T4 and T5 is denoted as SNR1, SNR2 and SNR3 respectively in figure 7.5.5.4.4-1.
Note 9: The SNR values are specified for testing a UE which supports 2RX on at least one band. For testing of a UE which supports 4RX on all bands, the SNR during T3 is modified as specified in clause D.4.
Note 10: Information about types of UE beam is given in TS 38.133 [6] clause B.2.1.3 and does not limit UE implementation or test system implementation.
Note 11: This value allows up to 1dB degradation from applied SNR to UE baseband.
Note 12: Including test tolerance given in Annex F.1.3.2.

The UE behaviour during time durations T1, T2, T3, T4 and T5 shall be as follows:

During the time duration T1 and T2, the UE shall transmit uplink signal at least in all subframes configured for CSI transmission on Cell 1.

During the period from time point A to time point B the UE shall transmit uplink signal in Cell 1 in all uplink slots configured for CSI transmission according to the configured periodic CSI reporting for Cell 1.

During T3 the UE shall detect beam failure and initiate link recovery. During T4 and T5 the UE measures and evaluate beam candidate from beam candidate set q_1.

No later than time point F occurring no later than D1 = 260+10 ms after the start of T5, the UE shall transmit preamble on a beam associated with the candidate beam set q_1. The UE shall not transmit preamble on a beam associated with the candidate beam set q_1 earlier than time point B.

Test is concluded once the test equipment has received the initial preamble transmission from the UE. The rate of correct events observed during repeated tests shall be at least 90%.

7.5.5.5 NR SA FR2 scheduling availability restriction during SSB-based beam failure detection and link recovery in non-DRX

Editor's Note: This test case is complete for the following configurations:

- Test frequency f ≤ 40.8 GHz
- UE PC3

This test case is incomplete for Test frequency f > 40.8 GHz

This test case is incomplete for UE power class other than PC3.

7.5.5.5.1 Test purpose

The purpose of this test is to test scheduling availability restrictions when the UE is performing beam failure detection or when the UE is performing L1-RSRP measurement for candidate beam detection, when no DRX is used, and to verify the scheduling availability restriction requirements for SSB based beam failure detection and link recovery for an FR2 serving cell in TS 38.133 [6] clause 8.5.7 and 8.5.8.

7.5.5.5.2 Test applicability

This test applies to all types of NR UE release 15 onwards.

7.5.5.5.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 7.5.5.0.1.

The normative reference for this requirement is TS 38.133 [6] clause A.7.5.5.5.

7.5.5.5.4 Test description

There is one NR serving cell configured in this test. This test consists of five successive time periods, with time duration of T1, T2, T3, T4 and T5 respectively. Figure 7.5.5.5.4-1 shows the variation of the downlink SNR of the SSB in set q0 in the active cell to emulate SSB based beam failure. Figure 7.5.5.5.4-1 additionally shows the variation of the downlink L1-RSRP of the SSB in set q1 of the candidate beam used for link recovery.

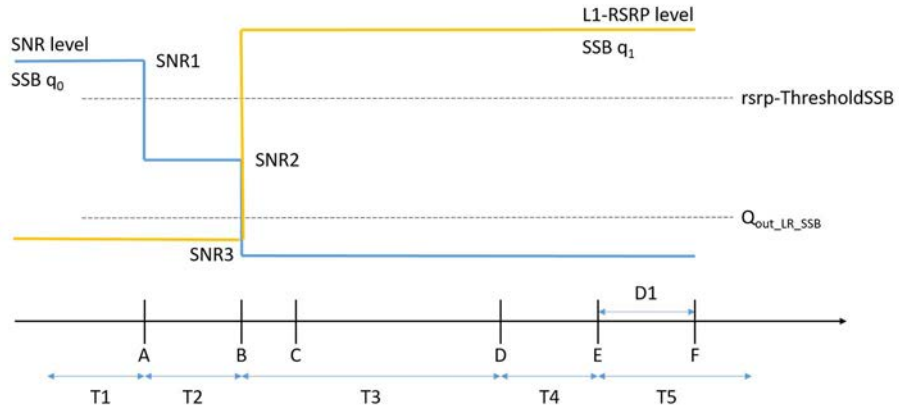


Figure 7.5.5.5.4-1: SNR and L1-RSRP variation for NR SA FR2 scheduling availability restriction during SSB-based beam failure detection and link recovery in non-DRX

7.5.5.5.4.1 Initial conditions

This test shall be tested using any of the test configurations in Table 7.5.5.5.4.1-1.

Table 7.5.5.5.4.1-1: Supported test configurations for NR SA FR2 scheduling availability restriction during SSB-based beam failure detection and link recovery in non-DRX

Configuration	Description
7.5.5.5-1	NR 120 kHz SSB SCS, 100MHz bandwidth, TDD duplex mode
7.5.5.5-2	NR 240 kHz SSB SCS, 100MHz bandwidth, TDD duplex mode
Note: The UE is only required to be tested in one of the supported test configurations	

Configure the test equipment and the DUT according to the parameters in Table 7.5.5.5.4.1-2.

Table 7.5.5.5.4.1-2: Initial conditions for NR SA FR2 scheduling availability restriction during SSB-based beam failure detection and link recovery in non-DRX

Parameter	Value	Comment
Test environment	NC	As specified in TS 38.508-1 [14] clause 4.1.
Test frequencies	As specified in Annex E, table E.5-1 and TS 38.508-1 [14] clause 4.3.1 and 4.4.2.	

Channel bandwidth	As specified by the test configuration selected from Table 7.5.5.5.4.1-1.		
Propagation conditions	AWGN		As specified in Annex C.2.2.
Connection Diagram	TE Part	A.3.3.1.1	As specified in TS 38.508-1 [14] Annex A.
	DUT Part	A.3.4.1.1	
Exceptions to connection diagram	N/A		

1. The general test parameter settings are set up according to Table 7.5.5.5.4.1-3.
2. Message contents are defined in clause 7.5.5.5.4.3.
3. There is one NR carrier and one NR cells specified in the test. Cell 1 is the NR cell used for connection setup with the power level set according to Annex C.1.1 and C.1.2 for this test.

Table 7.5.5.5.4.1-3: General test parameters for NR SA FR2 scheduling availability restriction during SSB-based beam failure detection and link recovery in non-DRX

Parameter		Test Config.	Unit	Value	Comment
				Test 1	
Active PCell		1-2		Cell 1	
RF Channel Number		1-2		1	
Duplex mode		1-2		TDD	
TDD Configuration		1-2		TDDConf.3.1	Table A.1.5-3
$BW_{channel}$		1-2	MHz	100: $N_{RB,c}$ = 66	
Data RBs allocated		1-2		66	
PDSCH/PDCCH subcarrier spacing		1-2	kHz	120	
DL initial BWP configuration		1-2		DLBWP.0.1	Table A.8.1-1
DL dedicated BWP configuration		1-2		DLBWP.1.1	Table A.8.1-2
UL initial BWP configuration		1-2		ULBWP.0.1	Table A.8.2-1
UL dedicated BWP configuration		1-2		ULBWP.1.1	Table A.8.2-2
PDSCH Reference Channel		1		SR.3.2 TDD	Table A.1.1.2-3
		2		SR.3.3 TDD	
RMSI CORESET Reference Channel		1		CR.3.1 TDD	Table A.1.2.2-3
		2		CR.3.2 TDD	
Dedicated CORESET Reference Channel		1		CCR.3.1 TDD	Table A.1.3.2-3
		2		CCR.3.7 TDD	
OCNG parameters		1-2		OP.1	Table A.2.1-1
CP length		1-2		Normal	
PDSCH/PDCCH TCI state		1-2		TCI.State.0	Table A.10.2-1
CSI-RS for tracking		1-2		TRS.2.1 TDD	
SSB Configuration		1		SSB.1 FR2	Table A.3.2-1
		2		SSB.2 FR2	
SMTC Configuration		1-2		SMTC.1	Table A.4-1
PRACH Configuration		1-2		PRACH.2 FR2	Table A.7.2-1
DRX configuration		1-2		OFF	
SSB index assigned as BFD RS (q_0)		1-2		0	
SSB index assigned as CBD RS (q_1)		1-2		1	
Beam failure detection transmission parameters	DCI format	1-2		1-0	
	Number of Control OFDM symbols	1-2		2	
	Aggregation level	1-2	CCE	8	
	Ratio of hypothetical PDCCH RE energy to average SSS RE energy	1-2	dB	0	
	Ratio of hypothetical PDCCH DMRS energy to average SSS RE energy	1-2	dB	0	
	DMRS precoder granularity	1-2		REG bundle size	
	REG bundle size	1-2		6	
Gap pattern ID		1-2		N/A	

rlmInSyncOutOfSyncThreshold	1-2		absent	Value 0 is applied. (TS 38.133 [6] Table 8.1.1-1).
rsrp-ThresholdSSB	1	dBm/SCS	-109 Note 3	Threshold used for $Q_{in_LR_SSB}$
	2		-106 Note 3	
powerControlOffsetSS	1-2		db0	Used for deriving rsrp-ThresholdCSI-RS
beamFailureInstanceMaxCount	1-2		n1	see TS 38.321 [12], clause 5.17
beamFailureDetectionTimer	1-2		pbfd4	see TS 38.321 [12], clause 5.17
CSI-RS configuration for CSI reporting	1-2		CSI-RS.3.1 TDD	Table A.1.4.2-3
reportConfigType	1-2		periodic	
reportQuantity	1-2		cri-RI-PMI-CQI	
CSI reporting periodicity	1-2	slot	40	
CSI reporting offset	1-2	slot	4	
T310	1-2	ms	1000	
N310	1-2		2	
T1	1-2	s	1	The UE shall be fully synchronized to cell 1 during T1
T2	1-2	s	2.6	
T3	1-2	s	1.64	
T4	1-2	s	0	
T5	1-2	s	1.01	
D1	1-2	s	0.97	
Note 1: All configurations are assigned to the UE prior to the start of time period T1. Note 2: UE-specific PDCCH is not transmitted after T1 starts. Note 3: Including test tolerance given in Annex F.1.3.2.				

7.5.5.5.4.2 Test procedure

Prior to the start of the time duration T1, the UE shall be fully synchronized to cell 1. The UE shall be configured for periodic CSI reporting with a reporting periodicity defined in CSI-RS configuration. This test will focus on the scheduling availability during beam failure detection and candidate beam detection. In the test, DRX configuration is not enabled. During the test the UE is scheduled to transmit continuously in UL.

1. Ensure the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity *NR*, Connected without release *On* and Test Mode *On* according to TS 38.508-1 [14] clause 4.5.

2. Set the parameters of NR Cell 1 according to T1 in Table 7.5.5.5.5-1. Propagation conditions are set according to Annex C.2.3. T1 starts.

3. When T1 expires the SS shall change the SNR value to T2 as specified in Table 7.5.5.5.5-1. T2 starts.

4. When T2 expires the SS shall change the SNR value to T3 as specified in Table 7.5.5.5.5-1. T3 starts.

5. When T3 expires the SS shall change the SNR value to T4 as specified in Table 7.5.5.5.5-1. T4 starts.

6. When T4 expires the SS shall change the SNR value to T5 as specified in Table 7.5.5.5.5-1. T5 starts.

7. If the SS:

   a) detects uplink power on NR carrier in each slot configured for CQI transmission (according CQI reporting on PUCCH) which are not overlapped with SSBs configured for beam failure detection during the period from time point B to time point D

   and

   b) detects uplink power on NR carrier in each slot configured for CQI transmission (according CQI reporting on PUCCH) during the period from time point D until T5 expires,

   the number of successful tests is increased by one.

Otherwise the number of failed tests is increased by one.

8. When T5 expires the SS shall change the SNR value to T1 as specified in Table 7.5.5.5.5-1.

9. Wait 1s for the UE to re-establish the connection or continue directly to step 10. If the UE re-establishes the connection within 1s continue to step 11. Otherwise continue to step 10.

10. Switch the UE on and off. Ensure the UE is in RRC_CONNECTED with generic procedure parameters Connectivity *NR*, Connected without release *On* and Test Mode *On* according to TS 38.508-1 [14] clause 4.5.

11. Repeat steps 2-10 until the confidence level according to Tables G.2.3-1 in Annex G clause G.2 is achieved.

7.5.5.5.4.3 Message contents

Message contents are according to TS 38.508-1 [14] clause 7.3 with the following exceptions:

Table 7.5.5.5.4.3-1: Common Exception messages for NR SA FR2 scheduling availability restriction during SSB-based beam failure detection and link recovery in non-DRX

Default Message Contents	
Common contents of system information blocks exceptions	
Default RRC messages and information elements contents exceptions	Table H.3.1-8 with Condition SSB BFD Table H.3.1-10 with Condition SSB Table H.3.1-10A

7.5.5.5.5 Test requirement

Table 7.5.5.5.4.1-3 and 7.5.5.5.5-1 define the primary level settings including test tolerances for NR SA FR2 scheduling availability restriction during SSB-based beam failure detection and link recovery in non-DRX.

Table 7.5.5.5.5-1: NR Cell specific test parameters for NR SA FR2 scheduling availability restriction during SSB-based beam failure detection and link recovery in non-DRX

Parameter		Unit	Test 1				
			T1	T2	T3	T4	T5
AoA Setup			Setup1 defined in A.3.15.1				
Assumption for UE beams Note 10			Rough				
EPRE ratio of PDCCH DMRS to SSS		dB	0				
EPRE ratio of PDCCH to PDCCH DMRS		dB					
EPRE ratio of PBCH DMRS to SSS		dB					
EPRE ratio of PBCH to PBCH DMRS		dB					
EPRE ratio of PSS to SSS		dB					
EPRE ratio of PDSCH DMRS to SSS		dB					
EPRE ratio of PDSCH to PDSCH DMRS		dB					
EPRE ratio of OCNG DMRS to SSS		dB					
EPRE ratio of OCNG to OCNG DMRS		dB					
SNR_SSB of set q_0	Config 1-2	dB	13.7 Note 11,12	5.7 Note 11,12	-12	-12	-12
SNR_SSB of set q_1	Config 1-2	dB	0.2	0.2	20 Note 12	20 Note 12	20 Note 12
SSB_RP of set q_1	Config 1	dBm/SCS kHz	-104.5	-104.5	-84.7 Note 12	-84.7 Note 12	-84.7 Note 12
	Config 2		-101.5	-101.5	-81.7 Note 12	-81.7 Note 12	-81.7 Note 12
N_{oc}	Config 1	dBm/120KHz	-104.7				
Propagation condition			TDL-A 30ns 75Hz				

Note 1:	OCNG shall be used such that the resources in Cell 1 are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.
Note 2:	The uplink resources for CSI reporting are assigned to the UE prior to the start of time period T1.
Note 3:	NZP CSI-RS resource set configuration for CSI reporting are assigned to the UE prior to the start of time period T1.
Note 4:	Void
Note 5:	The timers and layer 3 filtering related parameters are configured prior to the start of time period T1.
Note 6:	The signal contains PDCCH for UEs other than the device under test as part of OCNG.
Note 7:	SNR levels correspond to the signal to noise ratio over the SSS REs.
Note 8:	The SNR in time periods T1, T2, T3, T4 and T5 is denoted as SNR1, SNR2 and SNR3 respectively in figure 7.5.5.5.4-1.
Note 9:	The SNR values are specified for testing a UE which supports 2RX on at least one band. For testing of a UE which supports 4RX on all bands, the SNR during T3 is modified as specified in clause D.4.
Note 10:	Information about types of UE beam is given in TS 38.133 [6] clause B.2.1.3 and does not limit UE implementation or test system implementation.
Note 11:	This value allows up to 1dB degradation from applied SNR to UE baseband.
Note 12:	Including test tolerance given in Table F.1.3.2-4

The UE behaviour during time duration T3 follows the requirements defined in TS 38.133 [6] clause 8.5.7.3:

- The UE is not expected to transmit PUCCH/PUSCH/SRS or receive PDCCH/PDSCH/CSI-RS for tracking/CSI-RS for CQI on BFD-RS symbols to be measured for beam failure detection.

The UE behaviour during time durations T4 and T5 follows the requirements defined in TS 38.133 [6] clause 8.5.8.3:

- The UE is not expected to transmit PUCCH/PUSCH or receive PDCCH/PDSCH on reference symbols to be measured for candidate beam detection.

7.5.5.6 NR SA FR2 Scell CSI-RS-based beam failure detection and link recovery in non-DRX

Editor's Note:

- This test case is incomplete for Test frequency f > 40.8 GHz
- This test case is incomplete for UE power class other than PC3.

7.5.5.6.1 Test purpose

The purpose of this test is to verify that the UE properly detects CSI-RS-based beam failure in the set q_0 configured for an active SCell and that the UE performs correct CSI-RS-based link recovery based on beam candidate set q_1. The purpose is to test the downlink monitoring for beam failure detection within the UEs active DL BWP of the SCell with *schedulingRequestID-BFR-SCell-r16* configuration, during the evaluation period, and link recovery, when no DRX is used. This test will partly verify the CSI-RS based beam failure detection and link recovery for an FR2 SCell requirements in TS 38.133 [6] clause 8.5.

7.5.5.6.2 Test applicability

This test applies to all types of NR UE release 16 onwards supporting SCell BFR.

7.5.5.6.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 7.5.5.0.2 and 7.5.5.0.4.

The normative reference for this requirement is TS 38.133 [6] clause A.7.5.5.6.

7.5.5.6.4 Test description

There are two cells configured in this test. Cell 1 is the active PCell and Cell 2 is the active SCell. This test consists of five successive time periods, with time duration of T1, T2, T3, T4 and T5 respectively. Figure 7.5.5.6.4-1 shows the variation of the downlink SNR of the CSI-RS in set q_0 in the active SCell to emulate CSI-RS based beam failure. Figure 7.5.5.6.4-1 additionally shows the variation of the downlink L1-RSRP of the CSI-RS in set q_1 of the candidate beam used for link recovery.

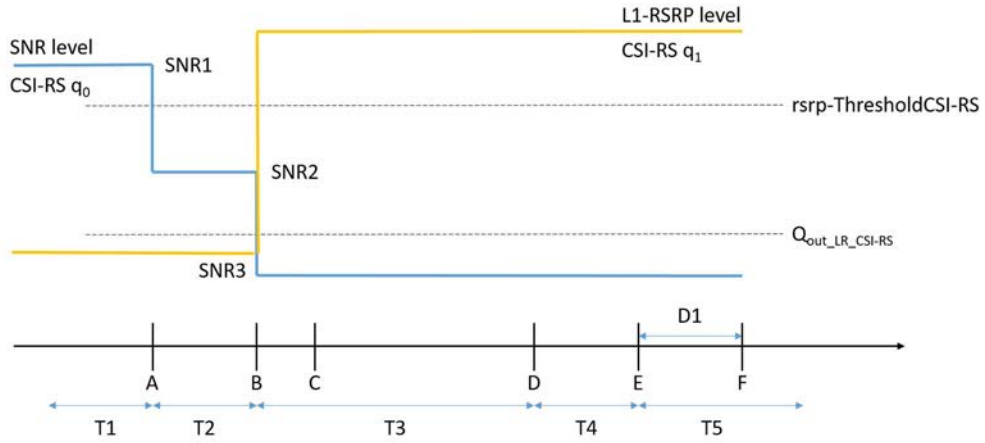


Figure 7.5.5.6.4-1: SNR and L1-RSRP variation for CSI-RS based beam failure detection and link recovery testing for SCell in non-DRX mode

7.5.5.6.4.1 Initial conditions

This test shall be tested using any of the test configurations in Table 7.5.5.6.4.1-1.

Table 7.5.5.6.4.1-1: Supported test configurations for SA FR2 SCell beam failure detection and link recovery testing in non-DRX

Configuration	Description
7.5.5.6-1	TDD duplex mode, 120 kHz SSB SCS, 100 MHz bandwidth
Note: The UE is only required to be tested in one of the supported test configurations	

Configure the test equipment and the DUT according to the parameters in Table 7.5.5.6.4.1-2.

Table 7.5.5.6.4.1-2: Initial conditions for SA FR2 SCell beam failure detection and link recovery testing in non-DRX

Parameter	Value		Comment
Test environment	NC		As specified in TS 38.508-1 [14] clause 4.1.
Test frequencies	As specified in Annex E, table E.5-1 and TS 38.508-1 [14] clause 4.3.1		
Channel bandwidth	As specified by the test configuration selected from Table 7.5.5.6.4.1-1.		
Propagation conditions	AWGN		As specified in Annex C.2.2.
Connection Diagram	TE Part	A.3.3.3.1	As specified in TS 38.508-1 [14] Annex A.
	DUT Part	A.3.4.1.1	
Exceptions to connection diagram	N/A		

1. The general test parameter settings are set up according to Table 7.5.5.6.4.1-3.
2. Message contents are defined in clause 7.5.5.6.4.3.
3. There are two NR cells specified in the test. Cell 1 is the cell used for connection setup with the power level set according to Annex C.1.1 and C.1.2 for this test.

Table 7.5.5.6.4.1-3: General test parameters for FR2 SCell for beam failure detection and link recovery testing in non-DRX mode

Parameter	Test Config.	Unit	Value	Comment
			Test 1	

Active PCell		1		Cell 1	
RF Channel Number for PCell		1		1	
Active SCell		1		Cell 2	
RF Channel Number for SCell		1		2	
Duplex mode		1		TDD	
TDD Configuration		1		TDDConf.3.1	
$BW_{channel}$		1	MHz	100: $N_{RB,c}$ = 66	
Data RBs allocated		1		66	
PDSCH/PDCCH subcarrier spacing		1	kHz	120	
DL initial BWP configuration		1		DLBWP.0.1	
DL dedicated BWP configuration		1		DLBWP.1.1	
UL initial BWP configuration		1		ULBWP.0.1	
UL dedicated BWP configuration		1		ULBWP.1.1	
PDSCH Reference Channel		1		SR.3.2 TDD	
RMSI CORESET Reference Channel		1		CR.3.1 TDD	A.1.2.2
Dedicated CORESET Reference Channel		1		CCR.3.1 TDD	
OCNG parameters		1		OP.1	A.2.1
CP length		1		Normal	
PDSCH/PDCCH TCI state		1		TCI.State.0	
CSI-RS for tracking		1		TRS.2.1 TDD	
SSB Configuration		1		SSB.3 FR2	A.3
SMTC Configuration		1		SMTC.3	A.4
PRACH Configuration		1		FR2 PRACH configuration 4	Table A.7.2-1
DRX configuration		1		OFF	
CSI-RS configuration for BFD/CBD on SCell		1		CSI-RS.3.2 TDD	A.1.4.2
CSI-RS index assigned as BFD RS (q_0)		1		0	
CSI-RS index assigned as CBD RS (q_1)		1		1	
CSI-RS configuration for RLM on PCell		1		CSI-RS.3.2 TDD	A.1.4.2
Beam failure detection transmission parameters	DCI format	1		1-0	
	Number of Control OFDM symbols	1		2	
	Aggregation level	1	CCE	8	
	Ratio of hypothetical PDCCH RE energy to average SSS RE energy	1	dB	0	
	Ratio of hypothetical PDCCH DMRS energy to average SSS RE energy	1	dB	0	
	DMRS precoder granularity	1		REG bundle size	
	REG bundle size	1		6	
Gap pattern ID		1		N/A	
schedulingRequestID-BFR-SCell-r16		1		Configured	
Periodicity of PUCCH for SR configuration for BFR on SCell		1	slot	40	5ms
Offset of PUCCH for SR configuration for BFR on SCell		1	slot	4	
PUCCH parameters for SR configuration for BFR on SCell		1		Table 8.3.3.1.2-1 in [28]	
rlmInSyncOutOfSyncThreshold		1		absent	Value 0 is applied. (Table 8.1.1-1 in TS 38.133 [6]).
rsrp-ThresholdSSB		1	dBm/SCS	-109 Note 2	Threshold used for $Q_{in_LR_SSB}$
powerControlOffsetSS		1		db0	Used for deriving rsrp-ThresholdCSI-RS
beamFailureInstanceMaxCount		1		n1	see TS 38.321 [7], clause 5.17
beamFailureDetectionTimer		1		pbfd4	see TS 38.321 [7], clause 5.17
CSI-RS configuration for CSI reporting		1		CSI-RS.3.1 TDD	A.1.4.2
reportConfigType		1		periodic	

reportQuantity	1		cri-RI-PMI-CQI	
CSI reporting periodicity	1	slot	40	
CSI reporting offset	1	slot	4	
T310	1	ms	1000	
N310	1		2	
T1	1	s	1	The UE shall be fully synchronized to cell 1 during T1
T2	1	s	1.17	
T3	1	s	0.9	
T4	1	s	0	
T5	1	s	0.31	
D1	1	s	0.27	
Note 1: UE-specific PDCCH is not transmitted after T1 starts. Note 2: Including test toelerance given in Annex F.1.3.2				

7.5.5.6.4.2 Test procedure

Prior to the start of the time duration T1, the UE shall be fully synchronized to Cell 1 and Cell 2. The UE shall be configured for periodic CSI reporting with a reporting periodicity defined in CSI-RS configuration. In the test, DRX configuration is not enabled. During the test the UE is scheduled to transmit continuously in UL.

1. Ensure the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity *NR*, Connected without release *On* and Test Mode *On* according to TS 38.508-1 [14] clause 4.5.4.
2. The SS shall configure SCell (Cell 2) on the SCC as per TS 38.508-1 [14] clause 7.5.2, with the message content exceptions defined in clause 7.5.5.6.4.3. NR RRCReconfiguration message is contained in RRCConnectionReconfiguration and NR RRCReconfigurationComplete message is contained in RRCConnectionReconfigurationComplete.
3. The SS activates SCC by sending the activation MAC-CE (Refer TS 38.321 [12], clauses 5.9, 6.1.3.10).
4. Set the parameters of NR Cell 1 and Cell 2 according to T1 in Table 7.5.5.6.5-1. Propagation conditions are set according to Annex C.2.3. T1 starts.
5. When T1 expires the SS shall change the SNR value to T2 as specified in Table 7.5.5.6.5-1. T2 starts.
6. When T2 expires the SS shall change the SNR value to T3 as specified in Table 7.5.5.6.5-1. T3 starts.
7. When T3 expires the SS shall change the SNR value to T4 as specified in Table 7.5.5.6.5-1. T4 starts.
8. When T4 expires the SS shall change the SNR value to T5 as specified in Table 7.5.5.6.5-1. T5 starts.
9. If the SS:

   a) detects uplink power on NR carrier equal to or higher than minimum output power defined in TS 38.521-2 [18] clause 6.3.1.5 in each slot configured for CSI transmission (according CSI reporting on PUCCH) during the period from time point A to time point B; and

   b) does not detect PUCCH with LRR before time point B, and

   c) detects PUCCH with LRR, followed by BFR MAC CE containing a beam associated with the candidate beam set q_1 before time point F (D1 after the start of T5),

   the number of successful tests is increased by one.

   Otherwise the number of failed tests is increased by one.

10. When T5 expires the SS shall change the SNR value to T1 as specified in Table 7.5.5.6.5-1.
11. If the iteration fails, the SS shall first attempt to release and add the FR2 SCell. If that also fails, then the UE is switched OFF/ON to proceed with the next iteration, and ensure the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity *EN-DC*, DC bearer *MCG* and *SCG*, Connected without release *On* and Test Mode *On* according to TS 38.508-1 [14] clause 4.5.4.

12. Repeat steps 2-11 for all subtests until the confidence level according to Tables G.2.3-1 in Annex G clause G.2 is achieved.

7.5.5.6.4.3 Message contents

Message contents are according to TS 38.508-1 [14] clause 7.3 with the following exceptions:

Table 7.5.5.6.4.3-1: Common Exception messages for SA FR2 SCell for beam failure detection and link recovery testing in non-DRX mode

Default Message Contents	
Common contents of system information blocks exceptions	
Default RRC messages and information elements contents exceptions	Table H.3.1-8 with Condition CSI-RS BFD Table H.3.1-12 on Cell 3 Table H.3.1-13 on Cell 3

Table 7.5.5.6.4.3-2: MAC-CellGroupConfig

Derivation Path: TS 38.508-1 [14], Table 4.6.3-68			
Information Element	**Value/remark**	**Comment**	**Condition**
MAC-CellGroupConfig ::= SEQUENCE {			
schedulingRequestID-BFR-SCell-r16	SchedulingRequestId		
}			

Table 7.5.5.6.4.3-3: *SchedulingRequestResourceConfig*

Derivation Path: TS 38.508-1 [14], Table 4.6.3-157			
Information Element	**Value/remark**	**Comment**	**Condition**
SchedulingRequestResourceConfig ::= SEQUENCE {			
periodicityAndOffset CHOICE {			
sl40	4		
}			
}			

7.5.5.6.5 Test requirement

Tables 7.5.5.6.4.1-3 and 7.5.5.6.5-1 define the primary level settings including test tolerances for SA FR2 SCell for beam failure detection and link recovery testing in non-DRX.

Table 7.5.5.6.5-1: NR Cell specific test parameters for SA FR2 SCell for beam failure detection and link recovery testing in non-DRX mode

Parameter	Unit	Cell1	Cell2 Test 1				
		T1 to T5	T1	T2	T3	T4	T5
AoA setup		Setup 1 defined in A.9.1	Setup 1 defined in A.9.1				
Assumption for UE beams[Note 10]		Rough	Rough				
EPRE ratio of PDCCH DMRS to SSS	dB	0	0				
EPRE ratio of PDCCH to PDCCH DMRS	dB						
EPRE ratio of PBCH DMRS to SSS	dB						
EPRE ratio of PBCH to PBCH DMRS	dB						
EPRE ratio of PSS to SSS	dB						
EPRE ratio of PDSCH DMRS to SSS	dB						
EPRE ratio of PDSCH to PDSCH DMRS	dB						

EPRE ratio of OCNG DMRS to SSS		dB						
EPRE ratio of OCNG to OCNG DMRS		dB						
SNR_CSI-RS of set q_0	Config 1	dB	5	13.7	5.7	-12	-12	-12
SNR_CSI-RS of set q_1	Config 1	dB	0.2	0.2	0.2	20	20	20
CSI-RS_RP of set q_1	Config 1	dBm/SCS kHz	-104.5	-104.5	-104.5	-84.7	-84.7	-84.7
N_{oc}	Config 1	dBm/120kHz	-104.7	-104.7				
Propagation condition			TDL-A 30ns 75Hz	TDL-A 30ns 75Hz				

Note 1: OCNG shall be used such that the resources in Cell 1 are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.
Note 2: The uplink resources for CSI reporting are assigned to the UE prior to the start of time period T1.
Note 3: NZP CSI-RS resource set configuration for CSI reporting are assigned to the UE prior to the start of time period T1.
Note 4: Void
Note 5: The timers and layer 3 filtering related parameters are configured prior to the start of time period T1.
Note 6: The signal contains PDCCH for UEs other than the device under test as part of OCNG.
Note 7: SNR levels correspond to the signal to noise ratio over the REs carrying CSI-RS.
Note 8: The SNR in time periods T1, T2, T3, T4 and T5 is denoted as SNR1, SNR2 and SNR3 respectively in figure 7.5.5.6.4-1.
Note 9: The SNR values are specified for testing a UE which supports 2RX on at least one band. For testing of a UE which supports 4RX on all bands, the SNR during T3 is modified as specified in clause D.4.
Note 10: Information about types of UE beam is given in B.2.1.3 in TS 38.133 [6], and does not limit UE implementation or test system implementation

The UE behaviour during time durations T1, T2, T3, T4 and T5 shall be as follows:

During the time duration T1 and T2, the UE shall transmit uplink signal at least in all subframes configured for CSI transmission on Cell 1.

During the period from time point A to time point B the UE shall transmit uplink signal in Cell 1 in all uplink slots configured for CSI transmission according to the configured periodic CSI reporting for Cell 1.

During T3 the UE shall detect beam failure and initial link recovery. During T4 and T5 the UE measures and evaluates beam candidate from beam candidate set q_1.

No later than time point F occurring no later than D1 = 260+10 ms after the start of T5, the UE shall transmit PUCCH with LRR, followed by BFR MAC CE containing a beam associated with the candidate beam set q_1. The UE shall not transmit PUCCH with an LRR with the candidate beam set q_1 earlier than time point B.

Test is concluded once the test equipment has received the initial preamble transmission from the UE. The rate of correct events observed during repeated tests shall be at least 90%.

7.5.5.7 NR SA FR2 Scell CSI-RS-based beam failure detection and link recovery in DRX

Editor's Note:

- This test case is incomplete for Test frequency f > 40.8 GHz
- This test case is incomplete for UE power class other than PC3.

The purpose of this test is to verify that the UE properly detects CSI-RS-based beam failure in the set q_0 configured for an active SCell and that the UE performs correct CSI-RS-based link recovery based on beam candidate set q_1. The purpose is to test the downlink monitoring for beam failure detection within the UEs active DL BWP of the SCell with *schedulingRequestID-BFR-SCell-r16* configuration, during the evaluation period, and link recovery, when DRX is used.

This test will partly verify the CSI-RS based beam failure detection and link recovery for an FR2 SCell requirements in TS 38.133 [6] clause 8.5.

7.5.5.7.2 Test applicability

This test applies to all types of NR UE release 16 onwards supporting SCell BFR.

7.5.5.7.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 7.5.5.0.2 and 7.5.5.0.4.

The normative reference for this requirement is TS 38.133 [6] clause A.7.5.5.7.

7.5.5.7.4 Test description

There are two cells configured in this test. Cell 1 is the active PCell and Cell 2 is the active SCell. This test consists of five successive time periods, with time duration of T1, T2, T3, T4 and T5 respectively. Figure 7.5.5.7.4-1 shows the variation of the downlink SNR of the CSI-RS in set q_0 in the active SCell to emulate CSI-RS based beam failure. Figure 7.5.5.7.4-1 additionally shows the variation of the downlink L1-RSRP of the CSI-RS in set q_1 of the candidate beam used for link recovery.

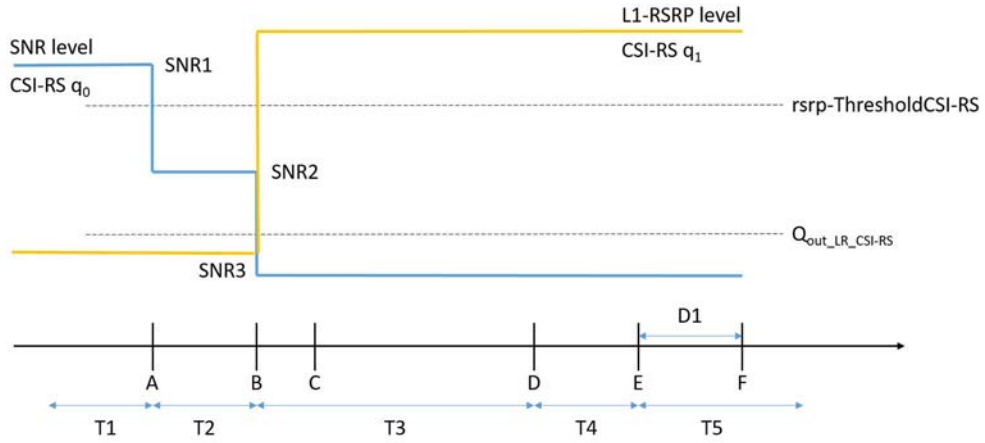


Figure 7.5.5.7.4-1: SNR and L1-RSRP variation for CSI-RS based beam failure detection and link recovery testing for SCell in DRX mode

7.5.5.7.4.1 Initial conditions

This test shall be tested using any of the test configurations in Table 7.5.5.7.4.1-1.

Table 7.5.5.7.4.1-1: Supported test configurations for SA FR2 SCell beam failure detection and link recovery testing in DRX

Configuration	Description
7.5.5.7-1	TDD duplex mode, 120 kHz SSB SCS, 100 MHz bandwidth
Note: The UE is only required to be tested in one of the supported test configurations	

Configure the test equipment and the DUT according to the parameters in Table 7.5.5.7.4.1-2.

Table 7.5.5.7.4.1-2: Initial conditions for SA FR2 SCell beam failure detection and link recovery testing in DRX

Parameter	Value	Comment
Test environment	NC	As specified in TS 38.508-1 [14] clause 4.1.
Test frequencies	As specified in Annex E, table E.5-1 and TS 38.508-1 [14] clause 4.3.1	
Channel bandwidth	As specified by the test configuration selected from Table 7.5.5.7.4.1-1.	
Propagation conditions	AWGN	As specified in Annex C.2.2.

Connection Diagram	TE Part	A.3.3.3.1	As specified in TS 38.508-1 [14] Annex A.
	DUT Part	A.3.4.1.1	
Exceptions to connection diagram	N/A		

1. The general test parameter settings are set up according to Table 7.5.5.7.4.1-3.
2. Message contents are defined in clause 7.5.5.7.4.3.
3. There are two NR cells specified in the test. Cell 1 is the cell used for connection setup with the power level set according to Annex C.1.1 and C.1.2 for this test.

Table 7.5.5.7.4.1-3: General test parameters for FR2 SCell for beam failure detection and link recovery testing in DRX mode

Parameter		Test Config.	Unit	Value	Comment
				Test 1	
Active PCell		1		Cell 1	
RF Channel Number for PCell		1		1	
Active SCell		1		Cell 2	
RF Channel Number for SCell		1		2	
Duplex mode		1		TDD	
TDD Configuration		1		TDDConf.3.1	
$BW_{channel}$		1	MHz	100: $N_{RB,c}$ = 66	
Data RBs allocated		1		66	
PDSCH/PDCCH subcarrier spacing		1	kHz	120	
DL initial BWP configuration		1		DLBWP.0.1	
DL dedicated BWP configuration		1		DLBWP.1.1	
UL initial BWP configuration		1		ULBWP.0.1	
UL dedicated BWP configuration		1		ULBWP.1.1	
PDSCH Reference Channel		1		SR.3.2 TDD	
RMSI CORESET Reference Channel		1		CR.3.1 TDD	A.1.2.2
Dedicated CORESET Reference Channel		1		CCR.3.1 TDD	
OCNG parameters		1		OP.1	A.2.1
CP length		1		Normal	
PDSCH/PDCCH TCI state		1		TCI.State.0	
CSI-RS for tracking		1		TRS.2.1 TDD	
SSB Configuration		1		SSB.3 FR2	A.3
SMTC Configuration		1		SMTC.3	A.4
PRACH Configuration		1		FR2 PRACH configuration 4	Table A.7.2-1
DRX configuration		1		DRX.3	A.5
CSI-RS configuration for BFD/CBD on SCell		1		CSI-RS.3.2 TDD	A.1.4.2
CSI-RS index assigned as BFD RS (q_0)		1		0	
CSI-RS index assigned as CBD RS (q_1)		1		1	
CSI-RS configuration for RLM on PCell		1		CSI-RS.3.2 TDD	A.1.4.2
Beam failure detection transmission parameters	DCI format	1		1-0	
	Number of Control OFDM symbols	1		2	
	Aggregation level	1	CCE	8	
	Ratio of hypothetical PDCCH RE energy to average SSS RE energy	1	dB	0	
	Ratio of hypothetical PDCCH DMRS energy to average SSS RE energy	1	dB	0	
	DMRS precoder granularity	1		REG bundle size	
	REG bundle size	1		6	
Gap pattern ID		1		N/A	
schedulingRequestID-BFR-SCell-r16		1		Configured	

Periodicity of PUCCH for SR configuration for BFR on SCell	1	slot	40	5ms
Offset of PUCCH for SR configuration for BFR on SCell	1	slot	4	
PUCCH parameters for SR configuration for BFR on SCell	1		Table 8.3.3.1.2-1 in [28]	
rlmInSyncOutOfSyncThreshold	1		absent	Value 0 is applied. (Table 8.1.1-1 in TS 38.133 [6]).
rsrp-ThresholdSSB	1	dBm/SCS	-109 Note 2	Threshold used for $Q_{in_LR_SSB}$
powerControlOffsetSS	1		db0	Used for deriving rsrp-ThresholdCSI-RS
beamFailureInstanceMaxCount	1		n1	see TS 38.321 [12], clause 5.17
beamFailureDetectionTimer	1		pbfd4	see TS 38.321 [12], clause 5.17
CSI-RS configuration for CSI reporting	1		CSI-RS.3.1 TDD	A.1.4.2
reportConfigType	1		periodic	
reportQuantity	1		cri-RI-PMI-CQI	
CSI reporting periodicity	1	slot	40	
CSI reporting offset	1	slot	4	
T310	1	ms	1000	
N310	1		2	
T1	1	s	1	The UE shall be fully synchronized to cell 1 during T1
T2	1	s	5.43	
T3	1	s	5.16	
T4	1	s	0	
T5	1	s	0.31	
D1	1	s	0.27	
Note 1: UE-specific PDCCH is not transmitted after T1 starts. Note 2: Including test toelerance given in Annex F.1.3.2				

7.5.5.7.4.2 Test procedure

Prior to the start of the time duration T1, the UE shall be fully synchronized to Cell 1 and Cell 2. The UE shall be configured for periodic CSI reporting with a reporting periodicity defined in CSI-RS configuration. In the test, DRX configuration is enabled in PCell and DRX inactivity timer has already been expired, i.e. UE tries to decode PDCCH and to send periodic CQI during the period when On-duration timer is running. Time alignment timers shall be set to "infinity" so that UL timing alignment is maintained during the test. During the test the UE is scheduled to transmit continuously in UL.

1. Ensure the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity *NR*, Connected without release *On* and Test Mode *On* according to TS 38.508-1 [14] clause 4.5.4.

2. The SS shall configure SCell (Cell 2) on the SCC as per TS 38.508-1 [14] clause 7.5.2, with the message content exceptions defined in clause 7.5.5.7.4.3. NR RRCReconfiguration message is contained in RRCConnectionReconfiguration and NR RRCReconfigurationComplete message is contained in RRCConnectionReconfigurationComplete.

3. The SS activates SCC by sending the activation MAC-CE (Refer TS 38.321 [12], clauses 5.9, 6.1.3.10).

4. Set the parameters of NR Cell 1 and Cell 2 according to T1 in Table 7.5.5.7.5-1. Propagation conditions are set according to Annex C.2.3. T1 starts.

5. When T1 expires the SS shall change the SNR value to T2 as specified in Table 7.5.5.7.5-1. T2 starts.

6. When T2 expires the SS shall change the SNR value to T3 as specified in Table 7.5.5.7.5-1. T3 starts.

7. When T3 expires the SS shall change the SNR value to T4 as specified in Table 7.5.5.7.5-1. T4 starts.

8. When T4 expires the SS shall change the SNR value to T5 as specified in Table 7.5.5.7.5-1. T5 starts.

9. If the SS:

   a) detects uplink power on NR carrier in each slot configured for CSI transmission (according CSI reporting on PUCCH) during the period from time point A to time point B; and

   b) does not detect PUCCH with LRR before time point B, and

   c) detects PUCCH with LRR, followed by BFR MAC CE containing a beam associated with the candidate beam set q_1 before time point F (D1 after the start of T5),

   the number of successful tests is increased by one.

   Otherwise the number of failed tests is increased by one.

10. When T5 expires the SS shall change the SNR value to T1 as specified in Table 7.5.5.7.5-1.

11. If the iteration fails, the SS shall first attempt to release and add the FR2 SCell. If that also fails, then the UE is switched OFF/ON to proceed with the next iteration, and ensure the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity *EN-DC*, DC bearer *MCG* and *SCG*, Connected without release *On* and Test Mode *On* according to TS 38.508-1 [14] clause 4.5.4.

12. Repeat steps 2-11 for all subtests until the confidence level according to Tables G.2.3-1 in Annex G clause G.2 is achieved.

7.5.5.7.4.3 Message contents

Message contents are according to TS 38.508-1 [14] clause 7.3 with the following exceptions:

Table 7.5.5.7.4.3-1: Common Exception messages for SA FR2 SCell for beam failure detection and link recovery testing in DRX mode

Default Message Contents	
Common contents of system information blocks exceptions	
Default RRC messages and information elements contents exceptions	Table H.3.1-8 with Condition CSI-RS BFD Table H.3.1-12 on Cell 3 Table H.3.1-13 on Cell 3 Table H.3.7-1 with condition DRX.3

Table 7.5.5.7.4.3-2: MAC-CellGroupConfig

Derivation Path: TS 38.508-1 [14], Table 4.6.3-68			
Information Element	**Value/remark**	**Comment**	**Condition**
MAC-CellGroupConfig ::= SEQUENCE {			
schedulingRequestID-BFR-SCell-r16	SchedulingRequestId		
}			

Table 7.5.5.7.4.3-3: *SchedulingRequestResourceConfig*

Derivation Path: TS 38.508-1 [14], Table 4.6.3-157			
Information Element	**Value/remark**	**Comment**	**Condition**
SchedulingRequestResourceConfig ::= SEQUENCE {			
periodicityAndOffset CHOICE {			
sl40	4		
}			
}			

7.5.5.7.5 Test requirement

Tables 7.5.5.7.4.1-3 and 7.5.5.7.5-1 define the primary level settings including test tolerances for SA FR2 SCell for beam failure detection and link recovery testing in DRX.

Table 7.5.5.7.5-1: NR Cell specific test parameters for SA FR2 SCell for beam failure detection and link recovery testing in DRX mode

Parameter		Unit	Cell1	Cell2 Test 1				
			T1 to T5	T1	T2	T3	T4	T5
AoA setup			Setup 1 defined in A.9.1	Setup 1 defined in A.9.1				
Assumption for UE beams[Note 10]			Rough	Rough				
EPRE ratio of PDCCH DMRS to SSS		dB	0	0				
EPRE ratio of PDCCH to PDCCH DMRS		dB						
EPRE ratio of PBCH DMRS to SSS		dB						
EPRE ratio of PBCH to PBCH DMRS		dB						
EPRE ratio of PSS to SSS		dB						
EPRE ratio of PDSCH DMRS to SSS		dB						
EPRE ratio of PDSCH to PDSCH DMRS		dB						
EPRE ratio of OCNG DMRS to SSS		dB						
EPRE ratio of OCNG to OCNG DMRS		dB						
SNR_CSI-RS of set q_0	Config 1	dB	5	13.7	5.7	-12	-12	-12
SNR_CSI-RS of set q_1	Config 1	dB	0.2	0.2	0.2	20	20	20
CSI-RS_RP of set q_1	Config 1	dBm/SCS kHz	-104.5	-104.5	-104.5	-84.7	-84.7	-84.7
N_{oc}	Config 1	dBm/120kHz	-104.7	-104.7				
Propagation condition			TDL-A 30ns 75Hz	TDL-A 30ns 75Hz				

Note 1: OCNG shall be used such that the resources in Cell 1 are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.
Note 2: The uplink resources for CSI reporting are assigned to the UE prior to the start of time period T1.
Note 3: NZP CSI-RS resource set configuration for CSI reporting are assigned to the UE prior to the start of time period T1.
Note 4: Void
Note 5: The timers and layer 3 filtering related parameters are configured prior to the start of time period T1.
Note 6: The signal contains PDCCH for UEs other than the device under test as part of OCNG.
Note 7: SNR levels correspond to the signal to noise ratio over the REs carrying CSI-RS.
Note 8: The SNR in time periods T1, T2, T3, T4 and T5 is denoted as SNR1, SNR2 and SNR3 respectively in figure 7.5.5.7.4-1.
Note 9: The SNR values are specified for testing a UE which supports 2RX on at least one band. For testing of a UE which supports 4RX on all bands, the SNR during T3 is modified as specified in clause D.4.
Note 10: Information about types of UE beam is given in B.2.1.3 in TS 38.133 [6], and does not limit UE implementation or test system implementation

The UE behaviour during time durations T1, T2, T3, T4 and T5 shall be as follows:

During the time duration T1 and T2, the UE shall transmit uplink signal at least in all subframes configured for CSI transmission on Cell 1.

During the period from time point A to time point B the UE shall transmit uplink signal in Cell 1 in all uplink slots configured for CSI transmission according to the configured periodic CSI reporting for Cell 1.

During T3 the UE shall detect beam failure and initial link recovery. During T4 and T5 the UE measures and evaluates beam candidate from beam candidate set q_1.

No later than time point F occurring no later than D1 = 260+10 ms after the start of T5, the UE shall transmit PUCCH with LRR, followed by BFR MAC CE containing a beam associated with the candidate beam set q_1. The UE shall not transmit PUCCH with an LRR with the candidate beam set q_1 earlier than time point B.

Test is concluded once the test equipment has received the initial preamble transmission from the UE. The rate of correct events observed during repeated tests shall be at least 90%.

7.5.5.8 FFS

FFS.

7.5.5.9 NR SA FR2 SCell TRP specific CSI-RS-based Beam Failure Detection and Link Recovery in DRX

Editor's Note:

- This test case is incomplete for Test frequency f > 40.8 GHz
- This test case is incomplete for UE power class other than PC3.
- TT analysis has not been provided.
- TS 38.522 applicability spec update is pending

7.5.5.9.1 Test purpose

The purpose of this test is to verify that the UE properly detects TRP specific CSI-RS-based beam failure and link recovery in the sets $\bar{q}_{0,0}$ and $\bar{q}_{0,1}$ for TRP1 when DRX is used for an FR2 active Scell requirements in TS38.133[6] clause 8.18.

7.5.5.9.2 Test applicability

This test applies to all types of NR UE release 17 onwards supporting TRP specific SCell BFR.

7.5.5.9.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 7.5.5.0.2 and 7.5.5.0.4.

The normative reference for this requirement is TS 38.133 [6] clause A.7.5.5.9.

7.5.5.9.4 Test description

The test consists of five successive time periods, with time duration of T1, T2, T3, T4 and T5 respectively. Figure 7.5.5.9.4-1shows the variation of the downlink SNR of the CSI-RS in set $\bar{q}_{0,0}$ and $\bar{q}_{1,0}$ in the active SCell for TRP1 and TRP2 respectively. Figure 7.5.5.9.1-1 additionally shows the variation of the downlink L1-RSRP of the CSI-RS in $\bar{q}_{0,1}$ for TPR1.

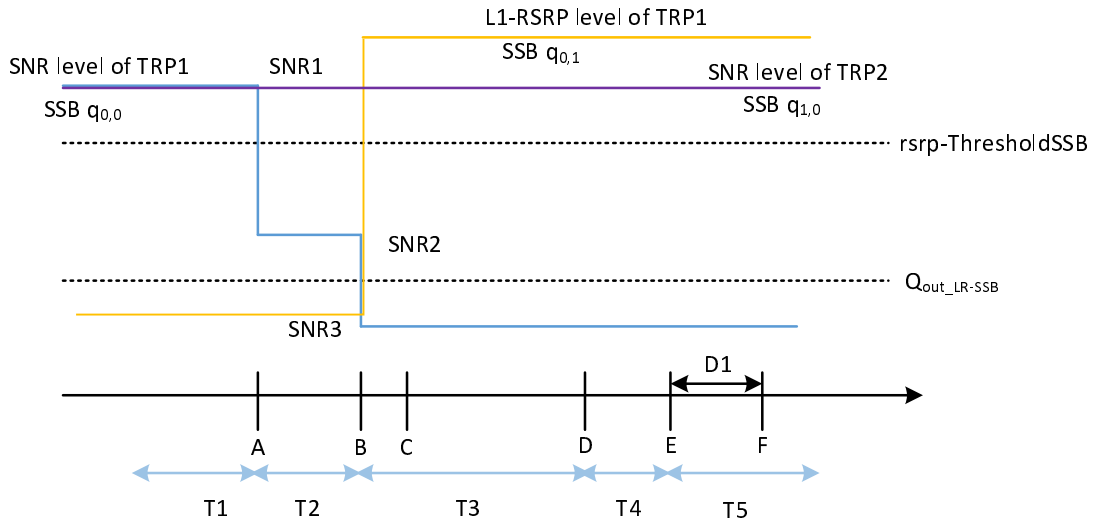


Figure 7.5.5.9.4-1: SNR and L1-RSRP variation for beam failure detection and link recovery testing for SCell in DRX mode

7.5.5.9.4.1 Initial conditions

This test shall be tested using any of the test configurations in Table 7.5.5.9.4.1-1.

Table 7.5.5.9.4.1-1: Supported test configurations for FR2 PCell and SCell

Configuration	Description
1	TDD duplex mode, 120 kHz SSB SCS, 100 MHz bandwidth

Configure the test equipment and the DUT according to the parameters in Table 7.5.5.9.4.1-2.

Table 7.5.5.9.4.1-2: Initial conditions for SA FR2 beam failure detection and link recovery testing in DRX

Parameter	Value		Comment
Test environment	NC		As specified in TS 38.508-1 [14] clause 4.1.
Test frequencies	As specified in Annex E, table E.5-1 and TS 38.508-1 [14] clause 4.3.1		
Channel bandwidth	As specified by the test configuration selected from Table 7.5.5.9.4.1-1.		
Propagation conditions	AWGN		As specified in Annex C.2.2.
Connection Diagram	TE Part	A.3.3.3.1	As specified in TS 38.508-1 [14] Annex A.
	DUT Part	A.3.4.1.1	
Exceptions to connection diagram	N/A		

1. The general test parameter settings are set up according to Table 7.5.5.9.4.1-3.
2. Message contents are defined in clause 7.5.5.9.4.3.
3. There are two NR cells specified in the test. Cell 1 is the cell used for connection setup with the power level set according to Annex C.1.1 and C.1.2 for this test.

Table 7.5.5.9.4.1-3: General test parameters for FR2 SCell for beam failure detection and link recovery testing in DRX mode

Parameter		Unit	Value	Comment
			Test 1	
Active PCell			Cell 1	
RF Channel Number for PCell			1	
Active SCell			Cell 2	
RF Channel Number for SCell			2	
Duplex mode	Config 1		TDD	
BW channel	Config 1		100: $N_{RB,c}$ = 66	
DL initial BWP configuration	Config 1		DLBWP.0.1	
DL dedicated BWP configuration	Config 1		DLBWP.1.1	
UL initial BWP configuration	Config 1		ULBWP.0.1	
UL dedicated BWP configuration	Config 1		ULBWP.1.1	
TDD Configuration	Config 1		TDDConf.3.1	
CORESET Reference Channel	Config 1		CR.3.1 TDD	A.3.1.2
SSB Configuration	Config 1		SSB.3 FR2	A.3.11
SMTC Configuration	Config 1		SMTC.3	A.3.10
PDSCH/PDCCH subcarrier spacing	Config 1		120 KHz	
PRACH Configuration	Config 1		Table A.3.8.3.1-1	
CSI-RS configuration for TRP0	Config 1		CSI-RS.3.2 TDD	A.3.14.2
CSI-RS configuration for TRP1	Config 1		CSI-RS.3.6 TDD	A.3.14.2
CSI-RS configuration for CSI reporting	Config 1		CSI-RS.3.1 TDD	A.3.14.2
TRS configuration	Config 1		TRS.2.1 TDD	
TCI configuration	Config 1		CSI-RS.Config.0	
OCNG parameters			OP.1	
CP length			Normal	
Correlation Matrix and Antenna Configuration			2x2 Low	
OCNG parameters			OP.1	A.3.2.1
CP length			Normal	
Correlation Matrix and Antenna Configuration			2x2 Low	
Beam failure detection transmission parameters	DCI format		1-0	
	Number of Control OFDM symbols		2	
	Aggregation level	CCE	8	
	Ratio of hypothetical PDCCH RE energy to average CSI-RS RE energy	dB	0	
	Ratio of hypothetical PDCCH DMRS energy to average CSI-RS RE energy	dB	0	
	DMRS precoder granularity		REG bundle size	
	REG bundle size		6	
DRX			DRX.3	
Gap pattern ID			N.A.	
schedulingRequestID-BFR-SCell-r16			Configured	
Periodicity of PUCCH for SR configuration for BFR on SCell		Slot	40	5ms

Offset of PUCCH for SR configuration for BFR on SCell		Slot	5	
PUCCH parameters for SR configuration for BFR on SCell			Table 8.3.3.1.2-1 in [13]	
csi-RS-Index assigned as BFD RS in set (q00)			0	
csi-RS-Index assigned as BFD RS in set (q01)			2	
CSI-RS index assigned as RLM RS			0, 1	
CSI-RS Index assigned as CBD RS in set (q10)			1	
CSI-RS Index assigned as CBD RS in set (q11)			3	
SSB index assigned as RLM RS			0, 1	
rlmInSyncOutOfSyncThreshold			absent	When the field is absent, the UE applies the value 0. (Table 8.1.1-1).
rsrp-ThresholdBFR	Config 1	dBm/SCS	-95	Threshold used for $Q_{in_LR_SSB}$
powerControlOffsetSS			db0	Used for deriving rsrp-ThresholdCSI-RS
beamFailureInstanceMaxCount			n1	see TS 38.321 [7], clause 5.17
beamFailureDetectionTimer			pbfd4	see TS 38.321 [7], clause 5.17
T310 Timer		ms	1000	
N310			2	
T1		s	1	During this time the UE shall be fully synchronized to cell 1
T2		s	10.81	
T3		s	10.28	
T4		s	0	
T5		s	0.57	
D1		s	0.53	
Note 1: UE-specific PDCCH is not transmitted after T1 starts.				

7.5.5.8.4.2 Test procedure

Prior to the start of the time duration T1, the UE shall be fully synchronized to cell 1 and cell 2. The UE shall be configured for periodic CSI reporting with a reporting periodicity of 2 ms. In the test, DRX configuration is enabled in PCell and DRX inactivity timer has already been expired, i.e. UE tries to decode PDCCH and to send periodic CQI during the period when On-duration timer is running. Time alignment timers shall be set to “infinity” so that UL timing alignment is maintained during the test.

1. Ensure the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity *NR*, Connected without release *On* and Test Mode *On* according to TS 38.508-1 [14] clause 4.5.4.

2. The SS shall configure SCell (Cell 2) on the SCC as per TS 38.508-1 [14] clause 7.5.2, with the message content exceptions defined in clause 7.5.5.9.4.3. NR RRCReconfiguration message is contained in RRCConnectionReconfiguration and NR RRCReconfigurationComplete message is contained in RRCConnectionReconfigurationComplete.

3. The SS activates SCC by sending the activation MAC-CE (Refer TS 38.321 [12], clauses 5.9, 6.1.3.10).

4. Set the parameters of NR Cell 1 and Cell 2 according to T1 in Table 7.5.5.9.5-1. Propagation conditions are set according to Annex C.2.3. T1 starts.

5. When T1 expires the SS shall change the SNR1 and SNR2 values to T2 as specified in Table 7.5.5.9.5-1. T2 starts.

6. When T2 expires the SS shall change the SNR1 and SNR2 values to T3 as specified in Table 7.5.5.9.5-1. T3 starts.

7. When T3 expires the SS shall change the SNR1 and SNR2 values to T4 as specified in Table 7.5.5.9.5-1. T4 starts.

8. When T4 expires the SS shall change the SNR1 and SNR2 values to T5 as specified in Table 7.5.5.9.5-1. T5 starts.

9. If the SS:

   a) detects uplink power on NR carrier in each slot configured for CSI transmission (according CSI reporting on PUCCH) during the period from time point A to time point B; and

   b) does not detect PUCCH with LRR before time point B, and

   c) detects PUCCH with LRR, followed by BFR MAC CE containing a beam associated with the candidate beam set q_{10} and q_{11} before time point F (D1 after the start of T5),

   the number of successful tests is increased by one.

   Otherwise the number of failed tests is increased by one.

10. When T5 expires the SS shall change the SNR value to T1 as specified in Table 7.5.5.7.5-1.

11. If the iteration fails, the SS shall first attempt to release and add the FR2 SCell. If that also fails, then the UE is switched OFF/ON to proceed with the next iteration, and ensure the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity *EN-DC*, DC bearer *MCG* and *SCG*, Connected without release *On* and Test Mode *On* according to TS 38.508-1 [14] clause 4.5.4.

12. Repeat steps 2-11 for all subtests until the confidence level according to Tables G.2.3-1 in Annex G clause G.2 is achieved.

7.5.5.7.4.3 Message contents

Message contents are according to TS 38.508-1 [14] clause 7.3 with the following exceptions:

Table 7.5.5.7.4.3-1: Common Exception messages for SA FR2 SCell for beam failure detection and link recovery testing in DRX mode

Default Message Contents	
Common contents of system information blocks exceptions	
Default RRC messages and information elements contents exceptions	Table H.3.1-8A with Condition CSI-RS BFD Table H.3.1-12A on Cell 3 Table H.3.1-13 on Cell 3 with condition SpCell Table H.3.7-1 with condition DRX.3

Table 7.5.5.7.4.3-2: *MAC-CellGroupConfig for R17 BFR*

Derivation Path: TS 38.508-1, Table 4.6.3-68			
Information Element	Value/remark	Comment	Condition
MAC-CellGroupConfig ::= SEQUENCE {			
schedulingRequestID-BFR-r17	Not present		
schedulingRequestID-BFR2-r17	Not present		
schedulingRequestConfig-v1700	SchedulingRequest-Config		
}			

Table 7.5.5.7.4.3-3: *SchedulingRequestResourceConfig*

Derivation Path: TS 38.508-1 [14], Table 4.6.3-157			
Information Element	**Value/remark**	**Comment**	**Condition**
SchedulingRequestResourceConfig ::= SEQUENCE {			
periodicityAndOffset CHOICE {			
sl40	4		
}			
}			

7.5.5.9.5 Test requirements

Tables 7.5.5.9.4.1-3 and 7.5.5.9.5-1 define the primary level settings including test tolerances for SA FR2 SCell for beam failure detection and link recovery testing in DRX.

Table A.7.5.5.9.5.1-3: Cell specific test parameters for FR2 SCell for beam failure detection and link recovery testing in DRX mode

Parameter	Unit	Cell1	Cell2				
		T1 to T5	T1	T2	T3	T4	T5
AoA setup		Setup 3 as specified in clause A.9.1					
Assumption for UE beams Note 10		Rough	Rough				
EPRE ratio of PDCCH DMRS to SSS	dB	0	0				
EPRE ratio of PDCCH to PDCCH DMRS	dB						
EPRE ratio of PBCH DMRS to SSS	dB						
EPRE ratio of PBCH to PBCH DMRS	dB						
EPRE ratio of PSS to SSS	dB						
EPRE ratio of PDSCH DMRS to SSS	dB						
EPRE ratio of PDSCH to PDSCH DMRS	dB						
EPRE ratio of OCNG DMRS to SSS	dB						
EPRE ratio of OCNG to OCNG DMRS	dB						
SNR_CSI-RS of set $q_{0,0}$	dB	5+TT	5+TT	-3+TT	-12+TT	-12+TT	-12+TT
SNR_CSI-RS of set $q_{1,0}$	dB	5+TT	5+TT	5+TT	5+TT	5+TT	5+TT
SNR_CSI-RS of set $q_{0,1}$	dB	0.2+TT	0.2+TT	0.2+TT	20.2+TT	20.2+TT	20.2+TT
CSI-RS_RP of set $q_{0,1}$	dBm/ SCS kHz	-104.5+TT	-104.5+TT	-104.5+TT	-84.5+TT	-84.5+TT	-84.5+TT
N_{oc}	dBm/120 kHz	-104.7+TT	-104.7+TT				
Propagation condition		TDL-A 30ns 75Hz	TDL-A 30ns 75Hz				

Note 1: OCNG shall be used such that the resources in Cell 1 are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.
Note 2: The uplink resources for CSI reporting are assigned to the UE prior to the start of time period T1.
Note 3: NZP CSI-RS resource set configuration for CSI reporting are assigned to the UE prior to the start of time period T1.
Note 4: Void
Note 5: The timers and layer 3 filtering related parameters are configured prior to the start of time period T1.
Note 6: The signal contains PDCCH for UEs other than the device under test as part of OCNG.
Note 7: SNR levels correspond to the signal to noise ratio over the REs carrying CSI-RS.
Note 8: The SNR in time periods T1, T2, T3, T4 and T5 is denoted as SNR1, SNR2 and SNR3 respectively in figure A.7.5.5.7.1-1.
Note 9: The SNR values are specified for testing a UE which supports 2RX on at least one band. For testing of a UE which supports 4RX on all bands, the SNR during T3 is modified as specified in clause TS38.133 A.3.6.
Note 10: Information about types of UE beam is given in B.2.1.3 and does not limit UE implementation or test system implementation.
Note 11: AoA1 for PCell and TRP1 of SCell , AoA2 for TRP2 of SCell

The UE behaviour during time durations T1, T2, T3, T4 and T5 in A.7.5.5.9.1 shall be as follows:

During the time duration T1 and T2, the UE shall transmit uplink signal at least in all subframes configured for CSI transmission on Cell 1 for TRP1 and TRP2.

During the period from time point A to time point B the UE shall transmit uplink signal in Cell 2 TRP1 and TRP2 in all uplink slots configured for CSI transmission according to the configured periodic CSI reporting for Cell 1.

During T3, T4, T5, the UE shall transmit uplink signal at least in all subframes configured for CSI transmission on Cell 1 for TRP2.

During T3 the UE shall detect beam failure and initiate link recovery for TRP1. During T4 and T5 the UE measures and evaluate beam candidate from beam candidate set $q_{0,1}$.

No later than time point F occurring no later than D1 = [520]+10 ms after the start of T5, the UE shall transmit PUCCH with LRR, followed by BFR MAC CE containing a beam associated with the candidate beam set $q_{0,1}$. The UE shall not transmit PUCCH with an LRR with the candidate beam set $q_{0,1}$ earlier than time point B.

Test is concluded once the test equipment has received the initial preamble transmission from the UE. The rate of correct events observed during repeated tests shall be at least 90%.

7.5.5.10 NR SA FR2 PCell TRP specific SSB-based Beam Failure Detection and Link Recovery in non-DRX

Editor's Note:

- This test case is incomplete for Test frequency f > 40.8 GHz
- This test case is incomplete for UE power class other than PC3.
- TT analysis has not been provided.
- TS 38.522 applicability spec update is pending

7.5.5.10.1 Test purpose

The purpose of this test is to verify that the UE properly detects TRP specific SSB-based beam failure and link recovery in the sets $\bar{q}_{0,0}$ and $\bar{q}_{0,1}$ for TRP1 with *schedulingRequestID-BFR-r17* configured, when no DRX is used for an FR2 serving cell requirements in TS38.133[6] clause 8.18.

7.5.5.10.2 Test applicability

This test applies to all types of NR UE release 17 onwards supporting TRP specific PCell BFR.

7.5.5.10.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 7.5.5.0.2 and 7.5.5.0.4.

The normative reference for this requirement is TS 38.133 [6] clause A.7.5.5.10.

7.5.5.10.4 Test description

The test consists of five successive time periods, with time duration of T1, T2, T3, T4 and T5 respectively. Figure 7.5.5.10.4-1 shows the variation of the downlink SNR of the SSB in set $\bar{q}_{0,0}$ and $\bar{q}_{1,0}$ for TRP1 and TRP2 respectively. Figure 7.5.5.10.4-1 additionally shows the variation of the downlink L1-RSRP of the SSB in set $\bar{q}_{0,1}$ for TPR1.

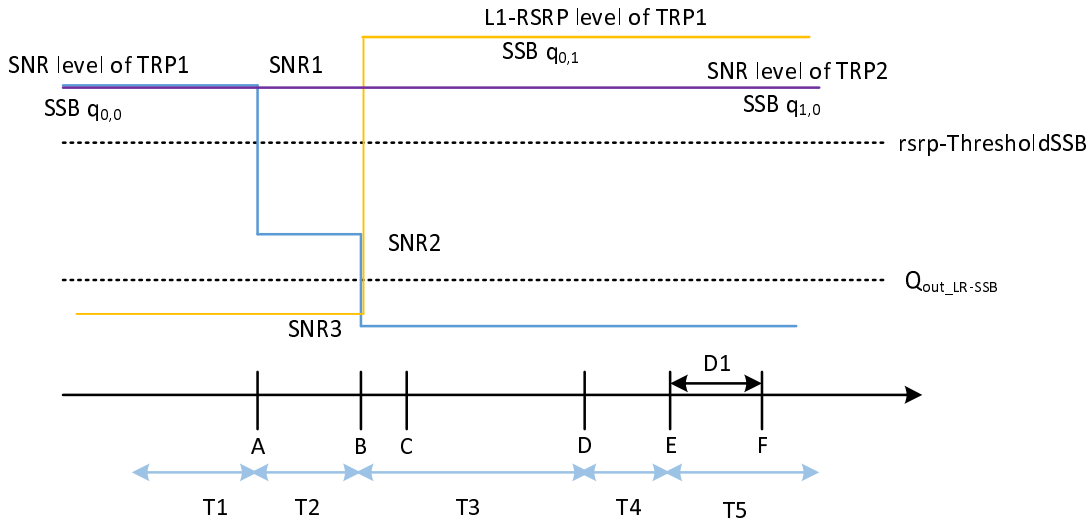


Figure 7.5.5.10.4-1: SNR and L1-RSRP variation SSB for SSB-based beam failure detection and link recovery testing in non-DRX mode

7.5.5.10.4.1 Initial conditions

This test shall be tested using any of the test configurations in Table 7.5.5.10.4.1-1.

Table 7.5.5.10.4-1: Supported test configurations for FR2 PCell

Configuration	Description
1	TDD duplex mode, 120 kHz SSB SCS, 100 MHz bandwidth
2	TDD duplex mode, 240 kHz SSB SCS, 100 MHz bandwidth
Note: The UE is only required to pass in one of the supported test configurations in FR2	

Configure the test equipment and the DUT according to the parameters in Table 7.5.5.10.4.1-2.

Table 7.5.5.10.4.1-2: Initial conditions for SA FR2 beam failure detection and link recovery testing in DRX

Parameter	Value		Comment
Test environment	NC		As specified in TS 38.508-1 [14] clause 4.1.
Test frequencies	As specified in Annex E, table E.5-1 and TS 38.508-1 [14] clause 4.3.1		
Channel bandwidth	As specified by the test configuration selected from Table 7.5.5.10.4.1-1.		
Propagation conditions	AWGN		As specified in Annex C.2.2.
Connection Diagram	TE Part	A.3.3.3.1	As specified in TS 38.508-1 [14] Annex A.
	DUT Part	A.3.4.1.1	
Exceptions to connection diagram	N/A		

1. The general test parameter settings are set up according to Table 7.5.5.10.4.1-3.
2. Message contents are defined in clause 7.5.5.10.4.3.
3. There are two NR cells specified in the test. Cell 1 is the cell used for connection setup with the power level set according to Annex C.1.1 and C.1.2 for this test.

Table 7.5.5.10.4.1-3: General test parameters for FR2 PCell for SSB-based beam failure detection and link recovery testing in non-DRX mode

Parameter		Unit	Value	Comment
			Test 1	Same configuration for both TRP wherever applicable
Active PCell			Cell 1	
RF Channel Number for PCell			1	
Duplex mode	Config 1,2		TDD	
TDD Configuration	Config 1,2		TDDConf.3.1	
BW channel	Config 1,2		100: $N_{RB,c}$ = 66	
Data RBs allocated	Config 1,2		66	
PDSCH/PDCCH subcarrier spacing	Config 1,2	kHz	120	
DL initial BWP configuration	Config 1,2		DLBWP.0.1	
DL dedicated BWP configuration	Config 1,2		DLBWP.1.1	
UL initial BWP configuration	Config 1,2		ULBWP.0.1	
UL dedicated BWP configuration	Config 1,2		ULBWP.1.1	
PDSCH Reference Channel	Config 1		SR.3.2 TDD	
	Config 2		SR.3.3 TDD	
RMSI CORESET Reference Channel	Config 1		CR.3.1 TDD	
	Config 2		CR.3.2 TDD	
Dedicated CORESET Reference Channel	Config 1		CCR.3.1 TDD	
	Config 2		CCR.3.7 TDD	
OCNG parameters	Config 1,2		OP.1	
CP length	Config 1,2		Normal	
PDSCH/PDCCH TCI state	Config 1,2		TCI.State.0	
CSI-RS for tracking	Config 1,2		TRS.2.1 TDD	
CSI-RS configuration for CSI reporting	Config 1,2		CSI-RS.3.1 TDD	
reportConfigType	Config 1,2		periodic	
reportQuantity	Config 1,2		cri-RI-PMI-CQI	
CSI reporting periodicity	Config 1,2	slot	40	
CSI reporting offset	Config 1,2	slot	4	
SSB Configuration for TRP0	Config 1		SSB.1 FR2	
	Config 2		SSB.2 FR2	
SSB Configuration for TRP1	Config 1		SSB.9 FR2	
	Config 2		SSB.10 FR2	
SMTC Configuration	Config 1,2		SMTC.3	
PRACH Configuration	Config 1,2		FR2 PRACH configuration 2	
DRX configuration	Config 1,2		OFF	
SSB Index assigned as BFD RS (q0,0)	Config 1,2		0	
SSB Index assigned as CBD RS (q1,0)	Config 1,2		1	
SSB Index assigned as BFD RS (q0,1)	Config 1,2		2	
SSB Index assigned as CBD RS (q1,1)	Config 1,2		3	
SSB Index assigned as RLM RS	Config 1,2		0,1,2,3	
Beam failure detection transmission parameters	DCI format		1-0	
	Number of Control OFDM symbols		2	
	Aggregation level	CCE	8	

	Ratio of hypothetical PDCCH RE energy to average CSI-RS RE energy	dB	0	
	Ratio of hypothetical PDCCH DMRS energy to average CSI-RS RE energy	dB	0	
	DMRS precoder granularity		REG bundle size	
	REG bundle size		6	
Gap pattern ID			gp0	
gapOffset			0	
schedulingRequestID-BFR- r17			Configured	
Periodicity of PUCCH for SR configuration for BFR on PCell		slot	40	5ms
rlmInSyncOutOfSyncThreshold			absent	When the field is absent, the UE applies the value 0.
rsrp-ThresholdBFR	Config 1	dBm/SCS	-95	Threshold used for $Q_{in_LR_SSB}$
	Config 2		-92	
powerControlOffsetSS			db0	Used for deriving rsrp-ThresholdCSI-RS
beamFailureInstanceMaxCount			n1	see TS 38.321 [12], clause 5.17
beamFailureDetectionTimer			pbfd4	see TS 38.321 [12], clause 5.17
T310 Timer		ms	1000	
N310			2	
T1		s	1	During this time the UE shall be fully synchronized to cell 1
T2		s	2.61	
T3		s	1.64	
T4		s	0	
T5		s	1.01	
D1		s	0.97	
Note 1: All configurations are assigned to the UE prior to the start of time period T1. Note 2: UE-specific PDCCH is not transmitted after T1 starts.				

7.5.5.10.4.2 Test procedure

Prior to the start of the time duration T1, the UE shall be fully synchronized to cell 1. The UE shall be configured for periodic CSI reporting with a reporting periodicity of 5 ms. In the test, DRX configuration is not enabled. The UE is configured to perform inter-frequency measurements using GP ID #0 (40ms) in test 1.

1. Ensure the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity *NR*, Connected without release *On* according to TS 38.508-1 [14] clause 4.5.

2. Set the parameters of NR Cell 1 according to T1 in Table 7.5.5.10.5-1. Propagation conditions are set according to Annex C.2.3. T1 starts.

3. When T1 expires the SS shall change the SNR1 and SNR2 values to T2 as specified in Table 7.5.5.10.5-1. T2 starts.

4. When T2 expires the SS shall change the SNR1 and SNR2 values to T3 as specified in Table 7.5.5.10.5-1. T3 starts.

5. When T3 expires the SS shall change the SNR1 and SNR2 values to T4 as specified in Table 7.5.5.10.5-1. T4 starts.

6. When T4 expires the SS shall change the SNR1 and SNR2 values to T5 as specified in Table 7.5.5.10.5-1. T5 starts.

7. If the SS:

a) detects uplink power on NR carrier in each slot configured for CQI transmission (according CQI reporting on PUCCH) during the period from time point A to time point B; and

b) does not detect a preamble on a beam associated with candidate beam set q_{10} and q_{11} before time point B; and

c) detects preamble on a beam associated with candidate beam set q_{10} and q_{11} before time point F (D1 after the start of T5),

the number of successful tests is increased by one. Otherwise the number of failed tests is increased by one.

8. When T5 expires the SS shall change the SNR value to T1 as specified in Table 7.5.5.10.5-1.
9. Wait 1s for the UE to re-establish the connection or continue directly to step 10. If the UE re-establishes the connection within 1s continue to step 11. Otherwise continue to step 10.
10. Switch the UE on and off. Ensure the UE is in RRC_CONNECTED with generic procedure parameters Connectivity *NR*, Connected without release *On* according to TS 38.508-1 [14] clause 4.5.
11. Repeat steps 2-10 until the confidence level according to Tables G.2.3-1 in Annex G clause G.2 is achieved.

7.5.5.10.4.3 Message contents

Message contents are according to TS 38.508-1 [14] clause 7.3 with the following exceptions:

Table 7.5.5.10.4.3-1: Common Exception messages for NR SA FR2 CSI-RS-based beam failure detection and link recovery in non-DRX

Default Message Contents	
Common contents of system information blocks exceptions	
Default RRC messages and information elements contents exceptions	Table H.3.1-8A with Condition CSI-RS BFD Table H.3.1-10 with Condition CSI-RS Table H.3.1-10A Table H.3.7-1 with Condition TRP-SPECIFIC-BFD

Table 7.5.5.10.4.3-2: *MAC-CellGroupConfig for R17 BFR*

Derivation Path: TS 38.508-1, Table 4.6.3-68			
Information Element	Value/remark	Comment	Condition
MAC-CellGroupConfig ::= SEQUENCE {			
schedulingRequestID-BFR-r17	Not present		
schedulingRequestID-BFR2-r17	Not present		
schedulingRequestConfig-v1700	SchedulingRequest-Config		
}			

7.5.5.10.5 Test requirement

Tables 7.5.5.10.4.1-3 and 7.5.5.10.5-1 define the primary level settings including test tolerances for TRP specific NR SA FR2 CSI-RS-based beam failure detection and link recovery in non-DRX.

Table7.5.5.10-1: Cell specific test parameters for FR2 PCell for SSB-based beam failure detection and link recovery testing in non-DRX mode

Parameter	Unit	Test 1				
		T1	T2	T3	T4	T5
AoA setup		Setup 3 as specified in clause A.9.1 Note 12				
Assumption for UE beams Note 10		Rough				
EPRE ratio of PDCCH DMRS to SSS	dB	0				
EPRE ratio of PDCCH to PDCCH DMRS	dB					
EPRE ratio of PBCH DMRS to SSS	dB					

EPRE ratio of PBCH to PBCH DMRS		dB					
EPRE ratio of PSS to SSS		dB					
EPRE ratio of PDSCH DMRS to SSS		dB					
EPRE ratio of PDSCH to PDSCH DMRS		dB					
EPRE ratio of OCNG DMRS to SSS		dB					
EPRE ratio of OCNG to OCNG DMRS		dB					
SNR_SSB of set $q_{0,0}$	Config 1-2	dB	5+TT Note 11	-3+TT Note 11	-12+TT	-12+TT	-12+TT
SNR_SSB of set $q_{1,0}$	Config 1-2	dB	5+TT Note 11	5+TT Note 11	5+TT Note 11	5+TT Note 11	5+TT Note 11
SNR_SSB of set $q_{0,1}$	Config 1-2	dB	0.2+TT	0.2+TT	20.2+TT	20.2+TT	20.2+TT
SSB_RP of set $q_{0,1}$	Config 1	dBm/ SCS	-104.5+TT	-104.5+TT	-84.5+TT	-84.5+TT	-84.5+TT
	Config 2		-101.5+TT	-101.5+TT	-81.5+TT	-81.5+TT	-81.5+TT
N_{oc}	Config 1,2	dBm/120 KHz	-104.7+TT				
Propagation condition			TDL-A 30ns 75Hz				

Note 1: OCNG shall be used such that the resources in Cell 1 are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.
Note 2: The uplink resources for CSI reporting are assigned to the UE prior to the start of time period T1.
Note 3: NZP CSI-RS resource set configuration for CSI reporting are assigned to the UE prior to the start of time period T1.
Note 4: Measurement gap configuration is assigned to the UE prior to the start of time period T1.
Note 5: The timers and layer 3 filtering related parameters are configured prior to the start of time period T1.
Note 6: The signal contains PDCCH for UEs other than the device under test as part of OCNG.
Note 7: SNR levels correspond to the signal to noise ratio over the SSS REs.
Note 8: The SNR in time periods T1, T2, T3, T4 and T5 is denoted as SNR1, SNR2 and SNR3 respectively in figure A.7.5.5.1.1-1.
Note 9: The SNR values are specified for testing a UE which supports 2RX on at least one band. For testing of a UE which supports 4RX on all bands, the SNR during T3 is modified as specified in clause A.3.6.
Note 10: Information about types of UE beam is given in B.2.1.3 and does not limit UE implementation or test system implementation.
Note 11: This value allows up to 1dB degradation from applied SNR to UE baseband
Note 12: AoA1 for TRP1 and AoA2 for TRP2

The UE behaviour during time durations T1, T2, T3, T4 and T5 shall be as follows:

During the time duration T1 and T2, the UE shall transmit uplink signal at least in all subframes configured for CSI transmission on Cell 1 for TRP 1 and TRP2.

During the period from time point A to time point B the UE shall transmit uplink signal for TRP 1 and TRP2 in all uplink slots configured for CSI transmission according to the configured periodic CSI reporting for Cell 1.

During T3, T4, T5, the UE shall transmit uplink signal at least in all subframes configured for CSI transmission for TRP 2.

During T3 the UE shall detect beam failure and initiate link recovery for TRP 1. During T4 and T5 the UE measures and evaluate beam candidate from beam candidate set $q_{0,1}$.

No later than time point F occurring no later than D1 = 960+10 ms after the start of T5, the UE shall transmit PUCCH with LRR, followed by BFR MAC CE containing a beam associated with the candidate beam set $q_{1,0}$. The UE shall not transmit PUCCH with an LRR with the candidate beam set $q_{1,0}$ earlier than time point B.

Test is concluded once the test equipment has received the initial preamble transmission from the UE. The rate of correct events observed during repeated tests shall be at least 90%.

7.5.6 Active BWP switch delay

7.5.6.1 DCI-based and time-based active BWP switch

7.5.6.1.0 Minimum conformance requirements

[TS 38.133, clause 8.6.2]

The requirements in this clause only apply to the case that the BWP switch is performed on a single CC.

For DCI-based BWP switch, after the UE receives BWP switching request at DL slot n on a serving cell, UE shall be able to receive PDSCH (for DL active BWP switch) or transmit PUSCH (for UL active BWP switch) on the new BWP on the serving cell on which BWP switch on the first DL or UL slot occurs right after the beginning of DL slot n+ $T_{BWPswitchDelay}$.

The UE is not required to transmit UL signals or receive DL signals during time duration $T_{BWPswitchDelay}$ on the cell where DCI-based BWP switch occurs. The UE is not required to follow the requirements defined in this clause when performing a DCI-based BWP switch between the BWPs in disjoint channel bandwidths or in partially overlapping channel bandwidths.

Depending on UE capability *bwp-SwitchingDelay* [2], UE shall finish BWP switch within the time duration $T_{BWPswitchDelay}$ defined in Table 7.5.6.1.0-1.

Table 7.5.6.1.0-1: BWP switch delay

μ	NR Slot length (ms)	BWP switch delay $T_{BWPswitchDelay}$ (slots)	
		Type 1[Note 1]	Type 2[Note 1]
0	1	1	3
1	0.5	2	5
2	0.25	3	9
3	0.125	6	18
Note 1: Depends on UE capability. Note 2: If the BWP switch involves changing of SCS, the BWP switch delay is determined by the smaller SCS between the SCS before BWP switch and the SCS after BWP switch.			

Provided the UE does not have the required TCI-state information to receive PDCCH and PDSCH in the new BWP, the UE shall use old TCI-states before the BWP switch until a new MAC CE updating the required TCI-state information for PDCCH and PDSCH is received after the BWP switch.

If UE has the information on the required TCI-state information to receive PDCCH and PDSCH in the new BWP,

- UE shall be able to receive PDCCH and PDSCH with old TCI-states before the delay as specified in Clause 8.10 in the new BWP.
- UE shall be able to receive PDCCH and PDSCH with new TCI-states after the delay as specified in Clause 8.10 in the new BWP.

7.5.6.1.1 NR SA FR2 DCI-based DL active BWP switch in non-DRX

Editor's note: This test case is incomplete. The following aspects are either missing or TBD

- Test tolerance analysis is missing

- Message contents are TBD

- Cell mapping is TBD

- Test procedure is TBD

- Test applicability needs to be added to TS 38.522

7.5.6.1.1.1 Test purpose

FFS

7.5.6.1.1.2 Test applicability

FFS

7.5.6.1.1.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 7.5.6.1.0.1.

The normative reference for this requirement is TS 38.133 [6] clause A.7.5.6.1.1.

7.5.6.1.1.4 Test description

7.5.6.1.1.4.1 Initial conditions

FFS

7.5.6.1.1.4.2 Test procedure

FFS

7.5.6.1.1.4.3 Message contents

FFS

7.5.6.1.1.5 Test requirements

FFS

7.5.6.1.2 NR SA FR1-FR2 DCI-based DL active BWP switch in non-DRX

Editor's note: This test case is incomplete. The following aspects are either missing or TBD

- Test tolerance analysis is missing

- Message contents are TBD

- Cell mapping is TBD

- Test procedure is TBD

- Test applicability needs to be added to TS 38.522

- NR FR1 - FR2 OTA testability is still FFS.

7.5.6.1.2.1 Test purpose

FFS

7.5.6.1.2.2 Test applicability

FFS

7.5.6.1.2.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 7.5.6.1.0.2.

The normative reference for this requirement is TS 38.133 [6] clause A.7.5.6.1.2.

7.5.6.1.2.4 Test description

7.5.6.1.2.4.1 Initial conditions

FFS

7.5.6.1.2.4.2 Test procedure

FFS

7.5.6.1.2.4.3 Message contents

FFS

7.5.6.1.2.5 Test requirements

FFS

7.5.6.1.3 NR SA FR2 DCI-based DL active BWP switch in non-DRX

Editor's note: This test case is incomplete. The following aspects are either missing or TBD

- Test tolerance analysis is missing

- Message contents are TBD

- Cell mapping is TBD

- Test procedure is TBD

- Test applicability needs to be added to TS 38.522

7.5.6.1.3.1 Test purpose

The purpose of this test is to verify the DL BWP switch delay requirement defined in TS 38.133 [6] clause 8.6

7.5.6.1.3.2 Test applicability

This test applies to all types of NR UE release 15 onwards.

7.5.6.1.3.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 7.5.6.1.0.

The normative reference for this requirement is TS 38.133 [6] clause A.7.5.6.1.3.

7.5.6.1.3.4 Test description

There is one cell configured in this test. Cell 1 is PCell. This test consists of three successive time periods, with time duration of T1, T2 and T3 respectively.

7.5.6.1.3.4.1 Initial conditions

This test shall be tested using any of the test configurations in Table 7.5.6.1.3.4.1-1.

Table 7.5.6.1.3.4.1-1: Supported test configurations for NR SA FR2 DCI-based DL active BWP switch in non-DRX

Config	Description
7.5.6.1.3-1	NR 120 kHz SSB SCS, 100 MHz bandwidth, TDD duplex mode
Note 1: A UE which fulfils the requirements in test case 7.5.6.1.1 or 7.5.6.1.2 can skip the test cases in 7.5.6.1.3.	

Configure the test equipment and the DUT according to the parameters in Table 7.5.6.1.3.4.1-2.

Table 7.5.6.1.3.4.1-2: Initial conditions for NR SA FR2 DCI-based DL active BWP switch in non-DRX

Parameter	Value	Comment
Test environment	NC	As specified in TS 38.508-1 [14] clause 4.1.
Test frequencies	As specified in Annex E, table E.5-1 and TS 38.508-1 [14] clause 4.3.1 and 4.4.2.	
Channel bandwidth	As specified by the test configuration selected from Table 5.5.5.5.4.1-1.	
Propagation conditions	AWGN	As specified in Annex C.2.2.

Connection Diagram	TE Part	A.3.TBD	As specified in TS 38.508-1 [14] Annex A.
	DUT Part	A.3.TBD	
Exceptions to connection diagram	N/A		

1. The general test parameter settings are set up according to Table 7.5.6.1.3.4.1-3.
2. Message contents are defined in clause 7.5.6.1.3.4.3.
3. There are one NR cell specified in the test. NR Cell 1 is the cell used for connection setup with the power level set according to Annex C.1.1 and C.1.2 for this test.

Table 7.5.6.1.3.4.1-3: General test parameters for NR SA FR2 DCI-based DL active BWP switch in non-DRX

Parameter	Unit	Value	Comment
NR RF Channel Number		1	One NR radio channel is used for this test
Active Cell		Cell 1	Cell on RF channel number 1.
CP length		Normal	
DRX		OFF	For both PCell and PSCell
bwp-InactivityTimer	ms	[200]	
T1	s	[0.2]	
T2	s	[0.2]	
T3	s	[0.2]	

7.5.6.1.3.4.2 Test procedure

FFS

7.5.6.1.3.4.3 Message contents

Message contents are according to TS 38.508-1 [14] clause 7.3 with the following exceptions:

Table 7.5.6.1.3.4.3-1: Common Exception messages for NR SA FR2 DCI-based DL active BWP switch in non-DRX

Default Message Contents	
Common contents of system information blocks exceptions	
Default RRC messages and information elements contents exceptions	FFS

7.5.6.1.3.5 Test requirements

FFS

7.5.6.2 RRC-based active BWP switch

7.5.6.2.0 Minimum conformance requirements

FFS

7.5.6.2.1 NR SA FR2 RRC-based DL active BWP switch in non-DRX

Editor's note: This test case is incomplete. The following aspects are either missing or TBD

- Message contents are TBD

- Cell mapping is TBD

- Test procedure is TBD

- Test applicability needs to be added to TS 38.522

7.5.6.2.1.1 Test purpose

FFS

7.5.6.2.1.2 Test applicability

FFS

7.5.6.2.1.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 7.5.6.2.0.1.

The normative reference for this requirement is TS 38.133 [6] clause A.7.5.6.2.1.

7.5.6.2.1.4 Test description

7.5.6.2.1.4.1 Initial conditions

FFS

7.5.6.2.1.4.2 Test procedure

FFS

7.5.6.2.1.4.3 Message contents

FFS

7.5.6.2.1.5 Test requirements

During T1, the UE shall be ready for the reception of uplink grant for PCell from the first DL slot that occurs right after the begining of DL slot $i + \frac{T_{\text{RRCprocessingDelay}} + T_{\text{BWPswitchDelayRRC}}}{\text{NR Slot length}}$ and starts to report valid ACK/NACK for the PCell from the first UL slot that occurs after the beginning of DL slot $i + \frac{T_{\text{RRCprocessingDelay}} + T_{\text{BWPswitchDelayRRC}}}{\text{NR Slot length}} + k_1$.

Where, k_1 is the timing between DL data receiving and acknowledgement as specified in [12].

All of the above test requirements shall be fulfilled in order for the observed PCell active BWP switch delay to be counted as correct.

The rate of correct events observed during repeated tests shall be at least 90%.

Table 7.5.6.2.1.5-1: NR Cell specific test parameters for DL BWP switch in SA

Parameter	Unit	Cell 1
Frequency Range		FR2
Duplex mode		TDD
TDD configuration		TDDConf.3.1
$BW_{channel}$		100 MHz: $N_{RB,c}$ = 66
Active BWP ID		1
Active DL BWP-1 Configuration		DLBWP.0.2
Active DL BWP-2 Configuration		DLBWP.1.1
Active UL BWP-1 Configuration		ULBWP.1.3
Active UL BWP-2 Configuration		ULBWP.1.1
PDSCH Reference measurement channel		SR.3.1 TDD
RMSI CORESET parameters		CR.3.1 TDD
Dedicated CORESET parameters		CCR.3.1 TDD
OCNG Patterns		OP.1
SSB Configuration		SSB.1 FR2
SMTC Configuration		SMTC.1
TCI State		TCI.State.0
TRS Configuration		TRS.2.1 TDD
Antenna Configuration		1x2
Propagation Condition		AWGN
EPRE ratio of PSS to SSS	dB	0
EPRE ratio of PBCH DMRS to SSS		
EPRE ratio of PBCH to PBCH DMRS		

Parameter	Unit	Cell 1
EPRE ratio of PDCCH DMRS to SSS		
EPRE ratio of PDCCH to PDCCH DMRS		
EPRE ratio of PDSCH DMRS to SSS		
EPRE ratio of PDSCH to PDSCH		
EPRE ratio of OCNG DMRS to SSS(Note 1)		
EPRE ratio of OCNG to OCNG DMRS (Note 1)		
NOTE 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols. NOTE 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for N_{oc} to be fulfilled. NOTE 3: SS-RSRP and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves. NOTE 4: For unpaired spectrum, a DL BWP is linked with an UL BWP. DLBWP.0.2 is linked with ULBWP.0.2; DLBWP.1.1 is linked with ULBWP.1.1; DLBWP.1.3 is linked with ULBWP.1.3 defined in clause 12 of TS 38.213 [3].		

Table 7.5.6.2.1.5-2: OTA related test parameters for BWP switching test case

Parameter		Unit	Cell 2
Angle of arrival configuration			According to table A.3.15
N_{oc} Note1	NR_TDD_FR2_A	dBm/15kHz	-112
	NR_TDD_FR2_B		
	NR_TDD_FR2_F		
	NR_TDD_FR2_G		
	NR_TDD_FR2_T		
	NR_TDD_FR2_Y		
N_{oc} Note1	NR_TDD_FR2_A	dBm/SCS	-103
	NR_TDD_FR2_B		
	NR_TDD_FR2_F		
	NR_TDD_FR2_G		
	NR_TDD_FR2_T		
	NR_TDD_FR2_Y		
SS-RSRP Note2	NR_TDD_FR2_A	dBm/SCS Note3	-85
	NR_TDD_FR2_B		
	NR_TDD_FR2_F		
	NR_TDD_FR2_G		
	NR_TDD_FR2_T		
	NR_TDD_FR2_Y		
$\hat{E}_s/I_{ot}$		dB	18
Io Note2	NR_TDD_FR2_A	dBm/95.04 MHz Note4	-56
	NR_TDD_FR2_B		
	NR_TDD_FR2_F		
	NR_TDD_FR2_G		
	NR_TDD_FR2_T		
	NR_TDD_FR2_Y		
NOTE 1: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for N_{oc} to be fulfilled. NOTE 2: SS-RSRP and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves. NOTE 3: SS-RSRP minimum requirements are specified assuming independent interference and noise at each receiver antenna port. NOTE 4: Equivalent power received by an antenna with 0dBi gain at the centre of the quiet zone			

7.5.7 PSCell addition and release delay

7.5.7.0 Minimum conformance requirements

7.5.7.0.1 Minimum conformance requirements for PSCell addition delay

Upon receiving PSCell addition in subframe *n*, the UE shall be capable to transmit PRACH preamble towards PSCell in FR2 no later than in subframe $n + T_{config_PSCell}$:

Where:

$T_{config_PSCell} = T_{RRC_delay} + T_{processing} + T_{search} + T_{\Delta} + T_{PSCell_DU} + 2$ ms

T_{RRC_delay} is the RRC procedure delay as specified in TS 38.331 [13].

$T_{processing}$ is the SW processing time needed by UE, including RF warm up period. $T_{processing}$ = 40 ms.

T_{search} is the time for AGC settling and PSS/SSS detection. If the target cell is known, T_{search} = 0 ms. If the target cell is unknown and the target cell $\hat{E}s/Iot \geq$ -2dB, T_{search} = 24* Trs ms.

T_{Δ} is time for fine time tracking and acquiring full timing information of the target cell. T_{Δ} = 1*Trs ms for a known or unknown PSCell.

T_{PSCell_DU} is the delay uncertainty in acquiring the first available PRACH occasion in the PSCell. T_{PSCell_DU} is up to the summation of SSB to PRACH occasion association period and 10 ms. SSB to PRACH occasion associated period is defined in Table 8.1-1 of TS 38.213 [8].

Trs is the SMTC periodicity of the target cell if the UE has been provided with an SMTC configuration for the target cell in PSCell addition message, otherwise Trs is the SMTC configured in the measObjectNR having the same SSB frequency and subcarrier spacing. If the UE is not provided SMTC configuration or measurement object on this frequency, the requirement in this clause is applied with Trs = 5 ms assuming the SSB transmission periodicity is 5 ms. There is no requirement if the SSB transmission periodicity is not 5 ms.

In FR1 and FR2, the PSCell is known if it has been meeting the following conditions:

During the last 5 seconds before the reception of the PSCell configuration command:

- the UE has sent a valid measurement report for the PSCell being configured and
- One of the SSBs measured from the PSCell being configured remains detectable according to the cell identification conditions specified in TS 38.133 [6] clause 9.3.

- One of the SSBs measured from PSCell being configured also remains detectable during the PSCell configuration delay T_{config_PSCell} according to the cell identification conditions specified in TS 38.133 [6] clause 9.3.

otherwise it is unknown.

The PCell interruption specified in TS 38.133 [6] clause 8.2 is allowed only during the RRC reconfiguration procedure in TS 38.331 [13].

The normative reference for this requirement is TS 38.133 [6] clause 8.9.2.

7.5.7.0.2 Minimum conformance requirements for PSCell release delay

The requirements in this clause shall apply for a UE which is configured with PCell and one PSCell.

Upon receiving PSCell release in subframe *n*, the UE shall accomplish the release actions specified in TS 38.331 [13] no later than in subframe $n + T_{RRC_delay}$:

Where

T_{RRC_delay} is the RRC procedure delay as specified in TS 38.331 [13].

The PCell interruption specified in TS 38.133 [6] clause 8.2 is allowed only during the RRC reconfiguration procedure in TS 38.331 [13].

The normative reference for this requirement is TS 38.133 [6] clause 8.9.3.

7.5.7.1 NR SA FR2 addition and release delay of known PSCell

Editor's note: This test case is incomplete. The following aspects are either missing or TBD

- Test procedure

- Connection diagram

- Message contents are not complete.

- Test Requirements (still brackets in core-spec for PRACH preamble time [112] ms and CSI report time [20] ms)

- TT analysis is missing.

- Test Applicability in TS38.522

- Annex F

- Cell configuration mapping in Annex E

7.5.7.1.1 Test purpose

The purpose of this test is:

- To verify the requirement for the PSCell addition and release delay are within the requirements specified in TS 38.133 [6] clause 8.9.2, when the PSCell is known to the UE at the time of addition.

7.5.7.1.2 Test applicability

This test applies to all types of NR UE from Release 15 onwards.

7.5.7.1.3 Minimum conformance requirements

The minimum conformance requirements are specified in clauses 7.5.7.0.1 and 7.5.7.0.2.

The normative reference for this requirement is TS 38.133 [6] clause A.7.5.7.1.

7.5.7.1.4 Test description

7.5.7.1.4.1 Initial conditions

This test shall be run in one of the configurations defined in Table 7.5.7.1.4.1-1.

Table 7.5.7.1.4.1-1: Supported test configurations for NR SA FR2 PSCell

Config	Description
1	FR1 FDD SSB SCS 15kHz BW 10MHz – FR2 TDD SSB SCS 240kHz BW 100MHz
2	FR1 TDD SSB SCS 15kHz BW 10MHz – FR2 TDD SSB SCS 240kHz BW 100MHz
3	FR1 TDD SSB SCS 30kHz BW 40MHz – FR2 TDD SSB SCS 240kHz BW 100MHz
Note 1: The UE is only required to be tested in one of the supported test configurations	

Configure the test equipment and the DUT according to the parameters in Table 7.5.7.1.4.1-2.

Table 7.5.7.1.4.1-2: Initial conditions for NR SA FR2 SCell activation case

Parameter	Value		Comment
Test environment	NC		As specified in TS 38.508-1 [14] clause 4.1.
Test frequencies	As specified in Annex E, table E.4-1 and TS 38.508-1 [14] clause 4.3.1.		
Channel bandwidth	As specified by the test configuration selected from Table 7.5.7.1.4.1-1.		
Propagation conditions	AWGN		As specified in Annex C.2.2.
Connection Diagram	TE Part	TBD	As specified in TS 38.508-1 [14] Annex A.
	DUT Part	TBD	

Exceptions to connection diagram	N/A	

1. The general test parameter settings are set up according to Table 7.5.7.1.4.1-3.

2. Message contents are defined in clause 7.5.7.1.4.3.

3. There are two NR carriers and 2 NR Cells specified in the test. Cell 1 is the PCell and Cell 2 is the neighbour cell (PSCell-to-be). Cell 1 and Cell 2 are configured according to Annex C.1.1 and C.1.2.

Table 7.5.7.1.4.1-3: General test parameters for NR SA FR2 PSCell addition and release delay

Parameter		Unit	Value	Comment
RF Channel Number			1, 2	Two radio channels are used for this test
Active PCell			Cell 1	PCell on RF channel number 1 in FR1
Neighbour cell			Cell 2	Neighbour cell (PSCell-to-be) on RF channel number 2 in FR2
A4	Hysteresis	dB	0	Hysteresis for event A4
	Threshold RSRP	dBm	-97	Threshold for event A4
	Time to Trigger	S	0	Time to trigger for event A4
DRX			OFF	For both PCell and PSCell once activated
Measurement gap pattern ID			0	Gaps are configured before T2 and released before T3.
PRACH configuration in Cell 2			FR2 PRACH configuration 2	PRACH configuration as specified in Clause A.3.8.3.2.
CSI reporting periodicity and offset configuration for Cell 2		ms	[2]	
T1		s	5	During this time the PCell is known and Cell 2 is unknown.
T2		s	1	During this time the UE shall identify neighbour cell 2 and report event B1.
T3		s	3.5	During this time the test system transmits the RRC messages to release measurement gap and add PSCell.
T4		s	1	During this time the UE adds the PSCell.
T5		s	1	During this time the UE sends CSI reports for PSCell.
T6		s	1	During this time the UE releases the PSCell.

7.5.7.1.4.2 Test procedure

TBD

7.5.7.1.4.3 Message contents

Message contents are according to TS 38.508-1 [14] clause 4.6 with the following exceptions:

Table 7.5.7.1.4.3-1: Common Exception messages

Default Message Contents	
Common contents of system information blocks exceptions	
Default RRC messages and information elements contents exceptions	FFS

7.5.7.1.5 Test requirement

TBD

7.5.7.2 NR SA FR2 addition and release delay of unknown PSCell

Editor's note: This test case is incomplete. The following aspects are either missing or TBD

- Test procedure
- Connection diagram
- Message contents are not complete
- Test Requirements (still brackets in core-spec for PRACH preamble time [572] ms and CSI report time [20] ms)
- TT analysis is missing
- Test Applicability in TS38.522
- Annex F
- Cell configuration mapping in Annex E

7.5.7.2.1 Test purpose

The purpose of this test is:

- To verify the requirement for the PSCell addition and release delay are within the requirements specified in TS 38.133 [6] clause 8.9.2, when the PSCell is unknown to the UE at the time of addition.

7.5.7.2.2 Test applicability

This test applies to all types of NR UE from Release 15 onwards.

7.5.7.2.3 Minimum conformance requirements

The minimum conformance requirements are specified in clauses 7.5.7.0.1 and 7.5.7.0.2.

The normative reference for this requirement is TS 38.133 [6] clause A.7.5.7.2.

7.5.7.2.4 Test description

7.5.7.2.4.1 Initial conditions

This test shall be run in one of the configurations defined in Table 7.5.7.2.4.1-1.

Table 7.5.7.2.4.1-1: Supported test configurations for NR SA FR2 PSCell

Config	Description
1	FR1 FDD SSB SCS 15kHz BW 10MHz – FR2 TDD SSB SCS 240kHz BW 100MHz
2	FR1 TDD SSB SCS 15kHz BW 10MHz – FR2 TDD SSB SCS 240kHz BW 100MHz
3	FR1 TDD SSB SCS 30kHz BW 40MHz – FR2 TDD SSB SCS 240kHz BW 100MHz
Note 1: The UE is only required to be tested in one of the supported test configurations	

Configure the test equipment and the DUT according to the parameters in Table 7.5.73.2.4.1-2.

Table 7.5.7.2.4.1-2: Initial conditions for NR SA FR2 PSCell addition and release delay

Parameter	Value		Comment
Test environment	NC		As specified in TS 38.508-1 [14] clause 4.1.
Test frequencies	As specified in Annex E, table E.4-1 and TS 38.508-1 [14] clause 4.3.1.		
Channel bandwidth	As specified by the test configuration selected from Table 7.5.3.7.4.1-1.		
Propagation conditions	AWGN		As specified in Annex C.2.2.
Connection Diagram	TE Part	TBD	As specified in TS 38.508-1 [14] Annex A.
	DUT Part	TBD	
Exceptions to connection diagram	N/A		

1. The general test parameter settings are set up according to Table 7.5.7.2.4.1-3.

2. Message contents are defined in clause 7.5.7.2.4.3.

3. There are two NR carriers and 2 NR Cells specified in the test. Cell 1 is the PCell and Cell 2 is the neighbour cell (PSCell-to-be). Cell 1 and Cell 2 are configured according to Annex C.1.1 and C.1.2.

Table 7.5.7.2.4.1-3: General test parameters for NR SA FR2 PSCell addition and release delay

Parameter	Unit	Value	Comment
RF Channel Number		1, 2	Two radio channels are used for this test
Active PCell		Cell 1	PCell on RF channel number 1 in FR1
Neighbour cell		Cell 2	Neighbour cell (PSCell-to-be) on RF channel number 2 in FR2
DRX		OFF	For both PCell and PSCell once activated
PRACH configuration in Cell 2		FR2 PRACH configuration 2	PRACH configuration as specified in Clause A.3.8.3.2.
CSI reporting periodicity and offset configuration for Cell 2	ms	[2]	
T1	s	5	During this time the PCell is known and Cell 2 is unknown.
T2	s	1	During this time the UE adds the PSCell.
T3	s	1	During this time the UE sends CSI reports for PSCell.
T4	s	1	During this time the UE releases the PSCell.

7.5.7.2.4.2 Test procedure

TBD

7.5.7.2.4.3 Message contents

Message contents are according to TS 38.508-1 [14] clause 4.6 with the following exceptions:

Table 7.5.7.2.4.3-1: Common Exception messages

Default Message Contents	
Common contents of system information blocks exceptions	
Default RRC messages and information elements contents exceptions	FFS

7.5.7.2.5 Test requirement

TBD

7.5.8 to 7.5.10

7.5.11 UE UL carrier RRC reconfiguration delay

7.5.11.1 UE UL carrier RRC reconfiguration delay

Editor's note: This test case is incomplete. The following aspects are either missing or TBD

- TT analysis is missing.

- Test Applicability in TS38.522

- Annex F

7.5.11.1.1 Test purpose

The purpose of this test is to verify that when the UE receives a RRC message implying NR UL carrier configuration, the UE shall be ready to start transmission on the newly configured carrier within the time limits specified in TS 38.133 [6] clause 8.4.2 and 8.4.3 for configuring and deconfiguring, respectively. The test will also verify the interruption at UL carrier configuration requirements on PCell in TS 38.133 [6] clause 8.2.2.2.4.

7.5.11.1.2 Test applicability

This test applies to all types of NR UE release 17 onwards supporting 5GS NR SA FR2.

7.5.11.1.3 Minimum conformance requirements

The normative reference for this requirement is TS 38.133 [6] clause A.7.5.11.1.

7.5.11.1.3.1 UE UL carrier configuration delay requirement

When the UE receives a RRC message implying NR UL or supplementary UL carrier configuration, the UE shall be ready to start transmission on the newly configured carrier within $T_{UL_carrier_config}$ from the end of slot n.

Where

- Slot n is the last slot overlapping with the PDSCH containing the RRC command.
- $T_{UL_carrier_config}$ equals the maximum RRC procedure delay defined in clause 11.2 in TS 36.331 [29] if the corresponding RRC message is embedded in E-UTRA RRC message, otherwise it equals the maximum RRC procedure delay defined in clause 12 in TS 38.331 [13].

7.5.11.1.3.2 UE carrier deconfiguration delay requirement

When the UE receives a RRC message implying NR UL or supplementary UL carrier deconfiguration RRC signalling, the UE shall stop UL signalling on the deconfigured UL carrier within $T_{UL_carrier_deconfig}$ from the end of slot n.

Where

- Slot n is the last slot overlapping with the PDSCH containing the RRC command.
- $T_{UL_carrier_deconfig}$ equals the maximum RRC procedure delay defined in clause 11.2 in TS 36.331 [29] if the corresponding RRC message is embedded in E-UTRA RRC message, otherwise it equals the maximum RRC procedure delay defined in clause 12 in TS 38.331 [13].

7.5.11.1.4 Test description

7.5.11.1.4.1 Initial conditions

There are two cells: FR2 PCell (Cell 1) on NR RF channel 1 and FR2 SCell (Cell 2) on NR RF channel 2. NR uplink is broadcast by *ServingCellConfigCommonSIB.* The test parameters for PCell and SCell are given in Table 7.5.11.4.1-1, Table 7.5.11.4.1-2 and Table 7.5.11.4.1-3. The test consists of three time periods, with duration of T1, T2 and T3 respectively. During time duration T1, NR uplink of Cell 2 is not configured to UE. At the start of T2, a NR uplink of Cell 2 is configured to UE through *RRCReconfiguration*, then UE shall start transmission on the NR uplink of Cell 2. At the start of T3, the NR uplink is released through *RRCReconfiguration*.

The test equipment also verifies that potential interruption of PCell due to UL carrier configuration on SCell is carried out within the correct time span and within the correct length by monitoring ACK/NACK sent in PCell.

Table 7.5.11.1.4.1-1: Supported test configurations

Configuration	PCell (Cell 1)	SCell (Cell 2)
1	120 kHz SSB SCS, 100 MHz bandwidth, TDD duplex mode	DL and UL: 120 kHz SSB SCS, 100 MHz bandwidth, TDD duplex mode

Table 7.5.11.1.4.1-2: Initial conditions for SA UE uplink RRC reconfiguration delay for FR2

Parameter	Value	Comment
Test environment	NC	As specified in TS 38.508-1 [14] clause 4.1.
Test frequencies	As specified in Annex E, table E.5-1 and TS 38.508-1 [14] clause 4.3.1.2.	

Channel bandwidth	As specified by the test configuration selected from Table 7.5.11.4.1-1.		
Propagation conditions	AWGN		As specified in Annex C.2.2.
Connection Diagram	TE Part	A.3.3.3	As specified in TS 38.508-1 [14] Annex A.
	DUT Part	A.3.3.3	
Exceptions to connection diagram	N/A		

Table 7.5.11.1.4.1-3: General test parameters for SA UE UL carrier RRC reconfiguration Delay for FR2

Parameter	Unit	Test configuration	Value	Comment
RF Channel Number		Config 1	1, 2	Two NR RF channels
Active cell		Config 1	Cell 1: FR2 PCell Cell 2: FR2 SCell	PCell on RF channel number 1 FR2 SCell on RF channel number 2
CP length		Config 1	Normal	
DRX		Config 1	OFF	
Measurement gap pattern Id		Config 1	OFF	
Filter coefficient		Config 1	0	L3 filtering is not used
Cell 2 timing offset to Cell 1	μs	Config 1	3	Synchronous cells.
T1	s	Config 1	5	
T2	s	Config 1	5	
T3	s	Config 1	5	

7.5.11.1.4.2 Test procedure

Test consists of 3 successive time periods, with time duration of T1, T2 and T3 respectively. There are two cells: FR2 PCell (Cell 1) on NR RF channel 1 and FR2 SCell (Cell 2) on NR RF channel 2. NR uplink is broadcast by *ServingCellConfigCommonSIB.*

1. Ensure the UE is in RRC_CONNECTED state with generic procedure parameters Connectivity NR, Connected without release On according to TS 38.508-1 [14] clause 4.5.

2. Set the parameter for PCell and SCell according to the table 7.5.11.1.4.1-1, 7.5.11.1.4.1-2 and 7.5.11.1.4.1-3.

3. T1 starts. At this moment NR uplink of Cell 2 is not configured to UE.

4. When T1 expires the SS shall initiates the *RRCReconfiguration* procedure to UE to configure the NR UL of Cell2. T2 starts.

5. The UE:

a) Starts transmission on the NR uplink carrier on SCell within 20ms from the start of T2.

and

b) Interruption of PCell due to UL carrier configuration shall not happen outside the UL carrier configuration delay which is 20ms in this test, and the length of interruption (0.125 ms after the start of T2) shall not exceed the length specified in clause TS 38.133 [6] 8.2.2.2.4.

6. When T2 expires the SS initiates *RRCReconfiguration* procedure to UE to release the NR UL of Cell2.

7. The UE:

   a) Stop the transmission on the NR uplink carrier on SCell within 20ms from the start of T3.

and

   b) Interruption of PCell due to UL carrier de-configuration shall not happen outside the UL carrier de-configuration delay which is 20ms in this test, and the length of interruption (0.125 ms after the start of T2) shall not exceed the length specified in clause TS 38.133 [6] 8.2.2.2.4.

8. Repeat step 2-7 until a test verdict has been achieved.
   The UL carrier configuration delay along with length of PCell interruption and UL carrier de-configuration delay along with length of PCell interruption is evaluated independently for the statistic, resulting in an event verdict: pass or fail. Each event is evaluated only until the confidence level according to Table G.2.3-1 in Annex G clause G.2 is achieved. Different events may require different times for a verdict. If both events pass, the test passes. If one event fails, the test fails.

7.5.11.1.4.3 Message contents

Message contents are according to TS 38.508-1 [14] clause 7.3.

7.5.11.1.5 Test requirement

The UE shall be ready to start transmission on the NR uplink carrier on SCell within 20ms from the start of T2.

The UE shall stop the transmission on the NR uplink carrier on SCell within 20ms from the start of T3.

During T2 and T3, the start of interruption of PCell due to UL carrier configuration or de-configuration on SCell shall not happen outside the UL carrier configuration delay which is 20ms in this test, and the length of interruption shall not exceed the length specified in 38.133 [6] clause 8.2.2.2.4.

All of the above test requirements shall be fulfilled in order for the observed UE UL carrier configuration delay and UE UL carrier release delay to be counted as correct. The rate of correct observed UE UL carrier configuration delay and UE UL carrier release delay during repeated tests shall be at least 90%.Table 7.5.11.1.5-1: NR Cell specific test parameters for SA UE UL carrier RRC reconfiguration Delay for FR2

Parameter		Unit	Test configuration	Cell 1			Cell 2		
				T1	T2	T3	T1	T2	T3
AoA setup			Config 1	Setup 1 as specified in clause A.3.15 [6]					
Beam Assumption[Note 7]			Config 1	Rough			Rough		
Frequency Range			Config 1	FR2			FR2		
NR RF Channel Number			Config 1	1			2		
Duplex mode			Config 1	TDD			TDD		
TDD configuration			Config 1	TDDConf.3.1			TDDConf.3.1		
$BW_{channel}$		MHz	Config 1	100: $N_{RB,c}$ = 66			100: $N_{RB,c}$ = 66		
Data RBs allocated			Config 1	66			66		
BWP configuration	Initial DL BWP		Config 1	DLBWP.0.1			DLBWP.0.1		
	Initial UL BWP			ULBWP.0.1			ULBWP.0.1		
	Dedicated DL BWP			DLBWP.1.1			DLBWP.1.1		
	Dedicated UL BWP			ULBWP.1.1			ULBWP.1.1		
OCNG Patterns			Config 1	OP.1			OP.1		
PDSCH Reference measurement channel			Config 1	SR.3.1 TDD			SR.3.1 TDD		
CORESET Reference Channel			Config 1	CR.3.1 TDD			CR.3.1 TDD		
SSB configuration			Config 1	SSB.1 FR2			SSB.1 FR2		
SMTC configuration			Config 1	SMTC.1			SMTC.1		
TRS configuration			Config 1	TRS.2.1 TDD			TRS.2.1 TDD		
TCI state			Config 1	TCI.State.0			TCI.State.0		
PUSCH parameters for NR UL carrier			Config 1	N/A			N/A	G-FR2-A3-4 in [28]	N/A
PUCCH parameters for NR UL carriers			Config 1	N/A			N/A	Table 11.3.2.3.1.2-2 in [28]	N/A
EPRE ratio of PSS to SSS			Config 1	0			0		

EPRE ratio of PBCH DMRS to SSS				
EPRE ratio of PBCH to PBCH DMRS				
EPRE ratio of PDCCH DMRS to SSS				
EPRE ratio of PDCCH to PDCCH DMRS				
EPRE ratio of PDSCH DMRS to SSS				
EPRE ratio of PDSCH to PDSCH				
EPRE ratio of OCNG DMRS to SSS(Note 1)				
EPRE ratio of OCNG to OCNG DMRS (Note 1)				
N_{oc} Note2	dBm/15kHz Note5	Config 1	-104.7 + TT	-104.7 + TT
N_{oc} Note2	dBm/SCS Note4	Config 1	-95.7 + TT	-95.7 + TT
SS-RSRP Note 3	dBm/SCS Note5	Config 1	-88.7 + TT	-88.7 + TT
$\hat{E}_s/I_{ot}$	dB	Config 1	7 + TT	7 + TT
$\hat{E}_s/N_{oc}$	dB	Config 1	7 + TT	7 + TT
Io Note3	dBm/95.04 MHz Note5	Config 1	-58.92 + TT	-58.92 + TT
Propagation Condition		Config 1	AWGN	AWGN

Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.
Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for N_{oc} to be fulfilled.
Note 3: SSB_RP and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.
Note 4: Void
Note 5: Equivalent power received by an antenna with 0 dBi gain at the centre of the quiet zone
Note 6: As observed with 0 dBi gain antenna at the centre of the quiet zone
Note 7: Information about types of UE beam is given in B.2.1.3 [6], and does not limit UE implementation or test system implementation

7.6 Measurement procedures

7.6.1 Intra-frequency measurements

7.6.1.0 Minimum conformance requirements

7.6.1.0.1 Minimum conformance requirements for event-triggered measurement without gap

[TS 38.133, clause 9.2.5.1 and 9.2.5.2]

The UE shall be able to identify a new detectable intra frequency cell within $T_{identify_intra_without_index}$ if UE is not indicated to report SSB based RRM measurement result with the associated SSB index(*reportQuantityRsIndexes* or *maxNrofRSIndexesToReport* is not configured), or the UE has been indicated that the neighbour cell is synchronous with the serving cell (*deriveSSB-IndexFromCell* is enabled). The UE shall be able to identify a new detectable intra frequency SS block of an already detected cell within $T_{identify_intra_without_index.}$ It is assumed that *deriveSSB-IndexFromCell*is always enabled for FR1 TDD and FR2.

$$T_{identify_intra_without_index} = (T_{PSS/SSS_sync_intra} + T_{SSB_measurement_period_intra}) \text{ ms}$$

Where:

T_{PSS/SSS_sync_intr}: it is the time period used in PSS/SSS detection given in table 7.6.1.0.1-1.

$T_{SSB_measurement_period_intra}$: equal to a measurement period of SSB based measurement given in table 7.6.1.0.1-2.

$CSSF_{intra}$: it is a carrier specific scaling factor and is determined according to $CSSF_{outside_gap,i}$ in TS 38.133 [6] clause 9.1.5.1 for measurement conducted outside measurement gaps.

$M_{pss/sss_sync_w/o_gaps}$: For a UE supporting FR2 power class 1, $M_{pss/sss_sync_w/o_gaps}$ = 40. For a UE supporting power class 2, $M_{pss/sss_sync_w/o_gaps}$ = 24. For a UE supporting FR2 power class 3, $M_{pss/sss_sync_w/o_gaps}$ = 24. For a UE supporting FR2 power class 4, $M_{pss/sss_sync_w/o_gaps}$ =24

$M_{meas_period_w/o_gaps}$: For a UE supporting power class 1, $M_{meas_period_w/o_gaps}$ = 40. For a UE supporting FR2 power class 2, $M_{meas_period_w/o_gaps}$ = 24. For a UE supporting power class 3, $M_{meas_period_w/o_gaps}$ = 24. For a UE supporting power class 4, $M_{meas_period_w/o_gaps}$ = 24.

When intrafrequency SMTC is fully non-overlapping with measurement gaps or intrafrequency SMTC is fully overlapping with MGs, Kp=1.

When intrafrequency SMTC is partially overlapping with measurement gaps, Kp = 1/(1- (SMTC period /MGRP)), where SMTC period < MGRP

For FR2 when any of the reference signals configured for RLM, BFD, CBD or L1-RSRP for beam reporting outside measurement gap is fully overlapping with intra-frequency SMTC, $K_{layer1_measurement}$= 1.5, otherwise $K_{layer1_measurement}$=1.

Table 7.6.1.0.1-1: Time period for PSS/SSS detection (Frequency range FR2)

DRX cycle	T_{PSS/SSS_sync_intra}
No DRX	max(600ms, ceil($M_{pss/sss_sync_w/o_gaps}$ x K_p x $K_{layer1_measurement}$) x SMTC period)$^{Note\ 1}$ x $CSSF_{intra}$
DRX cycle≤ 320ms	max(600ms, ceil(1.5 x $M_{pss/sss_sync_w/o_gaps}$ x K_p x $K_{layer1_measurement}$) x max(SMTC period, DRX cycle)) x $CSSF_{intra}$
DRX cycle>320ms	ceil($M_{pss/sss_sync_w/o_gaps}$ x K_p x $K_{layer1_measurement}$) x DRX cycle x $CSSF_{intra}$
NOTE 1: If different SMTC periodicities are configured for different cells, the SMTC period in the requirement is the one used by the cell being identified	

Table 7.6.1.0.1-2: Measurement period for intra-frequency measurements without gaps (Frequency FR2)

DRX cycle	$T_{SSB_measurement_period_intra}$
No DRX	max(400ms, ceil($M_{meas_period_w/o_gaps}$ x K_p x $K_{layer1_measurement}$) x SMTC period)$^{Note\ 1}$ x $CSSF_{intra}$
DRX cycle≤ 320ms	max(400ms, ceil(1.5x $M_{meas_period_w/o_gaps}$ x K_p x $K_{layer1_measurement}$) x max(SMTC period, DRX cycle)) x $CSSF_{intra}$
DRX cycle>320ms	ceil($M_{meas_period_w/o_gaps}$ xK_p x $K_{layer1_measurement}$) x DRX cycle x $CSSF_{intra}$
NOTE 1: If different SMTC periodicities are configured for different cells, the SMTC period in the requirement is the one used by the cell being identified	

[TS 38.133, clause 9.2.4.3]

Reported RSRP, RSRQ, and RS-SINR measurements contained in periodically triggered measurement reports shall meet the requirements in TS 38.133 [6] clause 10.1.2.1, 10.1.7.1 and 10.1.12.1, respectively.

The UE shall not send any event triggered measurement reports, as long as no reporting criteria are fulfilled.

The measurement reporting delay is defined as the time between an event that will trigger a measurement report and the point when the UE starts to transmit the measurement report over the air interface. This requirement assumes that the measurement report is not delayed by other RRC signalling on the DCCH. This measurement reporting delay excludes a delay uncertainty resulted when inserting the measurement report to the TTI of the uplink DCCH. The delay uncertainty

is: 2 x TTI_{DCCH}.This measurement reporting delay excludes a delay which caused by no UL resources for UE to send the measurement report.

The event triggered measurement reporting delay, measured without L3 filtering shall be less than $T_{identify\ intra\ without\ index}$ defined in TS 38.133 [6] clause 9.2.5.1. When L3 filtering is used an additional delay can be expected.

If a cell which has been detectable at least for the time period than $T_{identify\ intra\ without\ index}$ defined in TS 38.133 [6] clause 9.2.5.1 becomes undetectable for a period and then the cell becomes detectable again and triggers an event, the event triggered measurement reporting delay shall be less than $T_{Measurement_Period,\ Intra}$ provided the timing to that cell has not changed more than ± 3200 Tc while the measurement gap has not been available and the L3 filter has not been used. When L3 filtering is used, an additional delay can be expected.

[TS 38.133, clause 9.2.2]

The requirements given above apply, provided:

- The cell being identified or measured is detectable.

An intra-frequency cell shall be considered detectable when for each relevant SSB:

- SS-RSRP related side conditions given in TS 38.133 [6] sections 10.1.2 are fulfilled for a corresponding Band,
- SS-RSRQ related side conditions given in TS 38.133 [6] sections 10.1.7 are fulfilled for a corresponding Band,
- SS-SINR related side conditions given in TS 38.133 [6] sections 10.1.12 are fulfilled for a corresponding Band,
- SSB_RP and SSB Ês/Iot according to TS 38.133 [6] Annex B.2.2 for a corresponding Band.

References: The conformance requirements covered in the current TC are specified in: TS 38.133 [6], clauses 9.2.2, 9.2.4.3, 9.2.5.1 and 9.2.5.2.

7.6.1.0.2 Minimum conformance requirements for event-triggered measurement with gap

[TS 38.133 [6], clause 9.2.6.2, 9.2.6.3]

The UE shall be able to identify a new detectable intra frequency cell within $T_{identify_intra_without_index}$ if UE is not indicated to report SSB based RRM measurement result with the associated SSB index (*reportQuantityRsIndexes* or *maxNrofRSIndexesToReport* is not configured), or the UE has been indicated that the neighbour cell is synchronous with the serving cell (*deriveSSB-IndexFromCell* is enabled). It is assumed that *deriveSSB-IndexFromCell* is always enabled for FR1 TDD and FR2.

$$T_{identify_intra_without_index} = T_{PSS/SSS_sync_intra} + T_{SSB_measurement_period_intra}\ ms$$

Where:

T_{PSS/SSS_sync_intra}: it is the time period used in PSS/SSS detection given in table 7.6.1.0.2-1.

$T_{SSB_measurement_period_intra}$: equal to a measurement period of SSB based measurement given in table 7.6.1.0.2-2.

$CSSF_{intra}$: it is a carrier specific scaling factor and is determined according to $CSSF_{within_gap,i}$ in TS 38.133 [6] section 9.1.5.2.2 for measurement conducted within measurement gaps.

$M_{pss/sss_sync_with_gaps}$: For a UE supporting FR2 power class 1, $M_{pss/sss_sync\ with_gaps}$=40. For a UE supporting FR2 power class 2, $M_{pss/sss_sync\ with_gaps}$ =24. For a UE supporting FR2 power class 3, $M_{pss/sss_sync\ with_gaps}$ =24. For a UE supporting power class 4, $M_{pss/sss_sync\ with_gaps}$ =24

$M_{meas_period_ with_gaps}$: For a UE supporting power class 1, $M_{meas_period_ with_gaps}$ =40. For a UE supporting power class 2, $M_{meas_period_ with_gaps}$ =24. For a UE supporting power class 3, $M_{meas_period_ with_gaps}$ =24. For a UE supporting power class 4, $M_{meas_period\ with_gaps}$ =24.

Table 7.6.1.0.2-1: Time period for PSS/SSS detection (Frequency range FR2)

DRX cycle	T_{PSS/SSS_sync_intra}
No DRX	max(600ms, $M_{pss/sss_sync_with_gaps}$ x max(MGRP, SMTC period)) x $CSSF_{intra}$
DRX cycle≤ 320ms	max(600ms, ceil(1.5x $M_{pss/sss_sync_with_gaps}$) x max(MGRP, SMTC period, DRX cycle)) x $CSSF_{intra}$

DRX cycle>320ms	$M_{pss/sss_sync_with_gaps}$ x max(MGRP, DRX cycle) x $CSSF_{intra}$

Table 7.6.1.0.2-2: Measurement period for intra-frequency measurements with gaps (Frequency Range FR2)

DRX cycle	$T_{SSB_measurement_period_intra}$
No DRX	max(400ms, $M_{meas_period\ with_gaps}$ x max(MGRP, SMTC period)) x $CSSF_{intra}$
DRX cycle≤ 320ms	max(400ms, ceil(1.5 x $M_{meas_period\ with_gaps}$) x max(MGRP, SMTC period, DRX cycle)) Note 1 x $CSSF_{intra}$
DRX cycle>320ms	$M_{meas_period\ with_gaps}$ x max(MGRP, DRX cycle) x $CSSF_{intra}$

[TS 38.133 [6], clause 9.2.2]

The requirements given above apply, provided:

- The cell being identified or measured is detectable.

An intra-frequency cell shall be considered detectable when for each relevant SSB:

- SS-RSRP related side conditions given in TS 38.133 [6] sections 10.1.2 are fulfilled for a corresponding Band,
- SS-RSRQ related side conditions given in TS 38.133 [6] sections 10.1.7 are fulfilled for a corresponding Band,
- SS-SINR related side conditions given in TS 38.133 [6] Sections 10.1.12 are fulfilled for a corresponding Band,
- SSB_RP and SSB Ês/Iot according to TS 38.133 [6] Annex B.2.2 for a corresponding Band.

[TS 38.133 [6], clause 9.2.4.2]

The RSRP measurement accuracy for all measured cells shall be as specified in TS 38.133 [6] clauses 10.1.2.1.1 and 10.1.2.1.2, the RSRQ measurement accuracy for all measured cells shall be as specified in TS 38.133 [6] clauses 10.1.7.1.1, and the SINR measurement accuracy for all measured cells shall be as specified in the TS 38.133 [6] clause 10.1.12.1.1.

Reported RSRP, RSRQ and SINR measurements contained in event triggered measurement reports shall meet the requirements in TS 38.133 [6] clauses 10.1.2.1.1, 10.1.2.1.2, 10.1.7.1.1 and 10.1.12.1.1, respectively.

The UE shall not send any event triggered measurement reports, as long as no reporting criteria are fulfilled.

The measurement reporting delay is defined as the time between an event that will trigger a measurement report and the point when the UE starts to transmit the measurement report over the air interface. This requirement assumes that that the measurement report is not delayed by other RRC signalling on the DCCH. This measurement reporting delay excludes a delay uncertainty resulted when inserting the measurement report to the TTI of the uplink DCCH. The delay uncertainty is: 2 x TTI_{DCCH}. This measurement reporting delay excludes a delay which caused by no UL resources for UE to send the measurement report.

The event triggered measurement reporting delay, measured without L3 filtering shall be less than $T_{identify_intra_without_index}$ defined in TS 38.133 [6] section 9.2.6.2. When L3 filtering is used an additional delay can be expected.

The normative reference for this requirement is TS 38.133 [6] clauses 9.2.2, 9.2.4.2, 9.2.6.2 and 9.2.6.3.

7.6.1.1 NR SA FR2 event-triggered reporting without gap in non-DRX

Editor's Note: This test case has been completed for the following configurations:

- Test frequency f ≤ 40.8 GHz
- UE PC3

This test case is incomplete for UE power classes other than PC3

This test case is incomplete for test frequencies > 40.8 GHz

7.6.1.1.1 Test purpose

The purpose of this test is to verify the UE's ability to make a correct reporting of an event within intra-frequency cell search without gap under non-DRX. This test will partly verify the TDD intra-frequency cell search requirements defined in TS 38.133 clause 9.2.5.1 and 9.2.5.2

7.6.1.1.2 Test applicability

This test applies to all types of NR UE release 15 onwards.

7.6.1.1.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 7.6.1.0.1.

The normative reference for this requirement is TS 38.133 [6] clause A.7.6.1.1.

7.6.1.1.4 Test description

7.6.1.1.4.1 Initial conditions

This test shall be tested using any of the test configurations in Table 7.6.1.1.4.1-1.

Table 7.6.1.1.4.1-1: Supported test configurations for NR SA FR2 event-triggered reporting without gap in non-DRX

Test Case ID	Description
7.6.1.1-1	120 kHz SSB SCS, 100MHz bandwidth, TDD duplex mode
7.6.1.1-2	240 kHz SSB SCS, 100MHz bandwidth, TDD duplex mode
Note: The UE is only required to be tested in one of the supported test configurations.	

Configure the test requirement and the DUT according to the parameters in Table 7.6.1.1.4.1-2.

Table 7.6.1.1.4.1-2: Initial conditions for NR SA FR2 event-triggered reporting without gap in non-DRX

Parameter	Value		Comment
Test environment	NC		As specified in TS 38.508-1 [14] clause 4.1.
Test frequencies	As specified in Annex E, Table E.5-1 and TS 38.508-1 [14] clause 4.3.1.		
Channel bandwidth	As specified by the test configuration selected from Table 6.6.1.1.4.1-1.		
Propagation conditions	AWGN		As specified in Annex C.2.2
Connection Diagram	TE Part	A.3.3.1.1	As specified in TS 38.508-1 [14] Annex A.
	DUT Part	A.3.4.1.1	
Exceptions to connection diagram	N/A		

1. The test parameters for PCell and neighbour cell are given in Table 7.6.1.1.4.1-3 below.
2. Message contents are defined in clause 7.6.1.1.4.3.
3. There is one carrier and two cells specified in the test. NR Cell 1 is the cell used for connection setup with the power level set according to Annex C.1.1 and C.1.2 for this test.

Table 7.6.1.1.4.1-3: General test parameters for NR SA FR2 event-triggered reporting without gap in non-DRX

Parameter	Unit	Config	Value	Comment
Active cell		1, 2	PCell (Cell 1)	
Neighbour cell		1, 2	Cell 2	Cell to be identified.
RF Channel Number		1, 2	1: Cell 1 and Cell 2	One TDD carrier frequency is used for the NR cells.
SMTC configuration		1, 2	SMTC.1	

A3-Offset	dB	1, 2	11	
CP length		1, 2	Normal	
Hysteresis	dB	1, 2	0	
Time To Trigger	s	1, 2	0	
Filter coefficient		1, 2	0	L3 filtering is not used
DRX		1, 2	OFF	
Time offset between Cell 1 and Cell 2		1, 2	3 μs	Synchronous cells
T1	s	1, 2	5	
T2	s	1, 2	5	

7.6.1.1.4.2 Test procedure

Two cells are deployed in the test, which are FR2 PCell (NR Cell 1) and a FR2 neighbour cell (NR Cell 2) on the same frequency as the PCell. The general and cell specific test parameters for PCell and neighbour cell are given in Table 7.6.1.1.4.1-3 and Table 7.6.1.1.5-1, respectively. In the measurement control information a measurement object is configured for the frequency of the PCell, and it is indicated to the UE that event-triggered reporting with Event A3 is used. The test consists of two successive time periods, with time duration of T1, and T2 respectively. During time duration T1, the UE shall not have any timing information of NR Cell 2.

1. Ensure the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity *NR*, Connected without release *On* according to TS 38.508-1 [14] clause 4.5.

2. Set the parameters according to T1 in Table 7.6.1.1.5-1. T1 starts.

3. SS shall transmit an *RRCReconfiguration* message.

4. The UE shall transmit an *RRCReconfigurationComplete* message.

5. When T1 expires, the SS shall switch the power setting from T1 to T2 as specified in Table 7.6.1.1.5-1. T2 starts.

6. UE shall transmit a *MeasurementReport* message triggered by Event A3. If the overall delays measured from the beginning of time period T2 is less than X ms then the number of successful tests is increased by one. If the UE fails to report the event within the overall delays measured requirement then the number of failure tests is increased by one. Where X is

   - 2402 ms for UE supporting power class 1,

   - 1442 ms for UE supporting power class 2, 3 or 4,

7. After the SS receive the *MeasurementReport* message in step 6) or when T2 expires, the SS shall transmit an *RRCRelease* message to release the RRC connection which includes the release of the established radio bearers as well as all radio resources.

8. Set NR Cell 2 physical cell identity = ((current NR Cell 2 physical cell identity + 1) mod 14 + 2) for next iteration of the test procedure loop.

9. After the RRC connection release, the SS:
   - transmits in NR Cell 1 a Paging message (including PagingRecord with UE-Identity) for the UE and ensures the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity *NR*, Connected without release *On* according to TS 38.508-1 [14] clause 4.5 (if the paging fails, switches off and on the UE and ensures the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity *NR*, Connected without release *On* according to TS 38.508-1 [14] clause 4.5),
   or
   - switches off and on the UE and ensures the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity *NR*, Connected without release *On* according to TS 38.508-1 [14] clause 4.5.

10. Repeat step 2-9 until the confidence level according to Tables G.2.3-1 in Annex G clause G.2 is achieved.

7.6.1.1.4.3 Message contents

Message contents are according to TS 38.508-1 [14] clause 7.3 with the following exceptions:

Table 7.6.1.1.4.3-1: Common Exception messages for NR SA FR2 event-triggered reporting without gap in non-DRX

Default Message Contents	
Common contents of system information blocks exceptions	
Default RRC messages and information elements contents exceptions	Table H.3.1-1 Table H.3.1-2 Table H.3.1-4 with A3-offset = -11dB Table H.3.1-7 with Condition INTRA-FREQ

7.6.1.1.5 Test requirement

Table 7.6.1.1.4.1-3, Table 7.6.1.1.5-1 and Table 7.6.1.1.5-2 define the primary level settings including test tolerances for NR SA FR2 event-triggered reporting without gap in non-DRX.

Table 7.6.1.1.5-1: NR Cell specific test parameters for NR SA FR2 event-triggered reporting without gap in non-DRX

Parameter	Unit	Config	Cell 1		Cell 2	
			T1	T2	T1	T2
TDD configuration		1, 2	TDDConf.3.1		TDDConf.3.1	
$BW_{channel}$	MHz	1, 2	100: $N_{RB,c}$ = 66		100: $N_{RB,c}$ = 66	
Data RBs allocated		1	24		24	
		2	48		48	
Initial BWP configuration		1, 2	DLBWP.0.1 ULBWP.0.1		DLBWP.0.1 ULBWP.0.1	
Active DL BWP configuration		1, 2	DLBWP.1.1		DLBWP.1.1	
Active UL BWP configuration		1, 2	ULBWP.1.1		ULBWP.1.1	
RLM-RS		1, 2	SSB		SSB	
PDSCH RMC configuration		1	SR.3.2 TDD		N/A	
		2	SR.3.3 TDD			
RMSI CORESET RMC configuration		1	CR.3.1 TDD		CR.3.1 TDD	
		2	CCR.3.7 TDD		CCR.3.7 TDD	
Dedicated CORESET RMC configuration		1, 2	CCR.3.1 TDD		CCR.3.1 TDD	
TRS configuration		1, 2	TRS.2.1 TDD		N/A	
PDSCH/PDCCH TCI states		1, 2	TCI.state.2		N/A	
PDSCH/PDCCH subcarrier spacing	kHz	1, 2	120		120	
OCNG Patterns		1, 2	OP.1		OP.1	
cellIndividualOffset	dB	1~2	N/A		16	
SSB		1	SSB.3 FR2		SSB.3 FR2	
		2	SSB.4 FR2		SSB.4 FR2	
Propagation Condition		1, 2	AWGN			

Table 7.6.1.1.5-2: NR OTA Cell specific test parameters for NR SA FR2 event-triggered reporting without gap in non-DRX

Parameter	Unit	Config	Cell 1		Cell 2	
			T1	T2	T1	T2
AoA setup		1, 2	Setup 3 defined in A.9.3			
			AoA1		AoA2	
Beam assumption[Note 4]		1,2	Rough		Rough	
E_s	dBm/SCS	1	-89		-89	

		2	-86		-86	
$\hat{E}_s/I_{ot}$ BB Note 5	dB	1, 2	-0.12	-0.12	-Infinity	-0.12
SSB_RP	dBm/SCS	1	-89	-89	-Infinity	-89
		2	-86	-86	-Infinity	-86
Io	dBm/95.04MHz	1	-64.41	-64.41	-Infinity	-64.41
		2	-64.41	-64.41	-Infinity	-64.41
Time multiplexing of the downlink transmissions from each AoA		1, 2	Defined in Figure 7.6.1.1.5-1			

Note 1: The resources for uplink transmission are assigned to the UE prior to the start of time period T2.

Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for N_{oc} to be fulfilled.

Note 3: SS-RSRP levels have been derived from other parameters for information purposes. They are not settable parameters themselves.

Note 4: Information about types of UE beam is given in TS 38.133 [6] clause B.2.1.3, and does not limit UE implementation or test system implementation

Note 5: Calculation of Es/Iot$_{BB}$ includes the effect of UE internal noise up to the value assumed for the associated Refsens requirement in clause 7.3.2 of TS 38.101-2 [19], and an allowance of 1dB for UE multi-band relaxation factor ΔMB_P from TS 38.101-2 [19] Table 6.2.1.3-4.

In the test, the UE shall send one Event A3 triggered measurement report, with a measurement reporting delay less than X ms from the beginning of time period T2, where X is

- 2.4s for a UE supporting power class 1,
- 1.44s for a UE supporting power class 2, 3 and 4

The UE is not required to read the neighbour cell SSB index in this test.

The UE shall not send event triggered measurement reports, as long as the reporting criteria are not fulfilled.

The rate of correct events observed during repeated tests shall be at least 90%.

NOTE: The actual overall delays measured in the test may be up to 2xTTI$_{DCCH}$ higher than the measurement reporting delays above because of TTI insertion uncertainty of the measurement report in DCCH.

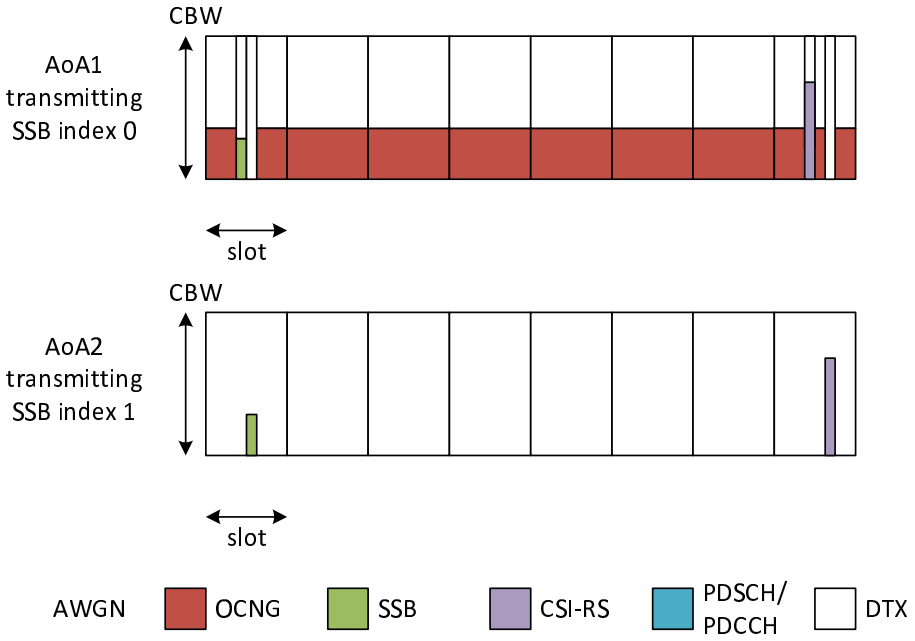


Figure 7.6.1.1.5-1: Time multiplexed downlink transmissions (Config 1 example)

7.6.1.2 NR SA FR2 event-triggered reporting without gap in DRX

Editor's Note: This test case is complete for the following configurations:

- Test frequency f ≤ 40.8 GHz
- UE PC3

This test case is incomplete for Test frequency f > 40.8 GHz

This test case is incomplete for UE power class other than PC3.

7.6.1.2.1 Test purpose

Ther purpose of this test is to verify the UE's ability to make a correct reporting of an event within intra-frequency cell search without gap under DRX. This test will partly verify the TDD intra-frequency cell search requirements in TS 38.133 clause 9.2.5.1 and 9.2.5.2.

7.6.1.2.2 Test applicability

This test applies to all types of NR UE release 15 and forward supporting 5GS NR SA FR2 and long DRX cycle.

7.6.1.2.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 7.6.1.0.2.

The normative reference for this requirement is TS 38.133 [6] clause A.7.6.1.2.

7.6.1.2.4 Test description

7.6.1.2.4.1 Initial conditions

This test shall be tested using any of the test configurations in Table 7.6.1.2.4.1-1.

Table 7.6.1.2.4.1-1: Supported test configurations for NR SA FR2 event-triggered reporting without gap in DRX

Test Case ID	Description
7.6.1.2-1	120 kHz SSB SCS, 100MHz bandwidth, TDD duplex mode
7.6.1.2-2	240 kHz SSB SCS, 100MHz bandwidth, TDD duplex mode
Note: The UE is only required to be tested in one of the supported test configurations.	

Configure the test equipment and the DUT according to the parameters in Table 7.6.1.2.4.1-2.

Table 7.6.1.2.4.1-2: Initial conditions for NR SA FR2 event-triggered reporting without gap in DRX

Parameter	Value		Comment
Test environment	NC		As specified in TS 38.508-1 [14] clause 4.1.
Test frequencies	As specified in Annex E, table E.5-1 and TS 38.508-1 [14] clause 4.3.1.		
Channel bandwidth	As specified by the test configuration selected from Table 7.6.1.2.4.1-1.		
Propagation conditions	AWGN		As specified in Annex C.2.2.
Connection Diagram	TE Part	A.3.3.1.1	As specified in TS 38.508-1 [14] Annex A.
	DUT Part	A.3.4.1.1	
Exceptions to connection diagram	N/A		

1. The test parameters for PCell and neighbour cell are given in Table 7.6.1.2.4.1-3 below.
2. Message contents are defined in clause 7.6.1.2.4.3.
3. There is one carrier and two cells specified in the test. NR Cell 1 is the cell used for connection setup with the power level set according to Annex C.1.1 and C.1.2 for this test.

Table 7.6.1.2.4.1-3: General test parameters for NR SA FR2 event-triggered reporting without gap in DRX

Parameter	Unit	Config	Value		Comment
			Test 1	Test 2	
Active cell		1, 2	PCell (Cell 1)		
Neighbour cell		1, 2	Cell 2		Cell to be identified.
RF Channel Number		1, 2	1: Cell 1 and Cell 2		One TDD carrier frequency is used for the NR cells.
SMTC configuration		1, 2	SMTC.1		
A3-Offset	dB	1, 2	7[Note 1]		
CP length		1, 2	Normal		
Hysteresis	dB	1, 2	0		
Time To Trigger	s	1, 2	0		
Filter coefficient		1, 2	0		L3 filtering is not used
DRX		1, 2	DRX.1	DRX. 7	
Time offset between Cell 1 and Cell 2		1, 2	3 μs		Synchronous cells
T1	s	1, 2	5		
T2	s	1, 2	10	52	
Note 1: Including test tolerance given in Annex F.1.3.2					

7.6.1.2.4.2 Test procedure

Two cells are deployed in the test, which are FR2 PCell (NR Cell 1) and a FR2 neighbour cell (NR Cell 2) on the same frequency as the PCell. The general and cell specific test parameters for PCell and neighbour cell are given in Table 7.6.1.2.4.1-3, Table 7.6.1.2.5-1 and Table 7.6.1.2.5-2, respectively. In the measurement control information a measurement object is configured for the frequency of the PCell, and it is indicated to the UE that event-triggered reporting with Event A3 is used. The test consists of two successive time periods, with time duration of T1, and T2 respectively. During time duration T1, the UE shall not have any timing information of NR Cell 2.

1. Ensure the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity *NR*, Connected without release *On* according to TS 38.508-1 [14] clause 4.5.

2. Set the parameters according to T1 in Table 7.6.1.2.5-1 and Table 7.6.1.2.5-2. T1 starts.

3. SS shall transmit an *RRCReconfiguration* message.

4. The UE shall transmit an *RRCReconfigurationComplete* message.

5. When T1 expires, the SS shall switch the power setting from T1 to T2 as specified in Table 7.6.1.2.5-1 and Table 7.6.1.2.5-2. T2 starts.

6. UE shall transmit a *MeasurementReport* message triggered by Event A3. If the overall delays measured from the beginning of time period T2 is less than X ms for sub-test 1 or less than Y ms for sub-test 2 then the number of successful tests is increased by one. If the UE fails to report the event within the overall delays measured requirement then the number of failure tests is increased by one. Where X is

   - 7202 for UE supporting power class 1,

   - 4322 for UE supporting power class 2, 3 or 4.

   and Y is

   - 51202 for UE supporting power class 1,

   - 30722 for UE supporting power class 2, 3 or 4.

7. After the SS receive the *MeasurementReport* message in step 6) or when T2 expires, the SS shall transmit an *RRCRelease* message to release the RRC connection which includes the release of the established radio bearers as well as all radio resources.

8. Set NR Cell 2 physical cell identity = ((current NR Cell 2 physical cell identity + 1) mod 14 + 2) for next iteration of the test procedure loop.

9. After the RRC connection release, the SS:
   - transmits in NR Cell 1 a Paging message (including PagingRecord with UE-Identity) for the UE and ensures the UE is in State state RRC_CONNECTED with generic procedure parameters Connectivity *NR*, Connected without release *On* according to TS 38.508-1 [14] clause 4.5 (if the paging fails, switches off and on the UE and ensures the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity *NR*, Connected without release *On* according to TS 38.508-1 [14] clause 4.5),
   or
   - switches off and on the UE and ensures the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity *NR*, Connected without release *On* according to TS 38.508-1 [14] clause 4.5.

10. Repeat step 2-9 until the confidence level according to Tables G.2.3-1 in Annex G clause G.2 is achieved.

11. Repeat step 1-10 for each sub-test in Table 7.6.1.2.4.1-1 as appropriate.

7.6.1.2.4.3 Message contents

Message contents are according to TS 38.508-1 [14] clause 4.6 with the following exceptions:

Table 7.6.1.2.4.3-1: Common Exception messages for NR SA FR2 event-triggered reporting without gap in DRX

Default Message Contents	
Common contents of system information blocks exceptions	
Default RRC messages and information elements contents exceptions	Table H.3.1-1 Table H.3.1-2 with Condition INTRA-FREQ Table H.3.1-3 with Condition INTRA-FREQ MO, Synchronous cells and NOT SS-SINR Table H.3.1-4 with A3-offset = -6dB Table H.3.1-7 with Condition INTRA-FREQ Table H.3.7-1 with Condition DRX.1 for sub-test 1 Table H.3.7-1 with Condition DRX. 7 for sub-test 2 Table 7.3.1-3 in TS 38.508-1 [14] with condition SMTC.1
Specific message contents exceptions for Test Configuration 7.6.1.2-1	Table 7.3.1-3a in TS 38.508-1 [14] with condition SSB.3 FR2
Specific message contents exceptions for Test Configuration 7.6.1.2-2	Table 7.3.1-3a in TS 38.508-1 [14] with condition SSB.4 FR2

7.6.1.2.5 Test requirement

Table 7.6.1.2.4.1-3, Table 7.6.1.2.5-1 and Table 7.6.1.2.5-2 define the primary level settings including test tolerances for NR event triggered reporting in synchronous cells when DRX is used test.

Table 7.6.1.2.5-1: NR Cell specific test parameters for NR SA FR2 event-triggered reporting without gap in DRX

Parameter	Unit	Config	Cell 1		Cell 2	
			T1	T2	T1	T2
TDD configuration		1, 2	TDDConf.3.1		TDDConf.3.1	
$BW_{channel}$	MHz	1, 2	100: $N_{RB,c}$ = 66		100: $N_{RB,c}$ = 66	
Data RBs allocated		1, 2	66		66	
Initial BWP configuration		1, 2	DLBWP.0.1 ULBWP.0.1		DLBWP.0.1 ULBWP.0.1	
Active DL BWP configuration		1, 2	DLBWP.1.1		DLBWP.1.1	
Active UL BWP configuration		1, 2	ULBWP.1.1		ULBWP.1.1	
RLM-RS		1, 2	SSB		SSB	
PDSCH RMC configuration		1	SR.3. 2 TDD		N/A	
		2	SR.3.3 TDD			

RMSI CORESET RMC configuration		1	CR.3.1 TDD	CR.3.1 TDD
		2	CR.3.2 TDD	CR.3.2 TDD
Dedicated CORESET RMC configuration		1	CCR.3.1 TDD	CCR.3.1 TDD
		2	CCR.3.7 TDD	CCR.3.7 TDD
TRS configuration		1, 2	TRS.2.1 TDD	N/A
PDSCH/PDCCH TCI states		1, 2	TCI.state.2	N/A
PDSCH/PDCCH subcarrier spacing	kHz	1, 2	120	120
OCNG Patterns		1, 2	OP.1	OP.1
SSB		1	SSB.3 FR2	SSB.3 FR2
		2	SSB.4 FR2	SSB.4 FR2
Propagation Condition		1, 2	AWGN	

Table 7.6.1.2.5-2: NR OTA Cell specific test parameters for NR SA FR2 event-triggered reporting without gap in DRX

Parameter	Unit	Config	Cell 1		Cell 2	
			T1	T2	T1	T2
AoA setup		1, 2	Setup 1 defined in A.9			
Beam assumption Note 4		1,2	Rough			
$\hat{E}_s/I_{ot}$ BB Note 5	dB	1, 2	3.51	-1.60	-Infinity	-1.60
N_{oc} Note 2	dBm/15 KHz	1, 2	-101.5 Note 6			
N_{oc} Note 2	dBm/SCS	1	-92.5			
		2	-89.5			
SSB_RPSS-RSRP	dBm/SCS	1	-88.47	-88.47	-Infinity	-88.47
		2	-85.47	-85.47	-Infinity	-85.47
$\hat{E}_s/N_{oc}$	dB	1, 2	4	4	-Infinity	4
Io	dBm/95.04MHz	1	-58.03	-55.68	-58.03	-55.68

Note 1: The resources for uplink transmission are assigned to the UE prior to the start of time period T2.
Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for N_{oc} to be fulfilled.
Note 3: SS-RSRP levels have been derived from other parameters for information purposes. They are not settable parameters themselves.
Note 4: Information about types of UE beam is given in TS 38.133 [6] clause B.2.1.3, and does not limit UE implementation or test system implementation.
Note 5: Calculation of Es/Iot_{BB} includes the effect of UE internal noise up to the value assumed for the associated Refsens requirement in clause 7.3.2 of TS 38.101-2 [19], and an allowance of 1dB for UE multi-band relaxation factor ΔMB_P from TS 38.101-2 [19] Table 6.2.1.3-4.
Note 6: Including test tolerance given in Annex F.1.3.2

In Test 1 when DRX cycle length = 40 ms, the overall delay measured is defined as the time from the beginning of time period T2 to the moment the UE send one Event A3 triggered measurement report on PUSCH.

In Test 2 when DRX cycle length = 640 ms, the overall delay measured is defined as the time from the beginning of time period T2 to the moment the UE starts to send preambles on the PRACH for Scheduling Request (SR) to obtain allocation to send the measurement report to NR Cell 2 on PUSCH.

For both tests:

The UE is not required to read the neighbour cell SSB index in this test.

The UE shall not send event triggered measurement reports, as long as the reporting criteria are not fulfilled.

The overall delays measured is defined as the time from the beginning of time period T2 to the moment the UE send one Event A3 triggered measurement report to NR Cell 2.

The overall delays measured in the test may be up to 2xTTI_{DCCH} higher than the measurement reporting delays because of TTI insertion uncertainty of the measurement report in DCCH.

The overall delay measured when DRX cycle length is 40 ms (sub-test 1) is expressed as:

Overall delays measured = measurement reporting delay + TTI insertion uncertainty

Measurement reporting delay = $T_{identify_intra_without_index}$

$T_{identify_intra_without_index}$ = (T_{PSS/SSS_sync_intra} + $T_{SSB_measurement_period_intra}$) ms

For UE supporting power class 1, T_{PSS/SSS_sync_intra} = 3600 ms, $T_{SSB_measurement_period_intra}$= 3600 ms,

For UE supporting power class 2, 3 or 4, T_{PSS/SSS_sync_intra} = 2160 ms, $T_{SSB_measurement_period_intra}$= 2160 ms

TTI insertion uncertainty = 2 ms

The overall delay measured when DRX cycle length is 40 ms shall be less than a total of X ms, where X is

- X = 7202 for UE supporting power class 1,

- X = 4322 for UE supporting power class 2, 3 or 4,

The overall delay measured when DRX cycle length is 640 ms (sub-test 2) is expressed as:

Overall delays measured = measurement reporting delay + TTI insertion uncertainty

Measurement reporting delay = $T_{identify_intra_without_index}$

$T_{identify_intra_without_index}$ = (T_{PSS/SSS_sync_intra} + $T_{SSB_measurement_period_intra}$) ms

For UE supporting power class 1, T_{PSS/SSS_sync_intra} = 25600 ms, $T_{SSB_measurement_period_intra}$= 25600 ms,

For UE supporting power class 2, 3 or 4, T_{PSS/SSS_sync_intra} = 15360 ms, $T_{SSB_measurement_period_intra}$= 15360 ms

TTI insertion uncertainty = 2 ms

The overall delay measured when DRX cycle length is 640 ms shall be less than a total of X ms, where

- X = 51202 for UE supporting power class 1,

- X = 30722 for UE supporting power class 2, 3 or 4,

For the test to pass, the total number of successful tests shall be more than 90% of the cases with a confidence level of 95%.

7.6.1.3 NR SA FR2 event-triggered reporting with gap in non-DRX

Editor's Note: This test case has been completed for the following configurations:

- Test frequency f ≤ 40.8 GHz
- UE PC3

This test case is incomplete for UE power classes other than PC3

This test case is incomplete for test frequencies > 40.8 GHz

7.6.1.3.1 Test purpose

The purpose of this test is to verify UE's ability to make a correct reporting of an event with gaps under non-DRX within intra-frequency cell search with gaps requirements. This test will partly verify the TDD intra-frequency cell search requirements in TS 38.133 clause 9.2.5.1 and 9.2.5.2.

7.6.1.3.2 Test applicability

This test applies to all types of NR UE release 15 onwards and supporting CSI-RS based RLM and BWP operation without bandwidth restriction.

7.6.1.3.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 7.6.1.0.2.

The normative reference for this requirement is TS 38.133 [6] clause A.7.6.1.3.

7.6.1.3.4 Test description

7.6.1.3.4.1 Initial conditions

This test shall be tested using any of the test configurations in Table 7.6.1.3.4.1-1.

Table 7.6.1.3.4.1-1: Supported test configurations for NR SA FR2 event-triggered reporting with gap in non-DRX

Test Case ID	Description
7.6.1.3-1	120 kHz SSB SCS, 100MHz bandwidth, TDD duplex mode
7.6.1.3-2	240 kHz SSB SCS, 100MHz bandwidth, TDD duplex mode
Note: The UE is only required to be tested in one of the supported test configurations.	

Configure the test equipment and the DUT according to the parameters in Table 7.6.1.3.4.1-2.

Table 7.6.1.3.4.1-2: Initial conditions for NR SA FR2 event-triggered reporting with gap in non-DRX

Parameter	Value		Comment
Test environment	NC		As specified in TS 38.508-1 [14] clause 4.1.
Test frequencies	As specified in Annex E, table E.5-1 and TS 38.508-1 [14] clause 4.3.1 and 4.4.2.		
Channel bandwidth	As specified by the test configuration selected from Table 6.6.1.3.4.1-1.		
Propagation conditions	AWGN		As specified in Annex C.2.2.
Connection Diagram	TE Part	A.3.3.1.1	As specified in TS 38.508-1 [14] Annex A.
	DUT Part	A.3.4.1.1	
Exceptions to connection diagram	N/A		

1. The general test parameter settings are set up according to Table 7.6.1.3.4.1-3.
2. Message contents are defined in clause 7.6.1.3.4.3.
3. There is one NR carrier and two cells specified in the test. Cell 1 is the cell used for connection setup with the power level set according to Annex C.1.1 and C.1.2 for this test.

Table 7.6.1.3.4.1-3: General test parameters for NR SA FR2 event-triggered reporting with gap in non-DRX

Parameter	Unit	Config	Value	Comment
Active cell		1, 2	PCell (Cell 1)	
Neighbour cell		1, 2	Cell 2	Cell to be identified.
RF Channel Number		1, 2	1: Cell 1 and Cell 2	One TDD carrier frequency is used for the NR cells.
Gap type		1, 2	Per-UE gaps	
Measurement gap repitition periodicity	ms	1, 2	40	
Measurement gap length	ms	1, 2	6	
Measurement gap offset	ms	1, 2	39	
SMTC configuration		1, 2	SMTC.1	

CSI-RS parameters		1, 2	CSI-RS.3.2 TDD	
A3-Offset	dB	1, 2	-11	
CP length		1, 2	Normal	
Hysteresis	dB	1, 2	0	
Time To Trigger	s	1, 2	0	
Filter coefficient		1, 2	0	L3 filtering is not used
DRX		1, 2	OFF	
Time offset between Cell 1 and Cell 2		1, 2	3 µs	Synchronous cells
T1	s	1, 2	5	
T2	s	1, 2	5	

7.6.1.3.4.2 Test procedure

Two cells are deployed in the test, which are FR1 PCell (Cell 1) and a FR1 neighbour cell (Cell 2) on the same frequency as the PCell. The general and cell specific test parameters for PCell and neighbour cell are given in Table 7.6.1.3.4.1-3, Table 7.6.1.3.5-1 and Tavke 7.6.1.3.5-2, respectively. In the measurement control information a measurement object is configured for the frequency of the PCell, and it is indicated to the UE that event-triggered reporting with Event A3 is used. The test consists of two successive time periods, with time duration of T1, and T2 respectively. During time duration T1, the UE shall not have any timing information of Cell 2.

There are two BWPs configured in Cell 1, BWP1 which contains the cell defining SSB, and BWP2 which does not contain any SSB of Cell 1. During the whole test, BWP2 is always scheduled as the active BWP for the UE.

1. Ensure the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity *NR*, Connected without release *On* according to TS 38.508-1 [14] clause 4.5.

2. Set the parameters according to T1 in Table 7.6.1.3.5-1 and Table 7.6.1.3.5-2. T1 starts.

3. SS shall transmit an *RRCReconfiguration* message.

4. The UE shall transmit an *RRCReconfigurationComplete* message.

5. When T1 expires, the SS shall switch the power setting from T1 to T2 as specified in Table 7.6.1.3.5-1 and Table 7.6.1.3.5-2.

6. UE shall transmit a *MeasurementReport* message triggered by Event A3. If the overall delays measured from the beginning of time period T2 is less than X ms then the number of successful tests is increased by one. If the UE fails to report the event within the overall delays measured requirement then the number of failure tests is increased by one. Where X is

   - X = 3202 for UE supporting power class 1,

   - X = 1922 ms for UE supporting power class 2, 3 or 4,

7. After the SS receive the MeasurementReport message in step 6) or when T2 expires, the SS shall transmit an *RRCRelease* message to release the RRC connection which includes the release of the established radio bearers as well as all radio resources.

8. Set Cell 2 physical cell identity = ((current Cell 2 physical cell identity + 1) mod 14 + 2) for next iteration of the test procedure loop.

9. After the RRC connection release, the SS:
   - transmits in Cell 1 a Paging message (including PagingRecord with UE-Identity) for the UE and ensures the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity NR, Connected without release On according to TS 38.508-1 [14] clause 4.5 (if the paging fails, switches off and on the UE and ensures the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity NR, Connected without release On according to TS 38.508-1 [14] clause 4.5),
   or
   - switches off and on the UE and ensures the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity NR, Connected without release On according to TS 38.508-1 [14] clause 4.5.

10. Repeat step 2-9 until the confidence level according to Tables G.2.3-1 in Annex G clause G.2 is achieved.

7.6.1.3.4.3 Message contents

Message contents are according to TS 38.508-1 [14] clause 4.6 with the following exceptions:

Table 7.6.1.3.4.3-1: Common Exception messages for NR SA FR1 event-triggered reporting with gap in non-DRX

Default Message Contents	
Common contents of system information blocks exceptions	
Default RRC messages and information elements contents exceptions	Table H.3.1-1 Table H.3.1-2 with Condition INTRA-FREQ and GAP NEEDED Table H.3.1-4 with A3-offset = -11dB Table H.3.1-6 with Condition gapUE and Pattern #0 Table H.3.1-7 with Condition INTRA-FREQ

Table 7.6.1.3.4.3-2: MeasObjectNR (Step 3, test procedure)

Derivation Path: Table H.3.1-3 with condition INTRA-FREQ MO, Synchronous cells and NOT SS-SINR			
Information Element	**Value/remark**	**Comment**	**Condition**
MeasObjectNR::= SEQUENCE {			
ssbSubcarrierSpacing	SubcarrierSpacing specified in 38.508-1 [14] Table 7.3.1-3a with condition SSB.3 FR2		7.6.1.3-1,
	SubcarrierSpacing specified in 38.508-1 [14] Table 7.3.1-3a with condition SSB.4 FR2		7.6.1.3-2,
smtc1	SSB-MTC specified in 38.508-1 [14] Table 7.3.1-3 with condition SMTC.1		
cellsToAddModList SEQUENCE (SIZE (1..maxNrofCellMeas)) OF CellsToAddMod {	1 entry		
CellsToAddMod[1] SEQUENCE {		entry 1	
physCellId	PhysCellId of Cell 2		
cellIndividualOffset SEQUENCE {			
rsrpOffsetSSB	dB16		
rsrqOffsetSSB	Not present		
sinrOffsetSSB	Not present		
rsrpOffsetCSI-RS	Not present		
rsrqOffsetCSI-RS	Not present		
sinrOffsetCSI-RS	Not present		
}			
}			
}			
}			

Table 7.6.1.3.4.3-3: *ServingCellConfig*

Derivation Path: TS 38.508-1 [14], Table 4.6.3-167 with condition BWP-Id1			
Information Element	**Value/remark**	**Comment**	**Condition**
ServingCellConfig ::= SEQUENCE {			
downlinkBWP-ToAddModList SEQUENCE (SIZE (1..maxNrofBWPs)) OF SEQUENCE {			
BWP-Downlink[1]	BWP-Downlink with condition BWP-Id1	DLBWP.1.2 configuration	
}			
firstActiveDownlinkBWP-Id	1	Active DL BWP-ID (BWP2)	BWP-Id1
defaultDownlinkBWP-Id	0	Initial BWP (BWP1)	
uplinkConfig SEQUENCE {			

uplinkBWP-ToAddModList SEQUENCE (SIZE (1..maxNrofBWPs)) OF SEQUENCE {			
BWP-Uplink[1]	BWP-Uplink with condition BWP-Id1	ULBWP.1.2 configuration	
}			
firstActiveUplinkBWP-Id	1	Active UL BWP-ID (BWP2)	BWP-Id1
}			
}			

7.6.1.3.5 Test requirement

Table 7.6.1.3.4.1-3 and Table 7.6.1.3.5-1 define the primary level settings including test tolerances for NR SA FR1 event-triggered reporting with gap in non-DRX test.

Table 7.6.1.3.5-1: NR Cell specific test parameters for NR SA FR1 event-triggered reporting with gap in non-DRX

Parameter	Unit	Config	Cell 1		Cell 2	
			T1	T2	T1	T2
TDD configuration		1, 2	TDDConf.3.1		TDDConf.3.1	
$BW_{channel}$	MHz	1, 2	100: $N_{RB,c}$ = 66		100: $N_{RB,c}$ = 66	
Initial BWP configuration		1, 2	DLBWP.0.1 ULBWP.0.1		DLBWP.0.1 ULBWP.0.1	
Active DL BWP configuration		1, 2	DLBWP.1.2		DLBWP.1.1	
Active UL BWP configuration		1, 2	ULBWP.1.2		ULBWP.1.1	
RLM-RS		1, 2	CSI-RS		SSB	
PDSCH RMC configuration		1	SR.3.2 TDD		N/A	
		2	SR.3.3 TDD			
RMSI CORESET RMC configuration		1	CR.3.1 TDD		CR.3.1 TDD	
		2	CR.3.2 TDD		CR.3.2 TDD	
Dedicated CORESET RMC configuration		1	CCR.3.1 TDD		CCR.3.1 TDD	
		2	CCR.3.7 TDD		CCR.3.7 TDD	
TRS configuration		1, 2	TRS.2.1 TDD		N/A	
PDSCH/PDCCH TCI states		1, 2	TCI.State.2		N/A	
PDSCH/PDCCH subcarrier spacing	kHz	1, 2	120		120	
OCNG Patterns		1, 2	OP.1		OP.1	
cellIndividualOffset	dB	1,2	N/A		16	
SSB		1	SSB.3 FR2		SSB.3 FR2	
		2	SSB.4 FR2		SSB.4 FR2	
Propagation Condition		1, 2	AWGN			

Table 7.6.1.3.5-2: NR OTA Cell specific test parameters for intra-frequency event triggered reporting for SA with TDD PCell in FR2 with per-UE gaps without DRX

Parameter	Unit	Config	Cell 1		Cell 2	
			T1	T2	T1	T2
AoA setup		1, 2	Setup 3 defined in A.9			
			AoA1		AoA2	
Beam Assumption[Note 4]		1,2	Rough		Rough	
E_s	dBm/SCS	1	-89		-89	
		2	-86		-86	

$\hat{E}_s/I_{ot}$ BB Note 5	dB	1, 2	-0.12	-0.12	-Infinity	-0.12
SSB_RP	dBm/SCS	1	-89	-89	-Infinity	-89
		2	-86	-86	-Infinity	86
Io	dBm/95.04MHz	1	-64.41	-64.41	-Infinity	-64.41
		2	-61.41	-61.41	-Infinity	-61.41
Time multiplexing of the downlink transmissions from each AoA		1,2	Defined in Figure 7.6.1.3.5-1			

Note 1: The resources for uplink transmission are assigned to the UE prior to the start of time period T2.

Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for N_{oc} to be fulfilled.

Note 3: SS-RSRP levels have been derived from other parameters for information purposes. They are not settable parameters themselves.

Note 4: Information about types of UE beam is given in TS 38.133 [6] clause B.2.1.3, and does not limit UE implementation or test system implementation

Note 5: Calculation of Es/Iot_{BB} includes the effect of UE internal noise up to the value assumed for the associated Refsens requirement in clause 7.3.2 of TS 38.101-2 [19], and an allowance of 1dB for UE multi-band relaxation factor ΔMB_P from TS 38.101-2 [19] Table 6.2.1.3-4.

The overall delays measured is defined as the time from the beginning of time period T2, to the moment the UE send one Event A3 triggered measurement report.

The overall delays measured in the test may be up to $2xTTI_{DCCH}$ higher than the measurement reporting delays because of TTI insertion uncertainty of the measurement report in DCCH.

The overall delays measured test requirement is expressed as:

Overall delays measured = measurement reporting delay + TTI insertion uncertainty

Measurement reporting delay = $T_{identify_intra_without_index}$

$T_{identify_intra_without_index} = T_{PSS/SSS_sync_intra} + T_{SSB_measurement_period_intra}$

For UE supporting power class 1, T_{PSS/SSS_sync_intr} = 1600 ms, $T_{SSB_measurement_period_intra}$= 1600 ms,

For UE supporting power class 2, 3 or 4, T_{PSS/SSS_sync_intr} = 960 ms, $T_{SSB_measurement_period_intra}$= 960 ms

TTI insertion uncertainty = 2 ms

The overall delays measured shall be less than a total of X ms in this test case (note: this gives a total of 800 ms for measurement reporting delay plus 2 ms for TTI insertion uncertainty), where

X = 3202 for UE supporting power class 1,

X = 1922 for UE supporting power class 2, 3 or 4,

The UE is not required to read the neighbour cell SSB index in this test.

The UE shall not send event triggered measurement reports, as long as the reporting criteria are not fulfilled.

For the test to pass, the total number of successful tests shall be more than 90% of the cases with a confidence level of 95%.

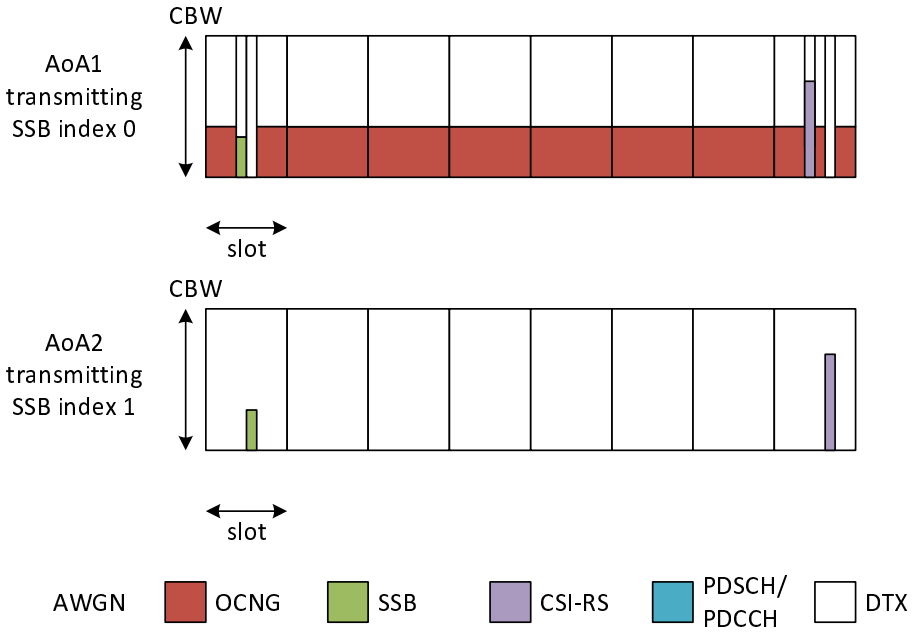


Figure 7.6.1.3.5-1: Time multiplexed downlink transmissions (Config 1 example)

7.6.1.4 NR SA FR2 event-triggered reporting with gap in DRX

Editor's Note: This test case is complete for the following configurations:

- Test frequency f ≤ 40.8 GHz
- UE PC3

This test case is incomplete for Test frequency f > 40.8 GHz

This test case is incomplete for UE power class other than PC3.

7.6.1.4.1 Test purpose

The purpose of this test is to verify UE's ability to make a correct reporting of an event with gaps under DRX within intra-frequency cell search with gaps requirements. This test will partly verify the TDD intra-frequency cell search requirements in TS 38.133 clause 9.2.5.1 and 9.2.5.2.

7.6.1.4.2 Test applicability

This test applies to all types of NR UE release 15 and forward supporting 5GS NR SA FR2, CSI-RS based RLM and long DRX cycle.

7.6.1.4.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 7.6.1.0.2.

The normative reference for this requirement is TS 38.133 [6] clause A.7.6.1.4.

7.6.1.4.4 Test description

7.6.1.4.4.1 Initial conditions

This test shall be tested using any of the test configurations in Table 7.6.1.4.4.1-1.

Table 7.6.1.4.4.1-1: Supported test configurations for NR SA FR2 event-triggered reporting with gap in DRX

Test Case ID	Description

7.6.1.4-1	120 kHz SSB SCS, 100MHz bandwidth, TDD duplex mode
7.6.1.4-2	240 kHz SSB SCS, 100MHz bandwidth, TDD duplex mode
Note: The UE is only required to be tested in one of the supported test configurations.	

Configure the test equipment and the DUT according to the parameters in Table 7.6.1.4.4.1-2.

Table 7.6.1.4.4.1-2: Initial conditions for NR SA FR2 event-triggered reporting with gap in DRX

Parameter	Value		Comment
Test environment	NC		As specified in TS 38.508-1 [14] clause 4.1.
Test frequencies	As specified in Annex E, table E.5-1 and TS 38.508-1 [14] clause 4.3.1 and 4.4.2.		
Channel bandwidth	As specified by the test configuration selected from Table 7.6.1.4.4.1-1.		
Propagation conditions	AWGN		As specified in Annex C.2.2.
Connection Diagram	TE Part	A.3.3.1.1	As specified in TS 38.508-1 [14] Annex A.
	DUT Part	A.3.4.1.1	
Exceptions to connection diagram	N/A		

1. The general test parameter settings are set up according to Table 7.6.1.4.4.1-3.

2. Message contents are defined in clause 7.6.1.4.4.3.

3. There is one NR carrier and two cells specified in the test. Cell 1 is the cell used for connection setup with the power level set according to Annex C.1.1 and C.1.2 for this test.

Table 7.6.1.4.4.1-3: General test parameters for NR SA FR2 event-triggered reporting with gap in DRX

Parameter	Unit	Config	Value		Comment
			Test 1	Test 2	
Active cell		1, 2	PCell (Cell 1)		
Neighbour cell		1, 2	Cell 2		Cell to be identified.
RF Channel Number		1, 2	1: Cell 1 and Cell 2		One TDD carrier frequency is used for the NR cells.
Gap type		1, 2	Per-UE gaps		
Measurement gap repitition periodicity	ms	1, 2	40		
Measurement gap length	ms	1, 2	6		
Measurement gap offset	ms	1, 2	39		
SMTC configuration		1, 2	SMTC.1		
CSI-RS parameters		1, 2	CSI-RS.3.2 TDD		
A3-Offset	dB	1, 2	-7[Note1]		
CP length		1, 2	Normal		
Hysteresis	dB	1, 2	0		
Time To Trigger	s	1, 2	0		
Filter coefficient		1, 2	0		L3 filtering is not used
DRX		1, 2	DRX.1	DRX. 7	
Time offset between Cell 1 and Cell 2		1, 2	3 μs		Synchronous cells
T1	s	1, 2	5		
T2	s	1, 2	10	52	
Note 1: Including test tolerance given in Annex F.1.3.2					

7.6.1.4.4.2 Test procedure

Two cells are deployed in the test, which are FR2 PCell (Cell 1) and a FR2 neighbour cell (Cell 2) on the same frequency as the PCell. The general and cell specific test parameters for PCell and neighbour cell are given in Table 7.6.1.4.4.1-3 and Table 7.6.1.4.4.2-1, respectively. In the measurement control information a measurement object is configured for the frequency of the PCell, and it is indicated to the UE that event-triggered reporting with Event A3 is used. The test consists of two successive time periods, with time duration of T1, and T2 respectively. During time duration T1, the UE shall not have any timing information of Cell 2.

There are two BWPs configured in Cell 1, BWP1 which contains the cell defining SSB, and BWP2 which does not contain any SSB of Cell 1. During the whole test, BWP2 is always scheduled as the active BWP for the UE.

In Test 1 when DRX cycle = 40 ms is used, UE needs to be provided at least once every 500 ms with new Timing Advance Command MAC control element to restart the Timer Alignment Timer to keep the UE uplink time alignment. Furthermore, the UE is allocated with PUSCH resource at every DRX cycle. In Test 2 when DRX = 640 ms is used, the uplink time alignment is not maintained and the UE needs to use RACH to obtain uplink allocation for measurement reporting.

1. Ensure the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity *NR*, Connected without release *On* according to TS 38.508-1 [14] clause 4.5.

2. Set the parameters according to T1 in Table 7.6.1.4.5-1 and Table 7.6.1.4.5-2. T1 starts.

3. SS shall transmit an *RRCReconfiguration* message.

4. The UE shall transmit an *RRCReconfigurationComplete* message.

5. When T1 expires, the SS shall switch the power setting from T1 to T2 as specified in Table 7.6.1.4.5-1 and Table 7.6.1.4.5-2.

6. UE shall transmit a *MeasurementReport* message triggered by Event A3. If the overall delays measured from the beginning of time period T2 is less than X ms for Test 1 or less than Y ms for Test 2 then the number of successful tests is increased by one. If the UE fails to report the event within the overall delays measured requirement then the number of failure tests is increased by one. Where X and Y is

   - X = 7202, Y = 51202 for UE supporting power class 1,

   - X = 4322, Y = 30722 for UE supporting power class 2, 3 or 4,

7. After the SS receive the *MeasurementReport* message in step 6) or when T2 expires, the SS shall transmit an *RRCRelease* message to release the RRC connection which includes the release of the established radio bearers as well as all radio resources.

8. Set Cell 2 physical cell identity = ((current Cell 2 physical cell identity + 1) mod 14 + 2) for next iteration of the test procedure loop.

9. After the RRC connection release, the SS:
   - transmits in Cell 1 a Paging message (including PagingRecord with UE-Identity) for the UE and ensures the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity NR, Connected without release On according to TS 38.508-1 [14] clause 4.5 (if the paging fails, switches off and on the UE and ensures the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity NR, Connected without release On according to TS 38.508-1 [14] clause 4.5),
   or
   - switches off and on the UE and ensures the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity NR, Connected without release On according to TS 38.508-1 [14] clause 4.5.

10. Repeat step 2-9 until the confidence level according to Tables G.2.3-1 in Annex G clause G.2 is achieved.

11. Repeat step 1-10 for each sub-test in Table 7.6.1.4.4.1-3 as appropriate.

7.6.1.4.4.3 Message contents

Message contents are according to TS 38.508-1 [14] clause 4.6 with the following exceptions:

Table 7.6.1.4.4.3-1: Common Exception messages for NR SA FR2 event-triggered reporting with gap in DRX

Default Message Contents	
Common contents of system information blocks exceptions	

Default RRC messages and information elements contents exceptions	Table H.3.1-1 Table H.3.1-2 with Condition INTRA-FREQ and GAP NEEDED Table Table H.3.1-3 with Condition INTRA-FREQ MO, Synchronous cells and NOT SS-SINR Table H.3.1-4 with A3-offset = -6dB Table H.3.1-6 with Condition gapUE and Pattern #0 Table H.3.1-7 with Condition INTRA-FREQ Table H.3.7-1 with Condition DRX.1 and Gap for test 1 Table H.3.7-1 with Condition DRX. 7 and Gap for test 2 Table 7.3.1-3 in TS 38.508-1 [14] with condition SMTC.1

Specific message contents exceptions for Test Configuration 7.6.1.4-1	Table 7.3.1-3a in TS 38.508-1 [14] with condition SSB.3 FR2
Specific message contents exceptions for Test Configuration 7.6.1.4-2	Table 7.3.1-3a in TS 38.508-1 [14] with condition SSB.4 FR2

Table 7.6.1.4.4.3-2: *ServingCellConfig*

Derivation Path: TS 38.508-1 [14], Table 4.6.3-167 with condition BWP-Id1			
Information Element	**Value/remark**	**Comment**	**Condition**
ServingCellConfig ::= SEQUENCE {			
downlinkBWP-ToAddModList SEQUENCE (SIZE (1..maxNrofBWPs)) OF SEQUENCE {			
BWP-Downlink[1]	BWP-Downlink with condition BWP-Id1	DLBWP.1.2 configuration	
}			
firstActiveDownlinkBWP-Id	1	Active DL BWP-ID (BWP2)	BWP-Id1
defaultDownlinkBWP-Id	0	Initial BWP (BWP1)	
uplinkConfig SEQUENCE {			
uplinkBWP-ToAddModList SEQUENCE (SIZE (1..maxNrofBWPs)) OF SEQUENCE {			
BWP-Uplink[1]	BWP-Uplink with condition BWP-Id1	ULBWP.1.2 configuration	
}			
firstActiveUplinkBWP-Id	1	Active UL BWP-ID (BWP2)	BWP-Id1
}			
}			

Condition	Explanation
BWP-Id1	Active BWP (BWP2)

7.6.1.4.5 Test requirement

Table 7.6.1.4.4.1-3 , Table 7.6.1.4.5-1 and Table 7.6.1.4.5-2 define the primary level settings including test tolerances for NR SA FR1 event-triggered reporting with gap in DRX test.

Table 7.6.1.4.5-1: NR Cell specific test parameters for NR SA FR2 event-triggered reporting with gap in DRX

Parameter	Unit	Config	Cell 1		Cell 2	
			T1	T2	T1	T2
TDD configuration		1, 2	TDDConf.3.1		TDDConf.3.1	
$BW_{channel}$	MHz	1, 2	100: $N_{RB,c}$ = 66		100: $N_{RB,c}$ = 66	
Data RBs allocated		1, 2	66		66	
Initial BWP configuration		1, 2	DLBWP.0.1 ULBWP.0.1		DLBWP.0.1 ULBWP.0.1	
Active DL BWP configuration		1, 2	DLBWP.1.2		DLBWP.1.1	

Active UL BWP configuration		1, 2	ULBWP.1.2	ULBWP.1.1
RLM-RS		1, 2	CSI-RS	SSB
PDSCH RMC configuration		1	SR.3.2 TDD	N/A
		2	SR.3.3 TDD	
RMSI CORESET RMC configuration		1	CR.3.1 TDD	CR.3.1 TDD
		2	CR.3.2 TDD	CR.3.2 TDD
Dedicated CORESET RMC configuration		1	CCR.3.1 TDD	CCR.3.1 TDD
		2	CCR.3.7 TDD	CCR.3.7 TDD
TRS configuration		1, 2	TRS.2.1 TDD	N/A
PDSCH/PDCCH TCI state		1, 2	TCI.State.2	N/A
OCNG Patterns		1, 2	OP.1	OP.1
SSB		1	SSB.3 FR2	SSB.3 FR2
		2	SSB.4 FR2	SSB.4 FR2
Propagation Condition		1, 2	AWGN	

Table 7.6.1.4.5-2: NR OTA Cell specific test parameters for NR SA FR2 event-triggered reporting with gap in DRX

Parameter	Unit	Config	Cell 1		Cell 2	
			T1	T2	T1	T2
AoA setup		1, 2	Setup 1 defined in A.3.15.1			
Beam Assumption Note 4		1,2	Rough			
$\hat{E}_s/I_{ot}$ BB Note 5	dB	1, 2	3.51	-1.60	-Infinity	-1.60
N_{oc} Note 2	dBm/15 KHz	1, 2	-101.5 Note 6			
N_{oc} Note 2	dBm/SCS	1	-92.5			
		2	-89.5			
SSB_RPSS-RSRP	dBm/SCS	1	-88.47	-88.47	-Infinity	-88.47
		2	-85.47	-85.47	-Infinity	-85.47
$\hat{E}_s/N_{oc}$	dB	1, 2	4	4	-Infinity	4
Io	dBm/95.04MHz	1	-58.03	-55.68	-58.03	-55.68

Note 1: The resources for uplink transmission are assigned to the UE prior to the start of time period T2.
Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for N_{oc} to be fulfilled.
Note 3: SS-RSRP levels have been derived from other parameters for information purposes. They are not settable parameters themselves.
Note 4: Information about types of UE beam is given in TS 38.133 [6] clause B.2.1.3, and does not limit UE implementation or test system implementation
Note 5: Calculation of Es/Iot_{BB} includes the effect of UE internal noise up to the value assumed for the associated Refsens requirement in clause 7.3.2 of TS 38.101-2 [19], and an allowance of 1dB for UE multi-band relaxation factor ΔMB_P from TS 38.101-2 [19] Table 6.2.1.3-4.
Note 6: Including test tolerance given in Annex F.1.3.2

In Test 1 when DRX cycle length = 40 ms is used, the overall delay measured is defined as the time from the beginning of time period T2, to the moment the UE send one Event A3 triggered measurement report on PUSCH.

In Test 2 when DRX cycle length = 640 ms is used, the overall delay measured is defined as the time from the beginning of time period T2, to the moment the UE starts to send preambles on the PRACH for Scheduling Request (SR) to obtain allocation to send the measurement report on PUSCH.

For both tests:

The overall delays measured in the test may be up to 2xTTI_{DCCH} higher than the measurement reporting delays because of TTI insertion uncertainty of the measurement report in DCCH.

NOTE 1: The actual overall delays measured in the test may be up to one DRX cycle higher than the measurement reporting delays above because UE is allowed to delay the initiation of the measurement reporting procedure to the next until the Active Time.

NOTE 2: In order to calculate the rate of correct events the system simulator shall verify that it has received correct Event A3 measurement report.

The overall delay measured when DRX cycle length is 40 ms test requirement is expressed as:

Overall delays measured = measurement reporting delay + TTI insertion uncertainty

Measurement reporting delay = $T_{identify_intra_without_index}$

$T_{identify_intra_without_index}$ = (T_{PSS/SSS_sync_intra} + $T_{SSB_measurement_period_intra}$) ms

For UE supporting power class 1, T_{PSS/SSS_sync_intra} = 7200ms, $T_{SSB_measurement_period_intra}$= 7200 ms,

For UE supporting power class 2, 3 or 4, T_{PSS/SSS_sync_intra} = 2160 ms, $T_{SSB_measurement_period_intra}$= 2160 ms

TTI insertion uncertainty = 2 ms

The overall delay measured when DRX cycle length is 40 ms shall be less than a total of X ms, where X is

- X = 7202 for UE supporting power class 1,
- X = 4322 for UE supporting power class 2, 3 or 4,

The overall delay measured when DRX cycle length is 640 ms test requirement is expressed as:

Overall delays measured = measurement reporting delay + TTI insertion uncertainty

Measurement reporting delay = $T_{identify_intra_without_index}$

$T_{identify_intra_without_index}$ = (T_{PSS/SSS_sync_intra} + $T_{SSB_measurement_period_intra}$) ms

For UE supporting power class 1, T_{PSS/SSS_sync_intra} = 25600 ms, $T_{SSB_measurement_period_intra}$= 25600 ms,

For UE supporting power class 2, 3 or 4, T_{PSS/SSS_sync_intra} = 15360 ms, $T_{SSB_measurement_period_intra}$= 15360 ms

TTI insertion uncertainty = 2 ms

The overall delay measured when DRX cycle length is 640 ms shall be less than a total of X ms, where

- X = 51202 for UE supporting power class 1,
- X = 30722 for UE supporting power class 2, 3 or 4,

For the test to pass, the total number of successful tests shall be more than 90% of the cases with a confidence level of 95%.

7.6.2 Inter-frequency measurements

7.6.2.0 Minimum conformance requirements for Inter-frequency measurements

Same as clause 5.6.2.0.

The normative reference for this requirement is TS 38.133 [6] clause 9.3.2, 9.3.4, 9.3.5, 9.3.6.3.

7.6.2.1 NR SA FR2-FR2 event-triggered reporting in non-DRX

Editor's Note: This test case has been completed for the following configurations:

- Test frequency f ≤ 40.8 GHz

- UE PC3

- The test is incomplete for UE power classes other than PC3

- The test is incomplete for test frequencies > 40.8 GHz

7.6.2.1.1 Test purpose

The purpose of this test is to verify that the UE makes correct reporting of an event within inter-frequency cell search requirements.

7.6.2.1.2 Test applicability

This test applies to all types of NR UE from Release 15 onwards.

7.6.2.1.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 7.6.2.0.

The normative reference for this requirement is TS 38.133 [6] clause A.7.6.2.1.

7.6.2.1.4 Test description

7.6.2.1.4.1 Initial conditions

This test shall be tested using any of the test configurations in Table 7.6.2.1.4.1-1.

Table 7.6.2.1.4.1-1: NR FR2-FR2 event triggered reporting tests in non-DRX supported test configurations

Test Case ID	Description
7.6.2.1-1	120 kHz SSB SCS, 100MHz bandwidth, TDD duplex mode
Note 1: Void	

Table 7.6.2.1.4.1-1: General test parameters for SA inter-frequency event triggered reporting for FR2 without SSB time index detection

Parameter	Unit	Test configuration	Value	Comment
NR RF Channel Number		Config 1	1, 2	Two FR2 NR carrier frequencies is used.
Active cell		Config 1	NR cell 1 (Pcell)	NR Cell 1 is on NR RF channel number 1.
Neighbour cell		Config 1	NR cell 2	NR cell 2 is on NR RF channel number 2.
Gap Pattern Id		Config 1	13	As specified in clause 9.1.2-1.
Measurement gap offset		Config 1	39	
SMTC-SSB parameters		Config 1	SSB.3 FR2	As specified in clause A.3.10.2
offsetMO	dB	Config 1	16	Applied to NR Cell 2 measurement object
A3-Offset	dB	Config 1	-11	
Hysteresis	dB	Config 1	0	
CP length		Config 1	Normal	
TimeToTrigger	s	Config 1	0	
Filter coefficient		Config 1	0	L3 filtering is not used
DRX		Config 1	OFF	DRX is not used
Time offset between serving and neighbour cells		Config 1	3µs	Synchronous cells.

T1	s	Config 1	5	
T2	s	Config 1	5.2 for PC1; 3.5 for other PC	

Table 7.6.2.1.4-3: Test Environment parameters for SA inter-frequency event triggered reporting without SSB time index detection in non-DRX

Parameter	Value		Comment
Test environment	NC		As specified in TS 38.508-1 [14] clause 4.1.
Test frequencies	As specified in Annex E, Table E.2-1 and TS 38.508-1 [14] clause 4.3.1 and 4.4.2.		
Channel bandwidth	As specified by the test configuration selected from Table 7.6.2.1.4.1-1.		
Propagation conditions	AWGN		As specified in Annex C.2.2.
Connection Diagram	TE Part	A.3.3.3.1	As specified in TS 38.508-1 [14] Annex A.
	DUT Part	A.3.4.1.1	
Exceptions to connection diagram			

1. Message contents are defined in clause 7.6.2.1.4.3.

2. There are two NR cells on two carriers specified in the test. Cell 1 is the cell used for connection setup and Cell 2 is a target cell on a different carrier than Cell 1. The power levels and settings for Cell 2 are set according to Annex C.1.2.

3. The AoA setup for this test is Setup 3 as defined in clause A.9 The UE RX spherical coverage direction has been obtained previously using one of the search procedures as described in Annex I.

7.6.2.1.4.2 Test procedure

In this test, there are two cells: NR cell 1 as PCell in FR2 on NR RF channel 1 and NR cell 2 as neighbour cell in FR2 on NR RF channel 2.

In test 1 measurement gap pattern configuration # 0 as defined in Table 7.6.2.1.4.1-2 is provided for UE that does not support per-FR gap and in test 2 measurement gap pattern configuration #13 as defined in Table 7.6.2.1.4.1-2 is provided for UE that supports per-FR gap.

In the measurement control information, it is indicated to the UE that event-triggered reporting with Event A3 is used. The test consists of two successive time periods, with time duration of T1, and T2 respectively. During time duration T1, the UE shall not have any timing information of NR cell 2.

1. Ensure the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity NR SA, Connected without release *On* according to TS 38.508-1 [14] clause 4.5.

2. Set the parameters according to T1 in Table 7.6.2.1.4.1-2. The TE shall ensure that the NR FR2 cells are from the set of directions corresponding to the EIS spherical coverage percentile of the DUT as defined in clause 7.3.4 of TS 38.101-2 [3] and relative angular offset between active probes are according to Table A.9.3-1. T1 starts.

3. The SS shall transmit an *RRCReconfiguration* message.

4. The UE shall transmit *RRCReconfigurationComplete* message.

5. When T1 expires, the SS shall switch the power setting from T1 to T2 as specified in Table 7.6.2.1.4.1-2. T2 starts.

6. UE shall transmit a *MeasurementReport* message triggered by Event A3. If the overall delays measured from the beginning of time period T2 is less than 5122 ms for UE supporting power class 1, or 3202 ms for UE supporting other power class for Test 1 and Test 2 then the number of successful tests is increased by one. If the UE fails to report the event within the overall delays measured requirement then the number of failure tests is increased by one.

7. After the SS receives the *MeasurementReport* message in step 6 or when T2 expires, the SS shall transmit *RRCRelease* message to release the RRC connection which includes the release of the established radio bearers as well as all radio resources.

8. Set Cell 2 physical cell identity = [(current cell 2 physical cell identity + 1) mod 1008] for next iteration of the test procedure loop.]

9. TE shall change the active probes in such way that relative angular offset between active probes differs in the following iteration.

10. After the RRC connection release, the SS:

- transmits in Cell 1 a *Paging* message (including PagingRecord with ue-Identity) for the UE and ensures the UE in state RRC_CONNECTED with generic procedure parameters Connectivity NR SA, Connected without release *On* according to TS 38.508-1 [14] clause 4.5. (if the paging fails, switches off and on the UE and ensures the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity NR SA, Connected without release *On* according to TS 38.508-1 [14] clause 4.5.),
or:

- switches off and on the UE and ensures the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity NR SA, Connected without release *On* according to TS 38.508-1 [14] clause 4.5.

11. Repeat step 2-10 until the confidence level according to Tables G.2.3-1 in Annex G clause G.2 is achieved.

12. Repeat step 1-11 for each sub-test in Table 7.6.2.1.4.1-2 as appropriate.

7.6.2.1.4.3 Message contents

Message contents are according to TS 38.508-1 [14] clause 4.6 with the following exceptions:

Table 7.6.2.1.4.3-1: Common Exception messages SA inter frequency event triggered reporting without SSB time index detection in non-DRX

Default Message Contents	
Common contents of system information blocks exceptions	
Default RRC messages and information elements contents exceptions	Table H.3.1-1 Table H.3.1-2 with Conditions GAP NEEDED and INTER-FREQ Table H.3.1-3 with Conditions INTER-FREQ MO and Synchronous cells Table H.3.1-4 with A3-offset = -11dB Table H.3.1-5 Table H.3.1-6 with Conditions gapUE and Pattern #13 Table H.3.1-7 with Condition INTER-FREQ

Table 7.6.2.1.4.3-2: MeasObjectNR-DEFAULT: SA FR2-FR2 measurement object configuration

Derivation Path: Table H.3.1-3			
Information Element	**Value/remark**	**Comment**	**Condition**
MeasObjectNR::= SEQUENCE {			
offsetMO SEQUENCE {			
rsrpOffsetSSB	dB16		
}			

7.6.2.1.5 Test requirement

Table 7.6.2.1.5-1 defines the primary level settings including test tolerances for all tests.

Table 7.6.2.1.5-1: Cell specific test parameters for SA inter-frequency event triggered reporting for FR2 without SSB time index detection

Parameter	Unit	Test configuration	Cell 1		Cell 2	
			T1	T2	T1	T2
AoA setup		Config 1	Setup 3 as specified in clause A.9			
			AoA1		AoA2	
Assumption for UE beams[Note 7]		Config 1,2	Rough		Rough	
NR RF Channel Number		Config 1	1		2	

Duplex mode			Config 1	TDD		TDD	
TDD configuration			Config 1	TDDConf.3.1		TDDConf.3.1	
$BW_{channel}$		MHz	Config 1	100: $N_{RB,c}$ = 66		100: $N_{RB,c}$ = 66	
Data RBs allocated			Config 1	66		66	
BWP BW		MHz	Config 1	100: $N_{RB,c}$ = 66		100: $N_{RB,c}$ = 66	
BWP configuration	Initial DL BWP		Config 1	DLBWP.0.1		N/A	
	Initial UL BWP			ULBWP.0.1		N/A	
	Dedicated DL BWP			DLBWP.1.1		N/A	
	Dedicated UL BWP			ULBWP.1.1		N/A	
OCNG Patterns			Config 1	OP.1		OP.1	
PDSCH Reference measurement channel			Config 1	SR.3.1 TDD		-	
CORESET Reference Channel			Config 1	CR.3.1 TDD		-	
SMTC configuration			Config 1	SMTC.1		SMTC.1	
PDSCH/PDCCH subcarrier spacing		kHz	Config 1	120		120	
TRS configuration			Config 1	TRS.2.1 TDD		N/A	
PDSCH/PDCCH TCI state			Config 1	TCI.State.2		N/A	
EPRE ratio of PSS to SSS			Config 1	0		0	
EPRE ratio of PBCH DMRS to SSS							
EPRE ratio of PBCH to PBCH DMRS							
EPRE ratio of PDCCH DMRS to SSS							
EPRE ratio of PDCCH to PDCCH DMRS							
EPRE ratio of PDSCH DMRS to SSS							
EPRE ratio of PDSCH to PDSCH							
EPRE ratio of OCNG DMRS to SSS(Note 1)							
EPRE ratio of OCNG to OCNG DMRS (Note 1)							
$\hat{E}_s$		dBm/SCS	Config 1	-87	-87	-Infinity	-87
SSB-RP Note 3		dBm/SCS Note5	Config 1	-87	-87	-Infinity	-87
$\hat{E}_s / I_{ot}$ BB Note 8		dB	Config 1	1.89	1.89	-Infinity	1.89
Io Note3		dBm/95.04 MHz Note5	Config 1	-58.01	-58.01	-Infinity	-58.01
Propagation Condition			Config 1	AWGN		AWGN	

Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.
Note 2: Void
Note 3: SSB-RP, Es/Iot and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.
Note 4: Void
Note 5: Equivalent power received by an antenna with 0dBi gain at the centre of the quiet zone
Note 6: As observed with 0dBi gain antenna at the centre of the quiet zone
Note 7: Information about types of UE beam is given in TS 38.133 [6] Annex B.2.1.3, and does not limit UE implementation or test system implementation
Note 8: Calculation of Es/Iot_{BB} includes the effect of UE internal noise up to the value assumed for the associated Refsens requirement in clause 7.3.2 of TS 38.101-2 [3], and an allowance of 1dB for UE multi-band relaxation factor ΔMB_S from TS 38.101-2 [3] Table 6.2.1.3-4.

The UE shall send one Event A3 triggered measurement report, with a measurement reporting delay less than X ms from the beginning of time period T2, where X is

5120 for UE supporting power class 1, or

3200 for UE supporting other power class.

The UE is not required to report SSB time index. The UE shall not send event triggered measurement reports, as long as the reporting criteria are not fulfilled. The rate of correct events observed during repeated tests shall be at least 90% with a confidence level of 95%.

NOTE: The actual overall delays measured in the test may be up to $2xTTI_{DCCH}$ higher than the measurement reporting delays above because of TTI insertion uncertainty of the measurement report in DCCH.

TTI insertion uncertainty = TTIDCCH = 1 ms; 2xTTIDCCH = 2 ms

The overall delays measured shall be less than a total of 5122 ms in this test for power class UE and 3202 ms for other power classes.

7.6.2.2 NR SA FR2-FR2 event-triggered reporting in DRX

Editor's Note: This test case has been completed for the following configurations:

- Test frequency f ≤ 40.8 GHz

- UE PC3

- The test is incomplete for UE power classes other than PC3

- The test is incomplete for test frequencies > 40.8 GHz

7.6.2.2.1 Test purpose

The purpose of this test is to verify that the UE makes correct reporting of an event within inter-frequency cell search requirements.

7.6.2.2.2 Test applicability

This test applies to all types of NR UE Release 15 and forward supporting 5GS NR SA FR2 and long DRX cycle.

7.6.2.2.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 7.6.2.0.

The normative reference for this requirement is TS 38.133 [6] clause A.7.6.2.2.

7.6.2.2.4 Test description

7.6.2.2.4.1 Initial conditions

This test shall be tested using any of the test configurations in Table 7.6.2.2.4.1-1.

Table 7.6.2.2.4.1-1: NR FR2-FR2 event triggered reporting tests in DRX supported test configurations

Test Case ID	Description
7.6.2.2-1	120 kHz SSB SCS, 100MHz bandwidth, TDD duplex mode
Note 1: Void	

Table 7.6.2.2.4.1-2: General test parameters for SA inter-frequency event triggered reporting for FR2 without SSB time index detection in DRX

Parameter	Unit	Test configuration	Value		Comment
			Test 1	Test 2	

NR RF Channel Number		Config 1	1, 2		Two FR1 NR carrier frequencies is used.
Active cell		Config 1	NR cell 1 (Pcell)		NR Cell 1 is on NR RF channel number 1.
Neighbour cell		Config 1	NR cell 2		NR cell 2 is on NR RF channel number 2.
Gap Pattern Id		Config 1	13		As specified in clause 9.1.2-1.
Measurement gap offset		Config 1	39		
SMTC-SSB parameters		Config 1	SSB.3 FR2		As specified in clause A.3.10.2
A3-Offset	dB	Config 1	-12		Value modified by TT
Hysteresis	dB	Config 1	0		
CP length		Config 1	Normal		
TimeToTrigger	s	Config 1	0		
Filter coefficient		Config 1	0		L3 filtering is not used
DRX		Config 1	DRX.1	DRX.2	As specified in clause A.3.3
Time offset between serving and neighbour cells		Config 1	3µs		Synchronous cells.
T1	s	Config 1	5		
T2	s	Config 1	8 for PC1; 5 for other PC	82 for PC1; 52 for other PC	

Table 7.6.2.2.4-3: Test Environment parameters for SA inter-frequency event triggered reporting without SSB time index detection in DRX

Parameter	Value		Comment
Test environment	NC		As specified in TS 38.508-1 [14] clause 4.1.
Test frequencies	As specified in Annex E, Table E.2-1 and TS 38.508-1 [14] clause 4.3.1 and 4.4.2.		
Channel bandwidth	As specified by the test configuration selected from Table 7.6.2.2.4.1-1.		
Propagation conditions	AWGN		As specified in Annex C.2.2.
Connection Diagram	TE Part	A.3.3.3.1	As specified in TS 38.508-1 [14] Annex A.
	DUT Part	A.3.4.1.1	
Exceptions to connection diagram			

1. Message contents are defined in clause 7.6.2.2.4.3.

2. There are two NR cells on two carriers specified in the test. Cell 1 is the cell used for connection setup and Cell 2 is a target cell on a different carrier than Cell 1. The power levels and settings for Cell 2 are set according to Annex C.1.2.

3. The UE Rx beam peak direction for Cell 2 has been obtained previously using one of the Rx beam peak search procedures as described in Annex I.

7.6.2.2.4.2 Test procedure

In this test, there are two cells: NR cell 1 as PCell in FR2 on NR RF channel 1 and NR cell 2 as neighbour cell in FR2 on NR RF channel 2.

In test 1&2 measurement gap pattern configuration #13 as defined in Table 7.6.2.2.4.1-2 is provided for UE that does not support per-FR gap and for UE that supports per-FR gap.

In the measurement control information, it is indicated to the UE that event-triggered reporting with Event A3 is used. The test consists of two successive time periods, with time duration of T1, and T2 respectively. During time duration T1, the UE shall not have any timing information of NR cell 2.

UE needs to be provided at least once every 500ms with new Timing Advance Command MAC control element to restart the Time alignment timer to keep UE uplink time alignment. Furthermore, UE is allocated with PUSCH resource at every DRX cycle.

1. Ensure the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity NR SA, Connected without release *On* according to TS 38.508-1 [14] clause 4.5.

2. Set the parameters according to T1 in Table 7.6.2.2.4.1-2. T1 starts.

3. The SS shall transmit an *RRCReconfiguration* message.

4. The UE shall transmit *RRCReconfigurationComplete* message.

5. When T1 expires, the SS shall switch the power setting from T1 to T2 as specified in Table 7.6.2.2.4.1-2.

6. UE shall transmit a *MeasurementReport* message triggered by Event A3. If the overall delays measured from the beginning of time period T2 is less than 7682 ms for UE supporting power class 1, or 4802 ms for UE supporting other power class for Test 1 and 81922 ms for UE supporting power class 1, or 51202 ms for UE supporting other power class for Test 2 then the number of successful tests is increased by one. If the UE fails to report the event within the overall delays measured requirement then the number of failure tests is increased by one.

7. After the SS receives the *MeasurementReport* message in step 6 or when T2 expires, the SS shall transmit *RRCRelease* message to release the RRC connection which includes the release of the established radio bearers as well as all radio resources.

8. Set Cell 2 physical cell identity = [(current cell 2 physical cell identity + 1) mod 1008] for next iteration of the test procedure loop.]

9. After the RRC connection release, the SS:

   - transmits in Cell 1 a *Paging* message (including PagingRecord with ue-Identity) for the UE and ensures the UE in state RRC_CONNECTED with generic procedure parameters Connectivity NR SA, Connected without release *On* according to TS 38.508-1 [14] clause 4.5. (if the paging fails, switches off and on the UE and ensures the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity NR SA, Connected without release *On* according to TS 38.508-1 [14] clause 4.5.),
   or:
   - switches off and on the UE and ensures the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity NR SA, Connected without release *On* according to TS 38.508-1 [14] clause 4.5.

10. Repeat step 2-9 until the confidence level according to Tables G.2.3-1 in Annex G clause G.2 is achieved.

11. Repeat step 1-10 for each sub-test in Table 7.6.2.2.4.1-2 as appropriate.

7.6.2.2.4.3 Message contents

Message contents are according to TS 38.508-1 [14] clause 4.6 with the following exceptions:

Table 7.6.2.2.4.3-1: Common Exception messages SA inter frequency event triggered reporting without SSB time index detection in DRX

Default Message Contents	
Common contents of system information blocks exceptions	
Default RRC messages and information elements contents exceptions	Table H.3.1-1 Table H.3.1-2 with Conditions GAP NEEDED and INTER-FREQ Table H.3.1-3 with Conditions INTER-FREQ MO and and Synchronous cells Table H.3.1-4 with A3-offset = -12dB Table H.3.1-5 Table H.3.1-6 with Conditions gapUE and Pattern #13 Table H.3.1-7 with Condition INTER-FREQ Table H.3.7-1 with Condition DRX.1 for Test 1 and DRX.2 for Test 2

7.6.2.2.5 Test requirement

Table 7.6.2.2.5-1 defines the primary level settings including test tolerances for all tests.

Table A.7.6.2.2.1-3: Cell specific test parameters for CA inter-frequency event triggered reporting without SSB time index detection

Parameter		Unit	Test configuration	Cell 1		Cell 2	
				T1	T2	T1	T2
AoA setup			Config 1	Setup 1 as specified in clause A.9			
Beam Assumption Note 7			Config 1	Rough			
NR RF Channel Number			Config 1	1		2	
TDD configuration			Config 1	TDDConf.3.1		TDDConf.3.1	
Duplex mode			Config 1	TDD		TDD	
$BW_{channel}$		MHz	Config 1	100: $N_{RB,c}$ = 66		100: $N_{RB,c}$ = 66	
Data RBs allocated			Config 1	66		66	
BWP BW		MHz	Config 1	100: $N_{RB,c}$ = 66		100: $N_{RB,c}$ = 66	
BWP configuration	Initial DL BWP		Config 1	DLBWP.0.1		N/A	
	Dedicated DL BWP			DLBWP.1.1		N/A	
	Dedicated UL BWP			ULBWP.1.1		N/A	
OCNG Patterns			Config 1	OP.1		OP.1	
PDSCH Reference measurement channel			Config 1	SR.3.1 TDD		-	
CORESET Reference Channel			Config 1	CR.3.1 TDD		-	
SMTC configuration			Config 1	SMTC.1		SMTC.1	
PDSCH/PDCCH subcarrier spacing		kHz	Config 1	120		120	
EPRE ratio of PSS to SSS			Config 1	0		0	
EPRE ratio of PBCH DMRS to SSS							
EPRE ratio of PBCH to PBCH DMRS							
EPRE ratio of PDCCH DMRS to SSS							
EPRE ratio of PDCCH to PDCCH DMRS							
EPRE ratio of PDSCH DMRS to SSS							
EPRE ratio of PDSCH to PDSCH							
EPRE ratio of OCNG DMRS to SSS(Note 1)							
EPRE ratio of OCNG to OCNG DMRS (Note 1)							
N_{oc} Note2		dBm/15 kHz Note5		-104.7		-104.7	
N_{oc} Note2		dBm/SCS Note4	Config 1	-95.7		-95.7	
SSB_RP Note 3		dBm/SCS Note5	Config 1	-89.7	-89.7	-Infinity	-86.7
$\hat{E}_s / I_{ot}$		dB	Config 1	6	6	-Infinity	9
$\hat{E}_s / N_{oc}$		dB	Config 1	6	6	-Infinity	9

Io[Note3]	dBm/95.04 MHz Note5	Config 1	-59.7	-59.7	-66.7	-57.2
Propagation Condition		Config 1	AWGN		AWGN	

Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.
Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for N_{oc} to be fulfilled.
Note 3: SSB_RP and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.
Note 4: Void
Note 5: Equivalent power received by an antenna with 0dBi gain at the centre of the quiet zone
Note 6: As observed with 0dBi gain antenna at the centre of the quiet zone
Note 7: Information about types of UE beam is given in TS 38.133 Annex B.2.1.3, and does not limit UE implementation or test system implementation

In test 1 the UE shall send one Event A3 triggered measurement report, with a measurement reporting delay less than X1 ms from the beginning of time period T2, where X1 is

7680 for UE supporting power class 1, or

4800 for UE supporting other power class.

In test 2 the UE shall send one Event A3 triggered measurement report, with a measurement reporting delay less than X2 ms from the beginning of time period T2, where X2 is

81920 for UE supporting power class 1, or

51200 for UE supporting other power class.

In test 1 and 2 UE is not required to report SSB time index.

The UE shall not send event triggered measurement reports, as long as the reporting criteria are not fulfilled. The rate of correct events observed during repeated tests shall be at least 90% with a confidence level of 95%.

NOTE: The actual overall delays measured in the test may be up to $2xTTI_{DCCH}$ higher than the measurement reporting delays above because of TTI insertion uncertainty of the measurement report in DCCH.

TTI insertion uncertainty = TTIDCCH = 1 ms; 2xTTIDCCH = 2 ms

The overall delays measured shall be less than a total of 7682 ms for power class 1 UE and 4802 ms for other power classes in test 1 and 81922 for power class 1 UE and 51202 ms for other power classes in test 2.

7.6.2.3 NR SA FR2-FR2 event-triggered reporting in non-DRX with SSB time index detection

Editor's Note: This test case has been completed for the following configurations:

- Test frequency f ≤ 40.8 GHz

- UE PC3

- The test is incomplete for UE power classes other than PC3

- The test is incomplete for test frequencies > 40.8 GHz

7.6.2.3.1 Test purpose

The purpose of this test is to verify that the UE makes correct reporting of an event within inter-frequency cell search requirements.

7.6.2.3.2 Test applicability

This test applies to all types of NR UE from Release 15 onwards.

7.6.2.3.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 7.6.2.0.

The normative reference for this requirement is TS 38.133 [6] clause A.7.6.2.3.

7.6.2.3.4 Test description

7.6.2.3.4.1 Initial conditions

This test shall be tested using any of the test configurations in Table 7.6.2.3.4.1-1.

Table 7.6.2.3.4.1-1: NR FR2-FR2 event triggered reporting tests in non-DRX with SSB time index detection supported test configurations

Test Case ID	Description
7.6.2.3-1	120 kHz SSB SCS, 100MHz bandwidth, TDD duplex mode
Note 1: Void	

Table 7.6.2.3.4.1-2: General test parameters for SA inter-frequency event triggered reporting for FR2 with SSB time index detection

Parameter	Unit	Test configuration	Value	Comment
NR RF Channel Number		Config 1	1, 2	Two FR2 NR carrier frequencies is used.
Active cell		Config 1	NR cell 1 (Pcell)	NR Cell 1 is on NR RF channel number 1.
Neighbour cell		Config 1	NR cell 2	NR cell 2 is on NR RF channel number 2.
Gap Pattern Id		Config 1	13	As specified in clause 9.1.2-1.
Measurement gap offset		Config 1	39	
SMTC-SSB parameters		Config 1	SSB.3 FR2	As specified in clause A.3.10.2
offsetMO	dB	Config 1	16	Applied to NR Cell 2 measurement object
A3-Offset	dB	Config 1	-11	
Hysteresis	dB	Config 1	0	
CP length		Config 1	Normal	
TimeToTrigger	s	Config 1	0	
Filter coefficient		Config 1	0	L3 filtering is not used
DRX		Config 1	OFF	DRX is not used
Time offset between serving and neighbour cells		Config 1	3μs	Synchronous cells.
T1	s	Config 1	5	
T2	s	Config 1	7 for PC1; 4.5 for other PC	

Table 7.6.2.3.4-3: Test Environment parameters for SA inter-frequency event triggered reporting with SSB time index detection in non-DRX

Parameter	Value		Comment
Test environment	NC		As specified in TS 38.508-1 [14] clause 4.1.
Test frequencies	As specified in Annex E, Table E.2-1 and TS 38.508-1 [14] clause 4.3.1 and 4.4.2.		
Channel bandwidth	As specified by the test configuration selected from Table 7.6.2.3.4.1-1.		
Propagation conditions	AWGN		As specified in Annex C.2.2.
Connection Diagram	TE Part	A.3.3.3.1	As specified in TS 38.508-1 [14] Annex A.
	DUT Part	A.3.4.1.1	
Exceptions to connection diagram			

1. Message contents are defined in clause 7.6.2.3.4.3.

2. There are two NR cells on two carriers specified in the test. Cell 1 is the cell used for connection setup and Cell 2 is a target cell on a different carrier than Cell 1. The power levels and settings for Cell 2 are set according to Annex C.1.2.

3. The AoA setup for this test is Setup 3 as defined in clause A.9. The UE RX spherical coverage direction has been obtained previously using one of the search procedures as described in Annex I.

7.6.2.3.4.2 Test procedure

In this test, there are two cells: NR cell 1 as PCell in FR2 on NR RF channel 1 and NR cell 2 as neighbour cell in FR2 on NR RF channel 2.

In test 1 measurement gap pattern configuration # 0 as defined in Table 7.6.2.3.4.1-2 is provided for UE that does not support per-FR gap and in test 2 measurement gap pattern configuration #13 as defined in Table 7.6.2.3.4.1-2 is provided for UE that supports per-FR gap.

In the measurement control information, it is indicated to the UE that event-triggered reporting with Event A3 is used. The test consists of two successive time periods, with time duration of T1, and T2 respectively. During time duration T1, the UE shall not have any timing information of NR cell 2.

1. Ensure the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity NR SA, Connected without release *On* according to TS 38.508-1 [14] clause 4.5.

2. Set the parameters according to T1 in Table 7.6.2.3.4.1-2. The TE shall ensure that the NR FR2 cells are from the set of directions corresponding to the EIS spherical coverage percentile of the DUT as defined in clause 7.3.4 of TS 38.101-2 [3] and relative angular offset between active probes are according to Table A.9.3-1. T1 starts.

3. The SS shall transmit an *RRCReconfiguration* message.

4. The UE shall transmit *RRCReconfigurationComplete* message.

5. When T1 expires, the SS shall switch the power setting from T1 to T2 as specified in Table 7.6.2.3.4.1-2. T2 starts.

6. UE shall transmit a *MeasurementReport* message triggered by Event A3. If the overall delays measured from the beginning of time period T2 is less than 6722 ms for UE supporting power class 1, or 4162 ms for UE supporting other power class for Test 1 and Test 2, then the number of successful tests is increased by one. If the UE fails to report the event within the overall delays measured requirement then the number of failure tests is increased by one.

7. After the SS receives the *MeasurementReport* message in step 6 or when T2 expires, the SS shall transmit *RRCRelease* message to release the RRC connection which includes the release of the established radio bearers as well as all radio resources.

8. Set Cell 2 physical cell identity = [(current cell 2 physical cell identity + 1) mod 1008] for next iteration of the test procedure loop.]

9. TE shall change the active probes in such way that relative angular offset between active probes differs in the following iteration.10. After the RRC connection release, the SS:

   - transmits in Cell 1 a *Paging* message (including PagingRecord with ue-Identity) for the UE and ensures the UE in state RRC_CONNECTED with generic procedure parameters Connectivity NR SA, Connected without release *On* according to TS 38.508-1 [14] clause 4.5. (if the paging fails, switches off and on the UE and ensures the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity NR SA, Connected without release *On* according to TS 38.508-1 [14] clause 4.5.),
   or:
   - switches off and on the UE and ensures the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity NR SA, Connected without release *On* according to TS 38.508-1 [14] clause 4.5.

11. Repeat step 2-10 until the confidence level according to Tables G.2.3-1 in Annex G clause G.2 is achieved.

12. Repeat step 1-11 for each sub-test in Table 7.6.2.3.4.1-2 as appropriate.

7.6.2.3.4.3 Message contents

Message contents are according to TS 38.508-1 [14] clause 4.6 with the following exceptions:

Table 7.6.2.3.4.3-1: Common Exception messages SA inter frequency event triggered reporting with SSB time index detection in non-DRX

Default Message Contents	
Common contents of system information blocks exceptions	
Default RRC messages and information elements contents exceptions	Table H.3.1-1 Table H.3.1-2 with Conditions GAP NEEDED and INTER-FREQ Table H.3.1-3 with Conditions INTER-FREQ MO and Synchronous cells Table H.3.1-4 with Condition SSB Index and A3-offset = -11dB Table H.3.1-5 Table H.3.1-6 with Conditions gapUE and Pattern #13 Table H.3.1-7 with Condition INTER-FREQ

Table 7.6.2.3.4.3-2: MeasObjectNR-DEFAULT: SA FR2-FR2 measurement object configuration

Derivation Path: Table H.3.1-3			
Information Element	**Value/remark**	**Comment**	**Condition**
MeasObjectNR::= SEQUENCE {			
offsetMO SEQUENCE {			
rsrpOffsetSSB	dB16		
}			

7.6.2.3.5 Test requirement

Table 7.6.2.3.5-1 defines the primary level settings including test tolerances for all tests.

Table 7.6.2.3.5-1: Cell specific test parameters for SA inter-frequency event triggered reporting for FR2 with SSB time index detection

Parameter		Unit	Test configuration	Cell 1		Cell 2	
				T1	T2	T1	T2
AoA setup			Config 1	Setup 3 as specified in clause A.9			
				AoA1		AoA2	
Beam Assumption[Note 7]			Config 1	Rough		Rough	
NR RF Channel Number			Config 1	1		2	
Duplex mode			Config 1	TDD		TDD	
TDD configuration			Config 1	TDDConf.3.1		TDDConf.3.1	
$BW_{channel}$		MHz	Config 1	100: $N_{RB,c}$ = 66		100: $N_{RB,c}$ = 66	
Data RBs allocated			Config 1	66		66	
BWP BW		MHz	Config 1	100: $N_{RB,c}$ = 66		100: $N_{RB,c}$ = 66	
BWP configuration	Initial DL BWP		Config 1	DLBWP.0.1		N/A	
	Initial UL BWP			ULBWP.0.1		N/A	
	Dedicated DL BWP			DLBWP.1.1		N/A	
	Dedicated UL BWP			ULBWP.1.1		N/A	
OCNG Patterns			Config 1	OP.1		OP.1	
PDSCH Reference measurement channel			Config 1	SR.3.1 TDD		-	
CORESET Reference Channel			Config 1	CR.3.1 TDD		-	

SMTC configuration		Config 1	SMTC.1		SMTC.1	
PDSCH/PDCCH subcarrier spacing	kHz	Config 1	120		120	
TRS configuration		Config 1	TRS.2.1 TDD		N/A	
PDSCH/PDCCH TCI state		Config 1	TCI.State.2		N/A	
EPRE ratio of PSS to SSS		Config 1	0		0	
EPRE ratio of PBCH DMRS to SSS						
EPRE ratio of PBCH to PBCH DMRS						
EPRE ratio of PDCCH DMRS to SSS						
EPRE ratio of PDCCH to PDCCH DMRS						
EPRE ratio of PDSCH DMRS to SSS						
EPRE ratio of PDSCH to PDSCH						
EPRE ratio of OCNG DMRS to SSS(Note 1)						
EPRE ratio of OCNG to OCNG DMRS (Note 1)						
$\hat{E}_s$	dBm/SCS	Config 1	-87	-87	-Infinity	-87
SSB-RP Note 3	dBm/SCS Note5	Config 1	-87	-87	-Infinity	-87
$\hat{E}_s / I_{ot}$ BB Note 8	dB	Config 1	1.89	1.89	-Infinity	1.89
Io Note3	dBm/95.04 MHz Note5	Config 1	-58.01	-58.01	-Infinity	-58.01
Propagation Condition		Config 1	AWGN		AWGN	

Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.
Note 2: Void
Note 3: SSB-RP, Es/Iot and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.
Note 4: Void
Note 5: Equivalent power received by an antenna with 0dBi gain at the centre of the quiet zone
Note 6: As observed with 0dBi gain antenna at the centre of the quiet zone
Note 7: Information about types of UE beam is given in TS 38.133 [6] Annex B.2.1.3, and does not limit UE implementation or test system implementation
Note 8: Calculation of Es/Iot_{BB} includes the effect of UE internal noise up to the value assumed for the associated Refsens requirement in clause 7.3.2 of TS 38.101-2 [3], and an allowance of 1dB for UE multi-band relaxation factor ΔMB_S from TS 38.101-2 [3] Table 6.2.1.3-4.

The UE shall send one Event A3 triggered measurement report, with a measurement reporting delay less than X ms from the beginning of time period T2, where X is

6720 for UE supporting power class 1, or

4160 for UE supporting other power class.

The UE is required to report SSB time index. The UE shall not send event triggered measurement reports, as long as the reporting criteria are not fulfilled. The rate of correct events observed during repeated tests shall be at least 90% with a confidence level of 95%.

NOTE: The actual overall delays measured in the test may be up to $2xTTI_{DCCH}$ higher than the measurement reporting delays above because of TTI insertion uncertainty of the measurement report in DCCH.

TTI insertion uncertainty = TTIDCCH = 1 ms; 2xTTIDCCH = 2 ms

The overall delays measured shall be less than a total of 6722 ms in this test for power class UE and 4162 ms for other power classes.

7.6.2.4 NR SA FR2-FR2 event-triggered reporting in DRX with SSB time index detection

Editor's Note: This test case has been completed for the following configurations:

- Test frequency f ≤ 40.8 GHz

- UE PC3

- The test is incomplete for UE power classes other than PC3

- The test is incomplete for test frequencies > 40.8 GHz

7.6.2.4.1 Test purpose

The purpose of this test is to verify that the UE makes correct reporting of an event within inter-frequency cell search requirements.

7.6.2.4.2 Test applicability

This test applies to all types of NR UE Release 15 and forward supporting 5GS NR SA FR2 and long DRX cycle.

7.6.2.4.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 7.6.2.0.

The normative reference for this requirement is TS 38.133 [6] clause A.7.6.2.4.

7.6.2.4.4 Test description

7.6.2.4.4.1 Initial conditions

This test shall be tested using any of the test configurations in Table 7.6.2.4.4.1-1.

Table 7.6.2.4.4.1-1: NR FR2-FR2 event triggered reporting tests in DRX with SSB time index detection supported test configurations

Test Case ID	Description
7.6.2.4-1	120 kHz SSB SCS, 100MHz bandwidth, TDD duplex mode
Note 1: Void	

Table 7.6.2.4.4.1-2: General test parameters for SA inter-frequency event triggered reporting for FR2 with SSB time index detection in DRX

Parameter	Unit	Test configuration	Value		Comment
			Test 1	Test 2	
NR RF Channel Number		Config 1	1, 2		Two FR1 NR carrier frequencies is used.
Active cell		Config 1	NR cell 1 (Pcell)		NR Cell 1 is on NR RF channel number 1.
Neighbour cell		Config 1	NR cell 2		NR cell 2 is on NR RF channel number 2.
Gap Pattern Id		Config 1	13		As specified in clause 9.1.2-1.
Measurement gap offset		Config 1	39		
SMTC-SSB parameters		Config 1	SSB.3 FR2		As specified in clause A.3.10.2
A3-Offset	dB	Config 1	-12		Value modified by TT
Hysteresis	dB	Config 1	0		
CP length		Config 1	Normal		
TimeToTrigger	s	Config 1	0		
Filter coefficient		Config 1	0		L3 filtering is not used
DRX		Config 1	DRX.1	DRX.2	As specified in clause A.3.3

Time offset between serving and neighbour cells		Config 1	3μs		Synchronous cells.
T1	s	Config 1	5		
T2	s	Config 1	11 for PC1; 6.5 for other PC	108 for PC1; 67 for other PC	

Table 7.6.2.4.4-3: Test Environment parameters for SA inter-frequency event triggered reporting with SSB time index detection in DRX

Parameter	Value		Comment
Test environment	NC		As specified in TS 38.508-1 [14] clause 4.1.
Test frequencies	As specified in Annex E, Table E.2-1 and TS 38.508-1 [14] clause 4.3.1 and 4.4.2.		
Channel bandwidth	As specified by the test configuration selected from Table 7.6.2.4.4.1-1.		
Propagation conditions	AWGN		As specified in Annex C.2.2.
Connection Diagram	TE Part	A.3.3.3.1	As specified in TS 38.508-1 [14] Annex A.
	DUT Part	A.3.4.1.1	
Exceptions to connection diagram			

1. Message contents are defined in clause 7.6.2.4.4.3.

2. There are two NR cells on two carriers specified in the test. Cell 1 is the cell used for connection setup and Cell 2 is a target cell on a different carrier than Cell 1. The power levels and settings for Cell 2 are set according to Annex C.1.2.

3. The UE Rx beam peak direction for Cell 2 has been obtained previously using one of the Rx beam peak search procedures as described in Annex I.

7.6.2.4.4.2 Test procedure

In this test, there are two cells: NR cell 1 as PCell in FR2 on NR RF channel 1 and NR cell 2 as neighbour cell in FR2 on NR RF channel 2.

In test 1&2 measurement gap pattern configuration # 13 as defined in Table 7.6.2.4.4.1-2 is provided for UE that does not support per-FR gap and for UE that supports per-FR gap.

In the measurement control information, it is indicated to the UE that event-triggered reporting with Event A3 is used. The test consists of two successive time periods, with time duration of T1, and T2 respectively. During time duration T1, the UE shall not have any timing information of NR cell 2.

UE needs to be provided at least once every 500ms with new Timing Advance Command MAC control element to restart the Time alignment timer to keep UE uplink time alignment. Furthermore, UE is allocated with PUSCH resource at every DRX cycle.

1. Ensure the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity NR SA, Connected without release *On* according to TS 38.508-1 [14] clause 4.5.

2. Set the parameters according to T1 in Table 7.6.2.4.4.1-2. T1 starts.

3. The SS shall transmit an *RRCReconfiguration* message.

4. The UE shall transmit *RRCReconfigurationComplete* message.

5. When T1 expires, the SS shall switch the power setting from T1 to T2 as specified in Table 7.6.2.4.4.1-2.

6. UE shall transmit a *MeasurementReport* message triggered by Event A3. If the overall delays measured from the beginning of time period T2 is less than 10082 ms for UE supporting power class 1, or 6242 ms for UE supporting other power class for Test 1 and 107522 ms for UE supporting power class 1, or 66562 ms for UE supporting other power class for Test 2, then the number of successful tests is increased by one. If the UE fails to

report the event within the overall delays measured requirement then the number of failure tests is increased by one.

7. After the SS receives the *MeasurementReport* message in step 6 or when T2 expires, the SS shall transmit *RRCRelease* message to release the RRC connection which includes the release of the established radio bearers as well as all radio resources.

8. Set Cell 2 physical cell identity = [(current cell 2 physical cell identity + 1) mod 1008] for next iteration of the test procedure loop.]

9. After the RRC connection release, the SS:

   - transmits in Cell 1 a *Paging* message (including PagingRecord with ue-Identity) for the UE and ensures the UE in state RRC_CONNECTED with generic procedure parameters Connectivity NR SA, Connected without release *On* according to TS 38.508-1 [14] clause 4.5. (if the paging fails, switches off and on the UE and ensures the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity NR SA, Connected without release *On* according to TS 38.508-1 [14] clause 4.5.),
   or:
   - switches off and on the UE and ensures the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity NR SA, Connected without release *On* according to TS 38.508-1 [14] clause 4.5.

10. Repeat step 2-9 until the confidence level according to Tables G.2.3-1 in Annex G clause G.2 is achieved.

11. Repeat step 1-10 for each sub-test in Table 7.6.2.4.4.1-2 as appropriate.

7.6.2.4.4.3 Message contents

Message contents are according to TS 38.508-1 [14] clause 4.6 with the following exceptions:

Table 7.6.2.4.4.3-1: Common Exception messages SA inter frequency event triggered reporting with SSB time index detection in DRX

Default Message Contents	
Common contents of system information blocks exceptions	
Default RRC messages and information elements contents exceptions	Table H.3.1-1 Table H.3.1-2 with Conditions GAP NEEDED and INTER-FREQ Table H.3.1-3 with Conditions INTER-FREQ MO and Synchronous cells Table H.3.1-4 with Condition SSB Index and A3-offset = -12dB Table H.3.1-5 Table H.3.1-6 with Conditions gapUE and Pattern #13 Table H.3.1-7 with Condition INTER-FREQ Table H.3.7-1 with Condition DRX.1 for Test 1 and DRX.2 for Test 2

7.6.2.4.5 Test requirement

Table 7.6.2.4.5-1 defines the primary level settings including test tolerances for all tests.

Table 7.6.2.4.5-1: Cell specific test parameters for CA inter-frequency event triggered reporting with SSB time index detection

Parameter	Unit	Test configuration	Cell 1		Cell 2	
			T1	T2	T1	T2
AoA setup		Config 1	Setup 1 as specified in clause A.9			
Beam Assumption[Note 7]		Config 1	Rough			
NR RF Channel Number		Config 1	1		2	
Duplex mode		Config 1	TDD		TDD	
TDD configuration		Config 1	TDDConf.3.1		TDDConf.3.1	
$BW_{channel}$	MHz	Config 1	100: $N_{RB,c}$ = 66		100: $N_{RB,c}$ = 66	
Data RBs allocated		Config 1	66		66	
BWP BW	MHz	Config 1	100: $N_{RB,c}$ = 66		100: $N_{RB,c}$ = 66	

BWP configuration	Initial DL BWP		Config 1	DLBWP.0.1		N/A	
	Dedicated DL BWP			DLBWP.1.1		N/A	
	Dedicated UL BWP			ULBWP.1.1		N/A	
OCNG Patterns			Config 1	OP.1		OP.1	
PDSCH Reference measurement channel			Config 1	SR.3.1 TDD		-	
CORESET Reference Channel			Config 1	CR.3.1 TDD		-	
SMTC configuration			Config 1	SMTC.1		SMTC.1	
PDSCH/PDCCH subcarrier spacing		kHz	Config 1	120		120	
EPRE ratio of PSS to SSS			Config 1	0		0	
EPRE ratio of PBCH DMRS to SSS							
EPRE ratio of PBCH to PBCH DMRS							
EPRE ratio of PDCCH DMRS to SSS							
EPRE ratio of PDCCH to PDCCH DMRS							
EPRE ratio of PDSCH DMRS to SSS							
EPRE ratio of PDSCH to PDSCH							
EPRE ratio of OCNG DMRS to SSS(Note 1)							
EPRE ratio of OCNG to OCNG DMRS (Note 1)							
N_{oc} Note2		dBm/15 kHz Note5		-104.7		-104.7	
N_{oc} Note2		dBm/SCS Note4	Config 1	-95.7		-95.7	
SSB_RP Note 3		dBm/SCS Note5	Config 1	-89.7	-89.7	-Infinity	-86.7
$\hat{E}_s/I_{ot}$		dB	Config 1	6	6	-Infinity	9
$\hat{E}_s/N_{oc}$		dB	Config 1	6	6	-Infinity	9
Io Note3		dBm/95.04 MHz Note5	Config 1	-59.7	-59.7	-66.7	-57.2
Propagation Condition			Config 1	AWGN			

Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.
Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for N_{oc} to be fulfilled.
Note 3: SSB_RP and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.
Note 4: Void
Note 5: Equivalent power received by an antenna with 0dBi gain at the centre of the quiet zone
Note 6: As observed with 0dBi gain antenna at the centre of the quiet zone
Note 7: Information about types of UE beam is given in TS 38.133 Annex B.2.1.3, and does not limit UE implementation or test system implementation

In test 1 the UE shall send one Event A3 triggered measurement report, with a measurement reporting delay less than X1 ms from the beginning of time period T2, where X1 is

10080 for UE supporting power class 1, or

6240 for UE supporting other power class.

In test 2 , the UE shall send one Event A3 triggered measurement report, with a measurement reporting delay less than X2 ms from the beginning of time period T2, where X2 is

107520 for UE supporting power class 1, or

66560 for UE supporting other power class.

In test 1 2 UE is required to report SSB time index. The UE shall not send event triggered measurement reports, as long as the reporting criteria are not fulfilled. The rate of correct events observed during repeated tests shall be at least 90% with a confidence level of 95%.

TTI insertion uncertainty = TTIDCCH = 1 ms; 2xTTIDCCH = 2 ms

The overall delays measured shall be less than a total of 10082 ms for power class 1 UE and 6242 ms for other power classes in test 1 and 107522 for power class 1 UE and 66562 ms for other power classes in test 2.

7.6.2.5 NR SA FR1-FR2 event-triggered reporting in non-DRX

Editor's Note: This test case has been completed for the following configurations:

- Test frequency f ≤ 40.8 GHz

- UE PC3

- The test is incomplete for UE power classes other than PC3

- The test is incomplete for test frequencies > 40.8 GHz

- NR FR1 - FR2 OTA testability is still FFS.

7.6.2.5.1 Test purpose

The purpose of this test is to verify that the UE makes correct reporting of an event within inter-frequency cell search requirements.

7.6.2.5.2 Test applicability

This test applies to all types of NR UE from Release 15 onwards.

7.6.2.5.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 7.6.2.0.

The normative reference for this requirement is TS 38.133 [6] clause A.7.6.2.5.

7.6.2.5.4 Test description

7.6.2.5.4.1 Initial conditions

This test shall be tested using any of the test configurations in Table 7.6.2.5.4.1-1.

Table 7.6.2.5.4.1-1: SA FR1-FR2 event triggered reporting tests in non-DRX supported test configurations

Test Case ID	Description of serving cell	Description of target cell
7.6.2.5-1	NR 15 kHz SSB SCS, 10MHz bandwidth, FDD duplex mode	120 kHz SSB SCS, 100MHz bandwidth, TDD duplex mode
7.6.2.5-2	NR 15 kHz SSB SCS, 10MHz bandwidth, TDD duplex mode	
7.6.2.5-3	NR 30kHz SSB SCS, 40MHz bandwidth, TDD duplex mode	
Note 1: The UE is only required to be tested in one of the supported test configurations		

Note 2: target NR cell has the same SCS, BW and duplex mode as NR serving cell

Table 7.6.2.5.4.1-2: General test parameters for SA inter-frequency event triggered reporting for FR2 without SSB time index detection

Parameter	Unit	Test configuration	Value		Comment
			Test 1	Test 2	
NR RF Channel Number		Config 1,2,3	1, 2		One NR FR1 and one NR FR2 carrier frequency is used.
Active cell		Config 1,2,3	NR cell 1 (Pcell)		NR Cell 1 is on NR RF channel number 1 in FR1
Neighbour cell		Config 1,2,3	NR cell 2		NR cell 2 is on NR RF channel number 2 in FR2.
Gap Pattern Id		Config 1,2,3	0	Gap not configured	As specified in TS 38.133 [6]clause 9.1.2-1.
Measurement gap offset		Config 1,2,3	39	N/A	
SMTC-SSB parameters on NR RF Channel 1		Config 1	SSB.1 FR1		As specified in clause A.3.1
		Config 2	SSB.1 FR1		As specified in clause A.3.1
		Config 3	SSB.2 FR1		As specified in clause A.3.1
SMTC-SSB parameters on NR RF Channel 2		Config 1,2,3	SSB.3 FR2		As specified in clause A.3.2
offsetMO	dB	Config 1,2,3	6		
Hysteresis	dB	Config 1,2,3	0		
a4-Threshold	dBm	Config 1,2,3	-105		
CP length		Config 1,2,3	Normal		
TimeToTrigger	s	Config 1,2,3	0		
Filter coefficient		Config 1,2,3	0		L3 filtering is not used
DRX		Config 1,2,3	OFF		DRX is not used
Time offset between serving and neighbour cells		Config 1	3ms		Asynchronous cells. The timing of Cell 2 is 3ms later than the timing of Cell 1.
		Config 2,3	3μs		Synchronous cells.
T1	s	Config 1,2,3	5		
T2	s	Config 1,2,3	5.2 for PC1; 3.5 for other PC	3 for PC1; 2 for other PC	PC1 - power class 1 as specified in TS 38.101-2 [3] Table 6.2.1.0

Table 7.6.2.5.4-3: Test Environment parameters for SA inter-frequency event triggered reporting with SSB time index detection in non-DRX

Parameter	Value		Comment
Test environment	NC		As specified in TS 38.508-1 [14] clause 4.1.
Test frequencies	As specified in Annex E, Table E.2-1 and TS 38.508-1 [14] clause 4.3.1 and 4.4.2.		
Channel bandwidth	As specified by the test configuration selected from Table 7.6.2.5.4.1-1.		
Propagation conditions	AWGN		As specified in Annex C.2.2.
Connection Diagram	TE Part	A.3.3.3.1	As specified in TS 38.508-1 [14] Annex A.
	DUT Part	A.3.4.1.1	
Exceptions to connection diagram			

1. Message contents are defined in clause 7.6.2.5.4.3.

2. There are two NR cells on two carriers specified in the test. Cell 1 is the cell used for connection setup and Cell 2 is a target cell on a different carrier than Cell 1. The power levels and settings for Cell 2 are set according to Annex C.1.2.

3. If a UE supports per-FR gap it is only required to pass test 2. Otherwise it is only required to pass test 1.

4. The UE Rx beam peak direction for Cell 2 has been obtained previously using one of the Rx beam peak search procedures as described in Annex I.

7.6.2.5.4.2 Test procedure

In this test, there are two cells: NR cell 1 as PCell in FR1 on NR RF channel 2 and NR cell 2 as neighbour cell in FR2 on NR RF channel 2.

In test 1 measurement gap pattern configuration # 0 as defined in Table 7.6.2.5.4.1-2 is provided for a UE that does not support per-FR gap and in test 2 measurement gap pattern configuration #13 as defined in Table 7.6.2.5.4.1-2 is provided for UE that support per-FR gap.

In the measurement control information, it is indicated to the UE that event-triggered reporting with Event A3 is used. The test consists of two successive time periods, with time duration of T1, and T2 respectively. During time duration T1, the UE shall not have any timing information of NR cell 3.

1. Ensure the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity NR SA, Connected without release *On* according to TS 38.508-1 [14] clause 4.5.

2. Set the parameters according to T1 in Table 7.6.2.5.4.1-2. The TE shall ensure that the NR FR2 cell will be received by the UE from the Rx beam peak direction. T1 starts.

3. The SS shall transmit an *RRCReconfiguration* message.

4. The UE shall transmit *RRCReconfigurationComplete* message.

5. When T1 expires, the SS shall switch the power setting from T1 to T2 as specified in Table 7.6.2.5.4.1-2.

6. UE shall transmit a *MeasurementReport* message triggered by Event A3. If the overall delays measured from the beginning of time period T2 is less than 5122 ms for UE supporting power class 1, or 3202 ms for UE supporting other power class for Test 1 and 2562 ms for UE supporting power class 1, or 1602 ms for UE supporting other power class for Test 2 then the number of successful tests is increased by one. If the UE fails to report the event within the overall delays measured requirement then the number of failure tests is increased by one.

7. After the SS receives the *MeasurementReport* message in step 6 or when T2 expires, the SS shall transmit *RRCRelease* message to release the RRC connection which includes the release of the established radio bearers as well as all radio resources.

8. Set Cell 2 physical cell identity = [(current cell 2 physical cell identity + 1) mod 1008] for next iteration of the test procedure loop.]

9. After the RRC connection release, the SS:

   - transmits in Cell 1 a *Paging* message (including PagingRecord with ue-Identity) for the UE and ensures the UE in state RRC_CONNECTED with generic procedure parameters Connectivity NR SA, Connected without release *On* according to TS 38.508-1 [14] clause 4.5. (if the paging fails, switches off and on the UE and ensures the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity NR SA, Connected without release *On* according to TS 38.508-1 [14] clause 4.5.),
   or:
   - switches off and on the UE and ensures the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity NR SA, Connected without release *On* according to TS 38.508-1 [14] clause 4.5.

10. Repeat step 2-9 until the confidence level according to Tables G.2.3-1 in Annex G clause G.2 is achieved.

11. Repeat step 1-10 for each sub-test in Table 7.6.2.5.4.1-2 as appropriate.

7.6.2.5.4.3 Message contents

Message contents are according to TS 38.508-1 [14] clause TBD with the following exceptions:

Table 7.6.2.5.4.3-1: Common Exception messages SA inter frequency event triggered reporting without SSB time index detection in non-DRX

Default Message Contents	
Common contents of system information blocks exceptions	
Default RRC messages and information elements contents exceptions	Table H.3.1-1 Table H.3.1-2 with Conditions GAP NEEDED and INTER-FREQ for Test 1 Table H.3.1-2 with Condition INTER-FREQ for Test 2 Table H.3.1-3 with Conditions INTER-FREQ MO and Synchronous cells Table H.3.1-4AA with A4-threshold= -105dB Table H.3.1-5 Table H.3.1-6 with Conditions gapUE and Pattern #0 for Test 1 Table H.3.1-7 with Condition INTER-FREQ

Table 7.6.2.5.4.3-2: MeasObjectNR-DEFAULT: SA FR1-FR2 measurement object configuration

Derivation Path: Table H.3.1-3			
Information Element	**Value/remark**	**Comment**	**Condition**
MeasObjectNR::= SEQUENCE {			
offsetMO SEQUENCE {			
rsrpOffsetSSB	dB6		
}			

7.6.2.5.5 Test requirement

Table 7.6.2.5.5-1 defines the primary level settings including test tolerances for all tests.

Table 7.6.2.5.5-1: Cell specific test parameters for SA inter-frequency event triggered reporting for FR2 without SSB time index detection

Parameter		**Unit**	**Test configuration**	**Cell 1**		**Cell 2**	
				T1	**T2**	**T1**	**T2**
AoA setup			Config 1,2,3	N/A		Setup 1 as specified in clause A.9	
Beam Assumption[Note 7]			Config 1,2,3	N/A		Rough	
NR RF Channel Number			Config 1,2,3	1		2	
Duplex mode			Config 1	FDD		TDD	
			Config 2,3	TDD		TDD	
TDD configuration			Config 1	Not Applicable		TDDConf.3.1	
			Config 2	TDDConf.1.1		TDDConf.3.1	
			Config 3	TDDConf.2.1		TDDConf.3.1	
$BW_{channel}$		MHz	Config 1	10: $N_{RB,c}$ = 52		100: $N_{RB,c}$ = 66	
			Config 2	10: $N_{RB,c}$ = 52		100: $N_{RB,c}$ = 66	
			Config 3	40: $N_{RB,c}$ = 106		100: $N_{RB,c}$ = 66	
BWP BW		MHz	Config 1	10: $N_{RB,c}$ = 52		100: $N_{RB,c}$ = 66	
			Config 2	10: $N_{RB,c}$ = 52		100: $N_{RB,c}$ = 66	
			Config 3	40: $N_{RB,c}$ = 106		100: $N_{RB,c}$ = 66	
BWP configuration	Initial DL BWP		Config 1,2,3	DLBWP.0.1		N/A	
	Initial UL BWP			ULBWP.0.1		N/A	
	Dedicated DL BWP			DLBWP.1.1		N/A	

	Dedicated UL BWP			ULBWP.1.1	N/A
OCNG Patterns			Config 1,2,3	OP.1	OP.1
PDSCH Reference measurement channel			Config 1	SR.1.1 FDD	-
			Config 2	SR.1.1 TDD	
			Config 3	SR.2.1 TDD	
RMSI CORESET Reference Channel			Config 1	CR.1.1 FDD	-
			Config 2	CR.1.1 TDD	
			Config 3	CR.2.1 TDD	
Dedicated CORESET RMC configuration			Config 1	CCR.1.1 FDD	CCR.3.1 TDD
			Config 2	CCR.1.1 TDD	CCR.3.1 TDD
			Config 3	CCR.2.1 TDD	CCR.3.1 TDD
SMTC configuration			Config 1	SMTC.2	SMTC.2
			Config 2,3	SMTC.1	SMTC.1
PDSCH/PDCCH subcarrier spacing		kHz	Config 1,2	15	120
			Config 3	30	120
EPRE ratio of PSS to SSS			Config 1,2,3	0	0
EPRE ratio of PBCH DMRS to SSS					
EPRE ratio of PBCH to PBCH DMRS					
EPRE ratio of PDCCH DMRS to SSS					
EPRE ratio of PDCCH to PDCCH DMRS					
EPRE ratio of PDSCH DMRS to SSS					
EPRE ratio of PDSCH to PDSCH					
EPRE ratio of OCNG DMRS to SSS(Note 1)					
EPRE ratio of OCNG to OCNG DMRS (Note 1)					
$\hat{E}_s$		dBm/SCS	Config 1,2,3	NA Link only, see clause A.3.7A	-Infinity / -87
SSB_RP Note 3		dBm/SCS	Config 1,2		-Infinity / -87
		Note5	Config 3		-Infinity / -87
$\hat{E}_s / I_{ot}$ BB Note 8		dB	Config 1,2,3		-Infinity / 14.69
		dBm/95.04 MHz Note5	Config 1,2,3		-Infinity / -58.01
Propagation Condition			Config 1,2,3		AWGN

Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.
Note 2: Void
Note 3: SSB_RP, Es/Iot and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.
Note 4: Void
Note 5: Equivalent power received by an antenna with 0 dBi gain at the centre of the quiet zone
Note 6: As observed with 0 dBi gain antenna at the centre of the quiet zone
Note 7: Information about types of UE beam is given in B.2.1.3, and does not limit UE implementation or test system implementation
Note 8: Calculation of Es/Iot_{BB} includes the effect of UE internal noise up to the value assumed for the associated Refsens requirement in clause 7.3.2 of TS 38.101-2 [19], and an allowance of 1dB for UE multi-band relaxation factor ΔMB_S from TS 38.101-2 [19] Table 6.2.1.3-4.

In test 1 with per-UE gap the UE shall send one Event A4 triggered measurement report, with a measurement reporting delay less than X ms from the beginning of time period T2, where X is

5120 for UE supporting power class 1, or

3200 for UE supporting other power class.

In test 2, without the gap, the UE shall send one Event A4 triggered measurement report, with a measurement reporting delay less than X ms from the beginning of time period T2, where X is

2560 for UE supporting power class 1, or

1600 for UE supporting other power class.

In test 1 and 2 UE is not required to report SSB time index. The UE shall not send event triggered measurement reports, as long as the reporting criteria are not fulfilled. The rate of correct events observed during repeated tests shall be at least 90% with a confidence level of 95%.

NOTE: The actual overall delays measured in the test may be up to $2xTTI_{DCCH}$ higher than the measurement reporting delays above because of TTI insertion uncertainty of the measurement report in DCCH.

TTI insertion uncertainty = TTIDCCH = 1 ms; 2xTTIDCCH = 2 ms

The overall delays measured shall be less than a total of 5122 ms for power class 1 UE and 3202 ms for other power classes in test 1 and 2562 for power class 1 UE and 1602 ms for other power classes in test 2.

7.6.2.6 NR SA FR1-FR2 event-triggered reporting in DRX

Editor's Note: This test case has been completed for the following configurations:

- Test frequency f ≤ 40.8 GHz

- UE PC3

- The test is incomplete for UE power classes other than PC3

- The test is incomplete for test frequencies > 40.8 GHz

- NR FR1 - FR2 OTA testability is still FFS.

7.6.2.6.1 Test purpose

The purpose of this test is to verify that the UE makes correct reporting of an event within inter-frequency cell search requirements.

7.6.2.6.2 Test applicability

This test applies to all types of NR UE Release 15 and forward supporting 5GS NR SA FR2 and long DRX cycle.

7.6.2.6.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 7.6.2.0.

The normative reference for this requirement is TS 38.133 [6] clause A.7.6.2.6.

7.6.2.6.4 Test description

7.6.2.6.4.1 Initial conditions

This test shall be tested using any of the test configurations in Table 7.6.2.6.4.1-1.

Table 7.6.2.6.4.1-1: SA FR1-FR2 event triggered reporting tests in DRX supported test configurations

Test Case ID	Description of serving cell	Description of target cell
7.6.2.6-1	NR 15 kHz SSB SCS, 10MHz bandwidth, FDD duplex mode	120 kHz SSB SCS, 100MHz bandwidth, TDD duplex mode
7.6.2.6-2	NR 15 kHz SSB SCS, 10MHz bandwidth, TDD duplex mode	
7.6.2.6-3	NR 30kHz SSB SCS, 40MHz bandwidth, TDD duplex mode	
Note 1: The UE is only required to be tested in one of the supported test configurations Note 2: target NR cell has the same SCS, BW and duplex mode as NR serving cell		

Table 7.6.2.6.4.1-2: General test parameters for SA inter-frequency event triggered reporting for FR2 without SSB time index detection in DRX

Parameter	Unit	Test configuration	Value				Comment
			Test 1	Test 2	Test 3	Test 4	
NR RF Channel Number		Config 1,2,3	1, 2				Two NR carrier frequencies is used.
Active cell		Config 1,2,3	NR cell 1 (Pcell)				NR Cell 1 is on NR RF channel number 1.
Neighbour cell		Config 1,2,3	NR cell 2				NR cell 2 is on NR RF channel number 2.
Gap Pattern Id		Config 1,2,3	0		Gap not configured		As specified in TS 38.133 [6] clause 9.1.2-1.
Measurement gap offset		Config 1,2,3	39		N/A		
SMTC-SSB parameters on NR RF Channel 1		Config 1	SSB.1 FR1				As specified in clause A.3.1
		Config 2	SSB.1 FR1				As specified in clause A.3.1
		Config 3	SSB.2 FR1				As specified in clause A.3.1
SMTC-SSB parameters on NR RF Channel 2		Config 1,2,3	SSB.3 FR2				As specified in clause A.3.2
offsetMO	dB	Config 1,2,3	6				
Hysteresis	dB	Config 1,2,3	0				
a4-Threshold	dBm	Config 1,2,3	-105				
CP length		Config 1,2,3	Normal				
TimeToTrigger	s	Config 1,2,3	0				
Filter coefficient		Config 1,2,3	0				L3 filtering is not used
DRX		Config 1,2,3	DRX .1	DRX .2	DRX .1	DRX .2	DRX is used
Time offset between serving and neighbour cells		Config 1	3ms				Asynchronous cells. The timing of Cell 2 is 3ms later than the timing of Cell 1.
		Config 2,3	3µs				Synchronous cells.
T1	s	Config 1,2,3	5				
T2	s	Config 1,2,3	8 for PC1; 5 for other PC	82 for PC1; 52 for other PC	8 for PC1; 5 for other PC	82 for PC1; 52 for other PC	PC1 - power class 1 as specified in TS 38.101-2 [3] Table 6.2.1.0

Table 7.6.2.6.4-3: Test Environment parameters for SA inter-frequency event triggered reporting without SSB time index detection in DRX

Parameter	Value		Comment
Test environment	NC		As specified in TS 38.508-1 [14] clause 4.1.
Test frequencies	As specified in Annex E, Table E.2-1 and TS 38.508-1 [14] clause 4.3.1 and 4.4.2.		
Channel bandwidth	As specified by the test configuration selected from Table 7.6.2.6.4.1-1.		
Propagation conditions	AWGN		As specified in Annex C.2.2.
Connection Diagram	TE Part	A.3.3.3.1	As specified in TS 38.508-1 [14] Annex A.
	DUT Part	A.3.4.1.1	

Exceptions to connection diagram		

1. Message contents are defined in clause 7.6.2.6.4.3.

2. There are two NR cells on two carriers specified in the test. Cell 1 is the cell used for connection setup and Cell 2 is a target cell on a different carrier than Cell 1. The power levels and settings for Cell 2 are set according to Annex C.1.2.

3. If a UE supports per-FR gap it is only required to pass test 3&4. Otherwise it is only required to pass test 1&2.

4. The UE Rx beam peak direction for Cell 2 has been obtained previously using one of the Rx beam peak search procedures as described in Annex I.7.6.2.6.4.2 Test procedure

In this test, there are two cells: NR cell 1 as PCell in FR1 on NR RF channel 2 and NR cell 2 as neighbour cell in FR2 on NR RF channel 2.

In test 1&2 measurement gap pattern configuration # 0 as defined in Table 7.6.2.6.4.1-2 is provided for a UE that does not support per-FR gap and in test 3&4 measurement gap pattern configuration #13 as defined in Table 7.6.2.6.4.1-2 is provided for UE that support per-FR gap.

In the measurement control information, it is indicated to the UE that event-triggered reporting with Event A3 is used. The test consists of two successive time periods, with time duration of T1, and T2 respectively. During time duration T1, the UE shall not have any timing information of NR cell 3.

UE needs to be provided at least once every 500ms with new Timing Advance Command MAC control element to restart the Time alignment timer to keep UE uplink time alignment. Furthermore UE is allocated with PUSCH resource at every DRX cycle.

1. Ensure the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity NR SA, Connected without release *On* according to TS 38.508-1 [14] clause 4.5.

2. Set the parameters according to T1 in Table 7.6.2.6.4.1-2. The TE shall ensure that the NR FR2 cell will be received by the UE from the Rx beam peak direction. T1 starts.

3. The SS shall transmit an *RRCReconfiguration* message.

4. The UE shall transmit *RRCReconfigurationComplete* message.

5. When T1 expires, the SS shall switch the power setting from T1 to T2 as specified in Table 7.6.2.6.4.1-2.

6. UE shall transmit a *MeasurementReport* message triggered by Event A3. If the overall delays measured from the beginning of time period T2 is less than 7682 ms for UE supporting power class 1, or 4802 ms for UE supporting other power class for Test 1 and Test 3 and 81922 ms for UE supporting power class 1, or 51202 ms for UE supporting other power class for Test 2 and Test 4, then the number of successful tests is increased by one. If the UE fails to report the event within the overall delays measured requirement then the number of failure tests is increased by one.

7. After the SS receives the *MeasurementReport* message in step 6 or when T2 expires, the SS shall transmit *RRCRelease* message to release the RRC connection which includes the release of the established radio bearers as well as all radio resources.

8. Set Cell 2 physical cell identity = [(current cell 2 physical cell identity + 1) mod 1008] for next iteration of the test procedure loop.]

9. After the RRC connection release, the SS:

   - transmits in Cell 1 a *Paging* message (including PagingRecord with ue-Identity) for the UE and ensures the UE in state RRC_CONNECTED with generic procedure parameters Connectivity NR SA, Connected without release *On* according to TS 38.508-1 [14] clause 4.5. (if the paging fails, switches off and on the UE and ensures the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity NR SA, Connected without release *On* according to TS 38.508-1 [14] clause 4.5.),
   or:

- switches off and on the UE and ensures the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity NR SA, Connected without release *On* according to TS 38.508-1 [14] clause 4.5.

10. Repeat step 2-9 until the confidence level according to Tables G.2.3-1 in Annex G clause G.2 is achieved.

11. Repeat step 1-10 for each sub-test in Table 7.6.2.6.4.1-2 as appropriate.

7.6.2.6.4.3 Message contents

Message contents are according to TS 38.508-1 [14] clause TBD with the following exceptions:

Table 7.6.2.6.4.3-1: Common Exception messages SA inter frequency event triggered reporting without SSB time index detection in DRX

Default Message Contents	
Common contents of system information blocks exceptions	
Default RRC messages and information elements contents exceptions	Table H.3.1-1 Table H.3.1-2 with Conditions GAP NEEDED and INTER-FREQ for Test 1 and Test 2 Table H.3.1-2 with Condition INTER-FREQ for Test 3 and Test 4 Table H.3.1-3 with Conditions INTER-FREQ MO and Synchronous cells Table H.3.1-4AA with A4-threshold= -105dB Table H.3.1-5 Table H.3.1-6 with Conditions gapUE and Pattern #0 for Test 1 and Test 2 Table H.3.1-7 with Condition INTER-FREQ Table H.3.7-1 with Condition DRX.1 for Test 1 and Test 3 and DRX.2 for Test 2 and Test 4

Table 7.6.2.6.4.3-2: MeasObjectNR-DEFAULT: SA FR1-FR2 measurement object configuration

Derivation Path: Table H.3.1-3			
Information Element	**Value/remark**	**Comment**	**Condition**
MeasObjectNR::= SEQUENCE {			
offsetMO SEQUENCE {			
rsrpOffsetSSB	dB6		
}			

7.6.2.6.5 Test requirement

Table 7.6.2.6.5-1 defines the primary level settings including test tolerances for all tests.

Table 7.6.2.6.5-1: Cell specific test parameters for SA inter-frequency event triggered reporting for FR2 without SSB time index detection

Parameter	Unit	Test configuration	Cell 1		Cell 2	
			T1	T2	T1	T2
AoA setup		Config 1,2,3	NA		Setup 1 as specified in clause A.9	
NR RF Channel Number		Config 1,2,3	1		2	
Duplex mode		Config 1	FDD		TDD	
		Config 2,3	TDD		TDD	
TDD configuration		Config 1	Not Applicable		TDDConf.3.1	
		Config 2	TDDConf.1.1		TDDConf.3.1	
		Config 3	TDDConf.2.1		TDDConf.3.1	
$BW_{channel}$	MHz	Config 1	10: $N_{RB,c}$ = 52		100: $N_{RB,c}$ = 66	
		Config 2	10: $N_{RB,c}$ = 52		100: $N_{RB,c}$ = 66	
		Config 3	40: $N_{RB,c}$ = 106		100: $N_{RB,c}$ = 66	
BWP BW	MHz	Config 1	10: $N_{RB,c}$ = 52		100: $N_{RB,c}$ = 66	

			Config 2	10: $N_{RB,c}$ = 52	100: $N_{RB,c}$ = 66	
			Config 3	40: $N_{RB,c}$ = 106	100: $N_{RB,c}$ = 66	
BWP configuration	Initial DL BWP		Config 1,2,3	DLBWP.0.1	N/A	
	Initial UL BWP			ULBWP.0.1	N/A	
	Dedicated DL BWP			DLBWP.1.1	N/A	
	Dedicated UL BWP			ULBWP.1.1	N/A	
OCNG Patterns			Config 1,2,3	OP.1	OP.1	
PDSCH Reference measurement channel			Config 1	SR.1.1 FDD	-	
			Config 2	SR.1.1 TDD		
			Config 3	SR2.1 TDD		
RMSI CORESET Reference Channel			Config 1	CR.1.1 FDD	-	
			Config 2	CR.1.1 TDD		
			Config 3	CR2.1 TDD		
Dedicated CORESET RMC configuration			Config 1	CCR.1.1 FDD	CCR.3.1 TDD	
			Config 2	CCR.1.1 TDD	CCR.3.1 TDD	
			Config 3	CCR.2.1 TDD	CCR.3.1 TDD	
SMTC configuration			Config 1	SMTC.2	SMTC.2	
			Config 2,3	SMTC.1	SMTC.1	
PDSCH/PDCCH subcarrier spacing		kHz	Config 1,2	15	120	
			Config 3	30	120	
EPRE ratio of PSS to SSS			Config 1,2,3	0	0	
EPRE ratio of PBCH DMRS to SSS						
EPRE ratio of PBCH to PBCH DMRS						
EPRE ratio of PDCCH DMRS to SSS						
EPRE ratio of PDCCH to PDCCH DMRS						
EPRE ratio of PDSCH DMRS to SSS						
EPRE ratio of PDSCH to PDSCH						
EPRE ratio of OCNG DMRS to SSS(Note 1)						
EPRE ratio of OCNG to OCNG DMRS (Note 1)						
N_{oc} Note2		dBm/15 kHz Note5		NA Link only, see clause A.3.7A	-104.7	
N_{oc} Note2		dBm/SCS Note4	Config 1,2		-95.7	
			Config 3		-95.7	
SSB_RP Note 3		dBm/SCS Note5	Config 1,2		-Infinity	-86.7
			Config 3		-Infinity	-86.7
$\hat{E}_s/I_{ot}$		dB	Config 1,2,3		-Infinity	9
$\hat{E}_s/N_{oc}$		dB	Config 1,2,3		-Infinity	9

Io[Note3]	dBm/9.36MHz	Config 1,2		-	-
	dBm/38.16MHz	Config 3		-	-
	dBm/95.04 MHz Note5	Config 1,2,3		-66.7	-57.2
Propagation Condition		Config 1,2,3	AWGN		

Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.
Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for N_{oc} to be fulfilled.
Note 3: SSB_RP and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.
Note 4: SSB_RP minimum requirements are specified assuming independent interference and noise at each receiver antenna port.
Note 5: Equivalent power received by an antenna with 0 dBi gain at the centre of the quiet zone
Note 6: As observed with 0 dBi gain antenna at the centre of the quiet zone

In test 1 with per-UE gap and in test 3 without the gap, the UE shall send one Event A3 triggered measurement report, with a measurement reporting delay less than X1 ms from the beginning of time period T2, where X1 is

7680 for UE supporting power class 1, or

4800 for UE supporting other power class.

In test 2 with per-UE gap and in test 4 without the gap, the UE shall send one Event A3 triggered measurement report, with a measurement reporting delay less than X2 ms from the beginning of time period T2, where X2 is

81920 for UE supporting power class 1, or

51200 for UE supporting other power class.

In test 1, 2, 3 and 4 UE is not required to report SSB time index. The UE shall not send event triggered measurement reports, as long as the reporting criteria are not fulfilled. The rate of correct events observed during repeated tests shall be at least 90% with a confidence level of 95%.

NOTE: The actual overall delays measured in the test may be up to $2xTTI_{DCCH}$ higher than the measurement reporting delays above because of TTI insertion uncertainty of the measurement report in DCCH.

TTI insertion uncertainty = TTIDCCH = 1 ms; 2xTTIDCCH = 2 ms

The overall delays measured shall be less than a total of 7682 ms for power class 1 UE and 4802 ms for other power classes in test 1 and test 3 and 81922 for power class 1 UE and 51202 ms for other power classes in test 2 and test 4.

7.6.2.7 NR SA FR1-FR2 event-triggered reporting in non-DRX with SSB time index detection

Editor's Note: This test case has been completed for the following configurations:

- Test frequency f ≤ 40.8 GHz

- UE PC3

- The test is incomplete for UE power classes other than PC3

- The test is incomplete for test frequencies > 40.8 GHz

- NR FR1 - FR2 OTA testability is still FFS.

7.6.2.7.1 Test purpose

The purpose of this test is to verify that the UE makes correct reporting of an event within inter-frequency cell search requirements.

7.6.2.7.2 Test applicability

This test applies to all types of NR UE from Release 15 onwards.

7.6.2.7.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 7.6.2.0.

The normative reference for this requirement is TS 38.133 [6] clause A.7.6.2.7.

7.6.2.7.4 Test description

7.6.2.7.4.1 Initial conditions

This test shall be tested using any of the test configurations in Table 7.6.2.7.4.1-1.

Table 7.6.2.7.4.1-1: SA FR1-FR2 event triggered reporting tests in non-DRX with SSB time index detection supported test configurations

Test Case ID	Description of serving cell	Description of target cell
7.6.2.7-1	NR 15 kHz SSB SCS, 10MHz bandwidth, FDD duplex mode	120 kHz SSB SCS, 100MHz bandwidth, TDD duplex mode
7.6.2.7-2	NR 15 kHz SSB SCS, 10MHz bandwidth, TDD duplex mode	
7.6.2.7-3	NR 30kHz SSB SCS, 40MHz bandwidth, TDD duplex mode	
Note 1: The UE is only required to be tested in one of the supported test configurations Note 2: target NR cell has the same SCS, BW and duplex mode as NR serving cell		

Table 7.6.2.7.4.1-2: General test parameters for SA inter-frequency event triggered reporting for FR2 with SSB time index detection in non-DRX

Parameter	Unit	Test configuration	Value		Comment
			Test 1	Test 2	
NR RF Channel Number		Config 1,2,3	1, 2		Two NR carrier frequencies is used
Active cell		Config 1,2,3	NR cell 1 (Pcell)		NR Cell 1 is on NR RF channel number 1.
Neighbour cell		Config 1,2,3	NR cell 2		NR cell 2 is on NR RF channel number 2.
Gap Pattern Id		Config 1,2,3	0	Gap not configured	As specified in TS 38.133 [6] clause 9.1.2-1
Measurement gap offset		Config 1,2,3	39	N/A	
SMTC-SSB parameters on NR RF Channel 1		Config 1	SSB.1 FR1		As specified in clause A.3.1
		Config 2	SSB.1 FR1		As specified in clause A.3.1
		Config 3	SSB.2 FR1		As specified in clause A.3.1
SMTC-SSB parameters on NR RF Channel 2		Config 1,2,3	SSB.3 FR2		As specified in clause A.3.2
offsetMO	dB	Config 1,2,3	6		
Hysteresis	dB	Config 1,2,3	0		
a4-Threshold	dBm	Config 1,2,3,4,5,6	-105		
CP length		Config 1,2,3	Normal		
TimeToTrigger	s	Config 1,2,3	0		

Filter coefficient		Config 1,2,3	0		L3 filtering is not used
DRX		Config 1,2,3	OFF		DRX is not used
Time offset between serving and neighbour cells		Config 1	3ms		Asynchronous cells. The timing of Cell 2 is 3ms later than the timing of Cell 1.
		Config 2,3	3μs		Synchronous cells
T1	s	Config 1,2,3	5		
T2	s	Config 1,2,3	7 for PC1; 4.5 for other PC	3.5 for PC1; 2.5 for other PC	PC1 - power class 1 as specified in TS 38.101-2 [3] Table 6.2.1.0

Table 7.6.2.7.4.1-3: Test Environment parameters for SA inter-frequency event triggered reporting with SSB time index detection in non-DRX

Parameter	Value		Comment
Test environment	NC		As specified in TS 38.508-1 [14] clause 4.1.
Test frequencies	As specified in Annex E, Table E.2-1 and TS 38.508-1 [14] clause 4.3.1 and 4.4.2.		
Channel bandwidth	As specified by the test configuration selected from Table 7.6.2.7.4.1-1.		
Propagation conditions	AWGN		As specified in Annex C.2.2.
Connection Diagram	TE Part	A.3.3.3.1	As specified in TS 38.508-1 [14] Annex A.
	DUT Part	A.3.4.1.1	
Exceptions to connection diagram			

1. Message contents are defined in clause 7.6.2.7.4.3.

2. There are two NR cells on two carriers specified in the test. Cell 1 is the cell used for connection setup and Cell 2 is a target cell on a different carrier than Cell 1. The power levels and settings for Cell 2 are set according to Annex C.1.2.

3. If a UE supports per-FR gap it is only required to pass test 2. Otherwise it is only required to pass test 1.

4. The UE Rx beam peak direction for Cell 2 has been obtained previously using one of the Rx beam peak search procedures as described in Annex I.

7.6.2.7.4.2 Test procedure

The purpose of this test is to verify that the UE makes correct reporting of an event. This test will partly verify the SA inter-frequency NR cell search requirements in clause 9.3.4.

In this test, there are two cells: NR cell 1 as PCell in FR1 on NR RF channel 2 and NR cell 2 as neighbour cell in FR2 on NR RF channel 2.

In test 1 measurement gap pattern configuration # 0 as defined in Table 7.6.2.7.4.1-2 is provided for a UE that does not support per-FR gap and in test 2 measurement gap pattern configuration #13 as defined in Table 7.6.2.7.4.1-2 is provided for UE that support per-FR gap.

In the measurement control information, it is indicated to the UE that event-triggered reporting with Event A3 is used. The test consists of two successive time periods, with time duration of T1, and T2 respectively. During time duration T1, the UE shall not have any timing information of NR cell 3.

1. Ensure the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity NR SA, Connected without release *On* according to TS 38.508-1 [14] clause 4.5.

2. Set the parameters according to T1 in Table 7.6.2.7.4.1-2. The TE shall ensure that the NR FR2 cell will be received by the UE from the Rx beam peak direction. T1 starts.

3. The SS shall transmit an *RRCReconfiguration* message.

4. The UE shall transmit *RRCReconfigurationComplete* message.

5. When T1 expires, the SS shall switch the power setting from T1 to T2 as specified in Table 7.6.2.7.4.1-2.

6. UE shall transmit a *MeasurementReport* message triggered by Event A3. If the overall delays measured from the beginning of time period T2 is less than 6722 ms for UE supporting power class 1, or 4162 ms for UE supporting other power class for Test 1 and 3362 ms for UE supporting power class 1, or 2082 ms for UE supporting other power class for Test 2 then the number of successful tests is increased by one. If the UE fails to report the event within the overall delays measured requirement then the number of failure tests is increased by one.

7. After the SS receives the *MeasurementReport* message in step 6 or when T2 expires, the SS shall transmit *RRCRelease* message to release the RRC connection which includes the release of the established radio bearers as well as all radio resources.

8. Set Cell 2 physical cell identity = [(current cell 2 physical cell identity + 1) mod 1008] for next iteration of the test procedure loop.]

9. After the RRC connection release, the SS:

   - transmits in Cell 1 a *Paging* message (including PagingRecord with ue-Identity) for the UE and ensures the UE in state RRC_CONNECTED with generic procedure parameters Connectivity NR SA, Connected without release *On* according to TS 38.508-1 [14] clause 4.5. (if the paging fails, switches off and on the UE and ensures the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity NR SA, Connected without release *On* according to TS 38.508-1 [14] clause 4.5.),
   or:
   - switches off and on the UE and ensures the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity NR SA, Connected without release *On* according to TS 38.508-1 [14] clause 4.5.

10. Repeat step 2-9 until the confidence level according to Tables G.2.3-1 in Annex G clause G.2 is achieved.

11. Repeat step 1-10 for each sub-test in Table 7.6.2.7.4.1-2 as appropriate.

7.6.2.7.4.3 Message contents

Message contents are according to TS 38.508-1 [14] clause TBD with the following exceptions:

Table 7.6.2.7.4.3-1: Common Exception messages SA inter frequency event triggered reporting with SSB time index detection in non-DRX

Default Message Contents	
Common contents of system information blocks exceptions	
Default RRC messages and information elements contents exceptions	Table H.3.1-1 Table H.3.1-2 with Conditions GAP NEEDED and INTER-FREQ for Test 1 Table H.3.1-2 with Condition INTER-FREQ for Test 2 Table H.3.1-3 with Conditions INTER-FREQ MO and Synchronous cells Table H.3.1-4AA with Condition SSB Index and A4-threshold= -105dB Table H.3.1-5 Table H.3.1-6 with Conditions gapUE and Pattern #0 for Test 1 Table H.3.1-7 with Condition INTER-FREQ

Table 7.6.2.7.4.3-2: MeasObjectNR-DEFAULT: SA FR1-FR2 measurement object configuration

Derivation Path: Table H.3.1-3			
Information Element	**Value/remark**	**Comment**	**Condition**
MeasObjectNR::= SEQUENCE {			
offsetMO SEQUENCE {			
rsrpOffsetSSB	dB6		
}			

7.6.2.7.5 Test requirement

Table 7.6.2.7.5-1 defines the primary level settings including test tolerances for all tests.

Table 7.6.2.7.5-1: Cell specific test parameters for SA inter-frequency event triggered reporting for FR2 with SSB time index detection

Parameter		Unit	Test configuration	Cell 1		Cell 2	
				T1	T2	T1	T2
AoA setup			Config 1,2,3	NA		Setup 1 as specified in clause A.9	
Beam Assumption[Note 7]			Config 1,2,3	N/A		Rough	
NR RF Channel Number			Config 1,2,3	1		2	
Duplex mode			Config 1	FDD		TDD	
			Config 2,3	TDD		TDD	
TDD configuration			Config 1	Not Applicable		TDDConf.3.1	
			Config 2	TDDConf.1.1		TDDConf.3.1	
			Config 3	TDDConf.2.1		TDDConf.3.1	
$BW_{channel}$		MHz	Config 1	10: $N_{RB,c}$ = 52		100: $N_{RB,c}$ = 66	
			Config 2	10: $N_{RB,c}$ = 52		100: $N_{RB,c}$ = 66	
			Config 3	40: $N_{RB,c}$ = 106		100: $N_{RB,c}$ = 66	
BWP BW		MHz	Config 1	10: $N_{RB,c}$ = 52		100: $N_{RB,c}$ = 66	
			Config 2	10: $N_{RB,c}$ = 52		100: $N_{RB,c}$ = 66	
			Config 3	40: $N_{RB,c}$ = 106		100: $N_{RB,c}$ = 66	
BWP configuration	Initial DL BWP		Config 1,2,3	DLBWP.0.1		N/A	
	Initial UL BWP			ULBWP.0.1		N/A	
	Dedicated DL BWP			DLBWP.1.1		N/A	
	Dedicated UL BWP			ULBWP.1.1		N/A	
OCNG Patterns			Config 1,2,3	OP.1		OP.1	
PDSCH Reference measurement channel			Config 1	SR.1.1 FDD		-	
			Config 2	SR.1.1 TDD			
			Config 3	SR.2.1 TDD			
RMSI CORESET Reference Channel			Config 1	CR.1.1 FDD		-	
			Config 2	CR.1.1 TDD			
			Config 3	CR.2.1 TDD			
Dedicated CORESET RMC configuration			Config 1	CCR.1.1 FDD		CCR.3.1 TDD	
			Config 2	CCR.1.1 TDD		CCR.3.1 TDD	
			Config 3	CCR.2.1 TDD		CCR.3.1 TDD	
SMTC configuration			Config 1	SMTC.2		SMTC.2	
			Config 2,3	SMTC.1		SMTC.1	
PDSCH/PDCCH subcarrier spacing		kHz	Config 1,2	15		120	
			Config 3	30		120	
EPRE ratio of PSS to SSS			Config 1,2,3	0		0	
EPRE ratio of PBCH DMRS to SSS							
EPRE ratio of PBCH to PBCH DMRS							
EPRE ratio of PDCCH DMRS to SSS							
EPRE ratio of PDCCH to PDCCH DMRS							
EPRE ratio of PDSCH DMRS to SSS							
EPRE ratio of PDSCH to PDSCH							

EPRE ratio of OCNG DMRS to SSS(Note 1)					
EPRE ratio of OCNG to OCNG DMRS (Note 1)					
$\hat{E}_s$	dBm/SCS	Config 1,2, 3	NA Link only, see clause A.3.7A	-Infinity	-87
SSB_RP Note 3	dBm/SCS	Config 1,2		-Infinity	-87
	Note5	Config 3		-Infinity	-87
$\hat{E}_s / I_{ot\ BB}$ Note 8	dB	Config 1,2,3		-Infinity	14.69
	dBm/95.04 MHz Note5	Config 1,2,3		Infinity	-58.01
Propagation Condition		Config 1,2,3		AWGN	

Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.
Note 2: Void
Note 3: SSB_RP, Es/Iot and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.
Note 4: Void
Note 5: Equivalent power received by an antenna with 0 dBi gain at the centre of the quiet zone
Note 6: As observed with 0 dBi gain antenna at the centre of the quiet zone
Note 7: Information about types of UE beam is given in B.2.1.3, and does not limit UE implementation or test system implementation
Note 8: Calculation of Es/Iot_{BB} includes the effect of UE internal noise up to the value assumed for the associated Refsens requirement in clause 7.3.2 of TS 38.101-2 [19], and an allowance of 1dB for UE multi-band relaxation factor ΔMB_S from TS 38.101-2 [19] Table 6.2.1.3-4.

In test 1 with per-UE gap , the UE shall send one Event A3 triggered measurement report, with a measurement reporting delay less than X ms from the beginning of time period T2, where X is

6720 for UE supporting power class 1, or

4160 for UE supporting other power class.

In test 2 without the gap, the UE shall send one Event A4 triggered measurement report, with a measurement reporting delay less than X ms from the beginning of time period T2, where X is

3360 for UE supporting power class 1, or

2080 for UE supporting other power class.

In test 1 and 2 UE is required to report SSB time index. The UE shall not send event triggered measurement reports, as long as the reporting criteria are not fulfilled. The rate of correct events observed during repeated tests shall be at least 90% with a confidence level of 95%.

NOTE: The actual overall delays measured in the test may be up to $2xTTI_{DCCH}$ higher than the measurement reporting delays above because of TTI insertion uncertainty of the measurement report in DCCH.

TTI insertion uncertainty = TTIDCCH = 1 ms; 2xTTIDCCH = 2 ms

The overall delays measured shall be less than a total of 6722 ms for power class 1 UE and 4162 ms for other power classes in test 1 and 3362 for power class 1 UE and 2082 ms for other power classes in test 2

7.6.2.8 NR SA FR1-FR2 event-triggered reporting in DRX with SSB time index detection

Editor's Note: This test case has been completed for the following configurations:

- Test frequency f ≤ 40.8 GHz

- UE PC3

- The test is incomplete for UE power classes other than PC3

- The test is incomplete for test frequencies > 40.8 GHz

- NR FR1 - FR2 OTA testability is still FFS.

7.6.2.8.1 Test purpose

The purpose of this test is to verify that the UE makes correct reporting of an event within inter-frequency cell search requirements.

7.6.2.8.2 Test applicability

This test applies to all types of NR UE Release 15 and forward supporting 5GS NR SA FR2 and long DRX cycle.

7.6.2.8.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 7.6.2.0.

The normative reference for this requirement is TS 38.133 [6] clause A.7.6.2.8.

7.6.2.8.4 Test description

7.6.2.8.4.1 Initial conditions

This test shall be tested using any of the test configurations in Table 7.6.2.8.4.1-1.

Table 7.6.2.8.4.1-1: SA FR1-FR2 event triggered reporting tests in DRX with SSB time index detection supported test configurations

Test Case ID	Description of serving cell	Description of target cell
7.6.2.8-1	NR 15 kHz SSB SCS, 10MHz bandwidth, FDD duplex mode	120 kHz SSB SCS, 100MHz bandwidth, TDD duplex mode
7.6.2.8-2	NR 15 kHz SSB SCS, 10MHz bandwidth, TDD duplex mode	
7.6.2.8-3	NR 30kHz SSB SCS, 40MHz bandwidth, TDD duplex mode	
Note 1: The UE is only required to be tested in one of the supported test configurations Note 2: target NR cell has the same SCS, BW and duplex mode as NR serving cell		

Table 7.6.2.8.4.1-2: General test parameters for SA inter-frequency event triggered reporting for FR2 with SSB time index detection in DRX

Parameter	Unit	Test configuration	Value				Comment
			Test 1	Test 2	Test 3	Test 4	
NR RF Channel Number		Config 1,2,3	1, 2				Two NR carrier frequencies is used.
Active cell		Config 1,2,3	NR cell 1 (Pcell)				NR Cell 1 is on NR RF channel number 1.
Neighbour cell		Config 1,2,3	NR cell 2				NR cell 2 is on NR RF channel number 2.
Gap Pattern Id		Config 1,2,3	0		Gap not configured		As specified in TS 38.133 [6] clause 9.1.2-1.
Measurement gap offset		Config 1,2,3	39		N/A		
SMTC-SSB parameters on NR RF Channel 1		Config 1	SSB.1 FR1				As specified in clause A.3.1
		Config 2	SSB.1 FR1				As specified in clause A.3.1
		Config 3	SSB.2 FR1				As specified in clause A.3.1
SMTC-SSB parameters on NR RF Channel 2		Config 1,2,3	SSB.3 FR2				As specified in clause A.3.2
offsetMO	dB	Config 1,2,3	6				

Hysteresis	dB	Config 1,2,3	0				
a4-Threshold	dBm	Config 1,2,3	-105				
CP length		Config 1,2,3	Normal				
TimeToTrigger	s	Config 1,2,3	0				
Filter coefficient		Config 1,2,3	0				L3 filtering is not used
DRX		Config 1,2,3	DRX .1	DRX .2	DRX .1	DRX .2	DRX is used
Time offset between serving and neighbour cells		Config 1	3ms				Asynchronous cells. The timing of Cell 2 is 3ms later than the timing of Cell 1.
		Config 2,3	3μs				Synchronous cells.
T1	s	Config 1,2,3	5				
T2	s	Config 1,2,3	11 for PC1; 6.5 for other PCT BD	108 for PC1; 67 for other PCT BD	11 for PC1; 6.5 for other PCT BD	108 for PC1; 67 for other PCT BD	PC1 - power class 1 as specified in TS 38.101-2 [3] Table 6.2.1.0

Table 7.6.2.8.4-3: Test Environment parameters for SA inter-frequency event triggered reporting with SSB time index detection in DRX

Parameter	Value		Comment
Test environment	NC		As specified in TS 38.508-1 [14] clause 4.1.
Test frequencies	As specified in Annex E, Table E.2-1 and TS 38.508-1 [14] clause 4.3.1 and 4.4.2.		
Channel bandwidth	As specified by the test configuration selected from Table 7.6.2.8.4.1-1.		
Propagation conditions	AWGN		As specified in Annex C.2.2.
Connection Diagram	TE Part	A.3.3.3.1	As specified in TS 38.508-1 [14] Annex A.
	DUT Part	A.3.4.1.1	
Exceptions to connection diagram			

1. Message contents are defined in clause 7.6.2.8.4.3.

2. There are two NR cells on two carriers specified in the test. Cell 1 is the cell used for connection setup and Cell 2 is a target cell on a different carrier than Cell 1. The power levels and settings for Cell 2 are set according to Annex C.1.2.

3. If a UE supports per-FR, it is only required to pass test 3&4. Otherwise it is only required to pass test 1&2.

4. The UE Rx beam peak direction for Cell 2 has been obtained previously using one of the Rx beam peak search procedures as described in Annex I.

7.6.2.8.4.2 Test procedure

In this test, there are two cells: NR cell 1 as PCell in FR1 on NR RF channel 2 and NR cell 2 as neighbour cell in FR2 on NR RF channel 2.

In test 1&2 measurement gap pattern configuration # 0 as defined in Table 7.6.2.8.4.1-2 is provided for a UE that does not support per-FR gap and in test 3&4 measurement gap pattern configuration #13 as defined in Table 7.6.2.8.4.1-2 is provided for UE that support per-FR gap.

In the measurement control information, it is indicated to the UE that event-triggered reporting with Event A3 is used. The test consists of two successive time periods, with time duration of T1, and T2 respectively. During time duration T1, the UE shall not have any timing information of NR cell 3.

1. Ensure the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity NR SA, Connected without release *On* according to TS 38.508-1 [14] clause 4.5.

2. Set the parameters according to T1 in Table 7.6.2.8.4.1-2. The TE shall ensure that the NR FR2 cell will be received by the UE from the Rx beam peak direction. T1 starts.

3. The SS shall transmit an *RRCReconfiguration* message.

4. The UE shall transmit *RRCReconfigurationComplete* message.

5. When T1 expires, the SS shall switch the power setting from T1 to T2 as specified in Table 7.6.2.8.4.1-2.

6. UE shall transmit a *MeasurementReport* message triggered by Event A3. If the overall delays measured from the beginning of time period T2 is less than 10082 ms for UE supporting power class 1, or 6242 ms for UE supporting other power class for Test 1 and Test 3 and 107522 ms for UE supporting power class 1, or 66562 ms for UE supporting other power class for Test 2 and Test 4 then the number of successful tests is increased by one. If the UE fails to report the event within the overall delays measured requirement then the number of failure tests is increased by one.

7. After the SS receives the *MeasurementReport* message in step 6 or when T2 expires, the SS shall transmit *RRCRelease* message to release the RRC connection which includes the release of the established radio bearers as well as all radio resources.

8. Set Cell 2 physical cell identity = [(current cell 2 physical cell identity + 1) mod 1008] for next iteration of the test procedure loop.]

9. After the RRC connection release, the SS:

   - transmits in Cell 1 a *Paging* message (including PagingRecord with ue-Identity) for the UE and ensures the UE in state RRC_CONNECTED with generic procedure parameters Connectivity NR SA, Connected without release *On* according to TS 38.508-1 [14] clause 4.5. (if the paging fails, switches off and on the UE and ensures the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity NR SA, Connected without release *On* according to TS 38.508-1 [14] clause 4.5.),
   or:
   - switches off and on the UE and ensures the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity NR SA, Connected without release *On* according to TS 38.508-1 [14] clause 4.5.

10. Repeat step 2-9 until the confidence level according to Tables G.2.3-1 in Annex G clause G.2 is achieved.

11. Repeat step 1-10 for each sub-test in Table 7.6.2.8.4.1-2 as appropriate.

7.6.2.8.4.3 Message contents

Message contents are according to TS 38.508-1 [14] clause TBD with the following exceptions:

Table 7.6.2.8.4.3-1: Common Exception messages SA inter frequency event triggered reporting with SSB time index detection in DRX

Default Message Contents	
Common contents of system information blocks exceptions	
Default RRC messages and information elements contents exceptions	Table H.3.1-1 Table H.3.1-2 with Conditions GAP NEEDED and INTER-FREQ for Test 1 and Test 2 Table H.3.1-2 with Condition INTER-FREQ for Test 3 and Test 4 Table H.3.1-3 with Conditions INTER-FREQ MO and Synchronous cells Table H.3.1-4AA with Condition SSB Index and A4-threshold= -105dB Table H.3.1-5 Table H.3.1-6 with Conditions gapUE and Pattern #0 for Test 1 and Test 2 Table H.3.1-7 with Condition INTER-FREQ Table H.3.7-1 with Condition DRX.1 for Test 1 and Test 3 and DRX.2 for Test 2 and Test 4

Table 7.6.2.8.4.3-2: MeasObjectNR-DEFAULT: SA FR1-FR2 measurement object configuration

Derivation Path: Table H.3.1-3			
Information Element	**Value/remark**	**Comment**	**Condition**
MeasObjectNR::= SEQUENCE {			
offsetMO SEQUENCE {			
rsrpOffsetSSB	dB6		
}			

7.6.2.8.5 Test requirement

Table 7.6.2.8.5-1 defines the primary level settings including test tolerances for all tests.

Table 7.6.2.8.5-1: Cell specific test parameters for SA inter-frequency event triggered reporting for FR2 with SSB time index detection in DRX

Parameter		**Unit**	**Test configuration**	**Cell 1**		**Cell 2**	
				T1	**T2**	**T1**	**T2**
AoA setup			Config 1,2,3	NA		Setup 1 as specified in clause A.9	
Beam Assumption[Note 7]			Config 1,2,3	N/A		Rough	
NR RF Channel Number			Config 1,2,3	1		2	
Duplex mode			Config 1	FDD		TDD	
			Config 2,3	TDD		TDD	
TDD configuration			Config 1	Not Applicable		TDDConf.3.1	
			Config 2	TDDConf.1.1		TDDConf.3.1	
			Config 3	TDDConf.2.1		TDDConf.3.1	
$BW_{channel}$		MHz	Config 1	10: $N_{RB,c}$ = 52		100: $N_{RB,c}$ = 66	
			Config 2	10: $N_{RB,c}$ = 52		100: $N_{RB,c}$ = 66	
			Config 3	40: $N_{RB,c}$ = 106		100: $N_{RB,c}$ = 66	
BWP BW		MHz	Config 1	10: $N_{RB,c}$ = 52		100: $N_{RB,c}$ = 66	
			Config 2	10: $N_{RB,c}$ = 52		100: $N_{RB,c}$ = 66	
			Config 3	40: $N_{RB,c}$ = 106		100: $N_{RB,c}$ = 66	
BWP configuration	Initial DL BWP		Config 1,2,3	DLBWP.0.1		N/A	
	Initial UL BWP			ULBWP.0.1		N/A	
	Dedicated DL BWP			DLBWP.1.1		N/A	
	Dedicated UL BWP			ULBWP.1.1		N/A	
OCNG Patterns			Config 1,2,3	OP.1		OP.1	
PDSCH Reference measurement channel			Config 1	SR.1.1 FDD		-	
			Config 2	SR.1.1 TDD			
			Config 3	SR2.1 TDD			
RMSI CORESET Reference Channel			Config 1	CR.1.1 FDD		-	
			Config 2	CR.1.1 TDD			
			Config 3	CR2.1 TDD			
Dedicated CORESET RMC configuration			Config 1	CCR.1.1 FDD		CCR.3.1 TDD	
			Config 2	CCR.1.1 TDD		CCR.3.1 TDD	
			Config 3	CCR.2.1 TDD		CCR.3.1 TDD	
SMTC configuration			Config 1	SMTC.2		SMTC.2	
			Config 2,3	SMTC.1		SMTC.1	
PDSCH/PDCCH subcarrier spacing		kHz	Config 1,2	15		120	
			Config 3	30		120	
EPRE ratio of PSS to SSS							

EPRE ratio of PBCH DMRS to SSS		Config 1,2,3	0	0	
EPRE ratio of PBCH to PBCH DMRS					
EPRE ratio of PDCCH DMRS to SSS					
EPRE ratio of PDCCH to PDCCH DMRS					
EPRE ratio of PDSCH DMRS to SSS					
EPRE ratio of PDSCH to PDSCH					
EPRE ratio of OCNG DMRS to SSS(Note 1)					
EPRE ratio of OCNG to OCNG DMRS (Note 1)					
N_{oc} Note2	dBm/15 kHz Note5			-104.7	
N_{oc} Note2	dBm/SCS Note4	Config 1,2		-95.7	
		Config 3		-95.7	
SSB_RP Note 3	dBm/SCS Note5	Config 1,2		-Infinity	-86.7
		Config 3		-Infinity	-86.7
$\hat{E}_s/I_{ot}$	dB	Config 1,2,3	NA Link only, see clause A.3.7A	-Infinity	9
$\hat{E}_s/N_{oc}$	dB	Config 1,2,3		-Infinity	9
Io Note3	dBm/9.36MHz	Config 1,2		-	-
	dBm/38.16MHz	Config 3		-	-
	dBm/95.04 MHz Note5	Config 1,2,3		-66.7	-57.2
Propagation Condition		Config 1,2,3		AWGN	

Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.

Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for N_{oc} to be fulfilled.

Note 3: SSB_RP and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.

Note 4: SSB_RP minimum requirements are specified assuming independent interference and noise at each receiver antenna port.

Note 5: Equivalent power received by an antenna with 0 dBi gain at the centre of the quiet zone

Note 6: As observed with 0 dBi gain antenna at the centre of the quiet zone

Note 7: Information about types of UE beam is given in B.2.1.3, and does not limit UE implementation or test system implementation

In test 1 with per-UE gap and in test 3 without the gap, the UE shall send one Event A3 triggered measurement report, with a measurement reporting delay less than X1 ms from the beginning of time period T2, where X1 is

10080 for UE supporting power class 1, or

6240 for UE supporting other power class.

In test 2 with per-UE gap and in test 4 without the gap, the UE shall send one Event A3 triggered measurement report, with a measurement reporting delay less than X2 ms from the beginning of time period T2, where X2 is

107520 for UE supporting power class 1, or

66560 for UE supporting other power class.

In test 1, 2, 3 and 4 UE is required to report SSB time index. The UE shall not send event triggered measurement reports, as long as the reporting criteria are not fulfilled. The rate of correct events observed during repeated tests shall be at least 90% with a confidence level of 95%.

NOTE: The actual overall delays measured in the test may be up to $2xTTI_{DCCH}$ higher than the measurement reporting delays above because of TTI insertion uncertainty of the measurement report in DCCH.

TTI insertion uncertainty = TTIDCCH = 1 ms; 2xTTIDCCH = 2 ms

The overall delays measured shall be less than a total of 10082 ms for power class 1 UE and 6240 ms for other power classes in test 1 and test 3 and 107522 for power class 1 UE and 66562 ms for other power classes in test 2 and test 4.

7.6.3 L1-RSRP measurement for beam reporting

7.6.3.0 Minimum conformance requirements for L1-RSRP measurement for beam reporting

7.6.3.0.1 Minimum conformance requirements for SSB-based L1-RSRP measurement for beam reporting

Same as clause 5.6.3.0.1

The normative reference for this requirement is TS 38.133 [6] clause 9.5.3.1, 9.5.4.1 and 9.5.5.1.

7.6.3.0.2 Minimum conformance requirements for CSI-RS-based L1-RSRP measurement for beam reporting

Same as clause 5.6.3.0.2

The normative reference for this requirement is TS 38.133 [6] clauses 9.5.3.1, 9.5.4.2 and 9.5.5.2.

7.6.3.1 NR SA FR2 SSB-based L1-RSRP measurement in non-DRX

Editor's Note: This test case has been completed for the following configurations:

- Test frequency f ≤ 40.8 GHz

- UE PC3

- Normal conditions

- The test is incomplete for UE power classes other than PC3

- The test is incomplete for test frequencies > 40.8 GHz

- The test case is incomplete for extreme conditions

7.6.3.1.1 Test purpose

To verify that the UE makes correct reporting of L1-RSRP measurement in non-DRX within L1-RSRP measurement requirements in TS 38.133 [6] clause 9.5.4.1.

7.6.3.1.2 Test applicability

This test applies to all types of NR UE from Release 15 onwards.

7.6.3.1.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 7.6.3.0.1.

The normative reference for this requirement is TS 38.133 [6] clause A.7.6.3.1.

7.6.3.1.4 Test description

7.6.3.1.4.1 Initial conditions

This test shall be tested using any of the test configurations in Table 7.6.3.1.4.1-1.

Table 7.6.3.1.4.1-1: NR SA FR2 SSB-based L1-RSRP measurement in non-DRX supported test configurations

Test Case ID	Description
7.6.3.1-1	NR 120 kHz SSB SCS, 100 MHz bandwidth, TDD duplex mode
7.6.3.1-2	NR 240 kHz SSB SCS, 100 MHz bandwidth, TDD duplex mode
Note: The UE is only required to be tested in one of the supported test configurations	

Table 7.6.3.1.4.1-2: General test parameters for NR SA FR2 SSB-based L1-RSRP measurement in non-DRX

Parameter	Config	Unit	Value
SSB GSCN	1~2		freq1
Duplex mode	1~2		TDD
TDD Configuration	1~2		TDDConf.3.1
$BW_{channel}$	1~2	MHz	100: $N_{RB,c}$ = 66
Data RBs allocated	1~2		66
PDSCH Reference measurement channel	1		SR.3.1 TDD
			SR.3.3 TDD
RMSI CORESET Reference Channel	1		CR.3.1 TDD
	2		CR.3.2 TDD
Dedicated CORESET Reference Channel	1		CCR.3.1 TDD
	2		CCR.3.7 TDD
SSB configuration	1		SSB.1 FR2
	2		SSB.2 FR2
OCNG Patterns	1~2		OP.1
Initial BWP Configuration	1~2		DLBWP.0.1 ULBWP.0.1
Dedicated BWP configuration	1~2		DLBWP.1.3 ULBWP.1.3
SMTC configuration	1~2		SMTC.1
TRS Configuration	1~2		TRS.2.1 TDD
PDCCH/PDSCH TCI Configuration	1~2		TCI.State.2
DRX configuration	1~2		Off
reportConfigType	1~2		periodic
reportQuantity	1~2		ssb-Index-RSRP
Number of reported RS	1~2		2
L1-RSRP reporting period	1~2	slot	320
T1	1~2	s	5
T2	1~2	s	2
EPRE ratio of PSS to SSS	1~2	dB	0
EPRE ratio of PBCH DMRS to SSS			
EPRE ratio of PBCH to PBCH DMRS			
EPRE ratio of PDCCH DMRS to SSS			
EPRE ratio of PDCCH to PDCCH DMRS			
EPRE ratio of PDSCH DMRS to SSS			
EPRE ratio of PDSCH to PDSCH DMRS			

EPRE ratio of OCNG DMRS to SSS Note 1			
EPRE ratio of OCNG to OCNG DMRS Note 1			
Propagation condition	1~2		AWGN
Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.			

Table 7.6.3.1.4-3: Test Environment parameters for NR SA FR2 SSB-based L1-RSRP measurement in non-DRX

Parameter	Value		Comment
Test environment	NC		As specified in TS 38.508-1 [14] clause 4.1.
Test frequencies	As specified in Annex E, Table E.2-1 and TS 38.508-1 [14] clause 4.3.1 and 4.4.2.		
Channel bandwidth	As specified by the test configuration selected from Table 7.6.3.1.4.1-1.		
Propagation conditions	AWGN		As specified in Annex C.2.2.
Connection Diagram	TE Part	A.3.3.3.1-1	As specified in TS 38.508-1 [14] Annex A.
	DUT Part	A.3.4.1.1	
Exceptions to connection diagram			

1. Message contents are defined in clause 7.6.3.1.4.3.

2. The AoA setup for this test is Setup 1 as defined in clause A.9. The UE RX Beam Peak direction has been obtained previously using one of the search procedures as described in Annex I.

7.6.3.1.4.2 Test procedure

Prior to the start of the time duration T1, the UE shall be configured for periodic CSI reporting in PUCCH [format 2] with a reporting periodicity as mentioned in the above table 7.6.3.1.4.1-2. Before the test, UE is configured to perform RLM, BFD and L1-RSRP measurement based on the SSBs.

1. Ensure the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity NR SA, Connected without release *On* and Test Mode *On*, according to TS 38.508-1 [14] clause 4.5 and general test parameters set according to Table 6.6.4.1.4.1-2.

2. Set the parameters according to T1 in Table 7.6.3.1.5-1. T1 starts.

3. The UE shall be transmitting CSI on PUCCH with a periodicity of 320 slots.

4. When T1 expires, the SS shall set the parameters according to T2 in 7.6.3.1.5-1. T2 starts.

5. The UE shall start sending valid L1-RSRP reports. The SS shall check the following requirements:

   - R1: the UE shall start to transmit valid L1-RSRP reports no later than 1760ms for UE supporting power class 1 in configuration 1, no later than 1720 ms for UE supporting power class 1 in configuration 2, no later than 1280 ms for UE supporting power class other than 1 in configuration 1 and no later than 1240 ms for UE supporting power class other than 1 in configuration 2 from the beginning of time period T2. A valid report shall meet the absolute L1-RSRP requirement for SSB#1 Table 7.6.3.1.5-2 for test configuration 1 and the corresponding absolute accuracy requirements in Table 7.6.3.1.5-3 for test configuration 2. If the first valid report is received before the specified time, the number of passed iterations for R1 is increased by one. Otherwise, the number of failed iterations for R1 is increased by one.

- R2: the UE shall transmit L1-RSRP reports every 320 slots. If the reports are received accordingly, the number of passed iterations for R2 is increased by one. Otherwise, the number of failed iterations for R2 is increased by one.

-R3: The L1-RSRP value of SSB#1 reported by the UE is compared to the expected L1-RSRP value for SSB#1. In all consecutive reports after the first valid value is received, if the resulting value is outside the corresponding absolute accuracy requirements in Table 7.6.3.1.5-2 for test configuration 1 and the corresponding absolute accuracy requirements in Table 7.6.3.1.5-3 for test configuration 2 the number of failed iterations for R3 is increased by one. Otherwise, the number of passed iterations for R3 is increased by one.

-R4: The DIFF-RSRP value of SSB#0 reported by the UE is compared to the expected DIFF-RSRP value. In all consecutive reports after the first valid value is received, if the resulting value is outside the corresponding relative accuracy requirements in Table 7.6.3.1.5-4 for all test configurations, the number of failed iterations for R4 is increased by one. Otherwise, the number of passed iterations for R4 is increased by one.

6. The SS waits until T2 expires.

7. The SS shall transmit *RRCRelease* message to release the RRC connection which includes the release of the established radio bearers as well as all radio resources.

8. After the RRC connection release, the SS:

   - transmits in Cell 1 a *Paging* message (including PagingRecord with ue-Identity) for the UE and ensures the UE in state RRC_CONNECTED with generic procedure parameters Connectivity NR SA, Connected without release *On* and Test Mode *On* according to TS 38.508-1 [14] clause 4.5. (if the paging fails, switches off and on the UE and ensures the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity NR SA, Connected without release *On* and Test Mode *On* according to TS 38.508-1 [14] clause 4.5.),
   or:
   - switches off and on the UE and ensures the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity NR SA, Connected without release *On* and Test Mode *On* according to TS 38.508-1 [14] clause 4.5.

9. Repeat steps 2-8 until the confidence level according to Tables G.2.3-1 in Annex G clause G.2 is achieved.

7.6.3.1.4.3 Message contents

Message contents are according to TS 38.508-1 [14] clause 4.6 with the following exceptions:

Table 7.6.3.1.4.3-1: Common Exception messages NR SA FR2 SSB-based L1-RSRP measurement in non-DRX

Default Message Contents	
Common contents of system information blocks exceptions	
Default RRC messages and information elements contents exceptions	Table H.3.1-1 Table H.3.1-2 Table H.3.6-2 with conditions PERIODIC and SS-RSRP Table H.3.6-3 with condition SSB

Table 7.6.3.1.4.3-2: RadioLinkMonitoringConfig

Derivation Path: TS 38.508-1 [14], Table 4.6.3-133			
Information Element	**Value/remark**	**Comment**	**Condition**
RadioLinkMonitoringConfig ::= SEQUENCE {			
failureDetectionResourcesToAddModList SEQUENCE (SIZE(1..maxNrofFailureDetectionResources)) OF SEQUENCE {	1 entry		
purpose	both	UE is configured to perform RLM and BFD based on the SSBs.	
detectionResource CHOICE {			
ssb-Index	0		

}			
}			
}			

7.6.3.1.5 Test requirement

Table 7.6.3.1.5-1 defines the primary level settings including test tolerances for all tests.

Table 7.6.3.1.5-1: Cell specific test parameters for NR SA FR2 SSB-based L1-RSRP measurement in non-DRX

Parameter	Config	Unit	SSB#0		SSB#1	
			T1	T2	T1	T2
Angle of arrival configuration			Setup 1 according to A.9			
Assumption for UE beamsNote 4	1~2		Rough			
N_{oc} Note2	1~2	dBm/15kHz	-105			
N_{oc} Note2	1	dBm/SSB SCS	-96			
	2		-93			
$\hat{E}_s/I_{ot}$	1~2	dB	0	0	-Infinity	9
SSB_RP Note3	1	dBm/SSB SCS	-96	-96	-Infinity	-87
	2		-93	-93	-Infinity	-84
Io Note3	1	dBm/95.04MHz	-63.97	-63.97	-66.98	-57.47
	2		-63.97	-63.97	-66.98	-57.47
$\hat{E}_s/N_{oc}$	1~2	dB	0	0	-Infinity	9

Note 1: The resources for uplink transmission are assigned to the UE prior to the start of time period T2.
Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for N_{oc} to be fulfilled.
Note 3: SSB_RP and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.
Note 4: Information about types of UE beam is given in TS 38.133 Annex B.2.1.3, and does not limit UE implementation or test system implementation

The UE shall send L1-RSRP report every 320 slots. No later than X ms plus 640 slots from the beginning of time period T2, UE shall send L1-RSRP report including the results for both SSB#0 and SSB#1 while meeting the accuracy requirements defined in clause 10.1.20.1, where X is

- 1680 for UE supporting power class 1
- 1200 for UE supporting power class 2,3 or 4.

Each L1-RSRP measurement report shall meet the corresponding absolute accuracy requirements in Table 7.6.3.1.5-2 for for test configuration 1 and the corresponding absolute accuracy requirements in Table 7.6.3.1.5-3 for test configuration 2 and the corresponding relative accuracy requirements in Table 7.6.3.1.5-4 for all test configurations.

Table 7.6.3.1.5-2: L1-RSRP absolute accuracy requirements for the reported values for test configuration 1 (R1 and R3)

Normal Conditions	T1	T2
Lowest reported value (SSB#1)	-	40
Highest reported value (SSB#1)	-	99

Table 7.6.3.1.5-3: L1-RSRP absolute accuracy requirements for the reported values for test configuration 2 (R1 and R3)

Normal Conditions	T1	T2
Lowest reported value (SSB#1)	-	43
Highest reported value (SSB#1)	-	102

Table 7.6.3.1.5-4: L1-RSRP relative accuracy requirements for the reported values for all test configurations (R4)

	T1	T2
Lowest DIFF RSRP reported (SSB#0)	-	1
Highest DIFF RSRP reported (SSB#0)	-	7

For the test to pass, the ratio of successful reported valued for each requirement (R1 to R4) shall be at least 90% with a confidence level of 95%. Each requirement is evaluated independently of the others.

7.6.3.2 NR SA FR2 SSB-based L1-RSRP measurement in DRX

Editor's Note: This test case has been completed for the following configurations:

- Test frequency f ≤ 40.8 GHz
- UE PC3
- Normal conditions
- The test is incomplete for UE power classes other than PC3
- The test is incomplete for test frequencies > 40.8 GHz
- The test case is incomplete for extreme conditions

7.6.3.2.1 Test purpose

To verify that the UE makes correct reporting of L1-RSRP measurement in DRX within L1-RSRP measurement requirements in TS 38.133 [6] clause 9.5.4.1.

7.6.3.2.2 Test applicability

This test applies to all types of NR UE Release 15 and forward supporting 5GS NR SA FR2 and long DRX cycle.

7.6.3.2.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 7.6.3.0.1.

The normative reference for this requirement is TS 38.133 [6] clause A.7.6.3.2.

7.6.3.2.4 Test description

7.6.3.2.4.1 Initial conditions

This test shall be tested using any of the test configurations in Table 7.6.3.2.4.1-1.

Table 7.6.3.2.4.1-1: NR SA FR2 SSB-based L1-RSRP measurement in DRX supported test configurations

Test Case ID	Description
7.6.3.2-1	NR 120 kHz SSB SCS, 100 MHz bandwidth, TDD duplex mode
7.6.3.2-2	NR 240 kHz SSB SCS, 100 MHz bandwidth, TDD duplex mode
Note: The UE is only required to be tested in one of the supported test configurations	

Table 7.6.3.2.4.1-2: General test parameters for NR SA FR2 SSB-based L1-RSRP measurement in DRX

Parameter	Config	Unit	Value
SSB GSCN	1~2		freq1
Duplex mode	1~2		TDD
TDD Configuration	1~2		TDDConf.3.1
$BW_{channel}$	1~2	MHz	100: $N_{RB,c}$ = 66
Data RBs allocated	1~2		66
PDSCH Reference measurement channel	1		SR.3.1 TDD
	2		SR.3.3 TDD
RMSI CORESET Reference Channel	1		CR.3.1 TDD
	2		CR.3.2 TDD
Dedicated CORESET Reference Channel	1		CCR.3.1 TDD
	2		CCR.3.7 TDD
SSB configuration	1		SSB.1 FR2
	2		SSB.2 FR2
OCNG Patterns	1~2		OP.1
Initial BWP Configuration	1~2		DLBWP.0.1 ULBWP.0.1
Dedicated BWP configuration	1~2		DLBWP.1.3 ULBWP.1.3
SMTC configuration	1~2		SMTC.1
TRS Configuration	1~2		TRS.2.1 TDD
PDCCH/PDSCH TCI Configuration	1~2		TCI.State.2
DRX configuration	1~2		DRX.3
reportConfigType	1~2		periodic
reportQuantity	1~2		ssb-Index-RSRP
Number of reported RS	1~2		2
L1-RSRP reporting period	1~2	slot	320
T1	1~2	s	5
T2	1~2	s	3
EPRE ratio of PSS to SSS	1~2	dB	0
EPRE ratio of PBCH DMRS to SSS			
EPRE ratio of PBCH to PBCH DMRS			
EPRE ratio of PDCCH DMRS to SSS			
EPRE ratio of PDCCH to PDCCH DMRS			
EPRE ratio of PDSCH DMRS to SSS			
EPRE ratio of PDSCH to PDSCH DMRS			
EPRE ratio of OCNG DMRS to SSS Note 1			
EPRE ratio of OCNG to OCNG DMRS Note 1			
Propagation condition	1~2		AWGN
Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.			

Table 7.6.3.2.4-3: Test Environment parameters for NR SA FR2 SSB-based L1-RSRP measurement in DRX

Parameter	Value	Comment
Test environment	NC	As specified in TS 38.508-1 [14] clause 4.1.
Test frequencies	As specified in Annex E, Table E.2-1 and TS 38.508-1 [14] clause 4.3.1 and 4.4.2.	

Channel bandwidth	As specified by the test configuration selected from Table 7.6.3.2.4.1-1.		
Propagation conditions	AWGN		As specified in Annex C.2.2.
Connection Diagram	TE Part	A.3.3.3.1-1	As specified in TS 38.508-1 [14] Annex A.
	DUT Part	A.3.4.1.1	
Exceptions to connection diagram			

1. Message contents are defined in clause 7.6.3.2.4.3.

2. The AoA setup for this test is Setup 1 as defined in clause A.9. The UE RX Beam Peak direction has been obtained previously using one of the search procedures as described in Annex I.

7.6.3.2.4.2 Test procedure

Same as in 7.6.3.1.4.2 with the following exception:

5. The UE shall start sending valid L1-RSRP reports. The SS shall check the following requirements:

   - R1: the UE shall start to transmit valid L1-RSRP reports no later than 2960ms for UE supporting power class 1 in configuration 1, no later than 2920ms for UE supporting power class 1 in configuration 2, no later than 2000ms for UE supporting power class other than 1 in configuration 1 and no later than 1960 ms for UE supporting power class other than 1 in configuration 2 from the beginning of time period T2. A valid report shall meet the absolute L1-RSRP requirement for SSB#1 Table 7.6.3.2.5-2 for test configuration 1 and the corresponding absolute accuracy requirements in Table 7.6.3.2.5-3 for test configuration 2. If the first valid report is received before the specified time, the number of passed iterations for R1 is increased by one. Otherwise, the number of failed iterations for R1 is increased by one.

   - R2: the UE shall transmit L1-RSRP reports every 320 slots. If the reports are received accordingly, the number of passed iterations for R2 is increased by one. Otherwise, the number of failed iterations for R2 is increased by one.

   -R3: The L1-RSRP value of SSB#1 reported by the UE is compared to the expected L1-RSRP value for SSB#1. In all consecutive reports after the first valid value is received, if the resulting value is outside the corresponding absolute accuracy requirements in Table 7.6.3.2.5-2 for test configurations 1 and 2 and the corresponding absolute accuracy requirements in Table 7.6.3.2.5-3 for test configurations 3 and 4 the number of failed iterations for R3 is increased by one. Otherwise, the number of passed iterations for R3 is increased by one.

   -R4: The DIFF-RSRP value of SSB#0 reported by the UE is compared to the expected DIFF-RSRP value. In all consecutive reports after the first valid value is received, if the resulting value is outside the corresponding relative accuracy requirements in Table 7.6.3.2.5-4 for all test configurations, the number of failed iterations for R4 is increased by one. Otherwise, the number of passed iterations for R4 is increased by one.

7.6.3.2.4.3 Message contents

Same message content as in subclause 7.6.3.1.4.3 with the following exception:

Table 7.6.3.2.4.3-1: Common Exception messages NR SA FR2 SSB-based L1-RSRP measurement in DRX

Default Message Contents	
Common contents of system information blocks exceptions	
Default RRC messages and information elements contents exceptions	Table H.3.1-1 Table H.3.1-2 Table H.3.7-1 with condition DRX.3

7.6.3.2.5 Test requirement

Table 7.6.3.2.5-1 defines the primary level settings including test tolerances for all tests.

Table 7.6.3.2.5-1: Cell specific test parameters for NR SA FR2 SSB-based L1-RSRP measurement in DRX

Parameter	Config	Unit	SSB#0		SSB#1	
			T1	T2	T1	T2
Angle of arrival configuration			Setup 1 according to A.9			
Assumption for UE beamsNote 4	1~2		Rough			
N_{oc} Note2	1~2	dBm/15kHz	-105			
N_{oc} Note2	1	dBm/SSB SCS	-96			
	2		-93			
$\hat{E}_s/I_{ot}$	1~2	dB	0	0	-Infinity	9
SSB_RP Note3	1	dBm/SSB SCS	-96	-96	-Infinity	-87
	2		-93	-93	-Infinity	-84
Io Note3	1	dBm/95.04MHz	-63.97	-63.97	-66.98	-57.47
	2		-63.97	-63.97	-66.98	-57.47
$\hat{E}_s/N_{oc}$	1~2	dB	0	0	-Infinity	9

Note 1: The resources for uplink transmission are assigned to the UE prior to the start of time period T2.
Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for N_{oc} to be fulfilled.
Note 3: SSB_RP and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.
Note 4: Information about types of UE beam is given in TS 38.133 Annex B.2.1.3, and does not limit UE implementation or test system implementation

The UE shall send L1-RSRP report every 320 slots. No later than X ms plus 640 slots from the beginning of time period T2, UE shall send L1-RSRP report including the results for both SSB#0 and SSB#1 while meeting the accuracy requirements defined in clause 10.1.20.1, where X is

- 2880 for UE supporting power class 1
- 1920 for UE supporting power class 2,3 or 4.

Each L1-RSRP measurement report shall meet the corresponding absolute accuracy requirements in Table 7.6.3.2.5-2 for test configuration 1 and the corresponding absolute accuracy requirements in Table 7.6.3.2.5-3 for test configuration 2 and the corresponding relative accuracy requirements in Table 7.6.3.2.5-4 for all test configurations.

Table 7.6.3.2.5-2: L1-RSRP absolute accuracy requirements for the reported values for test configuration 1 (R1 and R3)

Normal Conditions	T1	T2
Lowest reported value (SSB#1)	-	40
Highest reported value (SSB#1)	-	99

Table 7.6.3.2.5-3: L1-RSRP absolute accuracy requirements for the reported values for test configuration 2 (R1 and R3)

Normal Conditions	T1	T2
Lowest reported value (SSB#1)	-	43

Highest reported value (SSB#1)	-	102

Table 7.6.3.2.5-4: L1-RSRP relative accuracy requirements for the reported values for all test configurations (R4)

	T1	T2
Lowest DIFF RSRP reported (SSB#0)	-	1
Highest DIFF RSRP reported (SSB#0)	-	7

For the test to pass, the ratio of successful reported valued for each requirement (R1 to R4) shall be at least 90% with a confidence level of 95%. Each requirement is evaluated independently of the others.

7.6.3.3 NR SA FR2 CSI-RS-based L1-RSRP measurement in non-DRX

Editor's Note: This test case has been completed for the following configurations:

- Test frequency f ≤ 40.8 GHz
- UE PC3
- Normal conditions
- The test is incomplete for UE power classes other than PC3
- The test is incomplete for test frequencies > 40.8 GHz
- The test case is incomplete for extreme conditions

7.6.3.3.1 Test purpose

To verify that the UE makes correct reporting of L1-RSRP measurement in non-DRX within L1-RSRP measurement requirements in TS 38.133 [6] clause 9.5.4.2.

7.6.3.3.2 Test applicability

This test applies to all types of NR UE from Release 15 onwards.

7.6.3.3.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 7.6.3.0.2.

The normative reference for this requirement is TS 38.133 [6] clause A.7.6.3.3.

7.6.3.3.4 Test description

7.6.3.3.4.1 Initial conditions

This test shall be tested using any of the test configurations in Table 7.6.3.3.4.1-1.

Table 7.6.3.3.4.1-1: NR SA FR2 CSI-RS-based L1-RSRP measurement in non-DRX supported test configurations

Test Case ID	Description
7.6.3.4-1	NR 120 kHz CSI-RS SCS, 100 MHz bandwidth, TDD duplex mode

Table 7.6.3.3.4.1-2: General test parameters for NR SA FR2 CSI-RS-based L1-RSRP measurement in non-DRX

Parameter	Config	Unit	Value
SSB GSCN	1		freq1
Duplex mode	1		TDD
TDD Configuration	1		TDDConf.3.1

$BW_{channel}$	1	MHz	100: $N_{RB,c}$ = 66
Data $_{RBs}$ allocated	1		66
PDSCH Reference measurement channel	1		SR.3.1 TDD
RMSI CORESET Reference Channel	1		CR.3.1 TDD
Dedicated CORESET Reference Channel	1		CCR.3.1 TDD
SSB configuration	1		SSB.1 FR2
CSI-RS configuration	1		CSI-RS.3.3 TDD
OCNG Patterns	1		OP.1
Initial BWP Configuration	1		DLBWP.0.1 ULBWP.0.1
Dedicated BWP configuration	1		DLBWP.1.3 ULBWP.1.3
SMTC configuration	1		SMTC.1
TRS Configuration	1		TRS.2.1 TDD
PDCCH/PDSCH TCI Configuration	1		TCI.State.2
DRX configuration	1		Off
reportConfigType	1		aperiodic
reportQuantity	1		cri-RSRP
Number of reported RS	1		2
qcl-Info	1		SSB#0 for resource#0 SSB#1 for resource#1
reportSlotOffsetList	1		8
Propagation condition	1		AWGN
T1	1	s	5
EPRE ratio of PSS to SSS	1	dB	0
EPRE ratio of PBCH DMRS to SSS			
EPRE ratio of PBCH to PBCH DMRS			
EPRE ratio of PDCCH DMRS to SSS			
EPRE ratio of PDCCH to PDCCH DMRS			
EPRE ratio of PDSCH DMRS to SSS			
EPRE ratio of PDSCH to PDSCH DMRS			
EPRE ratio of OCNG DMRS to SSS Note 1			
EPRE ratio of OCNG to OCNG DMRS Note 1			
Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.			

Table 7.6.3.3.4-3: Test Environment parameters for NR SA FR2 CSI-RS-based L1-RSRP measurement in non-DRX

Parameter	Value		Comment
Test environment	NC		As specified in TS 38.508-1 [14] clause 4.1.
Test frequencies	As specified in Annex E, Table E.2-1 and TS 38.508-1 [14] clause 4.3.1 and 4.4.2.		
Channel bandwidth	As specified by the test configuration selected from Table 7.6.3.3.4.1-1.		
Propagation conditions	AWGN		As specified in Annex C.2.2.
Connection Diagram	TE Part	A.3.3.3.1-1	As specified in TS 38.508-1 [14] Annex A.
	DUT Part	A.3.4.1.1	
Exceptions to connection diagram			

1. Message contents are defined in clause 7.6.3.3.4.3.

2. The AoA setup for this test is Setup 1 as defined in clause A.9. The UE RX Beam Peak direction has been obtained previously using one of the search procedures as described in Annex I.

7.6.3.3.4.2 Test procedure

The test consists of a single time period T1, during which the UE is triggered via DCI to report L1-RSRP on aperiodic CSI-RS resources. Prior to the start of the time duration T1, the UE shall be fully synchronized to PCell. UE is also configured to measure L1-RSRP based on SSB. Upon receiving the DCI trigger, UE provides the report back based on the reporting configuration as defined in table 7.6.3.3.4.1-2.

1. Ensure the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity NR SA, Connected without release *On* and Test Mode *On*, according to TS 38.508-1 [14] clause 4.5.

2. Set the parameters according to T1 in Table 7.6.3.3.5-1. T1 starts.

3. After 480ms from the start of the test the SS transmits the DCI trigger in slot 1.

4. The SS shall check following requirements:

   - R1: the UE shall send L1-RSRP report at slot 8 from the reception of DCI trigger. If the report is received at slot 8 from the reception of DCI trigger, the number of passed iterations for R1 is increased by one. Otherwise, the number of failed iterations for R1 is increased by one.

   - R2: the L1-RSRP value of CSI-RS#1 reported by the UE is compared to the expected L1-RSRP value for CSI-RS #1. If the resulting value is outside the limits in Table 7.6.3.3.5-2 or the UE fails to report the measurement value for CSI-RS #1, the number of failed iterations for R2 is increased by one. Otherwise, the number of passed iterations for R2 is increased by one.

   -R3: The DIFF RSRP value of CSI-RS #0 reported by the UE is compared to the expected DIFF RSRP value. If the resulting value is outside the limits in Table 7.6.3.3.5-4 or the UE fails to report the measurement value for CSI-RS #0, the number of failed iterations for R3 is increased by one. Otherwise, the number of passed iterations for R3 is increased by one.

6. The SS shall transmit *RRCRelease* message to release the RRC connection which includes the release of the established radio bearers as well as all radio resources.

7. After the RRC connection release, the SS:

   - transmits in Cell 1 a *Paging* message (including PagingRecord with ue-Identity) for the UE and ensures the UE in state RRC_CONNECTED with generic procedure parameters Connectivity NR SA, Connected without release *On* and Test Mode *On* according to TS 38.508-1 [14] clause 4.5. (if the paging fails, switches off and on the UE and ensures the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity NR SA, Connected without release *On* and Test Mode *On* according to TS 38.508-1 [14] clause 4.5.),
   or:
   - switches off and on the UE and ensures the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity NR SA, Connected without release *On* and Test Mode *On* according to TS 38.508-1 [14] clause 4.5.

8. Repeat steps 2-7 until the confidence level according to Tables G.2.3-1 in Annex G clause G.2 is achieved.

7.6.3.3.4.3 Message contents

Message contents are according to TS 38.508-1 [14] clause 7.3 with the following exceptions:

Table 7.6.3.3.4.3-1: Common Exception messages NR SA FR2 CSI-RS-based L1-RSRP measurement in non-DRX

Default Message Contents	
Common contents of system information blocks exceptions	

Default RRC messages and information elements contents exceptions	Table H.3.1-1 Table H.3.1-2 Table H.3.6-2 with conditions APERIODIC and CSI-RSRP Table H.3.6-3 with conditions CSI-RS and APERIODIC

Table 7.6.3.3.4.3-2: RadioLinkMonitoringConfig

Derivation Path: TS 38.508-1 [14], Table 4.6.3-133			
Information Element	**Value/remark**	**Comment**	**Condition**
RadioLinkMonitoringConfig ::= SEQUENCE {			
failureDetectionResourcesToAddModList SEQUENCE (SIZE(1..maxNrofFailureDetectionResources)) OF SEQUENCE {	1 entry		
purpose	both	UE is configured to perform RLM and BFD based on the SSBs.	
}			
}			

7.6.3.3.5 Test requirement

Table 7.6.3.3.5-1 defines the primary level settings including test tolerances for all tests.

Table 7.6.3.3.5-1: Cell specific test parameters for NR SA FR2 CSI-RS-based L1-RSRP measurement in non-DRX

Parameter	Config	Unit	CSI-RS#0	CSI-RS#1
Angle of arrival configuration	1		Setup 1 according to A.9	
N_{oc} Note1	1	dBm/15kHz	-105	
N_{oc} Note1	1	dBm/SSB SCS	-95.97	
$\hat{E}_s / I_{ot}$	1	dB	0	9
CSI-RS RSRP Note2	1	dBm/SSB SCS	-95.97	-86.97
Io Note2	1	dBm/95.04MHz	-63.97	-57.47
$\hat{E}_s / N_{oc}$	1	dB	0	9
Note 1: Void Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for N_{oc} to be fulfilled. Note 3: CSI-RS RSRP and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.				

After 480ms from the beginning of the test, the UE shall send L1-RSRP report at slot 8 from the reception of DCI triggering the L1-RSRP measurement. The L1-RSRP report shall include the results for both CSI-RS#0 and CSI-RS#1. Each L1-RSRP measurement report shall meet the corresponding absolute accuracy requirements in Table 7.6.3.3.5-2 the corresponding relative accuracy requirements in Table 7.6.3.3.5-3.

Table 7.6.3.3.5-2: L1-RSRP absolute accuracy requirements for the reported values R2

Normal Conditions	T1
Lowest reported value (CSI-RS#1)	40
Highest reported value (CSI-RS#1)	99

Table 7.6.3.3.5-3: L1-RSRP relative accuracy requirements for the reported values R3

	T1

Lowest DIFF RSRP reported (CSI-RS#0)	1
Highest DIFF RSRP reported (CSI-RS#0)	7

The rate of correct events observed during repeated tests (R1 to R3) shall be at least 90% with a confidence level of 95%.

NOTE: The actual overall delays measured in the test may be up to $2xTTI_{DCCH}$ higher than the measurement reporting delays above because of TTI insertion uncertainty of the measurement report in DCCH.

7.6.3.4 NR SA FR2 CSI-RS-based L1-RSRP measurement in DRX

Editor's Note: This test case has been completed for the following configurations:

- Test frequency f ≤ 40.8 GHz

- UE PC3

- Normal conditions

- The test is incomplete for UE power classes other than PC3

- The test is incomplete for test frequencies > 40.8 GHz

- The test case is incomplete for extreme conditions

7.6.3.4.1 Test purpose

To verify that the UE makes correct reporting of L1-RSRP measurement in DRX within L1-RSRP measurement requirements in TS 38.133 [6] clause 9.5.4.2.

7.6.3.4.2 Test applicability

This test applies to all types of NR UE Release 15 and forward supporting 5GS NR SA FR2 and long DRX cycle.

7.6.3.4.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 7.6.3.0.2.

The normative reference for this requirement is TS 38.133 [6] clause A.7.6.3.4.

7.6.3.4.4 Test description

7.6.3.4.4.1 Initial conditions

This test shall be tested using any of the test configurations in Table 7.6.3.4.4.1-1.

Table 7.6.3.4.4.1-1: NR SA FR2 CSI-RS-based L1-RSRP measurement in DRX supported test configurations

Test Case ID	Description
7.6.3.4-1	NR 120 kHz CSI-RS SCS, 100 MHz bandwidth, TDD duplex mode

Table 7.6.3.4.4.1-2: General test parameters for NR SA FR2 CSI-RS-based L1-RSRP measurement in DRX

Parameter	Config	Unit	Value
SSB GSCN	1		freq1
Duplex mode	1		TDD
TDD Configuration	1		TDDConf.3.1
$BW_{channel}$	1	MHz	100: $N_{RB,c}$ = 66

Data $_{RBs}$ allocated	1		66
PDSCH Reference measurement channel	1		SR.3.1 TDD
RMSI CORESET Reference Channel	1		CR.3.1 TDD
Dedicated CORESET Reference Channel	1		CCR.3.1 TDD
SSB configuration	1		SSB.1 FR2
CSI-RS configuration	1		CSI-RS.3.3 TDD
OCNG Patterns	1		OP.1
Initial BWP Configuration	1		DLBWP.0.1 ULBWP.0.1
Dedicated BWP configuration	1		DLBWP.1.3 ULBWP.1.3
SMTC configuration	1		SMTC.1
TRS Configuration	1		TRS.2.1 TDD
PDCCH/PDSCH TCI Configuration	1		TCI.State.2
DRX configuration	1		DRX.3
reportConfigType	1		aperiodic
reportQuantity	1		cri-RSRP
Number of reported RS	1		2
qcl-Info	1		SSB#0 for resource#0 SSB#1 for resource#1
reportSlotOffsetList	1		8
Propagation condition	1		AWGN
T1	1	s	5
EPRE ratio of PSS to SSS	1	dB	0
EPRE ratio of PBCH DMRS to SSS			
EPRE ratio of PBCH to PBCH DMRS			
EPRE ratio of PDCCH DMRS to SSS			
EPRE ratio of PDCCH to PDCCH DMRS			
EPRE ratio of PDSCH DMRS to SSS			
EPRE ratio of PDSCH to PDSCH DMRS			
EPRE ratio of OCNG DMRS to SSS Note 1			
EPRE ratio of OCNG to OCNG DMRS Note 1			
Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.			

Table 7.6.3.4.4-3: Test Environment parameters for NR SA FR2 CSI-RS-based L1-RSRP measurement in DRX

Parameter	Value		Comment
Test environment	NC		As specified in TS 38.508-1 [14] clause 4.1.
Test frequencies	As specified in Annex E, Table E.2-1 and TS 38.508-1 [14] clause 4.3.1 and 4.4.2.		
Channel bandwidth	As specified by the test configuration selected from Table 7.6.3.4.4.1-1.		
Propagation conditions	AWGN		As specified in Annex C.2.2.
Connection Diagram	TE Part	A.3.3.3.1-1	As specified in TS 38.508-1 [14] Annex A.
	DUT Part	A.3.4.1.1	
Exceptions to connection diagram			

1. Message contents are defined in clause 7.6.3.4.4.3.

2. The AoA setup for this test is Setup 1 as defined in clause A.9. The UE RX Beam Peak direction has been obtained previously using one of the search procedures as described in Annex I.

7.6.3.4.4.2 Test procedure

Same test procedure as in subclause 7.6.3.3.4.2 with tables 7.6.3.3.4.1-2 and 7.6.3.3.5-1 replaced by tables 7.6.3.4.4.1-2 and 7.6.3.4.5-1 and following change in step 3.

3. After 1440ms from the start of the test the SS transmits the DCI trigger in slot 1.

7.6.3.4.4.3 Message contents

Same message content as in subclause 7.6.3.3.4.3 with the following exception:

Table 7.6.3.4.4.3-1: Common Exception messages NR SA FR2 CSI-RS-based L1-RSRP measurement in DRX

Default Message Contents	
Common contents of system information blocks exceptions	
Default RRC messages and information elements contents exceptions	Table H.3.1-1 Table H.3.1-2 Table H.3.7-1 with condition DRX.3

7.6.3.4.5 Test requirement

Table 7.6.3.4.5-1 defines the primary level settings including test tolerances for all tests.

Table 7.6.3.4.5-1: Cell specific test parameters for NR SA FR2 CSI-RS-based L1-RSRP measurement in DRX

Parameter	Config	Unit	CSI-RS#0	CSI-RS#1
Angle of arrival configuration	1		Setup 1 according to A.9	
Assumption for UE beams Note 3	1~2		Rough	
N_{oc} Note1	1	dBm/15kHz	-105	
N_{oc} Note1	1	dBm/SSB SCS	-95.97	
$\hat{E}_s / I_{ot}$	1	dB	0	9
CSI-RS RSRP Note2	1	dBm/SSB SCS	-95.97	-86.97
Io Note2	1	dBm/95.04MHz	-63.97	-57.47
$\hat{E}_s / N_{oc}$	1	dB	0	9
Note 1: Void Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for N_{oc} to be fulfilled. Note 3: CSI-RS RSRP and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves. Note 4: Information about types of UE beam is given in TS 38.133 Annex B.2.1.3, and does not limit UE implementation or test system implementation				

After 1440ms from the beginning of the test, the UE shall send L1-RSRP report at slot 8 from the reception of DCI triggering the L1-RSRP measurement. The L1-RSRP report shall include the results for both CSI-RS#0 and CSI-RS#1. Each L1-RSRP measurement report shall meet the corresponding absolute accuracy requirements in Table 7.6.3.4.5-2 the corresponding relative accuracy requirements in Table 7.6.3.4.5-3.

Table 7.6.3.4.5-2: L1-RSRP absolute accuracy requirements for the reported values

Normal Conditions	T1
Lowest reported value (CSI-RS#1)	40
Highest reported value (CSI-RS#1)	99

Table 7.6.3.4.5-3: L1-RSRP relative accuracy requirements for the reported values

	T1
Lowest DIFF RSRP reported (CSI-RS#0)	1
Highest DIFF RSRP reported (CSI-RS#0)	7

The rate of correct events observed during repeated tests shall be at least 90% with a confidence level of 95%.

NOTE: The actual overall delays measured in the test may be up to $2xTTI_{DCCH}$ higher than the measurement reporting delays above because of TTI insertion uncertainty of the measurement report in DCCH.

7.6.4 CLI measurements

7.6.4.0 Minimum conformance requirements

7.6.4.0.1 Minimum conformance requirements for SRS-RSRP measurement period

The UE shall be capable of performing SRS-RSRP measurement based on the configured SRS resource, and the UE shall be capable of reporting SRS-RSRP measured over measurement period of $T_{SRS_RSRP_measurement_period}$ for FR1 and FR2.

Table 7.6.4.0.1-1 Measurement period $T_{SRS_RSRP_measurement_period}$

Configuration	$T_{SRS_measurement_period}$ (ms)
No DRX	Max(60, 3 X T_{SRS})
DRX cycle ≤ 320ms	Max(60, Ceil(1.5 X 3) X max(T_{SRS}, T_{DRX}))
DRX cycle > 320ms	3 X T_{DRX}
Note: T_{SRS} is SRS measurement periodicity configured *SRS-PeriodicityAndOffset*, and T_{DRX} is the DRX cycle length.	

If the SRS resources configured for measurement are partially or fully overlapping with SMTC window, SSB or CSI-RS configured for RLM, BFD, CBD or L1-RSRP measurement or measurement gaps, requirements are not specified for $T_{SRS_RSRP_measurement_period}$.

When configured by the network, the UE shall be able to perform SRS-RSRP measurements of configured *srs-ResourceConfigCLI*. The requirements apply when the subcarrier spacing for SRS-RSRP measurement resource configuration is the same as the subcarrier spacing of the active DL BWP of serving cell. The UE is not required to measure SRS using different SCS compared to the downlink active BWP SCS of the same carrier.

The requirements as provided:

- SRS resources configured for SRS-RSRP measurements are measurable.

An SRS resource configured for SRS-RSRP shall be considered measurable when for each relevant SRS the following conditions are met:

- SRS-RSRP related side conditions given in clauses 10.1.22.1 for FR1 and FR2 for a corresponding band,
- SRS_RP and SRS Ês/Iot according to Annex B.2.7 for a corresponding band.

The UE shall send SRS-RSRP reports only for report configurations according to *reportType* which is *cliPeriodical* or *cliEventTriggered* when SRS-RSRP report is configured.

The UE shall report the SRS-RSRP value as a 7-bit value in the range [-140, -44] dBm with 1dB step size according to clause 10.1.22.1 for FR1 and FR2.

Reported SRS-RSRP measurements contained in periodically triggered measurement reports shall meet the requirements in clause 10.1.22.1.

Reported SRS-RSRP measurements contained in periodically triggered measurement reports shall meet the requirements in clauses 10.1.22.1.

The first report in event triggered periodic measurement reporting shall meet the requirements specified in clause 9.7.2.3.3.

Reported SRS-RSRP measurements contained in periodically triggered measurement reports shall meet the requirements in clause 10.1.22.1.

The UE shall not send any event triggered measurement reports as long as no reporting criteria is fulfilled.

The measurement reporting delay is defined as the time between an event that will trigger a measurement report and the point when the UE starts to transmit the measurement report over the air interface. This requirement assumes that the measurement report is not delayed by other RRC signalling on the DCCH. This measurement reporting delay excludes a delay uncertainty resulted when inserting the measurement report to the TTI of the uplink DCCH. The delay uncertainty is: 2 x TTI_{DCCH}. This measurement reporting delay excludes a delay which caused by no UL resources for UE to send the measurement report on.

The normative reference for this requirement is TS 38.133 [6] clause 9.7.2.5 and 9.7.2.1, 9.7.2.2 and 9.7.2.3

7.6.4.1 NR SA FR2 SRS-RSRP measurement in non-DRX

Editor's Note: This test case is incomplete. Following aspects are either missing or TBD

- The test applicability is FFS

- The test procedure is incomplete

- The message content is FFS

- MU/TT analysis for UE PC3 and test frequency f ≤ 40.8 GHz is complete.

- MU/TT analysis for UE power class other than PC3 is incomplete.

- MU//TT analysis for test frequency f > 40.8 GHz is incomplete.

7.6.4.1.1 Test purpose

The purpose of this test case is to verify that the UE makes correct reporting of SRS-RSRP measurement in non-DRX within SRS-RSRP measurement requirements in TS 38.133 [6] clause 9.7.2.5

7.6.4.1.2 Test applicability

FFS

7.6.4.1.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 7.6.4.0.1

The normative reference for this requirement is TS 38.133 [6] clause 9.7.2.5 and A.7.6.4.1.

7.6.4.1.4 Test description

One cell is deployed in the test, which is FR2 PCell (Cell 1).

7.6.4.1.4.1 Initial conditions

This test shall be tested using any of the test configurations in Table 7.6.4.1.4.1-1.

Table 7.6.4.1.4.1-1: Supported test configurations

Test Case ID	Description
7.6.4.1 - 1	NR 120 kHz SRS SCS, 100 MHz bandwidth, TDD duplex mode

Configure the test equipment and the DUT according to the parameters in Table 7.6.4.1.4.1-2.

Table 7.6.4.1.4.1-2: Initial conditions SA FR2 SRS-RSRP measurement in non-DRX

Parameter	Value		Comment
Test environment	NC		As specified in TS 38.508-1 [14] clause 4.1.
Test frequencies	As specified in Annex E, Table E.5-1 and TS 38.508-1 [14] clause 4.3.1.		
Channel bandwidth	As specified by the test configuration selected from Table 6.6.1.1.4.1-1.		
Propagation conditions	AWGN		As specified in Annex C.2.2
Connection Diagram	TE Part	A.3.3.1.1	As specified in TS 38.508-1 [14] Annex A.
	DUT Part	A.3.4.1.1	
Exceptions to connection diagram	N/A		

1. The test parameters are given in Table 7.6.4.1.4.1-3 below.

2. Message contents are defined in clause 7.6.4.1.4.3.

3. One cell is deployed in the test, which is FR2 PCell (Cell 1).. The test parameters for PSCell is given in Table A.7.6.4.1.4.1-3

4. The UE Rx beam peak direction has been obtained previously using one of the Rx Beam Peak Search procedures as described in Annex I.

Table 7.6.4.1.4.1-3: General test parameters for SRS-RSRP event triggered reporting for PCell in FR2

Parameter	Unit	Test configuration	Value	Comment
Active cell		1	Cell 1	
RF Channel Number		1	1: Cell 1	
SSB configuration		1	SSB.1 FR2	
SMTC configuration		1	SMTC.1	
SRS configuration		1	SRSConf.1	Table A.7.6.4.1.2-4
CP length		1	Normal	
i1-Threshold	dBm	1	-112	
Hysteresis	dB	1	0	
Time To Trigger	s	1	0	
Filter coefficient		1	0	L3 filtering is not used
DRX	ms	1	OFF	Non-DRX
Time offset between DL from serving cell and SRS from test system	µs	1	10.67	
T1	s	1	5	
T2	s	1	1	

7.6.4.1.4.2 Test procedure

There is one cell is deployed in the test, which is FR2 PSCell (Cell 1)

In the measurement control information, a measurement object is configured for the frequency of the PSCell, and it is indicated to the UE that event-triggered reporting with Event I1 is used. The test consists of two successive time periods, with time duration of T1 and T2, respectively.

During the test, the test system transmits SRS resource for measurement in the DL slot according to the SRS configuration in Table 7.6.4.1.5-3 and the test parameters for the (virtual) neighbour cell UE in Table 7.6.4.1.5-23.

During the test, the test system does not transmit PDCCH/PDSCH/OCNG on SRS symbol to be transmitted and on 2 data symbols before SRS to be transmitted.

1. Ensure the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity *NR*, Connected without release *On* and Test Mode *On* according to TS 38.508-1 [14] clause 4.5.
2. Set the parameters according to Table 7.6.4.1.5-1 as appropriate.
3. The SS shall transmit an RRCReconfiguration message on Cell 1 with event I1 configured..
4. The UE shall transmit an RRCReconfigurationComplete message.
5. The UE shall transmit periodically MeasurementReport messages.

<rest of the steps are FFS >

7.6.4.1.4.3 Message contents

Message contents are according to TS 38.508-1 [14] clause 7.3 with the following exceptions:

FFS

7.6.4.1.5 Test requirement

Table 7.6.4.1.5-1 defines the cell specific settings for all tests. Table 7.6.4.1.5-2 defines the OTA primary level settings including test tolerances for all tests.

Table 7.6.4.1.5-1: NR Cell specific test parameters for SA SRS-RSRP event triggered reporting for PCell in FR2

Parameter	Unit	Test configuration	Cell 1	
			T1	T2
TDD configuration		1	TDDConf.3.1	
PDSCH RMC configuration		1	SR.3.1 TDD	
RMSI CORESET RMC configuration		1	CR.3.1 TDD	
Dedicated CORESET RMC configuration		1	CCR.3.1 TDD	
OCNG Patterns		1	OP.1	
TRS configuration			TRS.2.1. TDD	
PDSCH/PDCCH TCI state		1	TCI.State.2	
Initial BWP configuration		1	DLBWP.0.1 ULBWP.0.1	
Active DL BWP configuration		1	DLBWP.1.1	
Active UL BWP configuration		1	ULBWP.1.1	
Propagation Condition		1	AWGN	

Table 7.6.4.1.5-2: NR OTA Cell specific test parameters for SA SRS-RSRP event triggered reporting for PCell and neighbour cell UE in FR2

Parameter	Unit	Test configuration	Cell 1		Neighbour cell UE	
			T1	T2	T1	T2
AoA setup		1	Setup 1 defined in A.3.15.1			
Beam assumption Note 4		1	Fine			
N_{oc} Note 2	dBm/15 kHz	1	~~-98~~-100.5		~~-98~~-100.5	
N_{oc} Note 2	dBm/SCS	1	-91.5		-91.5	
$\hat{E}_s/I_{ot}$	dB	1	-	-	-infinity	7
$\hat{E}_s/N_{oc}$	dB	1	-	-	-infinity	7

SRS-RSRP Note 3	dBm/SCS kHz	1	-	-	-infinity	-84.5
Io	dBm/95.04 MHz	1	-63.86	-56.07	-63.86	-56.07

Note 1: The resources for uplink transmission are assigned to the UE prior to the start of time period T2.
Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for N_{oc} to be fulfilled.
Note 3: SRS-RSRP levels have been derived from other parameters for information purposes. They are not settable parameters themselves.
Note 4: Information about types of UE beam is given in B.2.1.3, and does not limit UE implementation or test system implementation.
Note 5: Cell 2 doesn't transmit during the SRS and the 2 previous symbols. Es/NoC is not applied to those symbols.

Table7.6.4.1.5-3: SRS configuration for measurement reporting

	Field	SRSConf.1	Comments
SRS-ResourceSet	srs-ResourceSetId	0	
	srs-ResourceIdList	0	
	resourceType	Periodic	
	Usage	Codebook	
SRS-Resource	SRS-ResourceId	0	
	nrofSRS-Ports	Port1	
	transmissionComb	n2	
	combOffset-n2	0	
	cyclicShift-n2	0	
	resourceMapping startPosition	0	
	resourceMapping nrofSymbols	n1	
	resourceMapping repetitionFactor	n1	
	freqDomainPosition	0	
	freqDomainShift	0	
	freqHopping c-SRS	12	
	freqHopping b-SRS	0	
	freqHopping b-hop	0	
	groupOrSequenceHopping	Neither	
	resourceType	Periodic	
	periodicityAndOffset	sl40, 25	
	sequenceId	0	Any 10 bit number

The UE shall send one Event I1 triggered measurement report, with a measurement reporting delay less than 60 ms from the beginning of time period T2.

The UE shall not send event triggered measurement reports, as long as the reporting criteria are not fulfilled.

The rate of correct events observed during repeated tests shall be at least 90%.

NOTE: The actual overall delays measured in the test may be up to $2xTTI_{DCCH}$ higher than the measurement reporting delays above because of TTI insertion uncertainty of the measurement report in DCCH.

7.6.4.2 NR SA FR2 CLI-RSSI measurement in non-DRX

Editor's Note: This test case is incomplete. Following aspects are either missing or TBD

- The test applicability is FFS

- The test procedure is incomplete

- The message content is FFS

- TT analysis is missing.

7.6.4.2.1 Test purpose

The purpose of this test case is to verify that the UE makes correct reporting of CLI-RSSI measurement in non-DRX within CLI-RSSI measurement requirements in TS 38.133 [6] clause 9.7.3.5

7.6.4.2.2 Test applicability

FFS

7.6.4.2.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 7.6.4.0.1

The normative reference for this requirement is TS 38.133 [6] clause 9.7.2.5 and A.7.6.4.2.

7.6.4.2.4 Test description

One cell is deployed in the test, which is FR2 PCell (Cell 1).

7.6.4.2.4.1 Initial conditions

This test shall be tested using any of the test configurations in Table 7.6.4.2.4.1-1.

Table 7.6.4.2.4.1-1: Applicable NR configurations for FR2 CLI-RSSI test

Configuration	Description
1	NR 120 kHz SCS, 100 MHz bandwidth, TDD duplex mode

Configure the test equipment and the DUT according to the parameters in Table 7.6.4.2.4.1-2.

Table 7.6.4.2.4.1-2: Initial conditions SA FR2 CLI-RSSI measurement in non-DRX

Parameter	Value		Comment
Test environment	NC		As specified in TS 38.508-1 [14] clause 4.1.
Test frequencies	As specified in Annex E, Table E.5-1 and TS 38.508-1 [14] clause 4.3.1.		
Channel bandwidth	As specified by the test configuration selected from Table 6.6.1.1.4.1-1.		
Propagation conditions	AWGN		As specified in Annex C.2.2
Connection Diagram	TE Part	A.3.3.1.1	As specified in TS 38.508-1 [14] Annex A.
	DUT Part	A.3.4.1.1	
Exceptions to connection diagram	N/A		

1. The test parameters are given in Table 7.6.4.2.4.1-3 below.

2. Message contents are defined in clause 7.6.4.2.4.3.

3. One cell is deployed in the test, which is FR2 PCell (Cell 1).. The test parameters for PSCell is given in Table 7.6.4.2.4.1-3

4. The UE Rx beam peak direction has been obtained previously using one of the Rx Beam Peak Search procedures as described in Annex I.

Table 7.6.4.2.4.1-3: General test parameters for CLI-RSSI event triggered reporting for PCell in FR2

Parameter	Unit	Test configuration	Value	Comment
Active cell		1	NR Cell 1	
RF Channel Number		1	1: Cell 1	

SSB configuration		1	SSB.1 FR2	
SMTC configuration		1	SMTC.1	
CLI-RSSI configuration		1	CLI-RSSIConf.1	Table7.6.4.2.5-3
CP length		1	Normal	
i1-Threshold	dBm	1	-94.5	
Hysteresis	dB	1	0	
Time To Trigger	s	1	0	
Filter coefficient		1	0	L3 filtering is not used
DRX		1	OFF	Non-DRX
Time offset between DL from serving cell and OCNG from test system	µs	1	10.67	
T1	s	1	5	
T2	s	1	1	

7.6.4.2.4.2 Test procedure

There is one cell is deployed in the test, which is FR2 PSCell (Cell 1)

In the measurement control information, a measurement object is configured for the frequency of the PSCell, and it is indicated to the UE that event-triggered reporting with Event I1 is used. The test consists of two successive time periods, with time duration of T1 and T2, respectively.

During the test, the test system transmits SRS resource for measurement in the DL slot according to the SRS configuration in Table 7.6.4.2.5-3 and the test parameters for the (virtual) neighbour cell UE in Table 7.6.4.2.5-23. During the test, the test system does not transmit PDCCH/PDSCH/OCNG on SRS symbol to be transmitted and on 2 data symbols before SRS to be transmitted.

1. Ensure the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity *NR*, Connected without release *On* and Test Mode *On* according to TS 38.508-1 [14] clause 4.5.
2. Set the parameters according to Table 7.6.4.2.5-1 as appropriate.
3. The SS shall transmit an RRCReconfiguration message on Cell 1 with event I1 configured..
4. The UE shall transmit an RRCReconfigurationComplete message.
5. The UE shall transmit periodically MeasurementReport messages.

<rest of the steps are FFS >

7.6.4.2.4.3 Message contents

Message contents are according to TS 38.508-1 [14] clause 7.3 with the following exceptions:

FFS

7.6.4.2.5 Test requirement

Table 7.6.4.2.5-1 defines the cell specific settings for all tests. Table 7.6.4.2.5-2 defines the OTA primary level settings including test tolerances for all tests.

Table 7.6.4.2.5-1: : NR Cell specific test parameters for CLI-RSSI event triggered reporting for PCell in FR2

Parameter	Unit	Test configuration	Cell 1	
			T1	T2
TDD configuration		1	TDDConf.3.1	
PDSCH RMC configuration		1	SR.3.1 TDD	
PUSCH parameters		1	N/A	
RMSI CORESET RMC configuration		1	CR.3.1 TDD	

Dedicated CORESET RMC configuration		1	CCR.3.1 TDD
OCNG Patterns Note 1		1	OP.1
TRS configuration			TRS.2.1. TDD
PDSCH/PDCCH TCI state		1	TCI.State.2
Initial BWP configuration		1	DLBWP.0.1 ULBWP.0.1
Active DL BWP configuration		1	DLBWP.1.1
Active UL BWP configuration		1	ULBWP.1.1
Propagation Condition		1	AWGN
Note 1: OCNG is not transmitted in the CLI-RSSI measurement resources.			

Table 7.6.4.2.5-2: NR OTA Cell specific test parameters for CLI-RSSI event triggered reporting for PCell in FR2

Parameter	Unit	Test configuration	Cell 1	
			T1	T2
AoA setup		1	Setup 1 defined in A.3.15.1	
Beam assumption Note 3		1	Fine	Fine
N_{oc} on CLI-RSSI measurement resource Note 2	dBm/15 kHz	1	-119+TT	-108+TT
N_{oc} on CLI-RSSI measurement resource Note 2	dBm/SCS	1	-110	-99
Io on CLI-RSSI measurement resource	dBm/95.04 MHz	1	-81.01	-70.01
Io on CLI-RSSI measurement resource	dBm/1.08 MHz	1	-100.46	-89.46
Note 1: The resources for uplink transmission are assigned to the UE prior to the start of time period T2. Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for N_{oc} to be fulfilled. Note 3: Information about types of UE beam is given in B.2.1.3, and does not limit UE implementation or test system implementation.				

Table7.6.4.2.5-3: CLI-RSSI measurement resource configuration for measurement reporting

	Field	CLI-RSSIConf.1
RSSI-Resource	rssi-ResourceId	0
	rssi-SCS	120
	startPRB	0
	nrofPRBs	66
	startPosition	3
	nrofSymbols	11
	rssi-PeriodicityAndOffset	sl40, 25

The UE shall send one Event I1 triggered measurement report, with a measurement reporting delay less than 5ms from the beginning of time period T2. The nominal RSSI used to evaluate the requirement shall be based on Io.

The UE shall not send event triggered measurement reports, as long as the reporting criteria are not fulfilled.

The rate of correct events observed during repeated tests shall be at least 90%.

NOTE: The actual overall delays measured in the test may be up to $2xTTI_{DCCH}$ higher than the measurement reporting delays above because of TTI insertion uncertainty of the measurement report in DCCH.

7.6.5

7.6.6 L1-SINR measurement for beam reporting

7.6.6.0 Minimum conformance requirements

7.6.6.0.1 L1-SINR reporting with CSI-RS based CMR and no dedicated IMR configured

Same as clause 5.6.5.0.1

The normative reference for this requirement is TS 38.133 [6] clause 9.8.3, 9.8.4.1 and 9.8.5.

7.6.6.0.2 L1-SINR reporting with SSB based CMR and dedicated IMR configured

Same as clause 5.6.5.0.2

The normative reference for this requirement is TS 38.133 [6] clauses 9.8.3, 9.8.4.2 and 9.8.5.

7.6.6.0.3 L1-SINR reporting with CSI-RS based CMR and dedicated IMR configured

Same as clause 5.6.5.0.3

The normative reference for this requirement is TS 38.133 [6] clauses 99.8.3, 9.8.4.3 and 9.8.5.

7.6.6.1 NR SA FR2 CSI-RS based CMR and no dedicated IMR L1-SINR measurement in non-DRX

Editor's Note: This test case has been completed for the following configurations:

- Test frequency f ≤ 40.8 GHz
- UE PC3
- Normal conditions
- The test is incomplete for UE power classes other than PC3
- The test is incomplete for test frequencies > 40.8 GHz
- The test case is incomplete for extreme conditions

7.6.6.1.1 Test purpose

To verify that the UE makes correct reporting of L1-SINR measurement in non-DRX within L1-SINR measurement requirements in TS 38.133 [6] clause 9.8.4.1.

7.6.6.1.2 Test applicability

This test applies to all types of NR UE from Release 16 onwards and supporting L1-SINR measurement.

7.6.6.1.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 7.6.6.0.1.

The normative reference for this requirement is TS 38.133 [6] clause A.7.6.6.1.

7.6.6.1.4 Test description

7.6.6.1.4.1 Initial conditions

This test shall be tested using any of the test configurations in Table 7.6.6.1.4.1-1.

Table 7.6.6.1.4.1-1: Applicable NR configurations for FR2 CSI-RS based CMR and no dedicated IMR L1-SINR measurement

Config	Description
1	NR 120 kHz CSI-RS SCS, 100 MHz bandwidth, TDD duplex mode

Note: The UE is only required to be tested in one of the supported test configurations

Table 7.6.6.1.4.1-2: General test parameters for FR2 CSI-RS based CMR and no dedicated IMR L1-SINR measurement

Parameter	Config	Unit	Value
SSB GSCN	1		freq1
Duplex mode	1		TDD
TDD Configuration	1		TDDConf.3.1
$BW_{channel}$	1	MHz	100: $N_{RB,c}$ = 66
PDSCH Reference measurement channel	1		SR.3.1 TDD
RMSI CORESET Reference Channel	1		CR.3.1 TDD
Dedicated CORESET Reference Channel	1		CCR.3.1 TDD
SSB configuration	1		SSB.1 FR2
CSI-RS configuration	1		CSI-RS.3.3 TDD
OCNG Patterns	1		OP.1
Initial BWP Configuration	1		DLBWP.0.1 ULBWP.0.1
Dedicated BWP configuration	1		DLBWP.1.3 ULBWP.1.3
SMTC configuration	1		SMTC.1
TRS Configuration	1		TRS.2.1 TDD
PDCCH/PDSCH TCI Configuration	1		TCI.State.2
DRX configuration	1		Off
reportConfigType	1		aperiodic
reportQuantity	1		cri-SINR
reportQuantity-r16	1		cri-SINR-r16
Number of reported RS	1		2
qcl-Info	1		SSB#0 for resource#0
			SSB#1 for resource#1
reportSlotOffsetList	1		26
Propagation condition	1		AWGN
T1	1	s	5
EPRE ratio of PSS to SSS	1	dB	0
EPRE ratio of PBCH DMRS to SSS			
EPRE ratio of PBCH to PBCH DMRS			
EPRE ratio of PDCCH DMRS to SSS			
EPRE ratio of PDCCH to PDCCH DMRS			
EPRE ratio of PDSCH DMRS to SSS			
EPRE ratio of PDSCH to PDSCH DMRS			
EPRE ratio of OCNG DMRS to SSS Note 1			
EPRE ratio of OCNG to OCNG DMRS Note 1			
Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.			

Table 7.6.6.1.4.1-3: Test Environment parameters for FR2 CSI-RS based CMR and no dedicated IMR L1-SINR measurement

Parameter	Value	Comment
Test environment	NC	As specified in TS 38.508-1 [14] clause 4.1.

Test frequencies	As specified in Annex E, Table E.2-1 and TS 38.508-1 [14] clause 4.3.1 and 4.4.2.		
Channel bandwidth	As specified by the test configuration selected from Table 7.6.6.1.4.1-1.		
Propagation conditions	AWGN		As specified in Annex C.2.2.
Connection Diagram	TE Part	A.3.3.3.1-1	As specified in TS 38.508-1 [14] Annex A.
	DUT Part	A.3.4.1.1	
Exceptions to connection diagram			

1. Message contents are defined in clause 7.6.6.1.4.3.

2. The AoA setup for this test is Setup 1 as defined in clause A.9. The UE RX Beam Peak direction has been obtained previously using one of the search procedures as described in Annex I.

7.6.6.1.4.2 Test procedure

The test consists of a single time period T1, during which the UE is triggered via DCI to report L1-SINR on aperiodic CSI-RS resources. Prior to the start of the time duration T1, the UE shall be fully synchronized to PCell. UE is also configured to measure L1-SINR based on SSB. Upon receiving the DCI trigger, UE provides the report back based on the reporting configuration as defined in table 7.6.6.1.4.1-2.

1. Ensure the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity NR SA, Connected without release *On* and Test Mode *On*, according to TS 38.508-1 [14] clause 4.5.

2. Set the parameters according to T1 in Table 7.6.6.1.5-1. T1 starts.

3. After 160ms from the start of the test the SS transmits the DCI trigger in slot 8.

4. The SS shall check following requirements:

   - R1: the UE shall send L1-SINR report at slot 26 from the reception of DCI trigger. If the report is received at slot 26 from the reception of DCI trigger, the number of passed iterations for R1 is increased by one. Otherwise, the number of failed iterations for R1 is increased by one.

   - R2: the L1-SINR value of CSI-RS#1 reported by the UE is compared to the expected L1-SINR value for CSI-RS #1. If the resulting value is outside the limits in Table 7.6.6.1.5-2 or the UE fails to report the measurement value for CSI-RS #1, the number of failed iterations for R2 is increased by one. Otherwise, the number of passed iterations for R2 is increased by one.

   -R3: The DIFF SINR value of CSI-RS #0 reported by the UE is compared to the expected DIFF SINR value. If the resulting value is outside the limits in Table 7.6.6.1.5-3 or the UE fails to report the measurement value for CSI-RS #0, the number of failed iterations for R3 is increased by one. Otherwise, the number of passed iterations for R3 is increased by one.

6. The SS shall transmit *RRCRelease* message to release the RRC connection which includes the release of the established radio bearers as well as all radio resources.

7. After the RRC connection release, the SS:

   - transmits in Cell 1 a *Paging* message (including PagingRecord with ue-Identity) for the UE and ensures the UE in state RRC_CONNECTED with generic procedure parameters Connectivity NR SA, Connected without release *On* and Test Mode *On* according to TS 38.508-1 [14] clause 4.5. (if the paging fails, switches off and on the UE and ensures the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity NR SA, Connected without release *On* and Test Mode *On* according to TS 38.508-1 [14] clause 4.5.),
   or:
   - switches off and on the UE and ensures the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity NR SA, Connected without release *On* and Test Mode *On* according to TS 38.508-1 [14] clause 4.5.

8. Repeat steps 2-7 until the confidence level according to Tables G.2.3-1 in Annex G clause G.2 is achieved.

7.6.6.1.4.3 Message contents

Message contents are according to TS 38.508-1 [14] clause 7.3 with the following exceptions:

Table 7.6.6.1.4.3-1: Common Exception messages for FR2 CSI-RS based CMR and no dedicated IMR L1-SINR measurement in non-DRX

Default Message Contents	
Common contents of system information blocks exceptions	
Default RRC messages and information elements contents exceptions	Table H.3.6A-1 with conditions APERIODIC and CSI-SINR Table H.3.6A-2 with conditions CSI-RS and APERIODIC

Table 7.6.6.1.4.3-2: RadioLinkMonitoringConfig

Derivation Path: TS 38.508-1 [14], Table 4.6.3-133			
Information Element	**Value/remark**	**Comment**	**Condition**
RadioLinkMonitoringConfig ::= SEQUENCE {			
failureDetectionResourcesToAddModList SEQUENCE (SIZE(1..maxNrofFailureDetectionResources)) OF SEQUENCE {	1 entry		
purpose	both	UE is configured to perform RLM and BFD based on the SSBs.	
}			
}			

7.6.6.1.5 Test requirement

Table 7.6.6.1.5-1 defines the primary level settings including test tolerances for all tests.

Table 7.6.6.1.5-1: CSI-RS specific test parameters for NR SA FR2 CSI-RS-based L1-SINR measurement in non-DRX

Parameter	Config	Unit	CSI-RS#0	CSI-RS#1
Angle of arrival configuration	1		Setup 1 according to A.3.15.1	
Beam assumption Note 3	1		Rough	
N_{oc} Note1	1	dBm/15kHz	-105	
N_{oc} Note1	1	dBm/SSB SCS	-95.97	
$\hat{E}_s / I_{ot}$	1	dB	0	9
CSI-RS RSRP Note3	1	dBm/SSB SCS	-95.97	-86.97
Io Note2	1	dBm/95.04MHz	-63.97	-57.47
$\hat{E}_s / N_{oc}$	1	dB	0	9

Note 1: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for N_{oc} to be fulfilled.

Note 2: CSI-RS RSRP and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.

Note 3: Information about types of UE beam is given in B.2.1.3, and does not limit UE implementation or test system implementation

After 160ms from the beginning of the test, the UE shall send L1-SINR report at slot 26 from the reception of DCI triggering the L1-SINR measurement. The L1-SINR report shall include the results for both CSI-RS#0 and CSI-RS#1. Each L1-SINR measurement report shall meet the corresponding absolute accuracy requirements in Table 7.6.6.1.5-2 the corresponding relative accuracy requirements in Table 7.6.6.1.5-3.

Table 7.6.6.1.5-2: L1-SINR absolute accuracy requirements for the reported values R2

Normal Conditions	T1
Lowest reported value (CSI-RS#1)	51
Highest reported value (CSI-RS#1)	74

Table 7.6.6.1.5-3: L1-SINR relative accuracy requirements for the reported values R3

	T1
Lowest DIFF SINR reported (CSI-RS#0)	4
Highest DIFF SINR reported (CSI-RS#0)	13

The rate of correct events observed during repeated tests (R1 to R3) shall be at least 90% with a confidence level of 95%.

NOTE: The actual overall delays measured in the test may be up to $2xTTI_{DCCH}$ higher than the measurement reporting delays above because of TTI insertion uncertainty of the measurement report in DCCH.

7.6.6.2 NR SA FR2 SSB based CMR and dedicated IMR L1-SINR measurement in DRX

Editor's Note: This test case has been completed for the following configurations:

- Test frequency f ≤ 40.8 GHz
- UE PC3
- Normal conditions
- The test is incomplete for UE power classes other than PC3
- The test is incomplete for test frequencies > 40.8 GHz
- The test case is incomplete for extreme conditions

7.6.6.2.1 Test purpose

To verify that the UE makes correct reporting of L1-SINR measurement in DRX within L1-SINR measurement requirements in TS 38.133 [6] clause 9.8.4.2.

7.6.6.2.2 Test applicability

This test applies to all types of NR UE from Release 16 onwards, supporting long DRX cycle and L1-SINR measurement.

7.6.6.2.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 7.6.6.0.2.

The normative reference for this requirement is TS 38.133 [6] clause A.7.6.6.2.

7.6.6.2.4 Test description

7.6.6.2.4.1 Initial conditions

This test shall be tested using any of the test configurations in Table 7.6.6.2.4.1-1.

Table 7.6.6.2.4.1-1: Applicable NR configurations for FR2 SSB based CMR and CSI-IM based IMR L1-SINR measurement

Config	Description
1	NR 120 kHz SSB SCS, 100 MHz bandwidth, TDD duplex mode
2	NR 240 kHz SSB SCS, 100 MHz bandwidth, TDD duplex mode
Note: The UE is only required to be tested in one of the supported test configurations	

Table 7.6.6.2.4.1-2: General test parameters for FR2 SSB based CMR and CSI-IM based IMR L1-SINR measurement

Parameter	Config	Unit	Value
SSB GSCN	1~2		freq1
Duplex mode	1~2		TDD
TDD Configuration	1~2		TDDConf.3.1
$BW_{channel}$	1~2	MHz	100: $N_{RB,c}$ = 66
PDSCH Reference measurement channel	1~2		SR.3.1 TDD
RMSI CORESET Reference Channel	1~2		CR.3.1 TDD
Dedicated CORESET Reference Channel	1~2		CCR.3.1 TDD
SSB configuration	1		SSB.1 FR2
	2		SSB.2 FR2
CSI-IM configuration	1~2		CSI-IM.3.1 TDD
OCNG Patterns	1~2		OP.1
Initial BWP Configuration	1~2		DLBWP.0.1 ULBWP.0.1
Dedicated BWP configuration	1~2		DLBWP.1.3 ULBWP.1.3
SMTC configuration	1~2		SMTC.1
TRS Configuration	1~2		TRS.2.1 TDD
PDCCH/PDSCH TCI Configuration	1~2		TCI.State.2
DRX configuration	1~2		DRX.3
reportConfigType	1~2		periodic
reportQuantity-r16	1~2		ssb-Index-SINR-r16
Number of reported RS	1~2		2
L1-SINR reporting period	1~2	slot	640
T1	1~2	s	5
T2	1~2	s	2
Propagation condition	1~2		AWGN
EPRE ratio of PSS to SSS	1~2	dB	0
EPRE ratio of PBCH DMRS to SSS			
EPRE ratio of PBCH to PBCH DMRS			
EPRE ratio of PDCCH DMRS to SSS			
EPRE ratio of PDCCH to PDCCH DMRS			
EPRE ratio of PDSCH DMRS to SSS			
EPRE ratio of PDSCH to PDSCH DMRS			
EPRE ratio of OCNG DMRS to SSS Note 1			
EPRE ratio of OCNG to OCNG DMRS Note 1			
Propagation condition	1~2		AWGN
Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.			

Table 7.6.6.2.4-3: Test Environment parameters for FR2 SSB based CMR and CSI-IM based IMR L1-SINR measurement

Parameter	Value		Comment
Test environment	NC		As specified in TS 38.508-1 [14] clause 4.1.
Test frequencies	As specified in Annex E, Table E.2-1 and TS 38.508-1 [14] clause 4.3.1 and 4.4.2.		
Channel bandwidth	As specified by the test configuration selected from Table 7.6.6.2.4.1-1.		
Propagation conditions	AWGN		As specified in Annex C.2.2.
Connection Diagram	TE Part	A.3.3.3.1-1	As specified in TS 38.508-1 [14] Annex A.
	DUT Part	A.3.4.1.1	
Exceptions to connection diagram			

1. Message contents are defined in clause 7.6.6.2.4.3.

2. The AoA setup for this test is Setup 1 as defined in clause A.9. The UE RX Beam Peak direction has been obtained previously using one of the search procedures as described in Annex I.

7.6.6.2.4.2 Test procedure

Prior to the start of the time duration T1, the UE shall be configured for periodic CSI reporting in PUCCH [format 2] with a reporting periodicity as mentioned in the above table 7.6.6.2.4.1-2. Before the test, UE is configured to perform RLM, BFD and L1-SINR measurement based on the SSBs.

1. Ensure the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity NR SA, Connected without release *On* and Test Mode *On*, according to TS 38.508-1 [14] clause 4.5 and general test parameters set according to Table 6.6.4.1.4.1-2.

2. Set the parameters according to T1 in Table 7.6.6.2.5-1. T1 starts.

3. The UE shall be transmitting CSI on PUCCH with a periodicity of 640 slots.

4. When T1 expires, the SS shall set the parameters according to T2 in 7.6.6.2.5-1. T2 starts.

5. The UE shall start sending valid L1-SINR reports. The SS shall check the following requirements:

   - R1: the UE shall start to transmit valid L1-SINR reports no later than 2960ms for UE supporting power class 1 in configuration 1, no later than 2920ms for UE supporting power class 1 in configuration 2, no later than 2000ms for UE supporting power class other than 1 in configuration 1 and no later than 1960 ms for UE supporting power class other than 1 in configuration 2 from the beginning of time period T2. A valid report shall meet the absolute L1-SINR requirements for SSB#1 Table 7.6.6.2.5-2 for all test configurations. If the first valid report is received before the specified time, the number of passed iterations for R1 is increased by one. Otherwise, the number of failed iterations for R1 is increased by one.

   - R2: the UE shall transmit L1-SINR reports every 640 slots. If the reports are received accordingly, the number of passed iterations for R2 is increased by one. Otherwise, the number of failed iterations for R2 is increased by one.

   -R3: The L1-SINR value of SSB#1 reported by the UE is compared to the expected L1-SINR value for SSB#1. In all consecutive reports after the first valid value is received, if the resulting value is outside the corresponding absolute accuracy requirements in Table 7.6.6.2.5-2 for all test configurations, the number of failed iterations for R3 is increased by one. Otherwise, the number of passed iterations for R3 is increased by one.

   -R4: The DIFF-SINR value of SSB#0 reported by the UE is compared to the expected DIFF-SINR value. In all consecutive reports after the first valid value is received, if the resulting value is outside the corresponding

relative accuracy requirements in Table 7.6.6.2.5-3 for all test configurations, the number of failed iterations for R4 is increased by one. Otherwise, the number of passed iterations for R4 is increased by one.

6. The SS waits until T2 expires.

7. The SS shall transmit *RRCRelease* message to release the RRC connection which includes the release of the established radio bearers as well as all radio resources.

8. After the RRC connection release, the SS:

   - transmits in Cell 1 a *Paging* message (including PagingRecord with ue-Identity) for the UE and ensures the UE in state RRC_CONNECTED with generic procedure parameters Connectivity NR SA, Connected without release *On* and Test Mode *On* according to TS 38.508-1 [14] clause 4.5. (if the paging fails, switches off and on the UE and ensures the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity NR SA, Connected without release *On* and Test Mode *On* according to TS 38.508-1 [14] clause 4.5.),
   or:
   - switches off and on the UE and ensures the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity NR SA, Connected without release *On* and Test Mode *On* according to TS 38.508-1 [14] clause 4.5.

9. Repeat steps 2-8 until the confidence level according to Tables G.2.3-1 in Annex G clause G.2 is achieved.

7.6.6.2.4.3 Message contents

Message contents are according to TS 38.508-1 [14] clause 4.6 with the following exceptions:

Table 7.6.6.2.4.3-1: Common Exception messages for FR2 SSB based CMR and CSI-IM based IMR L1-SINR measurement

Default Message Contents	
Common contents of system information blocks exceptions	
Default RRC messages and information elements contents exceptions	Table H.3.6A-1 with conditions PERIODIC and SS-SINR and CSI-IM_IMR Table H.3.6A-2 with conditions SSB and PERIODIC Table H.3.6A-4 with condition PERIODIC Table H.3.7-1 with condition DRX.3 Table H.3.4-1

Table 7.6.6.2.4.3-2: RadioLinkMonitoringConfig

Derivation Path: TS 38.508-1 [14], Table 4.6.3-133			
Information Element	**Value/remark**	**Comment**	**Condition**
RadioLinkMonitoringConfig ::= SEQUENCE {			
failureDetectionResourcesToAddModList SEQUENCE (SIZE(1..maxNrofFailureDetectionResources)) OF SEQUENCE {	1 entry		
purpose	both	UE is configured to perform RLM and BFD based on the SSBs.	
detectionResource CHOICE {			
ssb-Index	0		
}			
}			
}			

7.6.6.2.5 Test requirement

Table 7.6.6.2.5-1 defines the primary level settings including test tolerances for all tests.

Table 7.6.6.2.5-1: SSB specific test parameters for FR2 SSB based CMR and CSI-IM based IMR L1-SINR measurement

Parameter	Config	Unit	SSB#0		SSB#1	
			T1	T2	T1	T2
Angle of arrival configuration	1~2		Setup 1 according to A.3.15.1			
Beam assumption Note 4	1~2		Rough			
N_{oc} Note2	1~2	dBm/15kHz	-105			
N_{oc} Note2	1	dBm/SSB SCS	-96			
	2		-93			
$\hat{E}_s / I_{ot}$	1~2	dB	0	0	-Infinity	9
SSB RSRP Note3	1	dBm/SSB SCS	-96	-96	-Infinity	-87
	2		-93	-93	-Infinity	-84
Io Note3	1	dBm/95.04MHz	-64	-64	-67	-57.5
	2		-64	-64	-67	-57.5
$\hat{E}_s / N_{oc}$	1~2	dB	0	0	-Infinity	9

Note 1: The resources for uplink transmission are assigned to the UE prior to the start of time period T2.
Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for N_{oc} to be fulfilled.
Note 3: SSB RSRP and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.
Note 4: Information about types of UE beam is given in B.2.1.3, and does not limit UE implementation or test system implementation

The UE shall send L1-SINR report every 640 slots. No later than X ms plus 640 slots from the beginning of time period T2, UE shall send L1-SINR report including the results for both SSB#0+CSI-IM#0 and SSB#1+CSI-IM#1 while meeting the accuracy requirements defined in clause 10.1.28.2, where X is

- 2880 for UE supporting power class 1
- 1920 for UE supporting power class 2,3 or 4.

Each L1-SINR measurement report shall meet the corresponding absolute accuracy requirements in Table 7.6.6.2.5-2 for all test configurations and the corresponding relative accuracy requirements in Table 7.6.6.2.5-3 for all test configurations.

Table 7.6.6.2.5-2: L1-SINR absolute accuracy requirements for the reported values for all test configurations R1 and R3

Normal Conditions	T1	T2
Lowest reported value (SSB#1)	-	53
Highest reported value (SSB#1)	-	72

Table 7.6.6.2.5-4: L1-SINR relative accuracy requirements for the reported values for all test configurations R4

	T1	T2
Lowest DIFF SINR reported (SSB#0)	-	5
Highest DIFF SINR reported (SSB#0)	-	12

For the test to pass, the ratio of successful reported valued for each requirement (R1 to R4) shall be at least 90% with a confidence level of 95%. Each requirement is evaluated independently of the others.

The rate of correct events observed during repeated tests shall be at least 90%.

NOTE: The actual overall delays measured in the test may be up to $2xTTI_{DCCH}$ higher than the measurement reporting delays above because of TTI insertion uncertainty of the measurement report in DCCH.

7.6.6.3 NR SA FR2 CSI-RS based CMR and dedicated IMR L1-SINR measurement in DRX

Editor's Note: This test case has been completed for the following configurations:

- Test frequency f ≤ 40.8 GHz

- UE PC3

- Normal conditions

- The test is incomplete for UE power classes other than PC3

- The test is incomplete for test frequencies > 40.8 GHz

- The test case is incomplete for extreme conditions

7.6.6.3.1 Test purpose

To verify that the UE makes correct reporting of L1-SINR measurement in DRX within L1-SINR measurement requirements in TS 38.133 [6] clause 9.8.4.3.

7.6.6.3.2 Test applicability

This test applies to all types of NR UE from Release 16 onwards and supporting long DRX cycle and L1-SINR measurement.

7.6.6.3.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 7.6.6.0.3.

The normative reference for this requirement is TS 38.133 [6] clause A.7.6.6.3.

7.6.6.3.4 Test description

7.6.6.3.4.1 Initial conditions

This test shall be tested using any of the test configurations in Table 7.6.6.3.4.1-1.

Table 7.6.6.3.4.1-1: Applicable NR configurations for FR2 CSI-RS based CMR and CSI-RS based IMR L1-SINR measurement

Config	Description
1	LTE FDD, NR 120 kHz CSI-RS SCS, 100 MHz bandwidth, TDD duplex mode
Note: The UE is only required to be tested in one of the supported test configurations	

Table 7.6.6.3.4.1-2: General test parameters for FR2 CSI-RS based CMR and CSI-RS based IMR L1-SINR measurement

Parameter	Config	Unit	Value
SSB GSCN	1		freq1
Duplex mode	1		TDD
TDD Configuration	1		TDDConf.3.1
$BW_{channel}$	1	MHz	100: $N_{RB,c}$ = 66
PDSCH Reference measurement channel	1		SR.3.1 TDD

RMSI CORESET Reference Channel	1		CR.3.1 TDD
Dedicated CORESET Reference Channel	1		CCR.3.1 TDD
SSB configuration	1		SSB.1 FR2
CSI-RS as CMR configuration	1		CSI-RS.3.3 TDD
CSI-RS as IMR configuration	1		CSI-RS.3.2A TDD
OCNG Patterns	1		OP.1
Initial BWP Configuration	1		DLBWP.0.1 ULBWP.0.1
Dedicated BWP configuration	1		DLBWP.1.3 ULBWP.1.3
SMTC configuration	1		SMTC.1
TRS Configuration	1		TRS.2.1 TDD
PDCCH/PDSCH TCI Configuration	1		TCI.State.2
DRX configuration	1		DRX.3
reportConfigType	1		aperiodic
reportQuantity-r16	1		cri-SINR-r16
Number of reported RS	1		2
qcl-Info	1		SSB#0 for resource#0 SSB#1 for resource#1
reportSlotOffsetList	1		26
T1	1	s	5
EPRE ratio of PSS to SSS	1	dB	0
EPRE ratio of PBCH DMRS to SSS			
EPRE ratio of PBCH to PBCH DMRS			
EPRE ratio of PDCCH DMRS to SSS			
EPRE ratio of PDCCH to PDCCH DMRS			
EPRE ratio of PDSCH DMRS to SSS			
EPRE ratio of PDSCH to PDSCH DMRS			
EPRE ratio of OCNG DMRS to SSS Note 1			
EPRE ratio of OCNG to OCNG DMRS Note 1			
Propagation condition	1		AWGN
Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.			

Table 7.6.6.3.4.1-3: Test Environment parameters for FR2 CSI-RS based CMR and CSI-RS based IMR L1-SINR measurement

Parameter	Value		Comment
Test environment	NC		As specified in TS 38.508-1 [14] clause 4.1.
Test frequencies	As specified in Annex E, Table E.2-1 and TS 38.508-1 [14] clause 4.3.1 and 4.4.2.		
Channel bandwidth	As specified by the test configuration selected from Table 7.6.6.3.4.1-1.		
Propagation conditions	AWGN		As specified in Annex C.2.2.
Connection Diagram	TE Part	A.3.3.3.1-1	As specified in TS 38.508-1 [14] Annex A.
	DUT Part	A.3.4.1.1	
Exceptions to connection diagram			

1. Message contents are defined in clause 7.6.6.3.4.3.

2. The AoA setup for this test is Setup 1 as defined in clause A.9. The UE RX Beam Peak direction has been obtained previously using one of the search procedures as described in Annex I.

7.6.6.3.4.2 Test procedure

The test consists of a single time period T1, during which the UE is triggered via DCI to report L1-SINR on aperiodic CSI-RS resources. Prior to the start of the time duration T1, the UE shall be fully synchronized to PCell. UE is also configured to measure L1-SINR based on SSB. Upon receiving the DCI trigger, UE provides the report back based on the reporting configuration as defined in table 7.6.6.3.4.1-2.

1. Ensure the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity NR SA, Connected without release *On* and Test Mode *On*, according to TS 38.508-1 [14] clause 4.5.

2. Set the parameters according to T1 in Table 7.6.6.3.5-1. T1 starts.

3. After 1440ms from the start of the test the SS transmits the DCI trigger in slot 8.

4. The SS shall check following requirements:

   - R1: the UE shall send L1-SINR report at slot 26 from the reception of DCI trigger. If the report is received at slot 26 from the reception of DCI trigger, the number of passed iterations for R1 is increased by one. Otherwise, the number of failed iterations for R1 is increased by one.

   - R2: the L1-SINR value of CSI-RS#1 reported by the UE is compared to the expected L1-SINR value for CSI-RS #1. If the resulting value is outside the limits in Table 7.6.6.3.5-2 or the UE fails to report the measurement value for CSI-RS #1, the number of failed iterations for R2 is increased by one. Otherwise, the number of passed iterations for R2 is increased by one.

   -R3: The DIFF SINR value of CSI-RS #0 reported by the UE is compared to the expected DIFF SINR value. If the resulting value is outside the limits in Table 7.6.6.3.5-3 or the UE fails to report the measurement value for CSI-RS #0, the number of failed iterations for R3 is increased by one. Otherwise, the number of passed iterations for R3 is increased by one.

6. The SS shall transmit *RRCRelease* message to release the RRC connection which includes the release of the established radio bearers as well as all radio resources.

7. After the RRC connection release, the SS:

   - transmits in Cell 1 a *Paging* message (including PagingRecord with ue-Identity) for the UE and ensures the UE in state RRC_CONNECTED with generic procedure parameters Connectivity NR SA, Connected without release *On* and Test Mode *On* according to TS 38.508-1 [14] clause 4.5. (if the paging fails, switches off and on the UE and ensures the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity NR SA, Connected without release *On* and Test Mode *On* according to TS 38.508-1 [14] clause 4.5.),
   or:
   - switches off and on the UE and ensures the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity NR SA, Connected without release *On* and Test Mode *On* according to TS 38.508-1 [14] clause 4.5.

8. Repeat steps 2-7 until the confidence level according to Tables G.2.3-1 in Annex G clause G.2 is achieved.

7.6.6.3.4.3 Message contents

Message contents are according to TS 38.508-1 [14] clause 7.3 with the following exceptions:

Table 7.6.6.3.4.3-1: Common Exception messages for FR2 CSI-RS based CMR and CSI-RS based IMR L1-SINR measurement

Default Message Contents	
Common contents of system information blocks exceptions	
Default RRC messages and information elements contents exceptions	Table H.3.6A-1 with conditions APERIODIC and CSI-SINR and CSI-RS_IMR Table H.3.6A-2 with conditions CSI-RS and APERIODIC Table H.3.6A-3 with conditions APERIODIC Table H.3.7-1 with condition DRX.3 Table H.3.4-1

Table 7.6.6.3.4.3-2: RadioLinkMonitoringConfig

Derivation Path: TS 38.508-1 [14], Table 4.6.3-133			
Information Element	**Value/remark**	**Comment**	**Condition**
RadioLinkMonitoringConfig ::= SEQUENCE {			
failureDetectionResourcesToAddModList SEQUENCE (SIZE(1..maxNrofFailureDetectionResources)) OF SEQUENCE {	1 entry		
purpose	both	UE is configured to perform RLM and BFD based on the SSBs.	
}			
}			

7.6.6.3.5 Test requirement

Table 7.6.6.3.5-1 defines the primary level settings including test tolerances for all tests.

Table 7.6.6.3.5-1: CSI-RS specific test parameters for NR SA FR2 CSI-RS-based CMR and CSI-RS based IMR L1-SINR measurement

Parameter	Config	Unit	CSI-RS#0	CSI-RS#1
Angle of arrival configuration	1~2		Setup 1 according to A.3.15.1	
Assumption for UE beams Note 3	1~2		Rough	
N_{oc} Note1	1~2	dBm/15kHz	-105	
N_{oc} Note1	1~2	dBm/SSB SCS	-95.97	
$\hat{E}_s / I_{ot}$	1~2	dB	1.5	9
CSI-RS RSRP Note2	1~2	dBm/SSB SCS	-94.5	-87.0
Io Note2	1~2	dBm/95.04MHz	-63.2	-57.5
$\hat{E}_s / N_{oc}$	1~2	dB	1.5	9

Note 1: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for N_{oc} to be fulfilled.

Note 2: CSI-RS RSRP and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.

Note 3: Information about types of UE beam is given in B.2.1.3, and does not limit UE implementation or test system implementation

After 1440ms from the beginning of the test, the UE shall send L1-SINR report at slot 26 from the reception of DCI triggering the L1-SINR measurement. The L1-SINR report shall include the results for both CSI-RS#0 as CMR + CSI-RS#0 as IMR and CSI-RS#1 as CMR + CSI-RS#1 as IMR. Each L1-SINR measurement report shall meet the corresponding absolute accuracy requirements in Table 7.6.6.3.5-2 the corresponding relative accuracy requirements in Table 7.6.6.3.5-3.

Table 7.6.6.3.5-2: L1-SINR absolute accuracy requirements for the reported values R2

Normal Conditions	T1
Lowest reported value (CSI-RS#1)	54
Highest reported value (CSI-RS#1)	71

Table 7.6.6.3.5-3: L1-SINR relative accuracy requirements for the reported values R3

	T1
Lowest DIFF SINR reported (CSI-RS#0)	4
Highest DIFF SINR reported (CSI-RS#0)	10

The rate of correct events observed during repeated tests (R1 to R3) shall be at least 90% with a confidence level of 95%.

NOTE: The actual overall delays measured in the test may be up to 2xTTI_{DCCH} higher than the measurement reporting delays above because of TTI insertion uncertainty of the measurement report in DCCH.

7.6.7 to 7.6.12

7.6.13.1 UE Rx-Tx time difference measurement for propagation delay compensation using PRS in FR2

Editor's note: This test case is incomplete. The following aspects are missing or TBD:

- Test purpose contains []
- Connection diagram is TBD
- Measurement Uncertainties and Test Tolerances are missing

7.6.13.1.0 Minimum conformance requirements

[38.133 clause 9.12.4.1, 9.12.5 and 10.1.25.3.1] for measurement time

When UE is configured with *prs-Ref-r17* in *MeasObjectRxTxDiff*-r17 defined in TS 38.331 [2] and provided with PRS resource configuration, the UE shall be able to measure UE Rx-Tx time difference on PCell within the measurement period $T_{UERx-Tx_PRS}$, where:

$$T_{UERxTx,PRS} = \left\lceil \frac{N_{PRS}^{slot}}{N'} \right\rceil * N_{sample} * K_{layer3} * LCM(T_{PRS}, T_{DRX})$$

Where:

N_{PRS}^{slot} is the maximum number of DL PRS resources configured in a slot,

N' is UE capability for number of DL PRS resources that it can process in a slot corresponding to *maxNumberPRS-ResourceProcessedPerSlot-r17* as specified in TS38.331 [2],

N_{sample} is the number of UE Rx-Tx time difference measurement samples and N_{sample} = 4,

T_{PRS} is the PRS resource periodicity specific for RTT-based propagation delay compensation,

T_{DRX} is the DRX cycle length when DRX is in use, 1ms otherwise.

K_{layer3} is

N_{total} / $N_{available}$, when $N_{available}$>0

Where,

- For a window W of duration LCM(T_{PRS}, MGRP, T_{SMTC}), where T_{SMTC} is the periodicity of SMTC for intra-frequency measurement without gap, starting at the beginning of any PRS resource occasion:
  - N_{total} is the total number of PRS resource occasions within the window, including those overlapped with measurement gap occasions or SMTC occasions within the window, and
  - $N_{available}$ is the number of PRS resource occasions that are not overlapped with:

- For FR2: any measurement gap occasions nor any SMTC occasions within the window W.

No requirements shall apply if $N_{available}$=0.

Editor Note: FFS requirements if concurrent measurement gaps are configured.

UE is only required to perform UE Rx-Tx time difference on PRS within the active DL BWP.

When UE is configured to perform UE Rx-Tx time difference measurement based on PRS, the requirements apply provided that the SCS of the PRS is same as that of the active BWP on PCell.

For FR2, the requirements apply if QCL information is provided for all the PRS resources in the resource set and for each resource one RS has QCL-TypeD.

If PRS resources overlap with Type 1A/1B/2 PPW, the UE is allowed longer measurement period to measure UE Rx-Tx time difference on PCell.

The UE Rx-Tx time difference measurement values contained in measurement report shall be based on the measurement report mapping requirements specified in clause 10.1.25.3, with k = 5.

The reporting range for the absolute UE Rx-Tx time difference measurement ($T_{UE\ Rx-Tx}$) is defined from -985024×Tc to 985024×Tc with the resolution step of 2*k*×Tc.

Table 7.6.13.1.0-1: Absolute UE Rx-Tx time difference measurement report mapping for *k*=5

Reported Quantity Value	Measured Quantity Value	Unit
RX-TX_TIME_DIFFERENCE_0000	$T_{UE\ Rx-Tx} < -985024$	T_c
RX-TX_TIME_DIFFERENCE_0001	$-985024 \le T_{UE\ Rx-Tx} < -984992$	T_c
RX-TX_TIME_DIFFERENCE_0002	$-984992 \le T_{UE\ Rx-Tx} < -984960$	T_c
…	…	…
RX-TX_TIME_DIFFERENCE_30782	$-32 \le T_{UE\ Rx-Tx} < 0$	T_c
RX-TX_TIME_DIFFERENCE_30783	$0 \le T_{UE\ Rx-Tx} < 32$	T_c
…	…	…
RX-TX_TIME_DIFFERENCE_61563	$984960 \le T_{UE\ Rx-Tx} < 984992$	T_c
RX-TX_TIME_DIFFERENCE_61564	$984992 \le T_{UE\ Rx-Tx} < 985024$	T_c
RX-TX_TIME_DIFFERENCE_61565	$985024 \le T_{UE\ Rx-Tx}$	T_c

[TS 38.133 clause 10.1.39.2] for measurement accuracy

The error in the reported value of UE Rx-Tx time difference measurement, including both the measurement error and the reporting quantization error, should be within the accuracy requirements specified in this clause.

The UE Rx-Tx time difference measurement accuracy requirements in this clause shall apply provided that:

- The UE transmits SRS within [-160, 160] msec of at least one PDC DL PRS resource from the serving cell (PCell).

When a serving cell change occurs during the UE Rx-Tx measurement period, the UE Rx-Tx time difference measurement accuracy requirements in this clause shall apply provided that the serving cell change does not impact SRS configuration for the UE Rx-Tx measurement.

The accuracy requirements in Table 7.6.13.1.0-2 for FR2 are valid under the following conditions:

Conditions defined in clause 7.3 of TS 38.101-2 [19] for reference sensitivity are fulfilled.

$PRP|_{dBm}$ according to Annex [TBD] for a corresponding Band.

AWGN propagation condition.

Table 7.6.13.1.0-2: UE Rx-Tx time difference measurement accuracy in FR2 in AWGN

Accuracy	Conditions				
					Io[Note 4] range

	PRS Ês/Iot	Minimum PRS bandwidth	PRS SCS	PRS resource repetition $(T_{rep}^{PRS} * L_{PRS}/K_{comb}^{PRS}$ Note 3	Minimum Io Note 1	Maximum Io
Tc Note 5	dB	RB	kHz		dBm / SCS_{PRS}	dBm/$BW_{Channel}$
± [22+δ+ε]	-3	≥[24]	60	≥[1]	Same value as PRP in Table B.2.14-2, according to UE Power class, operating band and angle of arrival	-50
± [15+δ+ε]		≥[64]		≥[1]	NOTE 6	NOTE 6
± [7+δ+ε]		≥[132]		≥[1]	NOTE 6	NOTE 6
± [12+δ+ε]		≥[32]	120	≥[1]	Same value as PRP in Table B.2.14-2, according to UE Power class, operating band and angle of arrival	-50
± [7+δ+ε]		≥[64]		≥[1]	NOTE 6	NOTE 6
± [4+δ+ε]		≥[128]		≥[1]	NOTE 6	NOTE 6

NOTE 1: This minimum Io condition is expressed as the average Io per RE over all REs in an OFDM symbol.
NOTE 2: NR operating band groups are as defined in Section 3.5.
NOTE 3: T_{rep}^{PRS}, L_{PRS}, K_{comb}^{PRS} are configured by higher layer parameter dl-PRS-ResourceRepetitionFactor, dl-PRS-NumSymbols and dl-PRS-CombSizeNdefined in TS 37.355 [34].
NOTE 4: The Io is defined in PRS slots. The same Io range applies to PRS and non-PRS symbols. Io levels are different in PRS and non-PRS symbols within the same slot.
NOTE 5: Tc is the basic timing unit defined in TS 38.211 [6].
NOTE 6: The same bands and the same Io conditions for each band apply for this requirement as for the corresponding requirement with the PRS bandwidth of the smallest RB number for the corresponding SCS.
NOTE 7: δ is the margin determined from Table 10.1.39.2-4.
NOTE 8: ε is the margin for reporting quantitization error and ε=16 Tc.

Table 7.6.13.1.0-3: Margin for UE Rx-Tx time difference measurement accuracy in FR2

Min(PRS BW, SRS BW) (MHz)		Margin (Tc Note 1)
SCS = 60 kHz	SCS = 120 kHz	
≥ 24	N/A	[76]
≥ 64	≥ 32	[32]
≥ 132	≥ 64	[24]
N/A	≥ 128	[20]

NOTE 1: Tc is the basic timing unit defined in TS 38.211 [6].
NOTE 2: If SRS and PRS have different SCS, the margin corresponding to the smallest RS BW in MHz applies.

7.6.13.1.1 UE Rx-Tx time difference measurement for propagation delay compensation using PRS in FR2 SA

7.6.13.1.1.1 Test purpose

The purpose of the test is to verify that the UE Rx-Tx measurement for RTT-based PDC meets the requirements specified in TS 38.133[6] clause 9.12.4.1 in AWGN propagation condition in FR2 in standalone scenario.

7.6.13.1.1.2 Test applicability

This test applies to all types of NR UE release 17 onwards supporting *rtt-BasedPDC-PRS-r17 or gNB-SideRTT-BasedPDC-r17.*

7.6.13.1.1.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 7.6.13.1.0.

The normative reference for this requirement is TS 38.133 [6] clauses 9.12.4.1, 9.12.5, 10.1.39.2 and A.7.6.13.1.

7.6.13.1.1.4 Test description

7.6.13.1.1.4.1 Initial conditions

This test shall be tested using any of the test configurations in Table 7.6.13.1.1.4.1-1

Table 7.6.13.1.1.4.1-1: Supported test configurations

Config	Description
7.6.13.1-1	120 kHz SSB and PRS SCS, 100 MHz bandwidth, TDD duplex mode

Configure the test requirement and the DUT according to the parameters in Table 7.6.13.1.1.4.1-2.

Table 7.6.13.1.1.4.1-2: Initial conditions for UE Tx-Rx time difference measurement for SA FR2

Parameter	Value		Comment
Test environment	NC		As specified in TS 38.508-1 [14] clause 4.1.
Test frequencies	As specified in Annex E, Table E.5-1 and TS 38.508-1 [14] clause 4.3.1.		
Channel bandwidth	As specified by the test configuration selected from Table 7.6.13.1.1.4.1-1.		
Propagation conditions	AWGN		As specified in Annex C.2.2
Connection Diagram	TE Part	TBD	As specified in TS 38.508-1 [14] Annex A.
	DUT Part	TBD	
Exceptions to connection diagram			

1. The general test parameter settings are set up according to Table 7.6.13.1.1.4.1-3.

2. Message contents are defined in clause 7.6.13.1.1.4.3.

3. The test scenario comprises of 1 NR Cell. The connection setup with the power level set according to Annex C.1.1 and C.1.2 for this test.

Table 7.6.13.1.1.4.1-3: General test parameters

Parameter	Unit	Test configuration	Value
Active cell		1	Cell 1
RF Channel Number		1	1
$BW_{channel}$	MHz	1	100: $N_{RB,c}$ = 66
SSB configuration		1	SSB.2 FR2
SMTC configuration		1	SMTC.1
Measurement gap		1	GP#24 or GP#13 Note 1
CP length		1	Normal
DRX		1	OFF
T1	s	1	5
T2	s	1	20
NOTE 1: GP#24 is configured if UE supports MG#24, otherwise GP#13 is configured.			

7.6.13.1.1.4.2 Test procedure

The test is considered with one cell (Cell 1) in FR2.

The test consists of two consecutive time intervals, with duration of T1 and T2. The Cell 1 mutes PRS transmission during T1 and transmits PRS during T2.

measObject with *measObjectRxTxDiff-r17*, and *NR-DL-PRS-PDC-Info* is defined ~~in~~ as per 7.6.13.1.1.4.3 and shall be provided to the UE during T1.

The last TTI containing the RRC configuration shall be provided to the UE ΔT ms before the start of T2, where ΔT = [TBD] ms. The UE is configured to transmit SRS during T2.

The general and cell specific test parameters for PCell is given in Table 7.6.13.1.1.4.1-3 and Table 7.6.13.1.1.5-1, respectively. In the measurement control information, a measurement object is configured for the frequency of the PCell, and. The test consists of two successive time periods, with time duration of T1, and T2 respectively.

1. Ensure the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity *NR*, Connected without release *On* and Test Mode *On* according to TS 38.508-1 [14] clause 4.5.

2. Set the parameters according to T1 in Table 7.6.13.1.1.5-1 as appropriate.

3. SS shall transmit an *RRCReconfiguration* message.

4. The UE shall transmit *RRCReconfigurationComplete* message. T1 starts.

5. When T1 expires, the SS shall switch the power setting from T1 to T2 as specified in Table 7.6.13.1.1.5-1. T2 starts.

6. The UE shall transmit periodically MeasurementReport messages.

7. After 10s wait from Step 3, the SS shall check the *result-k5-r17* reported values in the periodic MeasurementReport. The result-k5 value is outside the limits in Table 7.6.13.1.0-1 or the UE fails to report the measurement value for serving cell, the number of failed iterations is increased by one. Otherwise, the number of passed iterations is increased by one.

8. The SS shall continue checking the MeasurementReport messages transmitted by the UE until the confidence level according to Table G.2.3-1 in Annex G is achieved.

7.6.13.1.1.4.3 Message contents

Message contents are according to TS 38.508-1 [14] clause 4.6 with the following exceptions:

Default Message Contents	
Common contents of system information blocks exceptions	
Default RRC messages and information elements contents exceptions	Table 4.6.3-76B in 38.508-1 [14] with condition PRS_REF
Specific message contents exceptions for Test Configuration 7.6.13.1-1	Table 4.6.3-84AC in 38.508-1 [14] with condition SCS120

7.6.13.1.1.5 Test requirements

Table 7.6.13.1.1.4.1-3 and Table 7.6.13.1.1.5-1 define the primary level settings including test tolerances for UE Rx-Tx time difference measurement with PRS for RTT-based PDC in FR2 SA.

Table 7.6.13.1.1.5-1: Cell specific test parameters

Parameter	Unit	Test configuration	Cell 1	
			T1	T2
TDD configuration		1	TDDConf.3.1	
PDSCH RMC configuration		1	SR.3.1 TDD	
RMSI CORESET RMC configuration		1	CR.3.1 TDD	
Dedicated CORESET RMC configuration		1	CCR.3.1 TDD	
OCNG Patterns		1	OP.1	
TRS Configuration		1	TRS.2.1 TDD	
Initial BWP configuration		1	DLBWP.0.1 ULBWP.0.1	
Active DL BWP configuration		1	DLBWP.1.1	
Active UL BWP configuration		1	ULBWP.1.1	
PRS configuration		1	PRS.1.1 FR2	

PRS muting info		1	'10'	
SRS configuration		1	[PDC-SRS.3]	
N_{oc} Note 2	dBm/SCS	1	-89	
N_{oc} Note 2	dBm/15 kHz	1	-98	
PRS $\hat{E}_s/I_{ot}$	dB	1	-Infinity	-2.41
PRS $\hat{E}_s/N_{oc}$	dB	1	-Infinity	-2
PRS-RSRP Note 3	dBm/SCS kHz	1	-Infinity	-91
Io	dBm/95.04 MHz	1	N/A	-57.63
Propagation Condition		1	AWGN	

Note 1: The resources for uplink transmission are assigned to the UE prior to the start of time period T2.

Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for N_{oc} to be fulfilled.

Note 3: PRS-RSRP and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.

The UE Rx-Tx time difference measurement time shall fulfils the requirements specified in clause 7.6.13.1.0. The UE shall perform and report the UE Rx-Tx time difference measurements for Cell 1 within the specified UE Rx-Tx time difference measurement time starting from the beginning of time interval T2.

The reported UE Rx-Tx measurement for each correct event shall be within the UE Rx-Tx reporting range specified in clause 10.1.25.3.1, for k=5.

The UE Rx-Tx time difference measurement time fulfils the UE Rx-Tx measurement accuracy requirements specified in clause 7.6.13.1.0 for Cell 1.

For the test to pass, the ratio of successful reported values shall be more than 90% with a confidence level of 95%.

NOTE: The actual overall delays measured in the test may be up to $2xTTI_{DCCH}$ higher than the measurement reporting delays above because of TTI insertion uncertainty of the measurement report in DCCH.

7.7 Measurement performance requirements

7.7.1 SS-RSRP

7.7.1.0 Minimum conformance requirements

7.7.1.0.1 Intra-frequency SS-RSRP measurement accuracy requirements

Same as in clause 5.7.1.0.1.

7.7.1.0.2 Inter-frequency SS-RSRP measurement accuracy requirements

Same as in clause 5.7.1.0.2.

7.7.1.1 NR SA FR2 SS-RSRP measurement accuracy

Editor's Note: This test case has been completed for the following configurations:

- Test frequency f ≤ 40.8 GHz
- UE PC3
- Normal conditions
- The test is incomplete for UE power classes other than PC3
- The test is incomplete for test frequencies > 40.8 GHz

- The test is incomplete for extreme conditions

7.7.1.1.1 Test purpose

The purpose of this test is to verify that the intra-frequency SS-RSRP measurement accuracy is within the specified limits for all bands.

7.7.1.1.2 Test applicability

This test applies to all types of NR UE from Release 15 onwards.

7.7.1.1.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 7.7.1.0.1.

The normative reference for this requirement is TS 38.133 [6] clause A.7.7.1.1.

7.7.1.1.4 Test description

Two cells are configured in this test: Cell 1 is the NR FR2 serving cell and Cell 2 is the NR FR2 neighbour cell.

7.7.1.1.4.1 Initial conditions

This test shall be tested using any of the test configurations in Table 7.7.1.1.4.1-1.

Table 7.7.1.1.4.1-1: Supported test configurations

Configuration	Description
7.7.1.1-1	NR 120 kHz SSB SCS, 100 MHz bandwidth, FDD duplex mode
Note: The UE is only required to be tested in one of the supported test configurations	

Configure the test equipment and the DUT according to the parameters in Table 7.7.1.1.4.1-2.

Table 7.7.1.1.4.1-2: Initial conditions

Parameter	Value	Comment
Test environment	NC	As specified in TS 36.508 [25] clause 4.1.
Test frequencies	As specified in Annex E, Table E.5-1 and TS 38.508-1 [14] clause 4.3.1.	
Channel bandwidth	As specified by the selected test configuration.	
Propagation conditions	AWGN	As specified in Annex C.2.1
Connection Diagram	TE Part: A.3.3.1.1 DUT Part: A.3.4.1.1	As specified in TS 38.508-1 [14] Annex A.
Exceptions to connection diagram	N/A	

1. The general test parameter settings are set up according to Table 7.7.1.1.4.1-3.
2. Message contents are defined in clause 7.7.1.1.4.3.
3. There are two intra-frequency cells specified in the test, where Cell 1 is the NR FR2 serving cell and Cell 2 is the neighbour cell on the same NR FR2 carrier and the target cell for the SS-RSRP measurements.
4. The UE Rx beam peak direction has been obtained previously using one of the Rx Beam Peak Search procedures as described in Annex I.

7.7.1.1.4.2 Test procedure

1. Ensure the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity *NR*, Connected without release *On* and Test Mode *On* according to TS 38.508-1 [14] clause 4.5.

2. Set the parameters according to Table 7.7.1.1.5-1 as appropriate.

3. The SS shall transmit an RRCReconfiguration message on Cell 1.

4. The UE shall transmit an RRCReconfigurationComplete message.

5. The UE shall transmit periodically MeasurementReport messages.

6. After 10s wait from Step 3, the SS shall check the SS-RSRP reported values in the periodic MeasurementReport for the following requirements:

   - R1: The SS-RSRP value of Cell 1 reported by the UE is compared to the expected SS-RSRP for Cell 1. If the value is outside the limits in Table 7.7.1.1.5-3 or the UE fails to report the measurement value for Cell 1, the number of failed iterations for R1 is increased by one. Otherwise, the number of passed iterations for R1 is increased by one.

   - R2: The SS-RSRP value of Cell 2 reported by the UE is compared to the expected SS-RSRP for Cell 2. If the value is outside the limits in Table 7.7.1.1.5-3 or the UE fails to report the measurement value for Cell 2, the number of failed iterations for R2 is increased by one. Otherwise, the number of passed iterations for R2 is increased by one.

   - R3: The SS-RSRP value of Cell 2 reported by the UE is compared to the reported SS-RSRP of Cell 1. If the resulting value is outside the limits in Table 7.7.1.1.5-4 or the UE fails to report the measurement value for Cell 1 or Cell 2, the number of failed iterations for R3 is increased by one. Otherwise, the number of passed iterations for R3 is increased by one.

7. The SS shall continue checking the MeasurementReport messages transmitted by the UE until the confidence level according to Table G.2.3-1 in Annex G for each of the requirements is achieved. The evaluation of a specific requirement is concluded when the confidence level for that requirement is reached, even if more measurement reports are required for the remaining requirements.

7a. The SS shall check all the SS-RSRP reported values during Test 1 for the following requirements:

   - R9: The maximum SS-RSRP value is compared to the minimum SS-RSRP of Cell 1 reported by the UE. If the difference exceeds the limits in Table 7.7.1.1.5-3a count a fail for R9. Otherwise, R9 is passed.

   - R10: The maximum SS-RSRP value is compared to the minimum SS-RSRP of Cell 2 reported by the UE. If the difference exceeds the limits in Table 7.7.1.1.5-3a count a fail for R10. Otherwise, R10 is passed.

8. Set the parameters according to Test 2 in Table 7.7.1.1.5-2 as appropriate and repeat steps 5-7. In Step 6, the SS shall check the following requirements:

   - R4: The SS-RSRP value of Cell 1 reported by the UE is compared to the expected SS-RSRP for Cell 1. If the value is outside the limits in Table 7.7.1.1.5-3 or the UE fails to report the measurement value for Cell 1, the number of failed iterations for R4 is increased by one. Otherwise, the number of passed iterations for R4 is increased by one.

   - R5: The SS-RSRP value of Cell 2 reported by the UE is compared to the expected SS-RSRP for Cell 2. If the value is outside the limits in Table 7.7.1.1.5-3 or the UE fails to report the measurement value for Cell 2, the number of failed iterations for R5 is increased by one. Otherwise, the number of passed iterations for R5 is increased by one.

   - R6: The SS-RSRP value of Cell 2 reported by the UE is compared to the reported SS-RSRP of Cell 1. If the resulting value is outside the limits in Table 7.7.1.1.5-4 or the UE fails to report the measurement value for Cell 1 or Cell 2, the number of failed iterations for R6 is increased by one. Otherwise, the number of passed iterations for R6 is increased by one.

   - R7: The SS-RSRP value of Cell 1 reported by the UE during Test 2 is compared to the reported SS-RSRP of Cell 1 during Test 1 for the same iteration. If the resulting value is outside the limits in Table 7.7.1.1.5-5 or the UE fails to report the measurement value for Cell 1, the number of failed iterations for R7 is increased by one. Otherwise, the number of passed iterations for R7 is increased by one

   - R8: The SS-RSRP value of Cell 2 reported by the UE during Test 2 is compared to the reported SS-RSRP of Cell 2 during Test 1 for the same iteration. If the resulting value is outside the limits in Table 7.7.1.1.5-5 or

the UE fails to report the measurement value for Cell 2, the number of failed iterations for R8 is increased by one. Otherwise, the number of passed iterations for R8 is increased by one

8a. The SS shall check all the SS-RSRP reported values during Test 2 for the following requirements:

- R11: The maximum SS-RSRP value is compared to the minimum SS-RSRP of Cell 1 reported by the UE. If the difference exceeds the limits in Table 7.7.1.1.5-3a count a fail for R11. Otherwise, R11 is passed.

- R12: The maximum SS-RSRP value is compared to the minimum SS-RSRP of Cell 2 reported by the UE. If the difference exceeds the limits in Table 7.7.1.1.5-3a count a fail for R12. Otherwise, R12 is passed.

9. If more measurement reports with Test 1 configuration are needed in order to complete the evaluation R7 or R8, the SS shall set the parameters according to Table 7.7.1.1.5-2 as appropriate and repeat steps 5 to 8, evaluating R7 and / or R8 as appropriate.

7.7.1.1.4.3 Message contents

Message contents are according to TS 38.508-1 [14] clause 7.3 with the following exceptions:

Table 7.7.1.1.4.3-1: Common Exception messages

Default Message Contents	
Common contents of system information blocks exceptions	
Default RRC messages and information elements contents exceptions	Table H.3.1-1 Table H.3.1-2 Table H.3.1-3 with Condition Synchronous cells Table H.3.1-5 Table H.3.1-7 Table 7.3.1-3 in TS 38.508-1 [14] with condition SMTC.1

Table 7.7.1.1.4.3-2: ReportConfigNR-DEFAULT(Periodical)

Derivation Path: 38.508-1 [14] Table 4.6.3-142 with condition PERIODICAL			
Information Element	**Value/remark**	**Comment**	**Condition**
ReportConfigNR::= SEQUENCE {			
reportType CHOICE {			
periodical SEQUENCE {			PERIODICAL
reportQuantityCell SEQUENCE {			
rsrq	false		
sinr	false		
}			
maxReportCells	2		
}			
}			
}			

7.7.1.1.5 Test requirement

Table 7.7.1.1.5-1 defines the cell specific settings for all tests. Table 7.7.1.1.5-2 defines the OTA primary level settings including test tolerances for all tests.

The SS-RSRP measurement accuracy shall fulfil the absolute accuracy requirements in clause 7.7.1.0.1.1 and relative accuracy requirements in clause 7.7.1.0.1.2. The following eight requirements are to be verified:

During T1:

R1: Absolute accuracy of Cell 1. The UE is deemed to meet the requirement if the reported SS-RSRP is in the range shown in Table 7.7.1.1.5-3.

R2: Absolute accuracy of Cell 2. The UE is deemed to meet the requirement if the reported SS-RSRP is in the range shown in Table 7.7.1.1.5-3.

R3: Relative accuracy of Cell 2 compared with Cell 1. The UE is deemed to meet the requirement if the difference in reported SS-RSRP meets the requirements in Table 7.7.1.1.5-4.

R9: Δ(Max-Min) accuracy of Cell 1. The UE is deemed to meet the requirement if the difference between the maximum and the minimum SS-RSRP report does not exceed the limit in Table 7.7.1.1.5-3a.

R10: Δ(Max-Min) accuracy of Cell 2. The UE is deemed to meet the requirement if the difference between the maximum and the minimum SS-RSRP report does not exceed the limit in Table 7.7.1.1.5-3a.

During T2:

R4: Absolute accuracy of Cell 1. The UE is deemed to meet the requirement if the reported SS-RSRP is in the range shown in table 7.7.1.1.5-3.

R5: Absolute accuracy of Cell 2. The UE is deemed to meet the requirement if the reported SS-RSRP is in the range shown in table 7.7.1.1.5-3.

R6: Relative accuracy of Cell 2 compared with Cell 1. The UE is deemed to meet the requirement if the difference in reported SS-RSRP meets the requirements in Table 7.7.1.1.5-4.

R11: Δ(Max-Min) accuracy of Cell 1. The UE is deemed to meet the requirement if the difference between the maximum and the minimum SS-RSRP report does not exceed the limit in Table 7.7.1.1.5-3a.

R12: Δ(Max-Min) accuracy of Cell 2. The UE is deemed to meet the requirement if the difference between the maximum and the minimum SS-RSRP report does not exceed the limit in Table 7.7.1.1.5-3a.

During T1 and T2:

R7: Relative accuracy of Cell 1 during T2 compared with Cell 1 during T1. The UE is deemed to meet the requirement if the difference in reported SS-RSRP meets the requirements in Table 7.7.1.1.5-5.

R8: Relative accuracy of Cell 2 during T2 compared with Cell 2 during T1. The UE is deemed to meet the requirement if the difference in reported SS-RSRP meets the requirements in Table 7.7.1.1.5-5.

Table 7.7.1.1.5-1: SS-RSRP Intra frequency general test parameters

Parameter[Note 5]	Unit	T1		T2	
		Cell 1	Cell 2	Cell 1	Cell 2
Physical cell ID		**489**	**0**	**489**	**0**
SSB ARFCN		freq1		freq1	
Duplex mode		TDD		TDD	
TDD configuration		TDDConf.3.1		TDDConf.3.1	
$BW_{channel}$	MHz	100: $N_{RB,c}$ = 66		100: $N_{RB,c}$ = 66	
Data RBs allocated		24		24	
Downlink initial BWP configuration		DLBWP.0.1	-	DLBWP.0.1	-
Downlink dedicated BWP configuration		DLBWP.1.1	-	DLBWP.1.1	-
Uplink initial BWP configuration		ULBWP.0.1	-	ULBWP.0.1	-
Uplink dedicated BWP configuration		ULBWP.1.1	-	ULBWP.1.1	-
DRX cycle configuration		Not applicable	-	Not applicable	-
TRS configuration		TRS.2.1 TDD	-	TRS.2.1 TDD	-
TCI state		TCI.State.0	-	TCI.State.0	-
PDSCH Reference measurement channel		SR.3.2 TDD	-	SR.3.2 TDD	-
RMSI CORESET Reference Channel		CR.3.1 TDD	-	CR.3.1 TDD	-
Dedicated CORESET Reference Channel		CCR.3.1 TDD	-	CCR.3.1 TDD	-

OCNG Patterns		OP.3	OP.3	OP.3	OP.3
SSB configuration		SSB.3 FR2	SSB.3 FR2	SSB.3 FR2	SSB.3 FR2
SMTC configuration		SMTC. 1	SMTC. 1	SMTC. 1	SMTC. 1
Time offset with Cell 1	µs	-	3	-	3
PDSCH/PDCCH subcarrier spacing	kHz	120	120	120	120
EPRE ratio of PSS to SSS	dB	0	0	0	0
EPRE ratio of PBCH_DMRS to SSS					
EPRE ratio of PBCH to PBCH_DMRS					
EPRE ratio of PDCCH_DMRS to SSS					
EPRE ratio of PDCCH to PDCCH_DMRS					
EPRE ratio of PDSCH_DMRS to SSS					
EPRE ratio of PDSCH to PDSCH_DMRS					
EPRE ratio of OCNG DMRS to SSS Note 1					
EPRE ratio of OCNG to OCNG DMRS Note 1					
Propagation conditions		AWGN	AWGN	AWGN	AWGN
Antenna configuration		1x2	1x2	1x2	1x2
Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols. Note 2: Void Note 3: Void Note 4: Void Note 5: All parameters apply for configuration 1 and 2 Note 6: Void					

Table 7.7.1.1.5-2: SS-RSRP Intra frequency OTA related test parameters

Parameter	Unit	T1		T2	
		Cell 1	Cell 2	Cell 1	Cell 2
Angle of arrival configuration		Setup 1			
Assumption for UE beams Note 8		Rough			
N_{oc} Note1	dBm/15kHz Note4	-97.4		N/A	
N_{oc} Note1	dBm/SCS Note4	-88.37		N/A	
$\hat{E}_s / N_{oc}$	dB	6.0	1.4	N/A	N/A
E_s	dBm/SCS Note4			(Table B.2.2-2 Rx Beam Peak +9.8dB)	(Table B.2.2-2 Rx Beam Peak +9.8dB)
SSB_RP Note2	dBm/SCS	-82.37	-86.97	(Table B.2.2-2 Rx Beam Peak +9.8dB)	(Table B.2.2-2 Rx Beam Peak +9.8dB)
$\hat{E}_s / I_{ot}$ BB Note6	dB	2.20	-5.59	-1.77	-1.77
Io Note2	dBm/95.04 MHz Note4	-55.74		(Table B.2.2-2 Rx Beam Peak +37.40dB)	
Note 1: Where used, interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for N_{oc} to be fulfilled. Note 2: SSB_RP, Es/Iot and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves. Note 3: Void					

Note 4:	Equivalent power received by an antenna with 0 dBi gain at the centre of the quiet zone
Note 5:	Void
Note 6:	Calculation of Es/Iot_{BB} includes the effect of UE internal noise up to the value assumed for the associated Refsens requirement in clause 7.3.2 of TS 38.101-2 [3], and an allowance of 1dB for UE multi-band relaxation factor ΔMB_P from TS 38.101-2 [3] Table 6.2.1.3-4.
Note 7:	All parameters apply for configurations 1 and 2
Note 8:	Information about types of UE beam is given in B.2.1.3 of TS 38.133 [6], and does not limit UE implementation or test system implementation

Table 7.7.1.1.5-3: evaluation limits for the reported values for T1 and T2 absolute accuracy rules R1, R2, R4, R5

UE power class 3			
Normal Conditions	**Test 1 All bands**	**Test 2**	
Lowest reported value (Cell 1)	50	n257, n258, n261	31
		n260	33
		n259	FFS
Highest reported value (Cell 1)	108	n257, n258, n261	88
		n260	90
		n259	FFS
Lowest reported value (Cell 2)	46	n257, n258, n261	31
		n260	33
		n259	FFS
Highest reported value (Cell 2)	103	n257, n258, n261	88
		n260	90
		n259	FFS
Extreme Conditions	**Test 1 All bands**	**Test 2**	
Lowest reported value (Cell 1)	47+ FFS	n257, n258, n261	28 + FFS
		n260	30 + FFS
		n259	FFS
Highest reported value (Cell 1)	111+ FFS	n257, n258, n261	91 + FFS
		n260	93 + FFS
		n259	FFS
Lowest reported value (Cell 2)	46+ FFS	n257, n258, n261	28+ FFS
		n260	30+ FFS
		n259	FFS
Highest reported value (Cell 2)	106+ FFS	n257, n258, n261	91+ FFS
		n260	93+ FFS
		n259	FFS

Table 7.7.1.1.5-3a: evaluation limits for the Δ(Max-Min) reported values for each cell during each time period

UE power class 3		
Normal Conditions	**Test 1 All bands**	**Test 2 All bands**
Δ(Max-Min) reported value Cell 1	16	16
Δ(Max-Min) reported value Cell 2	16	16
Extreme Conditions	**Test 1 All bands**	**Test 2 All bands**
Δ(Max-Min) reported value Cell 1	16 + FFS	16+ FFS
Δ(Max-Min) reported value Cell 2	16 + FFS	16 + FFS

Table 7.7.1.1.5-4: evaluation limits for the reported values for T1 and T2 relative accuracy rules R3, R6

UE power class 3		
Normal Conditions	**Test 1 All bands**	**Test 2 All bands**
Lowest reported value (Cell 2 – Cell 1)	- 12	- 6
Highest reported value (Cell 2 – Cell 1)	+ 2	+ 6
Extreme Conditions	**Test 1 All bands**	**Test 2 All bands**
Lowest reported value (Cell 2 – Cell 1)	- 15+ FFS	- 9+ FFS
Highest reported value (Cell 2 – Cell 1)	+ 5+ FFS	+ 9+ FFS

Table 7.7.1.1.5-5: evaluation limits for the reported values for T2 with respect to T1 relative accuracy rules R7, R8

UE power class 3			
Test 2	**Bands**	**Normal Conditions**	**Extreme Conditions**
Lowest reported value (Cell 1 T2 – Cell 1 T1)	n257, n258, n261	- 28	- 31+ FFS
	n260	- 26	- 29+ FFS
	n259	FFS	FFS
Highest reported value (Cell 1 T2 – Cell 2 T1)	n257, n258, n261	- 12	- 9+ FFS
	n260	- 10	- 7+ FFS
	n259	FFS	FFS
Lowest reported value (Cell 2 T2 – Cell 2 T1)	n257, n258, n261	- 24	- 27+ FFS
	n260	- 21	- 24+ FFS
	n259	FFS	FFS
Highest reported value (Cell 2 T2 – Cell 2 T1)	n257, n258, n261	- 8	- 5+ FFS
	n260	- 5	- 2+ FFS
	n259	FFS	FFS

For the test to pass, the ratio of successful reported values for each requirement (R1 to R8) shall be more than 90% with a confidence level of 95%. Each requirement is evaluated independently of the others.

7.7.1.2 NR SA FR2-FR2 SS-RSRP measurement accuracy

Editor's Note: This test case has been completed for the following configurations:

- Test frequency f ≤ 40.8 GHz
- UE PC3
- Normal conditions
- The test is incomplete for UE power classes other than PC3
- The test is incomplete for test frequencies > 40.8 GHz
- The test is incomplete for extreme conditions

7.7.1.2.1 Test purpose

The purpose of this test is to verify that the inter-frequency SS-RSRP measurement accuracy is within the specified limits for all bands.

7.7.1.2.2 Test applicability

This test applies to all types of NR UE from Release 15 onwards.

7.7.1.2.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 7.7.1.0.2.

The normative reference for this requirement is TS 38.133 [6] clause A.7.7.1.2.

7.7.1.2.4 Test description

Two cells are configured in this test: Cell 1 is the NR FR2 serving cell and Cell 2 is the inter-frequency NR FR2 neighbour cell.

7.7.1.2.4.1 Initial conditions

This test shall be tested using any of the test configurations in Table 7.7.1.2.4.1-1.

Table 7.7.1.2.4.1-1: Supported test configurations

Configuration	Description
7.7.1.2-1	NR 120 kHz SSB SCS, 100 MHz bandwidth, FDD duplex mode
7.7.1.2-2	NR 240 kHz SSB SCS, 100 MHz bandwidth, TDD duplex mode
Note: The UE is only required to be tested in one of the supported test configurations	

Configure the test equipment and the DUT according to the parameters in Table 7.7.1.2.4.1-2.

Table 7.7.1.2.4.1-2: Initial conditions

Parameter	Value	Comment
Test environment	NC	As specified in TS 36.508 [25] clause 4.1.
Test frequencies	As specified in Annex E, Table E.5-1 and TS 38.508-1 [14] clause 4.3.1.	
Channel bandwidth	As specified by the selected test configuration.	
Propagation conditions	AWGN	As specified in Annex C.2.1
Connection Diagram	TE Part: A.3.3.1.1 DUT Part: A.3.4.1.1	As specified in TS 38.508-1 [14] Annex A.
Exceptions to connection diagram	N/A	

1. The general test parameter settings are set up according to Table 7.7.1.2.4.1-3.
2. Message contents are defined in clause 7.7.1.2.4.3.
3. There are two inter-frequency cells specified in the test, where Cell 1 is the serving cell on an NR FR2 carrier and Cell 2 is the neighbour cell on a different NR FR2 carrier and the target cell for the SS-RSRP measurements.
4. The rx beam peak and directions in which the UE meets the EIS spherical coverage criteria have been found with one of the procedures from Annex I.

7.7.1.2.4.2 Test procedure

1. Configure the positioning system for a valid test point as defined in A.9.4. Ensure the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity *NR*, Connected without release *On* and Test Mode *On* according to TS 38.508-1 [14] clause 4.5.
2. Set the parameters according to Table 7.7.1.2.5-1 as appropriate.
3. The SS shall transmit an RRCReconfiguration message on Cell 1.
4. The UE shall transmit an RRCReconfigurationComplete message.
5. The UE shall transmit periodically MeasurementReport messages.

6. After 10s wait from Step 3, the SS shall check the SS-RSRP reported values in the periodic MeasurementReport for the following requirements:

   - R1: The SS-RSRP value of Cell 1 reported by the UE is compared to the expected SS-RSRP for Cell 1. If the value is outside the limits in Table 7.7.1.2.5-3 or the UE fails to report the measurement value for Cell 1, the number of failed samples for R1 is increased by one. Otherwise, the number of passed samples for R1 is increased by one.

   - R2: The SS-RSRP value of Cell 2 reported by the UE is compared to the expected SS-RSRP for Cell 2. If the value is outside the limits in Table 7.7.1.2.5-3 or the UE fails to report the measurement value for Cell 2, the number of failed samples for R2 is increased by one. Otherwise, the number of passed samples for R2 is increased by one.

   - R3: The SS-RSRP value of Cell 2 reported by the UE is compared to the reported SS-RSRP of Cell 1. If the resulting value is outside the limits in Table 7.7.1.2.5-4 or the UE fails to report the measurement value for Cell 1 or Cell 2, the number of failed samples for R3 is increased by one. Otherwise, the number of passed samples for R3 is increased by one.

7. The SS shall continue checking the MeasurementReport messages transmitted by the UE until the confidence level according to Table G.2.3-1 in Annex G for each of the requirements is achieved. The evaluation of a specific requirement is concluded when the confidence level for that requirement is reached, even if more measurement reports are required for the remaining requirements.

7a. The SS shall check all the SS-RSRP reported values during Test 1 for the following requirements:

   - R7: The maximum SS-RSRP value is compared to the minimum SS-RSRP of Cell 1 reported by the UE. If the difference exceeds the limits in Table 7.7.1.2.5-3a count a fail for R7. Otherwise, R7 is passed.

   - R8: The maximum SS-RSRP value is compared to the minimum SS-RSRP of Cell 2 reported by the UE. If the difference exceeds the limits in Table 7.7.1.2.5-3a count a fail for R8. Otherwise, R8 is passed.

8. The SS shall select a new test point as defined in A.9.4 and rotate the positioning system for the selected test point.

9. Set the parameters according to Test 2 in Table 7.7.2.1.5-2 as appropriate and repeat steps 5-7. In Step 6, the SS shall check the following requirements:

   - R4: The SS-RSRP value of Cell 1 reported by the UE is compared to the expected SS-RSRP for Cell 1. If the value is outside the limits in Table 7.7.2.1.5-3 or the UE fails to report the measurement value for Cell 1, the number of failed samples for R4 is increased by one. Otherwise, the number of passed samples for R4 is increased by one.

   - R5: The SS-RSRP value of Cell 2 reported by the UE is compared to the expected SS-RSRP for Cell 2. If the value is outside the limits in Table 7.7.2.1.5-3 or the UE fails to report the measurement value for Cell 2, the number of failed samples for R5 is increased by one. Otherwise, the number of passed samples for R5 is increased by one.

   - R6: The SS-RSRP value of Cell 2 reported by the UE is compared to the reported SS-RSRP of Cell 1. If the resulting value is outside the limits in Table 7.7.2.1.5-4 or the UE fails to report the measurement value for Cell 1 or Cell 2, the number of failed samples for R6 is increased by one. Otherwise, the number of passed samples for R6 is increased by one.

10. The SS shall check all the SS-RSRP reported values during Test 1 for the following requirements:

   - R9: The maximum SS-RSRP value is compared to the minimum SS-RSRP of Cell 1 reported by the UE. If the difference exceeds the limits in Table 7.7.1.2.5-3a count a fail for R9. Otherwise, R9 is passed.

   - R10: The maximum SS-RSRP value is compared to the minimum SS-RSRP of Cell 2 reported by the UE. If the difference exceeds the limits in Table 7.7.1.2.5-3a count a fail for R10. Otherwise, R10 is passed.

7.7.1.2.4.3 Message contents

Message contents are according to TS 38.508-1 [14] clause 7.3 with the following exceptions:

Table 7.7.1.2.4.3-1: Common Exception messages

Default Message Contents	
Common contents of system information blocks exceptions	
Default RRC messages and information elements contents exceptions	Table H.3.1-1 Table H.3.1-2 with condition INTER-FREQ and GAP NEEDED Table H.3.1-3 with Conditions INTER-FREQ MO and Synchronous cells Table H.3.1-5 Table H.3.1-6 with condition Pattern #0 Table H.3.1-7 with condition INTER-FREQ Table 7.3.1-3 in TS 38.508-1 [14] with condition SMTC.1

Table 7.7.1.2.4.3-2: ReportConfigNR-DEFAULT(Periodical)

Derivation Path: 38.508-1 [14] Table 4.6.3-142 with condition PERIODICAL			
Information Element	**Value/remark**	**Comment**	**Condition**
ReportConfigNR::= SEQUENCE {			
reportType CHOICE {			
periodical SEQUENCE {			PERIODICAL
reportQuantityCell SEQUENCE {			
rsrq	false		
sinr	false		
}			
maxReportCells	2		
}			
}			
}			

7.7.1.2.5 Test requirement

Table 7.7.1.2.5-1 defines the cell specific settings for all tests. Table 7.7.1.2.5-2 defines the OTA primary level settings including test tolerances for all tests.

The SS-RSRP measurement accuracy shall fulfil the absolute accuracy requirements in clause 7.7.1.0.2.1 and relative accuracy requirements in clause 7.7.1.0.2.2. The following eight requirements are to be verified:

During T1:

R1: Absolute accuracy of Cell 1. The UE is deemed to meet the requirement if the reported SS-RSRP is in the range shown in Table 7.7.1.2.5-3 for test configuration 1 and in Table 7.7.1.2.5-4 for test configuration 2.

R2: Absolute accuracy of Cell 2. The UE is deemed to meet the requirement if the reported SS-RSRP is in the range shown in Table 7.7.1.2.5-3 for test configuration 1 and in Table 7.7.1.2.5-4 for test configuration 2 and Table 7.7.1.2.5-3a [for both configurations].

R3: Relative accuracy of Cell 2 compared with Cell 1. The UE is deemed to meet the requirement if the difference in reported SS-RSRP meets the requirements in Table 7.7.1.2.5-5.

R7: Δ(Max-Min) accuracy of Cell 1. The UE is deemed to meet the requirement if the difference between the maximum and the minimum SS-RSRP report does not exceed the limit in Table 7.7.1.2.5-3a.

R8: Δ(Max-Min) accuracy of Cell 2. The UE is deemed to meet the requirement if the difference between the maximum and the minimum SS-RSRP report does not exceed the limit in Table 7.7.1.2.5-3a.

During T2:

R4: Absolute accuracy of Cell 1. The UE is deemed to meet the requirement if the reported SS-RSRP is in the range shown in table 7.7.1.2.5-3 for test configuration 1 and in Table 7.7.1.2.5-4 for test configuration 2.

R5: Absolute accuracy of Cell 2. The UE is deemed to meet the requirement if the reported SS-RSRP is in the range shown in table 7.7.1.2.5-3 for test configuration 1 and in Table 7.7.1.2.5-4 for test configuration 2 and Table 7.7.1.2.5-3a [for both configurations].

R6: Relative accuracy of Cell 2 compared with Cell 1. The UE is deemed to meet the requirement if the difference in reported SS-RSRP meets the requirements in Table 7.7.1.2.5-5.

R9: Δ(Max-Min) accuracy of Cell 1. The UE is deemed to meet the requirement if the difference between the maximum and the minimum SS-RSRP report does not exceed the limit in Table 7.7.1.2.5-3a.

R10: Δ(Max-Min) accuracy of Cell 2. The UE is deemed to meet the requirement if the difference between the maximum and the minimum SS-RSRP report does not exceed the limit in Table 7.7.1.2.5-3a.

Table 7.7.1.2.5-1: SS-RSRP Inter frequency general test parameters

Parameter	Config	Unit	Test 1		Test 2	
			Cell 1	Cell 2	Cell 1	Cell 2
SSB ARFCN	1~2		freq1	freq2	freq1	freq2
$BW_{channel}$	1~2		100: $N_{RB,c}$ = 66		100: $N_{RB,c}$ = 66	
Data RBs allocated	1		24		24	
	2		48		48	
Gap pattern ID			0		0	
Duplex mode	1~2		TDD		TDD	
TDD configuration	1~2		TDDConf.3.1		TDDConf.3.1	
PDSCH Reference measurement channel	1		SR.3. 2 TDD	-	SR.3. 2 TDD	-
	2		SR.3.3 TDD		SR.3.3 TDD	
RMSI CORESET Reference Channel	1		CR.3.1 TDD	-	CR.3.1 TDD	-
	2		CR.3.2 TDD		CR.3.2 TDD	
Dedicated CORESET Reference Channel	1		CCR.3.1 TDD	-	CCR.3.1 TDD	-
	2		CCR.3.7 TDD		CCR.3.7 TDD	
SSB configuration	1		SSB.3 FR2		SSB.3 FR2	
	2		SSB.4 FR2		SSB.4 FR2	
PDSCH/PDCCH subcarrier spacing	1~2	kHz	120		120	
OCNG Patterns	1~2		OP.3		OP.3	
Initial BWP Configuration	1~2		DLBWP.0.1 ULBWP.0.1		DLBWP.0.1 ULBWP.0.1	
Dedicated BWP configuration	1~2		DLBWP.1.3 ULBWP.1.3		DLBWP.1.3 ULBWP.1.3	
TRS Configuration	1~2		TRS.2.1 TDD		TRS.2.1 TDD	
PDCCH/PDSCH TCI Configuration	1~2		TCI.State.2		TCI.State.2	
SMTC configuration	1~2		SMTC.1		SMTC.1	
Time offset between Cell 2 and Cell 1	1~2	μs	3		3	
EPRE ratio of PSS to SSS	1~2	dB	0	0	0	0
EPRE ratio of PBCH DMRS to SSS						
EPRE ratio of PBCH to PBCH DMRS						
EPRE ratio of PDCCH DMRS to SSS						
EPRE ratio of PDCCH to PDCCH DMRS						
EPRE ratio of PDSCH DMRS to SSS						
EPRE ratio of PDSCH to PDSCH DMRS						
EPRE ratio of OCNG DMRS to SSS Note 1						
EPRE ratio of OCNG to OCNG DMRS Note 1						
Propagation condition	1~2	-	AWGN	AWGN	AWGN	AWGN
Antenna configuration	1~2	-	1x2	1x2	1x2	1x2
Note 1: OCNG shall be used such that a constant total transmitted power spectral density is achieved for all OFDM symbols. Note 2: Void.						

Table 7.7.1.2.5-2: SS-RSRP Inter frequency OTA related test parameters

Parameter	Config	Unit	Test 1		Test 2	
			Cell 1	Cell 2	Cell 1	Cell 2
Angle of arrival configuration	1~2		Setup 4b according to clause A.9.4		Setup 4b according to clause A.9.4	
			AoA1 Spherical coverage	AoA2 Rx Beam Peak	AoA1 Spherical coverage	AoA2 Rx Beam Peak
Assumption for UE beams[Note 7]	1~2		Rough		Rough	
N_{oc} [Note1]	1,	dBm/15kHz[Note4]	-96.3	-96.3	(Table B.2.3-2 Rx Beam Peak[Note 8] -4.63dB)	(Table B.2.3-2 Rx Beam Peak[Note 8] -3.03dB)
	2		-99.3	-99.3		
N_{oc} [Note1]	1	dBm/SCS [Note4]	-87.3	-87.3	(Table B.2.3-2 Rx Beam Peak[Note 8] +4.4dB)	(Table B.2.3-2 Rx Beam Peak[Note 8] +6.0dB)
	2		-87.3	-87.3	(Table B.2.3-2 Rx Beam Peak[Note 8] +7.4dB)	(Table B.2.3-2 Rx Beam Peak[Note 8] +9.0dB)
$\hat{E}_s / N_{oc}$	1~2	dB	6.0	6.0	17.0	1.0
SSB_RP[Note2]	1	dBm/SCS	-81.3	-81.3	(Table B.2.3-2 Rx Beam Peak[Note 8] +21.4dB)	(Table B.2.3-2 Rx Beam Peak[Note 8] +7.0dB)
	2		-81.3	-81.3	(Table B.2.3-2 Rx Beam Peak[Note 8] +24.4dB)	(Table B.2. 3-2 Rx Beam Peak[Note 8] +10.0dB)
($SSB_RP_{Cell\ 1}$ – $SSB_RP_{Cell\ 2}$)	1~2	dB	0		14.40	
$\hat{E}_s / I_{ot\ BB}$[Note6]	1	dB	5.23	5.93	5.38	-1.46
	2		4. 58	5.87		
Io[Note2]	1	dBm/95.04 MHz [Note4]	-55.70	-55.70	(Table B.2.3-2 Rx Beam Peak[Note 8] +46.08dB)	(Table B.2.3-2 Rx Beam Peak[Note 8] +35.13dB)
	2		-55.7	-55.7	(Table B.2.3-2 Rx Beam Peak[Note 8] +49.09dB)	(Table B.2.3-2 Rx Beam Peak[Note 8] +38.14dB)
($Io_{freq\ 1}$ – $Io_{freq\ 2}$)	1~2	dB	0		11.95	

Note 1: Where used, interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for N_{oc} to be fulfilled.

Note 2: SSB_RP, Es/Iot, Io, ($SSB_RP_{Cell\ 2}$ – $SSB_RP_{Cell\ 1}$) and ($Io_{freq\ 2}$ – $Io_{freq\ 1}$) levels have been derived from other parameters for information purposes. They are not settable parameters themselves.

Note 3: Void

Note 4: Equivalent power received by an antenna with 0 dBi gain at the centre of the quiet zone

Note 5: Void

Note 6: Calculation of Es/Iot_{BB} includes the effect of UE internal noise up to the value assumed for the associated Refsens requirement in clause 7.3.2 of TS 38.101-2 [3], and an allowance of 1dB for UE multi-band relaxation factor ΔMB_P or ΔMB_S from TS 38.101-2 [3] Table 6.2.1.3-4.

Note 7: Information about types of UE beam is given in B.2.1.3 of TS 38.133 [6], and does not limit UE implementation or test system implementation

Note 8: The value in Table B.2.3-2 of TS 38.133 [6] is the Minimum SSB_RP for SCS_{SSB} = 120 kHz, selected according to the operating band of Cell 2 and UE power class, without $\Delta MB_{P,n}$ adjustment.

Table 7.7.1.2.5-3: evaluation limits for the reported values for T1 and T2 absolute accuracy rules R1, R2, R4, R5 for test configuration 1

UE power class 3				
Normal Conditions	**Test 1**		**Test 2**	
Lowest reported value (Cell 1)	n257, n258, n261	41	n257, n258, n261	33
	n260	39	n260	34
	n259	FFS	n259	FFS
Highest reported value (Cell 1)	All bands: 109		n257, n258, n261	101
			n260	104
			n259	FFS
Lowest reported value (Cell 2)	All bands: 52		n257, n258, n261	32
			n260	34
			n259	FFS
Highest reported value (Cell 2)	All bands: 109		n257, n258, n261	87
			n260	90
			n259	FFS
Extreme Conditions	**Test 1**		**Test 2**	
Lowest reported value (Cell 1)	n257, n258, n261	41 + FFS	n257, n258, n261	33 + FFS
	n260	39 + FFS	n260	34 + FFS
	n259	FFS	n259	FFS
Highest reported value (Cell 1)	All bands: 109 + FFS		n257, n258, n261	101 + FFS
			n260	104 + FFS
			n259	FFS
Lowest reported value (Cell 2)	All bands: 52 + FFS		n257, n258, n261	32+ FFS
			n260	34+ FFS
			n259	FFS
Highest reported value (Cell 2)	All bands: 109 + FFS		n257, n258, n261	87+ FFS
			n260	90+ FFS
			n259	FFS

Table 7.7.1.2.5-3a: evaluation limits for the Δ(Max-Min) reported absolute values for cell 2 during each time period

Normal Conditions	**Test 1 All bands**	**Test 2 All bands**
Δ(Max-Min) reported value Cell 2	16	16
Extreme Conditions	**Test 1 All bands**	**Test 2 All bands**
Δ(Max-Min) reported value Cell 2	16 + FFS	16 + FFS

Table 7.7.1.2.5-4: evaluation limits for the reported values for T1 and T2 absolute accuracy rules R1, R2, R4, R5 for test configuration 2

UE power class 3				
Normal Conditions	**Test 1**		**Test 2**	
Lowest reported value (Cell 1)	n257, n258, n261	41	n257, n258, n261	36
	n260	39	n260	37
	n259	FFS	n259	FFS
Highest reported value (Cell 1)	All bands: 109		n257, n258, n261	104
			n260	107
			n259	FFS
Lowest reported value (Cell 2)	All bands: 52		n257, n258, n261	35
			n260	37
			n259	FFS

Highest reported value (Cell 2)	All bands: 109		n257, n258, n261	90
			n260	93
			n259	FFS
Extreme Conditions	**Test 1**		**Test 2**	
Lowest reported value (Cell 1)	n257, n258, n261	41 + FFS	n257, n258, n261	36 + FFS
	n260	39 + FFS	n260	37 + FFS
	n259	FFS	n259	FFS
Highest reported value (Cell 1)	All bands: 109 + FFS		n257, n258, n261	104 + FFS
			n260	107 + FFS
			n259	FFS
Lowest reported value (Cell 2)	All bands: 52 + FFS		n257, n258, n261	35+ FFS
			n260	37+ FFS
			n259	FFS
Highest reported value (Cell 2)	All bands: 109 + FFS		n257, n258, n261	90+ FFS
			n260	93+ FFS
			n259	FFS

Table 7.7.1.2.5-5: evaluation limits for the reported values for T1 and T2 relative accuracy rules R3, R6

UE power class 3				
Normal Conditions	**Test 1**		**Test 2 All bands**	
Lowest value (RSRP report Cell 2 – RSRP report Cell 1)	All bands: -15		-29	
Highest value (RSRP report Cell 2 – RSRP report Cell 1)	n257, n258, n261	+25	n257, n258, n261	+11
	n260	+27	n260	+13
	n259	FFS	n259	FFS
Extreme Conditions	**Test 1**		**Test 2 All bands**	
Lowest value (RSRP report Cell 2 – RSRP report Cell 1)	-15 + FFS		-29+ FFS	
Highest value (RSRP report Cell 2 – RSRP report Cell 1)	n257, n258, n261	+25 + FFS	n257, n258, n261	+11 + FFS
	n260	+27+ FFS	n260	+13 + FFS
	n259	FFS	n259	FFS

For the test to pass, the ratio of successful reported values for each requirement (R1 to R6) shall be more than 90% with a confidence level of 95%. Each requirement is evaluated independently of the others.

7.7.1.3 Inter-frequency measurements between FR1 and FR2

7.7.1.3.1 NR SA FR1-FR2 SS-RSRP measurement accuracy

Editor's Note: This test case has been completed for the following configurations:

- Test frequency f ≤ 40.8 GHz
- UE PC3
- Normal conditions
- The test is incomplete for UE power classes other than PC3
- The test is incomplete for test frequencies > 40.8 GHz
- The test is incomplete for extreme conditions
- NR FR1 - FR2 OTA testability is still FFS.

7.7.1.3.1.1 Test Purpose

The purpose of this test is to verify that the inter-frequency SS-RSRP absolute measurement accuracy with FR1 serving cell and FR2 target cell.

7.7.1.3.1.2 Test applicability

This test applies to all types of NR UE release 15 onwards.

7.7.1.3.1.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 7.7.1.0.2.

The normative reference for this requirement is TS 38.133 [6] clause A.7.7.1.3.

7.7.1.3.1.4 Test description

7.7.1.3.1.4.1 Initial conditions

This test shall be tested using any of the test configurations in Table 7.7.1.3.1.4.1-1.

Table 7.7.1.3.1.4.1-1: Applicable NR configurations for FR1 inter-frequency SS-RSRP accuracy test

Config	Description of serving cell	Description of target cell
7.7.1.3.1-1	NR 15 kHz SSB SCS, 10MHz bandwidth, FDD duplex mode	120 kHz SSB SCS, 100MHz bandwidth, TDD duplex mode
7.7.1.3.1-2	NR 15 kHz SSB SCS, 10MHz bandwidth, TDD duplex mode	
7.7.1.3.1-3	NR 30kHz SSB SCS, 40MHz bandwidth, TDD duplex mode	

Configure the test equipment and the DUT according to the parameters in Table 7.7.1.3.1.4.1-2.

Table 7.7.1.3.1.4.1-2: Initial conditions for NR SA FR1-FR2 SS-RSRP absolute measurement accuracy

Parameter	Value		Comment
Test environment	NC, TL/VL, TL/VH, TH/VL, TH/VH		As specified in TS 38.508-1 [14] clause 4.1.
Test frequencies	As specified in Annex E, table E.4-1 and TS 38.508-1 [14] clause 4.3.1.		
Channel bandwidth	As specified by the test configuration selected from Table 7.7.1.3.1.4.1-1.		
Propagation conditions	AWGN		As specified in Annex C.2.2.
Connection Diagram	TE Part	A.3.3.1.1	As specified in TS 38.508-1 [14] Annex A.
	DUT Part	A.3.4.1.1	
Exceptions to connection diagram	N/A		

1. Message contents are defined in clause 7.7.1.3.1.4.3.

2. Cell 1 is the NR FR1 serving cell (PCell) and Cell 2 is the NR FR2 neighbour cell (the target cell for SS-RSRP measurements) on a different frequency than the PCell. The connection setup is done according to the settings in Annex C.1.1 and C.1.2.

3. The directions in which the UE meets the EIS spherical coverage criteria have been found with one of the procedures from Annex I.

7.7.1.3.1.4.2 Test procedure

1. Configure the positioning system for a valid test point as defined in A.9.2. Ensure the UE is in state RRC_CONNECTED with generic procedure parameters *Connectivity* NR, Connected without release *On* and Test Mode *On* according to TS 38.508-1 [14] clause 4.5.

2. Set the parameters according to Table 7.7.1.3.5-1 as appropriate.

3. The SS shall transmit an *RRCConnectionReconfiguration* message on Cell 1.

4. The UE shall transmit an *RRCConnectionReconfigurationComplete* message.

5. The UE shall transmit periodically MeasurementReport messages.

6. After 10s wait from Step 3, the SS shall check the SS-RSRP reported values in the periodic MeasurementReport for the following requirements:

   - R1: The SS-RSRP value of Cell 2 reported by the UE is compared to the expected SS-RSRP for Cell 2. If the value is outside the limits in Table 7.7.1.3.5-3 or the UE fails to report the measurement value for Cell 2, the number of failed iterations for R1 is increased by one. Otherwise, the number of passed iterations for R1 is increased by one.

7. The SS shall continue checking the MeasurementReport messages transmitted by the UE until the confidence level according to Table G.2.3-1 in Annex G for each of the requirements is achieved. The evaluation of a specific requirement is concluded when the confidence level for that requirement is reached, even if more measurement reports are required for the remaining requirements.

8. The SS shall select a new test point as defined in A.9.2 and rotate the positioning system for the selected test point.

9. Set the parameters according to Test 2 in Table 7.7.1.3.5-2 as appropriate and repeat steps 5-7. In Step 6, the SS shall check the following requirements:

   - R2: The SS-RSRP value of Cell 2 reported by the UE is compared to the expected SS-RSRP for Cell 2. If the value is outside the limits in Table 7.7.1.3.5-3 or the UE fails to report the measurement value for Cell 2, the number of failed iterations for R2 is increased by one. Otherwise, the number of passed iterations for R2 is increased by one.

7.7.1.3.1.4.3 Message contents

Message contents are according to TS 38.508-1 [14] clause 7.3 with the following exceptions:

Table 7.7.1.3.1.4.3-1: Common Exception messages for NR SA FR1-FR2 SS-RSRP absolute measurement accuracy

Default Message Contents	
Common contents of system information blocks exceptions	
Default RRC messages and information elements contents exceptions	Table H.3.1-1 Table H.3.1-2 with Condition INTER-FREQ and GAP NEEDED Table H.3.1-3 with Condition SSB.1 FR1 and Synchronous cells Table H.3.1-5 Table H.3.1-6 with condition Pattern #0 Table H.3.1-7 with Condition INTER-FREQ Table 7.3.1-3 in TS 38.508-1 [14] with condition SMTC.1

Table 7.7.1.3.1.4.3-2: ReportConfigNR-DEFAULT

Derivation Path: TS 38.508-1 [14] Table 4.6.3-142 with Condition PERIODICAL			
Information Element	**Value/remark**	**Comment**	**Condition**
ReportConfigNR::= SEQUENCE {			
reportType CHOICE {			
periodical SEQUENCE {			PERIODICAL
reportQuantityCell SEQUENCE {			
rsrq	false		
sinr	false		
}			
maxReportCells	2		
}			
}			
}			

7.7.1.3.1.5 Test requirement

Table 7.7.1.3.1.5-1 and Table 7.7.1.3.1.5-2 define the primary level settings including test tolerances for all tests.

Each SS-RSRP measurement report for each of the tests in Table 7.7.1.3.1.5-1 and 7.7.1.3.1.5-2 shall meet the corresponding absolute accuracy requirements in Table 7.7.1.3.1.5-3.

Table 7.7.1.3.1.5-1: SS-RSRP inter-frequency test parameters

Parameter	Config	Unit	Test 1		Test 2	
			Cell 1	Cell 2	Cell 1	Cell 2
SSB ARFCN	1~3		freq1	freq2	freq1	freq2
$BW_{channel}$	1	MHz	10: $N_{RB,c}$ = 52	100: $N_{RB,c}$ = 66	10: $N_{RB,c}$ = 52	100: $N_{RB,c}$ = 66
	2		10: $N_{RB,c}$ = 52		10: $N_{RB,c}$ = 52	
	3		40: $N_{RB,c}$ = 106		40: $N_{RB,c}$ = 106	
Duplex mode	1		FDD	TDD	FDD	TDD
	2		TDD		TDD	
	3		TDD		TDD	
TDD configuration	1		N/A	TDDConf. 3.1	N/A	TDDConf. 3.1
	2		TDDConf. 1.1		TDDConf. 1.1	
	3		TDDConf. 2.1		TDDConf. 2.1	
PDSCH Reference measurement channel	1		SR.1.1 FDD	-	SR.1.1 FDD	-
	2		SR.1.1 TDD		SR.1.1 TDD	
	3		SR.2.1 FDD		SR.2.1 FDD	
RMSI CORESET Reference Channel	1		CR.1.1 FDD	-	CR.1.1 FDD	-
	2		CR.1.1 TDD	-	CR.1.1 TDD	-
	3		CR.2.1 FDD	-	CR.2.1 FDD	-
Dedicated CORESET Reference Channel	1		CCR.1.1 FDD	-	CCR.1.1 FDD	-
	2		CCR.1.1 TDD	-	CCR.1.1 TDD	-
	3		CCR.2.1 TDD	-	CCR.2.1 TDD	-
SSB configuration	1		SSB.1 FR1	SSB.1 FR2	SSB.1 FR1	SSB.1 FR2
	2		SSB.1 FR1		SSB.1 FR1	
	3		SSB.2 FR1		SSB.2 FR1	
OCNG Patterns	1~3		OP.1		OP.1	
Initial BWP Configuration	1~3		DLBWP.0.1 ULBWP.0.1		DLBWP.0.1 ULBWP.0.1	
Dedicated BWP configuration	1~3		DLBWP.1.3 ULBWP.1.3		DLBWP.1.3 ULBWP.1.3	
TRS Configuration	1~3		TRS.2.1 TDD		TRS.2.1 TDD	
PDCCH/PDSCH TCI Configuration	1~3		TCI.State.2		TCI.State.2	
SMTC configuration	1~3		SMTC.1		SMTC.1	
Time offset between Cell 1 and Cell 2	1~3	µs	3		3	
EPRE ratio of PSS to SSS	1~3	dB	0	0	0	0
EPRE ratio of PBCH DMRS to SSS						
EPRE ratio of PBCH to PBCH DMRS						
EPRE ratio of PDCCH DMRS to SSS						
EPRE ratio of PDCCH to PDCCH DMRS						
EPRE ratio of PDSCH DMRS to SSS						
EPRE ratio of PDSCH to PDSCH DMRS						
EPRE ratio of OCNG DMRS to SSS Note 1						
EPRE ratio of OCNG to OCNG DMRS Note 1						

Propagation condition	1~3	-	NA Link only, see TS 38.133 [6] clause A.3.7A	AWGN	NA Link only, see TS 38.133 [6] clause A.3.7A	AWGN
Antenna configuration	1~3	-		1x2		1x2

Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.
Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for N_{oc} to be fulfilled.

Table 7.7.1.3.5-2: SS-RSRP inter-frequency OTA related test parameters

Parameter	Config	Unit	Test 1		Test 2 NOTE 3	
			Cell 1	Cell 2	Cell 1	Cell 2
Angle of arrival configuration according to clause A.9			NA	Setup 2b	NA	Setup 2b
Assumption for UE beams Note 4			N/A	Rough	N/A	Rough
N_{oc}	1~6	dBm/15 kHz	NA Link only, see clause A.3.7A of TS 38.133 [6]	-95.5	NA Link only, see clause A.3.7A of TS 38.133 [6]	NA
N_{oc}	1~6	dBm/SSB SCS		-86.47		NA
$\hat{E}_s/N_{oc}$	1~6	dB		5		NA
E_s	1~6	dBm/SCS		NA		(Table B.2.3-2 Spherical coverage +6.5dB)
SSB_RP Note1	1~6	dBm/SCS		-81.47		(Table B.2.3-2 Spherical coverage +6.5dB)
$\hat{E}_s/I_{otBB}$ Note6	1~6	dB		4.35		1.69
Io Note1	1~6	dBm/ 95.04MHz		-55.68		SSB_RP+34.48

Note 1: Es/Iot, SSB_RP and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.
Note 2: Void
Note 3: No additional noise is added by the test system in Test 2.
Note 4: Information about types of UE beam is given in B.2.1.3, of TS 38.133 [6] and does not limit UE implementation or test system implementation.
Note 5: Where used, interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for N_{OC} to be fulfilled.
Note 6: Calculation of Es/Iot_{BB} includes the effect of UE internal noise up to the value assumed for the associated Refsens requirement in clause 7.3.2 of TS 38.101-2 [2], and an allowance of 1dB for UE multi-band relaxation factor ΔMB_S from TS 38.101-2 [2] Table 6.2.1.3-4.

Table 7.7.1.3.5-3: evaluation limits for the reported values for Test 1 and Test 2 absolute accuracy rules R1, R2

UE power class 3				
Normal Conditions	**Test 1**		**Test 2**	
Lowest reported value (Cell 2)	n257, n258, n261	46	n257, n258, n261	46
	n260	45	n260	47
	n259	FFS	n259	FFS
Highest reported value (Cell 2)	n257, n258, n261	103	n257, n258, n261	101
	n260	102	n260	104
	n259	FFS	n259	FFS
Extreme Conditions	**Test 1**		**Test 2**	
Lowest reported value (Cell 2)	n257, n258, n261	FFS	n257, n258, n261	FFS
	n260	FFS	n260	FFS
	n259	FFS	n259	FFS
Highest reported value (Cell 2)	n257, n258, n261	FFS	n257, n258, n261	FFS
	n260	FFS	n260	FFS
	n259	FFS	n259	FFS

For the test to pass, the ratio of successful reported values in each test shall be more than 90% with a confidence level of 95%.

7.7.1.3.2 Void

7.7.2 SS-RSRQ

7.7.2.0 Minimum conformance requirements

7.7.2.0.1 Intra-frequency SS-RSRQ measurement accuracy requirements

Same as in clause 5.7.2.0.1.

7.7.2.0.2 Inter-frequency SS-RSRQ measurement accuracy requirements

Same as in clause 5.7.2.0.2.

7.7.2.1 NR SA FR2 SS-RSRQ measurement accuracy

Editor's Note: This test case has been completed for the following configurations:

- Test frequency f ≤ 40.8 GHz
- UE PC3
- Normal conditions
- The test is incomplete for UE power classes other than PC3
- The test is incomplete for test frequencies > 40.8 GHz
- The test is incomplete for extreme conditions

7.7.2.1.1 Test purpose

The purpose of this test is to verify that the intra-frequency SS-RSRQ measurement accuracy is within the specified limits for all bands.

7.7.2.1.2 Test applicability

This test applies to all types of NR UE from Release 15 onwards.

7.7.2.1.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 7.7.2.0.1.

The normative reference for this requirement is TS 38.133 [6] clause A.7.7.2.1.

7.7.2.1.4 Test description

Two cells are configured in this test: Cell 1 is the NR FR2 serving cell and Cell 2 is the intra-frequency NR FR2 neighbour cell.

7.7.2.1.4.1 Initial conditions

This test shall be tested using any of the test configurations in Table 7.7.2.1.4.1-1.

Table 7.7.2.1.4.1-1: Supported test configurations

Configuration	Description
7.7.2.1-1	NR 120 kHz SSB SCS, 100 MHz bandwidth, FDD duplex mode
Note: The UE is only required to be tested in one of the supported test configurations	

Configure the test equipment and the DUT according to the parameters in Table 7.7.2.1.4.1-2.

Table 7.7.2.1.4.1-2: Initial conditions

Parameter	Value	Comment
Test environment	NC	As specified in TS 36.508 [25] clause 4.1.
Test frequencies	As specified in Annex E, Table E.5-1 and TS 38.508-1 [14] clause 4.3.1.	
Channel bandwidth	As specified by the selected test configuration.	
Propagation conditions	AWGN	As specified in Annex C.2.1
Connection Diagram	TE Part: A.3.3.1.1 DUT Part: A.3.4.1.1	As specified in TS 38.508-1 [14] Annex A.
Exceptions to connection diagram	N/A	

1. The general test parameter settings are set up according to Table 7.7.2.1.4.1-3.
2. Message contents are defined in clause 7.7.2.1.4.3.
3. There are two intra-frequency cells specified in the test, where Cell 1 is the NR FR2 serving cell and Cell 2 is the neighbour cell on the same NR FR2 carrier and the target cell for the SS-RSRQ measurements.
4. The UE Rx beam peak direction has been obtained previously using one of the Rx Beam Peak Search procedures as described in Annex I.

7.7.2.1.4.2 Test procedure

1. Ensure the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity *NR*, Connected without release *On* and Test Mode *On* according to TS 38.508-1 [14] clause 4.5.
2. Set the parameters according to Table 7.7.2.1.5-1 as appropriate.
3. The SS shall transmit an RRCReconfiguration message on Cell 1.
4. The UE shall transmit an RRCReconfigurationComplete message.
5. The UE shall transmit periodically MeasurementReport messages.
6. After 10s wait from Step 3, the SS shall check the SS-RSRQ reported values in the periodic MeasurementReport. The SS-RSRQ value of Cell 2 reported by the UE is compared to the expected SS-RSRQ.

If the value is outside the limits in Table 7.7.2.1.5-3 or the UE fails to report the measurement value for Cell 2, the number of failed iterations is increased by one. Otherwise, the number of passed iterations is increased by one.

7. The SS shall continue checking the MeasurementReport messages transmitted by the UE until the confidence level according to Table G.2.3-1 in Annex G is achieved.

8. Set the parameters according to each sub-test in Table 7.7.2.1.5-2 as appropriate and repeat steps 5-7.

7.7.2.1.4.3 Message contents

Message contents are according to TS 38.508-1 [14] clause 7.3 with the following exceptions:

Table 7.7.2.1.4.3-1: Common Exception messages

Default Message Contents	
Common contents of system information blocks exceptions	
Default RRC messages and information elements contents exceptions	Table H.3.1-1 Table H.3.1-2 Table H.3.1-3 with Condition Synchronous cells Table H.3.1-5 Table H.3.1-7 Table 7.3.1-3 in TS 38.508-1 [14] with condition SMTC.1

Table 7.7.2.1.4.3-2: ReportConfigNR-DEFAULT(Periodical)

Derivation Path: 38.508-1 [14] Table 4.6.3-142 with condition PERIODICAL			
Information Element	**Value/remark**	**Comment**	**Condition**
ReportConfigNR::= SEQUENCE {			
reportType CHOICE {			
periodical SEQUENCE {			PERIODICAL
reportQuantityCell SEQUENCE {			
rsrp	false		
sinr	false		
}			
maxReportCells	2		
}			
}			
}			

7.7.2.1.5 Test requirement

Table 7.7.2.1.5-1 defines the cell specific settings for all tests. Table 7.7.2.1.5-2 defines the OTA primary level settings including test tolerances for all tests.

Each SS-RSRQ measurement report for each of the tests in Table 7.7.2.1.5-2 shall meet the corresponding absolute accuracy requirements in Table 7.7.2.1.5-3.

Table 7.7.2.1.5-1: SS-RSRQ Intra frequency test parameters

Parameter		Unit	Test 1		Test 2	
			Cell 1	Cell 2	Cell 1	Cell 2
SSB ARFCN			Freq1		Freq1	
Duplex mode			TDD		TDD	
TDD configuration			TDDConf.3.1		TDDConf.3.1	
$BW_{channel}$		MHz	100: $N_{RB,c}$ = 66		100: $N_{RB,c}$ = 66	
BWP configuration	Initial DL BWP		DLBWP.0.1			
	Dedicated DL BWP		DLBWP.1.1			
	Initial UL BWP		ULBWP.0.1			
	Dedicated UL BWP		ULBWP.1.1			
TRS configuration			TRS.2.1 TDD		TRS.2.1 TDD	

TCI state		TCI.State .0		TCI.Sta te.0	
PDSCH Reference measurement channel		SR.3.1 TDD		SR.3.1 TDD	
RMSI CORESET Reference Channel		CR.3.1 TDD	-	CR.3.1 TDD	
Control channel RMC		CCR.3.1 TDD	-	CCR.3. 1 TDD	-
OCNG Patterns		OP.1	OP.1	OP.1	OP.1
SMTC configuration		SMTC.1			
SSB configuration		SSB.3 FR2	SSB.3 FR2	SSB.3 FR2	SSB.3 FR2
PDSCH/PDCCH subcarrier spacing	kHz	120	120	120	120
SS-RSSI-Measurement		Not Applicable			
EPRE ratio of PSS to SSS	dB	0	0	0	0
EPRE ratio of PBCH_DMRS to SSS					
EPRE ratio of PBCH to PBCH_DMRS					
EPRE ratio of PDCCH_DMRS to SSS					
EPRE ratio of PDCCH to PDCCH_DMRS					
EPRE ratio of PDSCH_DMRS to SSS					
EPRE ratio of PDSCH to PDSCH_DMRS					
EPRE ratio of OCNG DMRS to SSS Note 1					
EPRE ratio of OCNG to OCNG DMRS Note 1					
Propagation condition		AWGN		AWGN	
Antenna Configuration		1x2		1x2	
Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols. Note 2: Void Note 3: Void Note 4: Void Note 5: Void.					

Table 7.7.2.1.5-2: SS-RSRQ Intra frequency OTA related test parameters

Parameter	Unit	Test 1		Test 2	
		Cell 1	Cell 2	Cell 1	Cell 2
Angle of arrival configuration		Setup 1		Setup 1	
Assumption for UE beams Note 9		Rough			
N_{oc} Note1	dBm/15kHz Note4	-100.7		-96.7	
N_{oc} Note1	dBm/SCS Note 3	-91.67		-87.67	
SSB_RP Note2	dBm/SCS Note4	-88.67	-88.67	-90.67	-90.67
SS-RSRQ Note2	dB	-14.81	-14.81	-16.84	-16.84
$\hat{E}_s / I_{ot}$	dB	-1.76	-1.76	-4.76	-4.76
$\hat{E}_s / N_{oc}$	dB	3	3	-3	-3
Io Note2	dBm/95.04 MHz Note4	-55.7		-55.67	-55.67

Note 1: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for N_{oc} to be fulfilled.
Note 2: SS-RSRQ, SSB_RP, and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.
Note 3: SS-RSRQ and SSB_RP minimum requirements are specified assuming independent interference and noise at each receiver antenna port.
Note 4: Equivalent power received by an antenna with 0dBi gain at the centre of the quiet zone
Note 5: As observed with 0dBi gain antenna at the centre of the quiet zone
Note 6: Void.
Note 7: Void
Note 8: Void
Note 9: Information about types of UE beam is given in B.2.1.3 of TS 38.133 [6], and does not limit UE implementation or test system implementation

Table 7.7.2.1.5-3: SS-RSRQ Intra frequency absolute accuracy requirements for the reported values

UE Power Class 3	Test 1 (All bands)	Test 2	
Normal Conditions			
Lowest reported value (Cell 2)	SS-RSRQ_41	n257, n258, n261	SS-RSRQ_35
		n260	SS-RSRQ_34
		n259	FFS
Highest reported value (Cell 2)	SS-RSRQ_73	All bands	SS-RSRQ_71
Extreme Conditions			
Lowest reported value (Cell 2)	SS-RSRQ_38+ FFS	n257, n258, n261	SS-RSRQ_34+ FFS
		n260	SS-RSRQ_33+ FFS
		n259	FFS
Highest reported value (Cell 2)	SS-RSRQ_76+ FFS	All bands	SS-RSRQ_72+ FFS

For the test to pass, the ratio of successful reported values in each test shall be more than 90% with a confidence level of 95%.

7.7.2.2 NR SA FR2-FR2 SS-RSRQ measurement accuracy

Editor's Note: This test case has been completed for the following configurations:

- Test frequency f ≤ 40.8 GHz

- UE PC3

- Normal conditions

- The test is incomplete for UE power classes other than PC3

- The test is incomplete for test frequencies > 40.8 GHz

- The test is incomplete for extreme conditions

7.7.2.2.1 Test purpose

The purpose of this test is to verify that the inter-frequency SS-RSRP measurement accuracy is within the specified limits for all bands.

7.7.2.2.2 Test applicability

This test applies to all types of NR UE from Release 15 onwards.

7.7.2.2.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 7.7.2.0.2.

The normative reference for this requirement is TS 38.133 [6] clause A.7.7.2.2.

7.7.2.2.4 Test description

Two cells are configured in this test: Cell 1 is the NR FR2 serving cell and Cell 2 is the inter-frequency NR FR2 neighbour cell.

7.7.2.2.4.1 Initial conditions

This test shall be tested using any of the test configurations in Table 7.7.2.2.4.1-1.

Table 7.7.2.2.4.1-1: Supported test configurations

Configuration	Description
7.7.2.2-1	NR 120 kHz SSB SCS, 100 MHz bandwidth, FDD duplex mode
Note: The UE is only required to be tested in one of the supported test configurations	

Configure the test equipment and the DUT according to the parameters in Table 7.7.2.2.4.1-2.

Table 7.7.2.2.4.1-2: Initial conditions

Parameter	Value	Comment
Test environment	NC	As specified in TS 36.508 [25] clause 4.1.
Test frequencies	As specified in Annex E, Table E.5-1 and TS 38.508-1 [14] clause 4.3.1.	
Channel bandwidth	As specified by the selected test configuration.	
Propagation conditions	AWGN	As specified in Annex C.2.1
Connection Diagram	TE Part: A.3.3.1.1 DUT Part: A.3.4.1.1	As specified in TS 38.508-1 [14] Annex A.
Exceptions to connection diagram	N/A	

1. The general test parameter settings are set up according to Table 7.7.2.2.4.1-3.
2. Message contents are defined in clause 7.7.2.2.4.3.
3. There are two inter-frequency cells specified in the test, where Cell 1 is the serving cell on an NR FR2 carrier and Cell 2 is the neighbour cell on a different NR FR2 carrier and the target cell for the SS-RSRQ measurements.
4. The UE Rx beam peak direction has been obtained previously using one of the Rx Beam Peak Search procedures as described in Annex I.

7.7.2.2.4.2 Test procedure

1. Ensure the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity *NR*, Connected without release *On* and Test Mode *On* according to TS 38.508-1 [14] clause 4.5.
2. Set the parameters according to Table 7.7.2.2.5-1 as appropriate.
3. The SS shall transmit an RRCReconfiguration message on Cell 1.
4. The UE shall transmit an RRCReconfigurationComplete message.
5. The UE shall transmit periodically MeasurementReport messages.
6. After 10s wait from Step 3, the SS shall check the SS-RSRQ reported values in the periodic MeasurementReport for the following requirements:

   - R1: The SS-RSRQ value of Cell 1 reported by the UE is compared to the expected SS-RSRQ for Cell 1. If the value is outside the limits in Table 7.7.2.2.5-3 or the UE fails to report the measurement value for Cell 1, the

number of failed iterations for R1 is increased by one. Otherwise, the number of passed iterations for R1 is increased by one.

- R2: The SS-RSRQ value of Cell 2 reported by the UE is compared to the expected SS-RSRQ for Cell 2. If the value is outside the limits in Table 7.7.2.2.5-3 or the UE fails to report the measurement value for Cell 2, the number of failed iterations for R2 is increased by one. Otherwise, the number of passed iterations for R2 is increased by one.

- R3: The SS-RSRQ value of Cell 2 reported by the UE is compared to the reported SS-RSRQ of Cell 1. If the resulting value is outside the limits in Table 7.7.2.2.5-4 or the UE fails to report the measurement value for Cell 1 or Cell 2, the number of failed iterations for R3 is increased by one. Otherwise, the number of passed iterations for R3 is increased by one.

7. The SS shall continue checking the MeasurementReport messages transmitted by the UE until the confidence level according to Table G.2.3-1 in Annex G is achieved.

8. Set the parameters according to each sub-test in Table 7.7.2.2.5-2 as appropriate and repeat steps 5-7. In Step 6, the SS shall check the following requirements:

- R4: The SS-RSRQ value of Cell 1 reported by the UE is compared to the expected SS-RSRQ for Cell 1. If the value is outside the limits in Table 7.7.2.2.5-3 or the UE fails to report the measurement value for Cell 1, the number of failed iterations for R4 is increased by one. Otherwise, the number of passed iterations for R4 is increased by one.

- R5: The SS-RSRQ value of Cell 2 reported by the UE is compared to the expected SS-RSRQ for Cell 2. If the value is outside the limits in Table 7.7.2.2.5-3 or the UE fails to report the measurement value for Cell 2, the number of failed iterations for R5 is increased by one. Otherwise, the number of passed iterations for R5 is increased by one.

- R6: The SS-RSRQ value of Cell 2 reported by the UE is compared to the reported SS-RSRQ of Cell 1. If the resulting value is outside the limits in Table 7.7.2.2.5-4 or the UE fails to report the measurement value for Cell 1 or Cell 2, the number of failed iterations for R6 is increased by one. Otherwise, the number of passed iterations for R6 is increased by one.

7.7.2.2.4.3 Message contents

Message contents are according to TS 38.508-1 [14] clause 7.3 with the following exceptions:

Table 7.7.2.2.4.3-1: Common Exception messages

Default Message Contents	
Common contents of system information blocks exceptions	
Default RRC messages and information elements contents exceptions	Table H.3.1-1 Table H.3.1-2 with condition INTER-FREQ and GAP NEEDED Table H.3.1-3 with Conditions INTER-FREQ MO and Synchronous cells Table H.3.1-5 Table H.3.1-6 with condition Pattern #0 Table H.3.1-7 with condition INTER-FREQ Table 7.3.1-3 in TS 38.508-1 [14] with condition SMTC.1

Table 7.7.2.2.4.3-2: ReportConfigNR-DEFAULT(Periodical)

Derivation Path: 38.508-1 [14] Table 4.6.3-142 with condition PERIODICAL			
Information Element	**Value/remark**	**Comment**	**Condition**
ReportConfigNR::= SEQUENCE {			
reportType CHOICE {			
periodical SEQUENCE {			PERIODICAL
reportQuantityCell SEQUENCE {			
rsrp	false		
sinr	false		
}			
maxReportCells	2		
}			

}			
}			

7.7.2.2.5 Test requirement

Table 7.7.2.2.5-1 defines the cell specific settings for all tests. Table 7.7.2.2.5-2 defines the OTA primary level settings including test tolerances for all tests.

The SS-RSRQ measurement accuracy shall fulfil the absolute accuracy requirements in clause 7.7.2.0.2.1 and relative accuracy requirements in clause 7.7.2.0.2.2. The following eight requirements are to be verified:

During T1:

R1: Absolute accuracy of Cell 1. The UE is deemed to meet the requirement if the reported SS-RSRQ is in the range shown in Table 7.7.2.2.5-3.

R2: Absolute accuracy of Cell 2. The UE is deemed to meet the requirement if the reported SS-RSRQ is in the range shown in Table 7.7.2.2.5-3.

R3: Relative accuracy of Cell 2 compared with Cell 1. The UE is deemed to meet the requirement if the difference in reported SS-RSRQ meets the requirements in Table 7.7.2.2.5-4.

During T2:

R4: Absolute accuracy of Cell 1. The UE is deemed to meet the requirement if the reported SS-RSRQ is in the range shown in table 7.7.2.2.5-3.

R5: Absolute accuracy of Cell 2. The UE is deemed to meet the requirement if the reported SS-RSRQ is in the range shown in table 7.7.2.2.5-3.

R6: Relative accuracy of Cell 2 compared with Cell 1. The UE is deemed to meet the requirement if the difference in reported SS-RSRQ meets the requirements in Table 7.7.2.2.5-4.

Table 7.7.2.2.5-1: SS-RSRQ Inter frequency general test parameters

Parameter	Unit	Test 1		Test 2	
		Cell 1	Cell 2	Cell 1	Cell 2
SSB ARFCN		Freq1	freq2	freq1	Freq2
SSB Configuration		SSB.1 FR2	SSB.1 FR2	SSB.1 FR2	SSB.1 FR2
Duplex mode		TDD		TDD	
TDD configuration		TDDConf.3.1		TDDConf.3.1	
$BW_{channel}$	MHz	100: $N_{RB,c}$ = 66		100: $N_{RB,c}$ = 66	
Data RBs allocated		66		66	
Downlink initial BWP configuration		DLBW P.0.1	-	DLBW P.0.1	-
Downlink dedicated BWP configuration		DLBW P.1.1	-	DLBW P.1.1	-
Uplink initial BWP configuration		ULBW P.0.1	-	ULBW P.0.1	-
Uplink dedicated BWP configuration		ULBW P.1.1	-	ULBW P.1.1	-
DRX cycle configuration		Not applicable	-	Not applicable	-
TRS configuration		TRS.2.1 TDD	-	TRS.2.1 TDD	-
TCI state		TCI.State.0	-	TCI.State.0	-
PDSCH Reference measurement channel		SR.3.1 TDD	-	SR.3.1 TDD	-
RMSI CORESET Reference Channel		CR.3.1 TDD	-	CR.3.1 TDD	-
OCNG Patterns		OP.1	OP.1	OP.1	OP.1

SMTC configuration		SMTC. 1 FR2	SMTC. 1 FR2	SMTC. 1 FR2	SMTC. 1 FR2
PDSCH/PDCCH subcarrier spacing	kHz	120	120	120	120
EPRE ratio of PSS to SSS	dB	0	0	0	0
EPRE ratio of PBCH_DMRS to SSS					
EPRE ratio of PBCH to PBCH_DMRS					
EPRE ratio of PDCCH_DMRS to SSS					
EPRE ratio of PDCCH to PDCCH_DMRS					
EPRE ratio of PDSCH_DMRS to SSS					
EPRE ratio of PDSCH to PDSCH_DMRS					
EPRE ratio of OCNG DMRS to SSS Note 1					
EPRE ratio of OCNG to OCNG DMRS Note 1					
Propagation conditions		AWGN	AWGN	AWGN	AWGN
Antenna configuration		1x2	1x2	1x2	1x2
Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols. Note 2: Void Note 3: Void Note 4: Void					

Table 7.7.2.2.5-2: SS-RSRQ Inter frequency OTA related test parameters

Parameter	Unit	Test 1		Test 2	
		Cell 1	Cell 2	Cell 1	Cell 2
AoA setup		Setup 1		Setup 1	
Assumption for UE beams Note 8		Rough		Rough	
N_{oc} Note1	dBm/15kHz Note4	-95.93	-95.93	-95.44	-95.44
N_{oc} Note1	dBm/SCS Note 3	-86.9	-86.9	-86.41	-86.41
$\hat{E}_s / N_{oc}$	dB	-1.75	-1.75	-3	-3
SSB_RP Note2	dBm/SCS Note4	-88.65	-88.65	-89.41	-89.41
SS-RSRQ Note2	dB	-14.75	-14.75	-15.56	-15.56
$\hat{E}_s / I_{ot}$	dB	-1.75	-1.75	-3	-3

Io[Note2]	dBm/95.04 MHz [Note4]	-55.7	-55.7	-55.7	-55.7

Note 1: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for N_{oc} to be fulfilled.
Note 2: SS-RSRQ, SSB_RP, and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.
Note 3: SS-RSRQ and SS-RSRP minimum requirements are specified assuming independent interference and noise at each receiver antenna port.
Note 4: Equivalent power received by an antenna with 0dBi gain at the centre of the quiet zone
Note 5: As observed with 0dBi gain antenna at the centre of the quiet zone
Note 6: Void
Note 7: Void
Note 8: Information about types of UE beam is given in B.2.1.3 of TS 38.133 [6], and does not limit UE implementation or test system implementation

Table 7.7.2.2.5-3: evaluation limits for the reported values for T1 and T2 absolute accuracy rules R1, R2, R4, R5

UE power class 3		
Normal Conditions	**Test 1 All bands**	**Test 2 All bands**
Lowest reported value (Cell 1)	RSRQ_41	RSRQ_37
Highest reported value (Cell 1)	RSRQ_73	RSRQ_74
Lowest reported value (Cell 2)	RSRQ_41	RSRQ_37
Highest reported value (Cell 2)	RSRQ_73	RSRQ_74
Extreme Conditions	**Test 1 All bands**	**Test 2 All bands**
Lowest reported value (Cell 1)	RSRQ_41 + FFS	RSRQ_37 + FFS
Highest reported value (Cell 1)	RSRQ_73 + FFS	RSRQ_74 + FFS
Lowest reported value (Cell 2)	RSRQ_41 + FFS	RSRQ_37 + FFS
Highest reported value (Cell 2)	RSRQ_73 + FFS	RSRQ_74 + FFS

Table 7.7.2.2.5-4: evaluation limits for the reported values for T1 and T2 relative accuracy rules R3, R6

UE power class 3		
Normal Conditions	**Test 1 All bands**	**Test 2 All bands**
Lowest value (RSRQ report Cell 2 – RSRQ report Cell 1)	- 7	- 9
Highest value (RSRQ report Cell 2 – RSRQ report Cell 1)	+ 7	+ 9
Extreme Conditions	**Test 1 All bands**	**Test 2 All bands**
Lowest value (RSRQ report Cell 2 – RSRQ report Cell 1)	– 7 + FFS	– 9 + FFS
Highest value (RSRQ report Cell 2 – RSRQ report Cell 1)	+ 7 + FFS	+ 9 + FFS

For the test to pass, the ratio of successful reported values for each requirement (R1 to R6) shall be more than 90% with a confidence level of 95%. Each requirement is evaluated independently of the others.

7.7.3 SS-SINR

7.7.3.0 Minimum conformance requirements

7.7.3.0.1 Intra-frequency SS-SINR measurement accuracy requirements

Same as in clause 5.7.3.0.1.

7.7.3.0.2 Inter-frequency SS-SINR measurement accuracy requirements

Same as in clause 5.7.3.0.2.

7.7.3.1 NR SA FR2 SS-SINR measurement accuracy

Editor's Note: This test case has been completed for the following configurations:

- Test frequency f ≤ 40.8 GHz
- UE PC3
- Normal conditions
- The test is incomplete for UE power classes other than PC3
- The test is incomplete for test frequencies > 40.8 GHz
- The test is incomplete for extreme conditions

7.7.3.1.1 Test purpose

The purpose of this test is to verify that the intra-frequency SS-SINR measurement accuracy is within the specified limits for all bands.

7.7.3.1.2 Test applicability

This test applies to all types of NR UE from Release 15 onwards supporting ss-SINR-Meas.

7.7.3.1.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 7.7.3.0.1.

The normative reference for this requirement is TS 38.133 [6] clause A.7.7.3.1.

7.7.3.1.4 Test description

Two cells are configured in this test: Cell 1 is the NR FR2 serving cell and Cell 2 is the intra-frequency NR FR2 neighbour cell.

7.7.3.1.4.1 Initial conditions

This test shall be tested using any of the test configurations in Table 7.7.3.1.4.1-1.

Table 7.7.3.1.4.1-1: Supported test configurations

Configuration	Description
7.7.3.1-1	NR 120 kHz SSB SCS, 100 MHz bandwidth, FDD duplex mode
Note: The UE is only required to be tested in one of the supported test configurations	

Configure the test equipment and the DUT according to the parameters in Table 7.7.3.1.4.1-2.

Table 7.7.3.1.4.1-2: Initial conditions

Parameter	Value	Comment
Test environment	NC	As specified in TS 36.508 [25] clause 4.1.
Test frequencies	As specified in Annex E, Table E.5-1 and TS 38.508-1 [14] clause 4.3.1.	
Channel bandwidth	As specified by the selected test configuration.	
Propagation conditions	AWGN	As specified in Annex C.2.1
Connection Diagram	TE Part: A.3.3.1.1 DUT Part: A.3.4.1.1	As specified in TS 38.508-1 [14] Annex A.
Exceptions to connection diagram	N/A	

1. The general test parameter settings are set up according to Table 7.7.3.1.4.1-3.
2. Message contents are defined in clause 7.7.3.1.4.3.
3. There are two intra-frequency cells specified in the test, where Cell 1 is the NR FR2 serving cell and Cell 2 is the neighbour cell on the same NR FR2 carrier and the target cell for the SS-SINR measurements.
4. The UE Rx beam peak direction has been obtained previously using one of the Rx Beam Peak Search procedures as described in Annex I.

7.7.3.1.4.2 Test procedure

1. Ensure the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity *NR*, Connected without release *On* and Test Mode *On* according to TS 38.508-1 [14] clause 4.5.
2. Set the parameters according to Table 7.7.3.1.5-1 as appropriate.
3. The SS shall transmit an RRCReconfiguration message on Cell 1.
4. The UE shall transmit an RRCReconfigurationComplete message.
5. The UE shall transmit periodically MeasurementReport messages.
6. After 10s wait from Step 3, the SS shall check the SS-SINR reported values in the periodic MeasurementReport. The SS-SINR value of Cell 2 reported by the UE is compared to the expected SS-SINR. If the value is outside the limits in Table 7.7.3.1.5-2 or the UE fails to report the measurement value for Cell 2, the number of failed iterations is increased by one. Otherwise, the number of passed iterations is increased by one.
7. The SS shall continue checking the MeasurementReport messages transmitted by the UE until the confidence level according to Table G.2.3-1 in Annex G is achieved.
8. Set the parameters according to each sub-test in Table 7.7.3.1.5-1 as appropriate and repeat steps 5-7.

7.7.3.1.4.3 Message contents

Message contents are according to TS 38.508-1 [14] clause 7.3 with the following exceptions:

Table 7.7.3.1.4.3-1: Common Exception messages

Default Message Contents	
Common contents of system information blocks exceptions	
Default RRC messages and information elements contents exceptions	Table H.3.1-1 Table H.3.1-2 Table H.3.1-3 with Condition Synchronous cells Table H.3.1-5 Table H.3.1-7 Table 7.3.1-3 in TS 38.508-1 [14] with condition SMTC.1

Table 7.7.3.1.4.3-2: ReportConfigNR-DEFAULT(Periodical)

Derivation Path: 38.508-1 [14] Table 4.6.3-142 with condition PERIODICAL			
Information Element	**Value/remark**	**Comment**	**Condition**
ReportConfigNR::= SEQUENCE {			
reportType CHOICE {			
periodical SEQUENCE {			PERIODICAL
reportQuantityCell SEQUENCE {			
rsrp	false		
rsrq	false		
}			
maxReportCells	2		
}			
}			
}			

7.7.3.1.5 Test requirement

Table 7.7.3.1.5-1 defines the cell specific settings for all tests. Table 7.7.3.1.5-2 defines the OTA primary level settings including test tolerances for all tests.

Each SS-SINR measurement report for each of the tests in Table 7.7.3.1.5-2 shall meet the corresponding absolute accuracy requirements in Table 7.7.3.1.5-3.

Table 7.7.3.1.5-1: SS-SINR Intra frequency test parameters

Parameter	**Unit**	**Test 1**		**Test 2**	
		Cell 1	**Cell 2**	**Cell 1**	**Cell 2**
SSB ARFCN		**Freq2**		**Freq2**	
Duplex mode		TDD		TDD	
TDD configuration		TDDConf.3.1		TDDConf.3.1	
$BW_{channel}$	MHz	100: $N_{RB,c}$ = 66		100: $N_{RB,c}$ = 66	
Downlink initial BWP configuration		DLBWP.0.1			
Downlink dedicated BWP configuration		DLBWP.1.1			
Uplink initial BWP configuration		ULBWP.0.1			
Uplink dedicated BWP configuration		ULBWP.1.1			
DRX cycle configuration	ms	Not applicable			
TRS configuration		TRS.2.1 TDD			
TCI state		TCI.State.0			
PDSCH Reference measurement channel		SR.3.1 TDD		SR.3.1 TDD	
RMSI CORESET Reference Channel		CR.3.1 TDD	-	CR.3.1 TDD	-
Dedicated RMSI CORESET Reference Channel		CCR.3 .1 TDD	-	CCR.3. 1 TDD	-
OCNG Patterns		OP.1	OP.1	OP.1	OP.1
SMTC configuration		SMTC.1			
SSB configuration		SSB.3 FR2	SSB.3 FR2	SSB.3 FR2	SSB.3 FR2
PDSCH/PDCCH subcarrier spacing	kHz	120	120	120	120
SS-RSSI-Measurement		Not Applicable			
EPRE ratio of PSS to SSS	dB	0	0	0	0
EPRE ratio of PBCH_DMRS to SSS					
EPRE ratio of PBCH to PBCH_DMRS					
EPRE ratio of PDCCH_DMRS to SSS					
EPRE ratio of PDCCH to PDCCH_DMRS					
EPRE ratio of PDSCH_DMRS to SSS					
EPRE ratio of PDSCH to PDSCH_DMRS					
EPRE ratio of OCNG DMRS to SSS Note 1					
EPRE ratio of OCNG to OCNG DMRS Note 1					
Propagation condition		AWGN		AWGN	
Antenna Configuration		1x2		1x2	

Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.
Note 2: Void.
Note 3: Void
Note 4: Void

Table 7.7.3.1.5-2: SS-SINR Intra frequency OTA related test parameters

Parameter		Unit	Test 1		Test 2	
			Cell 1	Cell 2	Cell 1	Cell 2
Angle of arrival configuration			Setup 1		Setup 1	
Assumption for UE beams Note 9			Rough		Rough	
N_{oc} Note1		dBm/15kHz Note4	-105		-105	
N_{oc} Note1		dBm/SCS Note3	-96		-96	
SSB_RP Note2		dBm/SCS Note4	-91.46	-93.34	-98.8	-98.8
SS-SINR Note2	n257, 258, n261	dB	-0.18	-3.32	-4.95	-4.95
	n260		-0.31	-3.42	-5.20	-5.20
	n259		-0.39	-3.48	-5.48	-5.48
$\hat{E}_s / I_{ot}$	n257, 258, n261	dB	-0.18	-3.32	-4.95	-4.95
	n260		-0.31	-3.42	-5.20	-5.20
	n259		-0.39	-3.48	-5.48	-5.48
$\hat{E}_s / N_{oc}$		dB	4.54	2.66	-3	-3
Io Note2		dBm/95.04 MHz Note4	-59.43		-63.87	

Note 1: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for N_{oc} to be fulfilled.
Note 2: SS-SINR, SSB_RP, and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.
Note 3: SS-SINR and SSB_RP minimum requirements are specified assuming independent interference and noise at each receiver antenna port.
Note 4: Equivalent power received by an antenna with 0dBi gain at the centre of the quiet zone
Note 5: As observed with 0dBi gain antenna at the centre of the quiet zone
Note 6: Void.
Note 7: Void
Note 8: Void
Note 9: Information about types of UE beam is given in B.2.1.3 of TS 38.133 [6], and does not limit UE implementation or test system implementation

Table 7.7.3.1.5-3: SS-SINR Intra frequency absolute accuracy requirements for the reported values

UE Power Class 3	Test 1		Test 2	
Normal Conditions				
Lowest reported value (Cell 2)	n257, n258, n261	SS-SINR_22	All bands	SS-SINR_18
	n260	SS-SINR_21		
	n259	FFS		
Highest reported value (Cell 2)	All bands	SS-SINR_58	n257, n258, n261	SS-SINR_55
			n260	SS-SINR_54
			n259	FFS
Extreme Conditions				
Lowest reported value (Cell 2)	n257, n258, n261	SS-SINR_21+ FFS	All bands	SS-SINR_17+ FFS
	n260	SS-SINR_20+ FFS		
	n259	FFS		
Highest reported value (Cell 2)	All bands	SS-SINR_59+ FFS	n257, n258, n261	SS-SINR_56+ FFS

			n260	SS-SINR_55+ FFS
			n259	FFS

For the test to pass, the ratio of successful reported values in each test shall be more than 90% with a confidence level of 95%.

7.7.3.2 NR SA FR2-FR2 SS-SINR measurement accuracy

Editor's Note: This test case has been completed for the following configurations:

- Test frequency f ≤ 40.8 GHz

- UE PC3

- Normal conditions

- The test is incomplete for UE power classes other than PC3

- The test is incomplete for test frequencies > 40.8 GHz

- The test is incomplete for extreme conditions

7.7.3.2.1 Test purpose

The purpose of this test is to verify that the inter-frequency SS-SINR measurement accuracy is within the specified limits for all bands.

7.7.3.2.2 Test applicability

This test applies to all types of NR UE from Release 15 onwards supporting ss-SINR-Meas.

7.7.3.2.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 7.7.3.0.2.

The normative reference for this requirement is TS 38.133 [6] clause A.7.7.3.2.

7.7.3.2.4 Test description

Two cells are configured in this test: Cell 1 is the NR FR2 serving cell and Cell 2 is the inter-frequency NR FR2 neighbour cell.

7.7.3.2.4.1 Initial conditions

This test shall be tested using any of the test configurations in Table 7.7.3.2.4.1-1.

Table 7.7.3.2.4.1-1: Supported test configurations

Configuration	Description
7.7.3.2-1	NR 120 kHz SSB SCS, 100 MHz bandwidth, FDD duplex mode
Note: The UE is only required to be tested in one of the supported test configurations	

Configure the test equipment and the DUT according to the parameters in Table 7.7.3.2.4.1-2.

Table 7.7.3.2.4.1-2: Initial conditions

Parameter	Value	Comment
Test environment	NC	As specified in TS 36.508 [25] clause 4.1.
Test frequencies	As specified in Annex E, Table E.5-1 and TS 38.508-1 [14] clause 4.3.1.	
Channel bandwidth	As specified by the selected test configuration.	
Propagation conditions	AWGN	As specified in Annex C.2.1

Connection Diagram	TE Part: A.3.3.1.1 DUT Part: A.3.4.1.1	As specified in TS 38.508-1 [14] Annex A.
Exceptions to connection diagram	N/A	

1. The general test parameter settings are set up according to Table 7.7.3.2.4.1-3.
2. Message contents are defined in clause 7.7.3.2.4.3.
3. There are two inter-frequency cells specified in the test, where Cell 1 is the serving cell on an NR FR2 carrier and Cell 2 is the neighbour cell on a different NR FR2 carrier and the target cell for the SS-SINR measurements.
4. The UE Rx beam peak direction has been obtained previously using one of the Rx Beam Peak Search procedures as described in Annex I.

7.7.3.2.4.2 Test procedure

1. Ensure the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity *NR*, Connected without release *On* and Test Mode *On* according to TS 38.508-1 [14] clause 4.5.
2. Set the parameters according to Table 7.7.3.2.5-1 as appropriate.
3. The SS shall transmit an RRCReconfiguration message on Cell 1.
4. The UE shall transmit an RRCReconfigurationComplete message.
5. The UE shall transmit periodically MeasurementReport messages.
6. After 10s wait from Step 3, the SS shall check the SS-SINR reported values in the periodic MeasurementReport for the following requirements:

   - R1: The SS-SINR value of Cell 1 reported by the UE is compared to the expected SS-SINR for Cell 1. If the value is outside the limits in Table 7.7.3.2.5-3 or the UE fails to report the measurement value for Cell 1, the number of failed iterations for R1 is increased by one. Otherwise, the number of passed iterations for R1 is increased by one.

   - R2: The SS-SINR value of Cell 2 reported by the UE is compared to the expected SS-SINR for Cell 2. If the value is outside the limits in Table 7.7.3.2.5-3 or the UE fails to report the measurement value for Cell 2, the number of failed iterations for R2 is increased by one. Otherwise, the number of passed iterations for R2 is increased by one.

   - R3: The SS-SINR value of Cell 2 reported by the UE is compared to the reported SS-SINR of Cell 1. If the resulting value is outside the limits in Table 7.7.3.2.5-4 or the UE fails to report the measurement value for Cell 1 or Cell 2, the number of failed iterations for R3 is increased by one. Otherwise, the number of passed iterations for R3 is increased by one.

7. The SS shall continue checking the MeasurementReport messages transmitted by the UE until the confidence level according to Table G.2.3-1 in Annex G is achieved.
8. Set the parameters according to each sub-test in Table 7.7.3.2.5-2 as appropriate and repeat steps 5-7. In Step 6, the SS shall check the following requirements for Test 2:

   - R4: The SS-SINR value of Cell 1 reported by the UE is compared to the expected SS-SINR for Cell 1. If the value is outside the limits in Table 7.7.3.2.5-3 or the UE fails to report the measurement value for Cell 1, the number of failed iterations for R4 is increased by one. Otherwise, the number of passed iterations for R4 is increased by one.

   - R5: The SS-SINR value of Cell 2 reported by the UE is compared to the expected SS-SINR for Cell 2. If the value is outside the limits in Table 7.7.3.2.5-3 or the UE fails to report the measurement value for Cell 2, the number of failed iterations for R5 is increased by one. Otherwise, the number of passed iterations for R5 is increased by one.

- R6: The SS-SINR value of Cell 2 reported by the UE is compared to the reported SS-SINR of Cell 1. If the resulting value is outside the limits in Table 7.7.3.2.5-4 or the UE fails to report the measurement value for Cell 1 or Cell 2, the number of failed iterations for R6 is increased by one. Otherwise, the number of passed iterations for R6 is increased by one.

And the following requirements for Test 3:

- R7: The SS-SINR value of Cell 1 reported by the UE is compared to the expected SS-SINR for Cell 1. If the value is outside the limits in Table 7.7.3.2.5-3 or the UE fails to report the measurement value for Cell 1, the number of failed iterations for R7 is increased by one. Otherwise, the number of passed iterations for R7 is increased by one.

- R8: The SS-SINR value of Cell 2 reported by the UE is compared to the expected SS-SINR for Cell 2. If the value is outside the limits in Table 7.7.3.2.5-3 or the UE fails to report the measurement value for Cell 2, the number of failed iterations for R8 is increased by one. Otherwise, the number of passed iterations for R8 is increased by one.

- R9: The SS-SINR value of Cell 2 reported by the UE is compared to the reported SS-SINR of Cell 1. If the resulting value is outside the limits in Table 7.7.3.2.5-4 or the UE fails to report the measurement value for Cell 1 or Cell 2, the number of failed iterations for R9 is increased by one. Otherwise, the number of passed iterations for R9 is increased by one.

7.7.3.2.4.3 Message contents

Message contents are according to TS 38.508-1 [14] clause 7.3 with the following exceptions:

Table 7.7.3.2.4.3-1: Common Exception messages

Default Message Contents	
Common contents of system information blocks exceptions	
Default RRC messages and information elements contents exceptions	Table H.3.1-1 Table H.3.1-2 with condition INTER-FREQ and GAP NEEDED Table H.3.1-3 with Conditions INTER-FREQ MO and Synchronous cells Table H.3.1-5 Table H.3.1-6 with condition Pattern #0 Table H.3.1-7 with condition INTER-FREQ Table 7.3.1-3 in TS 38.508-1 [14] with condition SMTC.1

Table 7.7.3.1.4.3-2: ReportConfigNR-DEFAULT(Periodical)

Derivation Path: 38.508-1 [14] Table 4.6.3-142 with condition PERIODICAL			
Information Element	**Value/remark**	**Comment**	**Condition**
ReportConfigNR::= SEQUENCE {			
reportType CHOICE {			
periodical SEQUENCE {			PERIODICAL
reportQuantityCell SEQUENCE {			
rsrp	false		
rsrq	false		
}			
maxReportCells	2		
}			
}			
}			

7.7.3.2.5 Test requirement

Table 7.7.3.2.5-1 defines the cell specific settings for all tests. Table 7.7.3.2.5-2 defines the OTA primary level settings including test tolerances for all tests.

The SS-SINR measurement accuracy shall fulfil the absolute accuracy requirements in clause 7.7.3.0.2.1 and relative accuracy requirements in clause 7.7.3.0.2.2. The following eight requirements are to be verified:

During Test 1:

R1: Absolute accuracy of Cell 1. The UE is deemed to meet the requirement if the reported SS-SINR is in the range shown in Table 7.7.3.2.5-3.

R2: Absolute accuracy of Cell 2. The UE is deemed to meet the requirement if the reported SS-SINR is in the range shown in Table 7.7.3.2.5-3.

R3: Relative accuracy of Cell 2 compared with Cell 1. The UE is deemed to meet the requirement if the difference in reported SS-SINR meets the requirements in Table 7.7.3.2.5-4.

During Test 2:

R4: Absolute accuracy of Cell 1. The UE is deemed to meet the requirement if the reported SS-SINR is in the range shown in table 7.7.3.2.5-3.

R5: Absolute accuracy of Cell 2. The UE is deemed to meet the requirement if the reported SS-SINR is in the range shown in table 7.7.3.2.5-3.

R6: Relative accuracy of Cell 2 compared with Cell 1. The UE is deemed to meet the requirement if the difference in reported SS-SINR meets the requirements in Table 7.7.3.2.5-4.

During Test 3:

R7: Absolute accuracy of Cell 1. The UE is deemed to meet the requirement if the reported SS-SINR is in the range shown in table 7.7.3.2.5-3.

R8: Absolute accuracy of Cell 2. The UE is deemed to meet the requirement if the reported SS-SINR is in the range shown in table 7.7.3.2.5-3.

R9: Relative accuracy of Cell 2 compared with Cell 1. The UE is deemed to meet the requirement if the difference in reported SS-SINR meets the requirements in Table 7.7.3.2.5-4.

Table 7.7.3.2.5-1: SS-SINR Inter frequency general test parameters

Parameter	Unit	Test 1		Test 2		Test 3	
		Cell 1	Cell 2	Cell 1	Cell 2	Cell 1	Cell 2
SSB ARFCN		freq1	freq2	freq1	freq2	freq1	freq2
Duplex mode		TDD		TDD		TDD	
TDD configuration		TDDConf.3.1		TDDConf.3.1		TDDConf.3.1	
$BW_{channel}$	MHz	100: $N_{RB,c}$ = 66		100: $N_{RB,c}$ = 66		100: $N_{RB,c}$ = 66	
Data RBs allocated		66		66		66	
Downlink initial BWP configuration		DLBWP.0.1					
Downlink dedicated BWP configuration		DLBWP.1.1					
Uplink initial BWP configuration		ULBWP.0.1					
Uplink dedicated BWP configuration		ULBWP.1.1					
DRX cycle configuration	ms	Not applicable					
TRS configuration		TRS.2.1 TDD					
TCI state		TCI.State.0					
PDSCH Reference measurement channel		SR.3.1 TDD	-	SR.3.1 TDD	-	SR.3.1 TDD	-
RMSI CORESET Reference Channel		CR.3.1 TDD	-	CR.3.1 TDD	-	CR.3.1 TDD	-
OCNG Patterns		OP.1	OP.1	OP.1	OP.1	OP.1	OP.1
SMTC configuration		SMTC. 1 FR2	SMTC. 1 FR2	SMTC. 1 FR2	SMTC. 1 FR2	SMTC. 1 FR2	SMTC. 1 FR2
SSB configuration		SSB.3 FR2	SSB.3 FR2	SSB.3 FR2	SSB.3 FR2	SSB.3 FR2	SSB.3 FR2
PDSCH/PDCCH subcarrier spacing	kHz	120	120	120	120	120	120
EPRE ratio of PSS to SSS	dB	0	0	0	0	0	0
EPRE ratio of PBCH_DMRS to SSS							
EPRE ratio of PBCH to PBCH_DMRS							
EPRE ratio of PDCCH_DMRS to SSS							
EPRE ratio of PDCCH to PDCCH_DMRS							
EPRE ratio of PDSCH_DMRS to SSS							
EPRE ratio of PDSCH to PDSCH_DMRS							

EPRE ratio of OCNG DMRS to SSS Note 1 EPRE ratio of OCNG to OCNG DMRS Note 1							
Propagation conditions		AWGN	AWGN	AWGN	AWGN	AWGN	AWGN
Antenna Configuration		1x2	1x2	1x2	1x2	1x2	1x2

Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.
Note 2: Void
Note 3: Void
Note 4: Void

Table 7.7.3.2.5-2: SS-SINR Inter frequency OTA related test parameters

Parameter	Unit	Test 1		Test 2		Test 3	
		Cell 1	Cell 2	Cell 1	Cell 2	Cell 1	Cell 2
Angle of arrival configuration	degrees	Setup 1		Setup 1		Setup 1	
Assumption for UE beams Note 10		Rough		Rough		Rough	
N_{oc} Note1	dBm/15kHz Note4	-105	-105	-105.1	-105.1	-105	-105
N_{oc} Note1	dBm/SCS Note3	-96	-96	-96.1	-96.1	-96	-96
$\hat{E}_s / N_{oc}$	dB	-0.5	-0.5	11	11	-2.1	-2.1
SS-RSRP Note2	dBm/SCS Note4	-96.5	-96.5	-85.1	-85.1	-98.1	-98.1
SS-SINR Note2	dB	-0.5	-0.5	11	11	-2.1	-2.1
$\hat{E}_s / I_{ot}$	dB	-0.5	-0.5	11	11	-2.1	-2.1
Io Note2	dBm/95.04 MHz Note4	-69.3	-69.3	-55.75	-55.75	-64.9	-64.9

Note 1: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for N_{oc} to be fulfilled.
Note 2: SS-SINR, SSB_RP, and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.
Note 3: SS-SINR and SS-RSRP minimum requirements are specified assuming independent interference and noise at each receiver antenna port.
Note 4: Equivalent power received by an antenna with 0dBi gain at the centre of the quiet zone
Note 5: As observed with 0dBi gain antenna at the centre of the quiet zone
Note 6: Void
Note 7: Void
Note 8: Void
Note 9: Void
Note 10: Information about types of UE beam is given in B.2.1.3 of TS 38.133 [6], and does not limit UE implementation or test system implementation

Table 7.7.3.2.5-3: evaluation limits for the reported values for T1 and T2 absolute accuracy rules R1, R2, R4, R5

UE power class 3						
Normal Conditions	**Test 1 All bands**		**Test 2 All bands**		**Test 3 All bands**	
Lowest reported value (Cell 1)	SINR_27		SINR_48		n257, n258, n261	SINR_23
					n260	SINR_22
					n259	FFS
Highest reported value (Cell 1)	n257, n258, n261	SINR_62	n257, n258, n261	SINR_87	n257, n258, n261	SINR_60
	n260	SINR_61	n260	SINR_86	n260	SINR_59
	n259	FFS	n259	FFS	n259	FFS
Lowest reported value (Cell 2)	SINR_27		SINR_48		n257, n258, n261	SINR_23
					n260	SINR_22
					n259	FFS
Highest reported value (Cell 2)	n257, n258, n261	SINR_62	n257, n258, n261	SINR_87	n257, n258, n261	SINR_60
	n260	SINR_61	n260	SINR_86	n260	SINR_59
	n259	FFS	n259	FFS	n259	FFS
Extreme Conditions	**Test 1 All bands**		**Test 2 All bands**		**Test 3 All bands**	
Lowest reported value (Cell 1)	SINR_27 + FFS		SINR_48 + FFS		n257, n258, n261	SINR_23 + FFS
					n260	SINR_22 + FfS
					n259	FFS
Highest reported value (Cell 1)	n257, n258, n261	SINR_62 + FFS	n257, n258, n261	SINR_87 + FFS	n257, n258, n261	SINR_60 + FFS
	n260	SINR_61 + FFS	n260	SINR_86 + FFS	n260	SINR_59 + FFS
	n259	FFS	n259	FFS	n259	FFS
Lowest reported value (Cell 2)	SINR_27 + FFS		SINR_48 + FFS		n257, n258, n261	SINR_23 + FFS
					n260	SINR_22 + FfS
					n259	FFS
Highest reported value (Cell 2)	n257, n258, n261	SINR_62 + FFS	n257, n258, n261	SINR_87 + FFS	n257, n258, n261	SINR_60 + FFS
	n260	SINR_61 + FFS	n260	SINR_86 + FFS	n260	SINR_59 + FFS
	n259	FFS	n259	FFS	n259	FFS

Table 7.7.3.2.5-4: evaluation limits for the reported values for T1 and T2 relative accuracy rules R3, R6

UE power class 3			
Normal Conditions	**Test 1 All bands**	**Test 2 All bands**	**Test 3 All bands**
Lowest value (SINR report Cell 2 – SINR report Cell 1)	- 8	- 17	- 9
Highest value (SINR report Cell 2 – SINR report Cell 1)	+ 8	+ 17	+ 9
Extreme Conditions	**Test 1 All bands**	**Test 2 All bands**	**Test 3 All bands**
Lowest value (SINR report Cell 2 – SINR report Cell 1)	– 8 + FFS	– 17 + FFS	– 9 + FFS
Highest value (SINR report Cell 2 – SINR report Cell 1)	+ 8 + FFS	+ 17 + FFS	+ 9 + FFS

For the test to pass, the ratio of successful reported values for each requirement (R1 to R6) shall be more than 90% with a confidence level of 95%. Each requirement is evaluated independently of the others.

7.7.4 L1-RSRP

7.7.4.0 Minimum conformance requirements

7.7.4.0.1 SSB-based L1-RSRP absolute measurement accuracy requirements

Same as in clause 5.7.4.0.1.

7.7.4.0.2 SSB-based L1-RSRP relative measurement accuracy requirements

Same as in clause 5.7.4.0.2.

7.7.4.0.3 CSI-RS-based L1-RSRP absolute measurement accuracy requirements

Same as in clause 5.7.4.0.3.

7.7.4.0.4 CSI-RS-based L1-RSRP relative measurement accuracy requirements

Same as in clause 5.7.4.0.4.

7.7.4.1 NR SA FR2 SSB based L1-RSRP measurement accuracy

Editor's Note: This test case has been completed for the following configurations:

- Test frequency f ≤ 40.8 GHz
- UE PC3
- Normal conditions
- The test is incomplete for UE power classes other than PC3
- The test is incomplete for test frequencies > 40.8 GHz
- The test is incomplete for extreme conditions

7.7.4.1.1 Test purpose

The purpose of this test is to verify that the SSB based L1-RSRP absolute measurement accuracy is within the specified limits for all bands.

7.7.4.1.2 Test applicability

This test applies to all types of NR UE from Release 15 onwards.

7.7.4.1.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 7.7.4.0.1 and 7.7.4.0.2.

The normative reference for this requirement is TS 38.133 [6] clause A.7.7.4.1.

7.7.4.1.4 Test description

7.7.4.1.4.1 Initial conditions

This test shall be tested using any of the test configurations in Table 7.7.4.1.4.1-1.

Table 7.7.4.1.4.1-1: Supported test configurations

Test Case ID	Description
7.7.4.1-1	NR 120 kHz SSB SCS, 100 MHz bandwidth, TDD duplex mode
7.7.4.1-2	NR 240 kHz SSB SCS, 100 MHz bandwidth, TDD duplex mode
Note: The UE is only required to be tested in one of the supported test configurations	

Configure the test equipment and the DUT according to the parameters in Table 7.7.4.1.4.1-2.

Table 7.7.4.1.4.1-2: Initial conditions

Parameter	Value		Comment
Test environment	NC, TL/VL, TL/VH, TH/VL, TH/VH		As specified in TS 38.508-1 [14] clause 4.1.
Test frequencies	As specified in Annex E, Table E.5-1 and TS 38.508-1 [14] clause 4.3.1.		
Channel bandwidth	As specified by the test configuration selected from Table 7.7.4.1.4.1-1.		
Propagation conditions	AWGN		As specified in Annex C.2.2.
Connection Diagram	TE Part	A.3.3.3.1-1	As specified in TS 38.508-1 [14] Annex A.
	DUT Part	A.3.4.1.1	
Exceptions to connection diagram	N/A		

1. Message contents are defined in clause 7.7.4.1.4.3.

2. Cell 1 is the NR FR2 cell and the target for SSB-based L1-RSRP measurements. The UE is configured to perform RLM, BFD and L1-RSRP measurement based on the SSBs. The connection setup is done according to the settings in Annex C.1.1.

3. The UE Rx beam peak direction has been obtained previously using one of the Rx Beam Peak Search procedures as described in Annex I.

7.7.4.1.4.2 Test procedure

Prior to the start of the time duration T1, the UE shall be fully synchronized to Cell 1. The UE shall be configured for periodic CSI reporting in PUCCH [format 2] with a reporting periodicity as mentioned in the above table 7.7.4.1.4.1-2.

1. Ensure the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity *NR*, Connected without release *On* and Test Mode *On* according to TS 38.508-1 [14] clause 4.5.

2. Set the parameters according to T1 in Table 7.7.4.1.5-1.

3. After 320 ms from the beginning of T1, the UE shall start sending L1-RSRP report including results of both SSB#0 and SSB#1 every 80 slots.

4. The UE shall start sending valid L1-RSRP reports, a valid report shall meet the absolute L1-RSRP requirement for SSB#0 and the relative L1-RSRP requirement for SSB#1. The SS shall check following requirements:

   - R1: The L1-RSRP value of SSB#0 reported by the UE is compared to the expected L1-RSRP value for SSB#0. If the value is outside the limits in Table 7.7.4.1.5-3, Table 5.7.4.1.5-3a or Table 7.7.4.1.5-4 (depending on the test configuration) or the UE fails to report the measurement value for SSB#0, the number of failed iterations for R1 is increased by one. Otherwise, the number of passed iterations for R1 is increased by one.

   - R2: The DIFF-RSRP value of SSB#1 reported by the UE is compared to the expected DIFF-RSRP value. If the resulting value is outside the limits in Table 5.7.1.1.5-5 or the UE fails to report the measurement value for SSB#1, the number of failed iterations for R2 is increased by one. Otherwise, the number of passed iterations for R2 is increased by one.

5. The SS shall continue checking the L1-RSRP report messages transmitted by the UE until the confidence level according to Table G.2.3-1 in Annex G is achieved.

6. Set the parameters according to T2 Table 7.7.4.1.5-1 and repeat steps 3-5. In Step 4, The SS shall check the L1-RSRP reported values of SSB#0 and SSB#1 in the periodic L1-RSRP reports for the following requirements.

   - R3: The L1-RSRP value of SSB#0 or SSB#1 reported by the UE is compared to the expected L1-RSRP value. If the value is outside the limits in Table 7.7.4.1.5-3, Table 5.7.4.1.5-3b or Table 7.7.4.1.5-4 (depending on the test configuration) or the UE fails to report the measurement value for SSB#0 or SSB#1, the number of failed iterations for R3 is increased by one. Otherwise, the number of passed iterations for R3 is increased by one.

   - R4: The DIFF-RSRP value of SSB#0 or SSB#1 reported by the UE is compared to the expected DIFF-RSRP value. If the resulting value is outside the limits in Table 5.7.1.1.5-5 or the UE fails to report the

measurement value for SSB#0 or SSB#1, the number of failed iterations for R4 is increased by one. Otherwise, the number of passed iterations for R4 is increased by one.

7.7.4.1.4.3 Message contents

Message contents are according to TS 38.508-1 [14] clause 7.3 with the following exceptions:

Table 7.7.4.1.4.3-1: Common Exception messages

Default Message Contents	
Common contents of system information blocks exceptions	
Default RRC messages and information elements contents exceptions	Table H.3.1-1 Table H.3.1-2 Table H.3.6-2 with conditions PERIODIC and SS-RSRP Table H.3.6-3 with conditions SSB and PERIODIC Table 7.3.1-3 in TS 38.508-1 [14] with condition SMTC.1

Table 7.7.4.1.4.3-2: RadioLinkMonitoringConfig

Derivation Path: TS 38.508-1 [14], Table 4.6.3-133			
Information Element	**Value/remark**	**Comment**	**Condition**
RadioLinkMonitoringConfig ::= SEQUENCE {			
failureDetectionResourcesToAddModList SEQUENCE (SIZE(1..maxNrofFailureDetectionResources)) OF SEQUENCE {	1 entry		
purpose	both	UE is configured to perform RLM and BFD based on the SSBs.	
detectionResource CHOICE {			
ssb-Index	0		
}			
}			
}			

7.7.4.1.5 Test requirement

Table 7.7.4.1.5-1 defines the primary level settings including test tolerances for all tests.

Each L1-RSRP measurement report for each of the tests in Table 7.7.4.1.5-1 shall meet the corresponding absolute accuracy requirements in Table 7.7.4.1.5-2 for test configurations 1, 2, 4 and 5, and the corresponding absolute accuracy requirements in Table 7.7.4.1.5-3 for test configurations 3 and 6 and Table 7.7.4.1.5-3a for all configurations.

Table 7.7.4.1.5-1: L1-RSRP test parameters

Parameter	Config	Unit	Test 1	Test 2
SSB GSCN	1,2		freq1	freq1
Duplex mode	1,2		TDD	TDD
TDD Configuration	1,2		TDDConf.3.1	TDDConf.3.1
$BW_{channel}$	1,2	MHz	100: $N_{RB,c}$ = 66	100: $N_{RB,c}$ = 66
Data RBs allocated	1,2		66	66
PDSCH Reference measurement channel	1		SR.3.2 TDD	SR.3.2 TDD
	2		SR.3.3 TDD	SR.3.3 TDD
RMSI CORESET Reference Channel	1		CR.3.1 TDD	CR.3.1 TDD
	2		CR.3.2 TDD	CR.3.2 TDD
Dedicated CORESET Reference Channel	1		CCR.3.1 TDD	CCR.3.1 TDD
	2		CCR.3.7 TDD	CCR.3.7 TDD

SSB configuration	1		SSB.1 FR2	SSB.1 FR2
	2		SSB.2 FR2	SSB.2 FR2
OCNG Patterns	1,2		OP.1	OP.1
Initial BWP Configuration	1,2		DLBWP.0.1 ULBWP.0.1	DLBWP.0.1 ULBWP.0.1
Dedicated BWP configuration	1,2		DLBWP.1.3 ULBWP.1.3	DLBWP.1.3 ULBWP.1.3
TRS Configuration	1,2		TRS.2.1 TDD	TRS.2.1 TDD
PDCCH/PDSCH TCI Configuration	1,2		TCI.State.2	TCI.State.2
SMTC configuration	1,2		SMTC.1	SMTC.1
reportConfigType	1,2		periodic	periodic
reportQuantity	1,2		ssb-Index-RSRP	ssb-Index-RSRP
Number of reported RS	1,2		2	2
L1-RSRP reporting period	1,2		slot320	slot320
Propagation condition	1,2		AWGN	AWGN
Antenna configuration			1x2	1x2
EPRE ratio of PSS to SSS	1,2	dB	0	0
EPRE ratio of PBCH DMRS to SSS				
EPRE ratio of PBCH to PBCH DMRS				
EPRE ratio of PDCCH DMRS to SSS				
EPRE ratio of PDCCH to PDCCH DMRS				
EPRE ratio of PDSCH DMRS to SSS				
EPRE ratio of PDSCH to PDSCH DMRS				
EPRE ratio of OCNG DMRS to SSS Note 1				
EPRE ratio of OCNG to OCNG DMRS Note 1				

Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.

Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for N_{oc} to be fulfilled.

Table 7.7.4.1.5-2: L1-RSRP OTA related test parameters

Parameter	Config	Unit	Test 1		Test 2 NOTE 3	
			SSB0	SSB1	SSB0	SSB1
Angle of arrival configuration			Setup 1 according to A.3.15.1		Setup 1 according to A.3.15.1	
Assumption for UE beams Note 4			Rough		Rough	
N_{oc}	1,2	dBm/15 kHz	-104.1		n.a.	
N_{oc}	1	dBm/SSB SCS	-95.1		n.a.	
	2		-92.1		n.a.	
$\hat{E}_s/I_{ot}$	1,2	dB	10	-1.6	n.a.	
SSB_RP Note1	1	dBm/SCS	-85.1	-96.9	As in Table B.2.4-2 + 5.7	
	2		-78	-90	As in Table B.2.4-2 + 5.7	
Io Note1	1,2	dBm/95.04MHz	-55.67		SSB_RP+34.68	

$\hat{E}_s / N_{oc}$	1,2	dB	10	-1.6	n.a.
Note 1: SSB_RP and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.					
Note 2: Void					
Note 3: No additional noise is added by the test system in Test 2.					
Note 4: Information about types of UE beam is given in B.2.1.3, and does not limit UE implementation or test system implementation					

Table 7.7.4.1.5-3: L1-RSRP absolute accuracy requirements for the reported values for test configurations 1 and 2 for the absolute accuracy rules R1, R3

UE power class 3			
Normal Conditions	**Test 1 All bands**	**Test 2**	
Lowest reported value (SSB#0)	42	n257, n258, n261	27
		n260	30
		n259	FFS
Highest reported value (SSB#0)	101	n257, n258, n261	83
		n260	86
		n259	FFS
Extreme Conditions	**Test 1 All bands**	**Test 2**	
Lowest reported value (SSB#0)	39 + FFS	n257, n258, n261	24 + FFS
		n260	27 + FFS
		n259	FFS
Highest reported value (SSB#0)	104 + FFS	n257, n258, n261	86 + FFS
		n260	89 + FFS
		n259	FFS

Table 7.7.4.1.5-3a: evaluation limits for the Δ(Max-Min) reported values for SSB#0 for rules R1

UE power class 3		
Normal Conditions	**Test 1 All bands**	**Test 2 All bands**
Δ(Max-Min) reported value SSB#0	18	18
Extreme Conditions	**Test 1 All bands**	**Test 2 All bands**
Δ(Max-Min) reported value SSB#0	18 + FFS	18+ FFS

Table 7.7.4.1.5-3b: evaluation limits for the Δ(Max-Min) reported values for SSB#0 or SSB#1 for rules R3

UE power class 3		
Normal Conditions	**Test 1 All bands**	**Test 2 All bands**
Δ(Max-Min) reported value SSB#0 or SSB#1	18	18
Extreme Conditions	**Test 1 All bands**	**Test 2 All bands**
Δ(Max-Min) reported value SSB#0 or SSB#1	18 + FFS	18+ FFS

Table 7.7.4.1.5-4: L1-RSRP absolute accuracy requirements for the reported values for test configurations 3 and 4 for the absolute accuracy rules R1, R3

UE power class 3			
Normal Conditions	**Test 1 All bands**	**Test 2**	
Lowest reported value	45	n257, n258, n261	30

		n260	33
		n259	FFS
Highest reported value	104	n257, n258, n261	86
		n260	89
		n259	FFS
		n259	FFS
Extreme Conditions	**Test 1 All bands**	**Test 2**	
Lowest reported value	42+ FFS	n257, n258, n261	27 + FFS
		n260	30 + FFS
		n259	FFS
Highest reported value	107+ FFS	n257, n258, n261	89 + FFS
		n260	92 + FFS
		n259	FFS

Table 7.7.4.1.5-5: evaluation limits for the reported values for T1 and T2 relative accuracy rules R2, R4

UE power class 3		
Normal Conditions	**Test 1 All bands**	**Test 2 All bands**
Lowest DIFF RSRP reported value	2	0
Highest DIFF RSRP reported value	9	4
Extreme Conditions	**Test 1 All bands**	**Test 2 All bands**
Lowest DIFF RSRP reported value	0+ FFS	0+ FFS
Highest DIFF RSRP reported value	12+ FFS	7+ FFS

For the test to pass, the ratio of successful reported values for each requirement (R1 to R6) shall be more than 90% with a confidence level of 95%. Each requirement is evaluated independently of the others.

7.7.4.2 NR SA FR2 CSI-RS based L1-RSRP measurement accuracy

Editor's Note: This test case has been completed for the following configurations:

- Test frequency f ≤ 40.8 GHz
- UE PC3
- Normal conditions
- The test is incomplete for UE power classes other than PC3
- The test is incomplete for test frequencies > 40.8 GHz
- The test is incomplete for extreme conditions

7.7.4.2.1 Test purpose

The purpose of this test is to verify that the CSI-RS based L1-RSRP absolute measurement accuracy is within the specified limits for all bands.

7.7.4.2.2 Test applicability

This test applies to all types of NR UE from Release 15 onwards.

7.7.4.2.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 7.7.4.0.3 and 7.7.4.0.4.

The normative reference for this requirement is TS 38.133 [6] clause A.7.7.4.1.

7.7.4.2.4 Test description

7.7.4.2.4.1 Initial conditions

This test shall be tested using any of the test configurations in Table 7.7.4.2.4.1-1.

Table 7.7.4.2.4.1-1: Supported test configurations

Test Case ID	Description
7.7.4.2-1	NR 120 kHz SSB SCS, 100 MHz bandwidth, TDD duplex mode
Note: The UE is only required to be tested in one of the supported test configurations	

Configure the test equipment and the DUT according to the parameters in Table 7.7.4.2.4.1-2.

Table 7.7.4.2.4.1-2: Initial conditions

Parameter	Value		Comment
Test environment	NC, TL/VL, TL/VH, TH/VL, TH/VH		As specified in TS 38.508-1 [14] clause 4.1.
Test frequencies	As specified in Annex E, Table E.5-1 and TS 38.508-1 [14] clause 4.3.1.		
Channel bandwidth	As specified by the test configuration selected from Table 7.7.4.2.4.1-1.		
Propagation conditions	AWGN		As specified in Annex C.2.2.
Connection Diagram	TE Part	A.3.3.1.1	As specified in TS 38.508-1 [14] Annex A.
	DUT Part	A.3.4.1.1	
Exceptions to connection diagram	N/A		

1. Message contents are defined in clause 7.7.4.2.4.3.

2. Cell 1 is the NR FR2 cell and the target for CSI-RS-based L1-RSRP measurements. The UE is configured to perform RLM, BFD and L1-RSRP measurement based on the SSBs. The connection setup is done according to the settings in Annex C.1.1.

3. The UE Rx beam peak direction has been obtained previously using one of the Rx Beam Peak Search procedures as described in Annex I.

7.7.4.2.4.2 Test procedure

Prior to the start of the time duration T1, the UE shall be fully synchronized to Cell 1. The UE shall be configured for periodic CSI reporting in PUCCH [format 2] with a reporting periodicity as mentioned in the above table 7.7.4.2.4.1-2.

1. Ensure the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity *NR*, Connected without release *On* and Test Mode *On* according to TS 38.508-1 [14] clause 4.5.

2. Set the parameters according to T1 in Table 7.7.4.2.5-1.

3. After 320 ms from the beginning of T1, the UE shall start sending L1-RSRP report including results of both CSI-RS0 and CSI-RS1.

4. The UE shall start sending valid L1-RSRP reports, a valid report shall meet the absolute L1-RSRP requirement for CSI-RS0 and the relative L1-RSRP requirement for CSI-RS1. The SS shall check for the following requirements:

   - R1: The L1-RSRP value of CSI-RS0 reported by the UE is compared to the expected L1-RSRP value for CSI-RS0. If the value is outside the limits in Table 7.7.4.2.5-3, Table 5.7.4.2.5-3a or Table 7.7.4.2.5-4 (depending on the test configuration) or the UE fails to report the measurement value for CSI-RS0, the number of failed iterations for R1 is increased by one. Otherwise, the number of passed iterations for R1 is increased by one.

   - R2: The DIFF-RSRP value of CSI-RS1 reported by the UE is compared to the expected DIFF-RSRP value. If the resulting value is outside the limits in Table 7.7.4.2.5-4 or the UE fails to report the measurement value for or CSI-RS1, the number of failed iterations for R2 is increased by one. Otherwise, the number of passed iterations for R2 is increased by one.

5. The SS shall continue checking the L1-RSRP report messages transmitted by the UE until the confidence level according to Table G.2.3-1 in Annex G is achieved.

6. Set the parameters according to T2 Table 7.7.4.2.5-1 and repeat steps 3-5. In Step 4, the SS shall check the L1-RSRP reported values of CSI-RS0 and CSI-RS1 in the periodic L1-RSRP reports for the following requirements.

   - R3: The L1-RSRP value of CSI-RS0 or CSI-RS1 reported by the UE is compared to the expected L1-RSRP value. If the value is outside the limits in Table 7.7.4.2.5-3, Table 5.7.4.2.5-3b or Table 7.7.4.2.5-4 (depending on the test configuration) or the UE fails to report the measurement value for CSI-RS0 or CSI-RS1, the number of failed iterations for R1 is increased by one. Otherwise, the number of passed iterations for R3 is increased by one.

   - R4: The DIFF-RSRP value of CSI-RS0 or CSI-RS1 reported by the UE is compared to the expected DIFF-RSRP value. If the resulting value is outside the limits in Table 7.7.4.2.5-4 or the UE fails to report the measurement value for CSI-RS0 or CSI-RS1, the number of failed iterations for R4 is increased by one. Otherwise, the number of passed iterations for R4 is increased by one.

7.7.4.2.4.3 Message contents

Message contents are according to TS 38.508-1 [14] clause 7.3 with the following exceptions:

Table 7.7.4.2.4.3-1: Common Exception messages

Default Message Contents	
Common contents of system information blocks exceptions	
Default RRC messages and information elements contents exceptions	Table H.3.1-1 Table H.3.1-2 Table H.3.6-2 with conditions PERIODIC and CSI-RSRP Table H.3.6-3 with conditions CSI-RS and PERIODIC Table 7.3.1-3 in TS 38.508-1 [14] with condition SMTC.1

Table 7.7.4.2.4.3-2: RadioLinkMonitoringConfig

Derivation Path: TS 38.508-1 [14], Table 4.6.3-133			
Information Element	**Value/remark**	**Comment**	**Condition**
RadioLinkMonitoringConfig ::= SEQUENCE {			
failureDetectionResourcesToAddModList SEQUENCE (SIZE(1..maxNrofFailureDetectionResources)) OF SEQUENCE {	1 entry		
purpose	both	UE is configured to perform RLM and BFD based on the SSBs.	
detectionResource CHOICE {			
csi-RS-Index	0		
}			
}			
}			

7.7.4.2.5 Test requirement

Table 7.7.4.2.5-1 defines the primary level settings including test tolerances for all tests.

Each L1-RSRP measurement report for each of the tests in Table 7.7.4.2.5-1 shall meet the corresponding absolute accuracy requirements in Table 7.7.4.2.5-2 for test configurations 1, 2, 4 and 5, and the corresponding absolute accuracy requirements in Table 7.7.4.2.5-3 for test configurations 3 and 6 and Table 7.7.4.2.5-3a for all configurations.

Table 7.7.4.2.5-1: L1-RSRP test parameters

Parameter	Config	Unit	Test 1	Test 2
SSB GSCN	1		freq1	freq1
Duplex mode	1		TDD	TDD

TDD Configuration	1		TDDConf.3.1	TDDConf.3.1
$BW_{channel}$	1	MHz	100: $N_{RB,c}$ = 66	100: $N_{RB,c}$ = 66
PDSCH Reference measurement channel	1		SR.3.1 TDD	SR.3.1 TDD
RMSI CORESET Reference Channel	1		CR.3.1 TDD	CR.3.1 TDD
Dedicated CORESET Reference Channel	1		CCR.3.1 TDD	CCR.3.1 TDD
SSB configuration	1		SSB.1 FR2	SSB.1 FR2
OCNG Patterns	1		OP.1	OP.1
Initial BWP Configuration	1		DLBWP.0.1 ULBWP.0.1	DLBWP.0.1 ULBWP.0.1
Dedicated BWP configuration	1		DLBWP.1.1 ULBWP.1.1	DLBWP.1.1 ULBWP.1.1
TRS Configuration	1		TRS.2.1 TDD	TRS.2.1 TDD
PDCCH/PDSCH TCI Configuration	1		TCI.State.2	TCI.State.2
SMTC configuration	1		SMTC.1	SMTC.1
CSI-RS	1		CSI-RS.3.2 TDD	CSI-RS.3.2 TDD
reportConfigType	1		periodic	periodic
reportQuantity	1		cri-RSRP	cri-RSRP
Number of reported RS	1		2	2
L1-RSRP reporting period	1		slot320	slot320
Propagation condition	1		AWGN	AWGN
Antenna configuration	1		1x2	1x2
EPRE ratio of PSS to SSS	1	dB	0	0
EPRE ratio of PBCH DMRS to SSS				
EPRE ratio of PBCH to PBCH DMRS				
EPRE ratio of PDCCH DMRS to SSS				
EPRE ratio of PDCCH to PDCCH DMRS				
EPRE ratio of PDSCH DMRS to SSS				
EPRE ratio of PDSCH to PDSCH DMRS				
EPRE ratio of OCNG DMRS to SSS Note 1				
EPRE ratio of OCNG to OCNG DMRS Note 1				

Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.

Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for N_{oc} to be fulfilled.

Table 7.7.4.2.5-2: L1-RSRP OTA related test parameters

Parameter	Config	Unit	Test 1		Test 2 NOTE 3	
			CSI-RS0	CSI-RS1	CSI-RS0	CSI-RS1
Angle of arrival configuration			Setup 1 according to A.3.15.1		Setup 1 according to A.3.15.1	
Assumption for UE beams Note 4			Rough		Rough	
N_{oc}	1	dBm/15 kHz	-104.10		n.a.	
N_{oc}	1	dBm/SSB SCS	-95.11		n.a. n.a.	
$\hat{E}_s / I_{ot}$	1	dB	10	-1.8	n.a.	

CSI-RS_RP[Note1]	1	dBm/SCS	-85.11	-96.93	As in Table B.2.4.2-2 + 5.7
Io[Note1]	1	dBm/95.04MHz	-55.67		CSI-RS_RP+34.68
$\hat{E}_s / N_{oc}$	1	dB	10	-1.82	n.a.
Note 1: RSRP and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves. Note 2: RSRP minimum requirements are specified assuming independent interference and noise at each receiver antenna port. Note 3: No additional noise is added by the test system in Test 2. Note 4: Information about types of UE beam is given in B.2.1.3, and does not limit UE implementation or test system implementation					

Table 7.7.4.2.5-3: L1-RSRP absolute accuracy requirements for the reported values for the absolute accuracy rules R1, R3

UE power class 3			
Normal Conditions	**Test 1 All bands**	**Test 2**	
Lowest reported value (CSI-RS0)	42	n257, n258, n261	27
		n260	30
		n259	FFS
Highest reported value (CSI-RS0)	101	n257, n258, n261	83
		n260	86
		n259	FFS
Extreme Conditions	**Test 1 All bands**	**Test 2**	
Lowest reported value (CSI-RS0)	39+ FFS	n257, n258, n261	25 + FFS
		n260	27 + FFS
		n259	FFS
Highest reported value (CSI-RS0)	104+ FFS	n257, n258, n261	86 + FFS
		n260	89 + FFS
		n259	FFS

Table 7.7.4.2.5-3a: evaluation limits for the Δ(Max-Min) reported values for CSI-RS#0 for rules R1

UE power class 3		
Normal Conditions	**Test 1 All bands**	**Test 2 All bands**
Δ(Max-Min) reported value CSI-RS#0	18	18
Extreme Conditions	**Test 1 All bands**	**Test 2 All bands**
Δ(Max-Min) reported value CSI-RS#0	18 + FFS	18+ FFS

Table 7.7.4.2.5-3b: evaluation limits for the Δ(Max-Min) reported values for CSI-RS#0 or CSI-RS#1 for rules R3

UE power class 3		
Normal Conditions	**Test 1 All bands**	**Test 2 All bands**
Δ(Max-Min) reported value CSI-RS#0 or CSI-RS#1	18	18
Extreme Conditions	**Test 1 All bands**	**Test 2 All bands**
Δ(Max-Min) reported value CSI-RS#0 or CSI-RS#1	18 + FFS	18+ FFS

Table 7.7.4.2.5-4: evaluation limits for the reported values for T1 and T2 relative accuracy rules R2, R4

UE power class 3		
Normal Conditions	**Test 1 All bands**	**Test 2 All bands**
Lowest DIFF RSRP reported value	2	0
Highest DIFF RSRP reported value	9	4
Extreme Conditions	**Test 1 All bands**	**Test 2 All bands**
Lowest DIFF RSRP reported value	0+ FFS	0+ FFS
Highest DIFF RSRP reported value	12+ FFS	7+ FFS

For the test to pass, the ratio of successful reported values for each requirement (R1 to R4) shall be more than 90% with a confidence level of 95%. Each requirement is evaluated independently of the others.

7.7.5 SRS-RSRP

7.7.5.0 Minimum conformance requirements

7.7.5.0.1 Minimum conformance requirements for SRS-RSRP measurement accuracy

The SRS-RSRP measurement reported by the UE shall fulfil the accuracy requirements defined in Table 7.7.5.0.1-1 for FR1 and Table 5.7.7.0.1-2 for FR2, provided that the following conditions are met. The accuracy requirements in this clause are derived based on AWGN radio propagation conditions.

- Conditions defined in clause 7.3 of TS 38.101-1 [18] for reference sensitivity are fulfilled.
- Conditions for SRS-RSRP measurements are fulfilled according to Annex B.2.z for a corresponding Band for each relevant SRS resource configured for measurement.
- The time difference between UE's DL reference timing in the serving cell and SRS arrival time is no larger than $T_{error_SRS_RSRP}$, where
  - $T_{error_SRS_RSRP} = T_C \times N_{TA_offset}$ + 4.67us for FR1
  - $T_{error_SRS_RSRP} = T_C \times N_{TA_offset}$ + 3.67us for FR2
  - N_{TA_offset} is defined in Table 7.1.2-2
  - T_C is 0.509ns
- The number of SRS ports in the SRS resource configured for measurement is 1,
- The number of symbols in the SRS resource configured for measurement is 1,
- The number of repetitions in the SRS resource configured for measurement is 1,
- Frequency hopping, sequence group hopping or sequence hopping is disabled in the SRS resource configured for measurement,
- The bandwidth of the SRS resource is 48 PRBs.
- One of the following conditions is met
  - There is no other SRS resource with the same root sequence and on the same symbol and with same comb as the relevant SRS resource.
  - If multiple SRS resources are on the same symbol and with same comb, the distance between cyclic shifts of any two resources is no less than 6 if transmissionComb = n4, and no less than 4 if transmissionComb = n2.

Table 7.7.5.0.1-1: SRS-RSRP absolute accuracy in FR1

Accuracy						Conditions						
Normal condition			Extreme condition			SRS Ês/Iot	Io Note 1 range					
							NR operating band groups Note 2	Minimum Io				Maximum Io
dB						dB		dBm / SCS_{SRS}			dBm/BW Channel	dBm/BW Channel
SCS_{SRS} (kHz)			SCS_{SRS} (kHz)									
15	30	60	15	30	60			SCS_{SRS} = 15 kHz	SCS_{SRS} = 30 kHz	SCS_{SRS} = 60 kHz		
±3	±3.5	±5	±7.5	±8	±9.5	≥1	NR_TDD_FR1_A,	-120	-117	-114	N/A	-70
							NR_TDD_FR1_C	-119	-116	-113	N/A	-70
							NR_TDD_FR1_D	-118.5	-115.5	-112.5	N/A	-70
							NR_TDD_FR1_E	-118	-115	-112	N/A	-70
±6.5	±7	±8.5	±9.5	±10	±11.5	≥1	NR_TDD_FR1_A, NR_TDD_FR1_C, NR_TDD_FR1_D, NR_TDD_FR1_E	N/A	N/A	N/A	-70	-50

NOTE 1: Io is assumed to have constant EPRE across the bandwidth.
NOTE 2: NR operating band groups in FR1 are as defined in clause 3.5.2.

Table 7.7.5.0.1-2: SRS-RSRP absolute accuracy in FR2

Accuracy				Conditions			
Normal condition		Extreme condition		SRS Ês/Iot	Io Note 1 range		
					Minimum Io		Maximum Io
dB				dB	dBm / SCS_{SRS} Note 2	dBm/$BW_{Channel}$	dBm/$BW_{Channel}$
SCS_{SRS} (kHz)		SCS_{SRS} (kHz)			SCS_{SRS} = 60kHz / SCS_{SRS} = 120kHz		
60	120	60	120				
±6	±8.5	±9	±11.5	≥1	Same value as SRS_RP in Table B.2.7-2, according to UE Power class, operating band and angle of arrival	N/A	-70
±9	±11.5	±11	±13.5	≥1	N/A	-70	-50

NOTE 1: Io specified at the Reference point, and assumed to have constant EPRE across the bandwidth.
NOTE 2: Values based on Refsens and EIS spherical coverage as defined in clauses 7.3.2 and 7.3.4 of TS 38.101-2 [19]. Applicable side condition selected depending on angle of arrival.
NOTE 3: In the test cases, the SSB Ês/Iot and related parameters may need to be adjusted to ensure Ês/Iot at UE baseband is above the value defined in this table.

7.7.5.0.1.1 SRS-RSRP report mapping

The reporting range of SRS-RSRP is defined from -140 dBm to -44 dBm with 1 dB resolution. The mapping of measured quantity is defined in Table 5.7.7.0.1.2-1. The range in the signalling may be larger than the guaranteed accuracy range.

Table 5.7.7.0.1.2-1: SRS-RSRP measurement report mapping

Reported value	Measured quantity value	Unit
SRS-RSRP_0	SRS-RSRP<-140	dBm
SRS-RSRP_1	-140≤ SRS-RSRP<-139	dBm
SRS-RSRP_2	-139≤ SRS-RSRP<-138	dBm
SRS-RSRP_3	-138≤ SRS-RSRP<-137	dBm
SRS-RSRP_4	-137≤ SRS-RSRP<-136	dBm
..	..	…
SRS-RSRP_95	-46≤ SRS-RSRP<-45	dBm
SRS-RSRP_96	-45≤ SRS-RSRP<-44	dBm
SRS-RSRP_97	-44≤ SRS-RSRP	dBm
SRS-RSRP_98	Infinity	
Note: 'Infinity' means that UE cannot detect SRS due to too strong signal to measure.		

The normative reference for this requirement is TS 38.133 [6] clause 10.1.22.1.

7.7.5.1 NR SA FR2 SRS-RSRP measurement accuracy

Editor's Note: This test case is incomplete. Following aspects are either missing or TBD

- The test procedure is incomplete

- The message content is FFS

- MU/TT analysis for UE PC3 and test frequency f ≤ 40.8 GHz is complete.

- MU/TT analysis for UE power class other than PC3 is incomplete.

- MU//TT analysis for test frequency f > 40.8 GHz is incomplete.

7.7.5.1.1 Test purpose

The purpose of this test is to verify that the SRS-RSRP measurement accuracy is within the specified limits with SRS-RSRP measurement requirements in TS 38.133 [6] clause 10.1.22.1.1.

7.7.5.1.2 Test applicability

This test applies to all types of NR UE release 16 onwards and supporting CLI-SRS-RSRP.

7.7.5.1.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 7.7.5.0.1.

The normative reference for this requirement is TS 38.133 [6] clause A.7.7.5.1.

7.7.5.1.4 Test description

7.7.5.1.4.1 Initial conditions

This test shall be tested using any of the test configurations in Table 7.7.5.1.4.1-1.

Table 7.7.5.1.4.1-1: Applicable NR configurations for FR2 SRS-RSRP accuracy test

Config	Description

1	120 kHz SRS SCS, 100 MHz bandwidth, TDD duplex mode
Note: The UE is only required to be tested in one of the supported test configurations in each supported band	

Configure the test equipment and the DUT according to the parameters in Table 7.7.5.1.4.1-2.

Table 7.7.5.1.4.1-2: Initial conditions SA FR2 SRS-RSRP measurement accuracy

Parameter	Value		Comment
Test environment	NC		As specified in TS 38.508-1 [14] clause 4.1.
Test frequencies	As specified in Annex E, Table E.5-1 and TS 38.508-1 [14] clause 4.3.1.		
Channel bandwidth	As specified by the test configuration selected from Table 6.6.1.1.4.1-1.		
Propagation conditions	AWGN		As specified in Annex C.2.2
Connection Diagram	TE Part	A.3.3.1.1	As specified in TS 38.508-1 [14] Annex A.
	DUT Part	A.3.4.1.1	
Exceptions to connection diagram	N/A		

1. Message contents are defined in clause 7.7.5.1.4.3.
2. In this set of test cases there is one cell in the test, FR2 PCell (Cell 1). The test parameters for the Cell 1 are given in Table 7.7.5.1.5-1 and Table 7.7.5.1.5-2 below. The test parameter for the (virtual) neighbour cell UE transmitting SRS are given in Table 7.7.5.1.5-2.
3. The UE Rx beam peak direction has been obtained previously using one of the Rx Beam Peak Search procedures as described in Annex I.

7.7.5.1.4 Test description

7.7.5.1.4.1 Initial conditions

7.7.5.1.4.2 Test procedure

1. Ensure the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity *NR*, Connected without release *On* and Test Mode *On* according to TS 38.508-1 [14] clause 4.5.
2. Set the parameters according to Table 7.7.5.1.5-1 as appropriate.
3. The SS shall transmit an RRCReconfiguration message on Cell 1.
4. The UE shall transmit an RRCReconfigurationComplete message.
5. The UE shall transmit periodically MeasurementReport messages.

<rest of the steps are FFS >

7.7.5.1.4.3 Message contents

Message contents are according to TS 38.508-1 [14] clause 7.3 with the following exceptions:

FFS

7.7.5.1.5 Test requirement

Table 7.7.5.1.5-1 defines the cell specific settings for all tests. Table 7.7.5.1.5-2 defines the OTA primary level settings including test tolerances for all tests.

Table 7.7.5.1.5-1: FR2 test parameters for SRS-RSRP accuracy

Parameter	Config	Unit	Test 1	Test 2
SSB GSCN	1		freq1	freq1
Duplex mode	1		TDD	TDD

TDD configuration	1		TDDConf.3.1	TDDConf.3.1
$BW_{channel}$	1	MHz	100: $N_{RB,c}$ = 66	100: $N_{RB,c}$ = 66
PDSCH Reference measurement channel	1		SR.3.1 TDD	SR.3.1 TDD
RMSI CORESET Reference Channel	1		CR.3.1 TDD	CR.3.1 TDD
Dedicated CORESET Reference Channel	1		CCR.3.1 TDD	CCR.3.1 TDD
SSB configuration	1		SSB.3 FR2	SSB.3 FR2
OCNG Patterns	1		OP.1	OP.1
TRS configuration	1		TRS.2.1 TDD	TRS.2.1 TDD
Initial BWP Configuration	1		DLBWP.0.1 ULBWP.0.1	DLBWP.0.1 ULBWP.0.1
Dedicated BWP configuration	1		DLBWP.1.3 ULBWP.1.3	DLBWP.1.3 ULBWP.1.3
SMTC configuration	1		SMTC.1	SMTC.1
Time offset between DL from serving cell and SRS from test system	1	µs	10.76	10.67
EPRE ratio of PSS to SSS	1	dB	0	0
EPRE ratio of PBCH DMRS to SSS				
EPRE ratio of PBCH to PBCH DMRS				
EPRE ratio of PDCCH DMRS to SSS				
EPRE ratio of PDCCH to PDCCH DMRS				
EPRE ratio of PDSCH DMRS to SSS				
EPRE ratio of PDSCH to PDSCH DMRS				
EPRE ratio of OCNG DMRS to SSS Note 1				
EPRE ratio of OCNG to OCNG DMRS Note 1				
Propagation condition	1		AWGN	AWGN
Antenna configuration	1		1x2	1x2
Note 1: OCNG shall be used such that a constant total transmitted power spectral density is achieved for all OFDM symbols.				

Table 7.7.5.1.5-2: SRS-RSRP accuracy OTA related test parameters for PCell and Neighbour cell UE in FR2

Parameter	Unit	T1	T2
Angle of arrival configuration		Setup 1 defined A.3.15.1	Setup 1 defined A.3.15.1
Beam assumption Note 5		Fine	Fine
N_{oc} Note1	dBm/15kHz Note3	-100	N/A
N_{oc} Note1	dBm/SCS Note3	-91	N/A
$\hat{E}_s / N_{oc}$	dB	2	N/A
E_s	dBm/SCS Note3		(Table B.2.7-2 Rx Beam Peak) +5
SRS_RP Note2	dBm/SCS	-89	(Table B.2.7-2 Rx Beam Peak) +5
$\hat{E}_s / I_{ot}$ BB Note4	dB	>1	1
Io Note2	dBm/95.04 MHz Note3	-57.89	(Table B.2.7-2 Rx Beam Peak +50.79dB)

Note 1:	Where used, interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for N_{oc} to be fulfilled.
Note 2:	SRS_RP, Es/Iot and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.
Note 3:	Equivalent power received by an antenna with 0 dBi gain at the centre of the quiet zone
Note 4:	Calculation of Es/Iot_{BB} includes the effect of UE internal noise up to the value assumed for the associated Refsens requirement in clause 7.3.2 of TS 36.101-2 [19], and an allowance of 2dB for UE multi-band relaxation factor $\sum MB_P$ from TS 38.101-2 [19] Table 6.2.1.3-4.
Note 5:	Information about types of UE beam is given in B.2.1.3, and does not limit UE implementation or test system implementation.

Table 7.7.5.1.5-3: SRS configuration parameters for FR2 SRS-RSRP accuracy

	Field	SRSConf.1
SRS-ResourceSet	srs-ResourceSetId	0
	srs-ResourceIdList	0
	resourceType	Periodic
	Usage	Codebook
SRS-Resource	SRS-ResourceId	0
	nrofSRS-Ports	Port1
	transmissionComb	n2
	combOffset-n2	0
	cyclicShift-n2	0
	resourceMapping startPosition	0
	resourceMapping nrofSymbols	n1
	resourceMapping repetitionFactor	n1
	freqDomainPosition	0
	freqDomainShift	0
	freqHopping c-SRS	12
	freqHopping b-SRS	0
	freqHopping b-hop	0
	groupOrSequenceHopping	Neither
	resourceType	Periodic
	periodicityAndOffset-p	sl160,25
	sequenceId	0

Table 7.7.5.1.5-4: SRS-RSRP absolute accuracy test requirement

	Test requirement Notes1,2,3
SRS	SRS_RP -δ +G_{min} ≤ Reported SRS-RSRP(dBm) ≤SRS_RP +δ +G_{max}
Note 1:	SRS_RP is the equivalent power received by an antenna with 0dBi gain at the centre of the quiet zone configured in the test
Note 2:	δ is the RSRP absolute accuracy requirement from Table 10.1.22.1.1-2, selected according to the Io used in the test
Note 3:	G_{min} and G_{max} are the minimum and maximum UE gain values from Table B.2.1.5.1-1, selected according to the UE power class

The SRS-RSRP measurement accuracy shall fulfil the absolute accuracy requirements in clauses 7.7.5.0. The following requirements are to be verified:

During T1:

The UE is deemed to meet the requirement if the reported SRS-RSRP is in the range shown in table 7.7.5.1.5-4.

During T2:

The UE is deemed to meet the requirement if the reported SRS-RSRP is in the range shown in table 7.7.5.1.5-4.

For the test to pass, the ratio of successful reported values for each requirement shall be more than 90% with a confidence level of 95%. Each requirement is evaluated independently of the others.

7.7.5.2 NR SA FR2 CLI-RSSI measurement accuracy

Editor's Note: This test case is incomplete. Following aspects are either missing or TBD

- The test procedure is incomplete

- The message content is FFS

- TT analysis is missing.

7.7.5.2.1 Test purpose

The purpose of this test is to verify that the CLI-RSSI measurement accuracy is within the specified limits with CLI-RSSI measurement requirements in TS 38.133 [6] clause 10.1.22.2.1.

7.7.5.2.2 Test applicability

This test applies to all types of NR UE release 16 onwards and supporting CLI-RSSI.

7.7.5.2.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 7.7.5.0.1.

The normative reference for this requirement is TS 38.133 [6] clause A.7.7.5.2.

7.7.5.2.4 Test description

7.7.5.2.4.1 Initial conditions

This test shall be tested using any of the test configurations in Table 7.7.5.2.4.1-1.

Table 7.7.5.2.4.1-1: Applicable NR configurations for FR2 CLI-RSSI accuracy test

Config	Description
1	120 kHz SRS SCS, 100 MHz bandwidth, TDD duplex mode
Note: The UE is only required to be tested in one of the supported test configurations in each supported band	

Configure the test equipment and the DUT according to the parameters in Table 7.7.5.2.4.1-2.

Table 7.7.5.2.4.1-2: Initial conditions SA FR2 CLI-RSSI measurement accuracy

Parameter	Value		Comment
Test environment	NC		As specified in TS 38.508-1 [14] clause 4.1.
Test frequencies	As specified in Annex E, Table E.5-1 and TS 38.508-1 [14] clause 4.3.1.		
Channel bandwidth	As specified by the test configuration selected from Table 6.6.1.1.4.1-1.		
Propagation conditions	AWGN		As specified in Annex C.2.2
Connection Diagram	TE Part	A.3.3.1.1	As specified in TS 38.508-1 [14] Annex A.
	DUT Part	A.3.4.1.1	
Exceptions to connection diagram	N/A		

1. Message contents are defined in clause 7.7.5.2.4.3.

2. In this set of test cases there is one cell in the test, FR2 PCell (Cell 1). The test parameters for the Cell 1 are given in Table 7.7.5.2.5-1 and Table 7.7.5.2.5-2 below. The test parameter for the (virtual) neighbour cell UE transmitting SRS are given in Table 7.7.5.2.5-2.

3. The UE Rx beam peak direction has been obtained previously using one of the Rx Beam Peak Search procedures as described in Annex I.

7.7.5.2.4 Test description

7.7.5.2.4.1 Initial conditions

7.7.5.2.4.2 Test procedure

1. Ensure the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity *NR*, Connected without release *On* and Test Mode *On* according to TS 38.508-1 [14] clause 4.5.

2. Set the parameters according to Table 7.7.5.2.5-1 as appropriate.

3. The SS shall transmit an RRCReconfiguration message on Cell 1.

4. The UE shall transmit an RRCReconfigurationComplete message.

5. The UE shall transmit periodically MeasurementReport messages.

<rest of the steps are FFS >

7.7.5.2.4.3 Message contents

Message contents are according to TS 38.508-1 [14] clause 7.3 with the following exceptions:

FFS

7.7.5.2.5 Test requirement

Table 7.7.5.2.5-1 defines the cell specific settings for all tests. Table 7.7.5.2.5-2 defines the OTA primary level settings including test tolerances for all tests.

Table 7.7.5.2.5-1: : FR2 test parameters for CLI-RSSI accuracy

Parameter	Config	Unit	Test 1	Test 2
SSB GSCN	1		freq1	freq1
Duplex mode	1		TDD	TDD
TDD configuration	1		TDDConf.3.1	TDDConf.3.1
$BW_{channel}$	1	MHz	100: $N_{RB,c}$ = 66	100: $N_{RB,c}$ = 66
PDSCH Reference measurement channel	1		SR.3.1 TDD	SR.3.1 TDD
RMSI CORESET Reference Channel	1		CR.3.1 TDD	CR.3.1 TDD
Dedicated CORESET Reference Channel	1		CCR.3.1 TDD	CCR.3.1 TDD
SSB configuration	1		SSB.3 FR2	SSB.3 FR2
OCNG Patterns Note2	1		OP.1	OP.1
TRS configuration	1		TRS.2.1 TDD	TRS.2.1 TDD
Initial BWP Configuration	1		DLBWP.0.1 ULBWP.0.1	DLBWP.0.1 ULBWP.0.1
Dedicated BWP configuration	1		DLBWP.1.3 ULBWP.1.3	DLBWP.1.3 ULBWP.1.3
SMTC configuration	1		SMTC.1	SMTC.1
Time offset between DL from serving cell and OCNG from test system	1	μs	10.67	10.67
EPRE ratio of PSS to SSS	1	dB	0	0
EPRE ratio of PBCH DMRS to SSS				
EPRE ratio of PBCH to PBCH DMRS				

EPRE ratio of PDCCH DMRS to SSS				
EPRE ratio of PDCCH to PDCCH DMRS				
EPRE ratio of PDSCH DMRS to SSS				
EPRE ratio of PDSCH to PDSCH DMRS				
EPRE ratio of OCNG DMRS to SSS Note 1				
EPRE ratio of OCNG to OCNG DMRS Note 1				
Propagation condition	1		AWGN	AWGN
Antenna configuration	1		1x2	1x2
Note 1: OCNG shall be used such that a constant total transmitted power spectral density is achieved for all OFDM symbols. Note 2: OCNG is not transmitted in the CLI-RSSI measurement resources.				

Table 7.7.5.2.5-2: CLI-RSSI accuracy OTA related test parameters

Parameter	Unit	T1	T2
Angle of arrival configuration		Setup 1 defined A.3.15.1	
Beam assumption Note 5		Fine	
N_{oc} on CLI-RSSI measurement resource Note1	dBm/15kHz Note3	-100+TT	
N_{oc} on CLI-RSSI measurement resource Note1	dBm/SCS Note3	-91	
$\hat{E}_s / N_{oc}$ on CLI-RSSI measurement resource	dB	-Infinity	
RSRP on CLI-RSSI measurement resource Note2	dBm/SCS	-Infinity	
$\hat{E}_s / I_{ot\ BB}$ on CLI-RSSI measurement resource Note4	dB	-Infinity	
Io on CLI-RSSI measurement resource Note2	dBm/95.04 MHz Note3	-62.01	
Io on CLI-RSSI measurement resource Note2	dBm/1.08 MHz	-81.46	
Note 1: Where used, interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for N_{oc} to be fulfilled. Note 2: SRS_RP, Es/Iot and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves. Note 3: Equivalent power received by an antenna with 0 dBi gain at the centre of the quiet zone Note 4: Calculation of Es/Iot_{BB} includes the effect of UE internal noise up to the value assumed for the associated Refsens requirement in clause 7.3.2 of TS 36.101-2 [19], and an allowance of 2dB for UE multi-band relaxation factor $\sum MB_P$ from TS 38.101-2 [19] Table 6.2.1.3-4. Note 5: Information about types of UE beam is given in B.2.1.3, and does not limit UE implementation or test system implementation.			

Table 7.7.5.2.5-3: CLI-RSSI measurement resource configuration for FR2 CLI-RSSI accuracy

	Field	SRSConf.1
CLI-RSSI measurement resource	rssi-ResourceId	0
	rssi-SCS	120kHz
	startPRB	0

	nrofPRBs	66
	startPosition	3
	nrofSymbols	11
	rssi-PeriodicityAndOffset	sl160, 25

Table 7.7.5.2.5-4: CLI-RSSI absolute accuracy test requirement

	Test requirement Notes1,2,3
	Io -δ +G_{min} ≤ Reported CLI-RSSI(dBm) ≤Io +δ +G_{max}
Note 1:	Io is the equivalent power received by an antenna with 0dBi gain at the centre of the quiet zone configured in the test for 1.08MHz
Note 2:	δ is the RSRP absolute accuracy requirement from Table 10.1.22.1.1-2, selected according to the Io used in the test
Note 3:	G_{min} and G_{max} are the minimum and maximum UE gain values from Table B.2.1.5.1-1, selected according to the UE power class

The CLI-RSSI measurement accuracy shall fulfil the absolute accuracy requirements in clauses 10.1.22.2.1. The following requirements are to be verified:

During T1:

The UE is deemed to meet the requirement if the reported CLI-RSSI is in the range shown in table 7.7.5.2.5-4.

During T2:

The UE is deemed to meet the requirement if the reported CLI-RSSI is in the range shown in table 7.7.5.2.5-4.

7.7.6 L1-SINR

7.7.6.0 Minimum conformance requirements

7.7.6.0.1 Minimum conformance requirements for CSI-RS based CMR and no dedicated IMR configured and CSI-RS resource set with repetition off

Dedicated resource configured as IMR for L1-SINR computation, and the UE physical layer shall be capable of reporting L1-SINR measured over the measurement period of $T_{L1\text{-}SINR_Measurement_Period_CSI\text{-}RS_CMR_Only}$.

The value of $T_{L1\text{-}SINR_Measurement_Period_CSI\text{-}RS_CMR_Only}$ is defined in Table 7.7.6.0.1-1 for FR2, where

For the value of M,

- For periodic and semi-persistent CSI-RS resources as CMR, M=1 if higher layer parameter *timeRestrictionForChannelMeasurement* is configured, and M=3 otherwise;
- For aperiodic CSI-RS resources as CMR, M=1.

For the value of N in FR2

- For periodic CSI-RS resources as CMR in a resource set configured with higher layer parameter *repetition* set to OFF, N=1. The requirements apply if *qcl-InfoPeriodicCSI-RS* is configured for all the resources in the resource set and for each resource one RS has QCL-TypeD with
  - SSB for L1-RSRP or L1-SINR measurement, or
  - another CSI-RS in resource set configured with repetition ON.
- For periodic CSI-RS resources as CMR in a resource set configured with higher layer parameter *repetition* set to ON, N=ceil(*maxNumberRxBeam* / $N_{res_per_set}$), where $N_{res_per_set}$ is number of resources in the resource set. The requirements apply provided *qcl-InfoPeriodicCSI-RS* is configured for all resources in the resource set.
- For semi-persistent CSI-RS resources as CMR in a resource set configured with higher layer parameter *repetition* set to OFF, N=1. The requirements apply provided TCI state is provided for all resources in the resource set in the MAC CE activating the resource set and for each resource has QCL-TypeD with

- SSB for L1-RSRP or L1-SINR measurement, or
- another CSI-RS in resource set configured with repetition ON.

- For semi-persistent CSI-RS resources as CMR in a resource set configured with higher layer parameter *repetition* set to ON, N=ceil(*maxNumberRxBeam* / $N_{res_per_set}$), where $N_{res_per_set}$ is number of resources in the resource set. The requirements apply provided TCI state is provided for all resources in the resource set in the MAC CE activating the resource set.

- For aperiodic CSI-RS resources as CMR in a resource set configured with higher layer parameter *repetition* set to OFF, N=1. The requirements apply provided *qcl-info* is configured for all resources in the resource set and for each resource has QCL-TypeD with
  - SSB for L1-RSRP or L1-SINR measurement, or
  - another CSI-RS in resource set configured with repetition ON.

- For aperiodic CSI-RS resources as CMR in a resource set configured with higher layer parameter *repetition* set to ON, N=1. UE is not required to meet the accuracy requirements in clause 10.1.28.1 and 10.1.28.3 if number of resources in the resource set is smaller than *maxNumberRxBeam*. The requirements apply provided *qcl-info* is configured for all resources in the resource set.

For the value of P in FR2,

- P=1, when CSI-RS is not overlapped with measurement gap and also not overlapped with SMTC occasion.

- $P=\frac{1}{1-\frac{T_{CSI-RS}}{MRGP}}$, when CSI-RS is partially overlapped with measurement gap and CSI-RS is not overlapped with SMTC occasion (T_{CSI-RS} < MGRP)

- $P=\frac{1}{1-\frac{T_{CSI-RS}}{T_{SMTCperiod}}}$, when CSI-RS is not overlapped with measurement gap and CSI-RS is partially overlapped with SMTC occasion ($T_{CSI-RS} < T_{SMTCperiod}$).

- P=3, when CSI-RS is not overlapped with measurement gap and CSI-RS is fully overlapped with SMTC occasion ($T_{CSI-RS} = T_{SMTCperiod}$).

- $P=\frac{1}{1-\frac{T_{CSI-RS}}{MRGP}-\frac{T_{CSI-RS}}{T_{SMTCperiod}}}$, when CSI-RS is partially overlapped with measurement gap and CSI-RS is partially overlapped with SMTC occasion ($T_{CSI-RS} < T_{SMTCperiod}$) and SMTC occasion is not overlapped with measurement gap and
  - $T_{SMTCperiod} \neq$ MGRP or
  - $T_{SMTCperiod}$ = MGRP and $T_{CSI-RS} < 0.5*T_{SMTCperiod}$

- $P=\frac{3}{1-\frac{T_{CSI-RS}}{MRGP}}$, when CSI-RS is partially overlapped with measurement gap and CSI-RS is partially overlapped with SMTC occasion ($T_{CSI-RS} < T_{SMTCperiod}$) and SMTC occasion is not overlapped with measurement gap and $T_{SMTCperiod}$ = MGRP and $T_{CSI-RS} = 0.5*T_{SMTCperiod}$

- $P=\frac{1}{1-\frac{T_{CSI-RS}}{\min(T_{SMTCperiod},MGRP)}}$, when CSI-RS is partially overlapped with measurement gap (T_{CSI-RS} < MGRP) and CSI-RS is partially overlapped with SMTC occasion ($T_{CSI-RS} < T_{SMTCperiod}$) and SMTC occasion is partially or fully overlapped with measurement gap.

- $P=\frac{3}{1-\frac{T_{CSI-RS}}{MRGP}}$, when CSI-RS is partially overlapped with measurement gap and CSI-RS is fully overlapped with SMTC occasion ($T_{CSI-RS} = T_{SMTCperiod}$) and SMTC occasion is partially overlapped with measurement gap ($T_{SMTCperiod}$ < MGRP)

Where:

$T_{SMTCperiod}$ = the configured SMTC1 period or SMTC2 period if configured.

T_{CSI-RS} = the periodicity of CSI-RS configured for L1-SINR measurement

If the high layer in TS 38.331 [2] signalling of *smtc2* is configured, $T_{SMTCperiod}$ corresponds to the value of higher layer parameter *smtc2*; Otherwise $T_{SMTCperiod}$ corresponds to the value of higher layer parameter *smtc1*.

Note: The overlap between CSI-RS for L1-SINR measurement and SMTC means that CSI-RS for L1-SINR measurement is within the SMTC window duration.

Longer evaluation period would be expected if the combination of CSI-RS, SMTC occasion and measurement gap configurations does not meet pervious conditions.

Table 7.7.6.0.1-1: Measurement period $T_{L1\text{-}SINR_Measurement_Period_CSI\text{-}RS_CMR_Only}$ for FR2

Configuration	$T_{L1\text{-}SINR_Measurement_Period_CSI\text{-}RS_CMR_Only}$ (ms)
non-DRX	max(T_{Report}, ceil(M*P*N)*$T_{CSI\text{-}RS}$)
DRX cycle ≤ 320ms	max(T_{Report}, ceil(1.5*M*P*N)*max(T_{DRX},$T_{CSI\text{-}RS}$))
DRX cycle > 320ms	ceil(M*P*N)*T_{DRX}
Note 1: $T_{CSI\text{-}RS}$ is the periodicity of CSI-RS configured for L1-SINR measurement. T_{DRX} is the DRX cycle length. T_{Report} is configured periodicity for reporting. Note 2: the requirements are applicable provided that the CSI-RS resource configured for L1-SINR measurement is transmitted with Density = 3.	

The accuracy requirements in Table 7.7.6.0.1-3 are valid under the following conditions:

- Conditions defined in clause 7.3 of TS 38.101-2 [19] for reference sensitivity are fulfilled.
- Conditions for L1-SINR measurements are fulfilled according to Annex B.2.8.1 for a corresponding Band for each relevant CSI-RS based CMR.
- The bandwidth of CSI-RS as CMR is 48 PRBs and the density is 3.
- The measured signals are in the directions covered by the percentile EIS spherical coverage of the UE, defined in clause 7.3.4 of TS 38.101-2 [19].
- AWGN radio propagation conditions.

The performance with larger bandwidth of CSI-RS as CMR is equal to or better than the accuracy requirements in Table 7.7.6.0.1-3.

Table 7.7.6.0.1-3: L1-SINR absolute accuracy for CSI-RS based CMR only in FR2

Accuracy		Conditions			
Normal condition	Extreme condition	CSI-RS CMR Ês/Iot Note 3	Io Note 1 range		
			Minimum Io		Maximum Io
dB	dB	dB	dBm / $SCS_{CSI\text{-}RS}$ Note 2	dBm/$BW_{Channel}$	dBm/$BW_{Channel}$
			$SCS_{CSI\text{-}RS}$ = 60kHz / $SCS_{CSI\text{-}RS}$ = 120kHz		
±5.5	±6.5	≥-3	Same value as CSI-RS_RP in Table in B.2.8.1, according to UE Power class, operating band and angle of arrival	N/A	-50
NOTE 1: Io specified at the Reference point, and assumed to have constant EPRE across the bandwidth. NOTE 2: Values based on Refsens and EIS spherical coverage as defined in clauses 7.3.2 and 7.3.4 of TS 38.101-2 [19]. Applicable side condition selected depending on angle of arrival. NOTE 3: In the test cases, the CSI-RS CMR Ês/Iot and related parameters may need to be adjusted to ensure Ês/Iot at UE baseband is above the value defined in this table.					

The normative reference for this requirement is TS 38.133 [6] clauses 9.8.4.1 and 10.1.28.1.

7.7.6.0.2 Minimum conformance requirements for SSB based CMR and dedicated IMR L1-SINR measurement accuracy

The UE shall be capable of performing L1-SINR measurements with the SSB configured as CMR and dedicated resource configured as IMR for L1-SINR computation, in which the NZP-CSI-RS or CSI-IM resource configured as

dedicated IMR shall be 1-to-1 mapped to SSB configured as CMR, with the same periodicity. The UE physical layer shall be capable of reporting L1-SINR measured over the measurement period of $T_{L1\text{-}SINR_Measurement_Period_SSB_CMR_IMR}$.

The requirements in this clause are not applicable if NZP-CSI-RS or CSI-IM resource configured as dedicated IMR is scheduled with different periodicity as SSB configured as CMR.

The value of $T_{L1\text{-}SINR_Measurement_Period_SSB_CMR_IMR}$ is defined in Table 7.7.6.0.2-1 for FR2, where

For the value of M

- For periodic or semi-persistent NZP CSI-RS or CSI-IM resource as dedicated IMR, M=1 if the higher layer parameters *timeRestrictionForChannelMeasurements* and/or *timeRestrictionForInterferenceMeasurements* are configured, and M=3 otherwise;

For the value of N in FR2

- N = 8.

P is defined as the maximum value between P_{CMR} and P_{IMR}, i.e., $P = \max(P_{CMR}, P_{IMR})$, where

- the value of P_{CMR} shall be derived in the same way as the value of P used for SSB based L1-RSRP measurement in clause 9.5.4.1, in which the occasions and period of the SSB for CMR shall be used instead.

- the value of P_{IMR} shall be derived in the same way as the value of P used for CSI-RS based L1-RSRP measurement in clause 9.5.4.2, in which the occasions and period of the NZP CSI-RS for NZP-IMR or CSI-IM for ZP-IMR shall be used instead.

Longer evaluation period would be expected if the combination of SSB, SMTC occasion and measurement gap configurations does not meet pervious conditions.

For L1-SINR measurement with SSB as CMR and CSI-RS or CSI-IM as IMR, the requirement shall apply if the CSI-RS is configured as IMR with repetition field as “repetition = OFF” or CSI-IM is configured as IMR.

For L1-SINR measurement with SSB as CMR and CSI-RS/CSI-IM as IMR, no requirement shall apply if SSB occasions for CMR or CSI-RS/CSI-IM occasions for IMR are fully overlapped with the configured measurement gap

Table 7.7.6.0.2-1: Measurement period $T_{L1\text{-}SINR_Measurement_Period_SSB_CMR_IMR}$ for FR2

Configuration	$T_{L1\text{-}SINR_Measurement_Period_SSB_CMR_IMR}$ (ms)
non-DRX	$\max(T_{Report}, \text{ceil}(M*P*N)*T_{SSB})$
DRX cycle ≤ 320ms	$\max(T_{Report}, \text{ceil}(1.5*M*P*N)*\max(T_{DRX},T_{SSB}))$
DRX cycle > 320ms	$\text{ceil}(1.5*M*P*N)*T_{DRX}$
Note 1: T_{SSB} = ssb-periodicityServingCell is the periodicity of the SSB-Index configured for L1-SINR measurement. T_{DRX} is the DRX cycle length. T_{Report} is configured periodicity for reporting. Note 2: The requirements are applicable provided that the CSI-RS resource configured for interference measurement shall be 1-to-1 mapped to SSB configured for channel measurement, with the same periodicity.	

The accuracy requirements in Tables 7.7.6.0.2-2 and 7.7.6.0.2-3 are valid under the following conditions:

- Conditions defined in clause 7.3 of TS 38.101-2 [19] for reference sensitivity are fulfilled.

- Conditions for L1-SINR measurements are fulfilled according to Annex B.2.8.2 for a corresponding Band for each relevant SSB based CMR and IMR.

- The bandwidth of NZP-IMR and ZP-IMR is 48 PRBs and the density is 3.

- The measured signals are in the directions covered by the percentile EIS spherical coverage of the UE, defined in clause 7.3.4 of TS 38.101-2 [19].

- AWGN radio propagation conditions.

- SSB based CMR and IMR in the test come from the same direction.

The performance with larger bandwidth of NZP-IMR and ZP-IMR is equal to or better than the accuracy requirements in Tables 7.7.6.0.2-2 and 7.7.6.0.2-3.

Table 7.7.6.0.2-2: L1-SINR absolute accuracy for SSB based CMR and NZP-IMR in FR2

Accuracy		Conditions				
Normal condition	Extreme condition	SSB CMR Ês/Iot Note 3	NZP-IMR Ês/Iot Note 3	Io Note 1 range		
				Minimum Io		Maximum Io
dB	dB	dB	dB	dBm / SCS_{SSB} Note 2	dBm/$BW_{Channel}$	dBm/$BW_{Channel}$
				SCS_{SSB} = 120kHz	SCS_{SSB} = 240kHz	
±4.0	±5.0	≥0	≥0	Same value as SSB_RP in Table in B.2.8.2, according to UE Power class, operating band and angle of arrival	N/A	-50

NOTE 1: Io specified at the Reference point, and assumed to have constant EPRE across the bandwidth.
NOTE 2: Values based on Refsens and EIS spherical coverage as defined in clauses 7.3.2 and 7.3.4 of TS 38.101-2 [19]. Applicable side condition selected depending on angle of arrival.
NOTE 3: In the test cases, the SSB Ês/Iot, NZP-IMR Ês/Iot and related parameters may need to be adjusted to ensure Ês/Iot at UE baseband is above the value defined in this table.

Table 7.7.6.0.2-3: L1-SINR absolute accuracy for SSB based CMR and ZP-IMR in FR2

Accuracy		Conditions			
Normal condition	Extreme condition	SSB CMR Ês/Iot Note 3	Io Note 1 range		
			Minimum Io		Maximum Io
dB	dB	dB	dBm / SCS_{SSB} Note 2	dBm/$BW_{Channel}$	dBm/$BW_{Channel}$
			SCS_{SSB} = 120kHz	SCS_{SSB} = 240kHz	
±4.5	±5.5	≥-3	Same value as SSB_RP in Table in B.2.8.2, according to UE Power class, operating band and angle of arrival	N/A	-50

NOTE 1: Io specified at the Reference point, and assumed to have constant EPRE across the bandwidth.
NOTE 2: Values based on Refsens and EIS spherical coverage as defined in clauses 7.3.2 and 7.3.4 of TS 38.101-2 [19]. Applicable side condition selected depending on angle of arrival.
NOTE 3: In the test cases, the SSB CMR Ês/Iot and related parameters may need to be adjusted to ensure Ês/Iot at UE baseband is above the value defined in this table.

The normative reference for this requirement is TS 38.133 [6] clauses 9.8.4.2 and 10.1.28.2.

7.7.6.0.3 Minimum conformance requirements for CSI-RS based CMR and dedicated IMR L1-SINR measurement accuracy

The UE shall be capable of performing L1-SINR measurements with the CSI-RS resource configured as CMR and dedicated resource configured as IMR for L1-SINR computation, in which the NZP-CSI-RS or CSI-IM resource configured as dedicated IMR shall be 1-to-1 mapped to CSI-RS resource configured as CMR, with the same periodicity. The UE physical layer shall be capable of reporting L1-SINR measured over the measurement period of $T_{L1\text{-}SINR_Measurement_Period_CSI\text{-}RS_CMR_IMR}$.

The requirements in this clause are not applicable if NZP-CSI-RS or CSI-IM resource configured as dedicated IMR is scheduled with different periodicity as CSI-RS resource configured as CMR.

The value of $T_{L1\text{-}SINR_Measurement_Period_CSI\text{-}RS_CMR_IMR}$ is defined in Table 7.7.6.0.3-2 for FR2, where

For the value of M,

- M=1 shall be applied if
  - aperiodic NZP-CSI-RS as CMR or dedicated IMR, or
  - aperiodic CSI-IMR as dedicated IMR, or
  - periodic and semi-persistent NZP-CSI-RS as CMR or dedicated IMR and the higher layer parameters *timeRestrictionForChannelMeasurement* and/or *timeRestrictionForInterferenceMeasurements* are configured, or
  - periodic and semi-persistent CSI-IM as dedicated IMR and the higher layer parameters *timeRestrictionForChannelMeasurement* and/or *timeRestrictionForInterferenceMeasurements* are configured;
- M=3 otherwise.

For the value of N in FR2

- For periodic CSI-RS resources as CMR in a resource set configured with higher layer parameter *repetition* set to OFF, N=1. The requirements apply if *qcl-InfoPeriodicCSI-RS* is configured for all the resources in the resource set and for each resource one RS has QCL-TypeD with
  - SSB for L1-RSRP or L1-SINR measurement, or
  - another CSI-RS in resource set configured with repetition ON.
- For periodic CSI-RS resources as CMR in a resource set configured with higher layer parameter *repetition* set to ON, N=ceil(*maxNumberRxBeam* / $N_{res_per_set}$), where $N_{res_per_set}$ is number of resources in the resource set. The requirements apply provided *qcl-InfoPeriodicCSI-RS* is configured for all resources in the resource set.
- For semi-persistent CSI-RS resources as CMR in a resource set configured with higher layer parameter *repetition* set to OFF, N=1. The requirements apply provided TCI state is provided for all resources in the resource set in the MAC CE activating the resource set and for each resource has QCL-TypeD with
  - SSB for L1-RSRP or L1-SINR measurement, or
  - another CSI-RS in resource set configured with repetition ON.
- For semi-persistent CSI-RS resources as CMR in a resource set configured with higher layer parameter *repetition* set to ON, N=ceil(*maxNumberRxBeam* / $N_{res_per_set}$), where $N_{res_per_set}$ is number of resources in the resource set. The requirements apply provided TCI state is provided for all resources in the resource set in the MAC CE activating the resource set.
- For aperiodic CSI-RS resources as CMR in a resource set configured with higher layer parameter *repetition* set to OFF, N=1. The requirements apply provided *qcl-info* is configured for all resources in the resource set and for each resource has QCL-TypeD with
  - SSB for L1-RSRP or L1-SINR measurement, or
  - another CSI-RS in resource set configured with repetition ON.
- For aperiodic CSI-RS resources as CMR in a resource set configured with higher layer parameter *repetition* set to ON, N=1. UE is not required to meet the accuracy requirements in clause 10.1.28.1 and 10.1.28.3 if number of resources in the resource set is smaller than *maxNumberRxBeam*. The requirements apply provided *qcl-info* is configured for all resources in the resource set.

P is defined as the maximum value between P_{CMR} and P_{IMR}, i.e., $P = \max(P_{CMR}, P_{IMR})$, where

- The value of P_{CMR} and P_{IMR} shall be derived in the same way as the value of P used for CSI-RS based L1-RSRP measurement in clause 9.5.4.2, in which the occasions and period of the CSI-RS for CMR and NZP CSI-RS for NZP-IMR or CSI-IM for ZP-IMR shall be used instead respectively.

Longer evaluation period would be expected if the combination of CSI-RS, SMTC occasion and measurement gap configurations does not meet pervious conditions.

For L1-SINR measurement with CSI-RS as CMR and CSI-RS as IMR, the requirement shall apply only if CSI-RS resources as CMR and IMR are configured with the same repetition field and the number of CSI-RS resources in the resource sets for CMR and IMR are same.

For L1-SINR measurement with CSI-RS as CMR and CSI-IM as IMR, the requirement shall apply only if the number of CSI-RS resources in the resource set for CMR and the number of CSI-IM resources in the resource set for IMR are same.

For L1-SINR measurement with CSI-RS as CMR and CSI-RS/CSI-IM as IMR, no requirement shall apply if CSI-RS occasions for CMR or CSI-RS/CSI-IM occasions for IMR are fully overlapped with the configured measurement gap.

Table 7.7.6.0.3-1: Measurement period $T_{L1\text{-}SINR_Measurement_Period_CSI\text{-}RS_CMR_IMR}$ for FR2

Configuration	$T_{L1\text{-}SINR_Measurement_Period_CSI\text{-}RS_CMR_IMR}$ (ms)
non-DRX	$\max(T_{Report}, \text{ceil}(M*P*N)*T_{CSI\text{-}RS})$
DRX cycle ≤ 320ms	$\max(T_{Report}, \text{ceil}(1.5*M*P*N)*\max(T_{DRX},T_{CSI\text{-}RS}))$
DRX cycle > 320ms	$\text{ceil}(M*P*N)*T_{DRX}$
Note 1: $T_{CSI\text{-}RS}$ is the periodicity of CSI-RS configured for L1-SINR measurement. T_{DRX} is the DRX cycle length. T_{Report} is configured periodicity for reporting.	
Note 2: the requirements are applicable provided that the CSI-RS resource configured for L1-SINR measurement is transmitted with Density = 3.	
Note 3: The requirements are applicable provided that the CSI-RS resource configured for interference measurement shall be 1-to-1 mapped to CSI-RS configured for channel measurement, with the same periodicity.	

The accuracy requirements in Tables 7.7.6.0.3-2 and 7.7.6.0.3-3 are valid under the following conditions:

- Conditions defined in clause 7.3 of TS 38.101-2 [19] for reference sensitivity are fulfilled.
- Conditions for L1-SINR measurements are fulfilled according to Annex B.2.8.3 for a corresponding Band for each relevant CSI-RS based CMR and IMR.
- The bandwidth of CSI-RS as CMR, NZP-IMR and ZP-IMR is 48 PRBs and the density is 3.
- The measured signals are in the directions covered by the percentile EIS spherical coverage of the UE, defined in clause 7.3.4 of TS 38.101-2 [19].
- AWGN radio propagation conditions.
- CSI-RS based CMR and IMR in the test come from the same direction.

The performance with larger bandwidth of CSI-RS as CMR, NZP-IMR and ZP-IMR is equal to or better than the accuracy requirements in Tables 7.7.6.0.3-2 and 7.7.6.0.3-3.

Table 7.7.6.0.3-2: L1-SINR absolute accuracy for CSI-RS based CMR and NZP-IMR in FR2

Accuracy		Conditions				
Normal condition	Extreme condition	CSI-RS CMR Ês/Iot Note 3	NZP-IMR Ês/Iot Note 3	Io Note 1 range		
				Minimum Io		Maximum Io
dB	dB	dB	dB	dBm / $SCS_{CSI\text{-}RS}$ Note 2	dBm/$BW_{Channel}$	dBm/$BW_{Channel}$
				$SCS_{CSI\text{-}RS}$ = 60kHz	$SCS_{CSI\text{-}RS}$ = 120kHz	
±4.0	±5.0	≥0	≥0	Same value as CSI-RS_RP in Table in B.2.8.3, according to UE Power class, operating band and angle of arrival	N/A	-50
NOTE 1: Io specified at the Reference point, and assumed to have constant EPRE across the bandwidth.						

NOTE 2: Values based on Refsens and EIS spherical coverage as defined in clauses 7.3.2 and 7.3.4 of TS 38.101-2 [19]. Applicable side condition selected depending on angle of arrival. NOTE 3: In the test cases, the CSI-RS Ês/Iot, NZP-IMR Ês/Iot and related parameters may need to be adjusted to ensure Ês/Iot at UE baseband is above the value defined in this table.

Table 7.7.6.0.3-3: L1-SINR absolute accuracy for CSI-RS based CMR and ZP-IMR in FR2

Accuracy		Conditions			
Normal condition	Extreme condition	CSI-RS CMR Ês/Iot Note 3	Io Note 1 range		
			Minimum Io		Maximum Io
dB	dB	dB	dBm / SCS_{CSI-RS} Note 2		dBm/$BW_{Channel}$	dBm/$BW_{Channel}$
			SCS_{CSI-RS} = 60kHz	SCS_{CSI-RS} = 120kHz		
±4.5	±5.5	≥-3	Same value as CSI-RS_RP in Table in B.2.8.3, according to UE Power class, operating band and angle of arrival		N/A	-50
NOTE 1: Io specified at the Reference point, and assumed to have constant EPRE across the bandwidth. NOTE 2: Values based on Refsens and EIS spherical coverage as defined in clauses 7.3.2 and 7.3.4 of TS 38.101-2 [19]. Applicable side condition selected depending on angle of arrival. NOTE 3: In the test cases, the CSI-RS Ês/Iot and related parameters may need to be adjusted to ensure Ês/Iot at UE baseband is above the value defined in this table.						

The normative reference for this requirement is TS 38.133 [6] clauses 9.8.4.3 and 10.1.28.3.

7.7.6.1 NR SA FR2 CSI-RS based CMR and no dedicated IMR configured and CSI-RS resource set with repetition off L1-SINR measurement accuracy

Editor's note: This test case is incomplete. The following aspects are either missing or not yet determined:

- The test is incomplete for test frequencies > 40.8 GHz

7.7.6.1.1 Test purpose

The purpose of this test is to verify that the L1-SINR measurement accuracy is within the specified limits.

7.7.6.1.2 Test applicability

This test applies to all types of NR UE from Release 16 onwards. Applicability requires support of L1-SINR measurements.

7.7.6.1.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 7.7.6.0.1.

The normative reference for this requirement is TS 38.133 [6] clause A.7.7.6.1.

7.7.6.1.4 Test description

7.7.6.1.4.1 Initial conditions

This test shall be tested using any of the test configurations in Table 7.7.6.1.4.1-1.

Table 7.7.6.1.4.1-1: Applicable NR configurations for FR2 L1-SINR test with CSI-RS based CMR and no dedicated IMR configured

Config	Description
1	NR 120 kHz CSI-RS SCS, 100 MHz bandwidth, TDD duplex mode

Configure the test equipment and the DUT according to the parameters in Table 7.7.6.1.4.1-2.

Table 7.7.6.1.4.1-2: Initial conditions for CSI-RS based L1-SINR absolute accuracy in FR2

Parameter	Value	Comment
Test environment	NC	As specified in TS 36.508 [25] clause 4.1.
Test frequencies	As specified in Annex E, Table E.5-1 and TS 38.508-1 [14] clause 4.3.1.	
Channel bandwidth	As specified by the selected test configuration.	
Propagation conditions	AWGN	As specified in Annex C.2.1
Connection Diagram	TE Part: A.3.3.1.1 DUT Part: A.3.4.1.1	As specified in TS 38.508-1 [14] Annex A.
Exceptions to connection diagram	N/A	

1. Message contents are defined in clause 7.7.6.1.4.3.
2. Cell 1 is the NR FR2 cell. Cell 1 is the target cell for the CSI-RS based L1-SINR measurements. The UE is configured to perform RLM and BFD measurement based on the CSI-RS.
3. The UE Rx beam peak direction has been obtained previously using one of the Rx Beam Peak Search procedures as described in Annex I.

7.7.6.1.4.2 Test procedure

Prior to the start of the time duration T1, the UE shall be fully synchronized to PSCell. The UE shall be configured for periodic CSI reporting in PUCCH [format 2] with a reporting periodicity as mentioned in the above table 7.7.6.1.4.1-2.

1. Ensure the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity *NR*, Connected without release *On* and Test Mode *On* according to TS 38.508-1 [14] clause 4.5.
2. Set the parameters according to T1 in Table 7.7.6.1.5-1.
3. After 640ms from the start of the test the SS transmits CSI-RS with a periodicity of 20 slots.
4. The SS shall check following requirements:

   - R1: the L1-SINR reported values of CSI-RS#0 and CSI-RS#1 in the periodic L1-RSRP reports. If the value for both CSI-RSs is within the limits in Table 7.7.6.1.5-2 or Table 7.7.6.1.5-3 (depending on the test configuration), the number of passed iterations is increased by one, otherwise the number of failed iterations is increased by one.

   - R2: the L1-SINR value of CSI-RS#1 reported by the UE is compared to the expected L1-SINR value for CSI-RS#1. If the resulting value is outside the limits in Table 7.7.6.1.5-4 or the UE fails to report the measurement value for CSI-RS#1, the number of failed iterations for R2 is increased by one. Otherwise, the number of passed iterations for R2 is increased by one.

   - R3: the DIFF SINR value of CSI-RS#0 reported by the UE is compared to the expected DIFF SINR value. If the resulting value is outside the limits in Table 7.7.6.1.5-4 or the UE fails to report the measurement value for CSI-RS#0, the number of failed iterations for R3 is increased by one. Otherwise, the number of passed iterations for R3 is increased by one.

5. The SS shall continue checking the L1-SINR report messages transmitted by the UE until the confidence level according to Table G.2.3-1 in Annex G is achieved.
6. Set the parameters according to each sub-test in Table 7.7.6.1.5-1 as appropriate and repeat steps 3-5.

7.7.6.1.4.3 Message contents

Message contents are according to TS 38.508-1 [14] clause 7.3 with the following exceptions:

Table 7.7.6.1.4.3-1: Common Exception messages NR SA CSI-RS-based L1-RSRP measurement

Default Message Contents	
Common contents of system information blocks exceptions	
Default RRC messages and information elements contents exceptions	Table H.3.6A-1 with conditions PERIODIC and CSI-SINR Table H.3.6A-2 with conditions CSI-RS and PERIODIC Table H.3.6A-3 with condition PERIODIC Table 7.3.1-3 in TS 38.508-1 [14] with condition SMTC.1

Table 7.7.6.1.4.3-2: RadioLinkMonitoringConfig

Derivation Path: TS 38.508-1 [14], Table 4.6.3-133			
Information Element	**Value/remark**	**Comment**	**Condition**
RadioLinkMonitoringConfig ::= SEQUENCE {			
failureDetectionResourcesToAddModList SEQUENCE (SIZE(1..maxNrofFailureDetectionResources)) OF SEQUENCE {	1 entry		
purpose	both	UE is configured to perform RLM and BFD based on the SSB.	
}			
}			

7.7.6.1.5 Test requirement

Table 7.7.6.1.5-1 defines the primary level settings excluding test tolerances for all tests. (Refer to Sec. 7.7.3.1.5)

Each L1-SINR measurement report for each of the tests in Table 7.7.6.1.5-1 shall meet the corresponding absolute accuracy requirements in Table 7.7.6.1.5-2 for test configurations 1 and 2, and the corresponding absolute accuracy requirements in Table 7.7.6.1.5-3 for test configuration 3.

Table 7.7.6.1.5-1: FR2 CSI-RS based L1-SINR general test parameters

Parameter	Config	Unit	Test 1
SSB GSCN	1		freq1
Duplex mode	1		TDD
TDD Configuration	1		TDDConf.3.1
$BW_{channel}$	1	MHz	100: $N_{RB,C}$ = 66
PDSCH Reference measurement channel	1		SR.3.1 TDD
RMSI CORESET Reference Channel	1		CR.3.1 TDD
Dedicated CORESET Reference Channel	1		CCR.3.1 TDD
SSB configuration	1		SSB.1 FR2
OCNG Patterns	1		OP.1
Initial BWP Configuration	1		DLBWP.0.1 ULBWP.0.1
Dedicated BWP configuration	1		DLBWP.1.3 ULBWP.1.3
TRS Configuration	1		TRS.2.1 TDD
PDCCH/PDSCH TCI Configuration	1		TCI.State.2
SMTC configuration	1		SMTC.1
CSI-RS	1		CSI-RS.3.2 TDD
reportConfigType	1		periodic
reportQuantity	1		cri-SINR-r16
nrofReportedRS	1		2
L1-SINR reporting period	1		slot80
Propagation condition	1		AWGN

Antenna configuration	1		1x2
EPRE ratio of PSS to SSS	1	dB	0
EPRE ratio of PBCH DMRS to SSS			
EPRE ratio of PBCH to PBCH DMRS			
EPRE ratio of PDCCH DMRS to SSS			
EPRE ratio of PDCCH to PDCCH DMRS			
EPRE ratio of PDSCH DMRS to SSS			
EPRE ratio of PDSCH to PDSCH DMRS			
EPRE ratio of OCNG DMRS to SSS Note 1			
EPRE ratio of OCNG to OCNG DMRS Note 1			
Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols. Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for N_{oc} to be fulfilled.			

Table 7.7.6.1.5-2: FR2 CSI-RS based L1-SINR OTA related test parameters

Parameter	Config	Unit	Test 1	
			CSI-RS0	CSI-RS1
Angle of arrival configuration			Setup 1 according to A.3.15.1	
Assumption for UE beams Note 4			Rough	
N_{oc}	1~2	dBm/15 kHz	-104.1	
N_{oc}	1~2	dBm/SSB SCS	-95.1	
$\hat{E}_s/I_{ot}$	1~2	dB	10	-1.8
CSI-RS-RSRP Note1	1~2	dBm/SCS	-85.07	-96.87
Io Note1	1~2	dBm/95.04MHz	-55.67	-63.88
$\hat{E}_s/N_{oc}$	1~2	dB	10	-1.8
Note 1: RSRP and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves. Note 2: RSRP minimum requirements are specified assuming independent interference and noise at each receiver antenna port. Note 3: Void. Note 4: Information about types of UE beam is given in TS 38.133 Annex B.2.1.3, and does not limit UE implementation or test system implementation				

After 640ms from the beginning of the test, the L1-SINR measurement accuracy for CSI-RS#0 and CSI-RS#1 of Cell 1 shall meet the corresponding absolute accuracy requirements in Table 7.7.6.1.5-3 and the corresponding relative accuracy requirements in Table 7.7.6.1.5-4.

Table 7.7.6.1.5-3: L1-SINR absolute accuracy requirements for the reported values R1

UE power class 3	
Normal Conditions	Test 1 All bands
Lowest reported value (CSI-RS0)	53

Highest reported value (CSI-RS0)	76
Extreme Conditions	**Test 1 All bands**
Lowest reported value (CSI-RS0)	51
Highest reported value (CSI-RS0)	78

Table 7.7.6.1.5-4: L1-SINR relative accuracy requirements for the reported values R2 and R3

UE power class 3	
Normal Conditions	**Test 1 All bands**
Lowest DIFF SINR reported value	6
Highest DIFF SINR reported value	15
Extreme Conditions	**Test 1 All bands**
Lowest DIFF SINR reported value	5
Highest DIFF SINR reported value	15

For the test to pass, the ratio of successful reported values for each requirement (R1 to R3) shall be more than 90% with a confidence level of 95%. Each requirement is evaluated independently of the others.

7.7.6.2 NR SA FR2 SSB based CMR and dedicated IMR L1-SINR measurement accuracy

Editor's note: This test case is incomplete. The following aspects are either missing or not yet determined:

- The test is incomplete for UE power classes other than PC3
- The test is incomplete for test frequencies > 40.8 GHz
- The test is incomplete for extreme conditions

7.7.6.2.1 Test purpose

The purpose of this test is to verify that the L1-SINR measurement accuracy is within the specified limits.

7.7.6.2.2 Test applicability

This test applies to all types of NR UE from Release 16 onwards. Applicability requires support of L1-SINR measurements.

7.7.6.2.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 7.7.6.0.2.

The normative reference for this requirement is TS 38.133 [6] clause A.7.7.6.2.

7.7.6.2.4 Test description

7.7.6.2.4.1 Initial conditions

This test shall be tested using any of the test configurations in Table 7.7.6.2.4.1-1.

Table 7.7.6.2.4.1-1: Applicable NR configurations for FR2 L1-SINR measurement test with SSB based CMR and CSI-IM based IMR

Config	Description
1	LTE FDD, NR 120 kHz SSB SCS, 100 MHz bandwidth, TDD duplex mode
2	LTE FDD, NR 240 kHz SSB SCS, 100 MHz bandwidth, TDD duplex mode
Note: The UE is only required to be tested in one of the supported test configurations in each supported band	

Configure the test equipment and the DUT according to the parameters in Table 7.7.6.2.4.1-2.

Table 7.7.6.2.4.1-2: Initial conditions for SSB based L1-SINR absolute accuracy in FR2

Parameter	Value	Comment
Test environment	NC	As specified in TS 36.508 [25] clause 4.1.
Test frequencies	As specified in Annex E, Table E.5-1 and TS 38.508-1 [14] clause 4.3.1.	
Channel bandwidth	As specified by the test configuration selected from Table 7.7.6.2.4.1-1.	
Propagation conditions	AWGN	As specified in Annex C.2.1
Connection Diagram	TE Part: A.3.3.1.1 DUT Part: A.3.4.1.1	As specified in TS 38.508-1 [14] Annex A.
Exceptions to connection diagram	N/A	

1. Message contents are defined in clause 7.7.6.2.4.3.

2. Cell 1 is the NR FR2 cell. Cell 1 is the target cell for the SSB-based L1-RSRP measurements. The UE is configured one SSB resource set with two SSB resources and one CSI-IM resource set with two CSI-IM resource. UE is configured to perform RLM and BFD measurement based on the SSB resources 0 and 1. UE is configured to perform L1-SINR measurement based on the SSBs as CMR and the CSI-IM resources as IMR..

3. The UE Rx beam peak direction has been obtained previously using one of the Rx Beam Peak Search procedures as described in Annex I.

7.7.6.2.4.2 Test procedure

Prior to the start of the time duration T1, the UE shall be fully synchronized to PSCell. The UE shall be configured for periodic CSI reporting in PUCCH [format 2] with a reporting periodicity as mentioned in the above table 7.7.6.2.4.1-2.

1. Ensure the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity NR SA, Connected without release *On* and Test Mode *On*, according to TS 38.508-1 [14] clause 4.5.

2. Set the parameters according to T1 in Table 7.7.6.2.5-1.

3. After 640ms from the start of the test the SS transmits CSI-RS as IMR with a periodicity of 20 slots.

4. The SS shall check following requirements:

   - R1: the L1-SINR reported values of SSB#0+CSI-IM#0 and SSB#1+CSI-IM#1 in the periodic L1-RSRP reports. If the value for both SSB#0+CSI-IM#0 and SSB#1+CSI-IM#1 is within the limits in Table 7.7.6.2.5-2 and Table 7.7.6.2.5-3 (depending on the test configuration), the number of passed iterations is increased by one, otherwise the number of failed iterations is increased by one.

   - R2: the L1-SINR value of SSB#1 reported by the UE is compared to the expected L1-SINR value for SSB#1. If the resulting value is outside the limits in Table 7.7.6.2.5-4 or the UE fails to report the

measurement value for SSB#1, the number of failed iterations for R2 is increased by one. Otherwise, the number of passed iterations for R2 is increased by one.

- R3: the DIFF SINR value of SSB#0 reported by the UE is compared to the expected DIFF SINR value. If the resulting value is outside the limits in Table 7.7.6.2.5-4 or the UE fails to report the measurement value for SSB#0, the number of failed iterations for R3 is increased by one. Otherwise, the number of passed iterations for R3 is increased by one.

5. The SS shall continue checking the L1-SINR report messages transmitted by the UE until the confidence level according to Table G.2.3-1 in Annex G is achieved.

6. Set the parameters according to each sub-test in Table 7.7.6.2.5-1 as appropriate and repeat steps 3-5.

7.7.6.2.4.3 Message contents

Message contents are according to TS 38.508-1 [14] clause 7.3 with the following exceptions:

Table 7.7.6.2.4.3-1: Common Exception messages NR SA SSB based L1-RSRP measurement

Default Message Contents	
Common contents of system information blocks exceptions	
Default RRC messages and information elements contents exceptions	Table H.3.6A-1 with conditions PERIODIC and SS-SINR and CSI-RS_IMR Table H.3.6A-2 with conditions SSB and PERIODIC Table H.3.6A-3 with condition PERIODIC Table 7.3.1-3 in TS 38.508-1 [14] with condition SMTC.1

Table 7.7.6.2.4.3-2: RadioLinkMonitoringConfig

Derivation Path: TS 38.508-1 [14], Table 4.6.3-133			
Information Element	**Value/remark**	**Comment**	**Condition**
RadioLinkMonitoringConfig ::= SEQUENCE {			
failureDetectionResourcesToAddModList SEQUENCE (SIZE(1..maxNrofFailureDetectionResources)) OF SEQUENCE {	1 entry		
purpose	both	UE is configured to perform RLM and BFD based on the SSBs.	
detectionResource CHOICE {			
ssb-Index	0		
}			
}			
}			

7.7.6.2.5 Test requirement

Table 7.7.6.2.5-1 defines the primary level settings including test tolerances for all tests.

Each L1-RSRP measurement report for each of the tests in Table 7.7.6.2.5-1 shall meet the corresponding absolute accuracy requirements in Table 7.7.6.2.5-2 for test configurations 1 and 2, and the corresponding absolute accuracy requirements in Table 7.7.6.2.5-3 for test configuration 3.

Table 7.7.6.2.5-1: FR2 L1-SINR general test parameters with SSB based CMR and CSI-IM based IMR

Parameter	Config	Unit	Test 1
SSB GSCN	1~2		freq1
Duplex mode	1~2		TDD
TDD Configuration	1~2		TDDConf.3.1
$BW_{channel}$	1~2	MHz	100: $N_{RB,c}$ = 66
PDSCH Reference measurement channel	1~2		SR.3.1 TDD

RMSI CORESET Reference Channel	1~2		CR.3.1 TDD
Dedicated CORESET Reference Channel	1~2		CCR.3.1 TDD
SSB configuration	1		SSB.1 FR2
	2		SSB.2 FR2
CSI-IM configuration	1~2		CSI-IM 3.1 TDD
OCNG Patterns	1~2		OP.1
Initial BWP Configuration	1~2		DLBWP.0.1 ULBWP.0.1
Dedicated BWP configuration	1~2		DLBWP.1.3 ULBWP.1.3
TRS Configuration	1~2		TRS.2.1 TDD
PDCCH/PDSCH TCI Configuration	1~2		TCI.State.2
SMTC configuration	1~2		SMTC.1
reportConfigType	1~2		periodic
reportQuantity-r16	1~2		ssb-Index-SINR-r16
Number of reported RS	1~2		2
L1-SINR reporting period	1~2		slot640
Propagation condition	1~2		AWGN
Antenna configuration	1~2		1x2
EPRE ratio of PSS to SSS	1~2	dB	0
EPRE ratio of PBCH DMRS to SSS			
EPRE ratio of PBCH to PBCH DMRS			
EPRE ratio of PDCCH DMRS to SSS			
EPRE ratio of PDCCH to PDCCH DMRS			
EPRE ratio of PDSCH DMRS to SSS			
EPRE ratio of PDSCH to PDSCH DMRS			
EPRE ratio of OCNG DMRS to SSS[Note 1]			
EPRE ratio of OCNG to OCNG DMRS [Note 1]			
Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols. Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for N_{oc} to be fulfilled.			

Table 7.7.6.2.5-2: FR2 L1-SINR SSB specific test parameters

Parameter	Config	Unit	Test 1	
			SSB0	SSB1
Angle of arrival configuration			Setup 1 according to A.3.15.1	
Assumption for UE beams[Note 4]			Rough	
N_{oc}	1~2	dBm/15kHz	-104.1	
N_{oc}	1	dBm/SSB SCS	-95.1	
	2		92.1	
$\hat{E}_s / I_{ot}$	1~2	dB	10	1.8
SS-RSRP[Note1]	1	dBm/SCS	-85.07	-96.87
	2		-82.06	-93.86
Io[Note1]	1~2	dBm/95.04 MHz	-55.67	
$\hat{E}_s / N_{oc}$	1~2	dB	10	-1.8
Note 1: RSRP and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.				

Note 2:	RSRP minimum requirements are specified assuming independent interference and noise at each receiver antenna port.
Note 3:	Information about types of UE beam is given in TS 38.133 Annex B.2.1.3, and does not limit UE implementation or test system implementation

After 640ms from the beginning of the test, the L1-SINR measurement accuracy for SSB#0+CSI-IM#0 and SSB#1+CSI-IM#1 of Cell 1 shall meet the corresponding absolute accuracy of SSB#0+CSI-IM#0 and absolute accuracy of SSB#1+CSI-IM#1 in Table 7.7.6.2.5-3. The corresponding relative accuracy requirements in Table 7.7.6.2.5-4

Table 7.7.6.2.5-3: L1-SINR absolute accuracy test requirement R1

UE power class 3	
Normal Conditions	**Test 1 All bands**
Lowest reported value (CSI-RS0)	55
Highest reported value (CSI-RS0)	74
Extreme Conditions	**Test 1 All bands**
Lowest reported value (CSI-RS0)	53
Highest reported value (CSI-RS0)	76

Table 7.7.6.2.5-4: L1-SINR relative accuracy requirements for the reported values R2 and R3

UE power class 3	
Normal Conditions	**Test 1 All bands**
Lowest DIFF SINR reported value	7
Highest DIFF SINR reported value	15
Extreme Conditions	**Test 1 All bands**
Lowest DIFF SINR reported value	6
Highest DIFF SINR reported value	15

For the test to pass, the ratio of successful reported values for each requirement (R1 to R3) shall be more than 90% with a confidence level of 95%. Each requirement is evaluated independently of the others.

7.7.6.3 NR SA FR2 CSI-RS based CMR and dedicated IMR L1-SINR measurement accuracy

Editor's note: This test case is incomplete. The following aspects are either missing or not yet determined:

- The test is incomplete for UE power classes other than PC3
- The test is incomplete for test frequencies > 40.8 GHz
- The test is incomplete for extreme conditions

7.7.6.3.1 Test purpose

The purpose of this test is to verify that the L1-SINR measurement accuracy is within the specified limits.

7.7.6.3.2 Test applicability

This test applies to all types of NR UE from Release 16 onwards. Applicability requires support of L1-SINR measurements.

7.7.6.3.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 7.7.6.0.3.

The normative reference for this requirement is TS 38.133 [6] clause A.7.7.6.3.

7.7.6.3.4 Test description

7.7.6.3.4.1 Initial conditions

This test shall be tested using any of the test configurations in Table 7.7.6.3.4.1-1.

Table 7.7.6.3.4.1-1: Applicable NR configurations for FR2 L1-SINR measurement test with CSI-RS based both CMR based IMR

Config	Description
1	NR 120 kHz CSI-RS SCS, 100 MHz bandwidth, TDD duplex mode

Configure the test equipment and the DUT according to the parameters in Table 7.7.6.3.4.1-2.

Table 7.7.6.3.4.1-2: Initial conditions for CSI-RS based L1-SINR absolute accuracy in FR2

Parameter	Value	Comment
Test environment	NC	As specified in TS 36.508 [25] clause 4.1.
Test frequencies	As specified in Annex E, Table E.5-1 and TS 38.508-1 [14] clause 4.3.1.	
Channel bandwidth	As specified by the test configuration selected from Table 7.7.6.3.4.1-1.	
Propagation conditions	AWGN	As specified in Annex C.2.1
Connection Diagram	TE Part: A.3.3.1.1 DUT Part: A.3.4.1.1	As specified in TS 38.508-1 [14] Annex A.
Exceptions to connection diagram	N/A	

1. Message contents are defined in clause 7.7.6.3.4.3.
2. Cell 1 is the NR FR2 cell. Cell 1 is the target cell for the SSB-based L1-RSRP measurements. The UE is configured configured two CSI-RS resource sets with two CSI-RS resources for each set. UE is configured to perform RLM and BFD based on SSB 0 and 1. CSI-RS is not transmitted in the same OFDM symbols as SSB. UE is configured to perform L1-SINR measurement based on the configured CSI-RS as both CMR and IMR.
3. The UE Rx beam peak direction has been obtained previously using one of the Rx Beam Peak Search procedures as described in Annex I.

7.7.6.3.4.2 Test procedure

Prior to the start of the time duration T1, the UE shall be fully synchronized to PSCell. The UE shall be configured for periodic CSI reporting in PUCCH [format 2] with a reporting periodicity as mentioned in the above table 7.7.6.3.4.1-2.

1. Ensure the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity NR SA, Connected without release *On* and Test Mode *On*, according to TS 38.508-1 [14] clause 4.5.

2. Set the parameters according to T1 in Table 7.7.6.3.5-1.

3. After 640ms from the start of the test the SS transmits CSI-RS as IMR with a periodicity of 20 slots.

4. The SS shall check following requirements:

   - R1: the L1-SINR reported values of CSI-RS#0+CSI-IM#0 and CSI-RS#1+CSI-IM#1 in the periodic L1-RSRP reports. If the value for both CSI-RS#0+CSI-IM#0 and CSI-RS#1+CSI-IM#1 is within the limits in Table 7.7.6.3.5-2 and Table 7.7.6.3.5-3 (depending on the test configuration), the number of passed iterations is increased by one, otherwise the number of failed iterations is increased by one.

   - R2: the L1-SINR value of CSI-RS#1 reported by the UE is compared to the expected L1-SINR value for CSI-RS #1. If the resulting value is outside the limits in Table 7.7.6.3.5-4 or the UE fails to report the measurement value for CSI-RS #1, the number of failed iterations for R2 is increased by one. Otherwise, the number of passed iterations for R2 is increased by one.

   -R3: The DIFF SINR value of CSI-RS #0 reported by the UE is compared to the expected DIFF SINR value. If the resulting value is outside the limits in Table 7.7.6.3.5-4 or the UE fails to report the measurement value for CSI-RS #0, the number of failed iterations for R3 is increased by one. Otherwise, the number of passed iterations for R3 is increased by one.

5. The SS shall continue checking the L1-SINR report messages transmitted by the UE until the confidence level according to Table G.2.3-1 in Annex G is achieved.

6. Set the parameters according to each sub-test in Table 7.7.6.3.5-1 as appropriate and repeat steps 3-5.

7.7.6.3.4.3 Message contents

Message contents are according to TS 38.508-1 [14] clause 7.3 with the following exceptions:

Table 7.7.6.3.4.3-1: Common Exception messages NR SA CSI-RS-based L1-RSRP measurement

Default Message Contents	
Common contents of system information blocks exceptions	
Default RRC messages and information elements contents exceptions	Table H.3.6A-1 with conditions PERIODIC and CSI-SINR Table H.3.6A-2 with conditions CSI-RS and PERIODIC Table H.3.6A-3 with condition PERIODIC Table 7.3.1-3 in TS 38.508-1 [14] with condition SMTC.1

Table 7.7.6.3.4.3-2: RadioLinkMonitoringConfig

Derivation Path: TS 38.508-1 [14], Table 4.6.3-133			
Information Element	**Value/remark**	**Comment**	**Condition**
RadioLinkMonitoringConfig ::= SEQUENCE {			
failureDetectionResourcesToAddModList SEQUENCE (SIZE(1..maxNrofFailureDetectionResources)) OF SEQUENCE {	1 entry		
purpose	both	UE is configured to perform RLM and BFD based on the SSB.	
}			
}			

7.7.6.3.5 Test requirement

Table 7.7.6.3.5-1 defines the primary level settings excluding test tolerances for all tests.

Each L1-SINR measurement report for each of the tests in Table 7.7.6.3.5-1 shall meet the corresponding absolute accuracy requirements in Table 7.7.6.3.5-2 for test configurations 1 and 2, and the corresponding absolute accuracy requirements in Table 7.7.6.3.5-3 for test configuration 3.

Table 7.7.6.3.5-1: FR2 L1-SINR measurement test with CSI-RS based both CMR and IMR

Parameter	Config	Unit	Test 1
SSB GSCN	1		freq1
Duplex mode	1		TDD
TDD Configuration	1		TDDConf.3.1
$BW_{channel}$	1	MHz	100: $N_{RB,c}$ = 66
PDSCH Reference measurement channel	1		SR.3.1 TDD
RMSI CORESET Reference Channel	1		CR.3.1 TDD
Dedicated CORESET Reference Channel	1		CCR.3.1 TDD
SSB configuration	1		SSB.1 FR2
OCNG Patterns	1		OP.1
Initial BWP Configuration	1		DLBWP.0.1 ULBWP.0.1
Dedicated BWP configuration	1		DLBWP.1.1 ULBWP.1.1
TRS Configuration	1		TRS.2.1 TDD
PDCCH/PDSCH TCI Configuration	1		TCI.State.2
SMTC configuration	1		SMTC.1
CSI-RS configuration as CMR	1		CSI-RS.3.2 TDD
CSI-RS configuration as IMR	1		CSI-RS.3.3A TDD
reportConfigType	1		periodic
reportQuantity-r16	1		cri-SINR-r16
nrofReportedRS	1		2
L1-RSRP reporting period	1		slot80
Propagation condition	1		AWGN
Antenna configuration	1		1x2
EPRE ratio of PSS to SSS	1	dB	0
EPRE ratio of PBCH DMRS to SSS			
EPRE ratio of PBCH to PBCH DMRS			
EPRE ratio of PDCCH DMRS to SSS			
EPRE ratio of PDCCH to PDCCH DMRS			
EPRE ratio of PDSCH DMRS to SSS			
EPRE ratio of PDSCH to PDSCH DMRS			
EPRE ratio of OCNG DMRS to SSS Note 1			
EPRE ratio of OCNG to OCNG DMRS Note 1			
Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols. Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for N_{oc} to be fulfilled.			

Table 7.7.6.3.5-2: FR2 CSI-RS based L1-SINR measurement OTA related test parameters

Parameter	Config	Unit	Test 1	
			CSI-RS0	CSI-RS1
Angle of arrival configuration			Setup 1 according to A.3.15.1	
Assumption for UE beams Note 4			Rough	
N_{oc}	1~2	dBm/15 kHz	-104.1	
N_{oc}	1~2	dBm/SS B SCS	-95.1	

$\hat{E}_s/I_{ot}$	1~2	dB	10	0.2
CSI-RS-RSRP[Note1]	1~2	dBm/SCS	-85.07	-94.87
Io[Note1]	1~2	dBm/95.04MHz	-55.67	-62.97
$\hat{E}_s/N_{oc}$	1~2	dB	10	0.2
Note 1: RSRP and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves. Note 2: RSRP minimum requirements are specified assuming independent interference and noise at each receiver antenna port. Note 3: No additional noise is added by the test system in Test 2. Note 4: Information about types of UE beam is given in TS 38.133 Annex B.2.1.3, and does not limit UE implementation or test system implementation				

After 640ms from the beginning of the test, the L1-SINR measurement accuracy for CSI-RS#0+CSI-RS#2 and CSI-RS#1+CSI-RS#3 of Cell 1 shall meet the corresponding absolute accuracy of CSI-RS#0 and absolute accuracy of CSI-RS#1 in Table 7.7.6.3.5-3. The corresponding relative accuracy of CSI-RS#0 compared with CSI-RS#1 in Table 7.7.6.3.5-4.

Table 7.7.6.3.5-3: L1-SINR absolute accuracy test requirement R1

UE power class 3	
Normal Conditions	**Test 1 All bands**
Lowest reported value (CSI-RS0)	55
Highest reported value (CSI-RS0)	74
Extreme Conditions	**Test 1 All bands**
Lowest reported value (CSI-RS0)	53
Highest reported value (CSI-RS0)	76

Table 7.7.6.3.5-4: L1-SINR relative accuracy test requirement for the reported values R2 and R3

UE power class 3	
Normal Conditions	**Test 1 All bands**
Lowest DIFF SINR reported value	5
Highest DIFF SINR reported value	13
Extreme Conditions	**Test 1 All bands**
Lowest DIFF SINR reported value	4
Highest DIFF SINR reported value	14

For the test to pass, the ratio of successful reported values for each requirement (R1 to R3) shall be more than 90% with a confidence level of 95%. Each requirement is evaluated independently of the others.

8 E-UTRA - NR inter-RAT with E-UTRA serving cell

8.0 General

This clause contains test scenarios for E-UTRA - NR inter-RAT with the serving cell in E-UTRA. The NR cells can be in FR1, FR2 or both.

For conformance testing involving FR2 test cases in this specification, the UE under test shall be pre-configured with UL Tx diversity schemes disabled to account for single polarization System Simulator (SS) in the test environment. The UE under test may transmit with dual polarization.

8.1 Void

8.2 RRC_IDLE state mobility

8.2.1 Inter-RAT cell re-selection

8.2.1.0 Minimum conformance requirements

8.2.1.0.1 Minimum conformance requirements for E-UTRA-NR FR1 inter-RAT cell reselection

[TS 36.133, clause 4.2.1]

When the UE is in either *Camped Normally* state or *Camped on Any Cell* state on a cell, the UE shall attempt to detect, synchronise, and monitor intra-frequency, inter-frequency and inter-RAT cells indicated by the serving cell. UE measurement activity is also controlled by measurement rules defined in TS36.304, allowing the UE to limit its measurement activity.

[TS 36.133, clause 4.2.2]

The UE shall search every layer of higher priority at least every $T_{higher_priority_search}$ = (60 * N_{layers}) seconds when the UE is not configured with eDRX_IDLE cycle, and at least every $T_{higher_priority_search}$ = MAX(60 * N_{layers}, one eDRX_IDLE cycle) when UE is configured with eDRX_IDLE cycle, where N_{layers} is the total number of configured higher priority E-UTRA, UTRA FDD, UTRA TDD, CDMA2000 1x, HRPD and NR carrier frequencies and is additionally increased by one if one or more groups of GSM frequencies is configured as a higher priority.

[TS 36.133, clause 4.2.2.5.6]

If Srxlev > $S_{nonIntraSearchP}$ and Squal > $S_{nonIntraSearchQ}$ then the UE shall search for inter-RAT NR layers of higher priority at least every $T_{higher_priority_search}$ where $T_{higher_priority_search}$ is described in TS 36.133 clause 4.2.2.

If Srxlev ≤ $S_{nonIntraSearchP}$ or Squal ≤ $S_{nonIntraSearchQ}$ then the UE shall search for and measure inter-RAT NR layers of higher, lower priority in preparation for possible reselection. In this scenario, the minimum rate at which the UE is required to search for and measure higher priority inter-RAT NR layers shall be the same as that defined below for lower priority RATs.

The requirements in this clause apply for inter-RAT NR measurements. When the measurement rules indicate that inter-RAT NR cells are to be measured, the UE shall measure SS-RSRP and SS-RSRQ of detected NR cells in the neighbour frequency list at the minimum measurement rate specified in this clause.

If Srxlev ≤ $S_{nonIntraSearchP}$ or Squal ≤ $S_{nonIntraSearchQ}$, a carrier is indicated to meet high speed requirement if *highSpeedInterRAT-NR-r16* is configured and the carrier to be measured is configured with *highSpeedCarrierNR-r16*. If Srxlev > $S_{nonIntraSearchP}$ and Squal > $S_{nonIntraSearchQ}$, the UE is required to meet non high speed requirements no matter whether *highSpeedInterRAT-NR-r16* or *highSpeedCarrierNR-r16* is configured or not. The parameter $N_{NR_carrier}$ is the number of configured NR carriers indicated to meet non high speed requirement in the neighbour frequency list. $N_{NR_carrier_HST}$ is the number of configured carriers for reselection indicated to meet high speed requirements. The

parameter $N_{NR_carrier}$ for a UE configured with idle mode DC measurements (while T331 is running) is the combined number of configured NR carriers indicated to meet non high speed requirement in the neighbour frequency list, and NR carriers configured for idle mode DC measurements.

NOTE: Combined total number means that if a carrier is indicated in the neighbour frequency list and additionally a carrier configured for idle mode DC measurements, it only counts as one carrier.

The UE shall filter SS-RSRP and SS-RSRQ measurements of each measured NR cell using at least 2 measurements. Within the set of measurements used for the filtering, at least two measurements shall be spaced by at least half the minimum specified measurement period.

The UE shall be able to evaluate whether a newly detectable inter-RAT NR cell meets the reselection criteria defined in TS 36.304 [1] within $N_{NR_carrier_HST} * T_{detect,\ NR_HST} + N_{NR_carrier} * T_{detect,\ NR}$

when $Srxlev \leq S_{nonIntraSearchP}$ or $Squal \leq S_{nonIntraSearchQ}$ when $T_{reselection} = 0$ provided that the reselection criteria is met by a margin of at least 5 dB in FR1 or 6.5 dB in FR2 for reselections based on ranking or 6 dB in FR1 or 7.5 dB in FR2 for SS-RSRP reselections based on absolute priorities or 4 dB in FR1 and 4 dB in FR2 for SS-RSRQ reselections based on absolute priorities.

When higher priority cells are found by the higher priority search, they shall be measured at least every $T_{measure,NR}$. If, after detecting a cell in a higher priority search, it is determined that reselection has not occurred then the UE is not required to continuously measure the detected cell to evaluate the ongoing possibility of reselection. However, the minimum measurement filtering requirements specified later in this clause shall still be met by the UE before it makes any determination that it may stop measuring the cell.

If the UE detects on an inter-RAT NR carrier a cell whose physical identity is indicated as not allowed for that carrier in the measurement control system information of the serving cell, the UE is not required to perform measurements on that cell.

The UE shall not consider an inter-RAT NR cell in cell reselection, if it is indicated as not allowed in the measurement control system information of the serving cell.

Cells which have been detected shall be measured at least every $N_{NR_carrier_HST} * T_{measure,\ NR_HST} + N_{NR_carrier} * T_{measure,\ NR}$ when $Srxlev \leq S_{nonIntraSearchP}$ or $Squal \leq S_{nonIntraSearchQ}$.

For a cell that has been already detected, but that has not been reselected to, the filtering shall be such that the UE shall be capable of evaluating that an already identified inter-RAT NR cell has met reselection criterion defined in TS 36.304 [1] within $N_{NR_carrier_HST} * T_{evaluate,\ NR_HST} + N_{NR_carrier} * T_{evaluate,\ NR}$ when $T_{reselection} = 0$ as specified in Table 8.2.1.0.1-1 and table 8.2.1.0.1-2 provided that the reselection criteria is met by a margin of at least 5dB in FR1 or 6.5 dB in FR2 for reselections based on ranking or 6 dB in FR1 or 7.5 dB in FR2 for SS-RSRP reselections based on absolute priorities or 4 dB in FR1 and 4 dB in FR2 for SS-RSRQ reselections based on absolute priorities.

If $T_{reselection}$ timer has a non-zero value and the inter-RAT NR cell is satisfied with the reselection criteria which are defined in TS 36.304 [1], the UE shall evaluate this NR cell for the $T_{reselection}$ time. If this cell remains satisfied with the reselection criteria within this duration, then the UE shall reselect that cell.

Table 8.2.1.0.1-1: $T_{detect,NR}$, $T_{measureNR,}$ and $T_{evaluate,NR}$

DRX cycle length [s]	Scaling Factor (N1)		$T_{detect,NR}$ [s] (number of DRX cycles)	$T_{measure,NR}$ [s] (number of DRX cycles)	$T_{evaluate,NR}$ [s] (number of DRX cycles)
	FR1	FR2[Note1]			
0.32	1	8	11.52 x 1.5 x N1 (36 x 1.5 x N1)	1.28 x 1.5 x N1 (4 x 1.5 x N1)	5.12 x 1.5 x N1 (16 x 1.5 x N1)
0.64		5	17.92 x N1 (28 x N1)	1.28 x N1 (2 x N1)	5.12 x N1 (8 x N1)
1.28		4	32 x N1 (25 x N1)	1.28 x N1 (1 x N1)	6.4 x N1 (5 x N1)
2.56		3	58.88 x N1 (23 x N1)	2.56 x N1 (1 x N1)	7.68 x N1 (3 x N1)
NOTE: Applies for UE supporting power class 2&3&4. For UE supporting power class 1, N1 = 8 for all DRX cycle length.					

Table 8.2.1.0.1-2: T_{detect,NR_HST}, $T_{measureNR_HST}$, and $T_{evaluate,NR_HST}$ for UE configured with highSpeedInterRAT-NR-r16

DRX cycle length [s]	T_{detect,NR_HST} [s] (number of DRX cycles)	$T_{measure,NR_HST}$ [s] (number of DRX cycles)	$T_{evaluate,NR_HST}$ [s] (number of DRX cycles)
0.32	4.16 x M2 (13 x M2) Note 2	0.64 x M3 (2 x M3) Note 2	0.96 x M4 (3 x M4) Note 2
0.64	7.68 (12))	1.28 (2)	1.92 (3)
1.28	12.8(10)	1.28 (1)	3.84 (3)
2.56	58.88 (23)	2.56 (1)	7.68 (3)
NOTE 1: FR2 high speed requirements are not specified. NOTE 2: M2=1.5, M3=2 and M4=2 if SMTC periodicity of measured intra-frequency cell > 40 ms; otherwise M2=1.			

The normative reference for this requirement is TS 36.133 clause 4.2.1, 4.2.2, 4.2.2.5.6.

8.2.1.1 E-UTRA - NR FR1 cell re-selection to higher priority NR target cell

8.2.1.1.1 Test purpose

The purpose of this test is to verify the requirement for the E-UTRAN to NR inter-RAT cell reselection requirements specified in TS 36.133 [23] clause 4.2.2.5.6.

8.2.1.1.2 Test applicability

This test applies to all types of NR UE from Release 15 onwards.

8.2.1.1.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 8.2.1.0.

The normative reference for this requirement is TS 38.133 [6] clause A.8.2.1.1.

8.2.1.1.4 Test description

There are two cells configured in this test, the E-UTRA Cell 1 and NR Cell 2. NR Cell 2 is the PCell and E-UTRA Cell 1 is the neighbour cell. This test consists of three successive time periods, with time duration of T1, T2, and T3 respectively. E-UTRA Cell 1 is already identified by the UE prior to the start of the test. Cell 2 is of higher priority than cell 1.

8.2.1.1.4.1 Initial conditions

This test shall be tested under any of the test configuration in Table 8.2.1.1.4.1-1.

Table 8.2.1.1.4.1-1: Supported test configurations

Configuration	Description
8.2.1.1-1	LTE FDD, NR 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode
8.2.1.1-2	LTE FDD, NR 15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode
8.2.1.1-3	LTE FDD, NR 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode
8.2.1.1-4	LTE TDD, NR 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode
8.2.1.1-5	LTE TDD, NR 15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode
8.2.1.1-6	LTE TDD, NR 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode
NOTE: The UE is only required to be tested in one of the supported test configurations.	

Configure the test requirement and the DUT according to the parameters in Table 8.2.1.1.4.1-2.

Table 8.2.1.1.4.1-2: Initial conditions for E-UTRA - NR FR1 cell re-selection to higher priority NR target cell

Parameter	Value		Comment
Test environment	NC		As specified in TS 36.508 [25] clause 4.1.
Test frequencies	As specified in Annex E, Table E.6-1 and TS 38.508-1 [14] clause 4.3.1.		
Channel bandwidth	As specified by the test configuration selected from Table 8.2.1.1.4.1-1.		
Propagation conditions	AWGN		As specified in clause C.2.1
Connection Diagram	TE Part	A.3.1.8.2	As specified in TS 38.508-1 [14] Annex A.
	DUT Part	A.3.2.3.4	
Exceptions to connection diagram	N/A		

1. The general test parameter settings are set up according to Table 8.2.1.1.4.1-3.

2. Message contents are defined in clause 8.2.1.1.4.3.

3. The test scenario comprises of one NR cell and one E-UTRAN cell. NR Cell 2 is the PCell and E-UTRA Cell 1 is the neighbour cell. E-UTRA Cell 1 is configured according to TS 36.521-3 [26] clauses C.1.0 and C.1.1 and NR Cell 2 is configured according to clauses C.1.1 and C.1.2.

Table 8.2.1.1.4.1-3: General test parameters for E-UTRA - NR FR1 cell re-selection to higher priority NR target cell

Parameter		Unit	Test configuration	Value	Comment
Initial condition	Active cell		1, 2, 3, 4, 5, 6	Cell2	The UE camps on cell 2 in the initial phase
	Neighbour cells		1, 2, 3, 4, 5, 6	Cell1	
T1 end condition	Active cell			Cell1	During T1 period the UE reselects to cell 1
	Neighbour cell			Cell2	
T3 end condition	Active cell		1, 2, 3, 4, 5, 6	Cell2	The UE shall perform reselection to cell 2 during T3
	Neighbour cell		1, 2, 3, 4, 5, 6	Cell1	
RF Channel Number			1, 2, 3, 4, 5, 6	1, 2	E-UTRAN radio channel (1) and NR radio channel (2) are used for this test
Time offset between cells			1, 4	3 ms	Asynchronous cells
			2, 5	3 µs	Synchronous cells
			3, 6	3 µs	Synchronous cells
Access Barring Information		-	1, 2, 3, 4, 5, 6	Not Sent	No additional delays in random access procedure.
DRX cycle length		s	1, 2, 3, 4, 5, 6	1.28	The value shall be used for all cells in the test.
NR PRACH configuration index			1, 2, 3, 4, 5, 6	102	The detailed configuration is specified in TS 38.211 clause 6.3.3.2
T1		s	1, 2, 3, 4, 5, 6	15	T1 needs to be defined so that cell re-selection reaction time is taken into account.
T2		s	1, 2, 3, 4, 5, 6	>7	During T2, cell 2 shall be powered off, and during the off time the physical cell identity shall be changed. The intention is to ensure that cell 2 has not been detected by the UE prior to the start of period T3.
T3		s	1, 2, 3, 4, 5, 6	75	T3 needs to be defined so that cell re-selection reaction time is taken into account.

8.2.1.1.4.2 Test procedure

Two cells are deployed in the test, which are one NR PCell (NR Cell 2) and a E-UTRA neighbour cell (E-UTRA Cell 1). The test consists of three successive time periods, with time duration of T1, T2, and T3 respectively. E-UTRA Cell 1 is already identified by the UE prior to the start of the test. NR Cell 2 is of higher priority than E-UTRA Cell 1.

In the following test procedure "UE responds" means "UE starts transmitting preamble on PRACH for sending the *RRCSetupRequest* message to perform a Registration procedure.

1. The SS shall send a *RRCRelease* message on NR Cell 2 to ensure the UE is in State RRC_IDLE with generic procedure parameters connectivity = *NR* with Test Mode *On* according to TS 38.508-1 [14] clause 4.5 on Cell 2.

2. The SS shall set the parameters according to T1 in Table 8.2.1.1.5-1 and 8.2.1.1.5-2 at the same time instance *RRCRelease* message is sent on NR Cell 2, T1 starts.

3. The SS waits for random access requests information from the UE to perform cell re-selection on the lower priority cell, E-UTRA Cell 1.

4. If the UE responds on lower priority cell, E-UTRA Cell 1 during time duration T1 within 8 seconds from the beginning of time period T1, then count a success for the event "Re-select lower priority Cell 1". Otherwise count a fail for the event "Re-select lower priority Cell 1".

5. If the UE has re-selected E-UTRA Cell 1 within T1, after the re-selection or when T1 expires, continue with step 5a. Otherwise, if T1 expires and the UE has not yet re-selected Cell 1, the TE shall switch off and on the UE and skip to step 11.

5a. The SS shall send an *RRCConnectionRelease* message to ensure that the UE is in state RRC_IDLE on Cell 1.

6. The SS shall switch the power setting from T1 to T2 as specified in Table 8.2.1.1.5-1. During time duration T2, Cell 2 shall be powered OFF and the physical cell identity = ((current Cell 2 physical cell identity + 1) mod 1008) shall be changed to ensure Cell 2 is not detected by the UE, T2 starts.

7. When T2 expires, the SS shall switch the power setting from T2 to T3 as specified in Table 8.2.1.1.5-1, T3 starts.

8. The SS waits for random access requests information from the UE to perform cell re-selection on the higher priority cell, NR Cell 2.

9. If the UE responds on higher priority cell, NR Cell 2 during time duration T3 within 68 seconds from the beginning of time period T3, then count a success for the event "Re-select higher priority Cell 2". Otherwise count a fail for the event "Re-select higher priority Cell 2".

10. If the UE has re-selected Cell 2 within T3, after the re-selection or when T3 expires, continues with step 10a. Otherwise, if T3 expires and the UE has not yet re-selected Cell 2, the TE shall switch off and on the UE and continue with step 11.

10a. The SS shall send an *RRCRelease* message on NR Cell 2 to ensure that the UE is in state RRC_IDLE with generic procedure parameters connectivity = NR with Test Mode On according to TS 38.508-1 [14] clause 4.5 on Cell 2.

11. The SS shall set the parameters according to T1 in Table 8.2.1.1.5-1 and 8.2.1.1.5-2 at the same time instance *RRCRelease* message is sent on NR Cell 2.

12. Repeat step 2-11 until a test verdict has been achieved.
Each of the events "Re-select lower priority Cell 1" and "Re-select higher priority Cell 2" is evaluated independently for the statistic, resulting in an event verdict: pass or fail. Each event is evaluated only until the confidence level according to Table G.2.3-1 in Annex G clause G.2 is achieved. Different events may require different times for a verdict.
If both events pass, the test passes. If one event fails, the test fails.

8.2.1.1.4.3 Message contents

Message contents are according to TS 36.508 [25] clause 7.3 with the following exceptions:

Table 8.2.1.1.4.3-1: Common Exception messages

Default Message Contents	
Common contents of system information blocks exceptions	Table H.2.3-1 Table H.2.3-2 with condition lower priority Table H.2.3-3 with condition lower priority

Default RRC messages and information elements contents exceptions	

Table 8.2.1.1.4.3-2: *SystemInformationBlockType3*

Derivation Path: TS 36.508 Table 4.4.3.3-2			
Information Element	**Value/remark**	**Comment**	**Condition**
SystemInformationBlockType3 ::= SEQUENCE {			
cellReselectionServingFreqInfo SEQUENCE {			
s-NonIntraSearch	25	Actual value = 50 dB	
threshServingLow	22	Actual value = 44 dB	
}			
}			

Table 8.2.1.1.4.3-3: SystemInformationBlockType24

Derivation Path: TS 36.508, Table 4.4.3.3-20 with Condition FR1			
Information Element	**Value/remark**	**Comment**	**Condition**
SystemInformationBlockType24-r15 ::= SEQUENCE {			
carrierFreqListNR-r15 SEQUENCE (SIZE (1..maxFreq)) OF SEQUENCE {	1 entry		
measTimingConfig-r15[1] SEQUENCE {			
periodicityAndOffset-r15 CHOICE {			
sf20-r15	0		
}			
ssb-Duration-r15	sf5	Asynchronous cells	Configuration 1,4
	sf2	Synchronous cells	Configuration 2,3,5,6
}			
subcarrierSpacingSSB-r15[1]	kHz15		Configuration 1,2,4,5
	kHz30		Configuration 3,6
threshX-High-r15[1]	24	Actual value = 48 dB	
threshX-Low-r15[1]	25	Actual value = 50 dB	
q-RxLevMin-r15[1]	-70	Actual value = -140 dBm	Configuration 1,2,4,5
	-69	Actual value = -137 dBm, Round down	Configuration 3,6
}			
}			

Table 8.2.1.1.4.3-4: Void

Table 8.2.1.1.4.3-5: Void

8.2.1.1.5 Test requirement

Tables 8.2.1.1.4.1-3, 8.2.1.1.5-1 and 8.2.1.1.5-2 define the primary level settings including test tolerances for higher priority NR cell re-selection test case.

Table 8.2.1.1.5-1: NR Cell specific test parameters for E-UTRA - NR FR1 cell re-selection to higher priority NR target cell

Parameter	Unit	Test configuration	Cell 2		
			T1	T2	T3
TDD configuration		1, 4	N/A		
		2, 5	TDDConf.1.1		
		3, 6	TDDConf.2.1		
PDSCH Reference measurement channel		1, 4	SR.1.1 FDD		
		2, 5	SR.1.1 TDD		
		3, 6	SR.2.1 TDD		
RMSI CORESET Reference Channel		1, 4	CR.1.1 FDD		
		2, 5	CR.1.1 TDD		
		3, 6	CR.2.1 TDD		
RMC CORESET Reference Channel		1, 4	CCR.1.1 FDD		
		2, 5	CCR.1.1 TDD		
		3, 6	CCR.2.1 TDD		
OCNG Patterns		1, 2, 3, 4, 5, 6	OP.1		
SMTC configuration		1, 2, 3, 4, 5, 6	SMTC.1		
SSB configuration		1, 4	SSB.1 FR1		
		2, 5	SSB.1 FR1		
		3, 6	SSB.2 FR1		
Initial DL BWP configuration		1, 2, 3, 4, 5, 6	DLBWP.0.1		
Initial UL BWP configuration		1, 2, 3, 4, 5, 6	ULBWP.0.1		
RLM-RS		1, 2, 3, 4, 5, 6	SSB		
Qrxlevmin	dBm/SCS	1, 2, 4, 5	-140		
		3, 6	-137		
Pcompensation	dB	1, 2, 3, 4, 5, 6	0		
$Qhyst_s$	dB	1, 2, 3, 4, 5, 6	0		
$Qoffset_{s,n}$	dB	1, 2, 3, 4, 5, 6	0		
Cell_selection_and_reselection_quality_measurement		1, 2, 3, 4, 5, 6	SS-RSRP		
$\hat{E}_s / I_{ot}$	dB	1, 4	-3.65	-infinity	13.55
		2, 5			
		3, 6			
N_{oc} Note2	dBm/SCS	1, 4	-99.90	-98	-98
		2, 5	-99.90	-98	-98
		3, 6	-96.90	-95	-95
N_{oc} Note2	dBm/15 kHz	1, 4	-99.90	-98	-98
		2, 5			
		3, 6			
$\hat{E}_s / N_{oc}$	dB	1, 4	-3.65	-infinity	13.55
		2, 5			
		3, 6			
SS-RSRP Note3	dBm/SCS	1, 4	-103.55	-infinity	-84.45
		2, 5	-103.55	-infinity	-84.45
		3, 6	-100.54	-infinity	-81.44
Io	dBm/9.36 MHz	1, 4	-70.39	-70.05	-56.31
	dBm/9.36 MHz	2, 5	-70.39	-70.05	-56.31
	dBm/38.16 MHz	3, 6	-64.29	-63.94	-50.21
Treselection	s	1, 2, 3, 4, 5, 6	0	0	0
SnonintrasearchP	dB	1, 2, 3, 4, 5, 6	50		
$Thresh_{x, highP}$	dB	1, 2, 3, 4, 5, 6	48		
$Thresh_{serving, lowP}$	dB	1, 2, 3, 4, 5, 6	44		
$Thresh_{x, lowP}$	dB	1, 2, 3, 4, 5, 6	50		
Propagation Condition		1, 2, 3, 4, 5, 6	AWGN		

NOTE 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.

NOTE 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for N_{oc} to be fulfilled.

NOTE 3: SS-RSRP levels have been derived from other parameters for information purposes. They are not settable parameters themselves.

Table 8.2.1.1.5-2: E-UTRA Cell specific test parameters for for E-UTRA - NR FR1 cell re-selection to higher priority NR target cell

Parameter	Unit	Cell 1		
		T1	T2	T3
E-UTRA RF Channel number		1		
$BW_{channel}$	MHz	10		
OCNG Patterns defined in TS 36.133 [15] clause A.3.2		OP.2 TDD for test configuration 1, 2, 3; OP.2 FDD for test configuration 4, 5, 6		
PBCH_RA	dB	0		
PBCH_RB	dB			
PSS_RA	dB			
SSS_RA	dB			
PCFICH_RB	dB			
PHICH_RA	dB			
PHICH_RB	dB			
PDCCH_RA	dB			
PDCCH_RB	dB			
PDSCH_RA	dB			
PDSCH_RB	dB			
OCNG_RA Note 1	dB			
OCNG_RB Note 1	dB			
Qrxlevmin	dBm	-140		
N_{oc} Note 2	dBm/15 kHz	-98		
RSRP Note 3	dBm/15 KHz	-84	-84	-82.45
$\hat{E}_s / I_{ot}$	dB	14	14	15.55
$\hat{E}_s / N_{oc}$	dB	14	14	15.55
$Treselection_{EUTRAN}$	S	0		
SnonintrasearchP	dB	50		
$Thresh_{x, highP}$	dB	48		
$Thresh_{serving, lowP}$	dB	44		
$Thresh_{x, lowP}$	dB	50		
Propagation Condition		AWGN		

NOTE 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.

NOTE 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for N_{oc} to be fulfilled.

NOTE 3: RSRP levels have been derived from other parameters for information purposes. They are not settable parameters themselves.

The cell reselection delay to a higher priority NR cell is defined as the time from the beginning of time period T3, to the moment when the UE camps on cell 2, and starts to send preambles on the PRACH for sending the *RRCSetupRequest* message to perform a Registration procedure for mobility on cell 2.

The cell re-selection delay to a higher priority cell shall be less than 68 s.

The rate of correct cell reselections observed during repeated tests shall be at least 90%.

NOTE: The cell re-selection delay to a higher priority cell can be expressed as: $T_{higher_priority_search} + T_{evaluate, NR} + T_{SI-NR,}$ and to a lower priority cell can be expressed as: $T_{evaluate, E-UTRAN} + T_{SI-E-UTRA}$,

Where:

$T_{higher_priority_search}$ is the higher priority search period, $T_{higher_priority_search}$ = 60 s according to TS 36.133 [23], clause 4.2.2;

$T_{evaluate, NR}$ is the evaluation time for NR Cell, $T_{evaluate, NR}$ = 6400 ms according TS 36.133 [23], Table 4.2.2.5.6-1;

T_{SI-NR} is the maximum repetition period of relevant system info blocks that needs to be received by the UE to camp on a cell; T_{SI-NR} = 1280 ms is assumed in this test case.

$T_{evaluate, E-UTRAN}$ is the evaluation time for E-UTRAN Cell, $T_{evaluate, E-UTRAN}$ = 6400 ms according TS 38.133 [6], Table 4.2.2.5-1;

$T_{SI-E-UTRA}$ is the maximum repetition period of relevant system info blocks that needs to be received by the UE to camp on a cell; $T_{SI-E-UTRA}$ = 1280 ms is assumed in this test case.

This gives a total of 67.68 s, allow 68 s for the cell re-selection delay to a higher priority NR cell and 7.68 s for the cell re-selection delay to a lower priority cell in the test case, which we allow 8 s.

8.2.1.2 E-UTRA - NR FR1 Cell reselection to lower priority NR target Cell in FR1 for UE configured with highSpeedInterRAT-NR-r16

8.2.1.2.1 Test purpose

The purpose of this test is to verify the requirement for the E-UTRAN to NR inter-RAT cell reselection requirements specified in TS 36.133 [23] clause 4.2.2.5.6.

8.2.1.2.2 Test applicability

This test applies to all types of NR UE configured with highSpeedInterRAT-NR-r16 from Release 15 onwards.

8.2.1.2.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 8.2.1.0.

The normative reference for this requirement is TS 38.133 [6] clause A.8.2.1.2.

8.2.1.2.4 Test description

8.2.1.2.4.1 Initial conditions

This test shall be tested under any of the test configuration in Table 8.2.1.2.4.1-1.

Table 8.2.1.2.4.1-1: Supported test configurations

Configuration	Description
8.2.1.2-1	LTE FDD, NR 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode
8.2.1.2-2	LTE FDD, NR 15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode
8.2.1.2-3	LTE FDD, NR 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode
8.2.1.2-4	LTE TDD, NR 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode
8.2.1.2-5	LTE TDD, NR 15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode
8.2.1.2-6	LTE TDD, NR 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode
NOTE: The UE is only required to be tested in one of the supported test configurations.	

Configure the test requirement and the DUT according to the parameters in Table 8.2.1.2.4.1-2.

Table 8.2.1.2.4.1-2: Initial conditions for E-UTRA - NR FR1 cell re-selection to lower priority NR target cell in FR1 for UE configured with highSpeedInterRAT-NR-r16

Parameter	Value		Comment
Test environment	NC		As specified in TS 36.508 [25] clause 4.1.
Test frequencies	As specified in Annex E, Table E.6-1 and TS 38.508-1 [14] clause 4.3.1.		
Channel bandwidth	As specified by the test configuration selected from Table 8.2.1.2.4.1-1.		
Propagation conditions	AWGN		As specified in clause C.2.1
Connection Diagram	TE Part	A.3.1.8.2	As specified in TS 38.508-1 [14] Annex A.
	DUT Part	A.3.2.3.4	

Exceptions to connection diagram	N/A	

1. The general test parameter settings are set up according to Table 8.2.1.2.4.1-3.
2. Message contents are defined in clause 8.2.1.2.4.3.
3. The test scenario comprises of one NR cell and one E-UTRAN cell. E-UTRA Cell 1 is configured according to TS 36.521-3 [26] clause C.1.0 and C.1.1 and NR Cell 2 is configured according to clauses C.1.1 and C.1.2.
4. In SIB of the E-UTRA cell, highSpeedInterRAT-NR-r16 is configured and the carrier of NR cell is configured with highSpeedCarrierNR-r16.

Table 8.2.1.2.4.1-3: General test parameters for E-UTRA - NR FR1 cell re-selection to lower priority NR target cell in FR1 for UE configured with highSpeedInterRAT-NR-r16

Parameter		Unit	Test configuration	Value	Comment
Initial condition	Active cell		1, 2, 3, 4, 5, 6	Cell1	The UE camps on cell 1 in the initial phase
T1 end condition	Active cell		1, 2, 3, 4, 5, 6	Cell2	The UE shall perform reselection to cell 2 during T1
	Neighbour cells		1, 2, 3, 4, 5, 6	Cell1	
T2 end condition	Active cell		1, 2, 3, 4, 5, 6	Cell1	The UE shall perform reselection to cell 1 during T2 for iteration of the tests.
	Neighbour cells		1, 2, 3, 4, 5, 6	Cell2	
RF Channel Number			1, 2, 3, 4, 5, 6	1, 2	E-UTRAN radio channel (1) and NR radio channel (2) are used for this test
Time offset between cells			1, 4	3 ms	Asynchronous cells
			2, 5	3 µs	Synchronous cells
			3, 6	3 µs	Synchronous cells
Access Barring Information		-	1, 2, 3, 4, 5, 6	Not Sent	No additional delays in random access procedure.
DRX cycle length		s	1, 2, 3, 4, 5, 6	0.32	The value shall be used for all cells in the test.
NR PRACH configuration index			1, 2, 3, 4, 5, 6	102	The detailed configuration is specified in TS 38.211 [7] clause 6.3.3.2
T1		s	1, 2, 3, 4, 5, 6	15	T1 needs to be defined so that cell re-selection reaction time is taken into account.
T2		s	1, 2, 3, 4, 5, 6	75	T2 needs to be defined so that cell re-selection reaction time is taken into account.

8.2.1.2.4.2 Test procedure

Two cells are deployed in the test, which are one E-UTRA Cell 1 and NR Cell 2. The test consists of two successive time periods, with time duration of T1 and T2 respectively. Both cells are already identified by the UE prior to the start of the test. NR Cell 2 is of lower priority than E-UTRA Cell 1. UE is camped on E-UTRA Cell 1 during the initial phase of the test.

In the following test procedure "UE responds" means "UE starts transmitting preamble on PRACH for sending the *RRCSetupRequest* message to perform a Registration procedure.

1. Ensure the UE is in State RRC_IDLE with generic procedure parameters Connectivity EUTRA/EPC with Test Mode *On* according to TS 38.508-1 [14] clause 4.5.
2. Set the parameters according to T2 in Table 8.2.1.2.5-1 and 8.2.1.2.5-2. Then wait 5s to ensure that Cell 2 has been detected by the UE.
3. Set the parameters according to T1 in Table 8.2.1.2.5-1 and 8.2.1.2.5-2, T1 starts.

4. The SS waits for random access requests information from the UE to perform cell re-selection on the lower priority NR Cell 2.

5. If the UE responds on lower priority cell, NR Cell 2 during time duration T1 within 3 seconds from the beginning of time period T1, then count a success for the event "Re-select lowe priority Cell 2". Otherwise count a fail for the event "Re-select lower priority Cell 2".

6. If the UE has re-selected Cell 2 within T1, after the re-selection or when T1 expires, continue with step 7. Otherwise, if T1 expires and the UE has not yet re-selected Cell 2, skip to step 10.

7. The SS shall switch the power setting from T1 to T2 as specified in Table Table 8.2.1.2.5-1 and 8.2.1.2.5-2. T2 starts.

8. The SS waits for random access requests information from the UE to perform cell re-selection on the higher priority E-UTRA Cell 1.

9. If the UE has re-selected Cell 1 within T2, after the re-selection or when T2 expires, skip to step 11. Otherwise, if T2 expires and the UE has not yet re-selected Cell 1, the TE shall switch off and on the UE and continue with step 10.

10. Ensure the UE is in state RRC_IDLE with generic procedure parameters Connectivity EUTRA/EPC with Test Mode *On* according to TS 38.508-1 [14] clause 4.5 in Cell 1.

11. Repeat step 3-9 the confidence level according to Table G.2.3-1 in Annex G is achieved.

8.2.1.2.4.3 Message contents

Message contents are according to TS 36.508 [25] clause 7.3 with the following exceptions:

Table 8.2.1.2.4.3-1: Common Exception messages

Default Message Contents	
Common contents of system information blocks exceptions	Table H.2.1-3 with Condition HighSpeedMeas Table H.2.3-1 Table H.2.3-2 with condition higher priority Table H.2.3-3 with condition higher priority
Default RRC messages and information elements contents exceptions	

Table 8.2.1.2.4.3-2: SystemInformationBlockType3

Derivation Path: TS 36.508 [25] Table 4.4.3.3-2			
Information Element	**Value/remark**	**Comment**	**Condition**
SystemInformationBlockType3 ::= SEQUENCE {			
cellReselectionServingFreqInfo SEQUENCE {			
s-NonIntraSearch	25	Actual value = 50 dB	
threshServingLow	22	Actual value = 44 dB	
cellReselectionPriority	5		higher priority E-UTRA
}			
}			

Table 8.2.1.2.4.3-3: highSpeedCarrierNR-r16 in SystemInformationBlockType24

Derivation Path: TS 36.508, Table 4.4.3.3-20 with Condition FR1			
Information Element	**Value/remark**	**Comment**	**Condition**
SystemInformationBlockType24-r15 ::= SEQUENCE {			
carrierFreqListNR-r15 SEQUENCE (SIZE (1..maxFreq)) OF SEQUENCE {	1 entry		
measTimingConfig-r15[*n*] SEQUENCE {			
periodicityAndOffset-r15 CHOICE {			

sf20	0		
}			
ssb-Duration-r15	sf5	Asynchronous cells	Configuration 1,4
	sf2	Synchronous cells	Configuration 2,3,5,6
}			
subcarrierSpacingSSB-r15[1]	kHz15		Configuration 1,2,4,5
	kHz30		Configuration 3,6
cellReselectionPriority-r15[*n*]	4		higher priority E-UTRA
threshX-High-r15[1]	24	Actual value = 48 dB	
threshX-Low-r15[1]	25	Actual value = 50 dB	
q-RxLevMin-r15[1]	-70	Actual value = -140 dBm	Configuration 1,2,4,5
	-69	Actual value = -137 dBm, Round down	Configuration 3,6
}			
carrierFreqListNR-v1610 ::= SEQUENCE {(SIZE (1..maxFreq)) OF SEQUENCE {	1 entry		
highSpeedCarrierNR-r16	TRUE		
}			

Table 8.2.1.2.4.3-4: highSpeedInterRAT-NR-r16 configuration

Derivation Path: TS 36.508 Table 4.6.3-14			
Information Element	**Value/remark**	**Comment**	**Condition**
RadioResourceConfigCommonSIB::= SEQUENCE {			
highSpeedInterRAT-NR-r16	TRUE		
}			

Table 8.2.1.2.4.3-5: *SIB2*

Derivation Path: TS 38.508-1, Table 4.6.2-1			
Information Element	**Value/remark**	**Comment**	**Condition**
SIB2 ::= SEQUENCE {			
cellReselectionServingFreqInfo SEQUENCE {			
s-NonIntraSearchP	Not present		
}			
}			

Table 8.2.1.2.4.3-6: SIB5

Derivation Path: Table H.2.3-3 with Condition higher priority			
Information Element	**Value/remark**	**Comment**	**Condition**
SIB5 ::= SEQUENCE {			
carrierFreqListEUTRA-v1610 SEQUENCE (SIZE (1..maxEUTRA-Carrier)) OF CarrierFreqEUTRA-v1610 {	1 entry	carrierFreqListEUTRA-v1610 and carrierFreqListEUTRA contain same number of entries. And the entries are listed in the same order	
CarrierFreqEUTRA-v1610[1] SEQUENCE {		entry 1	
highSpeedEUTRACarrier-r16	true		
}			
}			
}			

8.2.1.2.5 Test requirement

Tables 8.2.1.2.4.1-3, 8.2.1.2.5-1 and 8.2.1.2.5-2 define the primary level settings including test tolerances for higher priority E-UTRA cell re-selection test case.

Table 8.2.1.2.5-1: NR Cell specific test parameters for E-UTRA - NR FR1 cell re-selection to lower priority NR target cell for UE configured with highSpeedInterRAT-NR-r16

Parameter	Unit	Test configuration	Cell 2	
			T1	T2
TDD configuration		1, 4	N/A	
		2, 5	TDDConf.1.1	
		3, 6	TDDConf.2.1	
PDSCH Reference measurement channel		1, 4	SR.1.1 FDD	
		2, 5	SR.1.1 TDD	
		3, 6	SR.2.1 TDD	
RMSI CORESET Reference Channel		1, 4	CR.1.1 FDD	
		2, 5	CR.1.1 TDD	
		3, 6	CR.2.1 TDD	
RMC CORESET Reference Channel		1, 4	CCR.1.1 FDD	
		2, 5	CCR.1.1 TDD	
		3, 6	CCR.2.1 TDD	
OCNG Patterns		1, 2, 3, 4, 5, 6	OP.1	
SMTC configuration		1, 2, 3, 4, 5, 6	SMTC.1	
SSB configuration		1, 4	SSB.1 FR1	
		2, 5	SSB.1 FR1	
		3, 6	SSB.2 FR1	
Initial DL BWP configuration		1, 2, 3, 4, 5, 6	DLBWP.0.1	
Initial UL BWP configuration		1, 2, 3, 4, 5, 6	ULBWP.0.1	
RLM-RS		1, 2, 3, 4, 5, 6	SSB	
Qrxlevmin	dBm/SCS	1, 2, 4, 5	-140	
		3, 6	-137	
Pcompensation	dB	1, 2, 3, 4, 5, 6	0	
$Qhyst_s$	dB	1, 2, 3, 4, 5, 6	0	
$Qoffset_{s,n}$	dB	1, 2, 3, 4, 5, 6	0	
Cell_selection_and_reselection_quality_measurement		1, 2, 3, 4, 5, 6	SS-RSRP	
$\hat{E}_s/I_{ot}$	dB	1, 4	17.45	14
		2, 5		
		3, 6		
N_{oc} Note2	dBm/SCS	1, 4	-99.9	
		2, 5	-99.9	
		3, 6	-96.9	
N_{oc} Note2	dBm/15 kHz	1, 4	-99.9	
		2, 5		
		3, 6		
$\hat{E}_s/N_{oc}$	dB	1, 4	17.45	14
		2, 5		
		3, 6		
SS-RSRP Note3	dBm/SCS	1, 4	-82.45	-85.90
		2, 5	-82.45	-85.90
		3, 6	-79.45	-82.90
Io	dBm/9.36 MHz	1, 4	-54.42	-57.78
	dBm/9.36 MHz	2, 5	-54.42	-57.78
	dBm/38.16 MHz	3, 6	-48.32	-51.68
Treselection	s	1, 2, 3, 4, 5, 6	0	

Parameter	Unit	Test configuration	Cell 2	
			T1	T2
Snonintrasearch	dB	1, 2, 3, 4, 5, 6	Not sent	
$Thresh_{x, high}$	dB	1, 2, 3, 4, 5, 6	48	
$Thresh_{serving, low}$	dB	1, 2, 3, 4, 5, 6	44	
$Thresh_{x, low}$	dB	1, 2, 3, 4, 5, 6	50	
Propagation Condition		1, 2, 3, 4, 5, 6	AWGN 3334 Note 4	

NOTE 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.
NOTE 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for N_{oc} to be fulfilled.
NOTE 3: SS-RSRP levels have been derived from other parameters for information purposes. They are not settable parameters themselves.
NOTE 4: The AWGN 3334 Hz condition is a non fading propagation channel with one tap. Doppler shift is a constant 3334 Hz.

Table 8.2.1.2.5-2: E-UTRA Cell specific test parameters for for E-UTRA - NR FR1 cell re-selection to lower priority NR target cell for UE configured with highSpeedInterRAT-NR-r16

Parameter	Unit	Cell 1	
		T1	T2
E-UTRA RF Channel number		1	
$BW_{channel}$	MHz	10	
OCNG Patterns defined in TS 36.133 [23] clause A.3.2		OP.2 TDD for test configuration 1, 2, 3; OP.2 FDD for test configuration 4, 5, 6	
PBCH_RA	dB	0	
PBCH_RB	dB		
PSS_RA	dB		
SSS_RA	dB		
PCFICH_RB	dB		
PHICH_RA	dB		
PHICH_RB	dB		
PDCCH_RA	dB		
PDCCH_RB	dB		
PDSCH_RA	dB		
PDSCH_RB	dB		
OCNG_RA Note 1	dB		
OCNG_RB Note 1	dB		
Qrxlevmin	dBm	-140	
N_{oc} Note 2	dBm/15 kHz	-99.9	
RSRP Note 3	dBm/15 KHz	-103.55	-84.45
$\hat{E}_s/I_{ot}$	dB	-3.65	15.45
$\hat{E}_s/N_{oc}$	dB	-3.65	15.45
$Treselection_{EUTRAN}$	S	0	
Snonintrasearch	dB	50	
$Thresh_{x, high}$	dB	48	
$Thresh_{serving, low}$	dB	44	
$Thresh_{x, low}$	dB	50	
Propagation Condition		AWGN 1944 Hz Note4	

Parameter	Unit	Cell 1	
		T1	T2
NOTE 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols. NOTE 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for N_{oc} to be fulfilled. NOTE 3: RSRP levels have been derived from other parameters for information purposes. They are not settable parameters themselves. NOTE 4: The AWGN 1944 Hz condition is a non fading propagation channel with one tap. Doppler shift is a constant 1944 Hz.			

The cell reselection delay to a lower priority NR cell is defined as the time from the beginning of time period T1, to the moment when the UE camps on cell 2, and starts to send preambles on the PRACH for sending the RRCSetupRequest message to perform a Registration procedure on cell 2.

The cell re-selection delay to a lower priority cell shall be less than 3 s.

The rate of correct cell reselections observed during repeated tests shall be at least 90% with a confidence level of 95%.

NOTE: The cell re-selection delay to a lower priority cell can be expressed as: $T_{evaluate, NR_HST} + T_{SI-NR,}$

Where:

$T_{evaluate, NR_HST}$ See Table 4.2.2.5.6-2 in clause 4.2.2.5.6 in TS 36.133 [23]

T_{SI-NR} Maximum repetition period of relevant system info blocks that needs to be received by the UE to camp on a cell; 1280 ms is assumed in this test case.

This gives a total of 2.24 s, allow 3 s for the cell re-selection delay to a lower priority NR cell.

8.2.2 E-UTRA - NR Inter-RAT Early Measurement Reporting

8.2.2.0 Minimum conformance requirements

A UE supporting *ca-IdleModeMeasurements* shall perform the idle mode measurement on the inter-frequency CA candidate frequencies/cells indicated by higher layers and meet the requirement specified in this clause. A UE supporting *nr-IdleInactiveMeasFR1-r16* and/or *nr-IdleInactiveMeasFR2-r16* shall perform the idle mode measurement on the NR inter-RAT EN-DC candidate frequencies/cells indicated by higher layers and meet the requirement specified in this section.

Additionally, a UE supporting *ca-IdleModeMeasurements* or *nr-IdleInactiveMeasFR1-r16*/*nr-IdleInactiveMeasFR2-r16* shall perform the idle mode measurement on serving cell and meet the requirement specified in this section.

A UE only supporting *ca-IdleModeMeasurements* shall fulfil the requirements defined for a UE supporting *ca-IdleModeMeasurements* as defined in this section.

A UE only supporting *nr-IdleInactiveMeasFR1-r16*/*nr-IdleInactiveMeasFR2-r16* shall fulfil the requirements defined for a UE supporting *nr-IdleInactiveMeasFR1-r16*/*nr-IdleInactiveMeasFR2-r16* as defined in this section.

A UE supporting both *ca-IdleModeMeasurements* and *nr-IdleInactiveMeasFR1-r16*/*nr-IdleInactiveMeasFR2-r16* shall fulfil the requirements for a UE supporting *ca-IdleModeMeasurements* and *nr-IdleInactiveMeasFR1-r16*/*nr-IdleInactiveMeasFR2-r16* as defined in this section.

The requirements in clause 4.9 apply provided that the UE is provided with a valid timer T331 by dedicated RRC signalling and T331 is running.

For a UE which supports *ca-IdleModeMeasurements* the UE shall support the idle mode CA measurements on the serving cell, overlapping and non-overlapping carriers.

For inter-frequency idle mode measurements, an overlapping carrier is defined as a carrier configured by higher layer for early measurement reporting and inter-frequency mobility measurements. A non-overlapping carrier is defined as a

carrier configured by higher layer for early measurement reporting while not configured for inter-frequency mobility measurements.

This clause defines the requirements for the detected cell status for the idle mode CA measurement when UE transitions from RRC Connected mode to Idle mode and after UE has entered Idle mode. The requirements are applicable to an E-UTRAN carrier aggregation or EN-DC capable UE which has been configured with one or more downlink SCells or NR PSCell and one or more downlink NR SCells during the Connected mode and which supports *ca-IdleModeMeasurements* or *nr-IdleInactiveMeasFR1-r16*/*nr-IdleInactiveMeasFR2-r16*. The requirements are applicable for E-UTRAN FDD and TDD SCell(s), and NR PSCell and SCells.

Upon releasing the connection and if the UE has been configured with idle mode CA measurement reporting, following requirements apply concerning the detected cells in Connected mode upon state transitioning to Idle mode and during Idle mode:

- A cell which is detected cell in Connected mode prior to connection release, shall remain detected after UE has entered Idle mode and during Idle mode, provided that the following conditions are met:
  - The UE has been provided with a list of cells and/or carrier frequencies for early measurement reporting by dedicated RRC signalling and
  - The detected cell is among the list of cells or on a carrier frequency provided for early measurement reporting, and
  - The UE is provided with a valid timer T331 by dedicated RRC signalling, and
  - For inter-frequency carrier, the detected cell remains detectable until UE reconnects to the network and transmits the early measurement report, or for NR inter-RAT carrier, the detected cell and SSBs of the detected cell remains detectable until UE reconnects to the network and transmits the early measurement report.
  - The carrier frequency of the detected cell and the carrier frequency of the serving cell are among the supported band combination of the UE.

An inter-frequency cell is considered detectable according to RSRP, RSRP Ês/Iot, SCH_RP and SCH Ês/Iot defined in Annex B.1.1 and Annex B.1.2 for a corresponding Band. An inter-RAT NR cell is considered detectable according to the conditions in B.1.3 of [50] for a corresponding band. An SSB of an inter-RAT NR cell is considered detectable according to SSB_RP and SSB Ês/Iot defined in Annex B.1.3 of [50] for a corresponding Band.

In the absence or expiration of T331, it is up to UE implementation to apply the requirements on the detected cell status in this subclause.

The UE shall measure the RSRP and RSRQ level of the serving cell and evaluate the cell selection criterion S defined in section 4.2.2.1 and the UE physical layer shall be capable of reporting RSRP and RSRQ measurements of the serving cell to higher layers, with measurement accuracy as specified in clauses 9.1.2B.2 and 9.1.5B.2, respectively.

While T331 is running, the UE shall perform measurement on the configured NR inter-RAT carriers for idle mode measurement reporting.

In addition to the requirements defined in section 4.2.2.9 and 4.2.2.9a, a UE which supports *nr-IdleInactiveMeasFR1-r16 or nr-IdleInactiveMeasFR2-r16* shall be able to support idle mode DC measurements of.

- at least 8 inter-RAT NR carriers which are also configured for inter-RAT mobility measurements, and
- at least 2 inter-RAT NR carrier which are not configured for inter-RAT mobility measurements.

In addition to the requirements defined above, the UE shall be capable of monitoring a total of at least 8 inter-RAT NR carriers for idle mode DC measurements comprising of carriers configured for inter-RAT mobility measurements and carriers not configured for inter-RAT mobility measurements.

For idle mode DC measurements on NR inter-RAT carriers, if Srxlev $\leq S_{nonIntraSearchP}$ and Squal $\leq S_{nonIntraSearchQ}$, the NR inter-RAT measurement requirements defined in clause 4.2.2.5.6 shall apply, where UE shall search for and measure inter-RAT layers configured for idle mode DC measurements in preparation for possible reporting. If Srxlev > $S_{nonIntraSearchP}$ and Squal > $S_{nonIntraSearchQ}$, the UE shall search for NR inter-RAT layers configured for idle mode DC measurements at least every $T_{higher_priority_search}$ where $T_{higher_priority_search}$ is described in clause 4.2.2, where UE shall search for and measure NR inter-RAT layers configured for idle mode DC measurements in preparation for possible reporting.

For UE supporting *nr-IdleInactiveBeamMeasFR1-r16* and/or *nr-IdleInactiveBeamMeasFR2-r16*, if the UE is configured with *beamMeasConfigIdle-r16* on one or more carriers for idle mode DC measurement, the UE, on each carrier, shall be able to

- detect a newly detectable inter-RAT NR cell and perform RSRP/RSRQ measurement in preparation for reporting, and
- detect and acquire the SSB index for a newly detectable inter-RAT NR cell if *beamMeasConfigIdle-r16* is configured on this carrier and perform RSRP/RSRQ measurement in preparation for reporting,

within the requirements defined in clause 4.2.2.5.6 plus k*$T_{SSB_index,NR}$, where k is the number of carriers configured for idle mode DC measurement with *beamMeasConfigIdle-r16*, and $T_{SSB_index,NR}$ is the additional time period used to acquire the index of the SSB being measured as defined in Table 4.9.2.4-1.

Table 4.9.2.4-1: $T_{SSB_index,NR}$

DRX cycle length [s]	Scaling Factor (N1)		$T_{SSB_index,NR}$ [s] (number of DRX cycles)
	FR1	FR2[Note1]	
0.32	1	8	N2 x 1.28 x 1.5 x N1 (N2 x 4 x 1.5 x N1)
0.64		5	N2 x 1.28 x N1 (N2 x 2 x N1)
1.28		4	N2 x 1.28 x N1 (N2 x 1 x N1)
2.56		3	N2 x 2.56 x N1 (N2 x 1 x N1)
NOTE 1: Applies for UE supporting power class 2&3&4. For UE supporting power class 1, N1 = 8 for all DRX cycle length. NOTE 2: N2 = 3 if the NR inter-RAT carrier for idle mode DC measurement reporting is in FR1, and N2= 5 if the NR inter-RAT carrier for idle mode DC measurement reporting is in FR2.			

For UE supporting *nr-IdleInactiveBeamMeasFR1-r16* and/or *nr-IdleInactiveBeamMeasFR2-r16*, if the UE is configured with *beamMeasConfigIdle-r16* for idle mode DC measurement, the UE shall be capable of performing SS-RSRP, SS-RSRQ for at least

- 7 SSBs with different SSB index and/or PCI on an NR inter- RAT layer in FR1,
- 10 SSBs with different SSB index and/or PCI on an NR inter- RAT layer in FR2.

In the absence or expiration of T331, it is up to UE implementation to perform the idle mode DC measurement.

The UE shall be capable of performing SS-RSRP and SS-RSRQ measurements of the carriers for idle mode DC measurements, and the UE physical layer shall be capable of reporting SS-RSRP and SS-RSRQ measurements of the carriers for idle mode DC measurements to higher layers, with measurement accuracy as specified in sub-clauses 9.11.1A and 9.11.2A, respectively. The UE shall be able to report idle mode DC measurements when idle mode DC measurement reporting is requested by the network.

8.2.2.1 E-UTRA – NR FR1 Early Measurement Reporting

8.2.2.1.1 Test purpose

The purpose of this test is to verify the requirement for the E-UTRAN to NR inter-RAT Idle mode DC measurement requirements specified in TS 36.133 [23] clause 4.9.2.4 and verify to the accuracy requirement for the E-UTRAN to NR inter-RAT Idle mode DC measurement requirements specified in TS 36.133 [23] clause 9.11.1A and 9.11.2A.

8.2.2.1.2 Test applicability

This test applies to all types of E-UTRA UE from Release 16 onwards, capable of NR measurements and supporting eNB-configured SSB-based RRM measurements of NR FR1 carrier(s) in RRC_IDLE and in RRC_INACTIVE.

8.2.2.1.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 8.2.2.0.

The normative reference for this requirement is TS 38.133 [6] clause A.8.2.2.1.

8.2.2.1.4 Test description

8.2.2.1.4.1 Initial conditions

This test shall be tested under any of the test configuration in Table 8.2.2.1.4.1-1.

Table 8.2.2.1.4.1-1: Supported test configurations for E-UTRA - NR FR1 Inter-RAT Early Measurement Reporting

Test Case ID	Description
8.2.2.1-1	LTE FDD, NR 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode
8.2.2.1-2	LTE FDD, NR 15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode
8.2.2.1-3	LTE FDD, NR 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode
8.2.2.1-4	LTE TDD, NR 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode
8.2.2.1-5	LTE TDD, NR 15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode
8.2.2.1-6	LTE TDD, NR 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode
Note: The UE is only required to be tested in one of the supported test configurations	

Configure the test requirement and the DUT according to the parameters in Table 8.2.2.1.4.1-2.

Table 8.2.2.1.4.1-2: Initial conditions for E-UTRA – NR FR1 Inter-RAT Early Measurement Reporting

Parameter	Value		Comment
Test environment	NC		As specified in TS 36.508 [25] clause 4.1.
Test frequencies	As specified in Annex E, Table E.6-1 and TS 38.508-1 [14] clause 4.3.1.		
Channel bandwidth	As specified by the test configuration selected from Table 8.2.1.1.4.1-1.		
Propagation conditions	AWGN		As specified in clause C.2.1
Connection Diagram	TE Part	A.3.1. 6.1	As specified in TS 38.508-1 [14] Annex A.
	DUT Part	A.3.2.3.4	
Exceptions to connection diagram	N/A		

1. The general test parameter settings are set up according to Table 8.2.2.1.4.1-3.
2. Message contents are defined in clause 8.2.2.1.4.3.
3. The test scenario comprises of one NR cell and one E-UTRAN cell. E-UTRA Cell 1 is the PCell and Cell 2 is the neighbour cell. E-UTRA Cell 1 is configured according to TS 36.521-3 [26] clauses C.1.0 and C.1.1 and Cell 2 is configured according to clauses C.1.1 and C.1.2.

Table 8.2.1.1.4.1-3: General test parameters for E-UTRA – NR FR1 Inter-RAT Early Measurement Reporting

Parameter	Unit	Test configuration	Value	Comment
Active cell		1, 2, 3, 4, 5, 6	E-UTRAN Cell 1	
Neighbour cell		1, 2, 3, 4, 5, 6	NR Cell 2	Cell 2 is of higher priority.
RF Channel Number		1, 2, 3, 4, 5, 6	1: Cell 1 2: Cell 2	
DRX cycle length	s	1, 2, 3, 4, 5, 6	1.28	
Time offset between Cell 1 and Cell 2		1, 2, 3, 4, 5, 6	3 μs	
T1	s	1, 2, 3, 4, 5, 6	0.5	

T2	s	1, 2, 3, 4, 5, 6	71	
T3	s	1, 2, 3, 4, 5, 6	2	
T331	s	1, 2, 3, 4, 5, 6	300	

8.2.2.1.4.2 Test procedure

In this test there are two cells, E-UTRA PCell (Cell 1) and neighbour NR Cell (Cell 2). The test consists of three successive time periods, with time duration of T1, T2, and T3 respectively. Prior to the start of the test the UE shall be connected to Cell 1. During T1, NR Cell 2 shall be powered off.

At the end of T1, the RRC connection to Cell 1 is released and UE is configured Idle mode DC measurement on the carrier frequency of Cell 2.

1. Ensure the UE is in State RRC_IDLE with generic procedure parameters Connectivity EUTRA/EPC with Test Mode *On* according to TS 38.508-1 [14] clause 4.5.

2. The SS shall set the parameters for T1 according to Table 8.8.2.2.1.5-1 and Table 8.8.2.2.1.5-2 as appropriate. T1 starts.

3. After T1 expires, the SS shall send the RRCConnectionRelease with configuration of Idle mode DC measurement on the carrier frequency of Cell 2.

4. The SS shall set the parameters for T2 according to Table 8.8.2.2.1.5-1 and Table 8.8.2.2.1.5-2 as appropriate. T2 starts.

5. During the time period T2 the UE is in Idle mode configured to perform inter-RAT idle mode CA/DC measurements on Cell 2. The UE shall not perform reselection.

6. After T2 expires, the SS shall set the parameters for T3 according to Table 8.8.2.2.1.5-1 and Table 8.8.2.2.1.5-2 as appropriate. T3 starts.

7. The SS transmits in Cell 1 a Paging message (including PagingRecord with UE-Identity). During the connection setup the UE is reports idleMeasAvailable-r15 in the *RRCConnectionSetupComplete* message.

8. The SS shall send the *UEInformationRequest* message, requesting UE to report idle mode CA/DC measurements.

9. If UE responds with *UEInformationResponse* message containing the idle mode measurement results with SS-RSRP values within the limits in Table 8.2.2.1.5-3 for configuration 1, 2, 4 and 5 and Table 8.2.2.1.5-4 for configuration 3 and 6 and SS-RSRQ values within the limits in Table 8.2.2.1.5-5 for configuration 1, 2, 3, 4, 5 and 6 the number of passed iterations is increased by one. Otherwise, the number of failed iterations is increased by one.

10. If paging in step 7 succeeds, go to step 12, otherwise switch off the UE.

11. Switch on the UE and ensure the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity NR with Connected without release On according to TS 38.508-1 [14] clause 4.5.

12. Repeat step 2-12 until a test verdict has been achieved.

8.2.2.1.4.3 Message contents

Message contents are according to TS 38.508-1 [14] clause 7.3 with the following exceptions:

Table 8.2.2.1.4.3-2: *SystemInformationBlockType2*

Derivation Path: 36.508 Table 4.4.3.3-1			
Information Element	**Value/remark**	**Comment**	**Condition**
SystemInformationBlockType2 ::= SEQUENCE {			
idleModeMeasurementsNR-r16	true		
}			

Table 8.2.2.1.4.3-2: *RRCConnectionRelease*

Derivation Path: 36.508 Table 4.6.1-15			
Information Element	**Value/remark**	**Comment**	**Condition**
RRCConnectionRelease ::= SEQUENCE {			
rrc-TransactionIdentifier	RRC-TransactionIdentifier-DL		
criticalExtensions CHOICE {			
nonCriticalExtension SEQUENCE {			
measIdleConfig-r15 SEQUENCE {			
measIdleCarrierListNR-r16 ::= SEQUENCE {			
carrierFreqNR-r16	ARFCN of Cell2		
subcarrierSpacingSSB-r16	kHz15	8.2.2.1-1 8.2.2.1-2 8.2.2.1-4 8.2.2.1-5	
subcarrierSpacingSSB-r16	kHz30	8.2.2.1-3 8.2.2.1-6	
reportQuantitiesNR-r16	both		
}			
}			
}			
}			
}			

Table 8.2.2.1.4.3-2: *RRCConnectionSetupComplete*

Derivation Path: 36.508 Table 4.6.1-18			
Information Element	**Value/remark**	**Comment**	**Condition**
RRCConnectionSetupComplete ::= SEQUENCE {			
criticalExtensions CHOICE {			
nonCriticalExtension SEQUENCE {			
idleMeasAvailable-r15	true		
}			
}			
}			

Table 8.2.2.1.4.3-3: *UEInformationRequest*

Derivation Path: 36.508 Table 4.6.1-23A			
Information Element	**Value/remark**	**Comment**	**Condition**
UEInformationRequest-r9 ::= SEQUENCE {			
criticalExtensions CHOICE {			
nonCriticalExtension SEQUENCE {			
idleModeMeasurementReq-r15			
}			
}			
}			

Table 4.6.1-23B: *UEInformationResponse*

Derivation Path: 36.331 clause 6.2.2			
Information Element	**Value/remark**	**Comment**	**Condition**
UEInformationResponse-r9 ::= SEQUENCE {			
criticalExtensions CHOICE {			
nonCriticalExtension SEQUENCE {			
measResultListIdleNR-r16 SEQUENCE {			
carrierFreqNR-r16	ARFCN of Cell2		
measResultsPerCellListIdleNR-r16 SEQUENCE {			
physCellIdNR-r16	Cell ID of Cell2		
rsrpResultNR-r16	INTEGER (0..127)		

rsrqResultNR-r16	INTEGER (0..127)		
}			
}			
}			
}			
}			

8.2.2.1.5 Test requirement

Tables 8.2.2.1.5-1 and 8.2.2.1.5-2 define the primary level settings including test tolerances for and tables 8.2.2.1.5-3, 8.2.2.1.5-4, 8.2.2.1.5-5 and 8.2.2.1.5-6 define accuracy requirements E-UTRA - NR FR1 Early Measurement Reporting test case.

Table 8.2.2.1.5-1: Cell specific test parameters for NR cell 2 for E-UTRA – NR FR1 Inter-RAT Early Measurement Reporting

Parameter	Unit	Test configuration	Cell 2		
			T1	T2	T3
TDD configuration		1, 4	N/A		
		2, 5	TDDConf.1.1		
		3, 6	TDDConf.2.1		
PDSCH Reference measurement channel		1, 4	SR.1.1 FDD		
		2, 5	SR.1.1 TDD		
		3, 6	SR.2.1 TDD		
RMSI CORESET Reference Channel		1, 4	CR.1.1 FDD		
		2, 5	CR.1.1 TDD		
		3, 6	CR.2.1 TDD		
RMC CORESET Reference Channel		1, 4	CCR.1.1 FDD		
		2, 5	CCR.1.1 TDD		
		3, 6	CCR.2.1 TDD		
OCNG Patterns		1, 2, 3, 4, 5, 6	OP.1		
SMTC configuration		1, 2, 3, 4, 5, 6	SMTC.1		
SSB configuration		1, 4	SSB.1 FR1		
		2, 5	SSB.1 FR1		
		3, 6	SSB.2 FR1		
Initial DL BWP configuration		1, 2, 3, 4, 5, 6	DLBWP.0.1		
Initial UL BWP configuration		1, 2, 3, 4, 5, 6	ULBWP.0.1		
Qrxlevmin	dBm/SCS	1, 2, 4, 5	-140		
		3, 6	-137		
Pcompensation	dB	1, 2, 3, 4, 5, 6	0		
Qhysts	dB	1, 2, 3, 4, 5, 6	0		
Qoffsets, n	dB	1, 2, 3, 4, 5, 6	0		
Cell_selection_and_reselection_quality_measurement		1, 2, 3, 4, 5, 6	SS-RSRP		
$\hat{E}_s / I_{ot}$	dB	1, 4	-infinity	-4	4
		2, 5			
		3, 6			
N_{oc} Note2	dBm/SCS	1, 4	-98		
		2, 5	-98		
		3, 6	-95		
N_{oc} Note2	dBm/15 kHz	1, 4	-98		
		2, 5			
		3, 6			
$\hat{E}_s / N_{oc}$	dB	1, 4	-infinity	-3.7	-3.7

		2, 5			
		3, 6			
SS-RSRP Note3	dBm/SCS	1, 4	-infinity	-101.7	-101.7
		2, 5	-infinity	-101.7	-101.7
		3, 6	-infinity	-98.7	-98.7
SS-RSRQ Note3	dB	1, 4	-infinity	-16.03	-16.03
		2, 5	-infinity	-16.03	-16.03
		3, 6	-infinity	-16.03	-16.03
Io	dBm/9.36 MHz	1, 4	-70.05	-68. 51	-68. 51
	dBm/9.36 MHz	2, 5	-70.05	-68. 51	-68. 51
	dBm/38.16 MHz	3, 6	-63.94	-62.40	-62.40
Propagation Condition		1, 2, 3, 4, 5, 6	AWGN		

Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.

Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for N_{oc} to be fulfilled.

Note 3: SS-RSRP levels have been derived from other parameters for information purposes. They are not settable parameters themselves.

Table 8.2.2.1.5-2: Cell specific test parameters for E-UTRA cell 1 for E-UTRA – NR FR1 Inter-RAT Early Measurement Reporting

Parameter	Unit	Cell 1		
		T1	T2	T3
E-UTRA RF Channel number		1		
$BW_{channel}$	MHz	10		
OCNG Patterns defined in TS 36.133 [15] clause A.3.2		OP.2 TDD for test configuration 1, 2, 3; OP.2 FDD for test configuration 4, 5, 6		
PBCH_RA	dB	0		
PBCH_RB	dB			
PSS_RA	dB			
SSS_RA	dB			
PCFICH_RB	dB			
PHICH_RA	dB			
PHICH_RB	dB			
PDCCH_RA	dB			
PDCCH_RB	dB			
PDSCH_RA	dB			
PDSCH_RB	dB			
OCNG_RA Note 1	dB			
OCNG_RB Note 1	dB			
Qrxlevmin	dBm	-140		
N_{oc} Note 2	dBm/15 kHz	-98		
RSRP Note 3	dBm/15 KHz	-84	-84	-84
RSRQ Note 3	dB	-10.96	-10.96	-10.96
$\hat{E}_s/I_{ot}$	dB	14	14	14
$\hat{E}_s/N_{oc}$	dB	14	14	14
$Treselection_{EUTRAN}$	S	0		
SnonintrasearchP	dB	50		
$Thresh_{x, highP}$	dB	48		
$Thresh_{serving, lowP}$	dB	44		
$Thresh_{x, lowP}$	dB	50		
beamMeasConfigIdle		True		
Propagation Condition		AWGN		

Note 1:	OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.
Note 2:	Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for N_{oc} to be fulfilled.
Note 3:	RSRP levels have been derived from other parameters for information purposes. They are not settable parameters themselves.

Table 8.2.2.1.5-3: Absolute accuracy requirements for the Cell 2 SS-RSRP reported values for test configurations 1 and 2

Normal Conditions	T3
Lowest reported value (Cell 2)	44
Highest reported value (Cell 2)	66

Table 8.2.2.1.5-4: Absolute accuracy requirements for the Cell 2 SS-RSRP reported values for test configurations 3

Normal Conditions	T3
Lowest reported value (Cell 2)	47
Highest reported value (Cell 2)	69

Table 8.2.2.1.5-5: Absolute accuracy requirements for the Cell 2 SS-RSRQ reported values for test configurations 1, 2 and 3

Normal Conditions	T3
Lowest reported value (Cell 2)	44
Highest reported value (Cell 2)	65

At the beginning of the time-period T2 the connection is released, and UE enters idle mode. During the time period T2 the UE is in Idle mode and Cell 2 is active. The UE shall not perform reselection. The UE shall perform Idle Mode DC measurement according to clause 4.9.2.4 in TS 36.133 [23]. UE shall be able to detect, acquire the SSB index and measure the SS-RSRP and SS-RSRQ from Cell 2 for Idle mode DC measurement during T2.

At the start of T3 the UE is paged for connection setup. During the connection setup the UE is requested to transmit early measurement report. The UE shall send early measurement report to the PCell.

After receiving the requested early measurement report, the test equipment verifies the accuracy of measurement reported for serving Cell 1 and Cell 2 meets the requirements in Section 9.1.2B in TS 36.133 [23] and Section 9.1.3B, respectively and test ends.

The rate of correct events observed during repeated tests shall be at least 90% with a confidence level of 95%.

8.2.2.2 E-UTRA – NR FR2 Early Measurement Reporting

Editor's Note: This test case has been completed for the following configurations:

- Test frequency f ≤ 40.8 GHz
- UE PC3
- Normal conditions
- The test is incomplete for UE power classes other than PC3
- The test is incomplete for test frequencies > 40.8 GHz
- The test is incomplete for extreme conditions
- E-UTRA - FR2 OTA testability is still FFS.

8.2.2.2.1 Test purpose

The purpose of this test is to verify the requirement for the E-UTRAN to NR inter-RAT Idle mode DC measurement requirements specified in TS 36.133 [23] clause 4.9.2.4 and verify to the accuracy requirement for the E-UTRAN to NR inter-RAT Idle mode DC measurement requirements specified in TS 36.133 [23] clause 9.11.1A and 9.11.2A.

8.2.2.2.2 Test applicability

This test applies to all types of NR UE from Release 16 onwards, capable of NR measurements and supporting eNB-configured SSB-based RRM measurements of NR FR2 carrier(s) in RRC_IDLE and in RRC_INACTIVE.

8.2.2.2.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 8.2.2.0.

The normative reference for this requirement is TS 38.133 [6] clause A.8.2.2.2.

8.2.2.2.4 Test description

8.2.2.2.4.1 Initial conditions

This test shall be tested under any of the test configuration in Table 8.2.2.2.4.1-1.

Table 8.2.2.2.4.1-1: Supported test configurations for E-UTRA - NR FR2 Inter-RAT Early Measurement Reporting

Test ID	Description
8.2.2.2-1	LTE FDD, NR 120 kHz SSB SCS, 100 MHz bandwidth, TDD duplex mode
8.2.2.2-2	LTE TDD, NR 120 kHz SSB SCS, 100 MHz bandwidth, TDD duplex mode
Note: The UE is only required to be tested in one of the supported test configurations	

Configure the test requirement and the DUT according to the parameters in Table 8.2.2.2.4.1-2.

Table 8.2.2.2.4.1-2: Initial conditions for E-UTRA - NR FR2 Inter-RAT Early Measurement Reporting

Parameter	Value		Comment
Test environment	NC		As specified in TS 36.508 [25] clause 4.1.
Test frequencies	As specified in Annex E, Table E.6-1 and TS 38.508-1 [14] clause 4.3.1.		
Channel bandwidth	As specified by the test configuration selected from Table 8.2.1.1.4.1-1.		
Propagation conditions	AWGN		As specified in clause C.2.1
Connection Diagram	TE Part	A.3.3.3.1	As specified in TS 38.508-1 [14] Annex A.
	DUT Part	A.3.4.1.1	
Exceptions to connection diagram	N/A		

1. The general test parameter settings are set up according to Table 8.2.2.2.4.1-3.
2. Message contents are defined in clause 8.2.2.2.4.3.
3. The test scenario comprises of one NR cell and one E-UTRAN cell. E-UTRA Cell 1 is the PCell and Cell 2 is the neighbour cell. E-UTRA Cell 1 is configured according to TS 36.521-3 [26] clauses C.1.0 and C.1.1 and Cell 2 is configured according to clauses C.1.1 and C.1.2.
4. The UE Rx beam peak direction has been obtained previously using one of the Rx Beam Peak Search procedures as described in Annex I. Ensure that the UE is receiving NR Cell 2 from the Rx Beam Peak direction.

Table 8.2.2.2.4.1-3: General test parameters for E-UTRA – NR FR2 Inter-RAT Early Measurement Reporting

Parameter	Unit	Test	Value	Comment

		configuration		
Active cell		1, 2	E-UTRAN Cell 1	E-UTRA cell 1 is on E-UTRA RF channel number 1 as defined in clause A.3.7.2.2.
Neighbour cell		1, 2	NR Cell 2	
E-UTRA RF Channel Number		1, 2	1	One E-UTRA carrier frequency is used.
NR RF Channel Number		1, 2	1	One FR2 NR carrier frequency is used.
DRX cycle length	s	1, 2	1.28	
Time offset between Cell 1 and Cell 2		1, 2	3 μs	
T1	s	1, 2	0.5	
T2	s	1, 2	128	
T3	s	1, 2	2	
T331	s	1, 2	300	

8.2.2.2.4.2 Test procedure

Same test procedure as in 8.2.2.1.4.2.

8.2.2.2.4.3 Message contents

Same message content as in 8.2.2.1.4.3.

8.2.2.2.5 Test requirement

Table8.2.2.2.5-1 define the primary level settings including test tolerances and tables 8.2.2.2.5-2, 8.2.2.2.5-3 define accuracy requirements for E-UTRA - NR FR2 Early Measurement Reporting test case.

Table 8.2.2.2.5-1: Cell specific test parameters for NR cell 2 for E-UTRA – NR FR2 Inter-RAT Early Measurement Reporting

Parameter	Unit	Test configuration	Cell 2		
			T1	T2	T3
TDD configuration		1, 2	TDDConf.3.1		
PDSCH Reference measurement channel		1, 2	SR.3.1 TDD		
RMSI CORESET Reference Channel		1, 2	CR.3.1 TDD		
RMC CORESET Reference Channel		1, 2	CCR.3.1 TDD		
OCNG Patterns		1, 2	OP.1		
BWchannel	MHz	1, 2	100		
Data RBs allocated		1, 2	66		
SMTC configuration		1, 2	SMTC.1		
SSB configuration		1, 2	SSB.1 FR2		
Initial DL BWP configuration		1, 2	DLBWP.0.1		
Initial UL BWP configuration		1, 2	ULBWP.0.1		
RLM-RS			SSB		
Qrxlevmin			-140		
Pcompensation			0		
Qhysts			0		
Qoffsets, n			0		
Cell_selection_and_reselection_quality_measurement			SS-RSRP		
AoA setup			Setup 1 defined in A.3.15.1		
Beam assumption[Note 4]			Rough		
$\hat{E}_s/I_{ot}$ UE baseband	dB	1, 4	-infinity	-3.66	-3.66

N_{oc} Note2	dBm/SCS	1, 4	-98		
N_{oc} Note2	dBm/15kHz	1, 2	-107		
$\hat{E}_s / N_{oc}$	dB	1, 4	-infinity	-2.4	-2.4
SSbRP Note3	dBm/SCS	1, 4	-infinity	-100.4	-100.4
SS-RSRQ Note3	dB	1, 4	-infinity	-16.01	-16.01
Io	dBm/95.04MHz	1, 4	-68.98	-67.01	-67.01
Propagation Condition		1, 2	AWGN		

Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.

Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for N_{oc} to be fulfilled.

Note 3: SSB_RP, SS-RSRQ levels have been derived from other parameters for information purposes. They are not settable parameters themselves.

Note 4: Information about types of UE beam is given in B.2.1.3, and does not limit UE implementation or test system implementation

Note 5: Calculation of Es/IotBB includes the effect of UE internal noise up to the value assumed for the associated Refsens requirement in clause 7.3.2 of TS 38.101-2 [19], and an allowance of 1dB for UE multi-band relaxation factor ΔMBP from TS 38.101-2 [19] Table 6.2.1.3-4.

Table 8.2.2.2.5-2: Cell specific test parameters for E-UTRA cell 1 for E-UTRA – NR FR2 Inter-RAT Early Measurement Reporting

Parameter	Unit	Cell 1		
		T1	T2	T3
E-UTRA RF Channel number		1		
$BW_{channel}$	MHz	10		
OCNG Patterns defined in TS 36.133 [15] clause A.3.2		OP.2 TDD for test configuration 1, 2, 3; OP.2 FDD for test configuration 4, 5, 6		
PBCH_RA	dB	0		
PBCH_RB	dB			
PSS_RA	dB			
SSS_RA	dB			
PCFICH_RB	dB			
PHICH_RA	dB			
PHICH_RB	dB			
PDCCH_RA	dB			
PDCCH_RB	dB			
PDSCH_RA	dB			
PDSCH_RB	dB			
OCNG_RA Note 1	dB			
OCNG_RB Note 1	dB			
Qrxlevmin	dBm	-140		
N_{oc} Note 2	dBm/15 kHz	-98		
RSRP Note 3	dBm/15 KHz	-84	-84	-84
RSRQ Note 3	dB	-10.96	-10.96	-10.96
$\hat{E}_s / I_{ot}$	dB	14	14	14
$\hat{E}_s / N_{oc}$	dB	14	14	14
$Treselection_{EUTRAN}$	S	0		
SnonintrasearchP	dB	N/A		
$Thresh_{x, highP}$	dB	51		
$Thresh_{serving, lowP}$	dB	44		
$Thresh_{x, lowP}$	dB	50		
beamMeasConfigIdle		False		
Propagation Condition		AWGN		

Note 1:	OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.
Note 2:	Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for N_{oc} to be fulfilled.
Note 3:	RSRP levels have been derived from other parameters for information purposes. They are not settable parameters themselves.

Table 8.2.2.2.5-3: Absolute accuracy requirements for the Cell 2 SS-RSRP reported values

Normal Conditions	T3
Lowest reported value (Cell 2)	28
Highest reported value (Cell 2)	86

Table 8.2.2.2.5-4: Absolute accuracy requirements for the Cell 2 SS-RSRQ reported values

Normal Conditions	T3
Lowest reported value (Cell 2)	44
Highest reported value (Cell 2)	65

At the beginning of the time-period T2 the connection is released, and UE enters idle mode. During the time period T2 the UE is in Idle mode and Cell 2 is active. The UE shall not perform reselection. The UE shall perform Idle Mode DC measurement according to clause 4.9.2.4 in TS 36.133 [23]. UE shall be able to detect, acqure the SSB index and measure the SS-RSRP and SS-RSRQ from Cell 2 for Idle mode DC measurement during T2.

At the start of T3 the UE is paged for connection setup. During the connection setup the UE is requested to transmit early measurement report. The UE shall send early measurement report to the PCell.

After receiving the requested early measurement report, the test equipment verifies the accuracy of measurement reported for serving Cell 1 and Cell 2 meets the requirements in Section 9.1.2B in TS 36.133 [23] and Section 9.1.3B, respectively and test ends.

The rate of correct events observed during repeated tests shall be at least 90% with confidence level of 95%.

8.3 RRC_CONNECTED state mobility

8.3.1 Inter-RAT cell handover

8.3.1.0 Minimum conformance requirements

8.3.1.0.1 Minimum conformance requirements for E-UTRA - NR FR1 handover

[TS 36.133, clause 5.3.4.2]

When the UE receives a RRC message implying inter-RAT handover to the UE shall be ready to start the transmission of the uplink PRACH channel in NR within $D_{handover}$ seconds from the end of the last TTI containing the RRC command. $D_{handover}$ is defined as:

$$D_{handover} = T_{RRC_procedure_delay} + T_{interruption}$$

Where:

$T_{RRC_procedure_delay}$: it is the RRC procedure delay which is [50] ms.

$T_{interruption}$: it is the time between end of the last TTI containing the RRC command on the PDSCH in E-UTRAN and the time the UE starts transmission of the PRACH in NR, excluding $T_{RRC_procedure_delay}$. $T_{interruption}$ is defined in TS 36.133 clause 5.3.4.3.

[TS 36.133, clause 5.3.4.3]

When inter-RAT handover to NR is commanded, the interruption time shall be less than $T_{interruption}$

$$T_{interruption} = T_{search} + T_{IU} + T_{rs}+20 \text{ ms}$$

Where:

T_{search} is the time required to search the target cell when the target cell is not already known when the handover command is received by the UE. If the target cell is known, then T_{search} = 0 ms. If the target cell is an unknowncell and target cell Es/Iot ≥ [-2] dB, then $T_{search} = 3 \cdot T_{rs} + 2$ ms. Regardless of whether DRX is in use by the UE, T_{search} shall still be based on non-DRX target cell search times.

T_{IU} is the interruption uncertainty in acquiring the first available PRACH occasion in the new cell. T_{IU} can be up to the summation of SSB to PRACH occasion association period and 10 ms. SSB to PRACH occasion associated period is defined in the table 8.1-1 of TS 38.213.

NOTE: The actual value of T_{IU} shall depend upon the PRACH configuration used in the target cell.

T_{rs} is the SMTC period of the target NR cell if the UE has been provided with an SMTC configuration for the target cell prior to, or in the handover command, otherwise T_{rs} is the target cell SSB transmission period, if such is provided. If the UE is not provided with an SMTC configuration or SSB transmission period, the requirement in this clause is applied with Trs = 5 ms assuming the SSB transmission periodicity is 5ms. There is no requirement if the SSB transmission periodicity is not 5ms. If UE is provided with both SMTC configuration and SSB transmission period the requirement shall be based on SMTC periodicity.

In the interruption requirement a cell is known if it has been meeting the relevant cell identification requirement during the last 5 seconds otherwise it is unknown. Relevant cell identification requirements are described in clauses 8.1.2.4.21 and 8.1.2.4.22.

The normative reference for this requirement is TS 38.133 [6] clause 5.3.4.2 and 5.3.4.3.

8.3.1.1 E-UTRA - NR FR1 handover with known target cell

8.3.1.1.1 Test purpose

The purpose of this test is to verify the E-UTRAN to NR FR1 handover requirements as specified in TS 36.133 [23] clause 5.3.4.

8.3.1.1.2 Test applicability

This test applies to all E-UTRA UE release 15 onwards and capable of NR measurements.

8.3.1.1.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 8.3.1.0.

The normative reference for this requirement is TS 38.133 [6] clause A.8.3.1.1.

8.3.1.1.4 Test description

The test comprises of one E-UTRA carrier and one NR carrier. There are two cells and one cell on each carrier. Cell 1 is the E-UTRAN PCell and Cell 2 is an inter-RAT NR neighbour cell. The test consists of three successive time periods, with time durations of T1, T2 and T3 respectively. At the start of time duration T1, the UE does not have any timing information of Cell 2. Starting T2, Cell 2 becomes detectable and the UE is expected to detect and send a measurement report. Gap pattern configuration with id #0 as specified in Table 8.1.2.1-1 of TS 36.133 [23] is configured before T2 begins to enable inter-RAT frequency monitoring.

8.3.1.1.4.1 Initial conditions

This test shall be tested using any of the test configurations in Table 8.3.1.1.4.1-1.

Table 8.3.1.1.4.1-1: Supported test configurations for E-UTRA - NR FR1 handover with known target cell

Configuration	Description
8.3.1.1-1	LTE FDD, NR 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode
8.3.1.1-2	LTE FDD, NR 15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode
8.3.1.1-3	LTE FDD, NR 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode
8.3.1.1-4	LTE TDD, NR 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode
8.3.1.1-5	LTE TDD, NR 15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode
8.3.1.1-6	LTE TDD, NR 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode
NOTE: The UE is only required to be tested in one of the supported test configurations.	

Configure the test requirement and the DUT according to the parameters in Table 8.3.1.1.4.1-2.

Table 8.3.1.1.4.1-2: Initial conditions for E-UTRA - NR FR1 handover with known target cell

Parameter	Value		Comment
Test environment	NC		As specified in TS 36.508 [25] clause 4.1.
Test frequencies	As specified in Annex E, Table E.6-1 and TS 38.508-1 [14] clause 4.3.1.		
Channel bandwidth	As specified by the test configuration selected from Table 8.3.1.1.4.1-1.		
Propagation conditions	AWGN		As specified in clause C.2.1
Connection Diagram	TE Part	A.3.1.8.2	As specified in TS 38.508-1 [14] Annex A.
	DUT Part	A.3.2.3.4	
Exceptions to connection diagram	N/A		

1. The general test parameter settings are set up according to Table 8.3.1.1.4.1-3.
2. Message contents are defined in clause 8.3.1.1.4.3.
3. There are two carriers and two cells specified in the test, where E-UTRA Cell 1 is the E-UTRA PCell on the E-UTRA carrier and Cell 2 is the NR neighbour cell on the NR carrier. E-UTRA Cell 1 is configured according to TS 36.521-3 [26] clause C.1.0 and C.1.1.

Table 8.3.1.1.4.1-3: General test parameters for E-UTRA - NR FR1 handover with known target cell

Parameter		Unit	Value	Comment
NR RF Channel Number			1	1 NR carrier frequency is used in the test
LTE RF Channel Number			2	1 E-UTRAN carrier frequency is used in the test
Initial conditions	Active cell		Cell 1	E-UTRAN cell
	Neighbouring cell		Cell 2	NR cell
Final condition	Active cell		Cell 2	
NR measurement quantity			SS-RSRP	
E-UTRAN measurement quantity			RSRP	
b2-Threshold1		dBm	-83	Absolute E-UTRAN RSRP threshold for event B2
b2-Threshold2NR		dBm	As specified in Table 8.3.1.1.5-2	Absolute NR SS-RSRP threshold for event B2
Hysteresis		dB	0	
TimeToTrigger		s	0	
Filter coefficient			0	L3 filtering is not used
DRX			OFF	Non-DRX test
Access Barring Information		-	Not sent	No additional delays in random access procedure
Time offset between cells			3 ms	Asynchronous cells
Gap pattern configuration Id			0	As specified in Table 8.1.2.1-1 started before T2 starts [23]
T1		s	5	
T2		s	≤5	
T3		s	1	

8.3.1.1.4.2 Test procedure

The test comprises of one E-UTRA carrier and one NR carrier. There are two cells and one cell on each carrier. Cell 1 is the E-UTRAN and Cell 2 is an inter-RAT NR neighbour cell. The general and cell specific test parameters for PCell and neighbour cell are given in Table 8.3.1.1.4.1-3, 8.3.1.1.5-1 and 8.3.1.1.5-2, respectively.

The test consists of three successive time periods, with time durations of T1, T2 and T3 respectively. At the start of time duration T1, the UE does not have any timing information of Cell 2. Starting T2, Cell 2 becomes detectable and the UE is expected to detect and send a measurement report. Gap pattern configuration with id #0 as specified in Table 8.1.2.1-1 of TS 36.133 [23] is configured before T2 begins to enable inter-RAT frequency monitoring.

A RRC message implying handover shall be sent to the UE during period T2 after the UE has reported Event B2. The start of T3 is the instant when the last TTI containing the RRC message implying handover is sent to the UE. The handover message shall contain Cell 2 as the target cell.

1. Ensure the UE is in State 3A-RF according to TS 36.508 [25] clause 7.2A.3.
2. Set the parameters of Cell 1 and Cell 2 according to T1 in Table 8.3.1.1.5-1 and Table 8.3.1.1.5-2 respectively, T1 starts.
3. The SS shall transmit an *RRCConnectionReconfiguration* message.
4. The UE shall transmit an *RRCConnectionReconfigurationComplete* message.
5. When T1 expires, the SS shall switch the parameters setting from T1 to T2 as specified in Table 8.3.1.1.5-1 and Table 8.3.1.1.5-2 respectively. T2 Starts.
6. UE shall transmit a *MeasurementReport* message triggered by Event B2.
7. SS shall transmit a *MobilityFromEUTRACommand* message implying handover to Cell 2.
8. The start of T3 is the instant when the last TTI containing the *MobilityFromEUTRACommand* message implying handover is sent to the UE, at that instant the SS shall switch the power setting from T2 to T3 as specified in Table 8.3.1.1.5-1 and Table 8.3.1.1.5-2.
9. The UE shall transmit an *RRCReconfigurationComplete* message on Cell 2.
10. If the UE transmits the uplink PRACH channel to Cell 2 less than 112 ms from the beginning of time period T3 then the number of successful tests is increased by one. Otherwise, the number of failure tests is increased by one.
11. After T3 expires,
    - The SS could switch the parameters setting from T3 to T1 as specified in Table 8.3.1.1.5-1 and Table 8.3.1.1.5-2 respectively.
    - If the UE handover back to E-UTRA Cell 1, then T1 starts, skip to step 3. Otherwise, switch off and on the UE. Then ensure the UE is in State 3A-RF according to TS 36.508 [25] clause 7.2A.3. E-UTRA Cell 1 is the active cell.
    - Or, switch off and on the UE Then ensure the UE is in State 3A-RF according to TS 36.508 [25] clause 7.2A.3. E-UTRA Cell 1 is the active cell.
12. Set Cell 2 physical cell identity = ((current Cell 2 physical cell identity + 1) mod 1008) for next iteration of the test procedure loop.
13. Repeat step 2-12 until the confidence level according to Tables G.2.3-1 in Annex G clause G.2 is achieved

8.3.1.1.4.3 Message contents

Message contents are according to TS 36.508 [25] clause 7.3 with the following exceptions:

Table 8.3.1.1.4.3-1: Common Exception messages for E-UTRA - NR FR1 handover with known target cell

Default Message Contents	
Common contents of system information blocks exceptions	
Default RRC messages and information elements contents exceptions	Table H.3.3-2; Table H.3.4-1a Table H.3.4-4 with Condition INTER-RAT NR, EVENT B2 and gapUE Table H.3.4-5 with Condition Pattern #0
Specific message contents exceptions for Test Configuration 8.3.1.1-1, 8.3.1.1-2, 8.3.1.1-4 and 8.3.1.1-5	Table H.3.4-6 with Condition SSB.1 FR1, SMTC.1 and Asynchronous cells
Specific message contents exceptions for Test Configuration 8.3.1.1-3 and 8.3.1.1-6	Table H.3.4-6 with Condition SSB.2 FR1, SMTC.1 and Asynchronous cells

8.3.1.1.5 Test requirement

Table 8.3.1.1.4.1-3, 8.3.1.1.5-1 and 8.3.1.1.5-2 define the primary level settings including test tolerances for E-UTRA - NR FR1 handover with known target cell.

Table 8.3.1.1.5-1: E-UTRAN PCell specific test parameters for E-UTRA - NR FR1 handover with known target cell

Parameter	Unit	Configuration	Cell 1		
			T1	T2	T3
RF channel number		1, 2, 3, 4, 5, 6	2		
Duplex mode		1, 2, 3	FDD		
		4, 5, 6	TDD		
TDD special subframe configuration[Note1]		4, 5, 6	6		
TDD uplink-downlink configuration[Note1]		4, 5, 6	1		
$BW_{channel}$	MHz	1, 2, 3, 4, 5, 6	5 MHz: $N_{RB,c}$ = 25 10 MHz: $N_{RB,c}$ = 50 20 MHz: $N_{RB,c}$ = 100		
PRACH Configuration[Note2]		1, 2, 3	4		
		4, 5, 6	53		
PDSCH parameters: DL Reference Measurement Channel[Note3]		1, 2, 3	5 MHz: R.7 FDD 10 MHz: R.3 FDD 20 MHz: R.6 FDD		
		4, 5, 6	5 MHz: R.4 TDD 10 MHz: R.0 TDD 20 MHz: R.3 TDD		
PCFICH/PDCCH/PHICH parameters: DL Reference Measurement Channel[Note3]		1, 2, 3	5 MHz: R.11 FDD 10 MHz: R.6 FDD 20 MHz: R.10 FDD		
		4, 5, 6	5 MHz: R.11 TDD 10 MHz: R.6 TDD 20 MHz: R.10 TDD		
OCNG Patterns[Note3]		1, 2, 3	5 MHz: OP.20 FDD 10 MHz: OP.10 FDD 20 MHz: OP.17 FDD		
		4, 5, 6	5 MHz: OP.9 TDD 10 MHz: OP.1 TDD 20 MHz: OP.7 TDD		
PBCH_RA	dB	1, 2, 3, 4, 5, 6	0		
PBCH_RB					
PSS_RA					
SSS_RA					
PCFICH_RB					
PHICH_RA					
PHICH_RB					
PDCCH_RA					
PDCCH_RB					

Parameter	Unit	Configuration	Cell 1		
			T1	T2	T3
PDSCH_RA					
PDSCH_RB					
OCNG_RA Note4					
OCNG_RB Note4					
N_{oc} Note5	dBm/15kHz	1, 2, 3, 4, 5, 6	-98		
$\hat{E}_s/N_{oc}$	dB	1, 2, 3, 4, 5, 6	7	5.45	5.45
$\hat{E}_s/I_{ot}$ Note6	dB	1, 2, 3, 4, 5, 6	7	5.45	5.45
RSRP Note6	dBm/15kHz	1, 2, 3, 4, 5, 6	-91	-92.55	-92.55
SCH_RP Note6	dBm/15kHz	1, 2, 3, 4, 5, 6	-91	-92.55	-92.55
Io Note6	dBm/9MHz	1, 2, 3, 4, 5, 6	-62.43	-63.68	-63.68
Propagation Condition		1, 2, 3, 4, 5, 6	AWGN		
Antenna Configuration and Correlation Matrix Note7		1, 2, 3, 4, 5, 6	1x2 Low		

NOTE 1: Special subframe and uplink-downlink configurations are specified in table 4.2-1 in TS 36.211 [23].
NOTE 2: PRACH configurations are specified in table 5.7.1-2 and table 5.7.1-3 in TS 36.211 [23].
NOTE 3: DL RMCs and OCNG patterns are specified in clauses A 3.1 and A 3.2 of TS 36.133 [15] respectively.
NOTE 4: OCNG shall be used such that all cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.
NOTE 5: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for N_{oc} to be fulfilled.
NOTE 6: $\hat{E}_s/I_{ot}$, RSRP, SCH_RP and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.
NOTE 7: Propagation condition and correlation matrix are defined in clause B.2 in TS 36.101 [27].

Table 8.3.1.1.5-2: NR neighbour cell specific test parameters for E-UTRA - NR FR1 handover with known target cell

Parameter		Unit	Configuration	Cell 2		
				T1	T2	T3
RF channel number			1, 2, 3, 4, 5, 6	1		
Duplex mode			1, 4	FDD		
			2, 3, 5, 6	TDD		
TDD Configuration			2, 5	TDDConf.1.1		
			3, 6	TDDConf.2.1		
$BW_{channel}$		MHz	1, 4	10: $N_{RB,c}$ = 52 (FDD)		
			2, 5	10: $N_{RB,c}$ = 52 (TDD)		
			3, 6	40: $N_{RB,c}$ = 106 (TDD)		
PDSCH reference measurement channel			1, 4	SR.1.1 FDD		
			2, 5	SR.1.1 TDD		
			3, 6	SR.2.1 TDD		
CORSET reference channel			1, 4	CR.1.1 FDD		
			2, 5	CR.1.1 TDD		
			3, 6	CR.2.1 TDD		
OCNG pattern Note1			1, 2, 3, 4, 5, 6	OP.1		
BWP	Initial DL BWP		1, 2, 3, 4, 5, 6	DLBWP.0.1		
	Dedicated DL BWP			DLBWP.1.1		
	Initial UL BWP			ULBWP.0.1		
	Dedicated UL BWP			ULBWP.1.1		
SMTC configuration			1, 2, 3, 4, 5, 6	SMTC.1		
SSB configuration			1, 2, 4, 5	SSB.1 FR1		
			3, 6	SSB.2 FR1		
b2-Threshold2NR		dBm	1, 2, 4, 5	-106		
			3, 6	-103		
EPRE ratio of PSS to SSS		dB	1, 2, 3, 4, 5, 6	0		
EPRE ratio of PBCH_DMRS to SSS						
EPRE ratio of PBCH to PBCH_DMRS						
EPRE ratio of PDCCH_DMRS to SSS						
EPRE ratio of PDCCH to PDCCH_DMRS						
EPRE ratio of PDSCH_DMRS to SSS						

EPRE ratio of PDSCH to PDSCH_DMRS					
EPRE ratio of OCNG DMRS to SSS					
EPRE ratio of OCNG to OCNG DMRS					
N_{oc}[Note2]	dBm/15 KHz	1, 2, 3, 4, 5, 6	-98		
N_{oc}[Note2]	dBm/SCS	1, 2, 4, 5	-98		
		3, 6	-95		
$\hat{E}_s/N_{oc}$	dB	1, 2, 3, 4, 5, 6	-infinity	1.55	1.55
$\hat{E}_s/I_{ot}$[Note3]	dB	1, 2, 3, 4, 5, 6	-infinity	1.55	1.55
SS-RSRP[Note3]	dBm/SCS	1, 2, 4, 5	-infinity	-96.45	-96.45
		3, 6	-infinity	-93.44	-93.44
Io[Note3]	dBm/9.36 MHz	1, 2, 4, 5	-70.05	-66.19	-66.19
	dBm/38.16 MHz	3, 6	-63.94	-60.09	-60.09
Propagation condition		1, 2, 3, 4, 5, 6	AWGN		
Antenna Configuration and Correlation Matrix		1, 2, 3, 4, 5, 6	1x2 Low		
NOTE 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.					
NOTE 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for N_{oc} to be fulfilled.					
NOTE 3: $\hat{E}_s/I_{ot}$, SS-RSRP, and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.					

The UE shall start to transmit the PRACH to Cell 2 less than 112 ms from the beginning of time period T3.

The handover delay can be expressed as: RRC procedure delay + $T_{interrupt}$, where:

- RRC procedure delay = 50 ms and is specified in TS 36.133 [23].
- $T_{interrupt}$ = 62 ms in the test; $T_{interrupt}$ is defined in TS 36.133 [23] clause 5.3.4.3.

This gives a total of 112 ms.

The rate of correct handovers observed during repeated tests shall be at least 90%.

8.4 Measurement procedures

8.4.1 SFTD measurement delay

8.4.1.0 Minimum conformance requirements

8.4.1.0.1 Minimum conformance requirements for E-UTRA - NR FR1 SFTD measurement delay

[TS 36.133, clause 8.1.2.4.25.1]

The UE shall perform inter-RAT SFTD measurement and report SFTD result with/without SS-RSRP after the network requests with *reportSFTD-Meas* set to *neighborCells*. The overall delay includes RRC procedure delay to be defined in clause 11.2 in TS 36.331 and SFTD measurement reporting delay in TS 36.133 clause 8.1.2.4.25.3.

[TS 36.133, clause 8.1.2.4.25.2]

The requirements on SFTD measurement delay defined in this clause are applicable under the side condition SCH $\hat{E}s/Iot \geq$ -3 dB for the NR cell. Depending on configuration, the SFTD measurement may be carried out with or without the support of configured measurement gaps. In the current release, indication on whether to carry out the SFTD measurement with or without measurement gaps is implicit and depending on whether measurement gaps are configured.

The UE shall be able to detect, identify and measure SFTD of up to 3 of the strongest NR cells on the carrier frequency provided in the SFTD measurement configuration. Further depending on the SFTD measurement configuration, the UE shall additionally report SS-RSRP for the one or more NR cells. The UE may or may not be configured with

cellsForWhichToReportSFTD. The UE does not expect *cellsForWhichToReportSFTD* to change during an ongoing SFTD measurement.

When no measurement gaps are provided, the UE shall be capable of finding the NR cell regardless of its SSB position in the SMTC period. The SFTD measurement shall be conducted with sustained connection to the E-UTRA PCell and activated SCell(s), however, the UE may be allowed to cause a certain amount of interruptions for reconfiguration of the radio receiver, as specified in TS 36.133 clause 7.35.

When measurement gaps are provided, the UE shall be capable of finding the NR cell under the additional condition that the SSB at least occasionally falls within the measurement gap.

When no MCG DRX is used, the UE shall be capable of determining SFTD within a physical layer measurement period of $T_{measure_SFTD1}$ as follows:

- For SFTD measurements without measurement gaps, and without additional SS-RSRP reporting:
  - For NR carrier in FR1: $T_{measure_SFTD1}$ = [14] SMTC periods
- For SFTD measurements in measurement gaps, and without additional SS-RSRP reporting:
  - For NR carrier in FR1: $T_{measure_SFTD1} = [N_{freq} \times 8 \times \max(MGRP, SMTC\ period)]$
- For SFTD measurements without measurement gaps, and with additional SS-RSRP reporting:
  - For NR carrier in FR1: $T_{measure_SFTD1}$ = [19] SMTC periods
- For SFTD measurements in measurement gaps, and with additional SS-RSRP reporting:
  - For NR carrier in FR1: $T_{measure_SFTD1} = [N_{freq} \times 13 \times \max(MGRP, SMTC\ period)]$

Where N_{freq} is the number of carriers monitored in measurement gaps.

When MCG DRX is used, the same $T_{measure_SFTD1}$ as for non-DRX applies, but the reporting delay depends on the DRX cycle length in use.

In case an NR PSCell is added, the UE shall terminate the inter-RAT SFTD measurement.

In case PCell is changed due to handover, the UE shall terminate the inter-RAT SFTD measurement.

[TS 36.133, clause 8.1.2.4.25.3]

The SFTD measurement reporting delay is defined as the time between a command that will trigger an SFTD measurement report and the point when the UE starts to transmit the measurement report over the air interface. This requirement assumes that the measurement report is not delayed by other RRC signalling on the DCCH. This measurement reporting delay excludes a delay uncertainty resulted when inserting the measurement report to the TTI of the uplink DCCH. The delay uncertainty is: 2 x TTI_{DCCH}. This measurement reporting delay excludes any delay caused by no UL resources for UE to send the measurement report. When the UE is configured to perform SRS carrier-based switching, an additional delay can be expected.

The SFTD measurement reporting delay shall be less than $T_{measure_SFTD1}$ defined in TS 36.133, clause 8.1.2.4.25.2.

8.4.1.1 E-UTRA - NR FR1 SFTD measurement delay in non-DRX

8.4.1.1.1 Test purpose

The purpose of this test is to partly verify that measurement reporting delay for SFTD between E-UTRA PCell and inter-RAT NR neighbour cell in FR1 is within the requirements stated in clauses 8.1.2.4.25 and 8.1.2.4.26 of TS 36.133 [23] for E-UTRA FDD and TDD, respectively, when no measurement gaps are provided and no DRX is configured.

8.4.1.1.2 Test applicability

This test applies to all E-UTRA UE release 15 onwards and capable of inter-RAT SFTD measurements.

8.4.1.1.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 8.4.1.0.

The normative reference for this requirement is TS 38.133 [6] clause A.8.4.1.1.

8.4.1.1.4 Test description

Two carriers are used in this test: one E-UTRA carrier with the PCell (Cell 1), and one NR carrier with the NR neighbour cell (Cell 2).

This test consists of a single time period of duration T1. Prior to the start of time duration T1, the UE is connected to Cell 1 and configured to carry out intra-frequency measurements only. The point in time at which the UE receives, at the UE antenna connector(s), a RRC message containing a measurement configuration for SFTD measurements on RF channel 1 defines the start of time duration T1. Following the start of T1 the UE shall detect Cell 2, determine the SFN and frame time difference of Cell 2 relative to Cell 1, and send a measurement report. No measurement gaps are provided and no DRX is configured in this test.

8.4.1.1.4.1 Initial conditions

This test shall be tested using any of the test configurations in Table 8.4.1.1.4.1-1.

Table 8.4.1.1.4.1-1: Supported test configurations for E-UTRA - NR FR1 SFTD measurement delay in non-DRX

Config	Description
8.4.1.1-1	LTE FDD, NR 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode
8.4.1.1-2	LTE FDD, NR 15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode
8.4.1.1-3	LTE FDD, NR 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode
8.4.1.1-4	LTE TDD, NR 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode
8.4.1.1-5	LTE TDD, NR 15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode
8.4.1.1-6	LTE TDD, NR 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode
NOTE: The UE is only required to be tested in one of the supported test configurations.	

Configure the test requirement and the DUT according to the parameters in Table 8.4.1.1.4.1-2.

Table 8.4.1.1.4.1-2: Initial conditions for E-UTRA - NR FR1 SFTD measurement delay in non-DRX

Parameter	Value		Comment
Test environment	NC		As specified in TS 36.508 [25] clause 4.1.
Test frequencies	As specified in Annex E, Table E.6-1 and TS 38.508-1 [14] clause 4.3.1.		
Channel bandwidth	As specified by the test configuration selected from Table 8.4.1.1.4.1-1.		
Propagation conditions	AWGN		As specified in clause C.2.1
Connection Diagram	TE Part	A.3.1.8.2	As specified in TS 38.508-1 [14] Annex A.
	DUT Part	A.3.2.3.4	
Exceptions to connection diagram	N/A		

1. The general test parameter settings are set up according to Table 8.4.1.1.4.1-3.
2. Message contents are defined in clause 8.4.1.1.4.3.
3. There are two carriers and two cells specified in the test, where Cell 1 is the E-UTRA PCell on the E-UTRA carrier and Cell 2 is the NR neighbour cell on the NR carrier. Cell 1 is the cell used for connection setup for this test. E-UTRA Cell 1 is configured according to TS 36.521-3 [26] clauses C.1.0 and C.1.1.

Table 8.4.1.1.4.1-3: General test parameters for E-UTRA - NR FR1 SFTD measurement delay in non-DRX

Parameter	Unit	Test configuration	Value		Comment
			Test 1	Test 2	
E-UTRA RF Channel Number		Config 1,2,3,4,5,6	1		One E-UTRAN carrier frequencies is used.
NR RF Channel Number		Config 1,2,3,4,5,6	1		One NR FR1 carrier frequencies is used.
Active cell		Config 1,2,3,4,5,6	Cell 1		Cell 1 is on E-UTRA RF channel number 1.
Neighbour cell		Config 1,2,3,4,5,6	Cell 2		Cell 2 is on NR RF channel number 1.
SSB configuration		Config 1,4	SSB.1 FR1		As specified in TS 38.133 [6] clause A.3.10.1
		Config 2,5	SSB.1 FR1		As specified in TS 38.133 [6] clause A.3.10.1
		Config 3,6	SSB.2 FR1		As specified in TS 38.133 [6] clause A.3.10.1
CP length		Config 1,2,3,4,5,6	Normal		Applicable to both cells.
DRX		Config 1,2,3,4,5,6	OFF		DRX is not used
Frame time offset between serving and neighbour cells	ms	Config 1,2,4,5	3	7	Asynchronous cells. The timing of Cell 2 relative to the timing of Cell 1.
	µs	Config 3,6	3		Synchronous cells.
SFN offset between serving and neighbour cells		Config 1,2,3,4,5,6	0	1	SFN of Cell 2 relative to SFN of Cell 1.
T1	s	Config 1,2,3,4,5,6	1		

8.4.1.1.4.2 Test procedure

Two cells are deployed in the test, which are E-UTRA PCell (Cell 1) on the E-UTRA carrier and a FR1 NR neighbour cell (Cell 2) on NR carrier. The general test parameters are given in Table 8.4.1.1.4.1-3. The test has two subtests with different frame time offset and SFN offset. Cell specific test parameters for the E-UTRA PCell and neighbour cell are given in Table 8.4.1.1.5-1 and 8.4.1.1.5-2, respectively.

In the measurement control information, it is indicated to the UE that inter-RAT SFTD measurement on Cell 2 is used. This test consists of single time period with time duration of T1. Prior to the start of time duration T1, the UE is connected to Cell 1 and configured to carry out intra-frequency measurements only.

Configure the frame time offset and SFN offset according to Test 1 in Table 8.4.1.1.4.1-3.

1. Ensure the UE is in State 3A-RF according to TS 36.508 [25] clause 7.2A.3.
2. Set the parameters of Cell 2 according to T1 in Table 8.4.1.1.5-2, T1 starts.
3. The SS shall transmit an *RRCConnectionReconfiguration* message.
4. The UE shall transmit an *RRCConnectionReconfigurationComplete* message.
5. UE shall transmit a *MeasurementReport* message triggered by SFTD measurement reporting. If the overall delays measured from the beginning of time period T1 is less than 297 ms then the number of successful tests is increased by one. If the UE fails to report within the overall delays measured requirement then the number of failure tests is increased by one.
6. After the SS receive the *MeasurementReport* message in step 6) or when T1 expires, the SS shall transmit an *RRCConnectionRelease* message to release the RRC connection which includes the release of the established radio bearers as well as all radio resources.
7. Set Cell 2 physical cell identity = ((current Cell 2 physical cell identity + 1) mod 1008) for next iteration of the test procedure loop.

8. After the RRC connection release, the SS:

   - transmits in Cell 1 a Paging message (including PagingRecord with UE-Identity) for the UE and ensures the UE is in State 3A according to TS 36.508 [25] clause 4.5.3A (if the paging fails, switches off and on the UE and ensures the UE is in State 3A-RF according to TS 36.508 [25] clause 7.2A.3); or

   - switches off and on the UE and ensures the UE is in State 3A-RF according to TS 36.508 [25] clause 7.2A.3.

9. Repeat step 2-8 until the confidence level according to Tables G.2.3-1 in Annex G clause G.2 is achieved.

10 Set the frame time offset and SFN offset for Test 2 according to Table 8.4.1.1.4.1-3 and repeat steps 1 to 9.

8.4.1.1.4.3 Message contents

Message contents are according to TS 36.508 [25] clause 7.3 with the following exceptions:

Table 8.4.1.1.4.3-1: Common Exception messages for E-UTRA - NR FR1 SFTD measurement delay in non-DRX

Default Message Contents	
Common contents of system information blocks exceptions	
Default RRC messages and information elements contents exceptions	Table H.3.4-7 with Condition Inter-RAT and SFTD; Table H.3.4-4 with Condition INTER-RAT NR, SFTD and GAPLESS
Specific message contents exceptions for Test Configuration 8.4.1.1-1 8.4.1.1-2, 8.4.1.1-4 and 8.4.1.1-5	Table H.3.4-6 with Condition SSB.1 FR1 andSMTC.1
Specific message contents exceptions for Test Configuration 8.4.1.1-3 and 8.4.1.1-6	Table H.3.4-6 with Condition SSB.2 FR1 andSMTC.1

8.4.1.1.5 Test requirement

Table 8.4.1.1.4.1-3, 8.4.1.1.5-1 and 8.4.1.1.5-2 define the primary level settings including test tolerances for E-UTRA - NR FR1 SFTD measurement delay in non-DRX.

Table 8.4.1.1.5-1: E-UTRA Cell specific test parameters for E-UTRA - NR FR1 SFTD measurement delay in non-DRX

Parameter	Unit	E-UTRAN Cell1
E-UTRA RF Channel Number		1
Duplex mode		FDD or TDD
TDD special subframe configuration[Note1]		6
TDD uplink-downlink configuration[Note1]		1
$BW_{channel}$		5 MHz: $N_{RB,c}$ = 25 10 MHz: $N_{RB,c}$ = 50 20 MHz: $N_{RB,c}$ = 100
PDSCH parameters: DL Reference Measurement Channel[Note2]		5 MHz: R.7 FDD 10 MHz: R.3 FDD 20 MHz: R.6 FDD 5 MHz: R.4 TDD 10 MHz: R.0 TDD 20 MHz: R.3 TDD
PCFICH/PDCCH/PHICH parameters: DL Reference Measurement Channel[Note2]		5 MHz: R.11 FDD 10 MHz: R.6 FDD 20 MHz: R.10 FDD 5 MHz: R.11 TDD 10 MHz: R.6 TDD 20 MHz: R.10 TDD
OCNG Patterns[Note2]		5 MHz: OP.20 FDD 10 MHz: OP.10 FDD 20 MHz: OP.17 FDD 5 MHz: OP.9 TDD 10 MHz: OP.1 TDD 20 MHz: OP.7 TDD
PBCH_RA	dB	0

PBCH_RB	dB	
PSS_RA	dB	
SSS_RA	dB	
PCFICH_RB	dB	
PHICH_RA	dB	
PHICH_RB	dB	
PDCCH_RA	dB	
PDCCH_RB	dB	
PDSCH_RA	dB	
PDSCH_RB	dB	
OCNG_RA Note3	dB	
OCNG_RB Note3	dB	
N_{oc} Note4	dBm/15 kHz	-104
$\hat{E}_s/N_{oc}$	dB	17
$\hat{E}_s/I_{ot}$	dB	17
RSRP Note5	dBm/15 kHz	-87
SCH_RP Note5	dBm/15 kHz	-87
Io Note5	dBm/Ch BW	-59.13+10log($N_{RB,c}$ /50)
Propagation Condition		AWGN
Antenna Configuration		1x2

NOTE 1: Special subframe and uplink-downlink configurations are specified in table 4.2-1 in TS 36.211 [24].
NOTE 2: DL RMCs and OCNG patterns are specified in clauses A 3.1 and A 3.2 of TS 36.133 [23] respectively.
NOTE 3: OCNG shall be used such that all cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.
NOTE 4: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for N_{oc} to be fulfilled.
NOTE 5: E_s/I_{ot}, RSRP, SCH_RP and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.

Table 8.4.1.1.5-2: NR Cell specific test parameters for E-UTRA - NR FR1 SFTD measurement delay in non-DRX

Parameter	Unit	Test configuration	Cell 2
NR RF Channel Number		Config 1,2,3,4,5,6	1
Duplex mode		Config 1,4	FDD
		Config 2,3,5,6	TDD
$BW_{channel}$	MHz	Config 1,4	10: $N_{RB,c}$ = 52
		Config 2,5	10: $N_{RB,c}$ = 52
		Config 3,6	40: $N_{RB,c}$ = 106
TDD configuration		Config 2,5	TDDConf.1.1
		Config 3,6	TDDConf.2.1
OCNG Pattern defined in A.3.2.1.1		Config 1,2,3,4,5,6	OP.1
SMTC configuration		Config 1,2,3,4,5,6	SMTC.1
PDSCH/PDCCH subcarrier spacing	kHz	Config 1,2,4,5	15
		Config 3,6	30
EPRE ratio of PSS to SSS	dB	Config 1,2,3,4,5,6	0
EPRE ratio of PBCH DMRS to SSS	dB		
EPRE ratio of PBCH to PBCH DMRS	dB		
EPRE ratio of OCNG DMRS to SSS Note 1	dB		
EPRE ratio of OCNG to OCNG DMRS Note 1	dB		
N_{oc} Note2	dBm/15kHz		-98
N_{oc} Note2	dBm/SCS	Config 1,2,4,5	-98
		Config 3,6	-95
SS-RSRP Note 3, 4	dBm/SCS	Config 1,2,4,5	-94
		Config 3,6	-91
$\hat{E}_s/I_{ot}$	dB	Config 1,2,3,4,5,6	4
$\hat{E}_s/N_{oc}$	dB	Config 1,2,3,4,5,6	4
Io Note 3	dBm/9.36MHz	Config 1,2,4,5	-64.59
	dBm/38.16MHz	Config 3,6	-58.49

Propagation Condition		Config 1,2,3,4,5,6	AWGN
NOTE 1: OCNG shall be used such that the cell is fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.			
NOTE 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for N_{oc} to be fulfilled.			
NOTE 3: SS-RSRP and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.			
NOTE 4: SS-RSRP minimum requirements are specified assuming independent interference and noise at each receiver antenna port.			

The overall delays measured is defined as the time from the beginning of time period T1, to the moment the UE send one SFTD measurement triggered measurement report.

The overall delays measured in the test may be up to $2xTTI_{DCCH}$ higher than the measurement reporting delays because of TTI insertion uncertainty of the measurement report in DCCH.

The overall delays measured test requirement is expressed as:

- Overall delays measured = measurement reporting delay + TTI insertion uncertainty
- Measurement reporting delay = $T_{RRC_procedure_delay}$ + $T_{measure_SFTD1}$

  $T_{RRC_procedure_delay}$ = 15 ms, is the RRC procedure delay for RRC reconfiguration, which is defined in TS 36.331 [2] Clause 11.2

  $T_{measure_SFTD1}$ = 280 ms, is the SFTD measurement report delay defined in TS 36.133 [23] clause 8.1.2.4.25 and 8.1.2.4.26 for FDD and TDD E-UTRA Cell 1, respectively.
- TTI insertion uncertainty = 2 ms

The overall delays measured shall be less than a total of 297 ms.

For the test to pass, the total number of successful tests shall be more than 90% of the cases with a confidence level of 95%.

8.4.1.2 E-UTRA - NR FR1 SFTD measurement delay in DRX

8.4.1.2.1 Test purpose

The purpose of this test is:

- To partly verify that measurement reporting delay for SFTD between E-UTRA PCell and inter-RAT NR neighbour cell in FR1 is within the requirements stated in clauses 8.1.2.4.25 and 8.1.2.4.26 of TS 36.133 [23] for E-UTRA FDD and TDD, respectively, when no measurement gaps are provided and DRX is configured.

8.4.1.2.2 Test applicability

This test applies to all types of E-UTRA UE Release 15 and forward supporting inter-RAT SFTD measurements and long DRX cycle.

8.4.1.2.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 8.4.1.0.

The normative reference for this requirement is TS 38.133 [6] clause A.8.4.1.2.

8.4.1.2.4 Test description

Two carriers are used in this test: one E-UTRA carrier with the PCell (Cell 1), and one NR carrier with the NR neighbour cell (Cell 2).

This test consists of a single time period of duration T1. Prior to the start of time duration T1, the UE is connected to Cell 1 and configured to carry out intra-frequency measurements only. The point in time at which the UE receives, at the UE antenna connector(s), a RRC message containing a measurement configuration for SFTD measurements on RF channel 1 defines the start of time duration T1. Following the start of T1 the UE shall detect Cell 2, determine the SFN and frame time difference of Cell 2 relative to Cell 1, and send a measurement report. No measurement gaps are provided and DRX is configured in this test.

8.4.1.2.4.1 Initial conditions

This test shall be tested using any of the test configurations in Table 8.4.1.2.4.1-1.

Table 8.4.1.2.4.1-1: Supported test configurations for E-UTRA - NR FR1 SFTD measurement delay in DRX

Config	Description
8.4.1.2-1	LTE FDD, NR 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode
8.4.1.2-2	LTE FDD, NR 15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode
8.4.1.2-3	LTE FDD, NR 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode
8.4.1.2-4	LTE TDD, NR 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode
8.4.1.2-5	LTE TDD, NR 15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode
8.4.1.2-6	LTE TDD, NR 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode
NOTE: The UE is only required to be tested in one of the supported test configurations.	

Configure the test requirement and the DUT according to the parameters in Table 8.4.1.2.4.1-2.

Table 8.4.1.2.4.1-2: Initial conditions for E-UTRA - NR FR1 SFTD measurement delay in DRX

Parameter	Value		Comment
Test environment	NC		As specified in TS 36.508 [25] clause 4.1.
Test frequencies	As specified in Annex E, Table E.6-1 and TS 38.508-1 [14] clause 4.3.1.		
Channel bandwidth	As specified by the test configuration selected from Table 8.4.1.2.4.1-1.		
Propagation conditions	AWGN		As specified in clause C.2.1
Connection Diagram	TE Part	A.3.1.8.2	As specified in TS 38.508-1 [14] Annex A.
	DUT Part	A.3.2.3.4	
Exceptions to connection diagram	N/A		

1. The general test parameter settings are set up according to Table 8.4.1.2.4.1-3.
2. Message contents are defined in clause 8.4.1.2.4.3.
3. There are two carriers and two cells specified in the test, where Cell 1 is the E-UTRA PCell on the E-UTRA carrier and Cell 2 is the NR neighbour cell on the NR carrier. Cell 1 is the cell used for connection setup for this test. E-UTRA Cell 1 is configured according to TS 36.521-3 [26] clauses C.1.0 and C.1.1.

Table 8.4.1.2.4.1-3: General test parameters for E-UTRA - NR FR1 SFTD measurement delay in DRX

Parameter	Unit	Test configuration	Value		Comment
			Test 1	Test 2	
E-UTRA RF Channel Number		Config 1,2,3,4,5,6	1		One E-UTRAN carrier frequencies is used.
NR RF Channel Number		Config 1,2,3,4,5,6	1		One NR FR1 carrier frequencies is used.
Active cell		Config 1,2,3,4,5,6	Cell 1		Cell 1 is on E-UTRA RF channel number 1.
Neighbour cell		Config 1,2,3,4,5,6	Cell 2		Cell 2 is on NR RF channel number 1.
SSB Configuration		Config 1,4	SSB.1 FR1		As specified in TS 38.133 [6] clause A.3.10.1
		Config 2,5	SSB.1 FR1		As specified in TS 38.133 [6] clause A.3.10.1

		Config 3,6	SSB.2 FR1		As specified in TS 38.133 [6] clause A.3.10.1
CP length		Config 1,2,3,4,5,6	Normal		Applicable to both cells.
DRX		Config 1,2,3,4,5,6	DRX.4		DRX configuration as specified in TS 38.133 [6] clause A.3.3.4
Frame time offset between serving and neighbour cells	ms	Config 1,2,4,5	3	7	Asynchronous cells. The timing of Cell 2 relative to the timing of Cell 1.
	µs	Config 3,6	3		Synchronous cells.
SFN offset between serving and neighbour cells		Config 1,2,3,4,5,6	0	1	SFN of Cell 2 relative to SFN of Cell 1.
T1	s	Config 1,2,3,4,5,6	1		

8.4.1.2.4.2 Test procedure

Two cells are deployed in the test, which are E-UTRA PCell (Cell 1) on the E-UTRA carrier and a FR1 NR neighbour cell (Cell 2) on NR carrier. The general test parameters are given in Table 8.4.1.2.4.1-3. The test has two subtests with different frame time offset and SFN offset. Cell specific test parameters for the E-UTRA PCell and neighbour cell are given in Table 8.4.1.2.5-1 and 8.4.1.2.5-2, respectively.

In the measurement control information, it is indicated to the UE that inter-RAT SFTD measurement on Cell 2 is used. This test consists of single time period with time duration of T1. Prior to the start of time duration T1, the UE is connected to Cell 1 and configured to carry out intra-frequency measurements only.

Configure the frame time offset and SFN offset according to Test 1 in Table 8.4.1.2.4.1-3.

1. Ensure the UE is in State 3A-RF according to TS 36.508 [25] clause 7.2A.3.
2. Set the parameters of Cell 2 according to T1 in Table 8.4.1.2.5-2, T1 starts.
3. The SS shall transmit an *RRCConnectionReconfiguration* message.
4. The UE shall transmit an *RRCConnectionReconfigurationComplete* message.
5. UE shall transmit a *MeasurementReport* message triggered by SFTD measurement reporting. . If the overall delays measured from the beginning of time period T1 is less than 455 ms then the number of successful tests is increased by one, otherwise the number of failure tests is increased by one.
6. After the SS receive the *MeasurementReport* message in step 6) or when T1 expires, the SS shall transmit an *RRCConnectionRelease* message to release the RRC connection which includes the release of the established radio bearers as well as all radio resources.
7. Set Cell 2 physical cell identity = ((current Cell 2 physical cell identity + 1) mod1008) for next iteration of the test procedure loop.
8. After the RRC connection release, the SS:
   - transmits in Cell 1 a Paging message (including PagingRecord with UE-Identity) for the UE and ensures the UE is in State 3A according to TS 36.508 [25] clause 4.5.3A (if the paging fails, switches off and on the UE and ensures the UE is in State 3A-RF according to TS 36.508 [25] clause 7.2A.3); or
   - switches off and on the UE and ensures the UE is in State 3A-RF according to TS 36.508 [25] clause 7.2A.3.
9. Repeat step 2-8 until the confidence level according to Tables G.2.3-1 in Annex G clause G.2 is achieved.
10 Set the frame time offset and SFN offset for Test 2 according to Table 8.4.1.2.4.1-3 and repeat steps 1 to 9.

8.4.1.2.4.3 Message contents

Message contents are according to TS 36.508 [25] clause 7.3 with the following exceptions.

Table 8.4.1.2.4.3-1: Common Exception messages for E-UTRA - NR FR1 SFTD measurement delay in DRX

Default Message Contents	
Common contents of system information blocks exceptions	
Default RRC messages and information elements contents exceptions	Table H.3.4-7 with Condition Inter-RAT and SFTD; Table H.3.4-4 with Condition INTER-RAT NR, SFTD and GAPLESS Table H.3.7-2 with Condition DRX.4
Specific message contents exceptions for Test Configuration 8.4.1.1-1, 8.4.1.1-2, 8.4.1.1-4 and 8.4.1.1-5	Table H.3.4-6 with Condition SSB.1 FR1 and SMTC.1 and
Specific message contents exceptions for Test Configuration 8.4.1.1-3 and 8.4.1.1-6	Table H.3.4-6 with Condition SSB.2 FR1 and SMTC.1

8.4.1.2.5 Test requirement

Table 8.4.1.2.4.1-3, 8.4.1.2.5-1 and 8.4.1.2.5-2 define the primary level settings including test tolerances for E-UTRA - NR FR1 SFTD measurement delay in DRX.

Table 8.4.1.2.5-1: E-UTRA Cell specific test parameters for E-UTRA - NR FR1 SFTD measurement delay in DRX

Parameter	Unit	E-UTRAN Cell1
E-UTRA RF Channel Number		1
Duplex mode		FDD or TDD
TDD special subframe configuration[Note1]		6
TDD uplink-downlink configuration[Note1]		1
$BW_{channel}$		5 MHz: $N_{RB,c}$ = 25 10 MHz: $N_{RB,c}$ = 50 20 MHz: $N_{RB,c}$ = 100
PDSCH parameters: DL Reference Measurement Channel[Note2]		5 MHz: R.7 FDD 10 MHz: R.3 FDD 20 MHz: R.6 FDD 5 MHz: R.4 TDD 10 MHz: R.0 TDD 20 MHz: R.3 TDD
PCFICH/PDCCH/PHICH parameters: DL Reference Measurement Channel[Note2]		5 MHz: R.11 FDD 10 MHz: R.6 FDD 20 MHz: R.10 FDD 5 MHz: R.11 TDD 10 MHz: R.6 TDD 20 MHz: R.10 TDD
OCNG Patterns[Note2]		5 MHz: OP.20 FDD 10 MHz: OP.10 FDD 20 MHz: OP.17 FDD 5 MHz: OP.9 TDD 10 MHz: OP.1 TDD 20 MHz: OP.7 TDD
PBCH_RA	dB	0
PBCH_RB	dB	
PSS_RA	dB	
SSS_RA	dB	
PCFICH_RB	dB	
PHICH_RA	dB	
PHICH_RB	dB	
PDCCH_RA	dB	
PDCCH_RB	dB	
PDSCH_RA	dB	
PDSCH_RB	dB	
OCNG_RA[Note3]	dB	
OCNG_RB[Note3]	dB	
N_{oc}[Note4]	dBm/15 kHz	-104
$\hat{E}_s/N_{oc}$	dB	17
$\hat{E}_s/I_{ot}$	dB	17

RSRP Note5	dBm/15 kHz	-87
SCH_RP Note5	dBm/15 kHz	-87
Io Note5	dBm/Ch BW	-59.13+10log($N_{RB,c}$ /50)
Propagation Condition		AWGN
Antenna Configuration		1x2

NOTE 1: Special subframe and uplink-downlink configurations are specified in table 4.2-1 in TS 36.211 [24].
NOTE 2: DL RMCs and OCNG patterns are specified in clauses A 3.1 and A 3.2 of TS 36.133 [23] respectively.
NOTE 3: OCNG shall be used such that all cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.
NOTE 4: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for N_{oc} to be fulfilled.
NOTE 5: E_s/I_{ot}, RSRP, SCH_RP and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.

Table 8.4.1.2.5-2: NR Cell specific test parameters for E-UTRA - NR FR1 SFTD measurement delay in DRX

Parameter	Unit	Test configuration	Cell 2
NR RF Channel Number		Config 1,2,3,4,5,6	1
Duplex mode		Config 1,4	FDD
		Config 2,3,5,6	TDD
$BW_{channel}$	MHz	Config 1,4	10: $N_{RB,c}$ = 52
		Config 2,5	10: $N_{RB,c}$ = 52
		Config 3,6	40: $N_{RB,c}$ = 106
TDD configuration		Config 2,5	TDDConf.1.1
		Config 3,6	TDDConf.2.1
OCNG Pattern defined in A.3.2.1.1		Config 1,2,3,4,5,6	OP.1
SMTC configuration		Config 1,2,3,4,5,6	SMTC.1
PDSCH/PDCCH subcarrier spacing	kHz	Config 1,2,4,5	15
		Config 3,6	30
EPRE ratio of PSS to SSS	dB	Config 1,2,3,4,5,6	0
EPRE ratio of PBCH DMRS to SSS	dB		
EPRE ratio of PBCH to PBCH DMRS	dB		
EPRE ratio of OCNG DMRS to SSS Note 1	dB		
EPRE ratio of OCNG to OCNG DMRS Note 1	dB		
N_{oc} Note2	dBm/15kHz		-98
N_{oc} Note2	dBm/SCS	Config 1,2,4,5	-98
		Config 3,6	-95
SS-RSRP Note 3, 4	dBm/SCS	Config 1,2,4,5	-94
		Config 3,6	-91
$\hat{E}_s/I_{ot}$	dB	Config 1,2,3,4,5,6	4
$\hat{E}_s/N_{oc}$	dB	Config 1,2,3,4,5,6	4
Io Note 3	dBm/9.36MHz	Config 1,2,4,5	-64.59
	dBm/38.16MHz	Config 3,6	-58.49
Propagation Condition		Config 1,2,3,4,5,6	AWGN

NOTE 1: OCNG shall be used such that the cell is fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.
NOTE 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for N_{oc} to be fulfilled.
NOTE 3: SS-RSRP and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.
NOTE 4: SS-RSRP minimum requirements are specified assuming independent interference and noise at each receiver antenna port.

The overall delays measured is defined as the time from the beginning of time period T1, to the moment the UE send one SFTD measurement triggered measurement report.

The overall delays measured in the test may be up to $2xTTI_{DCCH}$ higher than the measurement reporting delays because of TTI insertion uncertainty of the measurement report in DCCH.

The overall delays measured test requirement is expressed as:

- Overall delays measured = measurement reporting delay + TTI insertion uncertainty
- Measurement reporting delay = $T_{RRC_procedure_delay} + T_{measure_SFTD1} + T_{DRX_transmission}$

  $T_{RRC_procedure_delay}$ = 15 ms, is the RRC procedure delay for RRC reconfiguration, which is defined in TS 36.331 [2] Clause 11.2

  $T_{measure_SFTD1}$ = 280 ms, is the SFTD measurement report delay defined in TS 36.133 [23] clause 8.1.2.4.25 and 8.1.2.4.26 for FDD and TDD E-UTRA Cell 1, respectively. When DRX is used, the same $T_{measure_SFTD1}$ as for non-DRX applies.

  $T_{DRX_transmission}$ = 158 ms, it is the time until the next transmission in the worst case that the last PDDCH is missed at 280ms from the beginning of T1.
- TTI insertion uncertainty = 2 ms

The overall delays measured shall be less than a total of 455 ms.

For the test to pass, the total number of successful tests shall be more than 90% of the cases with a confidence level of 95%.

8.4.2 Inter-RAT measurements

8.4.2.0 Minimum conformance requirements

8.4.2.0.1 Minimum conformance requirements for E-UTRA - NR event-triggered measurement

The UE shall be able to identify new inter-RAT E-UTRAN – NR cells and perform SS-RSRP, SS-RSRQ, and SS-SINR measurements of identified inter-RAT cells if carrier frequency information is provided by the PCell, even if no explicit neighbour list with physical layer cell identities is provided.

When measurement gaps are scheduled, the UE shall be able to identify a new detectable cell within $T_{identify_irat_without_index}$ if UE is not indicated to report SSB based RRM measurement result with the associated SSB index (*reportQuantityRsIndexes* or *maxNrofRSIndexesToReport* is not configured). Otherwise, UE shall be able to identify a new detectable inter-RAT frequency cell within $T_{identify_irat_with_index}$. The UE shall be able to identify a new detectable inter-RAT SS block of an already detected cell within $T_{identify_irat_without_index.}$

$$T_{identify_irat_without_index} = (T_{PSS/SSS_sync_irat} + T_{SSB_measurement_period_irat}) \text{ ms}$$

$$T_{identify_irat_with_index} = (T_{PSS/SSS_sync_irat} + T_{SSB_measurement_period_irat} + T_{SSB_time_index_irat}) \text{ ms}$$

Where:

T_{PSS/SSS_sync_irat}: it is the time period used in PSS/SSS detection given in table 8.4.2.0.1-1 and table 8.4.2.0.1-2.

$T_{SSB_time_index_irat}$: it is the time period used to acquire the index of the SSB being measured given in table 8.4.2.0.1-3 and table 8.4.2.0.1-4.

$T_{SSB_measurement_period_irat}$: equal to a measurement period of SSB based measurement given in table 8.4.2.0.1-5 and table 8.4.2.0.1-6.

M_{pss/sss_sync_irat}: For a UE supporting FR2 power class 1, M_{pss/sss_sync_ira}=64 samples. For a UE supporting FR2 power class 2 (vehicle mounted), M_{pss/sss_sync_irat}=40 samples. For a UE supporting FR2 power class 3 (handheld), M_{pss/sss_sync_irat}=40 samples. For a UE supporting FR2 power class 4, M_{pss/sss_syn_iratc}=40 samples.

$M_{SSB_index_irat}$: For a UE supporting power class 1, $M_{SSB_index_irat}$ =40 samples. For a vehicle mounted UE supporting power class 2 (vehicle mounted), M_{pss/sss_sync_irat}=24 samples.For a UE supporting power class 3 (handheld), $M_{SSB_index_irat}$ =24 samples. For a UE supporting power class 4, $M_{meas_period_irat}$ =24 samples.

$M_{meas_period_irat}$: For a UE supporting FR2 power class 1, $M_{meas_period_irat}$ =64 samples. For a vehicle mounted UE supporting FR2 power class 2 (vehicle mounted), M_{pss/sss_sync_irat}=40 samples.For a UE supporting FR2 power class 3 (handheld), $M_{meas_period_irat}$ =40 samples. For a UE supporting FR2 power class 4, $M_{meas_period_irat}$ =40 samples.

N_{freq} is defined in TS 36.133 [23] clause 8.1.2.1.1.

For per-FR measurement gap capable UE, when serving cells are in E-UTRA and measurement objects are only in FR2:

- UE can perform such measurements without gap; and
- UE fulfils the requirements for FR2 measurement objects based on effective MGRP = 20 ms.

Table 8.4.2.0.1-1: Time period for PSS/SSS detection, (Frequency range FR1)

Condition NOTE1,2	T_{PSS/SSS_sync_irat}
No DRX	max[600ms, 8 x max(MGRP, SMTC period)] x N_{freq}
DRX cycle ≤ 320ms	max[600ms, ceil(8x1.5) x max(MGRP, SMTC period, DRX cycle)] x N_{freq}
DRX cycle > 320ms	8 x DRX cycle x N_{freq}
NOTE 1: DRX or non DRX requirements apply according to the conditions described in TS 36.133 [23] clause 3.6.1 NOTE 2: In EN-DC operation, the parameters, timers and scheduling requests referred to in TS 36.133 [23] clause 3.6.1 are for the secondary cell group. The DRX cycle is the DRX cycle of the secondary cell group.	

Table 8.4.2.0.1-1A: Time period for PSS/SSS detection for UE configured with *highSpeedInterRAT-r16* (Frequency range FR1)

Condition NOTE1,2	T_{PSS/SSS_sync_irat}
No DRX	Max(600ms, 8 × Max(MGRP, SMTC period)) × N_{freq}
DRX cycle < 320ms	Max(600ms, ceil(8 × M) × max(MGRP, SMTC period, DRX cycle)) ×N_{freq}
DRX cycle ≥ 320ms	8× DRX cycle ×N_{freq}
NOTE 1: DRX or non DRX requirements apply according to the conditions described in clause 3.6.1 of TS 38.133 [3]. NOTE 2: In EN-DC operation, the parameters, timers and scheduling requests referred to in clause 3.6.1 of TS 38.133 [3] are for the secondary cell group. The DRX cycle is the DRX cycle of the secondary cell group. NOTE 3: M = 1 when SMTC < = 40ms, and M = 1.5 when SMTC > 40ms.	

Table 8.4.2.0.1-2: Time period for PSS/SSS detection, (Frequency range FR2)

Condition NOTE1,2	T_{PSS/SSS_sync_irat}
No DRX	Max(600ms, M_{pss/sss_sync_irat} x max(MGRP, SMTC period)) x N_{freq}
DRX cycle ≤ 320ms	Max(600ms, (1.5 x M_{pss/sss_sync_irat}) x max(MGRP, SMTC period, DRX cycle)) x N_{freq}
DRX cycle > 320ms	M_{pss/sss_sync_irat} x DRX cycle x N_{freq}
NOTE 1: DRX or non DRX requirements apply according to the conditions described in TS 36.133 [23] clause 3.6.1 NOTE 2: In EN-DC operation, the parameters, timers and scheduling requests referred to in TS 36.133 [23] clause 3.6.1 are for the secondary cell group. The DRX cycle is the DRX cycle of the secondary cell group.	

Table 8.4.2.0.1-3: Time period for time index detection (Frequency range FR1)

Condition NOTE1,2	$T_{SSB_time_index_irat}$
No DRX	Max(120ms, 3 x max(MGRP, SMTC period)) x N_{freq}
DRX cycle ≤ 320ms	Max(120ms, ceil(3 x 1.5) x max(MGRP, SMTC period,DRX cycle)) x N_{freq}
DRX cycle > 320ms	3 x DRX cycle x N_{freq}

NOTE 1: DRX or non DRX requirements apply according to the conditions described in TS 36.133 [23] clause 3.6.1
NOTE 2: In EN-DC operation, the parameters, timers and scheduling requests referred to in TS 36.133 [23] clause 3.6.1 are for the secondary cell group. The DRX cycle is the DRX cycle of the secondary cell group.

Table 8.4.2.0.1-3A: Time period for time index detection for UE configured with *highSpeedInterRAT-r16* (Frequency range FR1)

Condition NOTE1,2	$T_{SSB_time_index_irat}$
No DRX	$Max(120ms, 3 \times Max(MGRP, SMTC\ period)) \times N_{freq}$
DRX cycle < 320ms	$Max(120ms, Ceil(3 \times M) \times Max(MGRP, SMTC\ period, DRX\ cycle)) \times N_{freq}$
DRX cycle $\geq$ 320ms	$3 \times DRX\ cycle \times N_{freq}$
NOTE 1: DRX or non DRX requirements apply according to the conditions described in clause 3.6.1 of TS 38.133 [3].	
NOTE 2: In EN-DC operation, the parameters, timers and scheduling requests referred to in clause 3.6.1 of TS 38.133 [3] are for the secondary cell group. The DRX cycle is the DRX cycle of the secondary cell group.	
NOTE 3: M = 1 when SMTC < = 40ms, and M = 1.5 when SMTC > 40ms.	

Table 8.4.2.0.1-4: Time period for time index detection (Frequency range FR2)

Condition NOTE1,2	$T_{SSB_time_index_irat}$
No DRX	$Max(200ms, M_{SSB_index_irat} \times max(MGRP, SMTC\ period)) \times N_{freq}$
DRX cycle ≤ 320ms	$Max(200ms, (1.5 \times M_{SSB_index_irat}) \times max(MGRP, SMTC\ period, DRX\ cycle)) \times N_{freq}$
DRX cycle > 320ms	$M_{SSB_index_irat} \times DRX\ cycle \times N_{freq}$
NOTE 1: DRX or non DRX requirements apply according to the conditions described in TS 36.133 [23] clause 3.6.1	
NOTE 2: In EN-DC operation, the parameters, timers and scheduling requests referred to in TS 36.133 [23] clause 3.6.1 are for the secondary cell group. The DRX cycle is the DRX cycle of the secondary cell group.	

In the requirements, an NR cell is considered to be detectable when:

- NR SS-RSRP related conditions in the accuracy requirements in clause 9.11.1 are fulfilled for a corresponding Band, together with the corresponding side conditions in clause B.2.3 of TS 38.133 [6],
- NR SS-RSRQ related conditions in the accuracy requirements in clause 9.11.2 are fulfilled for a corresponding Band, together with the corresponding side conditions in clause B.2.3 of TS 38.133 [6],
- NR SS-SINR related conditions in the accuracy requirements in clause 9.11.3 are fulfilled for a corresponding Band, together with the corresponding side conditions in clause B.2.3 of TS 38.133 [6].

When measurement gaps are scheduled for NR measurements the UE physical layer shall be capable of reporting NR SS-RSRP, SS-RSRQ, and SS-SINR measurements to higher layers with measurement accuracy as specified in TS 36.133 [23] clause 9.11, with measurement period as shown in table 8.4.2.0.1-5 and table 8.4.2.0.1-6:

Table 8.4.2.0.1-5: Measurement period for inter-RAT frequency measurements (Frequency FR1)

Condition NOTE1,2	$T_{SSB_measurement_period_irat}$
No DRX	$Max(200ms, 8 \times max(MGRP, SMTC\ period)) \times N_{freq}$
DRX cycle ≤ 320ms	$Max(200ms, ceil(8 \times 1.5) \times max(MGRP, SMTC\ period, DRX\ cycle)) \times N_{freq}$
DRX cycle > 320ms	$8 \times DRX\ cycle \times N_{freq}$
NOTE 1: DRX or non DRX requirements apply according to the conditions described in TS 36.133 [23] clause 3.6.1	
NOTE 2: In EN-DC operation, the parameters, timers and scheduling requests referred to in TS 36.133 [23] clause 3.6.1 are for the secondary cell group. The DRX cycle is the DRX cycle of the secondary cell group.	

Table 8.4.2.0.1-5A: Measurement period for inter-RAT measurements for UE configured with *highSpeedInterRAT-r16* (Frequency range FR1)

Condition NOTE1,2	$T_{SSB_measurement_period_irat}$
No DRX	Max(200ms, 8 × Max(MGRP, SMTC period)) × N_{freq}
DRX cycle < 320ms	Max(200ms, ceil(8 × M) x max(MGRP, SMTC period, DRX cycle))×N_{freq}
DRX cycle ≥ 320ms	4× M × DRX cycle ×N_{freq}
NOTE 1: DRX or non DRX requirements apply according to the conditions described in clause 3.6.1 of TS 38.133 [50].	
NOTE 2: In EN-DC operation, the parameters, timers and scheduling requests referred to in clause 3.6.1 of TS 38.133 [50] are for the secondary cell group. The DRX cycle is the DRX cycle of the secondary cell group.	
NOTE 3: M = 1 when SMTC < = 40ms, and M = 1.5 when SMTC > 40ms.	

Table 8.4.2.0.1-6: Measurement period for inter-RAT frequency measurements (Frequency FR2)

Condition NOTE1,2	$T_{SSB_measurement_period_irat}$
No DRX	Max(400ms, $M_{meas_period_irat}$ x max(MGRP, SMTC period)) x N_{freq}
DRX cycle ≤ 320ms	Max(400ms, (1.5 x $M_{meas_period_irat}$) x max(MGRP, SMTC period, DRX cycle)) x N_{freq}
DRX cycle > 320ms	$M_{meas_period_irat}$ x DRX cycle x N_{freq}
NOTE 1: DRX or non DRX requirements apply according to the conditions described in TS 36.133 [23] clause 3.6.1.	
NOTE 2: In EN-DC operation, the parameters, timers and scheduling requests referred to in TS 36.133 [23] clause 3.6.1 are for the secondary cell group. The DRX cycle is the DRX cycle of the secondary cell group.	

The UE shall be capable of performing NR SS-RSRP, SS-RSRQ, and SS-SINR for up to 7 NR carrier frequencies.

For each RAT E-UTRAN - NR layer on FR1 or FR2, the UE shall be capable of monitoring at least 4 cells.

For each RAT E-UTRAN - NR layer on FR1, during each layer 1 measurement period, the UE shall be capable of monitoring at least 7 SSBs with different SSB index and/or PCI on the RAT E-UTRA -NR.

For each RAT E-UTRA - NR layer on FR2, during each layer 1 measurement period, the UE shall be capable of monitoring at least 10 SSBs with different SSB index and/or PCI on the RAT E-UTRAN - NR layer. The UE shall be capable of monitoring at least one SSB per cell.

The NR SS-RSRP measurement accuracy for all measured cells shall be as specified in TS 36.133 [23] clause 9.11.1.
The NR SS-RSRQ measurement accuracy for all measured cells shall be as specified in TS 36.133 [23] clause 9.11.2.
The NR SS-SINR measurement accuracy for all measured cells shall be as specified in TS 36.133 [23] clause 9.11.3.

Reported measurements in event triggered measurement reports shall meet the requirements in TS 36.133 [23] clause 9.

The UE shall not send any event triggered measurement reports, as long as the reporting criteria is not fulfilled.

The measurement reporting delay is defined as the time between any events that will trigger a measurement report until the UE starts to transmit the measurement report over the Uu interface. This requirement assumes that the measurement report is not delayed by other RRC signalling on the DCCH. This measurement reporting delay excludes a delay uncertainty resulted when inserting the measurement report to the TTI of the uplink DCCH. The delay uncertainty is twice the TTI of the uplink DCCH. This measurement reporting delay excludes a delay which caused by no UL resources for UE to send the measurement report.

The event triggered measurement reporting delay, measured without L3 filtering shall be less than $T_{identify_irat_without_index}$ or $T_{identify_irat_with_index}$ for the minimum requirements. When L3 filtering is used or IDC autonomous denial or the UE is performing reception and/or transmission for ProSe Direct Discovery and/or ProSe Direct Communication, or the UE is configured to perform SRS carrier based switching, an additional delay can be expected.

If a cell which has been detectable at least for the time period $T_{identify_irat_without_index}$ or $T_{identify_irat_with_index}$ for the minimum requirements and then triggers the measurement report as per TS 36.331 [2], the event triggered measurement reporting delay shall be less than $T_{measurement_NR_FDD}$ provided the timing to that cell has not changed more than ±3200 Tc while measurement gap has not been available and the L3 filter has not been used. When L3 filtering is used or IDC autonomous denial is configured or the UE is performing reception and/or transmission for ProSe Direct Discovery and/or ProSe Direct Communication, or the UE is configured to perform SRS carrier based switching, an additional delay can be expected.

The normative reference for this requirement is TS 36.133 [23] clause 8.1.2.4.21 and 8.1.2.4.22.

8.4.2.0.2 Void

8.4.2.1 E-UTRA event-triggered reporting of a NR FR1 neighbour cell without SSB time index detection in non-DRX

8.4.2.1.1 Test purpose

The purpose of this test isto verify that the UE makes correct reporting of an event and to verify partly the NR inter-RAT cell search requirements for E-UTRA FDD - NR FR1 measurements given in TS 36.133 [23] clause 8.1.2.4.21 and for E-UTRAN TDD - NR FR1 measurements given in TS 36.133 [23] clause 8.1.2.4.22.

8.4.2.1.2 Test applicability

This test applies to all E-UTRA UE release 15 onwards and capable of NR measurements. Test 1 is applicable to UEs not supporting per-FR gap (IndependentGapConfig, as defined in TS 38.306 [11]) and Test 2 is applicable only to UEs supporting per-FR gap and Gap Pattern Id 4.

8.4.2.1.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 8.4.2.0.1.

The normative reference for this requirement is TS 38.133 [6] clause A.8.4.2.1.

8.4.2.1.4 Test description

The test consists of two sub-tests with two cells configured, the E-UTRA PCell and NR neighbour cell; the difference between the two sub-tests is whether per-FR measurement gap is configured or not. Each sub-test consists of two successive time periods, with time duration of T1 and T2 respectively. During time duration T1, the UE shall not have any timing information of NR neighbour cell. In all sub-tests the UE is not required to report SSB time index.

8.4.2.1.4.1 Initial conditions

This test shall be tested using any of the test configurations in Table 8.4.2.1.4.1-1.

Table 8.4.2.1.4.1-1: Supported test configurations for E-UTRA - NR FR1 event-triggered reporting without SSB time index detection in non-DRX

Configuration	Description
8.4.2.1-1	LTE FDD, NR 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode
8.4.2.1-2	LTE FDD, NR 15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode
8.4.2.1-3	LTE FDD, NR 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode
8.4.2.1-4	LTE TDD, NR 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode
8.4.2.1-5	LTE TDD, NR 15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode
8.4.2.1-6	LTE TDD, NR 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode
NOTE: The UE is only required to be tested in one of the supported test configurations.	

Configure the test requirement and the DUT according to the parameters in Table 8.4.2.1.4.1-2.

Table 8.4.2.1.4.1-2: Initial conditions for E-UTRA - NR FR1 event-triggered reporting without SSB time index detection in non-DRX

Parameter	Value		Comment
Test environment	NC		As specified in TS 36.508 [25] clause 4.1.
Test frequencies	As specified in Annex E, Table E.6-1 and TS 38.508-1 [14] clause 4.3.1.		
Channel bandwidth	As specified by the test configuration selected from Table 8.4.2.1.4.1-1.		
Propagation conditions	AWGN		As specified in clause C.2.1
Connection Diagram	TE Part	A.3.1.8.2	As specified in TS 38.508-1 [14] Annex A.
	DUT Part	A.3.2.3.4	
Exceptions to connection diagram	N/A		

1. The general test parameter settings are set up according to Table 8.4.2.1.4.1-3.

2. Message contents are defined in clause 8.4.2.1.4.3.

3. There are two carriers and two cells specified in the test, where Cell 1 is the E-UTRA PCell on the E-UTRA carrier and Cell 2 is the NR neighbour cell on the NR carrier. Cell 1 is the cell used for connection setup with the power level set according to Table 8.4.2.1.5-1 for this test. Cell 1 is configured according to clauses C.1.1 and C.1.2.

Table 8.4.2.1.4.1-3: General test parameters for E-UTRA - NR FR1 event-triggered reporting without SSB time index detection in non-DRX

Parameter	Unit	Test configuration	Value		Comment
			Test 1	Test 2	
E-UTRA RF Channel Numbers		1, 2, 3, 4, 5, 6	1		One E-UTRA carrier frequency is used.
NR RF Chanel Number		1, 2, 3, 4, 5, 6	1		One FR1 NR carrier frequency is used.
Active cell		1, 2, 3, 4, 5, 6	E-UTRA cell 1 (PCell)		E-UTRA cell 1 is on E-UTRA RF channel number 1.
Neighbour cell		1, 2, 3, 4, 5, 6	NR cell 2		NR cell 2 is on NR RF channel number 1.
Gap Pattern Id		1, 2, 3, 4, 5, 6	0	4	As specified in clause Table 8.1.2.1-1 of TS 36.133 [23].
Measurement gap offset		1, 2, 3, 4, 5, 6	39	19	As specified in TS 36.331 [29].
b2-Threshold1	dBm	1, 2, 3, 4, 5, 6	Note 1		E-UTRA RSRP threshold for E-UTRA RSRP measurement on cell 1 for event B2 [29]
b2-Threshold2NR	dBm	1, 2, 3, 4, 5, 6	Note 2		SS-RSRP threshold for SS-RSRP measurement on cell 2 for event B2 [29]
Hysteresis	dB	1, 2, 3, 4, 5, 6	0		
CP length		1, 2, 3, 4, 5, 6	Normal		
TimeToTrigger	s	1, 2, 3, 4, 5, 6	0		
Filter coefficient		1, 2, 3, 4, 5, 6	0		L3 filtering is not used
DRX		1, 2, 3, 4, 5, 6	OFF		DRX is not used
Time offset between serving and neighbour cells		1, 4	3ms		Asynchronous cells. The timing of Cell 2 is 3ms later than the timing of Cell 1.
		2, 3, 5, 6	3μs		Synchronous cells.
T1	s	1, 2, 3, 4, 5, 6	5		
T2	s	1, 2, 3, 4, 5, 6	1	1	
NOTE 1: The value of b2-Threshold1 is defined in Table 8.4.2.1.5-1. NOTE 2: The value of b2-Threshold2NR is defined in Table 8.4.2.1.5-2.					

8.4.2.1.4.2 Test procedure

Two cells are deployed in the test, which are E-UTRA PCell (Cell 1) on the E-UTRA carrier and a FR1 NR neighbour cell (Cell 2) on NR carrier. The general and cell specific test parameters for PCell and neighbour cell are given in Table 8.4.2.1.4.1-3, 8.4.2.1.5-1 and 8.4.2.1.5-2, respectively.

In sub-test 1 measurement gap pattern configuration #0 as defined in Table 8.4.2.1.4.1-3 is provided for UE that does not support per-FR gap and in sub-test 2 measurement gap pattern configuration #4 as defined in Table 8.4.2.1.4.1-3 is provided for UE that supports per-FR gap.

In the measurement control information, it is indicated to the UE that event-triggered reporting with Event B2 is used. The test consists of two successive time periods, with time duration of T1 and T2 respectively. During time duration T1, the UE shall not have any timing information of NR cell 2.

1. Ensure the UE is in State 3A-RF according to TS 36.508 [25] clause 7.2A.3.
2. Set the parameters of Cell 1 and Cell 2 according to T1 in Table 8.4.2.1.5-1 and Table 8.4.2.1.5-2 respectively, T1 starts.
3. The SS shall transmit an *RRCConnectionReconfiguration* message.
4. The UE shall transmit an *RRCConnectionReconfigurationComplete* message.
5. When T1 expires, the SS shall switch the parameters setting from T1 to T2 as specified in Table 8.4.2.1.5-1 and Table 8.4.2.1.5-2 respectively. T2 Starts.
6. UE shall transmit a *MeasurementReport* message triggered by Event B2. If the overall delays measured from the beginning of time period T2 is less than X ms then the number of successful tests is increased by one. If the UE fails to report the event within the overall delays measured requirement then the number of failure tests is increased by one. Where X is,
   - 922 for sub-test 1,
   - 802 for sub-test 2.
7. After the SS receive the *MeasurementReport* message in step 6) or when T2 expires, the SS shall transmit an *RRCConnectionRelease* message to release the RRC connection which includes the release of the established radio bearers as well as all radio resources, or
   - switch off the UE.
8. Set Cell 2 physical cell identity = ((current Cell 2 physical cell identity + 1) mod 14 + 2) for next iteration of the test procedure loop.
9. The SS:
   - transmits in Cell 1 a Paging message (including PagingRecord with UE-Identity) for the UE and ensures the UE is in State 3A according to TS 36.508 clause 4.5.3A (if the paging fails, switches off and on the UE and ensures the UE is in State 3A-RF according to TS 36.508 [25] clause 7.2A.3); or
   - switches on the UE and ensures the UE is in State 3A-RF according to TS 36.508 [25] clause 7.2A.3.
10. Repeat step 2-9 until the confidence level according to Tables G.2.3-1 in Annex G clause G.2 is achieved.

8.4.2.1.4.3 Message contents

Message contents are according to TS 36.508 [25] clause 7.3 with the following exceptions.

Table 8.4.2.1.4.3-1: Common Exception messages for E-UTRA - NR FR1 event-triggered reporting without SSB time index detection in non-DRX

Default Message Contents	
Common contents of system information blocks exceptions	
Default RRC messages and information elements contents exceptions	Table H.3.4-7 with Condition Inter-RAT and EVENT B2; Table H.3.4-4 with Condition INTER-RAT NR, EVENT B2 for Test 1; Table H.3.4-4 with Condition INTER-RAT NR, EVENT B2 for Test 2; Table H.3.4-5 with Condition Pattern #0 for Test 1; Table H.3.4-5 with Condition Pattern #4 for Test 2;
Specific message contents exceptions for Test Configuration 8.4.2.1-1 and 8.4.2.1-4	Table H.3.4-6 with Conditions SMTC.2, SSB.1 FR1 and Asynchronous cells

Specific message contents exceptions for Test Configuration 8.4.2.1-2 and 8.4.2.1-5	Table H.3.4-6 with Conditions SMTC.1, SSB.1 FR1 and Synchronous cells
Specific message contents exceptions for Test Configuration 8.4.2.1-3 and 8.4.2.1-6	Table H.3.4-6 with Conditions SMTC.1, SSB.2 FR1 and Synchronous cells

Table 8.4.2.1.4.3-2: SchedulingRequest-Config-DEFAULT

Derivation Path: TS 36.508 [25] Table 4.6.3-20			
Information Element	**Value/remark**	**Comment**	**Condition**
SchedulingRequest-Config-DEFAULT ::= CHOICE {			
setup SEQUENCE {			
sr-ConfigIndex	25		Config 8.4.2.1-1/2/3
	22		Config 8.4.2.1-4/5/6
}			
}			

8.4.2.1.5 Test requirement

Table 8.4.2.1.4.1-3, 8.4.2.1.5-1 and 8.4.2.1.5-2 define the primary level settings including test tolerances for E-UTRA - NR FR1 event-triggered reporting without SSB time index detection in non-DRX.

Table 8.4.2.1.5-1: E-UTRAN PCell specific test parameters for E-UTRA - NR FR1 event-triggered reporting without SSB time index detection in non-DRX

Parameter	**Unit**	**Configuration**	**Cell 1**	
			T1	**T2**
RF channel number		1, 2, 3, 4, 5, 6	1	
Duplex mode		1, 2, 3	FDD	
		4, 5, 6	TDD	
TDD special subframe configuration[Note1]		4, 5, 6	6	
TDD uplink-downlink configuration[Note1]		4, 5, 6	1	
$BW_{channel}$	MHz	1, 2, 3, 4, 5, 6	5 MHz: $N_{RB,c}$ = 25 10 MHz: $N_{RB,c}$ = 50 20 MHz: $N_{RB,c}$ = 100	
PDSCH parameters: DL Reference Measurement Channel[Note2]		1, 2, 3	5 MHz: R.7 FDD 10 MHz: R.3 FDD 20 MHz: R.6 FDD	
		4, 5, 6	5 MHz: R.4 TDD 10 MHz: R.0 TDD 20 MHz: R.3 TDD	
PCFICH/PDCCH/PHICH parameters: DL Reference Measurement Channel[Note2]		1, 2, 3	5 MHz: R.11 FDD 10 MHz: R.6 FDD 20 MHz: R.10 FDD	
		4, 5, 6	5 MHz: R.11 TDD 10 MHz: R.6 TDD 20 MHz: R.10 TDD	
OCNG Patterns[Note2]		1, 2, 3	5 MHz: OP.20 FDD 10 MHz: OP.10 FDD 20 MHz: OP.17 FDD	
		4, 5, 6	5 MHz: OP.9 TDD 10 MHz: OP.1 TDD 20 MHz: OP.7 TDD	
b2-Threshold1	dBm	1, 2, 3, 4, 5, 6	-77	
PBCH_RA	dB	1, 2, 3, 4, 5, 6	0	
PBCH_RB				
PSS_RA				
SSS_RA				
PCFICH_RB				
PHICH_RA				
PHICH_RB				

PDCCH_RA				
PDCCH_RB				
PDSCH_RA				
PDSCH_RB				
OCNG_RA Note3				
OCNG_RB Note3				
N_{oc} Note4	dBm/15kHz	1, 2, 3, 4, 5, 6	-104	
$\hat{E}_s/N_{oc}$	dB	1, 2, 3, 4, 5, 6	17	15.35
$\hat{E}_s/I_{ot}$ Note5	dB	1, 2, 3, 4, 5, 6	17	15.35
RSRP Note5	dBm/15kHz	1, 2, 3, 4, 5, 6	-87	-88.65
SCH_RP Note5	dBm/15kHz	1, 2, 3, 4, 5, 6	-87	-88.65
Io Note5	dBm/9MHz	1, 2, 3, 4, 5, 6	-59.13+10log ($N_{RB,c}$ /50)	60.74+10log ($N_{RB,c}$ /50)
Propagation Condition Note6		1, 2, 3, 4, 5, 6	ETU70	
Antenna Configuration and Correlation Matrix Note6		1, 2, 3, 4, 5, 6	1x2 Low	

NOTE 1: Special subframe and uplink-downlink configurations are specified in table 4.2-1 in TS 36.211 [24].
NOTE 2: DL RMCs and OCNG patterns are specified in clauses A 3.1 and A 3.2 of TS 36.133 [23] respectively.
NOTE 3: OCNG shall be used such that all cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.
NOTE 4: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for N_{oc} to be fulfilled.
NOTE 5: $\hat{E}_s/I_{ot}$, RSRP, SCH_RP and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.
NOTE 6: Propagation condition and correlation matrix are defined in clause B.2 in TS 36.101 [27].

Table 8.4.2.1.5-2: NR neighbour cell specific test parameters for E-UTRA - NR FR1 event-triggered reporting without SSB time index detection in non-DRX

Parameter	Unit	Test configuration	Cell 2	
			T1	T2
NR RF Channel Number		1, 2, 3, 4, 5, 6	1	
Duplex mode		1, 4	FDD	
		2, 3, 5, 6	TDD	
TDD configuration		2, 5	TDDConf.1.1	
		3, 6	TDDConf.2.1	
$BW_{channel}$	MHz	1, 2, 4, 5	10: $N_{RB,c}$ = 52	
		3, 6	40: $N_{RB,c}$ = 106	
OCNG Patterns		1, 2, 3, 4, 5, 6	OP.1	
SMTC configuration		1, 4	SMTC.2	
		2, 3, 5, 6	SMTC.1	
PDSCH/PDCCH subcarrier spacing	kHz	1, 2, 4, 5	15	
		3, 6	30	
b2-Threshold2NR	dBm/SCS	1, 2, 4, 5	-101	
		3, 6	-98	
EPRE ratio of PSS to SSS		1, 2, 3, 4, 5, 6	0	
EPRE ratio of PBCH DMRS to SSS				
EPRE ratio of PBCH to PBCH DMRS				
EPRE ratio of PDCCH DMRS to SSS				
EPRE ratio of PDCCH to PDCCH DMRS				
EPRE ratio of PDSCH DMRS to SSS				
EPRE ratio of PDSCH to PDSCH				
EPRE ratio of OCNG DMRS to SSS (Note 1)				
EPRE ratio of OCNG to OCNG DMRS (Note 1)				
N_{oc} Note2	dBm/15kHz	1, 2, 3, 4, 5, 6	-98	
N_{oc} Note2	dBm/SCS	1, 2, 4, 5	-98	
		3, 6	-95	
SS-RSRP Note 3	dBm/SCS	1, 2, 4, 5	-Infinity	-89.35
		3, 6	-Infinity	-86.34
$\hat{E}_s/I_{ot}$	dB	1, 2, 3, 4, 5, 6	-Infinity	8.65

$\hat{E}_s/N_{oc}$	dB	1, 2, 3, 4, 5, 6	-Infinity	8.65
Io[Note3]	dBm/9.36MHz	1, 2, 4, 5	-70.05	-60.84
	dBm/38.16MHz	3, 6	-63.94	-54.74
Propagation Condition		1, 2, 3, 4, 5, 6	TDL-C 300ns 100Hz	
Antenna Configuration and Correlation Matrix		1, 2, 3, 4, 5, 6	1x2 Low	
NOTE 1: OCNG shall be used such that the cell is fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols. NOTE 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for N_{oc} to be fulfilled. NOTE 3: SS-RSRP and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves. NOTE 4: SS-RSRP minimum requirements are specified assuming independent interference and noise at each receiver antenna port.				

In test 1 with per-UE gap, the UE shall send one Event B2 triggered measurement report, with a measurement reporting delay less than 922 ms from the beginning of time period T2. The UE shall not send event triggered measurement reports, as long as the reporting criteria are not fulfilled. The rate of correct events observed during repeated tests shall be at least 90%.

In test 2 with per-FR gap, the UE shall send one Event B2 triggered measurement report, with a measurement reporting delay less than 802 ms from the beginning of time period T2. The UE shall not send event triggered measurement reports, as long as the reporting criteria are not fulfilled. The rate of correct events observed during repeated tests shall be at least 90%.

In test 1 and test 2, the UE is not required to report SSB time index.

NOTE: The overall delay requirement is defined as the delay requirement in TS 38.133 plus 2 ms corresponding to the TTI insertion uncertainty of the measurement report in DCCH.

8.4.2.2 E-UTRA event-triggered reporting of a NR FR1 neighbour cell without SSB time index detection in DRX

8.4.2.2.1 Test purpose

The purpose of this test is to verify that the UE makes correct reporting of an event and to verify partly the NR inter-RAT cell search requirements given in clause 8.1.2.4.21 of TS 36.133 for E-UTRAN FDD-NR measurements and clause 8.1.2.4.22 of TS 36.133 for E-UTRAN TDD-NR measurements.

8.4.2.2.2 Test applicability

This test applies to all E-UTRA UE release 15 onwards supporting long DRX cycle and capable of NR measurements. Test 1 and Test 2 are applicable to UEs not supporting per-FR gap (IndependentGapConfig, as defined in TS 38.306 [11]) and Test 3 and Test 4 are applicable only to UEs supporting per-FR gap and Gap Pattern Id 4.

8.4.2.2.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 8.4.2.0.1.

The normative reference for this requirement is TS 38.133 [6] clause A.8.4.2.2.

8.4.2.2.4 Test description

The test consists of four sub-tests with two cells configured, the E-UTRA PCell and NR neighbour cell; the difference between the four sub-tests is whether per-FR measurement gap is configured or not and the DRX configuration parameters. Each sub-test consists of two successive time periods, with time duration of T1 and T2 respectively. During time duration T1, the UE shall not have any timing information of NR neighbour cell. In all sub-tests the UE is not required to report SSB time index.

8.4.2.2.4.1 Initial conditions

This test shall be tested using any of the test configurations in Table 8.4.2.2.4.1-1.

Table 8.4.2.2.4.1-1: Supported test configurations for E-UTRA - NR FR1 event-triggered reporting without SSB time index detection in DRX

Configuration	Description
8.4.2.2-1	LTE FDD, NR 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode
8.4.2.2-2	LTE FDD, NR 15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode
8.4.2.2-3	LTE FDD, NR 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode
8.4.2.2-4	LTE TDD, NR 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode
8.4.2.2-5	LTE TDD, NR 15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode
8.4.2.2-6	LTE TDD, NR 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode
NOTE: The UE is only required to be tested in one of the supported test configurations.	

Configure the test requirement and the DUT according to the parameters in Table 8.4.2.2.4.1-2.

Table 8.4.2.2.4.1-2: Initial conditions for E-UTRA - NR FR1 event-triggered reporting without SSB time index detection in DRX

Parameter	Value		Comment
Test environment	NC		As specified in TS 36.508 [25] clause 4.1.
Test frequencies	As specified in Annex E, Table E.6-1 and TS 38.508-1 [14] clause 4.3.1.		
Channel bandwidth	As specified by the test configuration selected from Table 8.4.2.2.4.1-1.		
Propagation conditions	AWGN		As specified in clause C.2.1
Connection Diagram	TE Part	A.3.1.8.2	As specified in TS 38.508-1 [14] Annex A.
	DUT Part	A.3.2.3.4	
Exceptions to connection diagram	N/A		

1. The general test parameter settings are set up according to Table 8.4.2.2.4.1-3.
2. Message contents are defined in clause 8.4.2.2.4.3.
3. There are two carriers and two cells specified in the test, where Cell 1 is the E-UTRA PCell on the E-UTRA carrier and Cell 2 is the NR neighbour cell on the NR carrier. Cell 1 is the cell used for connection setup with the power level set according to Table 8.4.2.2.5-1 for this test. Cell 1 is configured according to clauses C.1.1 and C.1.2.

Table 8.4.2.2.4.1-3: General test parameters for E-UTRA - NR FR1 event-triggered reporting without SSB time index detection in DRX

Parameter	Unit	Test configuration	Value				Comment
			Test 1	Test 2	Test 3	Test 4	
E-UTRA RF Channel Number		1, 2, 3, 4, 5, 6	1				One E-UTRA carrier frequency is used.
NR RF Channel Number		1, 2, 3, 4, 5, 6	1				One FR1 NR carrier frequency is used.
Active cell		1, 2, 3, 4, 5, 6	E-UTRA cell 1 (PCell)				E-UTRA cell 1 is on E-UTRA RF channel number 1.
Neighbour cell		1, 2, 3, 4, 5, 6	NR cell 2				NR cell 2 is on NR RF channel number 1.
Gap Pattern Id		1, 2, 3, 4, 5, 6	0		4		As specified in clause Table 8.1.2.1-1 of TS 36.133 [23].
Measurement gap offset		1, 2, 3, 4, 5, 6	39		19		As specified in TS 36.331 [29].
b2-Threshold1	dBm	1, 2, 3, 4, 5, 6	Note 1				E-UTRA RSRP threshold for E-UTRA RSRP measurement on cell 1 for event B2 [29]

b2-Threshold2NR	dBm	1, 2, 3, 4, 5, 6	Note 2				SS-RSRP threshold for SS-RSRP measurement on cell 2 for event B2 [29]
Hysteresis	dB	1, 2, 3, 4, 5, 6	0				
CP length		1, 2, 3, 4, 5, 6	Normal				
TimeToTrigger	s	1, 2, 3, 4, 5, 6	0				
Filter coefficient		1, 2, 3, 4, 5, 6	0				L3 filtering is not used
DRX		1, 2, 3, 4, 5, 6	DRX.9	DRX.12	DRX.9	DRX.12	As specified in clause A.5
Time offset between serving and neighbour cells		1, 4	3ms				Asynchronous cells. The timing of Cell 2 is 3ms later than the timing of Cell 1.
		2, 3, 5, 6	3μs				Synchronous cells.
T1	s	1, 2, 3, 4, 5, 6	5				
T2	s	1, 2, 3, 4, 5, 6	2	11	2	11	
NOTE 1: The value of b2-Threshold1 is defined in Table 8.4.2.2.5-1. NOTE 2: The value of b2-Threshold2NR is defined in Table 8.4.2.2.5-2.							

8.4.2.2.4.2 Test procedure

Two cells are deployed in the test, which are E-UTRA PCell (Cell 1) on the E-UTRA carrier and a FR1 NR neighbour cell (Cell 2) on NR carrier. The general and cell specific test parameters for PCell and neighbour cell are given in Table 8.4.2.2.4.1-3, 8.4.2.2.5-1 and 8.4.2.2.5-2, respectively.

In sub-test 1 and sub-test 2 measurement gap pattern configuration #0 as defined in Table 8.4.2.2.4.1-3 is provided for UE that does not support per-FR gap and in sub-test 3 and sub-test 4 measurement gap pattern configuration #4 as defined in Table 8.4.2.2.4.1-3 is provided for UE that supports per-FR gap.

DRX cycle = 40 ms is used in sub-test 1 and sub-test 3, DRX cycle = 640 ms is used in sub-test 2 and sub-test 4. The UE is allocated with PUSCH resource at every DRX cycle.

In the measurement control information, it is indicated to the UE that event-triggered reporting with Event B2 is used. The test consists of two successive time periods, with time duration of T1 and T2 respectively. During time duration T1, the UE shall not have any timing information of NR cell 2.

1. Ensure the UE is in State 3A-RF according to TS 36.508 [25] clause 7.2A.3.
2. Set the parameters of Cell 1 and Cell 2 according to T1 in Table 8.4.2.2.5-1 and Table 8.4.2.2.5-2 respectively, T1 starts.
3. The SS shall transmit an *RRCConnectionReconfiguration* message.
4. The UE shall transmit an *RRCConnectionReconfigurationComplete* message.
5. When T1 expires, the SS shall switch the parameters setting from T1 to T2 as specified in Table 8.4.2.2.5-1 and Table 8.4.2.2.5-2 respectively. T2 Starts.
6. UE shall transmit a *MeasurementReport* message triggered by Event B2. If the overall delays measured from the beginning of time period T2 is less than X ms then the number of successful tests is increased by one. If the UE fails to report the event within the overall delays measured requirement then the number of failure tests is increased by one. Where X is,
   - 1082 for sub-test 1 and sub-test 3,
   - 10242 for sub-test 2 and sub-test 4.
7. .After the SS receive the *MeasurementReport* message in step 6) or when T2 expires, the SS shall:
   - transmit an *RRCConnectionRelease* message to release the RRC connection which includes the release of the established radio bearers as well as all radio resources, or
   - switch off the UE.
8. Set Cell 2 physical cell identity = ((current Cell 2 physical cell identity + 1) mod 14 + 2) for next iteration of the test procedure loop.

9. The SS:

   - transmits in Cell 1 a Paging message (including PagingRecord with UE-Identity) for the UE and ensures the UE is in State 3A according to TS 36.508 [25] clause 4.5.3A (if the paging fails, switches off and on the UE and ensures the UE is in State 3A-RF according to TS 36.508 [25] clause 7.2A.3); or

   - switches on the UE and ensures the UE is in State 3A-RF according to TS 36.508 [25] clause 7.2A.3.

10. Repeat step 2-9 until the confidence level according to Tables G.2.3-1 in Annex G clause G.2 is achieved.

8.4.2.2.4.3 Message contents

Message contents are according to TS 36.508 [25] clause 7.3 with the following exceptions:

Table 8.4.2.2.4.3-1: Common Exception messages for E-UTRA - NR FR1 event-triggered reporting without SSB time index detection in DRX

Default Message Contents	
Common contents of system information blocks exceptions	
Default RRC messages and information elements contents exceptions	Table H.3.4-7 with Condition Inter-RAT and EVENT B2; Table H.3.4-4 with Condition INTER-RAT NR, EVENT B2 for Test 1 and Test 2; Table H.3.4-4 with Condition INTER-RAT NR, EVENT B2 for Test 3 and Test 4; Table H.3.4-5 with Condition Pattern #0 for Test 1 and Test 2; Table H.3.4-5 with Condition Pattern #4 for Test 3 and Test 4; Table H.3.7-2 with Condition DRX.9 and Gap for Test 1 and Test 3 Table H.3.7-2 with Condition DRX.12 and Gap for Test 2 and Test 4
Specific message contents exceptions for Test Configuration 8.4.2.2-1 and 8.4.2.2-4	Table H.3.4-6 with Conditions SMTC.2, SSB.1 FR1 and Asynchronous cells
Specific message contents exceptions for Test Configuration 8.4.2.2-2 and 8.4.2.2-5	Table H.3.4-6 with Conditions SMTC.1, SSB.1 FR1 and Synchronous cells
Specific message contents exceptions for Test Configuration 8.4.2.2-3 and 8.4.2.2-6	Table H.3.4-6 with Conditions SMTC.1, SSB.2 FR1 and Synchronous cells

Table 8.4.2.2.4.3-2: SchedulingRequest-Config-DEFAULT

Derivation Path: TS 36.508 [25] Table 4.6.3-20			
Information Element	**Value/remark**	**Comment**	**Condition**
SchedulingRequest-Config-DEFAULT ::= CHOICE {			
setup SEQUENCE {			
sr-ConfigIndex	25		Config 8.4.2.2-1/2/3
	22		Config 8.4.2.2-4/5/6
}			
}			

8.4.2.2.5 Test requirement

Table 8.4.2.2.4.1-3, 8.4.2.2.5-1 and 8.4.2.2.5-2 define the primary level settings including test tolerances for E-UTRA - NR FR1 event-triggered reporting without SSB time index detection in DRX.

Table 8.4.2.2.5-1: E-UTRAN PCell specific test parameters for E-UTRA - NR FR1 event-triggered reporting without SSB time index detection in DRX

Parameter	Unit	Configuration	Cell 1	
			T1	T2
RF channel number		1, 2, 3, 4, 5, 6	1	
Duplex mode		1, 2, 3	FDD	
		4, 5, 6	TDD	

TDD special subframe configuration[Note1]		4, 5, 6	6	
TDD uplink-downlink configuration[Note1]		4, 5, 6	1	
$BW_{channel}$	MHz	1, 2, 3, 4, 5, 6	5 MHz: $N_{RB,c}$ = 25 10 MHz: $N_{RB,c}$ = 50 20 MHz: $N_{RB,c}$ = 100	
PDSCH parameters: DL Reference Measurement Channel[Note2]		1, 2, 3	5 MHz: R.7 FDD 10 MHz: R.3 FDD 20 MHz: R.6 FDD	
		4, 5, 6	5 MHz: R.4 TDD 10 MHz: R.0 TDD 20 MHz: R.3 TDD	
PCFICH/PDCCH/PHICH parameters: DL Reference Measurement Channel[Note2]		1, 2, 3	5 MHz: R.11 FDD 10 MHz: R.6 FDD 20 MHz: R.10 FDD	
		4, 5, 6	5 MHz: R.11 TDD 10 MHz: R.6 TDD 20 MHz: R.10 TDD	
OCNG Patterns[Note2]		1, 2, 3	5 MHz: OP.20 FDD 10 MHz: OP.10 FDD 20 MHz: OP.17 FDD	
		4, 5, 6	5 MHz: OP.9 TDD 10 MHz: OP.1 TDD 20 MHz: OP.7 TDD	
b2-Threshold1	dBm	1, 2, 3, 4, 5, 6	-77	
PBCH_RA	dB	1, 2, 3, 4, 5, 6	0	
PBCH_RB				
PSS_RA				
SSS_RA				
PCFICH_RB				
PHICH_RA				
PHICH_RB				
PDCCH_RA				
PDCCH_RB				
PDSCH_RA				
PDSCH_RB				
OCNG_RA[Note3]				
OCNG_RB[Note3]				
N_{oc}[Note4]	dBm/15kHz	1, 2, 3, 4, 5, 6	-104	
$\hat{E}_s/N_{oc}$	dB	1, 2, 3, 4, 5, 6	17	15.35
$\hat{E}_s/I_{ot}$[Note5]	dB	1, 2, 3, 4, 5, 6	17	15.35
RSRP[Note5]	dBm/15kHz	1, 2, 3, 4, 5, 6	-87	-88.65
SCH_RP[Note5]	dBm/15kHz	1, 2, 3, 4, 5, 6	-87	-88.65
Io[Note5]	dBm/9MHz	1, 2, 3, 4, 5, 6	-59.13+10log ($N_{RB,c}$ /50)	-60.74+10log ($N_{RB,c}$ /50)
Propagation Condition [Note6]		1, 2, 3, 4, 5, 6	ETU70	
Antenna Configuration and Correlation Matrix [Note6]		1, 2, 3, 4, 5, 6	1x2 Low	

NOTE 1: Special subframe and uplink-downlink configurations are specified in table 4.2-1 in TS 36.211 [24].
NOTE 2: DL RMCs and OCNG patterns are specified in clauses A 3.1 and A 3.2 of TS 36.133 [23] respectively.
NOTE 3: OCNG shall be used such that all cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.
NOTE 4: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for N_{oc} to be fulfilled.
NOTE 5: $\hat{E}_s/I_{ot}$, RSRP, SCH_RP and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.
NOTE 6: Propagation condition and correlation matrix are defined in clause B.2 in TS 36.101 [27].

Table 8.4.2.2.5-2: NR neighbour cell specific test parameters for E-UTRA - NR FR1 event-triggered reporting without SSB time index detection in DRX

Parameter	Unit	Test configuration	Cell 2	
			T1	T2
NR RF Channel Number		1, 2, 3, 4, 5, 6	1	

Duplex mode		1, 4	FDD	
		2, 3, 5, 6	TDD	
TDD configuration		2, 5	TDDConf.1.1	
		3, 6	TDDConf.2.1	
$BW_{channel}$	MHz	1, 2, 4, 5	10: $N_{RB,c}$ = 52	
		3, 6	40: $N_{RB,c}$ = 106	
OCNG Patterns		1, 2, 3, 4, 5, 6	OP.1	
SMTC configuration		1, 4	SMTC.2	
		2, 3, 5, 6	SMTC.1	
PDSCH/PDCCH subcarrier spacing	kHz	1, 2, 4, 5	15	
		3, 6	30	
b2-Threshold2NR	dBm/SCS	1, 2, 4, 5	-101	
		3, 6	-98	
EPRE ratio of PSS to SSS		1, 2, 3, 4, 5, 6	0	
EPRE ratio of PBCH DMRS to SSS				
EPRE ratio of PBCH to PBCH DMRS				
EPRE ratio of PDCCH DMRS to SSS				
EPRE ratio of PDCCH to PDCCH DMRS				
EPRE ratio of PDSCH DMRS to SSS				
EPRE ratio of PDSCH to PDSCH				
EPRE ratio of OCNG DMRS to SSS (Note 1)				
EPRE ratio of OCNG to OCNG DMRS (Note 1)				
N_{oc} Note2	dBm/15kHz	1, 2, 3, 4, 5, 6	-98	
N_{oc} Note2	dBm/SCS	1, 2, 4, 5	-98	
		3, 6	-95	
SS-RSRP Note 3	dBm/SCS	1, 2, 4, 5	-Infinity	-89.35
		3, 6	-Infinity	-86.34
$\hat{E}_s/I_{ot}$	dB	1, 2, 3, 4, 5, 6	-Infinity	8.65
$\hat{E}_s/N_{oc}$	dB	1, 2, 3, 4, 5, 6	-Infinity	8.65
Io Note3	dBm/9.36MHz	1, 2, 4, 5	-70.05	-60.84
	dBm/38.16MHz	3, 6	-63.95	-54.74
Propagation Condition		1, 2, 3, 4, 5, 6	TDL-C 300ns 100Hz	
Antenna Configuration and Correlation Matrix		1, 2, 3, 4, 5, 6	1x2 Low	

NOTE 1: OCNG shall be used such that the cell is fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.
NOTE 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for N_{oc} to be fulfilled.
NOTE 3: SS-RSRP and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.
NOTE 4: SS-RSRP minimum requirements are specified assuming independent interference and noise at each receiver antenna port.

In test 1 with per-UE gap, the UE shall send one Event B2 triggered measurement report, with a measurement reporting delay less than 1082 ms from the beginning of time period T2. The UE shall not send event triggered measurement reports, as long as the reporting criteria are not fulfilled. The rate of correct events observed during repeated tests shall be at least 90%.

In test 2 with per-UE gap, the UE shall send one Event B2 triggered measurement report, with a measurement reporting delay less than 10242 ms from the beginning of time period T2. The UE shall not send event triggered measurement reports, as long as the reporting criteria are not fulfilled. The rate of correct events observed during repeated tests shall be at least 90%.

In test 3 with per-FR gap, the UE shall send one Event B2 triggered measurement report, with a measurement reporting delay less than 1082 ms from the beginning of time period T2. The UE shall not send event triggered measurement reports, as long as the reporting criteria are not fulfilled. The rate of correct events observed during repeated tests shall be at least 90%.

In test 4 with per-FR gap, the UE shall send one Event B2 triggered measurement report, with a measurement reporting delay less than 10242 ms from the beginning of time period T2. The UE shall not send event triggered measurement

reports, as long as the reporting criteria are not fulfilled. The rate of correct events observed during repeated tests shall be at least 90%.

In tests 1, 2, 3 and 4, the UE is not required to report SSB time index.

NOTE: The overall delay requirement is defined as the delay requirement in TS 38.133 plus 2 ms corresponding to the TTI insertion uncertainty of the measurement report in DCCH.

8.4.2.3 E-UTRA event-triggered reporting of a NR FR1 neighbour cell with SSB time index detection in non-DRX

8.4.2.3.1 Test purpose

The purpose of this test is to verify that the UE makes correct reporting of an event and to verify partly the NR inter-RAT cell search requirements for E-UTRA FDD - NR FR1 measurements given in TS 36.133 [23] clause 8.1.2.4.21 and for E-UTRAN TDD - NR FR1 measurements given in TS 36.133 [23] clause 8.1.2.4.22.

8.4.2.3.2 Test applicability

This test applies to all E-UTRA UE release 15 onwards and capable of NR measurements. Test 1 is applicable to UEs not supporting per-FR gap (IndependentGapConfig, as defined in TS 38.306 [11]) and Test 2 is applicable only to UEs supporting per-FR gap and Gap Pattern Id 4.

8.4.2.3.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 8.4.2.0.2.

The normative reference for this requirement is TS 38.133 [6] clause A.8.4.2.3.

8.4.2.3.4 Test description

The test consists of two sub-tests with two cells configured, the E-UTRA PCell and NR neighbour cell; the difference between the two sub-tests is whether per-FR measurement gap is configured or not. Each sub-test consists of two successive time periods, with time duration of T1 and T2 respectively. During time duration T1, the UE shall not have any timing information of NR neighbour cell. In the measurement configuration the UE shall be indicated to report the SSB index of the identified NR cell.

8.4.2.3.4.1 Initial conditions

This test shall be tested using any of the test configurations in Table 8.4.2.3.4.1-1.

Table 8.4.2.3.4.1-1: Supported test configurations for E-UTRA - NR FR1 event-triggered reporting with SSB time index detection in non-DRX

Configuration	Description
8.4.2.3-1	LTE FDD, NR 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode
8.4.2.3-2	LTE FDD, NR 15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode
8.4.2.3-3	LTE FDD, NR 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode
8.4.2.3-4	LTE TDD, NR 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode
8.4.2.3-5	LTE TDD, NR 15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode
8.4.2.3-6	LTE TDD, NR 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode
NOTE: The UE is only required to be tested in one of the supported test configurations.	

Configure the test requirement and the DUT according to the parameters in Table 8.4.2.3.4.1-2.

Table 8.4.2.3.4.1-2: Initial conditions for E-UTRA - NR FR1 event-triggered reporting with SSB time index detection in non-DRX

Parameter	Value	Comment
Test environment	NC	As specified in TS 36.508 [25] clause 4.1.
Test frequencies	As specified in Annex E, Table E.6-1 and TS 38.508-1 [14] clause 4.3.1.	

Channel bandwidth	As specified by the test configuration selected from Table 8.4.2.3.4.1-1.		
Propagation conditions	AWGN		As specified in clause C.2.1
Connection Diagram	TE Part	A.3.1.8.2	As specified in TS 38.508-1 [14] Annex A.
	DUT Part	A.3.2.3.4	
Exceptions to connection diagram	N/A		

1. The general test parameter settings are set up according to Table 8.4.2.3.4.1-3.
2. Message contents are defined in clause 8.4.2.3.4.3.
3. There are two carriers and two cells specified in the test, where Cell 1 is the E-UTRA PCell on the E-UTRA carrier and Cell 2 is the NR neighbour cell on the NR carrier. Cell 1 is the cell used for connection setup with the power level set according to Table 8.4.2.3.5-1 for this test. Cell 1 is configured according to clauses C.1.1 and C.1.2.

Table 8.4.2.3.4.1-3: General test parameters for E-UTRA - NR FR1 event-triggered reporting with SSB time index detection in non-DRX

Parameter	Unit	Test configuration	Value		Comment
			Test 1	Test 2	
E-UTRA RF Channel Numbers		1, 2, 3, 4, 5, 6	1		One E-UTRA carrier frequency is used.
NR RF Channel Number		1, 2, 3, 4, 5, 6	1		One FR1 NR carrier frequency is used.
Active cell		1, 2, 3, 4, 5, 6	E-UTRA cell 1 (PCell)		E-UTRA cell 1 is on E-UTRA RF channel number 1.
Neighbour cell		1, 2, 3, 4, 5, 6	NR cell 2		NR cell 2 is on NR RF channel number 1.
Gap Pattern Id		1, 2, 3, 4, 5, 6	0	4	As specified in clause Table 8.1.2.1-1 of TS 36.133 [23].
Measurement gap offset		1, 2, 3, 4, 5, 6	39	19	As specified in TS 36.331 [29].
b2-Threshold1	dBm	1, 2, 3, 4, 5, 6	Note 1		E-UTRA RSRP threshold for E-UTRA RSRP measurement on cell 1 for event B2 [29]
b2-Threshold2NR	dBm	1, 2, 3, 4, 5, 6	Note 2		SS-RSRP threshold for SS-RSRP measurement on cell 2 for event B2 [29]
Hysteresis	dB	1, 2, 3, 4, 5, 6	0		
CP length		1, 2, 3, 4, 5, 6	Normal		
TimeToTrigger	s	1, 2, 3, 4, 5, 6	0		
Filter coefficient		1, 2, 3, 4, 5, 6	0		L3 filtering is not used
DRX		1, 2, 3, 4, 5, 6	OFF		DRX is not used
Time offset between serving and neighbour cells		1, 4	3ms		Asynchronous cells. The timing of Cell 2 is 3 ms later than the timing of Cell 1.
		2, 3, 5, 6	3μs		Synchronous cells.
T1	s	1, 2, 3, 4, 5, 6	5		
T2	s	1, 2, 3, 4, 5, 6	2	1	
NOTE 1: The value of b2-Threshold1 is defined in Table 8.4.2.3.5-1. NOTE 2: The value of b2-Threshold2NR is defined in Table 8.4.2.3.5-2.					

8.4.2.3.4.2 Test procedure

Two cells are deployed in the test, which are E-UTRA PCell (Cell 1) on the E-UTRA carrier and a FR1 NR neighbour cell (Cell 2) on NR carrier. The general and cell specific test parameters for PCell and neighbour cell are given in Table 8.4.2.3.4.1-3, 8.4.2.3.5-1 and 8.4.2.3.5-2, respectively.

In sub-test 1 measurement gap pattern configuration #0 as defined in Table 8.4.2.3.4.1-3 is provided for UE that does not support per-FR gap and in sub-test 2 measurement gap pattern configuration #4 as defined in Table 8.4.2.3.4.1-3 is provided for UE that supports per-FR gap.

In the measurement control information, it is indicated to the UE that event-triggered reporting with Event B2 is used. The test consists of two successive time periods, with time duration of T1 and T2 respectively. During time duration T1, the UE shall not have any timing information of NR cell 2.

1. Ensure the UE is in State 3A-RF according to TS 36.508 [25] clause 7.2A.3.
2. Set the parameters of Cell 1 and Cell 2 according to T1 in Table 8.4.2.3.5-1 and Table 8.4.2.3.5-2 respectively, T1 starts.
3. The SS shall transmit an *RRCConnectionReconfiguration* message.
4. The UE shall transmit an *RRCConnectionReconfigurationComplete* message.
5. When T1 expires, the SS shall switch the parameters setting from T1 to T2 as specified in Table 8.4.2.3.5-1 and Table 8.4.2.3.5-2 respectively. T2 Starts.
6. UE shall transmit a *MeasurementReport* message triggered by Event B2. If the overall delays measured from the beginning of time period T2 is less than X ms then the number of successful tests is increased by one. If the UE fails to report the event within the overall delays measured requirement then the number of failure tests is increased by one. Where X is,
   - 1042 for sub-test 1,
   - 922 for sub-test 2.
7. . After the SS receive the *MeasurementReport* message in step 6) or when T2 expires, the SS shall:
   - transmit an *RRCConnectionRelease* message to release the RRC connection which includes the release of the established radio bearers as well as all radio resources, or
   - switch off the UE.
8. Set Cell 2 physical cell identity = ((current Cell 2 physical cell identity + 1) mod 14 + 2) for next iteration of the test procedure loop.
9. The SS:
   - transmits in Cell 1 a Paging message (including PagingRecord with UE-Identity) for the UE and ensures the UE is in State 3A according to TS 36.508 [25] clause 4.5.3A (if the paging fails, switches off and on the UE and ensures the UE is in State 3A-RF according to TS 36.508 [25] clause 7.2A.3); or
   - switches on the UE and ensures the UE is in State 3A-RF according to TS 36.508 [25] clause 7.2A.3.
10. Repeat step 2-9 until the confidence level according to Tables G.2.3-1 in Annex G clause G.2 is achieved.

8.4.2.3.4.3 Message contents

Message contents are according to TS 36.508 [25] clause 7.3 with the following exceptions.

Table 8.4.2.3.4.3-1: Common Exception messages for E-UTRA - NR FR1 event-triggered reporting with SSB time index detection in non-DRX

Default Message Contents	
Common contents of system information blocks exceptions	
Default RRC messages and information elements contents exceptions	Table H.3.4-7 with Condition Inter-RAT and EVENT B2; Table H.3.4-4 with Condition INTER-RAT NR, EVENT B2 for Test 1; Table H.3.4-4 with Condition INTER-RAT NR, EVENT B2 for Test 2; Table H.3.4-5 with Condition Pattern #0 for Test 1; Table H.3.4-5 with Condition Pattern #4 for Test 2; Table H.3.4-8 with Condition SSB-Index
Specific message contents exceptions for Test Configuration 8.4.2.3-1 and 8.4.2.3-4	Table H.3.4-6 with Conditions SMTC.2, SSB.1 FR1 and Asynchronous cells
Specific message contents exceptions for Test Configuration 8.4.2.3-2 and 8.4.2.3-5	Table H.3.4-6 with Conditions SMTC.1, SSB.1 FR1 and Synchronous cells

Specific message contents exceptions for Test Configuration 8.4.2.3-3 and 8.4.2.3-6	Table H.3.4-6 with Conditions SMTC.1, SSB.2 FR1 and Synchronous cells

Table 8.4.2.3.4.3-2: SchedulingRequest-Config-DEFAULT

Derivation Path: 36.508 [25] Table 4.6.3-20			
Information Element	**Value/remark**	**Comment**	**Condition**
SchedulingRequest-Config-DEFAULT ::= CHOICE {			
setup SEQUENCE {			
sr-ConfigIndex	25		Config 8.4.2.3-1/2/3
	22		Config 8.4.2.3-4/5/6
}			
}			

8.4.2.3.5 Test requirement

Table 8.4.2.3.4.1-3, 8.4.2.3.5-1 and 8.4.2.3.5-2 define the primary level settings including test tolerances for E-UTRA - NR FR1 event-triggered reporting with SSB time index detection in non-DRX.

Table 8.4.2.3.5-1: E-UTRAN PCell specific test parameters for E-UTRA - NR FR1 event-triggered reporting with SSB time index detection in non-DRX

Parameter	Unit	Configuration	Cell 1	
			T1	T2
RF channel number		1, 2, 3, 4, 5, 6	1	
Duplex mode		1, 2, 3	FDD	
		4, 5, 6	TDD	
TDD special subframe configuration[Note1]		4, 5, 6	6	
TDD uplink-downlink configuration[Note1]		4, 5, 6	1	
$BW_{channel}$	MHz	1, 2, 3, 4, 5, 6	5 MHz: $N_{RB,c}$ = 25 10 MHz: $N_{RB,c}$ = 50 20 MHz: $N_{RB,c}$ = 100	
PDSCH parameters: DL Reference Measurement Channel[Note2]		1, 2, 3	5 MHz: R.7 FDD 10 MHz: R.3 FDD 20 MHz: R.6 FDD	
		4, 5, 6	5 MHz: R.4 TDD 10 MHz: R.0 TDD 20 MHz: R.3 TDD	
PCFICH/PDCCH/PHICH parameters: DL Reference Measurement Channel[Note2]		1, 2, 3	5 MHz: R.11 FDD 10 MHz: R.6 FDD 20 MHz: R.10 FDD	
		4, 5, 6	5 MHz: R.11 TDD 10 MHz: R.6 TDD 20 MHz: R.10 TDD	
OCNG Patterns[Note2]		1, 2, 3	5 MHz: OP.20 FDD 10 MHz: OP.10 FDD 20 MHz: OP.17 FDD	
		4, 5, 6	5 MHz: OP.9 TDD 10 MHz: OP.1 TDD 20 MHz: OP.7 TDD	
b2-Threshold1	dBm	1, 2, 3, 4, 5, 6	-77	
PBCH_RA	dB	1, 2, 3, 4, 5, 6	0	
PBCH_RB				
PSS_RA				
SSS_RA				
PCFICH_RB				
PHICH_RA				
PHICH_RB				
PDCCH_RA				
PDCCH_RB				

Parameter	Unit	Configuration	Cell 1	
			T1	T2
PDSCH_RA				
PDSCH_RB				
OCNG_RA Note3				
OCNG_RB Note3				
N_{oc} Note4	dBm/15kHz	1, 2, 3, 4, 5, 6	-104	
$\hat{E}_s/N_{oc}$	dB	1, 2, 3, 4, 5, 6	17	15.35
$\hat{E}_s/I_{ot}$ Note5	dB	1, 2, 3, 4, 5, 6	17	15.35
RSRP Note5	dBm/15kHz	1, 2, 3, 4, 5, 6	-87	-88.65
SCH_RP Note5	dBm/15kHz	1, 2, 3, 4, 5, 6	-87	-88.65
Io Note5	dBm/9MHz	1, 2, 3, 4, 5, 6	-59.13+10log ($N_{RB,c}$ /50)	-60.74+10log ($N_{RB,c}$ /50)
Propagation Condition Note6		1, 2, 3, 4, 5, 6	ETU70	
Antenna Configuration and Correlation Matrix Note6		1, 2, 3, 4, 5, 6	1x2 Low	

NOTE 1: Special subframe and uplink-downlink configurations are specified in table 4.2-1 in TS 36.211 [24].
NOTE 2: DL RMCs and OCNG patterns are specified in clauses A 3.1 and A 3.2 of TS 36.133 [23] respectively.
NOTE 3: OCNG shall be used such that all cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.
NOTE 4: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for N_{oc} to be fulfilled.
NOTE 5: $\hat{E}_s/I_{ot}$, RSRP, SCH_RP and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.
NOTE 6: Propagation condition and correlation matrix are defined in clause B.2 in TS 36.101 [27].

Table 8.4.2.3.5-2: NR neighbour cell specific test parameters for E-UTRA - NR FR1 event-triggered reporting with SSB time index detection in non-DRX

Parameter	Unit	Test configuration	Cell 2	
			T1	T2
NR RF Channel Number		1, 2, 3, 4, 5, 6	1	
Duplex mode		1, 4	FDD	
		2, 3, 5, 6	TDD	
TDD configuration		2, 5	TDDConf.1.1	
		3, 6	TDDConf.2.1	
$BW_{channel}$	MHz	1, 2, 4, 5	10: $N_{RB,c}$ = 52	
		3, 6	40: $N_{RB,c}$ = 106	
OCNG Patterns		1, 2, 3, 4, 5, 6	OP.1	
SMTC configuration		1, 4	SMTC.2	
		2, 3, 5, 6	SMTC.1	
PDSCH/PDCCH subcarrier spacing	kHz	1, 2, 4, 5	15	
		3, 6	30	
b2-Threshold2NR	dBm/SCS	1, 2, 4, 5	-101	
		3, 6	-98	
EPRE ratio of PSS to SSS		1, 2, 3, 4, 5, 6	0	
EPRE ratio of PBCH DMRS to SSS				
EPRE ratio of PBCH to PBCH DMRS				
EPRE ratio of PDCCH DMRS to SSS				
EPRE ratio of PDCCH to PDCCH DMRS				
EPRE ratio of PDSCH DMRS to SSS				
EPRE ratio of PDSCH to PDSCH				
EPRE ratio of OCNG DMRS to SSS (Note 1)				
EPRE ratio of OCNG to OCNG DMRS (Note 1)				
N_{oc} Note2	dBm/15kHz	1, 2, 3, 4, 5, 6	-98	
N_{oc} Note2	dBm/SCS	1, 2, 4, 5	-98	
		3, 6	-95	
SS-RSRP Note 3	dBm/SCS	1, 2, 4, 5	-Infinity	-89.35
		3, 6	-Infinity	-86.34
$\hat{E}_s/I_{ot}$	dB	1, 2, 3, 4, 5, 6	-Infinity	8.65

$\hat{E}_s/N_{oc}$	dB	1, 2, 3, 4, 5, 6	-Infinity	8.65
Io[Note3]	dBm/9.36MHz	1, 2, 4, 5	-70.05	-60.84
	dBm/38.16MHz	3, 6	-63.95	-54.74
Propagation Condition		1, 2, 3, 4, 5, 6	TDL-C 300ns 100Hz	
Antenna Configuration and Correlation Matrix		1, 2, 3, 4, 5, 6	1x2 Low	
NOTE 1: OCNG shall be used such that the cell is fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols. NOTE 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for N_{oc} to be fulfilled. NOTE 3: SS-RSRP and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves. NOTE 4: SS-RSRP minimum requirements are specified assuming independent interference and noise at each receiver antenna port.				

In test 1 with per-UE gap, the UE shall send one Event B2 triggered measurement report, with a measurement reporting delay less than 1042 ms from the beginning of time period T2. The UE shall not send event triggered measurement reports, as long as the reporting criteria are not fulfilled. The rate of correct events observed during repeated tests shall be at least 90%.

In test 2 with per-FR gap, the UE shall send one Event B2 triggered measurement report, with a measurement reporting delay less than 922 ms from the beginning of time period T2. The UE shall not send event triggered measurement reports, as long as the reporting criteria are not fulfilled. The rate of correct events observed during repeated tests shall be at least 90%.

In test 1 and test 2, the UE is required to report SSB time index.

NOTE: The overall delay requirement is defined as the delay requirement in TS 38.133 plus 2 ms corresponding to the TTI insertion uncertainty of the measurement report in DCCH.

8.4.2.4 E-UTRA event-triggered reporting of a NR FR1 neighbour cell with SSB time index detection in DRX

8.4.2.4.1 Test purpose

The purpose of this test is to verify that the UE makes correct reporting of an event and to verify partly the NR inter-RAT cell search requirements for E-UTRA FDD - NR FR1 measurements given in TS 36.133 [23] clause 8.1.2.4.21 and for E-UTRAN TDD - NR FR1 measurements given in TS 36.133 [23] clause 8.1.2.4.22.

8.4.2.4.2 Test applicability

This test applies to all E-UTRA UE release 15 onwards supporting long DRX cycle and capable of NR measurements. Test 1 and Test 2 are applicable to UEs not supporting per-FR gap (IndependentGapConfig, as defined in TS 38.306 [11]) and Test 3 and Test 4 are applicable only to UEs supporting per-FR gap and Gap Pattern Id 4.

8.4.2.4.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 8.4.2.0.2.

The normative reference for this requirement is TS 38.133 [6] clause A.8.4.2.4.

8.4.2.4.4 Test description

The test consists of four sub-tests with two cells configured, the E-UTRA PCell and NR neighbour cell; the difference between the four sub-tests is whether per-FR measurement gap is configured or not and the DRX configuration. Each subtest consists of two successive time periods, with time duration of T1 and T2 respectively. During time duration T1, the UE shall not have any timing information of NR neighbour cell. In measurements configuration UE shall be indicated to report the SSB index of the identified NR cell.

8.4.2.4.4.1 Initial conditions

This test shall be tested using any of the test configurations in Table 8.4.2.4.4.1-1.

Table 8.4.2.4.4.1-1: Supported test configurations for E-UTRA - NR FR1 event-triggered reporting with SSB time index detection in DRX

Configuration	Description
8.4.2.4-1	LTE FDD, NR 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode
8.4.2.4-2	LTE FDD, NR 15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode
8.4.2.4-3	LTE FDD, NR 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode
8.4.2.4-4	LTE TDD, NR 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode
8.4.2.4-5	LTE TDD, NR 15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode
8.4.2.4-6	LTE TDD, NR 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode
NOTE: The UE is only required to be tested in one of the supported test configurations.	

Configure the test requirement and the DUT according to the parameters in Table 8.4.2.4.4.1-2.

Table 8.4.2.4.4.1-2: Initial conditions for E-UTRA - NR FR1 event-triggered reporting with SSB time index detection in DRX

Parameter	Value		Comment
Test environment	NC		As specified in TS 36.508 [25] clause 4.1.
Test frequencies	As specified in Annex E, Table E.6-1 and TS 38.508-1 [14] clause 4.3.1.		
Channel bandwidth	As specified by the test configuration selected from Table 8.4.2.4.4.1-1.		
Propagation conditions	AWGN		As specified in clause C.2.1
Connection Diagram	TE Part	A.3.1.8.2	As specified in TS 38.508-1 [14] Annex A.
	DUT Part	A.3.2.3.4	
Exceptions to connection diagram	N/A		

1. The general test parameter settings are set up according to Table 8.4.2.4.4.1-3.
2. Message contents are defined in clause 8.4.2.4.4.3.
3. There are two carriers and two cells specified in the test, where Cell 1 is the E-UTRA PCell on the E-UTRA carrier and Cell 2 is the NR neighbour cell on the NR carrier. Cell 1 is the cell used for connection setup with the power level set according to Table 8.4.2.4.5-1 for this test. Cell 1 is configured according to clauses C.1.1 and C.1.2.

Table 8.4.2.4.4.1-3: General test parameters for E-UTRA - NR FR1 event-triggered reporting with SSB time index detection in DRX

Parameter	Unit	Test configuration	Value				Comment
			Test 1	Test 2	Test 3	Test 4	
E-UTRA RF Channel Number		1, 2, 3, 4, 5, 6	1				One E-UTRA carrier frequency is used.
NR RF Channel Number		1, 2, 3, 4, 5, 6	1				One FR1 NR carrier frequency is used.
Active cell		1, 2, 3, 4, 5, 6	E-UTRA cell 1 (PCell)				E-UTRA cell 1 is on E-UTRA RF channel number 1.
Neighbour cell		1, 2, 3, 4, 5, 6	NR cell 2				NR cell 2 is on NR RF channel number 1.
Gap Pattern Id		1, 2, 3, 4, 5, 6	0		4		As specified in clause Table 8.1.2.1-1 of TS 36.133 [23].
Measurement gap offset		1, 2, 3, 4, 5, 6	39		19		As specified in TS 36.331 [29].
b2-Threshold1	dBm	1, 2, 3, 4, 5, 6	Note 1				E-UTRA RSRP threshold for E-UTRA RSRP measurement on cell 1 for event B2 [29]

b2-Threshold2NR	dBm	1, 2, 3, 4, 5, 6	Note 2					SS-RSRP threshold for SS-RSRP measurement on cell 2 for event B2 [29]
Hysteresis	dB	1, 2, 3, 4, 5, 6	0					
CP length		1, 2, 3, 4, 5, 6	Normal					
TimeToTrigger	s	1, 2, 3, 4, 5, 6	0					
Filter coefficient		1, 2, 3, 4, 5, 6	0					L3 filtering is not used
DRX		1, 2, 3, 4, 5, 6	DRX.9	DRX.12	DRX.9	DRX.12		As specified in clause A.5
Time offset between serving and neighbour cells		1, 4	3ms					Asynchronous cells. The timing of Cell 2 is 3ms later than the timing of Cell 1.
		2, 3, 5, 6	3μs					Synchronous cells.
T1	s	1, 2, 3, 4, 5, 6	5					
T2	s	1, 2, 3, 4, 5, 6	2	13	2	13		
NOTE 1: The value of b2-Threshold1 is defined in Table 8.4.2.4.5-1. NOTE 2: The value of b2-Threshold2NR is defined in Table 8.4.2.4.5-2.								

8.4.2.4.4.2 Test procedure

Two cells are deployed in the test, which are E-UTRA PCell (Cell 1) on the E-UTRA carrier and a FR1 NR neighbour cell (Cell 2) on NR carrier. The general and cell specific test parameters for PCell and neighbour cell are given in Table 8.4.2.4.4.1-3, 8.4.2.4.5-1 and 8.4.2.4.5-2, respectively.

In sub-test 1 and sub-test 2 measurement gap pattern configuration #0 as defined in Table 8.4.2.4.4.1-3 is provided for UE that does not support per-FR gap and in sub-test 3 and sub-test 4 measurement gap pattern configuration #4 as defined in Table 8.4.2.4.4.1-3 is provided for UE that supports per-FR gap.

DRX cycle = 40 ms is used in sub-test 1 and sub-test 3, DRX cycle = 640 ms is used in sub-test 2 and sub-test 4. The UE is allocated with PUSCH resource at every DRX cycle.

In the measurement control information, it is indicated to the UE that event-triggered reporting with Event B2 is used. The test consists of two successive time periods, with time duration of T1 and T2 respectively. During time duration T1, the UE shall not have any timing information of NR cell 2.

1. Ensure the UE is in State 3A-RF according to TS 36.508 clause 7.2A.3.
2. Set the parameters of Cell 1 and Cell 2 according to T1 in Table 8.4.2.4.5-1 and Table 8.4.2.4.5-2 respectively, T1 starts.
3. The SS shall transmit an *RRCConnectionReconfiguration* message.
4. The UE shall transmit *RRCConnectionReconfigurationComplete* message.
5. When T1 expires, the SS shall switch the parameters setting from T1 to T2 as specified in Table 8.4.2.4.5-1 and Table 8.4.2.4.5-2 respectively. T2 Starts.
6. UE shall transmit a *MeasurementReport* message triggered by Event B2. If the overall delays measured from the beginning of time period T2 is less than X ms then the number of successful tests is increased by one. If the UE fails to report the event within the overall delays measured requirement then the number of failure tests is increased by one. Where X is,
   - 1282 for sub-test 1 and sub-test 3,
   - 12162 for sub-test 2 and sub-test 4.
7. . After the SS receive the *MeasurementReport* message in step 6) or when T2 expires, the SS shall:
   - transmit an *RRCConnectionRelease* message to release the RRC connection which includes the release of the established radio bearers as well as all radio resources, or
   - switch off the UE.
8. Set Cell 2 physical cell identity = ((current Cell 2 physical cell identity + 1) mod 14 + 2) for next iteration of the test procedure loop.

9. The SS:

   - transmits in Cell 1 a Paging message (including PagingRecord with UE-Identity) for the UE and ensures the UE is in State 3A according to TS 36.508 [25] clause 4.5.3A (if the paging fails, switches off and on the UE and ensures the UE is in State 3A-RF according to TS 36.508 [25] clause 7.2A.3); or

   - switches on the UE and ensures the UE is in State 3A-RF according to TS 36.508 [25] clause 7.2A.3.

10. Repeat step 2-9 until the confidence level according to Tables G.2.3-1 in Annex G clause G.2 is achieved.

8.4.2.4.4.3 Message contents

Message contents are according to TS 36.508 [25] clause 7.3 with the following exceptions:

Table 8.4.2.4.4.3-1: Common Exception messages for E-UTRA - NR FR1 event-triggered reporting with SSB time index detection in DRX

Default Message Contents	
Common contents of system information blocks exceptions	
Default RRC messages and information elements contents exceptions	Table H.3.4-7 with Condition Inter-RAT and EVENT B2; Table H.3.4-4 with Condition INTER-RAT NR, EVENT B2 for Test 1 and Test 2; Table H.3.4-4 with Condition INTER-RAT NR, EVENT B2 for Test 3 and Test 4; Table H.3.4-5 with Condition Pattern #0 for Test 1 and Test 2; Table H.3.4-5 with Condition Pattern #4 for Test 3 and Test 4; Table H.3.4-8 with Condition SSB-Index Table H.3.7-2 with Condition DRX.9 and Gap for Test 1 and Test 3 Table H.3.7-2 with Condition DRX.12 and Gap for Test 2 and Test 4
Specific message contents exceptions for Test Configuration 8.4.2.4-1 and 8.4.2.4-4	Table H.3.4-6 with Conditions SMTC.2, SSB.1 FR1 and Asynchronous cells
Specific message contents exceptions for Test Configuration 8.4.2.4-2 and 8.4.2.4-5	Table H.3.4-6 with Conditions SMTC.1, SSB.1 FR1 and Synchronous cells
Specific message contents exceptions for Test Configuration 8.4.2.4-3 and 8.4.2.4-6	Table H.3.4-6 with Conditions SMTC.1, SSB.2 FR1 and Synchronous cells

Table 8.4.2.4.4.3-2: SchedulingRequest-Config-DEFAULT

Derivation Path: 36.508 [25] Table 4.6.3-20			
Information Element	**Value/remark**	**Comment**	**Condition**
SchedulingRequest-Config-DEFAULT ::= CHOICE {			
setup SEQUENCE {			
sr-ConfigIndex	25		Config 8.4.2.4-1/2/3
	22		Config 8.4.2.4-4/5/6
}			
}			

8.4.2.4.5 Test requirement

Table 8.4.2.4.4.1-3, 8.4.2.4.5-1 and 8.4.2.4.5-2 define the primary level settings including test tolerances for E-UTRA - NR FR1 event-triggered reporting with SSB time index detection in DRX.

Table 8.4.2.4.5-1: E-UTRAN PCell specific test parameters for E-UTRA - NR FR1 event-triggered reporting with SSB time index detection in DRX

Parameter	Unit	Configuration	Cell 1	
			T1	T2
RF channel number		1, 2, 3, 4, 5, 6	1	
Duplex mode		1, 2, 3	FDD	
		4, 5, 6	TDD	
TDD special subframe configuration[Note1]		4, 5, 6	6	
TDD uplink-downlink configuration[Note1]		4, 5, 6	1	
$BW_{channel}$	MHz	1, 2, 3, 4, 5, 6	5 MHz: $N_{RB,c}$ = 25 10 MHz: $N_{RB,c}$ = 50 20 MHz: $N_{RB,c}$ = 100	
PDSCH parameters: DL Reference Measurement Channel[Note2]		1, 2, 3	5 MHz: R.7 FDD 10 MHz: R.3 FDD 20 MHz: R.6 FDD	
		4, 5, 6	5 MHz: R.4 TDD 10 MHz: R.0 TDD 20 MHz: R.3 TDD	
PCFICH/PDCCH/PHICH parameters: DL Reference Measurement Channel[Note2]		1, 2, 3	5 MHz: R.11 FDD 10 MHz: R.6 FDD 20 MHz: R.10 FDD	
		4, 5, 6	5 MHz: R.11 TDD 10 MHz: R.6 TDD 20 MHz: R.10 TDD	
OCNG Patterns[Note2]		1, 2, 3	5 MHz: OP.20 FDD 10 MHz: OP.10 FDD 20 MHz: OP.17 FDD	
		4, 5, 6	5 MHz: OP.9 TDD 10 MHz: OP.1 TDD 20 MHz: OP.7 TDD	
b2-Threshold1	dBm	1, 2, 3, 4, 5, 6	-77	
PBCH_RA	dB	1, 2, 3, 4, 5, 6	0	
PBCH_RB				
PSS_RA				
SSS_RA				
PCFICH_RB				
PHICH_RA				
PHICH_RB				
PDCCH_RA				
PDCCH_RB				
PDSCH_RA				
PDSCH_RB				
OCNG_RA[Note3]				
OCNG_RB[Note3]				
N_{oc}[Note4]	dBm/15kHz	1, 2, 3, 4, 5, 6	-104	
$\hat{E}_s/N_{oc}$	dB	1, 2, 3, 4, 5, 6	17	15.35
$\hat{E}_s/I_{ot}$[Note5]	dB	1, 2, 3, 4, 5, 6	17	15.35
RSRP[Note5]	dBm/15kHz	1, 2, 3, 4, 5, 6	-87	-88.65
SCH_RP[Note5]	dBm/15kHz	1, 2, 3, 4, 5, 6	-87	-88.65
Io[Note5]	dBm/9MHz	1, 2, 3, 4, 5, 6	-59.13+10log ($N_{RB,c}$ /50)	-60.74+10log ($N_{RB,c}$ /50)
Propagation Condition [Note6]		1, 2, 3, 4, 5, 6	ETU70	
Antenna Configuration and Correlation Matrix [Note6]		1, 2, 3, 4, 5, 6	1x2 Low	

NOTE 1: Special subframe and uplink-downlink configurations are specified in table 4.2-1 in TS 36.211 [24].
NOTE 2: DL RMCs and OCNG patterns are specified in clauses A 3.1 and A 3.2 of TS 36.133 [23] respectively.
NOTE 3: OCNG shall be used such that all cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.
NOTE 4: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for N_{oc} to be fulfilled.
NOTE 5: $\hat{E}_s/I_{ot}$, RSRP, SCH_RP and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.
NOTE 6: Propagation condition and correlation matrix are defined in clause B.2 in TS 36.101 [27].

Table 8.4.2.4.5-2: NR neighbour cell specific test parameters for E-UTRA - NR FR1 event-triggered reporting with SSB time index detection in DRX

Parameter	Unit	Test configuration	Cell 2	
			T1	T2
NR RF Channel Number		1, 2, 3, 4, 5, 6	1	
Duplex mode		1, 4	FDD	
		2, 3, 5, 6	TDD	
TDD configuration		2, 5	TDDConf.1.1	
		3, 6	TDDConf.2.1	
$BW_{channel}$	MHz	1, 2, 4, 5	10: $N_{RB,c}$ = 52	
		3, 6	40: $N_{RB,c}$ = 106	
OCNG Patterns		1, 2, 3, 4, 5, 6	OP.1	
SMTC configuration		1, 4	SMTC.2	
		2, 3, 5, 6	SMTC.1	
PDSCH/PDCCH subcarrier spacing	kHz	1, 2, 4, 5	15	
		3, 6	30	
b2-Threshold2NR	dBm/SCS	1, 2, 4, 5	-101	
		3, 6	-98	
EPRE ratio of PSS to SSS		1, 2, 3, 4, 5, 6	0	
EPRE ratio of PBCH DMRS to SSS				
EPRE ratio of PBCH to PBCH DMRS				
EPRE ratio of PDCCH DMRS to SSS				
EPRE ratio of PDCCH to PDCCH DMRS				
EPRE ratio of PDSCH DMRS to SSS				
EPRE ratio of PDSCH to PDSCH				
EPRE ratio of OCNG DMRS to SSS (Note 1)				
EPRE ratio of OCNG to OCNG DMRS (Note 1)				
N_{oc} Note2	dBm/15kHz	1, 2, 3, 4, 5, 6	-98	
N_{oc} Note2	dBm/SCS	1, 2, 4, 5	-98	
		3, 6	-95	
SS-RSRP Note 3	dBm/SCS	1, 2, 4, 5	-Infinity	-89.35
		3, 6	-Infinity	-86.34
$\hat{E}_s/I_{ot}$	dB	1, 2, 3, 4, 5, 6	-Infinity	8.65
$\hat{E}_s/N_{oc}$	dB	1, 2, 3, 4, 5, 6	-Infinity	8.65
Io Note3	dBm/9.36MHz	1, 2, 4, 5	-70.05	-60.84
	dBm/38.16MHz	3, 6	-63.95	-54.74
Propagation Condition		1, 2, 3, 4, 5, 6	TDL-C 300ns 100Hz	
Antenna Configuration and Correlation Matrix		1, 2, 3, 4, 5, 6	1x2 Low	

NOTE 1: OCNG shall be used such that the cell is fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.
NOTE 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for N_{oc} to be fulfilled.
NOTE 3: SS-RSRP and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.
NOTE 4: SS-RSRP minimum requirements are specified assuming independent interference and noise at each receiver antenna port.

In test 1 with per-UE gap, the UE shall send one Event B2 triggered measurement report, with a measurement reporting delay less than 1282 ms from the beginning of time period T2. The UE shall not send event triggered measurement reports, as long as the reporting criteria are not fulfilled. The rate of correct events observed during repeated tests shall be at least 90%.

In test 2 with per-UE gap, the UE shall send one Event B2 triggered measurement report, with a measurement reporting delay less than 12162 ms from the beginning of time period T2. The UE shall not send event triggered measurement reports, as long as the reporting criteria are not fulfilled. The rate of correct events observed during repeated tests shall be at least 90%.

In test 3 with per-FR gap, the UE shall send one Event B2 triggered measurement report, with a measurement reporting delay less than 1282 ms from the beginning of time period T2. The UE shall not send event triggered measurement reports, as long as the reporting criteria are not fulfilled. The rate of correct events observed during repeated tests shall be at least 90%.

In test 4 with per-FR gap, the UE shall send one Event B2 triggered measurement report, with a measurement reporting delay less than 12162 ms from the beginning of time period T2. The UE shall not send event triggered measurement reports, as long as the reporting criteria are not fulfilled. The rate of correct events observed during repeated tests shall be at least 90%.

In tests 1, 2, 3 and 4, the UE is required to report SSB time index.

NOTE: The overall delay requirement is defined as the delay requirement in TS 38.133 plus 2 ms corresponding to the TTI insertion uncertainty of the measurement report in DCCH.

8.4.2.5 E-UTRA event-triggered reporting of a NR FR2 neighbour cell without SSB time index detection in non-DRX

Editor's Note: This test case has been completed for the following configurations:

- *Test frequency f ≤ 40.8 GHz*
- *UE PC3*
- *The test is incomplete for UE power classes other than PC3*
- *The test is incomplete for test frequencies > 40.8 GHz*
- *E-UTRA – NR FR2 testability issue is not cleared*

8.4.2.5.1 Test purpose

To verify the UE's ability to make a correct reporting of an event without SSB time index detection in non-DRX within E-UTRA - NR FR2 cell search requirements.

8.4.2.5.2 Test applicability

This test applies to all E-UTRA UE release 15 onwards and capable of NR FR2 measurements. Test 1 is applicable to UEs not supporting per-FR gap (IndependentGapConfig, as defined in TS 38.306 [11]) and Test 2 is applicable only to UEs supporting Gap Pattern Id 4.

8.4.2.5.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 8.4.2.0.1.

The normative reference for this requirement is TS 38.133 [6] clause A.8.4.2.5.

8.4.2.5.4 Test description

8.4.2.5.4.1 Initial conditions

This test shall be tested using any of the test configurations in Table 8.4.2.5.4.1-1.

Table 8.4.2.5.4.1-1: NR inter-RAT event triggered reporting tests without SSB index reading for FR2 in non-DRX

Configuration	Description
8.4.2.5-1	LTE FDD, NR 120 kHz SSB SCS, 100 MHz bandwidth, TDD duplex mode
8.4.2.5-2	LTE TDD, NR 120 kHz SSB SCS, 100 MHz bandwidth, TDD duplex mode
NOTE: The UE is only required to be tested in one of the supported test configurations.	

Configure the test requirement and the DUT according to the parameters in Table 8.4.2.5.4.1-2.

Table 8.4.2.5.4.1-2: Initial conditions for E-UTRA - NR FR2 event-triggered reporting without SSB time index detection in non-DRX

Parameter	Value		Comment
Test environment	NC		As specified in TS 36.508 [25] clause 4.1.
Test frequencies	As specified in Annex E, Table E.6-1 and TS 38.508-1 [14] clause 4.3.1.		
Channel bandwidth	As specified by the test configuration selected from Table 8.4.2.5.4.1-1.		
Propagation conditions	AWGN		As specified in clause C.2.1
Connection Diagram	TE Part	A.3.3.3.1	As specified in TS 38.508-1 [14] Annex A.
	DUT Part	A.3.4.1.1	
Exceptions to connection diagram	N/A		

1. The general test parameter settings are set up according to Table 8.4.2.5.4.1-3.
2. Message contents are defined in clause 8.4.2.5.4.3.
3. There are two carriers and two cells specified in the test, where Cell 1 is the E-UTRA PCell on the E-UTRA carrier and Cell 2 is the NR FR2 neighbour cell on the NR carrier. Cell 1 is the cell used for connection setup with the power level set according to clause A.6.1.2 for this test.

Table 8.4.2.5.4.1-3: General test parameters for NR inter-RAT event triggered reporting for FR2 without SSB time index detection in non-DRX

Parameter	Unit	Test configuration	Value		Comment
			Test 1	Test 2	
E-UTRA RF Channel Number		1, 2	1		One E-UTRA carrier frequency is used.
NR RF Channel Number		1, 2	1		One FR2 NR carrier frequency is used.
Active cell		1, 2	E-UTRA cell 1 (PCell)		E-UTRA cell 1 is on E-UTRA RF channel number 1 as defined in clause A.6.1.2.
Neighbour cell		1, 2	NR cell 2		NR cell 2 is on NR RF channel number 1.
Gap Pattern Id		1, 2	0	4	As specified in clause Table 8.1.2.1-1 of TS 36.133 [23].
Measurement gap offset		1, 2	39	19	As specified in TS 36.331 [29].
b1-ThresholdNR	dBm	1, 2	Note 1		SS-RSRP threshold for SS-RSRP measurement on cell 2 for event B1 [29].
Hysteresis	dB	1, 2	0		
CP length		1, 2	Normal		
TimeToTrigger	s	1, 2	0		
Filter coefficient		1, 2	0		L3 filtering is not used.
DRX		1, 2	OFF		DRX is not used.
Time offset between serving and neighbour cells		1	3ms		Asynchronous cells. The timing of Cell 2 is 3ms later than the timing of Cell 1.
		2	3μs		Synchronous cells.
T1	s	1, 2	10		
T2	s	1, 2	6	3	
NOTE: The value of b1-ThresholdNR is defined in Table 8.4.2.5.5-1.					

8.4.2.5.4.2 Test procedure

In test 1 measurement gap pattern configuration # 0 as defined in Table 8.4.2.5.4.1-3 is provided for UE that does not support per-FR gap and in test 2 measurement gap pattern configuration #4 as defined in Table 8.4.2.5.4.1-3 is provided for UE that supports per-FR gap.

In the measurement control information, it is indicated to the UE that event-triggered reporting with Event B1 (Inter RAT neighbour becomes better than threshold) [29] is used. The test consists of two successive time periods, with time duration of T1, and T2 respectively. During time duration T1, the UE shall not have timing information of NR cell 2.

1. Ensure the UE is in State 3A-RF according to TS 36.508 [25] clause 7.2A.3.
2. Set the parameters of Cell 1 and Cell 2 according to Table A.6.1.2-1 and T1 in Table 8.4.2.5.5-1 respectively, T1 starts.
3. The SS shall transmit an *RRCConnectionReconfiguration* message.
4. The UE shall transmit an *RRCConnectionReconfigurationComplete* message.
5. When T1 expires, the SS shall switch the parameters setting from T1 to T2 as specified in Table 8.4.2.5.5-1. T2 Starts.
6. UE shall transmit a *MeasurementReport* message triggered by Event B1. If the overall delays measured from the beginning of time period T2 is less than X ms then the number of successful tests is increased by one. If the UE fails to report the event within the overall delays measured requirement then the number of failure tests is increased by one. Where X is,
   - 3200 for sub-test 1,
   - 1600 for sub-test 2.
7. . After the SS receive the *MeasurementReport* message in step 6) or when T2 expires, the SS shall:
   - transmit an *RRCConnectionRelease* message to release the RRC connection which includes the release of the established radio bearers as well as all radio resources, or
   - switch off the UE.
8. Set Cell 2 physical cell identity = ((current Cell 2 physical cell identity + 1) mod 1008) for next iteration of the test procedure loop.
9. The SS:
   - transmits in Cell 1 a Paging message (including PagingRecord with UE-Identity) for the UE and ensures the UE is in State 3A according to TS 36.508 clause 4.5.3A (if the paging fails, switches off and on the UE and ensures the UE is in State 3A-RF according to TS 36.508 [25] clause 7.2A.3); or
   - switches on the UE and ensures the UE is in State 3A-RF according to TS 36.508 [25] clause 7.2A.3.
10. Repeat step 2-9 until the confidence level according to Tables G.2.3-1 in Annex G clause G.2 is achieved.

8.4.2.5.4.3 Message contents

Message contents are according to TS 36.508 [25] clause 7.3 with the following exceptions:

Table 8.4.2.5.4.3-1: Common Exception messages for E-UTRA - NR FR2 event-triggered reporting without SSB time index detection in non-DRX

Default Message Contents	
Common contents of system information blocks exceptions	
Default RRC messages and information elements contents exceptions	Table H.3.4-1a; Table H.3.4-4 with Condition INTER-RAT NR, EVENT B1 for Test 1; Table H.3.4-4 with Condition INTER-RAT NR, EVENT B1 and GAPLESS for Test 2; Table H.3.4-5 with Condition Pattern #0 for Test 1; Table H.3.4-5 with Condition Pattern #4 for Test 2;
Specific message contents exceptions for Test Configuration 8.4.2.5-1	Table H.3.4-6 with Conditions SMTC.2, SSB.3 FR2 and Asynchronous cells
Specific message contents exceptions for Test Configuration 8.4.2.5-2	Table H.3.4-6 with Conditions SMTC.1, SSB.3 FR2 and Synchronous cells

Table 8.4.2.5.4.3-2: SchedulingRequest-Config-DEFAULT

Derivation Path: 36.508 [25] Table 4.6.3-20

Information Element	Value/remark	Comment	Condition
SchedulingRequest-Config-DEFAULT ::= CHOICE {			
setup SEQUENCE {			
sr-ConfigIndex	25		Config 8.4.2.5-1/2/3
	22		Config 8.4.2.5-4/5/6
}			
}			

8.4.2.5.5 Test requirement

Tables 8.4.2.5.4.1-3 and 8.4.2.5.5-1 define the primary level settings including test tolerances for E-UTRA - NR FR2 event-triggered reporting without SSB time index detection in non-DRX.

Table 8.4.2.5.5-1: NR neighbour cell specific test parameters for NR inter-RAT event triggered reporting for FR2 without SSB time index detection in non-DRX

Parameter	Unit	Test configuration	Cell 2	
			T1	T2
AoA setup defined in A.3.15.2.1		1, 2	Setup 2a	
Assumption for UE beams Note 5		1, 2	Rough	
NR RF Channel Number		1, 2	1	
Duplex mode		1, 2	TDD	
TDD configuration		1, 2	TDDConf.3.1	
$BW_{channel}$	MHz	1, 2	100: $N_{RB,c}$ = 66	
OCNG patterns defined in A.3.2.1.1		1, 2	OP. 3	
SMTC configuration defined in A.3.11.1 and A.3.11.2		1	SMTC.2	
		2	SMTC.1	
PDSCH/PDCCH subcarrier spacing	kHz	1, 2	120	
b1-ThresholdNR UE power class 3	dBm/SCS	1, 2	-112	
EPRE ratio of PSS to SSS		1, 2	0	
EPRE ratio of PBCH DMRS to SSS				
EPRE ratio of PBCH to PBCH DMRS				
EPRE ratio of PDCCH DMRS to SSS				
EPRE ratio of PDCCH to PDCCH DMRS				
EPRE ratio of PDSCH DMRS to SSS				
EPRE ratio of PDSCH to PDSCH				
EPRE ratio of OCNG DMRS to SSS (Note 1)				
EPRE ratio of OCNG to OCNG DMRS (Note 1)				
N_{oc} $\hat{E}_s$	dBm/SCS	1, 2	- Infinity	-80.6
SS B_RP Note 3	dBm/SCS	1, 2	-Infinity	-80.6
$\hat{E}_s / I_{ot}$ BB Note 6	dB	1, 2	-Infinity	8.3
Io Note3	dBm/95.04MHz	1, 2	-Infinity	-56.0
Propagation Condition		1, 2	AWGN	

Note 1:	OCNG shall be used such that a constant total transmitted power spectral density is achieved for all OFDM symbols.
Note 2:	Void
Note 3:	SS B_RP and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.
Note 4:	Void
Note 5:	Information about types of UE beam is given in B.2.1.3, and does not limit UE implementation or test system implementation
Note 6:	Calculation of Es/Iot_{BB} includes the effect of UE internal noise up to the value assumed for the associated Refsens requirement in clause 7.3.2 of TS 38.101-2 [19], and an allowance of 1dB for UE multi-band relaxation factor ΔMB_P from TS 38.101-2 [19] Table 6.2.1.3-4.

Table 8.4.2.5.5-2: Test requirements for NR inter-RAT event triggered reporting for FR2 without SSB time index detection in non-DRX

Test case	Measurement reporting delay (ms)	
	Test 1: D1 ms	Test 2: D2 ms
UE power class 3	3200	1600

NOTE: The actual overall delays measured in the test may be up to $2xTTI_{DCCH}$ higher than the measurement reporting delays above because of TTI insertion uncertainty of the measurement report in DCCH.

In test 1 with per-UE gap, the UE shall send one Event B1 triggered measurement report, with a measurement reporting delay less than D1 ms from the beginning of time period T2. The UE shall not send event triggered measurement reports, as long as the reporting criteria are not fulfilled. The rate of correct events observed during repeated tests shall be at least 90%.

In test 2 with per-FR gap, the UE shall send one Event B1 triggered measurement report, with a measurement reporting delay less than D2 ms from the beginning of time period T2. The UE shall not send event triggered measurement reports, as long as the reporting criteria are not fulfilled. The rate of correct events observed during repeated tests shall be at least 90%.

In test 1 and test 2, the UE is not required to report SSB time index.

8.4.2.6 E-UTRA event-triggered reporting of a NR FR2 neighbour cell without SSB time index detection in DRX

Editor's Note: This test case has been completed for the following configurations:

- *Test frequency f ≤ 40.8 GHz*
- *UE PC3*
- *The test is incomplete for UE power classes other than PC3*
- *The test is incomplete for test frequencies > 40.8 GHz*
- *E-UTRA – NR FR2 testability issue is not cleared*

8.4.2.6.1 Test purpose

To verify the UE's ability to make a correct reporting of an event without SSB time index detection in DRX within E-UTRA - NR FR2 cell search requirements.

8.4.2.6.2 Test applicability

This test applies to all E-UTRA UE release 15 onwards supporting long DRX cycle and capable of NR FR2 measurements. Test 1 and Test 2 is applicable to UEs not supporting per-FR gap (IndependentGapConfig, as defined in TS 38.306 [11]) and Test 3 and Test 4 are applicable only to UEs supporting Gap Pattern Id 4.

8.4.2.6.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 8.4.2.0.1.

The normative reference for this requirement is TS 38.133 [6] clause A.8.4.2.6.

8.4.2.6.4 Test description

8.4.2.6.4.1 Initial conditions

This test shall be tested using any of the test configurations in Table 8.4.2.6.4.1-1.

Table 8.4.2.6.4.1-1: NR inter-RAT event triggered reporting tests without SSB index reading for FR2 in DRX

Configuration	Description
8.4.2.6-1	LTE FDD, NR 120 kHz SSB SCS, 100 MHz bandwidth, TDD duplex mode
8.4.2.6-2	LTE TDD, NR 120 kHz SSB SCS, 100 MHz bandwidth, TDD duplex mode
NOTE: The UE is only required to be tested in one of the supported test configurations.	

Configure the test requirement and the DUT according to the parameters in Table 8.4.2.6.4.1-2.

Table 8.4.2.6.4.1-2: Initial conditions for E-UTRA - NR FR2 event-triggered reporting without SSB time index detection in DRX

Parameter	Value		Comment
Test environment	NC		As specified in TS 36.508 [25] clause 4.1.
Test frequencies	As specified in Annex E, Table E.6-1 and TS 38.508-1 [14] clause 4.3.1.		
Channel bandwidth	As specified by the test configuration selected from Table 8.4.2.6.4.1-1.		
Propagation conditions	AWGN		As specified in clause C.2.1
Connection Diagram	TE Part	A.3.3.3.1	As specified in TS 38.508-1 [14] Annex A.
	DUT Part	A.3.4.1.1	
Exceptions to connection diagram	N/A		

1. The general test parameter settings are set up according to Table 8.4.2.6.4.1-3.
2. Message contents are defined in clause 8.4.2.6.4.3.
3. There are two carriers and two cells specified in the test, where Cell 1 is the E-UTRA PCell on the E-UTRA carrier and Cell 2 is the NR FR2 neighbour cell on the NR carrier. Cell 1 is the cell used for connection setup with the power level set according to clause A.6.1.2 for this test.

Table 8.4.2.6.4.1-3: General test parameters for NR inter-RAT event triggered reporting for FR2 without SSB time index detection in DRX

Parameter	Unit	Test configuration	Value				Comment
			Test 1	Test 2	Test 3	Test 4	
E-UTRA RF Channel Number		1, 2	1				One E-UTRA carrier frequency is used.
NR RF Channel Number		1, 2	1				One FR2 NR carrier frequency is used.
Active cell		1, 2, 3, 4, 5, 6	E-UTRA cell 1 (PCell)				E-UTRA cell 1 is on E-UTRA RF channel number 1 as defined in clause A.6.1.2.
Neighbour cell		1, 2, 3, 4, 5, 6	NR cell 2				NR cell 2 is on NR RF channel number 1.
Gap Pattern Id		1, 2, 3, 4, 5, 6	0		4		As specified in clause Table 8.1.2.1-1 of TS 36.133 [23].
Measurement gap offset		1, 2, 3, 4, 5, 6	39		19		As specified in TS 36.331 [29].

b1-ThresholdNR	dBm	1, 2	Note 1					SS-RSRP threshold for SS-RSRP measurement on cell 2 for event B1 [29].
Hysteresis	dB	1, 2, 3, 4, 5, 6	0					
CP length		1, 2, 3, 4, 5, 6	Normal					
TimeToTrigger	s	1, 2, 3, 4, 5, 6	0					
Filter coefficient		1, 2, 3, 4, 5, 6	0					L3 filtering is not used.
DRX		1, 2, 3, 4, 5, 6	DRX.9	DRX.12	DRX.9	DRX.12		As specified in clause A.3.3.
Time offset between serving and neighbour cells		1	3ms					Asynchronous cells. The timing of Cell 2 is 3ms later than the timing of Cell 1.
		2	3μs					Synchronous cells.
T1	s	1, 2, 3, 4, 5, 6	5					
T2	s	1, 2, 3, 4, 5, 6	6	83	6	83		
NOTE: The value of b1-ThresholdNR is defined in Table 8.4.2.6.5-1.								

8.4.2.6.4.2 Test procedure

In tests 1 and 2, measurement gap pattern configuration # 0 as defined in Table 8.4.2.6.4.1-3 is provided for UE that does not support per-FR gap and in tests 3 and 4, measurement gap pattern configuration #4 as defined in Table 8.4.2.6.4.1-3 is provided for UE that supports per-FR gap.

In the measurement control information, it is indicated to the UE that event-triggered reporting with Event B1 (Inter RAT neighbour becomes better than threshold) [29] is used. In the measurement configuration the UE shall be indicated to report the SSB index of the identified NR cell. The test consists of two successive time periods, with time duration of T1, and T2 respectively. During time duration T1, the UE shall not have timing information of NR cell 2.

1. Ensure the UE is in State 3A-RF according to TS 36.508 [25] clause 7.2A.3.
2. Set the parameters of Cell 1 and Cell 2 according to Table A.6.1.2-1 and T1 in Table 8.4.2.6.5-1 respectively, T1 starts.
3. The SS shall transmit an *RRCConnectionReconfiguration* message.
4. The UE shall transmit an *RRCConnectionReconfigurationComplete* message.
5. When T1 expires, the SS shall switch the parameters setting from T1 to T2 as specified in Table 8.4.2.6.5-1. T2 Starts.
6. UE shall transmit a *MeasurementReport* message triggered by Event B1. If the overall delays measured from the beginning of time period T2 is less than X ms then the number of successful tests is increased by one. If the UE fails to report the event within the overall delays measured requirement then the number of failure tests is increased by one. Where X is,
   - 4800 for sub-test 1 and sub-test 3,
   - 51200 for sub-test 2 and sub-test 4.
7. After the SS receive the *MeasurementReport* message in step 6) or when T2 expires, the SS shall:
   - transmit an *RRCConnectionRelease* message to release the RRC connection which includes the release of the established radio bearers as well as all radio resources, or
   - switch off the UE
8. Set Cell 2 physical cell identity = ((current Cell 2 physical cell identity + 1) mod 1008) for next iteration of the test procedure loop.
9. The SS:
   - transmits in Cell 1 a Paging message (including PagingRecord with UE-Identity) for the UE and ensures the UE is in State 3A according to TS 36.508 [25] clause 4.5.3A (if the paging fails, switches off and on the UE and ensures the UE is in State 3A-RF according to TS 36.508 [25] clause 7.2A.3); or
   - switches on the UE and ensures the UE is in State 3A-RF according to TS 36.508 [25] clause 7.2A.3.

10. Repeat step 2-9 until the confidence level according to Tables G.2.3-1 in Annex G clause G.2 is achieved.

8.4.2.6.4.3 Message contents

Message contents are according to TS 36.508 [25] clause 7.3 with the following exceptions:

Table 8.4.2.6.4.3-1: Common Exception messages for E-UTRA - NR FR2 event-triggered reporting without SSB time index detection in DRX

Default Message Contents	
Common contents of system information blocks exceptions	
Default RRC messages and information elements contents exceptions	Table H.3.4-1a; Table H.3.4-4 with Condition INTER-RAT NR, EVENT B1 for Test 1 and Test 2; Table H.3.4-4 with Condition INTER-RAT NR, EVENT B1 and GAPLESS for Test 3 and Test 4; Table H.3.4-5 with Condition Pattern #0 for Test 1 and Test 2; Table H.3.4-5 with Condition Pattern #4 for Test 3 and Test 4; Table H.3.7-2 with Condition DRX.9 for Test 1 and Test 3 Table H.3.7-2 with Condition DRX.12 for Test 2 and Test 4
Specific message contents exceptions for Test Configuration 8.4.2.6-1	Table H.3.4-6 with Conditions SMTC.2, SSB.3 FR2 and Asynchronous cells
Specific message contents exceptions for Test Configuration 8.4.2.6-2	Table H.3.4-6 with Conditions SMTC.1, SSB.3 FR2 and Synchronous cells

Table 8.4.2.6.4.3-2: SchedulingRequest-Config-DEFAULT

Derivation Path: 36.508 [25] Table 4.6.3-20			
Information Element	**Value/remark**	**Comment**	**Condition**
SchedulingRequest-Config-DEFAULT ::= CHOICE {			
setup SEQUENCE {			
sr-ConfigIndex	25		Config 8.4.2.6-1/2/3
	22		Config 8.4.2.6-4/5/6
}			
}			

8.4.2.6.5 Test requirement

Tables 8.4.2.6.4.1-3 and 8.4.2.6.5-1 define the primary level settings including test tolerances for E-UTRA - NR FR2 event-triggered reporting without SSB time index detection in DRX.

Table 8.4.2.6.5-1: NR neighbour cell specific test parameters for NR inter-RAT event triggered reporting for FR2 without SSB time index detection in DRX

Parameter		Unit	Test configuration	Cell 2	
				T1	T2
AoA setup defined in A.3.15.1			1, 2	Setup 1	
Assumption for UE beams[Note 5]			1, 2	Rough	
NR RF Channel Number			1, 2	1	
Duplex mode			1, 2	TDD	
TDD configuration			1, 2	TDDConf.3.1	
$BW_{channel}$		MHz	1, 2	100: $N_{RB,c}$ = 66	
OCNG patterns defined in A.3.2.1.1 (OP.1)			1, 2	OP.1	
SMTC configuration defined in A.3.11.1 and A.3.11.2			1	SMTC.2	
			2	SMTC.1	
PDSCH/PDCCH subcarrier spacing		kHz	1, 2	120	
b1-ThresholdNR	UE power class 3	dBm/SCS	1, 2	-106	

EPRE ratio of PSS to SSS		1, 2	0	
EPRE ratio of PBCH DMRS to SSS				
EPRE ratio of PBCH to PBCH DMRS				
EPRE ratio of PDCCH DMRS to SSS				
EPRE ratio of PDCCH to PDCCH DMRS				
EPRE ratio of PDSCH DMRS to SSS				
EPRE ratio of PDSCH to PDSCH				
EPRE ratio of OCNG DMRS to SSS (Note 1)				
EPRE ratio of OCNG to OCNG DMRS (Note 1)				
N_{oc} Note2	dBm/15kHz	1, 2	-104.7	
N_{oc} Note2	dBm/SCS	1, 2	-95.7	
SS-RSRP Note 3	dBm/SCS	1, 2	-Infinity	-87.7
$\hat{E}_s/I_{ot}$	dB	1, 2	-Infinity	8
$\hat{E}_s/N_{oc}$	dB	1, 2	-Infinity	8
Io Note3	dBm/95.04MHz	1, 2	-66.7	-58.0
Propagation Condition		1, 2	AWGN	

Note 1: OCNG shall be used such that the cell is fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.

Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for N_{oc} to be fulfilled.

Note 3: SS-RSRP and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.

Note 4: SS-RSRP minimum requirements are specified assuming independent interference and noise at each receiver antenna port.

Note 5: Information about types of UE beam is given in B.2.1.3, and does not limit UE implementation or test system implementation

Table 8.4.2.6.5-2: Test requirements for NR inter-RAT event triggered reporting for FR2 without SSB time index detection in DRX

Test case	Measurement reporting delay (ms)			
	Test 1: D1 ms	Test 2: D2 ms	Test 3: D3 ms	Test 4: D4 ms
UE power class 3	4800	51200	4800	51200

NOTE: The actual overall delays measured in the test may be up to $2xTTI_{DCCH}$ higher than the measurement reporting delays above because of TTI insertion uncertainty of the measurement report in DCCH.

In test 1 with per-UE gap, the UE shall send one Event B1 triggered measurement report, with a measurement reporting delay less than D1 ms from the beginning of time period T2. The UE shall not send event triggered measurement reports, as long as the reporting criteria are not fulfilled. The rate of correct events observed during repeated tests shall be at least 90%.

In test 2 with per-UE gap, the UE shall send one Event B1 triggered measurement report, with a measurement reporting delay less than D2 ms from the beginning of time period T2. The UE shall not send event triggered measurement reports, as long as the reporting criteria are not fulfilled. The rate of correct events observed during repeated tests shall be at least 90%.

In test 3 with per-FR gap, the UE shall send one Event B1 triggered measurement report, with a measurement reporting delay less than D3 ms from the beginning of time period T2. The UE shall not send event triggered measurement reports, as long as the reporting criteria are not fulfilled. The rate of correct events observed during repeated tests shall be at least 90%.

In test 4 with per-FR gap, the UE shall send one Event B1 triggered measurement report, with a measurement reporting delay less than D4 ms from the beginning of time period T2. The UE shall not send event triggered measurement reports, as long as the reporting criteria are not fulfilled. The rate of correct events observed during repeated tests shall be at least 90%.

In tests 1, 2, 3 and 4, the UE is not required to report SSB time index.

8.4.2.7 E-UTRA event-triggered reporting of a NR FR2 neighbour cell with SSB time index detection in non-DRX

Editor's Note: This test case has been completed for the following configurations:

- *Test frequency f ≤ 40.8 GHz*
- *UE PC3*
- *The test is incomplete for UE power classes other than PC3*
- *The test is incomplete for test frequencies > 40.8 GHz*
- *E-UTRA – NR FR2 testability issue is not cleared*

8.4.2.7.1 Test purpose

To verify the UE's ability to make a correct reporting of an event with SSB time index detection in non-DRX within E-UTRA - NR FR2 cell search requirements.

8.4.2.7.2 Test applicability

This test applies to all E-UTRA UE release 15 onwards and capable of NR FR2 measurements. Test 1 is applicable to UEs not supporting per-FR gap (IndependentGapConfig, as defined in TS 38.306 [11]) and Test 2 is applicable only to UEs supporting Gap Pattern Id 4.

8.4.2.7.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 8.4.2.0.1.

The normative reference for this requirement is TS 38.133 [6] clause A.8.4.2.7.

8.4.2.7.4 Test description

8.4.2.7.4.1 Initial conditions

This test shall be tested using any of the test configurations in Table 8.4.2.7.4.1-1.

Table 8.4.2.7.4.1-1: NR inter-RAT event triggered reporting tests with SSB index reading for FR2 in non-DRX

Configuration	Description
8.4.2.7-1	LTE FDD, NR 120 kHz SSB SCS, 100 MHz bandwidth, TDD duplex mode
8.4.2.7-2	LTE TDD, NR 120 kHz SSB SCS, 100 MHz bandwidth, TDD duplex mode
NOTE: The UE is only required to be tested in one of the supported test configurations.	

Configure the test requirement and the DUT according to the parameters in Table 8.4.2.7.4.1-2.

Table 8.4.2.7.4.1-2: Initial conditions for E-UTRA - NR FR2 event-triggered reporting with SSB time index detection in non-DRX

Parameter	Value		Comment
Test environment	NC		As specified in TS 36.508 [25] clause 4.1.
Test frequencies	As specified in Annex E, Table E.6-1 and TS 38.508-1 [14] clause 4.3.1.		
Channel bandwidth	As specified by the test configuration selected from Table 8.4.2.7.4.1-1.		
Propagation conditions	AWGN		As specified in clause C.2.1
Connection Diagram	TE Part	A.3.3.3.1	As specified in TS 38.508-1 [14] Annex A.
	DUT Part	A.3.4.1.1	
Exceptions to connection diagram	N/A		

1. The general test parameter settings are set up according to Table 8.4.2.7.4.1-3.

2. Message contents are defined in clause 8.4.2.7.4.3.

3. There are two carriers and two cells specified in the test, where Cell 1 is the E-UTRA PCell on the E-UTRA carrier and Cell 2 is the NR FR2 neighbour cell on the NR carrier. Cell 1 is the cell used for connection setup with the power level set according to clause A.6.1.2 for this test.

Table 8.4.2.7.4.1-3: General test parameters for NR inter-RAT event triggered reporting for FR2 with SSB time index detection in non-DRX

Parameter	Unit	Test configuration	Value		Comment
			Test 1	Test 2	
E-UTRA RF Channel Numbers		1, 2	1		One E-UTRA carrier frequency is used.
NR RF Channel Numbers		1, 2	1		One FR2 NR carrier frequency is used.
Active cell		1, 2	E-UTRA cell 1 (PCell)		E-UTRA cell 1 is on E-UTRA RF channel number 1 as defined in clause A.6.1.2.
Neighbour cell		1, 2	NR cell 2		NR cell 2 is on NR RF channel number 1.
Gap Pattern Id		1, 2	0	4	As specified in clause Table 8.1.2.1-1 of TS 36.133 [23].
Measurement gap offset		1, 2	39	19	As specified in TS 36.331 [29].
b1-ThresholdNR	dBm	1, 2	Note 1		SS-RSRP threshold for SS-RSRP measurement on cell 2 for event B1 [29]
Hysteresis	dB	1, 2	0		
CP length		1, 2	Normal		
TimeToTrigger	s	1, 2	0		
Filter coefficient		1, 2	0		L3 filtering is not used.
DRX		1, 2	OFF		DRX is not used.
Time offset between serving and neighbour cells		1	3ms		Asynchronous cells. The timing of Cell 2 is 3ms later than the timing of Cell 1.
		2	3μs		Synchronous cells.
T1	s	1, 2	5		
T2	s	1, 2	5	3	
NOTE: The value of b1-ThresholdNR is defined in Table A.8.4.2.7.5-1.					

8.4.2.7.4.2 Test procedure

In test 1 measurement gap pattern configuration # 0 as defined in Table 8.4.2.7.4.1-3 is provided for UE that does not support per-FR gap and in test 2 measurement gap pattern configuration #4 as defined in Table 8.4.2.7.4.1-3 is provided for UE that supports per-FR gap.

In the measurement control information, it is indicated to the UE that event-triggered reporting with Event B1 (Inter RAT neighbour becomes better than threshold) [29] is used. In the measurement configuration the UE shall be indicated to report the SSB index of the identified NR cell. The test consists of two successive time periods, with time duration of T1, and T2 respectively. During time duration T1, the UE shall not have any timing information of NR cell 2.

1. Ensure the UE is in State 3A-RF according to TS 36.508 [25] clause 7.2A.3.

2. Set the parameters of Cell 1 and Cell 2 according to Table A.6.1.2-1 and T1 in Table 8.4.2.7.5-1 respectively, T1 starts.

3. The SS shall transmit an *RRCConnectionReconfiguration* message.

4. The UE shall transmit an *RRCConnectionReconfigurationComplete* message.

5. When T1 expires, the SS shall switch the parameters setting from T1 to T2 as specified in Table 8.4.2.7.5-1. T2 Starts.

6. UE shall transmit a *MeasurementReport* message triggered by Event B1. If the overall delays measured from the beginning of time period T2 is less than X ms then the number of successful tests is increased by one. If the

UE fails to report the event within the overall delays measured requirement then the number of failure tests is increased by one. Where X is,

- 4160 for sub-test 1,
- 2080 for sub-test 2.

7. After the SS receive the *MeasurementReport* message in step 6) or when T2 expires, the SS shall:
   - transmit an *RRCConnectionRelease* message to release the RRC connection which includes the release of the established radio bearers as well as all radio resources, or
   - switch off the UE.
8. Set Cell 2 physical cell identity = ((current Cell 2 physical cell identity + 1) mod 1008) for next iteration of the test procedure loop.
9. The SS:
   - transmits in Cell 1 a Paging message (including PagingRecord with UE-Identity) for the UE and ensures the UE is in State 3A according to TS 36.508 clause 4.5.3A (if the paging fails, switches off and on the UE and ensures the UE is in State 3A-RF according to TS 36.508 [25] clause 7.2A.3); or
   - switches on the UE and ensures the UE is in State 3A-RF according to TS 36.508 [25] clause 7.2A.3.
10. Repeat step 2-9 until the confidence level according to Tables G.2.3-1 in Annex G clause G.2 is achieved.

8.4.2.7.4.3 Message contents

Message contents are according to TS 36.508 [25] clause 7.3 with the following exceptions:

Table 8.4.2.7.4.3-1: Common Exception messages for E-UTRA - NR FR2 event-triggered reporting with SSB time index detection in non-DRX

Default Message Contents	
Common contents of system information blocks exceptions	
Default RRC messages and information elements contents exceptions	Table H.3.4-1a; Table H.3.4-4 with Condition INTER-RAT NR, EVENT B1 for Test 1; Table H.3.4-4 with Condition INTER-RAT NR, EVENT B1 and GAPLESS for Test 2; Table H.3.4-5 with Condition Pattern #0 for Test 1; Table H.3.4-5 with Condition Pattern #4 for Test 2; Table H.3.4-8 with Condition SSB-Index
Specific message contents exceptions for Test Configuration 8.4.2.7-1	Table H.3.4-6 with Conditions SMTC.2, SSB.3 FR2 and Asynchronous cells
Specific message contents exceptions for Test Configuration 8.4.2.7-2	Table H.3.4-6 with Conditions SMTC.1, SSB.3 FR2 and Synchronous cells

Table 8.4.2.7.4.3-2: SchedulingRequest-Config-DEFAULT

Derivation Path: 36.508 [25] Table 4.6.3-20			
Information Element	**Value/remark**	**Comment**	**Condition**
SchedulingRequest-Config-DEFAULT ::= CHOICE {			
setup SEQUENCE {			
sr-ConfigIndex	25		Config 8.4.2.7-1/2/3
	22		Config 8.4.2.7-4/5/6
}			
}			

8.4.2.7.5 Test requirement

Tables 8.4.2.7.4.1-3 and 8.4.2.7.5-1 define the primary level settings including test tolerances for E-UTRA - NR FR2 event-triggered reporting with SSB time index detection in non-DRX.

Table 8.4.2.7.5-1: NR neighbour cell specific test parameters for NR inter-RAT event triggered reporting for FR2 with SSB time index detection in non-DRX

Parameter	Unit	Test configuration	Cell 2	
			T1	T2
AoA setup defined in A.3.15.1		1, 2	Setup 1	
Assumption for UE beams[Note 5]		1, 2	Rough	
NR RF Channel Number		1, 2	1	
Duplex mode		1, 2	TDD	
TDD configuration		1, 2	TDDConf.3.1	
$BW_{channel}$	MHz	1, 2	100: $N_{RB,c}$ = 66	
OCNG patterns defined in A.3.2.1.1		1, 2	OP.1	
SMTC configuration defined in A.3.11.1 and A.3.11.2		1	SMTC.2	
		2	SMTC.1	
PDSCH/PDCCH subcarrier spacing	kHz	1, 2	120	
b1-ThresholdNR UE power class 3	dBm/SCS	1, 2	-106	
EPRE ratio of PSS to SSS		1, 2	0	
EPRE ratio of PBCH DMRS to SSS				
EPRE ratio of PBCH to PBCH DMRS				
EPRE ratio of PDCCH DMRS to SSS				
EPRE ratio of PDCCH to PDCCH DMRS				
EPRE ratio of PDSCH DMRS to SSS				
EPRE ratio of PDSCH to PDSCH				
EPRE ratio of OCNG DMRS to SSS (Note 1)				
EPRE ratio of OCNG to OCNG DMRS (Note 1)				
$\frac{N}{N_{oc}}$ [Note2]	dBm/15kHz	1, 2	-104.7	
N_{oc} [Note2]	dBm/SCS	1, 2	-95.7	
SS-RSRP [Note 3]	dBm/SCS	1, 2	-Infinity	-87.7
$\hat{E}_s/I_{ot}$	dB	1, 2	-Infinity	8
$\hat{E}_s/N_{oc}$	dB	1, 2	-Infinity	8
Io[Note3]	dBm/95.04MHz	1, 2	-66.7	-58.0
Propagation Condition		1, 2	AWGN	

Note 1: OCNG shall be used such that the cell is fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.

Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for N_{oc} to be fulfilled.

Note 3: SS-RSRP and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.

Note 4: SS-RSRP minimum requirements are specified assuming independent interference and noise at each receiver antenna port.

Note 5: Information about types of UE beam is given in B.2.1.3, and does not limit UE implementation or test system implementation

Table 8.4.2.7.5-2: Test requirements for NR inter-RAT event triggered reporting for FR2 with SSB time index detection in non-DRX

Test case	Measurement reporting delay (ms)	
	Test 1: D1 ms	Test 2: D2 ms
UE power class 3	4160	2080

NOTE: The actual overall delays measured in the test may be up to $2xTTI_{DCCH}$ higher than the measurement reporting delays above because of TTI insertion uncertainty of the measurement report in DCCH.

In test 1 with per-UE gap, the UE shall send one Event B2 triggered measurement report, with a measurement reporting delay less than D1 ms from the beginning of time period T2. The UE shall not send event triggered measurement reports, as long as the reporting criteria are not fulfilled. The rate of correct events observed during repeated tests shall be at least 90%.

In test 2 with per-FR gap, the UE shall send one Event B2 triggered measurement report, with a measurement reporting delay less than D2 ms from the beginning of time period T2. The UE shall not send event triggered measurement reports, as long as the reporting criteria are not fulfilled. The rate of correct events observed during repeated tests shall be at least 90%.

In test 1 and test 2, the UE is required to report SSB time index.

NOTE: The actual overall delays measured in the test may be up to $2xTTI_{DCCH}$ higher than the measurement reporting delays above because of TTI insertion uncertainty of the measurement report in DCCH.

8.4.2.8 E-UTRA event-triggered reporting of a NR FR2 neighbour cell with SSB time index detection in DRX

Editor's Note: This test case has been completed for the following configurations:

- *Test frequency f ≤ 40.8 GHz*
- *UE PC3*
- *The test is incomplete for UE power classes other than PC3*
- *The test is incomplete for test frequencies > 40.8 GHz*
- *E-UTRA – NR FR2 testability issue is not cleared*

8.4.2.8.1 Test purpose

To verify the UE's ability to make a correct reporting of an event with SSB time index detection in DRX within E-UTRA - NR FR2 cell search requirements.

8.4.2.8.2 Test applicability

This test applies to all E-UTRA UE release 15 onwards supporting long DRX cycle and capable of NR FR2 measurements. Test 1 and Test 2 is applicable to UEs not supporting per-FR gap (IndependentGapConfig, as defined in TS 38.306 [11]) and Test 3 and Test 4 are applicable only to UEs supporting Gap Pattern Id 4.

8.4.2.8.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 8.4.2.0.1.

The normative reference for this requirement is TS 38.133 [6] clause A.8.4.2.8.

8.4.2.8.4 Test description

8.4.2.8.4.1 Initial conditions

This test shall be tested using any of the test configurations in Table 8.4.2.8.4.1-1.

Table 8.4.2.8.4.1-1: NR inter-RAT event triggered reporting tests without SSB index reading for FR2 in DRX

Configuration	Description
8.4.2.8-1	LTE FDD, NR 120 kHz SSB SCS, 100 MHz bandwidth, TDD duplex mode
8.4.2.8-2	LTE TDD, NR 120 kHz SSB SCS, 100 MHz bandwidth, TDD duplex mode
NOTE: The UE is only required to be tested in one of the supported test configurations.	

Configure the test requirement and the DUT according to the parameters in Table 8.4.2.8.4.1-2.

Table 8.4.2.8.4.1-2: Initial conditions for E-UTRA - NR FR2 event-triggered reporting with SSB time index detection in DRX

Parameter	Value		Comment
Test environment	NC		As specified in TS 36.508 [25] clause 4.1.
Test frequencies	As specified in Annex E, Table E.6-1 and TS 38.508-1 [14] clause 4.3.1.		
Channel bandwidth	As specified by the test configuration selected from Table 8.4.2.8.4.1-1.		
Propagation conditions	AWGN		As specified in clause C.2.1
Connection Diagram	TE Part	A.3.3.3.1	As specified in TS 38.508-1 [14] Annex A.
	DUT Part	A.3.4.1.1	
Exceptions to connection diagram	N/A		

1. The general test parameter settings are set up according to Table 8.4.2.8.4.1-3.
2. Message contents are defined in clause 8.4.2.8.4.3.
3. There are two carriers and two cells specified in the test, where Cell 1 is the E-UTRA PCell on the E-UTRA carrier and Cell 2 is the NR FR2 neighbour cell on the NR carrier. Cell 1 is the cell used for connection setup with the power level set according to clause A.6.1.2 for this test.

Table 8.4.2.8.4.1-3: General test parameters for NR inter-RAT event triggered reporting for FR2 with SSB time index detection in DRX

Parameter	Unit	Test configuration	Value				Comment
			Test 1	Test 2	Test 3	Test 4	
E-UTRA RF Channel Numbers		1, 2	1				One E-UTRA carrier frequency is used.
NR RF Channel Numbers		1, 2	1				One FR2 NR carrier frequency is used.
Active cell		1, 2	E-UTRA cell 1 (PCell)				E-UTRA cell 1 is on E-UTRA RF channel number 1 as defined in clause A.6.1.2.
Neighbour cell		1, 2	NR cell 2				NR cell 2 is on NR RF channel number 1.
Gap Pattern Id		1, 2	0		4		As specified in clause Table 8.1.2.1-1 of TS 36.133 [23].
Measurement gap offset		1, 2	39		19		As specified in TS 36.331 [29].
b1-ThresholdNR	dBm	1, 2	Note 1				SS-RSRP threshold for SS-RSRP measurement on cell 2 for event B1 [29].
Hysteresis	dB	1, 2	0				
CP length		1, 2	Normal				
TimeToTrigger	s	1, 2	0				
Filter coefficient		1, 2	0				L3 filtering is not used.
DRX			DRX.9	DRX.12	DRX.9	DRX.12	As specified in clause A.3.3.
Time offset between serving and neighbour cells		1	3ms				Asynchronous cells. The timing of Cell 2 is 3ms later than the timing of Cell 1.
		2	3μs				Synchronous cells.
T1	s	1, 2	5				
T2	s	1, 2	7	70	7	70	
NOTE: The value of b1-ThresholdNR is defined in Table A.8.4.2.8.5-1							

8.4.2.8.4.2 Test procedure

In tests 1 and 2, measurement gap pattern configuration # 0 as defined in Table 8.4.2.8.4.1-3 is provided for UE that does not support per-FR gap and in tests 3 and 4, measurement gap pattern configuration #4 as defined in Table 8.4.2.8.4.1-3 is provided for UE that supports per-FR gap.

In the measurement control information, it is indicated to the UE that event-triggered reporting with Event B1 (Inter RAT neighbour becomes better than threshold) [29] is used. In the measurement configuration the UE shall be indicated

to report the SSB index of the identified NR cell. The test consists of two successive time periods, with time duration of T1, and T2 respectively. During time duration T1, the UE shall not have any timing information of NR cell 2.

1. Ensure the UE is in State 3A-RF according to TS 36.508 [25] clause 7.2A.3.
2. Set the parameters of Cell 1 and Cell 2 according to Table A.6.1.2-1 and T1 in Table 8.4.2.8.5-1 respectively, T1 starts.
3. The SS shall transmit an *RRCConnectionReconfiguration* message.
4. The UE shall transmit an *RRCConnectionReconfigurationComplete* message.
5. When T1 expires, the SS shall switch the parameters setting from T1 to T2 as specified in Table 8.4.2.8.5-1. T2 Starts.
6. UE shall transmit a *MeasurementReport* message triggered by Event B1. If the overall delays measured from the beginning of time period T2 is less than X ms then the number of successful tests is increased by one. If the UE fails to report the event within the overall delays measured requirement then the number of failure tests is increased by one. Where X is,
   - 4800 for sub-test 1 and sub-test 3,
   - 51200 for sub-test 2 and sub-test 4.
7. . After the SS receive the *MeasurementReport* message in step 6) or when T2 expires, the SS shall:
   - transmit an *RRCConnectionRelease* message to release the RRC connection which includes the release of the established radio bearers as well as all radio resources, or
   - switch off the UE.
8. Set Cell 2 physical cell identity = ((current Cell 2 physical cell identity + 1) mod 1008) for next iteration of the test procedure loop.
9. The SS:
   - transmits in Cell 1 a Paging message (including PagingRecord with UE-Identity) for the UE and ensures the UE is in State 3A according to TS 36.508 clause 4.5.3A (if the paging fails, switches off and on the UE and ensures the UE is in State 3A-RF according to TS 36.508 [25] clause 7.2A.3); or
   - switches on the UE and ensures the UE is in State 3A-RF according to TS 36.508 [25] clause 7.2A.3.
10. Repeat step 2-9 until the confidence level according to Tables G.2.3-1 in Annex G clause G.2 is achieved.

8.4.2.8.4.3 Message contents

Message contents are according to TS 36.508 [25] clause 7.3 with the following exceptions:

Table 8.4.2.8.4.3-1: Common Exception messages for E-UTRA - NR FR2 event-triggered reporting with SSB time index detection in DRX

Default Message Contents	
Common contents of system information blocks exceptions	
Default RRC messages and information elements contents exceptions	Table H.3.4-1a; Table H.3.4-4 with Condition INTER-RAT NR, EVENT B1 for Test 1 and Test 2; Table H.3.4-4 with Condition INTER-RAT NR, EVENT B1 and GAPLESS for Test 3 and Test 4; Table H.3.4-5 with Condition Pattern #0 for Test 1 and Test 2; Table H.3.4-5 with Condition Pattern #4 for Test 3 and Test 4; Table H.3.4-8 with Condition SSB-Index Table H.3.7-2 with Condition DRX.9 for Test 1 and Test 3 Table H.3.7-2 with Condition DRX.12 for Test 2 and Test 4
Specific message contents exceptions for Test Configuration 8.4.2.8-1	Table H.3.4-6 with Conditions SMTC.2, SSB.3 FR2 and Asynchronous cells

Specific message contents exceptions for Test Configuration 8.4.2.8-2	Table H.3.4-6 with Conditions SMTC.1, SSB.3 FR2 and Synchronous cells

Table 8.4.2.8.4.3-2: SchedulingRequest-Config-DEFAULT

Derivation Path: 36.508 [25] Table 4.6.3-20			
Information Element	**Value/remark**	**Comment**	**Condition**
SchedulingRequest-Config-DEFAULT ::= CHOICE {			
setup SEQUENCE {			
sr-ConfigIndex	25		Config 8.4.2.8-1/2/3
	22		Config 8.4.2.8-4/5/6
}			
}			

8.4.2.8.5 Test requirement

Tables 8.4.2.8.4.1-3 and 8.4.2.8.5-1 define the primary level settings including test tolerances for E-UTRA - NR FR2 event-triggered reporting with SSB time index detection in DRX.

Table 8.4.2.8.5-1: NR neighbour cell specific test parameters for NR inter-RAT event triggered reporting for FR2 with SSB time index detection

Parameter	**Unit**	**Test configuration**	**Cell 2**	
			T1	**T2**
AoA setup defined in A.3.15.1		1, 2	Setup 1	
Assumption for UE beams Note 5		1, 2	Rough	
NR RF Channel Number		1, 2	1	
Duplex mode		1, 2	TDD	
TDD configuration		1, 2	TDDConf.3.1	
$BW_{channel}$	MHz	1, 2	100: $N_{RB,c}$ = 66	
OCNG patterns defined in A.3.2.1.1		1, 2	OP.1	
SMTC configuration defined in A.3.11.1 and A.3.11.2		1	SMTC.2	
		2	SMTC.1	
PDSCH/PDCCH subcarrier spacing	kHz	1, 2	120	
b1-ThresholdNR UE power class 3	dBm/SCS	1, 2	-206	
EPRE ratio of PSS to SSS		1, 2	0	
EPRE ratio of PBCH DMRS to SSS				
EPRE ratio of PBCH to PBCH DMRS				
EPRE ratio of PDCCH DMRS to SSS				
EPRE ratio of PDCCH to PDCCH DMRS				
EPRE ratio of PDSCH DMRS to SSS				
EPRE ratio of PDSCH to PDSCH				
EPRE ratio of OCNG DMRS to SSS (Note 1)				
EPRE ratio of OCNG to OCNG DMRS (Note 1)				
N_{oc} Note2	dBm/15kHz	1, 2	-104.7	
N_{oc} Note2	dBm/SCS	1, 2	-95.7	
SS-RSRP Note 3	dBm/SCS	1, 2	-Infinity	-87.7
$\hat{E}_s/I_{ot}$	dB	1, 2	-Infinity	8
$\hat{E}_s/N_{oc}$	dB	1, 2	-Infinity	8
Io Note3	dBm/95.04MHz	1, 2	-66.7	-58.0
Propagation Condition		1, 2	AWGN	

Note 1:	OCNG shall be used such that the cell is fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.
Note 2:	Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for N_{oc} to be fulfilled.
Note 3:	SS-RSRP and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.
Note 4:	SS-RSRP minimum requirements are specified assuming independent interference and noise at each receiver antenna port.
Note 5:	Information about types of UE beam is given in B.2.1.3, and does not limit UE implementation or test system implementation

Table 8.4.2.8.5-2: Test requirements for NR inter-RAT event triggered reporting for FR2 with SSB time index detection in DRX

Test case	Measurement reporting delay (ms)			
	Test 1: D1 ms	Test 2: D2 ms	Test 3: D3 ms	Test 4: D4 ms
UE power class 3	6240	66560	6240	66560

In test 1 with per-UE gap, the UE shall send one Event B2 triggered measurement report, with a measurement reporting delay less than D1 ms from the beginning of time period T2. The UE shall not send event triggered measurement reports, as long as the reporting criteria are not fulfilled. The rate of correct events observed during repeated tests shall be at least 90%.

In test 2 with per-UE gap, the UE shall send one Event B2 triggered measurement report, with a measurement reporting delay less than D2 ms from the beginning of time period T2. The UE shall not send event triggered measurement reports, as long as the reporting criteria are not fulfilled. The rate of correct events observed during repeated tests shall be at least 90%.

In test 3 with per-FR gap, the UE shall send one Event B2 triggered measurement report, with a measurement reporting delay less than D3 ms from the beginning of time period T2. The UE shall not send event triggered measurement reports, as long as the reporting criteria are not fulfilled. The rate of correct events observed during repeated tests shall be at least 90%.

In test 4 with per-FR gap, the UE shall send one Event B2 triggered measurement report, with a measurement reporting delay less than D4 ms from the beginning of time period T2. The UE shall not send event triggered measurement reports, as long as the reporting criteria are not fulfilled. The rate of correct events observed during repeated tests shall be at least 90%.

In tests 1, 2, 3 and 4, the UE is required to report SSB time index.

NOTE: The actual overall delays measured in the test may be up to $2xTTI_{DCCH}$ higher than the measurement reporting delays above because of TTI insertion uncertainty of the measurement report in DCCH.

8.4.2.9 E-UTRA event triggered reporting of a NR FR1 neighbour cell with SSB time index detection in DRX for UE configured with highSpeedInterRAT-NR-r16

8.4.2.9.1 Test purpose

The purpose of this test is to verify that the UE makes correct reporting of an event and to verify partly the NR inter-RAT cell search requirements for E-UTRA FDD - NR FR1 measurements given in TS 36.133 [23] clause 8.1.2.4.21 and for E-UTRAN TDD - NR FR1 measurements given in TS 36.133 [23] clause 8.1.2.4.22 when UE is configured with *highSpeedInterRAT-NR-r16*.

8.4.2.9.2 Test applicability

This test applies to all E-UTRA UEs capable of NR measurements and configured with highSpeedInterRAT-NR-r16 from release 15 onwards.

8.4.2.9.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 8.4.2.0.1.

The normative reference for this requirement is TS 38.133 [6] clause A.8.4.2.9.

8.4.2.9.4 Test description

8.4.2.9.4.1 Initial conditions

This test shall be tested using any of the test configurations in Table 8.4.2.9.4.1-1.

Table 8.4.2.9.4.1-1: Supported test configurations for NR inter-RAT event triggered reporting for FR1 with SSB time index detection for UE configured with highSpeedInterRAT-NR-r16

Configuration	Description
8.4.2.9-1	LTE FDD, NR 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode
8.4.2.9-2	LTE FDD, NR 15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode
8.4.2.9-3	LTE FDD, NR 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode
8.4.2.9-4	LTE TDD, NR 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode
8.4.2.9-5	LTE TDD, NR 15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode
8.4.2.9-6	LTE TDD, NR 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode
NOTE: The UE is only required to be tested in one of the supported test configurations.	

Configure the test requirement and the DUT according to the parameters in Table 8.4.2.9.4.1-2.

Table 8.4.2.9.4.1-2: Initial conditions for NR inter-RAT event triggered reporting for FR1 with SSB time index detection for UE configured with highSpeedInterRAT-NR-r16

Parameter	Value		Comment
Test environment	NC		As specified in TS 36.508 [25] clause 4.1.
Test frequencies	As specified in Annex E, Table E.6-1 and TS 38.508-1 [14] clause 4.3.1.		
Channel bandwidth	As specified by the test configuration selected from Table 8.4.2.1.4.1-1.		
Propagation conditions	AWGN		As specified in clause C.2.1
Connection Diagram	TE Part	A.3.1.8.2	As specified in TS 38.508-1 [14] Annex A.
	DUT Part	A.3.2.3.4	
Exceptions to connection diagram	N/A		

Table 8.4.2.9.4.1-3: General test parameters for NR inter-RAT event triggered reporting for FR1 with SSB time index detection for UE configured with highSpeedInterRAT-NR-r16

Parameter	Unit	Test configuration	Value	Comment
E-UTRA RF Channel Number		1, 2, 3, 4, 5, 6	1	One E-UTRA carrier frequency is used.
NR RF Channel Number		1, 2, 3, 4, 5, 6	1	One FR1 NR carrier frequency is used.
Active cell		1, 2, 3, 4, 5, 6	E-UTRA cell 1 (PCell)	E-UTRA cell 1 is on E-UTRA RF channel number 1.
Neighbour cell		1, 2, 3, 4, 5, 6	NR cell 2	NR cell 2 is on NR RF channel number 1.
Gap Pattern Id		1, 2, 3, 4, 5, 6	0	As specified in clause Table 8.1.2.1-1 of TS 36.133 [15].
Measurement gap offset		1, 2, 3, 4, 5, 6	39	As specified in TS 36.331 [16].
b2-Threshold1	dBm	1, 2, 3, 4, 5, 6	Note 1	E-UTRA RSRP threshold for E-UTRA RSRP measurement on cell 1 for event B2 [16]
b2-Threshold2NR	dBm	1, 2, 3, 4, 5, 6	Note 2	SS-RSRP threshold for SS-RSRP measurement on cell 2 for event B2 [16]
Hysteresis	dB	1, 2, 3, 4, 5, 6	0	
CP length		1, 2, 3, 4, 5, 6	Normal	
TimeToTrigger	s	1, 2, 3, 4, 5, 6	0	

Filter coefficient		1, 2, 3, 4, 5, 6	0	L3 filtering is not used
DRX		1, 2, 3, 4, 5, 6	DRX.5	As specified in clause A.5
Time offset between serving and neighbour cells		1, 4	3ms	Asynchronous cells. The timing of Cell 2 is 3ms later than the timing of Cell 1.
		2, 3, 5, 6	3µs	Synchronous cells.
T1	s	1, 2, 3, 4, 5, 6	5	
T2	s	1, 2, 3, 4, 5, 6	5	
NOTE 1: The value of b2-Threshold1 is defined in Table A.8.4.2.9.1-3. NOTE 2: The value of b2-Threshold2NR is defined in Table A.8.4.2.9.1-4.				

8.4.2.9.4.2 Test procedure

Two cells are deployed in the test, which are E-UTRA PCell (Cell 1) on the E-UTRA carrier and a FR1 NR neighbour cell (Cell 2) on NR carrier. The general and cell specific test parameters for PCell and neighbour cell are given in Table 8.4.2.9.4.1-3, 8.4.2.9.5-1 and 8.4.2.9.5-2, respectively.

In the measurement control information, it is indicated to the UE that event-triggered reporting with Event B2 is used. The test consists of two successive time periods, with time duration of T1 and T2 respectively. During time duration T1, the UE shall not have any timing information of NR cell 2. UE is configured with *highSpeedInterRAT-NR-r16*.

1. Ensure the UE is in State 3A-RF according to TS 36.508 clause 7.2A.3.

2. Set the parameters of Cell 1 and Cell 2 according to T1 in Table 8.4.2.9.5-1 and Table 8.4.2.9.5-2 respectively, T1 starts.

3. The SS shall transmit an *RRCConnectionReconfiguration* message.

4. The UE shall transmit *RRCConnectionReconfigurationComplete* message.

5. When T1 expires, the SS shall switch the parameters setting from T1 to T2 as specified in Table 8.4.2.9.5-1 and Table 8.4.2.9.5-2 respectively. T2 Starts.

6. UE shall transmit a *MeasurementReport* message triggered by Event B2. If the overall delays measured from the beginning of time period T2 is less than 4.8s ms then the number of successful tests is increased by one. If the UE fails to report the event within the overall delays measured requirement then the number of failure tests is increased by one.

7. After the SS receive the *MeasurementReport* message in step 6) or when T2 expires, the SS shall transmit an *RRCConnectionRelease* message to release the RRC connection which includes the release of the established radio bearers as well as all radio resources.

8. Set Cell 2 physical cell identity = ((current Cell 2 physical cell identity + 1) mod 1008) for next iteration of the test procedure loop.

9. After the RRC connection release, the SS:

   - transmits in Cell 1 a Paging message (including PagingRecord with UE-Identity) for the UE and ensures the UE is in State 3A according to TS 36.508 [25] clause 4.5.3A (if the paging fails, switches off and on the UE and ensures the UE is in State 3A-RF according to TS 36.508 [25] clause 7.2A.3),

   or

   - switches off and on the UE and ensures the UE is in State 3A-RF according to TS 36.508 [25] clause 7.2A.3.

10. Repeat step 2-9 until the confidence level according to Tables G.2.3-1 in Annex G clause G.2 is achieved.

8.4.2.9.4.3 Message contents

Message contents are according to TS 36.508 [25] clause 7.3 with the following exceptions:

Table 8.4.2.9.4.3-1: Common Exception messages

Default Message Contents	
Common contents of system information blocks on condition of HighSpeedMeas with exceptions	Table H.2.1-3 with Condition HighSpeedMeas
Default RRC messages and information elements contents exceptions	Table H.3.4-7 with Condition Inter-RAT and EVENT B2; Table H.3.4-4 with Condition INTER-RAT NR and EVENT B2 Table H.3.4-5 with Condition Pattern #0 Table H.3.4-8 with Condition SSB-Index Table H.3.7-2 with Condition DRX.5 and Gap

Table 8.4.2.9.4.3-2: highSpeedCarrierNR-r16 in SystemInformationBlockType24

Derivation Path: TS 36.508, Table 4.4.3.3-20 with Condition FR1			
Information Element	**Value/remark**	**Comment**	**Condition**
SystemInformationBlockType24-r15 ::= SEQUENCE {			
CarrierFreqNR-v1610 ::= SEQUENCE {(SIZE (1..maxFreq)) OF SEQUENCE {	1 entry		
highSpeedCarrierNR-r16	TRUE		
}			

Table 8.4.2.9.4.3-3: highSpeedInterRAT-NR-r16 configuration

Derivation Path: 36.508 Table 4.6.3-14			
Information Element	**Value/remark**	**Comment**	**Condition**
RadioResourceConfigCommonSIB::= SEQUENCE {			
highSpeedInterRAT-NR-r16	TRUE		
}			

8.4.2.9.5 Test requirement

Tables 8.4.2.9.4.1-3, 8.4.2.9.5-1 and 8.4.2.9.5-2 define the primary level settings including test tolerances for E-UTRA - NR FR2 event-triggered reporting with SSB time index detection in DRX for UE configured with highSpeedInterRAT-NR-r16.

Table 8.4.2.9.5-1: E-UTRAN PCell specific test parameters for NR inter-RAT event triggered reporting with NR neighbour cell in FR1 with SSB time index detection for UE configured with highSpeedInterRAT-NR-r16

Parameter	Unit	Configuration	Cell 1	
			T1	T2
RF channel number		1, 2, 3, 4, 5, 6	1	
Duplex mode		1, 2, 3	FDD	
		4, 5, 6	TDD	
TDD special subframe configuration[Note1]		4, 5, 6	6	
TDD uplink-downlink configuration[Note1]		4, 5, 6	1	
$BW_{channel}$	MHz	1, 2, 3, 4, 5, 6	5 MHz: $N_{RB,c}$ = 25 10 MHz: $N_{RB,c}$ = 50 20 MHz: $N_{RB,c}$ = 100	
PDSCH parameters: DL Reference Measurement Channel[Note2]		1, 2, 3	5 MHz: R.7 FDD 10 MHz: R.3 FDD 20 MHz: R.6 FDD	
		4, 5, 6	5 MHz: R.4 TDD 10 MHz: R.0 TDD 20 MHz: R.3 TDD	

Parameter	Unit	Configuration	Cell 1	
			T1	T2
PCFICH/PDCCH/PHICH parameters: DL Reference Measurement Channel[Note2]		1, 2, 3	5 MHz: R.11 FDD 10 MHz: R.6 FDD 20 MHz: R.10 FDD	
		4, 5, 6	5 MHz: R.11 TDD 10 MHz: R.6 TDD 20 MHz: R.10 TDD	
OCNG Patterns[Note2]		1, 2, 3	5 MHz: OP.20 FDD 10 MHz: OP.10 FDD 20 MHz: OP.17 FDD	
		4, 5, 6	5 MHz: OP.9 TDD 10 MHz: OP.1 TDD 20 MHz: OP.7 TDD	
b2-Threshold1	dBm	1, 2, 3, 4, 5, 6	-77	
PBCH_RA	dB	1, 2, 3, 4, 5, 6	0	
PBCH_RB				
PSS_RA				
SSS_RA				
PCFICH_RB				
PHICH_RA				
PHICH_RB				
PDCCH_RA				
PDCCH_RB				
PDSCH_RA				
PDSCH_RB				
OCNG_RA[Note3]				
OCNG_RB[Note3]				
N_{oc}[Note4]	dBm/15kHz	1, 2, 3, 4, 5, 6	-104	
$\hat{E}_s/N_{oc}$	dB	1, 2, 3, 4, 5, 6	17	17
$\hat{E}_s/I_{ot}$[Note5]	dB	1, 2, 3, 4, 5, 6	17	17
RSRP[Note5]	dBm/15kHz	1, 2, 3, 4, 5, 6	-87	-87
SCH_RP[Note5]	dBm/15kHz	1, 2, 3, 4, 5, 6	-87	-87
Io[Note5]	dBm/9MHz	1, 2, 3, 4, 5, 6	-59.13+10log ($N_{RB,c}$ /50)	-59.13+10log ($N_{RB,c}$ /50)
Propagation Condition [Note6]		1, 2, 3, 4, 5, 6	AWGN	
Antenna Configuration and Correlation Matrix [Note6]		1, 2, 3, 4, 5, 6	1x2 Low	

NOTE 1: Special subframe and uplink-downlink configurations are specified in table 4.2-1 in TS 36.211 [23].
NOTE 2: DL RMCs and OCNG patterns are specified in clauses A 3.1 and A 3.2 of TS 36.133 [15] respectively.
NOTE 3: OCNG shall be used such that all cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.
NOTE 4: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for N_{oc} to be fulfilled.
NOTE 5: $\hat{E}_s/I_{ot}$, RSRP, SCH_RP and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.
NOTE 6: Propagation condition and correlation matrix are defined in clause B.2 in TS 36.101 [25].

Table 8.4.2.9.5-2: NR neighbour cell specific test parameters for NR inter-RAT event triggered reporting for FR1 with SSB time index detection for UE configured with highSpeedInterRAT-NR-r16

Parameter	Unit	Test configuration	Cell 2	
			T1	T2
NR RF Channel Number		1, 2, 3, 4, 5, 6	1	
Duplex mode		1, 4	FDD	
		2, 3, 5, 6	TDD	
TDD configuration		2, 5	TDDConf.1.1	
		3, 6	TDDConf.2.1	
$BW_{channel}$	MHz	1, 2, 4, 5	10: $N_{RB,c}$ = 52	
		3, 6	40: $N_{RB,c}$ = 106	
OCNG Patterns		1, 2, 3, 4, 5, 6	OP.1	
SMTC configuration		1, 4	SMTC.2	
		2, 3, 5, 6	SMTC.1	

Parameter	Unit	Test configuration	Cell 2	
			T1	T2
PDSCH/PDCCH subcarrier spacing	kHz	1, 2, 4, 5	15	
		3, 6	30	
b2-Threshold2NR	dBm/SCS	1, 2, 4, 5	-101	
		3, 6	-98	
EPRE ratio of PSS to SSS		1, 2, 3, 4, 5, 6	0	
EPRE ratio of PBCH DMRS to SSS				
EPRE ratio of PBCH to PBCH DMRS				
EPRE ratio of PDCCH DMRS to SSS				
EPRE ratio of PDCCH to PDCCH DMRS				
EPRE ratio of PDSCH DMRS to SSS				
EPRE ratio of PDSCH to PDSCH				
EPRE ratio of OCNG DMRS to SSS (Note 1)				
EPRE ratio of OCNG to OCNG DMRS (Note 1)				
N_{oc} Note2	dBm/15kHz	1, 2, 3, 4, 5, 6	-98	
N_{oc} Note2	dBm/SCS	1, 2, 4, 5	-98	
		3, 6	-95	
SS-RSRP Note 3	dBm/SCS	1, 2, 4, 5	-Infinity	-91
		3, 6	-Infinity	-88
$\hat{E}_s/I_{ot}$	dB	1, 2, 3, 4, 5, 6	-Infinity	7
$\hat{E}_s/N_{oc}$	dB	1, 2, 3, 4, 5, 6	-Infinity	7
Io Note3	dBm/9.36MHz	1, 2, 4, 5	-70.05	-62.26
	dBm/38.16MHz	3, 6	-63.95	-56.16
Propagation Condition		1, 2, 4, 5	AWGN1944	
		3,6	AWGN3334	
Antenna Configuration and Correlation Matrix		1, 2, 3, 4, 5, 6	1x2 Low	
NOTE 1: OCNG shall be used such that the cell is fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.				
NOTE 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for N_{oc} to be fulfilled.				
NOTE 3: SS-RSRP and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.				
NOTE 4: SS-RSRP minimum requirements are specified assuming independent interference and noise at each receiver antenna port.				

The UE shall send one Event B2 triggered measurement report, with a measurement reporting delay less than 4.8s from the beginning of time period T2. The UE is required to read the neighbour cell SSB index and report the acquired SSB index in this test. The rate of correct events observed during repeated tests shall be at least 90% with a confidence level of 95%.

NOTE: The actual overall delays measured in the test may be up to $2xTTI_{DCCH}$ higher than the measurement reporting delays above because of TTI insertion uncertainty of the measurement report in DCCH.

8.5 Measurement performance requirements

8.5.1 SFTD measurement accuracy

8.5.1.0 Minimum conformance requirements

8.5.1.0.1 Intra-frequency absolute SS-RSRP measurement accuracy requirements

The SFN and frame timing difference (SFTD) is measured between PCell and NR cell for inter-RAT SFTD. The inter-RAT SFTD measurement can only be configured for E-UTRA - NR band combinations that are supported by the UE.

The accuracy requirements in Table 8.5.1.0.1-3 are applicable under the following conditions:

For PCell SFN and frame timing measurement:

- Cell specific reference signals are transmitted either from one, two or four antenna ports.
- Conditions defined in TS 36.101 clause 7.3 for reference sensitivity are fulfilled.
- No changes to the uplink transmission timing are applied during the measurement period.
- $RSRP|_{dBm}$ according to TS 36.133 Annex B.3.5 for a corresponding Band.
- Io range defined in Table 8.5.1.0.1-1.

Table 8.5.1.0.1-1: PCell Io range conditions for SFTD measurement accuracy

Parameter	Io Note 1 range		
	E-UTRA operating band groups Note 4, 5	Minimum Io	Maximum Io
		dBm/15kHz Note 2, 3	$dBm/BW_{Channel}$
Conditions	FDD_A, TDD_A	-121	-50
	FDD_C, TDD_C	-120	-50
	FDD_D	-119.5	-50
	FDD_E, TDD_E	-119	-50
	FDD_F	-118.5	-50
	FDD_G	-118	-50
	FDD_H	-117.5	-50
	FDD_N	-114.5	-50

NOTE 1: When in dBm/15kHz, the minimum Io condition is expressed as the average Io per RE over all REs in that symbol. Io may be different in different symbols within a subframe.
NOTE 2: The condition level is increased by $\Delta>0$, when applicable, as described in clause B.4.2 and B.4.3.
NOTE 3: The condition level is increased by MSD as defined in clause 7.3B in TS 38.101-3 [54], if applicable depending on E-UTRA - NR band combination.
NOTE 4: E-UTRA operating band groups are as defined in clause 3.5.
NOTE 5: Only E-UTRA bands within EN-DC band combinations as specified in clause 5.5B in TS 38.101-3 [54] are applicable.

For NR PSCell, or NR cell SFN and frame timing measurement in FR1:

- Conditions defined in TS 38.101-1 clause 7.3 for reference sensitivity are fulfilled.
- Io range defined in Table 8.5.1.0.1-2.

Table 8.5.1.0.1-2: NR PSCell, or NR cell Io range conditions for SFTD measurement accuracy in FR1

Parameter	Io Note 1 range			
	NR operating band groups Note 4, 5	Minimum Io Note 2, 3		Maximum Io
		dBm/ SCS_{SSB}		
		SCS_{SSB} = 15 kHz	SCS_{SSB} = 30 kHz	$dBm/BW_{Channel}$
Conditions	NR_FDD_FR1_A, NR_TDD_FR1_A	-121	-118	-50
	NR_FDD_FR1_B	-120.5	-117.5	-50
	NR_TDD_FR1_C	-120	-117	-50
	NR_FDD_FR1_D, NR_TDD_FR1_D	-119.5	-116.5	-50
	NR_FDD_FR1_E, NR_TDD_FR1_E	-119	-116	-50
	NR_FDD_FR1_G	-118	-115	-50
	NR_FDD_FR1_H	-117.5	-114.5	-50

NOTE 1: Io is assumed to have constant EPRE across the bandwidth.
NOTE 2: The condition level is increased by $\Delta R_{IB,c}$ as defined in clause 7.3B in TS 38.101-3 [54], depending on E-UTRA - NR band combination.
NOTE 3: The condition level is increased by MSD as defined in clause 7.3B in TS 38.101-3 [54], if applicable depending on E-UTRA - NR band combination.
NOTE 4: NR operating band groups are as defined in clause 3.5.
NOTE 5: Only NR bands within EN-DC band combinations as specified in clause 5.5B in TS 38.101-3 [54] are applicable.

Table 8.5.1.0.1-3: SFTD measurement accuracy

Accuracy	Conditions	
	Ês/Iot	Frequency range
Ts [Note 1]	dB	
40	≥ -3 dB	FR1
NOTE 1: Ts is the basic timing unit defined in TS 36.211 [16]. NOTE 2: The parameter Ês/Iot is the minimum Ês/Iot of the pair of cells to which the requirement applies.		

8.5.1.1 E-UTRA - NR FR1 SFTD measurement accuracy

8.5.1.1.1 Test purpose

The purpose of this test is to verify that the SFTD measurement accuracy is within the specified limits and to verify the requirements as specified in clause 9.1.27 in TS 36.133 [23] for inter-RAT FR1 SFTD measurements.

8.5.1.1.2 Test applicability

This test applies to all types of NR UE from Release 15 onwards and support inter-RAT NR SFTD measurements.

8.5.1.1.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 8.5.1.0.

The normative reference for this requirement is TS 38.133 [6] clause A.8.5.1.1.

8.5.1.1.4 Test description

Two cells are configured in this test: E-UTRA Cell 1 is the E-UTRAN PCell and Cell 2 is the inter-RAT NR FR1 neighbour cell.

8.5.1.1.4.1 Initial conditions

This test shall be tested using any of the test configurations in Table 8.5.1.1.4.1-1.

Table 8.5.1.1.4.1-1: Supported test configurations for E-UTRA - NR FR1 SFTD measurement accuracy

Configuration	Description
8.5.1.1-1	NR 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode, LTE FDD
8.5.1.1-2	NR 15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode, LTE FDD
8.5.1.1-3	NR 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode, LTE FDD
8.5.1.1-4	NR 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode, LTE TDD
8.5.1.1-5	NR 15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode, LTE TDD
8.5.1.1-6	NR 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode, LTE TDD
NOTE: The UE is only required to be tested in one of the supported test configurations.	

Configure the test equipment and the DUT according to the parameters in Table 8.5.1.1.4.1-2.

Table 8.5.1.1.4.1-2: Initial conditions for E-UTRA - NR FR1 SFTD measurement accuracy

Parameter	Value		Comment
Test environment	NC		As specified in TS 36.508 [25] clause 4.1.
Test frequencies	As specified in Annex E, Table E.6-1 and TS 38.508-1 [14] clause 4.3.1.		
Channel bandwidth	As specified by the test configuration selected from Table 8.4.2.1.4.1-1.		
Propagation conditions	AWGN		As specified in clause C.2.1
Connection Diagram	TE Part	A.3.1.8.2	As specified in TS 38.508-1 [14] Annex A.
	DUT Part	A.3.2.3.4	

Exceptions to connection diagram	N/A	

1. The general test parameter settings are set up according to Table 8.5.1.1.4.1-3.
2. Message contents are defined in clause 8.5.1.1.4.3.
3. There are two carriers and two cells specified in the test, where E-UTRA Cell 1 is the E-UTRA PCell on the E-UTRA carrier and Cell 2 is the NR neighbour cell on the NR carrier. E-UTRA Cell 1 is configured according to TS 36.521-3 [26] clause C.1.0 and C.1.1.
4. The SFTD between PCell and NR neighbour cell shall be set to one of the conditions in Table 8.5.1.1.5-3. For negative Frame boundary offset, it can be achieved delaying NR neighbor cell in regards to PCell OR advancing PCell in regards to NR neighbor cell. For positive Frame boundary offset, it can be achieved delaying PCell in regards to NR neighbor cell OR advancing NR neighbor cell in regards to PCell.

8.5.1.1.4.2 Test procedure

1. Ensure the UE is in State 3A-RF according to TS 36.508 [25] clause 7.2A.3.
2. Set the parameters according to Table 8.5.1.1.5-1 and Table 8.5.1.1.5-3 as appropriate. (Condition = 3)
3. The SS shall transmit an *RRCConnectionReconfiguration* message on Cell 1.
4. The UE shall transmit an *RRCConnectionReconfigurationComplete* message.
5. The UE shall transmit a *MeasurementReport* message triggered by SFTD measurement.
6. The SS shall check the reported values of SFN offset and frame boundary offset in the *MeasurementReport*. The SFN offset value and frame boundary offset value between E-UTRA Cell 1 and Cell 2 reported by the UE is compared to the expected SFN offset value and frame boundary offset, respectively. The number of failed iterations is increased by one, if

   - The value of *sfn-OffsetResult* is different with the expected SFN offset value, or
   - The value of *frameBoundaryOffsetResult*is outside the range given in Table 8.5.1.1.5-5, or
   - The UE fails to report the measurement value for Cell 2.

   Otherwise the number of successful iterations is increased by one.
7. After the RRC connection release, the SS:

   - transmits in Cell 1 a Paging message (including PagingRecord with UE-Identity) for the UE and ensures the UE is in State 3A according to TS 36.508 [25] clause 4.5.3A (if the paging fails, switches off and on the UE and ensures the UE is in State 3A-RF according to TS 36.508 [25] clause 7.2A.3); or
   - switches off and on the UE and ensures the UE is in State 3A-RF according to TS 36.508 [25] clause 7.2A.3.
8. Repeat steps 1-7 until the confidence level according to Table G.2.3-1 in Annex G is achieved.

8.5.1.1.4.3 Message contents

Message contents are according to TS 36.508 [25] clause 7.3 with the following exceptions:

Table 8.5.1.1.4.3-1: Common Exception messages for E-UTRA - NR FR1 SFTD measurement accuracy

Default Message Contents	
Common contents of system information blocks exceptions	
Default RRC messages and information elements contents exceptions	Table H.3.4-7 with Condition Inter-RAT and SFTDTable H.3.4-4 with Condition INTER-RAT NR, SFTD and GAPLESS

Specific message contents exceptions for Test Configuration 8.5.1.1-1 and 8.5.1.1-4	Table H.3.4-6 with Condition SSB.1 FR1 and SMTC.1
Specific message contents exceptions for Test Configuration 8.5.1.1-2 and 8.5.1.1-5	Table H.3.4-6 with Condition SSB.1 FR1 and SMTC.1
Specific message contents exceptions for Test Configuration 8.5.1.1-3 and 8.5.1.1-6	Table H.3.4-6 with Condition SSB.2 FR1 and SMTC.1

8.5.1.1.5 Test requirement

Table 8.5.1.1.5-1 and 8.5.1.1.5-2 defines the primary level settings including test tolerances for E-UTRA - NR FR1 SFTD measurement accuracy.

The SFN offset and frame boundary offset between E-UTRA PCell and the inter-RAT neighbour cell shall be set to one of the configurations in Table 8.5.1.1.5-3. The reported SFTD accuracy shall fulfil the accuracy requirements in Table 8.5.1.1.5-4. The SFN offset in reported SFTD shall match the values in Table 8.5.1.1.5-3 and the frame boundary offset in reported SFTD shall be within the range given in Table 8.5.1.1.5-5.

Table 8.5.1.1.5-1: E-UTRA cell specific test parameters for E-UTRA - NR FR1 SFTD measurement accuracy

Parameter	Unit	Test 1
E-UTRA RF Channel Number		1
Duplex mode		FDD or TDD
TDD special subframe configuration[Note1]		6
TDD uplink-downlink configuration[Note1]		1
$BW_{channel}$		5 MHz: $N_{RB,c}$ = 25 10 MHz: $N_{RB,c}$ = 50 20 MHz: $N_{RB,c}$ = 100
PDSCH parameters: DL Reference Measurement Channel[Note2]		5 MHz: R.7 FDD 10 MHz: R.3 FDD 20 MHz: R.6 FDD 5 MHz: R.4 TDD 10 MHz: R.0 TDD 20 MHz: R.3 TDD
PCFICH/PDCCH/PHICH parameters: DL Reference Measurement Channel[Note2]		5 MHz: R.11 FDD 10 MHz: R.6 FDD 20 MHz: R.10 FDD 5 MHz: R.11 TDD 10 MHz: R.6 TDD 20 MHz: R.10 TDD
OCNG Patterns[Note2]		5 MHz: OP.20 FDD 10 MHz: OP.10 FDD 20 MHz: OP.17 FDD 5 MHz: OP.9 TDD 10 MHz: OP.1 TDD 20 MHz: OP.7 TDD
PBCH_RA	dB	0
PBCH_RB	dB	
PSS_RA	dB	
SSS_RA	dB	
PCFICH_RB	dB	
PHICH_RA	dB	
PHICH_RB	dB	
PDCCH_RA	dB	
PDCCH_RB	dB	
PDSCH_RA	dB	
PDSCH_RB	dB	
OCNG_RA[Note3]	dB	
OCNG_RB[Note3]	dB	
N_{oc}[Note4]	dBm/15 kHz	-104
$\hat{E}_s/N_{oc}$	dB	-2.2
$\hat{E}_s/I_{ot}$	dB	-2.2
RSRP [Note5]	dBm/15 kHz	-106.2
SCH_RP [Note5]	dBm/15 kHz	-106.2

Io Note5	dBm/Ch BW	-74.17 +10log ($N_{RB,c}$ /50)
Propagation Condition		AWGN
Antenna Configuration		1x2

NOTE 1: Special subframe and uplink-downlink configurations are specified in table 4.2-1 in TS 36.211 [24].
NOTE 2: DL RMCs and OCNG patterns are specified in clauses A 3.1 and A 3.2 of TS 36.133 [23] respectively.
NOTE 3: OCNG shall be used such that all cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.
NOTE 4: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for N_{oc} to be fulfilled.
NOTE 5: Es/Iot, RSRP, SCH_RP and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.

Table 8.5.1.1.5-2: NR cell specific test parameters for E-UTRA - NR FR1 SFTD measurement accuracy

Parameter		Config	Unit	Test 1
SSB GSCN		1~6		freq1
Duplex mode		1,4		FDD
		2,5		TDD
		3,6		TDD
TDD Configuration		1,4		N/A
		2,5		TDDConf.1.1
		3,6		TDDConf.2.1
$BW_{channel}$		1,4	MHz	10: $N_{RB,c}$ = 52
		2,5		10: $N_{RB,c}$ = 52
		3,6		40: $N_{RB,c}$ = 106
PDSCH Reference measurement channel		1,4		SR.1.1 FDD
		2,5		SR.1.1 TDD
		3,6		SR.2.1 TDD
RMSI CORESET Reference Channel		1,4		CR.1.1 FDD
		2,5		CR.1.1 TDD
		3,6		CR.2.1 TDD
RMC CORESET Reference Channel		1,4		CCR.1.1 FDD
		2,5		CCR.1.1 TDD
		3,6		CCR.2.1 TDD
SSB configuration		1,4		SSB.1 FR1
		2,5		SSB.1 FR1
		3,6		SSB.2 FR1
SMTC configuration		1~6		SMTC.1
DL BWP configuration		1~6		DLBWP.1.1
UL BWP configuration		1~6		ULBWP.1.1
OCNG Patterns		1~6		OP.1
EPRE ratio of PSS to SSS		1~6	dB	0
EPRE ratio of PBCH DMRS to SSS				
EPRE ratio of PBCH to PBCH DMRS				
EPRE ratio of PDCCH DMRS to SSS				
EPRE ratio of PDCCH to PDCCH DMRS				
EPRE ratio of PDSCH DMRS to SSS				
EPRE ratio of PDSCH to PDSCH DMRS				
EPRE ratio of OCNG DMRS to SSS Note 1				
EPRE ratio of OCNG to OCNG DMRS Note 1				
N_{oc} Note2	NR_FDD_FR1_A, NR_TDD_FR1_A	1~6	dBm/15kHz	-104
	NR_FDD_FR1_B			
	NR_TDD_FR1_C			
	NR_FDD_FR1_D, NR_TDD_FR1_D			
	NR_FDD_FR1_E, NR_TDD_FR1_E			
	NR_FDD_FR1_G			

Parameter		Config	Unit	Test 1
	NR_FDD_FR1_H			
N_{oc} Note2	NR_FDD_FR1_A, NR_TDD_FR1_A	1,2,4,5	dBm/SSB SCS	-104
	NR_FDD_FR1_B			
	NR_TDD_FR1_C			
	NR_FDD_FR1_D, NR_TDD_FR1_D			
	NR_FDD_FR1_E, NR_TDD_FR1_E			
	NR_FDD_FR1_G			
	NR_FDD_FR1_H			
	NR_FDD_FR1_A, NR_TDD_FR1_A	3,6		-101
	NR_FDD_FR1_B			
	NR_TDD_FR1_C			
	NR_FDD_FR1_D, NR_TDD_FR1_D			
	NR_FDD_FR1_E, NR_TDD_FR1_E			
	NR_FDD_FR1_G			
	NR_FDD_FR1_H			
$\hat{E}_s / I_{ot}$		1~6	dB	-2.7
$\hat{E}_s / N_{oc}$		1~6	dB	-2.7
SS-RSRP Note3	NR_FDD_FR1_A, NR_TDD_FR1_A	1,2,4,5	dBm/SCS	-106.7
	NR_FDD_FR1_B			
	NR_TDD_FR1_C			
	NR_FDD_FR1_D, NR_TDD_FR1_D			
	NR_FDD_FR1_E, NR_TDD_FR1_E			
	NR_FDD_FR1_G			
	NR_FDD_FR1_H			
	NR_FDD_FR1_A, NR_TDD_FR1_A	3,6		-103.7
	NR_FDD_FR1_B			
	NR_TDD_FR1_C			
	NR_FDD_FR1_D, NR_TDD_FR1_D			
	NR_FDD_FR1_E, NR_TDD_FR1_E			
	NR_FDD_FR1_G			
	NR_FDD_FR1_H			
Io Note3	NR_FDD_FR1_A, NR_TDD_FR1_A	1,2,4,5	dBm/9.36 MHz	-74.18
	NR_FDD_FR1_B			
	NR_TDD_FR1_C			
	NR_FDD_FR1_D, NR_TDD_FR1_D			
	NR_FDD_FR1_E, NR_TDD_FR1_E			
	NR_FDD_FR1_G			
	NR_FDD_FR1_H			
	NR_FDD_FR1_A, NR_TDD_FR1_A	3,6	dBm/38.16 MHz	-68.08
	NR_FDD_FR1_B			
	NR_TDD_FR1_C			
	NR_FDD_FR1_D, NR_TDD_FR1_D			
	NR_FDD_FR1_E, NR_TDD_FR1_E			
	NR_FDD_FR1_G			
	NR_FDD_FR1_H			
Propagation condition		1~6		AWGN

Parameter	Config	Unit	Test 1
Antenna configuration	1~6		1x2
NOTE 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols. NOTE 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for N_{oc} to be fulfilled. NOTE 3: SS-RSRP and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves. NOTE 4: SS-RSRP minimum requirements are specified assuming independent interference and noise at each receiver antenna port.			

Table 8.5.1.1.5-3: Timing offsets for E-UTRA - NR FR1 SFTD measurement accuracy

Condition	SFN offset between PCell and PSCell	Frame boundary offset between PCell and PSCell (Ts)
1	100	-122000
2	300	-60540
3	500	1000
4	700	62540
5	900	124000

Table 8.5.1.1.5-4: SFTD measurement accuracy

Accuracy	Conditions	
	Ês/Iot	Frequency range
Ts Note 1	dB	
40	≥ -3 dB	FR1
NOTE 1: Ts is the basic timing unit defined in TS 36.211 [24]. NOTE 2: The parameter Ês/Iot is the minimum Ês/Iot of the pair of cells to which the requirement applies.		

Table 8.5.1.1.5-5: E-UTRA - NR FR1 SFTD measurement accuracy requirements for the value of frameBoundaryOffsetResult in reported SFTD

Normal and Extreme Conditions	frameBoundaryOffsetResult				
	Condition 1	Condition 2	Condition 3	Condition 4	Condition 5
Lowest reported value	-24408	-12116	192	12500	24792
Highest reported value	-24392	-12100	208	12516	24808

For the test to pass, the ratio of successful reported values in each test shall be more than 90% with a confidence level of 95%.

8.5.2 Inter-RAT measurement accuracy

8.5.2.1 SS-RSRP

8.5.2.1.0 Minimum conformance requirements

The measurement period of NR SS-RSRP measurements in RRC_CONNECTED state is specified in TS 36.133 [23] Clause 8.1.2.4.21 for UE with FDD PCell not configured with E-UTRA-NR Dual Connectivity operation. The measurement period of NR SS-RSRP measurements in RRC_CONNECTED state is specified in TS 36.133 [23] Clause 8.1.2.4.22 for UE with TDD PCell not configured with E-UTRA-NR Dual Connectivity operation.

The reporting range for SS-RSRP is defined from -156dBm to -31dBm with 1dB resolution. The mapping of the measured quantity to the reported value is defined by Table 4.7.1.0.1-2.

The normative reference for this requirement is TS 36.133 [23] clause 9.11.1.

8.5.2.1.0.1 Inter-RAT E-UTRA - NR FR1 SS-RSRP measurement accuracy requirements

The accuracy requirements of NR SS-RSRP measurements in FR1 and the corresponding side conditions shall be the same as the inter-frequency SS-RSRP absolute accuracy requirements in clause 4.7.1.0.3.

8.5.2.1.0.2 Inter-RAT E-UTRA - NR FR2 SS-RSRP minimum conformance requirements

The accuracy requirements of NR SS-RSRP measurements in FR2 and the corresponding side conditions shall be the same as the inter-frequency SS-RSRP absolute accuracy requirements in clause 5.7.1.0.2.

8.5.2.1.1 SS-RSRP with NR FR1 target cell

8.5.2.1.1.1 E-UTRA SS-RSRP absolute measurement accuracy of a NR FR1 neighbour cell

8.5.2.1.1.1.1 Test purpose

The purpose of this test is to verify that the inter-RAT SS-RSRP absolute measurement accuracy is within the specified limits for all bands, when the serving cell is E-UTRA and the target cell is NR FR1.

8.5.2.1.1.1.2 Test applicability

This test applies to all E-UTRA UE release 15 onwards and capable of NR measurements.

8.5.2.1.1.1.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 8.5.2.1.0.

The normative reference for this requirement is TS 38.133 [6] clause A.8.5.2.1.1.1.

8.5.2.1.1.1.4 Test description

Two cells are configured in this test: E-UTRA Cell 1 is the E-UTRAN PCell and Cell 2 is the inter-RAT NR FR1 neighbour cell.

8.5.2.1.1.1.4.1 Initial conditions

This test shall be tested using any of the test configurations in Table 8.5.2.1.1.1.4.1-1.

Table 8.5.2.1.1.1.4.1-1: Supported test configurations

Configuration	Description
8.5.2.1.1.1-1	NR 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode, LTE FDD
8.5.2.1.1.1-2	NR 15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode, LTE FDD
8.5.2.1.1.1-3	NR 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode, LTE FDD
8.5.2.1.1.1-4	NR 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode, LTE TDD
8.5.2.1.1.1-5	NR 15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode, LTE TDD
8.5.2.1.1.1-6	NR 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode, LTE TDD
NOTE: The UE is only required to be tested in one of the supported test configurations.	

Configure the test equipment and the DUT according to the parameters in Table 8.5.2.1.1.1.4.1-2.

Table 8.5.2.1.1.1.4.1-2: Initial conditions

Parameter	Value	Comment
Test environment	NC, TL/VL, TL/VH, TH/VL, TH/VH	As specified in TS 36.508 [25] clause 4.1.
Test frequencies	As specified in Annex E, Table E.6-1 and TS 38.508-1 [14] clause 4.3.1.	
Channel bandwidth	As specified by the selected test configuration.	
Propagation conditions	AWGN	As specified in clause C.2.1

Connection Diagram	TE Part 2Rx	A.3.1.7.2	As specified in TS 38.508-1 [14] Annex A.
	TE Part 4Rx	A.3.1.7.3	
	DUT Part 2Rx	A.3.2.3.4	
	DUT Part 4Rx	A.3.2.5.2	
Exceptions to connection diagram	Without faders		

1. The general test parameter settings are set up according to Table 8.5.2.1.1.1.4.1-3.
2. Message contents are defined in clause 8.5.2.1.1.1.4.3.
3. There are two carriers and two cells specified in the test, where E-UTRA Cell 1 is the E-UTRA PCell on the E-UTRA carrier and Cell 2 is the NR neighbour cell on the NR carrier. E-UTRA Cell 1 is configured according to TS 36.521-3 [26] clause C.1.0 and C.1.1.

8.5.2.1.1.1.4.2 Test procedure

1. Ensure the UE is in State 3A-RF according to TS 36.508 [25] clause 7.2A.3.
2. Set the parameters according to Table 8.5.2.1.1.1.5-1 as appropriate.
3. The SS shall transmit an *RRCConnectionReconfiguration* message on Cell 1.
4. The UE shall transmit an *RRCConnectionReconfigurationComplete* message.
5. The UE shall transmit periodically MeasurementReport messages.
6. After 10s wait from Step 3, the SS shall check the SS-RSRP reported values in the periodic MeasurementReport. The SS-RSRP value of Cell 2 reported by the UE is compared to the expected SS-RSRP. If the value is outside the limits in clause 8.5.2.1.1.1.5 or the UE fails to report the measurement value for Cell 2, the number of failed iterations is increased by one. Otherwise, the number of passed iterations is increased by one.
7. The SS shall continue checking the MeasurementReport messages transmitted by the UE until the confidence level according to Table G.2.3-1 in Annex G is achieved.
8. Set the parameters according to each sub-test in Table 8.5.2.1.1.1.5-1 as appropriate and repeat steps 5-7.

8.5.2.1.1.1.4.3 Message contents

Message contents are according to TS 36.508 [25] clause 7.3 with the following exceptions:

Table 8.5.2.1.1.1.4.3-1: Common Exception messages

Default Message Contents	
Common contents of system information blocks exceptions	
Default RRC messages and information elements contents exceptions	Table H.3.4-7 Table 4.6.6-2B in TS 36.508 [25]

Table 8.5.2.1.1.1.4.3-2: ReportConfigInterRAT-DEFAULT(Periodical)

Derivation Path: 36.508 [25] Table 4.6.6-9			
Information Element	**Value/remark**	**Comment**	**Condition**
ReportConfigNR::= SEQUENCE {			
reportType CHOICE {			
periodical SEQUENCE {			
ReportQuantityNR-r15 SEQUENCE {	PRESENT		
ss-rsrp	true		
}			
}			
}			
}			

8.5.2.1.1.1.5 Test requirement

Table 8.5.2.1.1.1.5-1 defines the primary level settings including test tolerances for all tests.

Each SS-RSRP measurement report for each of the tests in Table 8.5.2.1.1.1.5-1 shall meet the corresponding absolute accuracy requirements in Table 8.5.2.1.1.1.5-2 for test configurations 1, 2, 4 and 5, and the corresponding absolute accuracy requirements in Table 8.5.2.1.1.1.5-3 for test configurations 3 and 6.

Table 8.5.2.1.1.1.5-1: SS-RSRP inter-RAT test parameters

Parameter			Unit	Test 1	Test 2
				Cell 2	Cell 2
SSB ARFCN				freq1	freq1
Duplex mode		Config 1,4		FDD	
		Config 2,3,5,6		TDD	
TDD configuration		Config 1,4		Not Applicable	
		Config 2,5		TDDConf.1.1	
		Config 3,6		TDDConf.2.1	
Downlink initial BWP configuration				DLBWP.0.1	
Uplink initial BWP configuration				ULBWP.0.1	
DRX Cycle configuration			ms	Not Applicable	
PDSCH Reference measurement channel		Config 1,4		-	-
		Config 2,5			
		Config 3,6			
RMSI CORESET Reference Channel		Config 1,4		-	-
		Config 2,5			
		Config 3,6			
Dedicated CORESET Reference Channel		Config 1,4		-	-
		Config 2,5			
		Config 3,6			
OCNG Patterns				OP.1	
SS-RSSI-Measurement				Not Applicable	
SMTC configuration				SMTC.1	
SSB configuration		Config 1,2,4,5		SSB.1 FR1	
		Config 3,6		SSB.2 FR1	
PDSCH/PDCCH subcarrier spacing		Config 1,2,4,5	kHz	15	
		Config 3,6		30	
EPRE ratio of PSS to SSS EPRE ratio of PBCH DMRS to SSS EPRE ratio of PBCH to PBCH DMRS EPRE ratio of PDCCH DMRS to SSS EPRE ratio of PDCCH to PDCCH DMRS EPRE ratio of PDSCH DMRS to SSS EPRE ratio of PDSCH to PDSCH EPRE ratio of OCNG DMRS to SSS(Note 1) EPRE ratio of OCNG to OCNG DMRS (Note 1)			dB	0	0	0	0
N_{oc} Note2	Config 1,2,4,5	Depending on band group	dBm/15kHz	-94.65		-117 + Δ_{BG_offset}	
	Config 3,6	Depending on band group	dBm/15kHz	-96.00		-117 + Δ_{BG_offset}	
N_{oc} Note2	Config 1,2,4,5		dBm/SCS	-94.65		Same as Noc for 15kHz	
	Config 3,6	Depending on band group		-93.00		-114 + Δ_{BG_offset}	
$\hat{E}_s / I_{ot}$			dB	10		-3.2	
$\hat{E}_s / N_{oc}$			dB	10		-3.2	
SS-RSRP Note3	Config 1,2,4,5	Depending on band group	dBm/SCS	-84.65		-120.2 + Δ_{BG_offset}	
	Config 3,6	Depending on band group		-83.00		-117.2 + Δ_{BG_offset}	
Io Note3	Config 1,2,4,5	Depending on band group	dBm/9.36MHz	-56.28		-87.35 + Δ_{BG_offset}	

Parameter			Unit	Test 1	Test 2
				Cell 2	Cell 2
	Config 3,6	Depending on band group	dBm/ 38.16MHz	-51.53	-81.25 + Δ_{BG_offset}
Propagation condition			-	AWGN	
Antenna configuration			-	1x2	

NOTE 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.
NOTE 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for N_{oc} to be fulfilled.
NOTE 3: SS-RSRP, and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.
NOTE 4: SS-RSRP minimum requirements are specified assuming independent interference and noise at each receiver antenna port.
NOTE 5: NR operating band groups are as defined in clause 3.5.2.
NOTE 6: The test configuration excludes support for band n51 and it is not required to run this test on band n51 in this release of the specification.

Table 8.5.2.1.1.1.5-2: SS-RSRP Inter RAT absolute accuracy requirements for the reported values for test configurations 1, 2, 4 and 5

Normal Conditions	Test 1 All bands	Test 2	
Lowest reported value (Cell 2)	62	Bands NR_FDD_FR1_A, NR_TDD_FR1_A	30
		Bands NR_FDD_FR1_B	31
		Bands NR_TDD_FR1_C	31
		Bands NR_FDD_FR1_D, NR_TDD_FR1_D	32
		Bands NR_FDD_FR1_E, NR_TDD_FR1_E	32
		Bands NR_FDD_FR1_F	33
		Bands NR_FDD_FR1_G	33
		Bands NR_FDD_FR1_H	34
Highest reported value (Cell 2)	82	Bands NR_FDD_FR1_A, NR_TDD_FR1_A	43
		Bands NR_FDD_FR1_B	43
		Bands NR_TDD_FR1_C	44
		Bands NR_FDD_FR1_D, NR_TDD_FR1_D	44
		Bands NR_FDD_FR1_E, NR_TDD_FR1_E	45
		Bands NR_FDD_FR1_F	45
		Bands NR_FDD_FR1_G	46
		Bands NR_FDD_FR1_H	46
Extreme Conditions	**Test 1 All bands**	**Test 2**	
Lowest reported value (Cell 2)	59	Bands NR_FDD_FR1_A, NR_TDD_FR1_A	26
		Bands NR_FDD_FR1_B	26
		Bands NR_TDD_FR1_C	27
		Bands NR_FDD_FR1_D, NR_TDD_FR1_D	27
		Bands NR_FDD_FR1_E, NR_TDD_FR1_E	28
		Bands NR_FDD_FR1_F	28
		Bands NR_FDD_FR1_G	29
		Bands NR_FDD_FR1_H	29
Highest reported value (Cell 2)	85	Bands NR_FDD_FR1_A, NR_TDD_FR1_A	47
		Bands NR_FDD_FR1_B	48
		Bands NR_TDD_FR1_C	48
		Bands NR_FDD_FR1_D, NR_TDD_FR1_D	49

		Bands NR_FDD_FR1_E, NR_TDD_FR1_E	49
		Bands NR_FDD_FR1_F	50
		Bands NR_FDD_FR1_G	50
		Bands NR_FDD_FR1_H	51
NOTE: NR operating band groups are defined in clause 3A.4, Table 3A.4.1-2.			

Table 8.5.2.1.1.1.5-3: SS-RSRP Inter RAT absolute accuracy requirements for the reported values for test configurations 3 and 6

Normal Conditions	Test 1 All bands	Test 2	
Lowest reported value (Cell 2)	64	Bands NR_FDD_FR1_A, NR_TDD_FR1_A	33
		Bands NR_FDD_FR1_B	34
		Bands NR_TDD_FR1_C	34
		Bands NR_FDD_FR1_D, NR_TDD_FR1_D	35
		Bands NR_FDD_FR1_E, NR_TDD_FR1_E	35
		Bands NR_FDD_FR1_F	36
		Bands NR_FDD_FR1_G	36
		Bands NR_FDD_FR1_H	37
Highest reported value (Cell 2)	83	Bands NR_FDD_FR1_A, NR_TDD_FR1_A	46
		Bands NR_FDD_FR1_B	46
		Bands NR_TDD_FR1_C	47
		Bands NR_FDD_FR1_D, NR_TDD_FR1_D	47
		Bands NR_FDD_FR1_E, NR_TDD_FR1_E	48
		Bands NR_FDD_FR1_F	48
		Bands NR_FDD_FR1_G	49
		Bands NR_FDD_FR1_H	49
Extreme Conditions	**Test 1 All bands**	**Test 2**	
Lowest reported value (Cell 2)	61	Bands NR_FDD_FR1_A, NR_TDD_FR1_A	29
		Bands NR_FDD_FR1_B	29
		Bands NR_TDD_FR1_C	30
		Bands NR_FDD_FR1_D, NR_TDD_FR1_D	30
		Bands NR_FDD_FR1_E, NR_TDD_FR1_E	31
		Bands NR_FDD_FR1_F	31
		Bands NR_FDD_FR1_G	32
		Bands NR_FDD_FR1_H	32
Highest reported value (Cell 2)	86	Bands NR_FDD_FR1_A, NR_TDD_FR1_A	50
		Bands NR_FDD_FR1_B	51
		Bands NR_TDD_FR1_C	51
		Bands NR_FDD_FR1_D, NR_TDD_FR1_D	52
		Bands NR_FDD_FR1_E, NR_TDD_FR1_E	52
		Bands NR_FDD_FR1_F	53
		Bands NR_FDD_FR1_G	53
		Bands NR_FDD_FR1_H	54
NOTE: NR operating band groups are defined in clause 3A.4, Table 3A.4.1-2.			

For the test to pass, the ratio of successful reported values in each test shall be more than 90% with a confidence level of 95%.

8.5.2.1.1.2 Void

8.5.2.1.2 E-UTRA SS-RSRP absolute measurement accuracy of a NR FR2 neighbour cell

Editor's Note: This test case has been completed for the following configurations:

- Test frequency f ≤ 40.8 GHz
- UE PC3
- Normal conditions
- The test is incomplete for UE power classes other than PC3
- The test is incomplete for test frequencies > 40.8 GHz
- The test is incomplete for extreme conditions

8.5.2.1.2.1 Test purpose

The purpose of this test is to verify that the inter-RAT SS-RSRP measurement accuracy is within the specified limits for all bands, when the serving cell is E-UTRA and the target cell is NR FR2.

8.5.2.1.2.2 Test applicability

This test applies to all E-UTRA UE release 15 onwards and capable of NR FR2 measurements.

8.5.2.1.2.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 8.5.2.1.0.2.

The normative reference for this requirement is TS 38.133 [6] clause A.8.5.2.1.2.

8.5.2.1.2.4 Test description

Two cells are configured in this test: E-UTRA Cell 1 is the E-UTRAN PCell and Cell 2 is the inter-RAT NR FR2 neighbour cell.

8.5.2.1.2.4.1 Initial conditions

This test shall be tested using any of the test configurations in Table 8.5.2.1.2.4.1-1.

Table 8.5.2.1.2.4.1-1: Supported test configurations

Configuration	Description
8.5.2.1.2-1	NR 120 kHz SSB SCS, 100 MHz bandwidth, TDD duplex mode, LTE FDD
8.5.2.1.2-2	NR 120 kHz SSB SCS, 100 MHz bandwidth, TDD duplex mode, LTE TDD
NOTE: The UE is only required to be tested in one of the supported test configurations	

Configure the test equipment and the DUT according to the parameters in Table 8.5.2.1.2.4.1-2.

Table 8.5.2.1.2.4.1-2: Initial conditions

Parameter	Value	Comment
Test environment	NC, TL/VL, TL/VH, TH/VL, TH/VH	As specified in TS 36.508 [25] clause 4.1.
Test frequencies	As specified in Annex E, Table E.6-2 and TS 38.508-1 [14] clause 4.3.1.	
Channel bandwidth	As specified by the selected test configuration.	
Propagation conditions	AWGN	As specified in clause C.2.1
Connection Diagram	TE Part: A.3.3.3.1 UE Part: A.3.4.1.1	As specified in TS 38.508-1 [14] Annex A.

Exceptions to connection diagram	N/A	

1. The general test parameter settings are set up according to Table 8.5.2.1.2.4.1-3.
2. Message contents are defined in clause 8.5.2.1.2.4.3.
3. There are two carriers and two cells specified in the test, where E-UTRA Cell 1 is the E-UTRA PCell on the E-UTRA carrier and Cell 2 is the NR neighbour cell on the NR carrier. E-UTRA Cell 1 is configured according to TS 36.521-3 [26] clause C.1.0 and C.1.1.
4. The UE Rx beam peak direction has been obtained previously using one of the Rx beam peak search procedures as described in Annex I.

8.5.2.1.2.4.2 Test procedure

1. Ensure the UE is in State 3A-RF according to TS 36.508 [25] clause 7.2A.3.
2. Set the parameters according to Table 8.5.2.1.2.5-1 and Table 8.5.2.1.2.5-2 as appropriate. The TE shall ensure that the NR FR2 cell will be received by the UE from the Rx beam peak direction.
3. The SS shall transmit an *RRCConnectionReconfiguration* message on Cell 1 to configure inter-RAT NR neighbour cell periodical measurements.
4. The UE shall transmit an *RRCConnectionReconfigurationComplete* message.
5. The UE shall transmit periodically MeasurementReport messages.
6. After 10s wait from Step 3, the SS shall check the SS-RSRP reported values in the periodic MeasurementReport. The SS-RSRP value of Cell 2 reported by the UE is compared to the expected SS-RSRP. If the value is outside the limits in clause 8.5.2.1.2.5 or the UE fails to report the measurement value for Cell 2, the number of failed iterations is increased by one. Otherwise, the number of passed iterations is increased by one.
7. The SS shall continue checking the MeasurementReport messages transmitted by the UE until the confidence level according to Table G.2.3-1 in Annex G is achieved.
8. Set the parameters according to each sub-test in Tables 8.5.2.1.2.5-1 and 8.5.2.1.2.5-2 as appropriate and repeat steps 5-7.

8.5.2.1.2.4.3 Message contents

Message contents are according to TS 36.508 [25] clause 7.3 with the following exceptions:

Table 8.5.2.1.2.4.3-1: Common Exception messages

Default Message Contents	
Common contents of system information blocks exceptions	
Default RRC messages and information elements contents exceptions	Table H.3.4-7 Table 4.6.6-2B in TS 36.508 [25]

Table 8.5.2.1.2.4.3-2: ReportConfigInterRAT-DEFAULT(Periodical)

Derivation Path: 36.508 [25] Table 4.6.6-9			
Information Element	**Value/remark**	**Comment**	**Condition**
ReportConfigNR::= SEQUENCE {			
reportType CHOICE {			
periodical SEQUENCE {			
ReportQuantityNR-r15 SEQUENCE {	PRESENT		
rsrp	true		
}			
}			

}			
}			

8.5.2.1.2.5 Test requirement

Table 8.5.2.1.2.5-1 defines the general test parameters and Table 8.5.2.1.2.5-2 defines the primary level OTA settings including test tolerances for all tests.

Each SS-RSRP measurement report for each of the tests in Table 8.5.2.1.2.5-2 shall meet the corresponding absolute accuracy requirements in Table 8.5.2.1.2.5-3

Table 8.5.2.1.2.5-1: SS-RSRP Inter-RAT general test parameters

Parameter	Unit	Test 1	Test 2
		Cell 2	Cell 2
SSB ARFCN		Freq1	freq1
Duplex mode		TDD	TDD
TDD configuration		TDDConf.3.1	TDDConf.3.1
$BW_{channel}$	MHz	100: $N_{RB,c}$ = 66	100: $N_{RB,c}$ = 66
Downlink initial BWP configuration		DLBWP.0.1	
Uplink initial BWP configuration		ULBWP.0.1	
DRX cycle configuration	ms	Not applicable	
PDSCH Reference measurement channel		-	-
RMSI CORESET Reference Channel		-	-
OCNG Patterns		OP.1	OP.1
SMTC configuration		SMTC.1	SMTC.1
SSB configuration		SSB.3 FR2	SSB.3 FR2
PDSCH/PDCCH subcarrier spacing	kHz	120	120
EPRE ratio of PSS to SSS	dB	0	0
EPRE ratio of PBCH_DMRS to SSS			
EPRE ratio of PBCH to PBCH_DMRS			
EPRE ratio of PDCCH_DMRS to SSS			
EPRE ratio of PDCCH to PDCCH_DMRS			
EPRE ratio of PDSCH_DMRS to SSS			
EPRE ratio of PDSCH to PDSCH_DMRS			
EPRE ratio of OCNG DMRS to SSS Note 1			
NOTE 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols. NOTE 2: Void. NOTE 3: Void. NOTE 4: Void.			

Table 8.5.2.1.2.5-2: SS-RSRP Inter-RAT OTA related test parameters

Parameter	Unit	Test 1	Test 2
		Cell 2	Cell 2
Angle of arrival configuration		Setup 1 according to A.3.15.1	Setup 1 according to A.3.15.1
Assumption for UE beams Note 9		Rough	Rough
N_{oc} Note1	dBm/15kHz Note4	-105.1	N/A
N_{oc} Note1	dBm/SCS Note4	-96.07	N/A
$\hat{E}_s / N_{oc}$	dB	11	N/A
E_s	dBm/SCS Note 4		(Table B.2.3-2 of TS 38.133 [6] Rx Beam Peak +6.65dB)

SSB_RP Note2	dBm/SCS Note4	-85.07	(Table B.2.3-2 of TS 38.133 [6] Rx Beam Peak +6.65dB)
$\hat{E}_s / I_{ot}$ BB Note 7	dB	9.95	1.84
Io Note2	dBm/95.04 MHz Note4	-55.75	(Table B.2.3-2 of TS 38.133 [6] Rx Beam Peak +35.65dB)

NOTE 1: Where used, interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for N_{oc} to be fulfilled.

NOTE 2: SSB_RP, Es/Iot and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.

NOTE 3: Void

NOTE 4: Equivalent power received by an antenna with 0 dBi gain at the centre of the quiet zone

NOTE 5: Void

NOTE 6: Void

NOTE 7: Calculation of Es/Iot_{BB} includes the effect of UE internal noise up to the value assumed for the associated Refsens requirement in clause 7.3.2 of TS 36.101-2 [3], and an allowance of 1dB for UE multi-band relaxation factor ΔMB_P from TS 38.101-2 [3] Table 6.2.1.3-4.

NOTE 8: Information about types of UE beam is given in B.2.1.3, and does not limit UE implementation or test system implementation

Table 8.5.2.1.2.5-3: evaluation limits for the reported values

UE power class 3			
Normal Conditions	**Test 1 All bands**	**Test 2**	
Lowest reported value (Cell 2)	48	n257, n258, n261	29
		n260	32
		n259	33
Highest reported value (Cell 2)	105	n257, n258, n261	87
		n260	89
		n259	90
Extreme Conditions	**Test 1 All bands**	**Test 2**	
Lowest reported value (Cell 2)	45	n257, n258, n261	26
		n260	29
		n259	30
Highest reported value (Cell 2)	108	n257, n258, n261	90
		n260	92
		n259	93

For the test to pass, the ratio of successful reported values in each test shall be more than 90% with a confidence level of 95%.

8.5.2.2 SS-RSRQ

8.5.2.2.0 Minimum conformance requirements

The measurement period of NR SS-RSRQ measurements is the same as the measurement period of NR SS-RSRP measurements defined in clause 8.5.2.1.0.

The reporting range of SS-RSRQ is defined from -43 dB to 20 dB with 0.5 dB resolution. The mapping of measured quantity is defined in Table 4.7.2.0.1-2. The range in the signalling may be larger than the guaranteed accuracy range.

The normative reference for this requirement is TS 36.133 [23] clause 9.11.2.

8.5.2.2.0.1 Inter-RAT E-UTRA - NR FR1 SS-RSRQ minimum conformance requirements

The accuracy requirements of NR SS-RSRQ measurements in FR1 and the corresponding side conditions shall be the same as the inter-frequency SS-RSRQ absolute accuracy requirements in clause 4.7.2.0.2.

8.5.2.2.0.2 Inter-RAT E-UTRA - NR FR2 SS-RSRQ minimum conformance requirements

The accuracy requirements of NR SS-RSRP measurements in FR2 and the corresponding side conditions shall be the same as the inter-frequency SS-RSRP absolute accuracy requirements in clause 5.7.2.0.2.

8.5.2.2.1 E-UTRA SS-RSRQ absolute measurement accuracy of a NR FR1 neighbour cell

8.5.2.2.1.1 Test purpose

The purpose of this test is to verify that the inter-RAT SS-RSRQ measurement accuracy is within the specified limits for all bands, when the serving cell is E-UTRA and the target cell is NR FR1.

8.5.2.2.1.2 Test applicability

This test applies to all E-UTRA UE release 15 onwards and capable of NR measurements.

8.5.2.2.1.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 8.5.2.2.0.1.

The normative reference for this requirement is TS 38.133 [6] clause A.8.5.2.2.1.

8.5.2.2.1.4 Test description

Two cells are configured in this test: E-UTRA Cell 1 is the E-UTRAN PCell and Cell 2 is the inter-RAT NR FR1 neighbour cell.

8.5.2.2.1.4.1 Initial conditions

This test shall be tested using any of the test configurations in Table 8.5.2.2.1.4.1-1.

Table 8.5.2.2.1.4.1-1: Supported test configurations

Configuration	Description
8.5.2.2.1-1	NR 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode, LTE FDD
8.5.2.2.1-2	NR 15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode, LTE FDD
8.5.2.2.1-3	NR 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode, LTE FDD
8.5.2.2.1-4	NR 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode, LTE TDD
8.5.2.2.1-5	NR 15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode, LTE TDD
8.5.2.2.1-6	NR 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode, LTE TDD
NOTE: The UE is only required to be tested in one of the supported test configurations.	

Configure the test equipment and the DUT according to the parameters in Table 8.5.2.2.1.4.1-2.

Table 8.5.2.2.1.4.1-2: Initial conditions

Parameter	Value		Comment
Test environment	NC, TL/VL, TL/VH, TH/VL, TH/VH		As specified in TS 36.508 [25] clause 4.1.
Test frequencies	As specified in Annex E, Table E.6-1 and TS 38.508-1 [14] clause 4.3.1.		
Channel bandwidth	As specified by the selected test configuration.		
Propagation conditions	AWGN		As specified in clause C.2.1
Connection Diagram	TE Part 2Rx	A.3.1.7.2	As specified in TS 38.508-1 [14] Annex A.
	TE Part 4Rx	A.3.1.7.3	
	DUT Part 2Rx	A.3.2.3.4	
	DUT Part 4Rx	A.3.2.5.2	

Exceptions to connection diagram	N/A	

1. The general test parameter settings are set up according to Table 8.5.2.2.1.4.1-3.
2. Message contents are defined in clause 8.5.2.2.1.4.3.
3. There are two carriers and two cells specified in the test, where E-UTRA Cell 1 is the E-UTRA PCell on the E-UTRA carrier and Cell 2 is the NR neighbour cell on the NR carrier. E-UTRA Cell 1 is configured according to TS 36.521-3 [26] clause C.1.0 and C.1.1.

8.5.2.2.1.4.2 Test procedure

1. Ensure the UE is in State 3A-RF according to TS 36.508 [25] clause 7.2A.3.
2. Set the parameters according to Table 8.5.2.2.1.5-1 as appropriate.
3. The SS shall transmit an *RRCConnectionReconfiguration* message on Cell 1.
4. The UE shall transmit an *RRCConnectionReconfigurationComplete* message.
5. The UE shall transmit periodically MeasurementReport messages.
6. After 10s wait from Step 3, the SS shall check the SS-RSRQ reported values in the periodic MeasurementReport. The SS-RSRQ value of Cell 2 reported by the UE is compared to the expected SS-RSRQ. If the value is outside the limits in clause 8.5.2.2.1.5 or the UE fails to report the measurement value for Cell 2, the number of failed iterations is increased by one. Otherwise, the number of passed iterations is increased by one.
7. The SS shall continue checking the MeasurementReport messages transmitted by the UE until the confidence level according to Table G.2.3-1 in Annex G is achieved.
8. Set the parameters according to each sub-test in Table 8.5.2.2.1.5-1 as appropriate and repeat steps 5-7.

8.5.2.2.1.4.3 Message contents

Message contents are according to TS 36.508 [25] clause 7.3 with the following exceptions:

Table 8.5.2.2.1.4.3-1: Common Exception messages

Default Message Contents	
Common contents of system information blocks exceptions	
Default RRC messages and information elements contents exceptions	Table H.3.4-7 Table 4.6.6-2B in TS 36.508 [25]

Table 8.5.2.2.1.4.3-2: ReportConfigInterRAT-DEFAULT(Periodical)

Derivation Path: 36.508 [25] Table 4.6.6-9			
Information Element	**Value/remark**	**Comment**	**Condition**
ReportConfigNR::= SEQUENCE {			
reportType CHOICE {			
periodical SEQUENCE {			
ReportQuantityNR-r15 SEQUENCE {	PRESENT		
ss-rsrq	true		
}			
}			
}			
}			

8.5.2.2.1.5 Test requirement

Table 8.5.2.2.1.5-1 defines the primary level settings including test tolerances for all tests.

Each SS-RSRQ measurement report for each of the tests in Table 8.5.2.2.1.5-1 shall meet the corresponding absolute accuracy requirements in Table 8.5.2.2.1.5-2.

Table 8.5.2.2.1.5-1: SS-RSRQ inter-RAT test parameters

Parameter			Unit	Test 1	Test 2	Test 3
				Cell 2	Cell 2	Cell 2
SSB ARFCN				freq1	freq1	freq1
Duplex mode		Config 1,4		FDD		
		Config 2,3,5,6		TDD		
TDD configuration		Config 1,4		Not Applicable		
		Config 2,5		TDDConf.1.1		
		Config 3,6		TDDConf.2.1		
Downlink initial BWP configuration				DLBWP.0.1		
Uplink initial BWP configuration				ULBWP.0.1		
DRX Cycle configuration			ms	Not Applicable		
PDSCH Reference measurement channel		Config 1,4		-	-	-
		Config 2,5				
		Config 3,6				
RMSI CORESET Reference Channel		Config 1,4		-	-	-
		Config 2,5				
		Config 3,6				
Dedicated CORESET Reference Channel		Config 1,4		-	-	-
		Config 2,5				
		Config 3,6				
OCNG Patterns				OP.1		
SS-RSSI-Measurement				Not Applicable		
SMTC configuration				SMTC.1		
SSB configuration		Config 1,2,4,5		SSB.1 FR1		
		Config 3,6		SSB.2 FR1		
PDSCH/PDCCH subcarrier spacing		Config 1,2,4,5	kHz	15		
		Config 3,6		30		
EPRE ratio of PSS to SSS			dB	0	0	0	0	0	0
EPRE ratio of PBCH DMRS to SSS									
EPRE ratio of PBCH to PBCH DMRS									
EPRE ratio of PDCCH DMRS to SSS									
EPRE ratio of PDCCH to PDCCH DMRS									
EPRE ratio of PDSCH DMRS to SSS									
EPRE ratio of PDSCH to PDSCH									
EPRE ratio of OCNG DMRS to SSS(Note 1)									
EPRE ratio of OCNG to OCNG DMRS (Note 1)									
N_{oc} Note2	Config 1,2,4,5	Depending on band group	dBm/15kHz	-81.68	-106	-116 + Δ_{BG_offset}
	Config 3,6			-87.80	-113	Same as Noc for 15kHz for Config 1,2,4,5
N_{oc} Note2	Config 1,2,4,5		dBm/SCS	-81.68	-106	Same as Noc for 15kHz
	Config 3,6	Depending on band group		-84.80	-110	-113 + Δ_{BG_offset}
$\hat{E}_s / I_{ot}$			dB	-1.75	-1.75	-1.75
$\hat{E}_s / N_{oc}$			dB	-1.75	-1.75	-1.75
SS-RSRP Note3	Config 1,2,4,5	Depending on band group	dBm/SCS	-83.43	-107.75	-117.75 + Δ_{BG_offset}
	Config 3,6	Depending on band group		-86.55	-111.75	-114.75 + Δ_{BG_offset}
SS-RSRQ Note3			dB	-14.77	-14.76	-14.76
Io Note3	Config 1,2,4,5	Depending on band group	dBm/ 9.36MHz	-50	-75.83	-85.83 + Δ_{BG_offset}
	Config 3,6	Depending on band group	dBm/ 38.16MHz	-50	-76.73	-79.73 + Δ_{BG_offset}
Propagation condition			-	AWGN		

Parameter	Unit	Test 1	Test 2	Test 3
		Cell 2	Cell 2	Cell 2
Antenna configuration	-	1x2		
NOTE 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.				
NOTE 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for N_{oc} to be fulfilled.				
NOTE 3: SS-RSRQ, SS-RSRP, and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.				
NOTE 4: SS-RSRQ minimum requirements are specified assuming independent interference and noise at each receiver antenna port.				
NOTE 5: NR operating band groups are as defined in clause 3.5.2.				
NOTE 6: The test configuration excludes support for band n51 and it is not required to run this test on band n51 in this release of the specification.				

Table 8.5.2.2.1.5-2: SS-RSRQ accuracy requirements for the reported values

	Test 1	Test 2	Test 3
	All bands	All bands	All bands
Normal Conditions			
Lowest reported value (Cell 2)	SS-RSRQ_51	SS-RSRQ_51	SS-RSRQ_51
Highest reported value (Cell 2)	SS-RSRQ_63	SS-RSRQ_63	SS-RSRQ_63
Extreme Conditions			
Lowest reported value (Cell 2)	SS-RSRQ_48	SS-RSRQ_48	SS-RSRQ_48
Highest reported value (Cell 2)	SS-RSRQ_66	SS-RSRQ_66	SS-RSRQ_66

For the test to pass, the ratio of successful reported values in each test shall be more than 90% with a confidence level of 95%.

8.5.2.2.2 E-UTRA SS-RSRQ absolute measurement accuracy of a NR FR2 neighbour cell

Editor's Note: This test case has been completed for the following configurations:

- Test frequency f ≤ 40.8 GHz
- UE PC3
- Normal conditions
- The test is incomplete for UE power classes other than PC3
- The test is incomplete for test frequencies > 40.8 GHz
- The test is incomplete for extreme conditions

8.5.2.2.2.1 Test purpose

The purpose of this test is to verify that the inter-RAT SS-RSRQ measurement accuracy is within the specified limits for all bands, when the serving cell is E-UTRA and the target cell is NR FR2.

8.5.2.2.2.2 Test applicability

This test applies to all E-UTRA UE release 15 onwards and capable of NR FR2 measurements.

8.5.2.2.2.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 8.5.2.1.0.2.

The normative reference for this requirement is TS 38.133 [6] clause A.8.5.2.2.2.

8.5.2.2.2.4 Test description

Two cells are configured in this test: E-UTRA Cell 1 is the E-UTRAN PCell and Cell 2 is the inter-RAT NR FR2 neighbour cell.

8.5.2.2.2.4.1 Initial conditions

This test shall be tested using any of the test configurations in Table 8.5.2.2.2.4.1-1.

Table 8.5.2.2.2.4.1-1: Supported test configurations

Configuration	Description
8.5.2.2.2-1	NR 120 kHz SSB SCS, 100 MHz bandwidth, TDD duplex mode, LTE FDD
8.5.2.2.2-2	NR 120 kHz SSB SCS, 100 MHz bandwidth, TDD duplex mode, LTE TDD
NOTE: The UE is only required to be tested in one of the supported test configurations	

Configure the test equipment and the DUT according to the parameters in Table 8.5.2.2.2.4.1-2.

Table 8.5.2.2.2.4.1-2: Initial conditions

Parameter	Value	Comment
Test environment	NC, TL/VL, TL/VH, TH/VL, TH/VH	As specified in TS 36.508 [25] clause 4.1.
Test frequencies	As specified in Annex E, Table E.6-2 and TS 38.508-1 [14] clause 4.3.1.	
Channel bandwidth	As specified by the selected test configuration.	
Propagation conditions	AWGN	As specified in clause C.2.1
Connection Diagram	TE Part: A.3.3.3.1	As specified in TS 38.508-1 [14] Annex A.
	UE Part: A.3.4.1.1	
Exceptions to connection diagram	N/A	

1. The general test parameter settings are set up according to Table 8.5.2.2.2.4.1-3.
2. Message contents are defined in clause 8.5.2.2.2.4.3.
3. There are two carriers and two cells specified in the test, where E-UTRA Cell 1 is the E-UTRA PCell on the E-UTRA carrier and Cell 2 is the NR neighbour cell on the NR carrier. E-UTRA Cell 1 is configured according to TS 36.521-3 [26] clause C.1.0 and C.1.1.
4. The UE Rx beam peak direction has been obtained previously using one of the Rx beam peak search procedures as described in Annex I.

8.5.2.2.2.4.2 Test procedure

1. Ensure the UE is in State 3A-RF according to TS 36.508 [25] clause 7.2A.3.
2. Set the parameters according to Table 8.5.2.2.2.5-1 and Table 8.5.2.2.2.5-2 as appropriate. The TE shall ensure that the NR FR2 cell will be received by the UE from the Rx beam peak direction.
3. The SS shall transmit an *RRCConnectionReconfiguration* message on Cell 1 to configure inter-RAT NR neighbour cell periodical measurements.
4. The UE shall transmit an *RRCConnectionReconfigurationComplete* message.
5. The UE shall transmit periodically MeasurementReport messages.
6. After 10s wait from Step 3, the SS shall check the SS-RSRQ reported values in the periodic MeasurementReport. The SS-RSRQ value of Cell 2 reported by the UE is compared to the expected SS-RSRQ. If the value is outside the limits in clause 8.5.2.2.2.5 or the UE fails to report the measurement value for Cell 2, the number of failed iterations is increased by one. Otherwise, the number of passed iterations is increased by one.

7. The SS shall continue checking the MeasurementReport messages transmitted by the UE until the confidence level according to Table G.2.3-1 in Annex G is achieved.

8. Set the parameters according to each sub-test in Tables 8.5.2.2.2.5-1 and 8.5.2.2.2.5-2 as appropriate and repeat steps 5-7.

8.5.2.2.2.4.3 Message contents

Message contents are according to TS 36.508 [25] clause 7.3 with the following exceptions:

Table 8.5.2.2.2.4.3-1: Common Exception messages

Default Message Contents	
Common contents of system information blocks exceptions	
Default RRC messages and information elements contents exceptions	Table H.3.4-7 Table 4.6.6-2B in TS 36.508 [25]

Table 8.5.2.2.2.4.3-2: ReportConfigInterRAT-DEFAULT(Periodical)

Derivation Path: 36.508 [25] Table 4.6.6-9			
Information Element	**Value/remark**	**Comment**	**Condition**
ReportConfigNR::= SEQUENCE {			
reportType CHOICE {			
periodical SEQUENCE {			
ReportQuantityNR-r15 SEQUENCE {	PRESENT		
rsrq	true		
}			
}			
}			
}			

8.5.2.2.2.5 Test requirement

Table 8.5.2.2.2.5-1 defines the general test parameters and Table 8.5.2.2.2.5-2 defines the primary level OTA settings including test tolerances for all tests.

Each SS-RSRQ measurement report for each of the tests in Table 8.5.2.2.2.5-2 shall meet the corresponding absolute accuracy requirements in Table 8.5.2.2.2.5-3

Table 8.5.2.2.2.5-1: SS-RSRQ Inter-RAT general test parameters

Parameter	Unit	Test 1	Test 2
		Cell 2	Cell 2
SSB ARFCN		Freq1	freq1
Duplex mode		TDD	TDD
TDD configuration		TDDConf.3.1	TDDConf.3.1
$BW_{channel}$	MHz	100: $N_{RB,c}$ = 66	100: $N_{RB,c}$ = 66
Downlink initial BWP configuration		DLBWP.0.1	
Uplink initial BWP configuration		ULBWP.0.1	
DRX cycle configuration	ms	Not applicable	
PDSCH Reference measurement channel		-	-
RMSI CORESET Reference Channel		-	-
OCNG Patterns		OP.1	OP.1
SMTC configuration		SMTC.1	SMTC.1
SSB configuration		SSB.3 FR2	SSB.3 FR2
PDSCH/PDCCH subcarrier spacing	kHz	120	120
EPRE ratio of PSS to SSS	dB	0	0
EPRE ratio of PBCH_DMRS to SSS			
EPRE ratio of PBCH to PBCH_DMRS			

EPRE ratio of PDCCH_DMRS to SSS			
EPRE ratio of PDCCH to PDCCH_DMRS			
EPRE ratio of PDSCH_DMRS to SSS			
EPRE ratio of PDSCH to PDSCH_DMRS			
EPRE ratio of OCNG DMRS to SSS Note 1			

NOTE 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.
NOTE 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for N_{oc} to be fulfilled.
NOTE 3: SS-SINR, SS-RSRP and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.
NOTE 4: SS-SINR and SS-RSRP minimum requirements are specified assuming independent interference and noise at each receiver antenna port.

Table 8.5.2.2.2.5-2: SS-RSRQ Inter-RAT OTA related test parameters

Parameter	Unit	Test 1	Test 2
		Cell 2	Cell 2
Angle of arrival configuration		Setup 1	Setup 1
Assumption for UE beams Note 10		Rough	Rough
N_{oc} Note1	dBm/15kHz Note4	-105	(Table B.2.3-2 of TS 38.133 [6] Rx Beam Peak -5dB) (Note 7)
N_{oc} Note1	dBm/SCS Note4	-95.97	(Table B.2.3-2 of TS 38.133 [6] Rx Beam Peak +4dB) (Note 7)
$\hat{E}_s / N_{oc}$	dB	-0.5	3.55
SSB_RP Note2	dBm/SCS Note4	-96.47	(Table B.2.3-2 of TS 38.133 [6] Rx Beam Peak +7.55dB) (Note 8)
SS-RSRQ Note2	dB	-14.06	-12.38
$\hat{E}_s / I_{ot}$ Note2	dB	-0.5	3.55
Io Note2	dBm/95.04 MHz Note4	-64.21	(Table B.2.3-2 of TS 38.133 [6] Rx Beam Peak +43.16dB) (Note 9)

NOTE 1: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for N_{oc} to be fulfilled.
NOTE 2: SSB_RP, SS-RSRQ, Es/Iot and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.
NOTE 3: Void
NOTE 4: Equivalent power received by an antenna with 0dBi gain at the centre of the quiet zone.
NOTE 5: Void
NOTE 6: Void
NOTE 7: N_{oc} for SCS 15kHz is applied at $-10\log_{10}(8)+4$dB above the minimum level specified in Table B.2.3-2 of TS 38.133 [6] for beam peak. N_{oc} for SCS 120kHz is applied at 4dB above the minimum level specified in Table B.2.3-2 for beam peak.
NOTE 8: SSB_RP is applied at 2.25dB above the minimum level specified in Table B.2.3-2 of TS 38.133 [6] for beam peak.
NOTE 9: Io is applied at $10\log_{10}(792)+6.22$dB above the minimum level specified in Table B.2.3-2 of TS 38.133 [6] for beam peak.
NOTE 10: Information about types of UE beam is given in B.2.1.3 of TS 38.133 [6], and does not limit UE implementation or test system implementation.

Table 8.5.2.2.2.5-3: evaluation limits for the reported values

Normal Conditions	Test 1	Test 2
Lowest reported value (Cell 2)	23	26
Highest reported value (Cell 2)	95	98
Extreme Conditions	**Test 1**	**Test 2**
Lowest reported value (Cell 2)	20	23
Highest reported value (Cell 2)	98	101

8.5.2.3 SS-SINR

8.5.2.3.0 Minimum conformance requirements

The measurement period of NR SS-SINR measurements is the same as the measurement period of NR SS-RSRP measurements defined in clause 8.5.2.1.0.

The reporting range of SS-SINR and CSI-SINR is defined from -23 dB to 40 dB with 0.5 dB resolution. The mapping of measured quantity is defined in Table 4.7.3.0.1-2. The range in the signalling may be larger than the guaranteed accuracy range.

The normative reference for this requirement is TS 36.133 [23] clause 9.11.3.

8.5.2.3.0.1 Inter-RAT E-UTRA - NR FR1 SS-SINR minimum conformance requirements

The accuracy requirements of NR SS-SINR measurements in FR1 and the corresponding side conditions shall be the same as the inter-frequency SS-SINR absolute accuracy requirements in clause 4.7.3.0.2.

8.5.2.3.0.2 Inter-RAT E-UTRA - NR FR2 SS-SINR minimum conformance requirements

The accuracy requirements of NR SS-SINR measurements in FR2 and the corresponding side conditions shall be the same as the inter-frequency SS-SINR absolute accuracy requirements in clause 5.7.3.0.2.

8.5.2.3.1 E-UTRA SS-SINR absolute measurement accuracy of a NR FR1 neighbour cell

8.5.2.3.1.1 Test purpose

The purpose of this test is to verify that the inter-RAT SS-SINR measurement accuracy is within the specified limits for all bands, when the serving cell is E-UTRA and the target cell is NR FR1.

8.5.2.3.1.2 Test applicability

This test applies to all E-UTRA UE release 15 onwards supporting ss-SINR-Meas and capable of NR measurements.

8.5.2.3.1.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 8.5.2.3.0.1.

The normative reference for this requirement is TS 38.133 [6] clause A.8.5.2.3.1.

8.5.2.3.1.4 Test description

Two cells are configured in this test: E-UTRA Cell 1 is the E-UTRAN PCell and Cell 2 is the inter-RAT NR FR1 neighbour cell.

8.5.2.3.1.4.1 Initial conditions

This test shall be tested using any of the test configurations in Table 8.5.2.3.1.4.1-1.

Table 8.5.2.3.1.4.1-1: Supported test configurations

Configuration	Description
8.5.2.3.1-1	NR 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode, LTE FDD
8.5.2.3.1-2	NR 15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode, LTE FDD
8.5.2.3.1-3	NR 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode, LTE FDD
8.5.2.3.1-4	NR 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode, LTE TDD
8.5.2.3.1-5	NR 15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode, LTE TDD
8.5.2.3.1-6	NR 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode, LTE TDD
NOTE: The UE is only required to be tested in one of the supported test configurations.	

Configure the test equipment and the DUT according to the parameters in Table 8.5.2.3.1.4.1-2.

Table 8.5.2.3.1.4.1-2: Initial conditions

Parameter	Value		Comment
Test environment	NC, TL/VL, TL/VH, TH/VL, TH/VH		As specified in TS 36.508 [25] clause 4.1.
Test frequencies	As specified in Annex E, Table E.6-1 and TS 38.508-1 [14] clause 4.3.1.		
Channel bandwidth	As specified by the selected test configuration.		
Propagation conditions	AWGN		As specified in clause C.2.1
Connection Diagram	TE Part 2Rx	A.3.1.7.2	As specified in TS 38.508-1 [14] Annex A.
	TE Part 4Rx	A.3.1.7.3	
	DUT Part 2Rx	A.3.2.3.4	
	DUT Part 4Rx	A.3.2.5.2	
Exceptions to connection diagram	N/A		

1. The general test parameter settings are set up according to Table 8.5.2.3.1.4.1-3.
2. Message contents are defined in clause 8.5.2.3.1.4.3.
3. There are two carriers and two cells specified in the test, where E-UTRA Cell 1 is the E-UTRA PCell on the E-UTRA carrier and Cell 2 is the NR neighbour cell on the NR carrier. E-UTRA Cell 1 is configured according to TS 36.521-3 [26] clause C.1.0 and C.1.1.

8.5.2.3.1.4.2 Test procedure

1. Ensure the UE is in State 3A-RF according to TS 36.508 [25] clause 7.2A.3.
2. Set the parameters according to Table 8.5.2.3.1.5-1 as appropriate.
3. The SS shall transmit an *RRCConnectionReconfiguration* message on Cell 1.
4. The UE shall transmit an *RRCConnectionReconfigurationComplete* message.
5. The UE shall transmit periodically MeasurementReport messages.
6. After 10s wait from Step 3, the SS shall check the SS-SINR reported values in the periodic MeasurementReport. The SS- SINR value of Cell 2 reported by the UE is compared to the expected SS- SINR. If the value is outside the limits in clause 8.5.2.3.1.5 or the UE fails to report the measurement value for Cell 2, the number of failed iterations is increased by one. Otherwise, the number of passed iterations is increased by one.
7. The SS shall continue checking the MeasurementReport messages transmitted by the UE until the confidence level according to Table G.2.3-1 in Annex G is achieved.
8. Set the parameters according to each sub-test in Table 8.5.2.3.1.5-1 as appropriate and repeat steps 5-7.

8.5.2.3.1.4.3 Message contents

Message contents are according to TS 36.508 [25] clause 7.3 with the following exceptions:

Table 8.5.2.3.1.4.3-1: Common Exception messages

Default Message Contents	
Common contents of system information blocks exceptions	
Default RRC messages and information elements contents exceptions	Table H.3.4-7 Table 4.6.6-2B in TS 36.508 [25]

Table 8.5.2.3.1.4.3-2: ReportConfigInterRAT-DEFAULT(Periodical)

Derivation Path: 36.508 [25] Table 4.6.6-9			
Information Element	**Value/remark**	**Comment**	**Condition**
ReportConfigNR::= SEQUENCE {			
reportType CHOICE {			
periodical SEQUENCE {			
ReportQuantityNR-r15 SEQUENCE {	PRESENT		
ss-sinr	true		
}			
}			
}			
}			

8.5.2.3.1.5 Test requirement

Table 8.5.2.3.1.5-1 defines the primary level settings including test tolerances for all tests.

Each SS-RSRQ measurement report for each of the tests in Table 8.5.2.3.1.5-1 shall meet the corresponding absolute accuracy requirements in Table 8.5.2.3.1.5-2.

Table 8.5.2.3.1.5-1: SS-SINR inter-RAT test parameters

Parameter		Unit	Test 1	Test 2	Test 3
			Cell 2	Cell 2	Cell 2
SSB ARFCN			freq1	freq1	freq1
Duplex mode	Config 1,4		FDD		
	Config 2,3,5,6		TDD		
TDD configuration	Config 1,4		Not Applicable		
	Config 2,5		TDDConf.1.1		
	Config 3,6		TDDConf.2.1		
Downlink initial BWP configuration			DLBWP.0.1		
Uplink initial BWP configuration			ULBWP.0.1		
DRX Cycle configuration		ms	Not Applicable		
PDSCH Reference measurement channel	Config 1,4		-	-	-
	Config 2,5				
	Config 3,6				
RMSI CORESET Reference Channel	Config 1,4		-	-	-
	Config 2,5				
	Config 3,6				
Dedicated CORESET Reference Channel	Config 1,4		-	-	-
	Config 2,5				
	Config 3,6				
OCNG Patterns			OP.1		
SS-RSSI-Measurement			Not Applicable		
SMTC configuration			SMTC.1		
SSB configuration	Config 1,2,4,5		SSB.1 FR1		
	Config 3,6		SSB.2 FR1		
PDSCH/PDCCH subcarrier spacing	Config 1,2,4,5	kHz	15		
	Config 3,6		30		
EPRE ratio of PSS to SSS		dB	0	0	0	0	0	0
EPRE ratio of PBCH DMRS to SSS								
EPRE ratio of PBCH to PBCH DMRS								
EPRE ratio of PDCCH DMRS to SSS								
EPRE ratio of PDCCH to PDCCH DMRS								

Parameter			Unit	Test 1	Test 2	Test 3
				Cell 2	Cell 2	Cell 2
EPRE ratio of PDSCH DMRS to SSS						
EPRE ratio of PDSCH to PDSCH						
EPRE ratio of OCNG DMRS to SSS(Note 1)						
EPRE ratio of OCNG to OCNG DMRS (Note 1)						
N_{oc} Note2	Config 1,2,4,5	Depending on band group	dBm/15kHz	-88	-108.5	-119.5 + Δ_{BG_offset}
N_{oc} Note2	Config 1,2,4,5		dBm/SCS	-88	-108.5	Same as Noc for 15kHz
	Config 3,6	Depending on band group		-85	-105.5	-116.5 + Δ_{BG_offset}
$\hat{E}_s / I_{ot}$			dB	-1.75	20	-3.2
$\hat{E}_s / N_{oc}$			dB	-1.75	20	-3.2
SS-RSRP Note3	Config 1,2,4,5	Depending on band group	dBm/SCS	-89.75	-88.5	-122.7 + Δ_{BG_offset}
	Config 3,6	Depending on band group		-86.75	-85.5	-119.7 + Δ_{BG_offset}
SS-SINR Note3			dB	-1.75	20	-4.0
Io Note3	Config 1,2,4,5	Depending on band group	dBm/ 9.36MHz	-57.83	-60.5	-89.85 + Δ_{BG_offset}
	Config 3,6	Depending on band group	dBm/ 38.16MHz	-51.73	-54.41	-83.75 + Δ_{BG_offset}
Propagation condition			-	AWGN		
Antenna configuration			-	1x2		

NOTE 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.
NOTE 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for N_{oc} to be fulfilled.
NOTE 3: SS-SINR, SS-RSRP, and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.
NOTE 4: SS-SINR, SS-RSRP minimum requirements are specified assuming independent interference and noise at each receiver antenna port.
NOTE 5: NR operating band groups are as defined in clause 3.5.2.
NOTE 6: The test configuration excludes support for band n51 and it is not required to run this test on band n51 in this release of the specification.

Table 8.5.2.3.1.5-2: SS-SINR accuracy requirements for the reported values

	Test 1	Test 2	Test 3
	All bands	All bands	All bands
Normal Conditions			
Lowest reported value (Cell 2)	SS-SINR_35	SS-SINR_79	SS-SINR_32
Highest reported value (Cell 2)	SS-SINR_51	SS-SINR_94	SS-SINR_49
Extreme Conditions			
Lowest reported value (Cell 2)	SS-SINR_33	SS-SINR_77	SS-SINR_31
Highest reported value (Cell 2)	SS-SINR_53	SS-SINR_96	SS-SINR_50

For the test to pass, the ratio of successful reported values in each test shall be more than 90% with a confidence level of 95%.

8.5.2.3.2 E-UTRA SS-SINR absolute measurement accuracy of a NR FR2 neighbour cell

Editor's Note: This test case has been completed for the following configurations:

- Test frequency f ≤ 40.8 GHz

- UE PC3

- Normal conditions

- The test is incomplete for UE power classes other than PC3

- The test is incomplete for test frequencies > 40.8 GHz

- The test is incomplete for extreme conditions

8.5.2.3.2.1 Test purpose

The purpose of this test is to verify that the inter-RAT SS-SINR measurement accuracy is within the specified limits for all bands, when the serving cell is E-UTRA and the target cell is NR FR2.

8.5.2.3.2.2 Test applicability

This test applies to all E-UTRA UE release 15 onwards supporting ss-SINR-Meas and capable of NR FR2 measurements.

8.5.2.3.2.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 8.5.2.3.0.2.

The normative reference for this requirement is TS 38.133 [6] clause A.8.5.2.3.2.

8.5.2.3.2.4 Test description

Two cells are configured in this test: E-UTRA Cell 1 is the E-UTRAN PCell and Cell 2 is the inter-RAT NR FR2 neighbour cell.

8.5.2.3.2.4.1 Initial conditions

This test shall be tested using any of the test configurations in Table 8.5.2.3.2.4.1-1.

Table 8.5.2.3.2.4.1-1: Supported test configurations

Configuration	Description
8.5.2.3.2-1	NR 120 kHz SSB SCS, 100 MHz bandwidth, TDD duplex mode, LTE FDD
8.5.2.3.2-2	NR 120 kHz SSB SCS, 100 MHz bandwidth, TDD duplex mode, LTE TDD
NOTE: The UE is only required to be tested in one of the supported test configurations	

Configure the test equipment and the DUT according to the parameters in Table 8.5.2.3.2.4.1-2.

Table 8.5.2.3.2.4.1-2: Initial conditions

Parameter	Value	Comment
Test environment	NC, TL/VL, TL/VH, TH/VL, TH/VH	As specified in TS 36.508 [25] clause 4.1.
Test frequencies	As specified in Annex E, Table E.6-2 and TS 38.508-1 [14] clause 4.3.1.	
Channel bandwidth	As specified by the selected test configuration.	
Propagation conditions	AWGN	As specified in clause C.2.1
Connection Diagram	TE Part: A.3.3.3.1	As specified in TS 38.508-1 [14] Annex A.
	UE Part: A.3.4.1.1	
Exceptions to connection diagram	N/A	

1. The general test parameter settings are set up according to Table 8.5.2.3.2.4.1-3.

2. Message contents are defined in clause 8.5.2.3.2.4.3.

3. There are two carriers and two cells specified in the test, where E-UTRA Cell 1 is the E-UTRA PCell on the E-UTRA carrier and Cell 2 is the NR neighbour cell on the NR carrier. E-UTRA Cell 1 is configured according to TS 36.521-3 [26] clause C.1.0 and C.1.1.

4. The UE Rx beam peak direction has been obtained previously using one of the Rx beam peak search procedures as described in Annex I.

8.5.2.3.2.4.2 Test procedure

1. Ensure the UE is in State 3A-RF according to TS 36.508 [25] clause 7.2A.3.
2. Set the parameters according to Table 8.5.2.3.2.5-1 and Table 8.5.2.3.2.5-2 as appropriate. The TE shall ensure that the NR FR2 cell will be received by the UE from the Rx beam peak direction.
3. The SS shall transmit an *RRCConnectionReconfiguration* message on Cell 1 to configure inter-RAT NR neighbour cell periodical measurements.
4. The UE shall transmit an *RRCConnectionReconfigurationComplete* message.
5. The UE shall transmit periodically MeasurementReport messages.
6. After 10s wait from Step 3, the SS shall check the SS-SINR reported values in the periodic MeasurementReport. The SS- SINR value of Cell 2 reported by the UE is compared to the expected SS- SINR. If the value is outside the limits in clause 8.5.2.3.2.5 or the UE fails to report the measurement value for Cell 2, the number of failed iterations is increased by one. Otherwise, the number of passed iterations is increased by one.
7. The SS shall continue checking the MeasurementReport messages transmitted by the UE until the confidence level according to Table G.2.3-1 in Annex G is achieved.
8. Set the parameters according to each sub-test in Tables 8.5.2.3.2.5-1 and 8.5.2.3.2.5-2 as appropriate and repeat steps 5-7.

8.5.2.3.2.4.3 Message contents

Message contents are according to TS 36.508 [25] clause 7.3 with the following exceptions:

Table 8.5.2.3.2.4.3-1: Common Exception messages

Default Message Contents	
Common contents of system information blocks exceptions	
Default RRC messages and information elements contents exceptions	Table H.3.4-7 Table 4.6.6-2B in TS 36.508 [25]

Table 8.5.2.3.2.4.3-2: ReportConfigInterRAT-DEFAULT(Periodical)

Derivation Path: 36.508 [25] Table 4.6.6-9			
Information Element	**Value/remark**	**Comment**	**Condition**
ReportConfigNR::= SEQUENCE {			
reportType CHOICE {			
periodical SEQUENCE {			
ReportQuantityNR-r15 SEQUENCE {	PRESENT		
sinr	true		
}			
}			
}			
}			

8.5.2.3.2.5 Test requirement

Table 8.5.2.3.2.5-1 defines the general test parameters and Table 8.5.2.3.2.5-2 defines the primary level OTA settings including test tolerances for all tests.

Each SS-RSRQ measurement report for each of the tests in Table 8.5.2.3.2.5-2 shall meet the corresponding absolute accuracy requirements in Table 8.5.2.3.2.5-3.

Table 8.5.2.3.2.5-1: SS-SINR Inter-RAT general test parameters

Parameter	Unit	Test 1	Test 2	Test 3
		Cell 2	Cell 2	Cell 2
SSB ARFCN		Freq1	freq1	freq1
Duplex mode		TDD	TDD	TDD
TDD configuration		TDDConf.3.1	TDDConf.3.1	TDDConf.3.1
$BW_{channel}$	MHz	100: $N_{RB,c}$ = 66	100: $N_{RB,c}$ = 66	100: $N_{RB,c}$ = 66
Downlink initial BWP configuration		DLBWP.0.1		
Uplink initial BWP configuration		ULBWP.0.1		
DRX cycle configuration	ms	Not applicable		
PDSCH Reference measurement channel		-	-	-
RMSI CORESET Reference Channel		-	-	-
OCNG Patterns		OP.1	OP.1	OP.1
SMTC configuration		SMTC.1	SMTC.1	SMTC.1
SSB configuration		SSB.3 FR2	SSB.3 FR2	SSB.3 FR2
PDSCH/PDCCH subcarrier spacing	kHz	120	120	120
EPRE ratio of PSS to SSS	dB	0	0	0
EPRE ratio of PBCH_DMRS to SSS				
EPRE ratio of PBCH to PBCH_DMRS				
EPRE ratio of PDCCH_DMRS to SSS				
EPRE ratio of PDCCH to PDCCH_DMRS				
EPRE ratio of PDSCH_DMRS to SSS				
EPRE ratio of PDSCH to PDSCH_DMRS				
EPRE ratio of OCNG DMRS to SSS Note 1				

NOTE 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.
NOTE 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for N_{oc} to be fulfilled.
NOTE 3: SS-SINR, SS-RSRP and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.
NOTE 4: SS-SINR and SS-RSRP minimum requirements are specified assuming independent interference and noise at each receiver antenna port.

Table 8.5.2.3.2.5-2: SS-SINR Inter-RAT OTA related test parameters

Parameter	Unit	Test 1	Test 2	Test 3
		Cell 2	Cell 2	Cell 2
Angle of arrival configuration		Setup 1	Setup 1	Setup 1
Assumption for UE beams Note 10		Rough	Rough	Rough
N_{oc} Note1	dBm/15kHz Note4	-105	-105.1	(Table B.2.3-2 of TS 38.133 [6] Rx Beam Peak -5dB) (Note 7)
N_{oc} Note1	dBm/SCS Note4	-95.97	-96.07	(Table B.2.3-2 of TS 38.133 [6] Rx Beam Peak +4dB) (Note 7)
$\hat{E}_s / N_{oc}$	dB	-0.5	11	3.7
SSB_RP Note2	dBm/SCS Note4	-96.47	-85.07	(Table B.2.3-2 of TS 38.133 [6] Rx Beam Peak +7.6dB) (Note 8)
SS-SINR Note2	dB	-0.5	11	3.6
$\hat{E}_s / I_{ot}$ Note2	dB	-0.5	11	3.6
Io Note2	dBm/95.04 MHz Note4	-64.21	-55.75	(Table B.2.3-2 of TS 38.133 [6] Rx Beam Peak +43.19dB)

				(Note 9)

NOTE 1: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for N_{oc} to be fulfilled.
NOTE 2: SSB_RP, SS-SINR, Es/Iot and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.
NOTE 3: Void
NOTE 4: Equivalent power received by an antenna with 0 dBi gain at the centre of the quiet zone.
NOTE 5: Void
NOTE 6: Void
NOTE 7: N_{oc} for SCS 15kHz is applied at $-10\log_{10}(8)+4$dB above the minimum level specified in Table B.2.3-2 of TS 38.133 [6] for beam peak. N_{oc} for SCS 120kHz is applied at 4dB above the minimum level specified in Table B.2.3-2 of TS 38.133 [6] for beam peak.
Note 8: SSB_RP is applied at 3dB above the minimum level specified in Table B.2.3-2 of TS 38.133 [6] for beam peak.
Note 9: Io is applied at level $10\log_{10}(792)+6.54$dB above the minimum level specified in Table B.2.3-2 of TS 38.133 [6] for beam peak.
Note 10: Information about types of UE beam is given in B.2.1.3 of TS 38.133 [6], and does not limit UE implementation or test system implementation.

Table 8.5.2.3.2.5-3: evaluation limits for the reported values

Normal Conditions	Test 1	Test 2	Test 3
Lowest reported value (Cell 2)	9	32	17
Highest reported value (Cell 2)	82	105	90
Extreme Conditions	**Test 1**	**Test 2**	**Test 3**
Lowest reported value (Cell 2)	7	30	15
Highest reported value (Cell 2)	84	107	92

9 NR sidelink

9.1 NR sidelink in FR1

9.1.1 UE transmit timing

9.1.1.0 Minimum conformance requirements

9.1.1.0.1 Minimum conformance requirements for GNSS as synchronization reference source

The requirements in this subclause are applicable when the reference timing used by the UE for NR sidelink communication is derived from GNSS.

The sidelink transmissions takes place $\left(N_{\mathrm{TA,SL}} + N_{\mathrm{TA\,offset}}\right) \times T_c$ before the subframe starting boundary as defined in TS 38.331 [13], where $N_{\mathrm{TA\,offset}} = 0$ and $N_{\mathrm{TA,SL}} = 0$.

The transmission timing error for sidelink transmissions shall be less than or equal to $\pm T_e$ where the timing error limit value T_e is defined in Table 9.1.1.0.1-1.

Table 9.1.1.0.1-1: T_e Timing Error Limit

Frequency Range of sidelink	$T_{e_}$
FR1	$12*64*T_c$
Note 1: T_c is the basic timing unit defined in TS 38.211 [7].	

The normative reference for this requirement is TS 38.133 [6] clause 12.2.2.

9.1.1.0.2 Minimum conformance requirements for SyncRef UE as synchronization reference source

The requirements in this subclause are applicable when the reference timing used for deriving sidelink transmission is from SyncRef UE transmitting sidelink synchronization signals.

The sidelink transmissions takes place $\left(N_{\mathrm{TA,SL}} + N_{\mathrm{TA\,offset}}\right) \times T_c$ before the reception of the first detected path (in time) of the corresponding timing reference frame from the SyncRef UE, where $N_{\mathrm{TA\,offset}} = 0$ and $N_{\mathrm{TA,SL}} = 0$.

The transmission timing error for sidelink transmissions shall be less than or equal to $\pm T_e$ where the timing error limit value T_e is defined in Table 9.1.1.0.2-1.

Table 9.1.1.0.2-1: T_e Timing Error Limit

Frequency Range of sidelink	SCS of sidelink signals (kHz)	T_e
FR1	15	$12*64*T_c$
	30	$8*64*T_c$
	60	$5*64*T_c$
Note 1: T_c is the basic timing unit defined in TS 38.211 [7].		

The normative reference for this requirement is TS 38.133 [6] clause 12.2.5.

9.1.1.0.3 Minimum conformance requirements for FR1 NR Cell as synchronization reference source

The requirements in this subclause are applicable when the reference timing used for sidelink transmissions is a NR serving cell on a non-NR sidelink carrier.

The sidelink transmissions takes place $\left(N_{\mathrm{TA,SL}} + N_{\mathrm{TA\,offset}}\right) \times T_c$ before the reception of the first detected path (in time) of the corresponding downlink frame from the reference cell, where $N_{\mathrm{TA\,offset}} = 0$ and $N_{\mathrm{TA,SL}} = 0$.

The transmission timing error for sidelink transmissions shall be less than or equal to $\pm T_e$ where the timing error limit value T_e is defined in Table 9.1.1.0.3-1.

Table 9.1.1.0.3-1: T_e Timing Error Limit

Frequency Range of sidelink	SCS of SSB signals (kHz)	SCS of sidelink signals (kHz)	T_e
FR1	15	15	$14*64*T_c$
		30	$12*64*T_c$
		60	$12*64*T_c$
	30	15	$10*64*T_c$
		30	$10*64*T_c$
		60	$9*64*T_c$
Note 1: T_c is the basic timing unit defined in TS 38.211 [7].			

The normative reference for this requirement is TS 38.133 [6] clause 12.2.3.

9.1.1.1 NR SA FR1 UE transmit timing accuracy for GNSS as synchronization reference source

9.1.1.1.1 Test purpose

The purpose of this test is to verify the UE timing requirements as specified in TS 38.133 [6] clause 12.2.2, when the GNSS is used as timing reference.

9.1.1.1.2 Test applicability

This test applies to all types of NR UEs from release 16 onwards and supporting NR sidelink communication.

9.1.1.1.3 Minimum conformance requirements

The minimum conformance requirements are defined in clause 9.1.1.0.1

The normative reference for this requirement is TS 38.133 [6] clause A.9.1.1.1.

9.1.1.1.4 Test description

9.1.1.1.4.1 Initial conditions

Configure the test equipment and the DUT according to the parameters in Table 9.1.1.1.4.1-1.

Table 9.1.1.1.4.1-1: Initial conditions for NR SA FR1 UE transmit timing accuracy for GNSS as synchronization reference source

Parameter	Value		Comment
Test environment	NC		As specified in TS 38.508-1 [14] clause 4.1.
Test frequencies	PC5: As specified in TS 38.508-1 [14] clause 4.3.1.8. 1		
Channel bandwidth	PC5: As specified by the test configuration selected from Table 9.1.1.1.4.1-2.		
Propagation conditions	AWGN		As specified in Annex C.2.2.
Connection Diagram	TE Part	A.3.1.9.1	As specified in TS 38.508-1 [14] Annex A.
	DUT Part	A.3.2.7.1	
Exceptions to connection diagram	N/A		

1. The parameter settings for the NR sidelink communication are pre-configured according to TS 38.508-1 [14] clause 4.10.1.
2. Message content exceptions are given in clause 9.1.1.1.4.3
3. The GNSS simulator is configured for Scenario #1: static in Geographical area #1, as defined in TS 38.508-1 [14] Table 4.11.2-2.

Table 9.1.1.1.4.1-2: NR sidelink test parameters for NR SA FR1 UE transmit timing accuracy for GNSS as synchronization reference source

Parameter	Unit	Value	Comment
RF Channel Number		1	HD carrier in Band n47 or n38
Channel Bandwidth ($BW_{channel}$) Note 1	MHz	20 ($N_{RB,c}$ = 50) or 40 ($N_{RB,c}$ = 100)	
SCS	kHz	30	
Active cell		None	
Active SyncRef UE		None	
NR sidelink communication pre-configuration		As specified in section A.11.2	IE values unless specified otherwise in this test.
PSCCH Reference Measurement Channel		CC.1A HD	As specified in Table A.11.3-1
PSSCH Reference Measurement Channel		CD.1A HD	As specified in Table A.11.3-2
Propagation condition		AWGN	
Note 1: The UE is only required to be tested in one of the supported test configurations.			

9.1.1.1.4.2 Test procedure

For this test, the UE is triggered by the test loop function to transmit for NR sidelink communication. There is one GNSS based synchronization source during the test. The test system can emulate and send the GNSS signal to the test UE.

1. Ensure the UE is in state 4-A with generic procedure parameters Test Mode = *On* and GNSS Sync = *On* according to TS 38.508-1 [14] clause 4.4A.2.
2. The GNSS simulator is triggered to start step 1 of Scenario #1 to simulate a location in the centre of Geographical area #1.
3. Wait at least 20 seconds for the UE to acquire the GNSS signal.
4. The SS sends AT command +CCUTLE to close test loop function and trigger UE to transmit.
5. The UE starts to transmit NR sidelink communication data over the PC5 interface in accordance of pre-configuration and to schedule PSSCH.
6. After the UE is synchronized to the GNSS synchronization source, the SS shall monitor all PSSCH transmissions and verify that, for each received PSSCH, the timing is within $\left(N_{\mathrm{TA,SL}} + N_{\mathrm{TA\ offset}}\right) \times T_c \pm T_e$ before the subframe starting boundary determined by the GNSS reference time in the GNSS simulator, where $N_{\mathrm{TA\ offset}} = 0$ and $N_{\mathrm{TA,SL}} = 0$, and T_e is given in Table 9.1.1.1.5-1.
7. The SS sends AT command +CCUTLE to open test loop function.

9.1.1.1.4.3 Message contents

Message contents are according to TS 38.508-1 [14] clause 7.3 with the following exceptions:

Table 9.1.1.1.4.3-1: +CCUTLE (Test procedure, step 4)

Derivation Path: 38.508-1[14] Table 4.7B-1 with condition Close and Transmit

Table 9.1.1.1.4.3-2: +CCUTLE (Test procedure, step 7)

Derivation Path: 38.508-1[14] Table 4.7B-1 with condition Open

9.1.1.1.5Test requirement

The sidelink transmissions takes place $\left(N_{\mathrm{TA,SL}} + N_{\mathrm{TA\ offset}}\right) \times T_c$ before the subframe starting boundary as defined in TS 38.331 [13] clause 5.8.12, where $N_{\mathrm{TA\ offset}} = 0$ and $N_{\mathrm{TA,SL}} = 0$.

The transmission timing error for sidelink transmissions shall be less than or equal to $\pm T_e$ where the timing error limit value T_e is defined in Table 9.1.1.1.5-1.

Table 9.1.1.1.5-1: T_e Timing Error Limit

Frequency Range of sidelink	T_e Note 2
FR1	$15*64*T_c$
Note 1: T_c is the basic timing unit defined in TS 38.211 [7]. Note 2: Including the test tolerance given in annex F.	

9.1.1.2 NR SA FR1 UE transmit timing accuracy for SyncRef UE as synchronization reference source

9.1.1.2.1 Test purpose

The purpose of this test is to verify the UE timing requirements as specified in TS 38.133 [6] clause 12.2.5, when SyncRef UE is used as timing reference.

9.1.1.2.2 Test applicability

This test applies to all types of NR UEs from release 16 onwards and supporting NR sidelink communication.

9.1.1.2.3 Minimum conformance requirements

The minimum conformance requirements are defined in clause 9.1.1.0.2

The normative reference for this requirement is TS 38.133 [6] clause A.9.1.1.2.

9.1.1.2.4 Test description

9.1.1.2.4.1 Initial conditions

Configure the test equipment and the DUT according to the parameters in Table 9.1.1.2.4.1-1.

Table 9.1.1.2.4.1-1: Initial conditions for NR SA FR1 UE transmit timing accuracy for SyncRef UE as synchronization reference source

Parameter	Value		Comment
Test environment	NC		As specified in TS 38.508-1 [14] clause 4.1.
Test frequencies	PC5: As specified in TS 38.508-1 [14] clause 4.3.1.8. 1		
Channel bandwidth	PC5: As specified by the test configuration selected from Table 9.1.1.2.4.1-2.		
Propagation conditions	AWGN		As specified in Annex C.2.2.
Connection Diagram	TE Part	A.3.1.9.1	As specified in TS 38.508-1 [14] Annex A.
	DUT Part	A.3.2.7.1	
Exceptions to connection diagram	GNSS System Simulator is not used.		

1. The parameter settings for the NR sidelink communication are pre-configured according to TS 38.508-1 [14] clause 4.10.1.
2. Message content exceptions are given in clause 9.1.1.2.4.3
3. There is one NR-SS-UE (SyncRef UE 1) specified in this test. SyncRef UE 1 is configured according to the parameters in Table 9.1.1.2.4.1-1.

Table 9.1.1.2.4.1-2: NR sidelink test parameters for NR SA FR1 UE transmit timing accuracy for SyncRef UE as synchronization reference source

Parameter		Unit	Value	Comment
RF Channel Number			1	HD carrier in Band n47 or n38
Channel Bandwidth ($BW_{channel}$) Note 3		MHz	20 ($N_{RB,c}$ = 50) or 40 ($N_{RB,c}$ = 100)	
Active cell			None	
Active SyncRef UE			SyncRef UE 1	Transmitting S-SSB on RF channel number 1
NR sidelink communication preconfiguration			As specified in section A.11.2	IE values unless specified otherwise in this test.
PSCCH Reference Measurement Channel			CC.1A HD	As specified in Table A.11.3-1
PSSCH Reference Measurement Channel			CD.1A HD	As specified in Table A.11.3-2
Noc Note1,2		dBm/30kHz	-95	
SyncRef UE 1	sl-SSB-TimeAllocation		sl-SSB-TimeAllocation1	
	slssid		30	
	inCoverage		TRUE	In MIB-SL
	networkControlledSyncTx		ON	
	NR sidelink communication configuration		As specified in section A.11.2	IE values unless specified otherwise in this test.
	Ês/Noc		3	

	PSBCH-RSRP Note1, Note 2	dBm/30kHz	-92	
Propagation condition			AWGN	
Note 1: PSBCH-RSRP levels have been derived from other parameters for information purposes. They are not settable parameters themselves. Note 2: S-PSS Ês/Noc and S-PSS Ês/Noc are set the same as PSBCH Ês/Noc. Note 3: The UE is only required to be tested in one of the supported test configurations.				

9.1.1.2.4.2 Test procedure

In this test there is one active NR-SS-UE (SyncRef UE 1) and no serving cell nor GNSS signals. The UE is triggered by the test loop function to transmit for NR sidelink communication.

1. Ensure the UE is in state 4-A with generic procedure parameters Test Mode = *On* according to TS 38.508-1 [14] clause 4.4A.2.
2. The SS sends AT command +CCUTLE to close test loop function and trigger UE to transmit.
3. The UE starts to transmit NR sidelink communication data over the PC5 interface in accordance of pre-configuration and to schedule PSSCH.
4. Power on SyncRef UE 1 and wait at least 8 seconds for the UE to be synchronized to SyncRef UE 1.
5. After the UE is synchronized to SyncRef UE 1, the SS shall monitor all PSSCH transmissions and verify that, for each received PSSCH, the timing is within $\left(N_{\mathrm{TA,SL}} + N_{\mathrm{TA\,offset}}\right) \times T_c \pm T_e$ before the subframe starting boundary determined by the reception of the first detected path (in time) of corresponding timing reference frame from SyncRef UE 1, where $N_{\mathrm{TA\,offset}} = 0$ and $N_{\mathrm{TA,SL}} = 0$, and T_e is given in Table 9.1.1.2.5-1.
6. The SS sends AT command +CCUTLE to open test loop function.

9.1.1.2.4.3 Message contents

Message contents are according to TS 38.508-1 [14] clause 7.3 with the following exceptions:

Table 9.1.1.2.4.3-1: +CCUTLE (Test procedure, step 2)

Derivation Path: 38.508-1[14] Table 4.7B-1 with condition Close and Transmit

Table 9.1.1.2.4.3-2: MasterInformationBlockSidelink (SyncRef UE 1)

Derivation Path: TS 38.508-1 [14], Table 4.6.1A-1 with condition NB_SYNC and RX

Table 9.1.1.2.4.3-3: SL-ConfigDedicatedNR (SyncRef UE 1)

Derivation Path: TS 38.508-1 [14], Table 4.6.6-7 with condition SELECTED			
Information Element	**Value/remark**	**Comment**	**Condition**
SL-ConfigDedicatedNR-r16 ::= SEQUENCE {			
sl-PHY-MAC-RLC-Config-r16 SEQUENCE {			
sl-FreqInfoToAddModList-r16 SEQUENCE (SIZE (1..maxNrofFreqSL-r16)) OF SL-FreqConfig-r16 {	1 entry		
SL-FreqConfig-r16[1] SEQUENCE {		entry 1	
sl-SyncConfigList-r16 SEQUENCE (SIZE (1..maxSL-SyncConfig-r16)) OF SL-SyncConfig-r16 {	1 entry		
SL-SyncConfig-r16[1]	SL-SyncConfig	entry 1 Table 9.1.1.2.4.3-4	
}			
sl-SyncPriority-r16	gnbEnb		
}			
}			
networkControlledSyncTx-r16	on		
}			
}			

Table 9.1.1.2.4.3-4: SL-SyncConfig (Table 9.1.1.2.4.3-3)

Derivation Path: TS 38.508-1 [14], Table 4.6.6-31			
Information Element	**Value/remark**	**Comment**	**Condition**
SL-SyncConfig-r16 ::= SEQUENCE {			
sl-SSID-r16	30		
}			
}			

Table 9.1.1.2.4.3-5: +CCUTLE (Test procedure, step 6)

Derivation Path: 38.508-1[14] Table 4.7B-1 with condition Open

9.1.1.2.5 Test requirement

The sidelink transmissions takes place $\left(N_{\mathrm{TA,SL}} + N_{\mathrm{TA\,offset}}\right) \times T_c$ before the reception of the first detected path (in time) of the corresponding timing reference frame from SyncRef UE 1, where $N_{\mathrm{TA\,offset}} = 0$ and $N_{\mathrm{TA,SL}} = 0$.

The transmission timing error for sidelink transmissions shall be less than or equal to $\pm T_e$ where the timing error limit value T_e is defined in Table 9.1.1.2.5-1.

Table 9.1.1.2.5-1: T_e Timing Error Limit

Frequency Range of sidelink	**SCS of sidelink signals (kHz)**	**T_e Note 2**
FR1	30	$10*64*T_c$
Note 1: T_c is the basic timing unit defined in TS 38.211 [7].		
Note 2: Including the test tolerance given in annex F.		

9.1.1.3 NR SA FR1 UE transmit timing accuracy for FR1 NR cell as synchronization reference source

9.1.1.3.1 Test purpose

The purpose of this test is to verify the UE timing requirements as specified in TS 38.133 [6] clause 12.2.5, when the downlink timing of the serving cell (RRC_IDLE) or PCell (RRC_CONNECTED) on a non-sidelink NR carrier is used as timing reference.

9.1.1.3.2 Test applicability

This test applies to all types of NR UEs from release 16 onwards and supporting NR Uu and sidelink communication.

9.1.1.3.3 Minimum conformance requirements

The minimum conformance requirements are defined in clause 9.1.1.0.3

The normative reference for this requirement is TS 38.133 [6] clause A.9.1.1.3.

9.1.1.3.4 Test description

9.1.1.3.4.1 Initial conditions

This test shall be tested using any of the test configurations in Table 9.1.1.3.4.1-1.

Table 9.1.1.3.4.1-1: Supported test configurations for FR1 NR Cell

Configuration	Description
9.1.1.3-1	NR Uu: FDD, SSB SCS 15 kHz, data SCS 15 kHz, BW 10 MHz
9.1.1.3-2	NR Uu: TDD, SSB SCS 15 kHz, data SCS 15 kHz, BW 10 MHz
9.1.1.3-3	NR Uu: TDD, SSB SCS 30 kHz, data SCS 30 kHz, BW 40 MHz
Note: The UE is only required to pass in one of the supported test configurations in FR1	

Configure the test equipment and the DUT according to the parameters in Table 9.1.1.3.4.1-2.

Table 9.1.1.3.4.1-2: Initial conditions for NR SA FR1 UE transmit timing accuracy for FR1 NR cell as synchronization reference source

Parameter	Value		Comment
Test environment	NC		As specified in TS 38.508-1 [14] clause 4.1.
Test frequencies	Uu & PC5: As specified in TS 38.508-1 [14] clause 4.3.1.8.2.1		
Channel bandwidth	Uu: As specified by the test configuration selected from Table 9.1.1.3.4.1-1 PC5: As specified by the test configuration selected from Table 9.1.1.3.4.1-3.		
Propagation conditions	AWGN		As specified in Annex C.2.2.
Connection Diagram	TE Part	A.3.1.9.3	As specified in TS 38.508-1 [14] Annex A.
	DUT Part	A.3.2.7.3	
Exceptions to connection diagram	N/A		

1. The parameter settings for the NR sidelink communication are pre-configured according to TS 38.508-1 [14] clause 4.10.1.
2. Message content exceptions are defined in clause 9.1.1.3.4.3
3. There is one NR Uu carrier and one NR Cell (Cell 1) specified in this test. Cell 1 is configured according to Annex C.1.1 and C.1.2.
4. Test parameters for Cell 1 are given in Table 9.1.1.3.4.1-3.

Table 9.1.1.3.4.1-3: NR sidelink test parameters for NR SA FR1 UE transmit timing accuracy for FR1 NR cell as synchronization reference source

Parameter	Unit	Value	Comment
RF Channel Number		1	HD carrier in Band n47 or n38
Channel Bandwidth ($BW_{channel}$) Note 1	MHz	20 ($N_{RB,c}$ = 50) or 40 ($N_{RB,c}$ = 100)	
SCS	kHz	30	
Active cell		Cell 1	
Active SyncRef UE		None	
V2X sidelink communication configuration		As specified in section A.11.2	IE values unless specified otherwise in this test.
PSCCH Reference Measurement Channel		CC.1A HD	As specified in Table A.11.3-1
PSSCH Reference Measurement Channel		CD.1A HD	As specified in Table A.11.3-2
Note 1: The UE is only required to be tested in one of the supported test configurations.			

Table 9.1.1.3.4.1-3: Cell Test Parameters for NR SA FR1 UE transmit timing accuracy for FR1 NR cell as synchronization reference source

Parameter		Unit	Cell 1
RF Channel Number			2
Duplex Mode	Config 1		FDD
	Config 2,3		TDD
TDD configuration	Config 1		Not Applicable
	Config 2		TDDConf.1.1
	Config 3		TDDConf.2.1
Channel Bandwidth ($BW_{channel}$)	Config 1,2	MHz	10: $N_{RB,c}$ = 52
	Config 3		40: $N_{RB,c}$ = 106
Initial BWP Configuration			DLBWP.0.1 ULBWP.0.1
Dedicated BWP Configuration			DLBWP.1.1 ULBWP.1.1
DRX Cycle			N/A
PDSCH Reference measurement channel	Config 1		SR.1.1 FDD
	Config 2		SR.1.1 TDD
	Config 3		SR.2.1 TDD
CORESET Reference Channel	Config 1		CR.1.1 FDD
	Config 2		CR.1.1 TDD
	Config 3		CR.2.1 TDD
Dedicated CORESET Reference Channel	Config 1		CCR.1.1 FDD
	Config 2		CCR.1.1 TDD
	Config 3		CCR.2.1 TDD
SSB configuration	Config 1,2		SSB.1 FR1
	Config 3		SSB.2 FR1
SMTC Configuration			SMTC.2
OCNG Patterns			OP.1
EPRE ratio of PSS to SSS		dB	0
EPRE ratio of PBCH DMRS to SSS			
EPRE ratio of PBCH to PBCH DMRS			
EPRE ratio of PDCCH DMRS to SSS			
EPRE ratio of PDCCH to PDCCH DMRS			
EPRE ratio of PDSCH DMRS to SSS			
EPRE ratio of PDSCH to PDSCH			
EPRE ratio of OCNG DMRS to SSS(Note 1)			
EPRE ratio of OCNG to OCNG DMRS (Note 1)			
Noc Note2	Config 1,2,3	dBm/15 kHz	-98
Noc Note2	Config 1,2	dBm/SCS	-98
	Config 3		-95
Ês/Noc		dB	3
SS-RSRP Note3	Config 1,2	dBm/SCS	-95
	Config 3		-92
Io Note 3	Config 1,2	dBm/9.36 MHz	-65.2
	Config 3	dBm/38.1 MHz	-59.2
Propagation Condition			AWGN

Note 1: OCNG shall be used such that cell is fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.
Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for Noc to be fulfilled.
Note 3: SS-RSRP levels have been derived from other parameters for information purposes. They are not settable parameters themselves.

9.1.1.3.4.2 Test procedure

In this test there is one active cell (Cell 1). For this test, the UE is triggered by the test loop function or the upper layers to transmit for NR sidelink communication.

1. Ensure the UE is in state 1N-B with generic procedure parameters Test Mode = *On* according to TS 38.508-1 [14] clause 4.4A.2.

2. The SS sends AT command +CCUTLE to close test loop function and trigger UE to transmit.
3. The UE starts to transmit NR sidelink communication data over the PC5 interface in according to Pre-configuration and to schedule PSSCH.
4. The SS shall monitor all PSSCH transmissions and verify that, for each received PSSCH, the timing is within $(N_{\mathrm{TA,SL}} + N_{\mathrm{TA\ offset}}) \times T_c \pm T_e$ before the subframe starting boundary determined by the reception of the first detected path (in time) of the corresponding downlink frame from the Cell 1, where $N_{\mathrm{TA\ offset}} = 0$ and $N_{\mathrm{TA,SL}} = 0$, and T_e is given in Table 9.1.1.3.5-1.
5. The SS sends AT command +CCUTLE to open test loop function.
6. Ensure the UE is in state 3N-B with generic procedure parameters Test Mode = *On* according to TS 38.508-1 [14] clause 4.4A.2.
7. The SS sends an *RRCReconfiguration* message with *sl-ConfigDedicatedNR* to provide sidelink configuration.
8. The UE sends an *RRCReconfigurationComplete* message.
9. The SS sends a CLOSE UE TEST LOOP message to close test loop function and trigger UE to transmit.
10. The UE sends a CLOSE UE TEST LOOP COMPLETE message.
11. The SS shall monitor all PSSCH transmissions and verify that, for each received PSSCH, the timing is within $(N_{\mathrm{TA,SL}} + N_{\mathrm{TA\ offset}}) \times T_c \pm T_e$ before the subframe starting boundary determined by the reception of the first detected path (in time) of the corresponding downlink frame from the Cell 1, where $N_{\mathrm{TA\ offset}} = 0$ and $N_{\mathrm{TA,SL}} = 0$, and T_e is given in Table 9.1.1.3.5-1.
12. The SS sends an OPEN UE TEST LOOP message to open test loop function.
13. The UE sends an OPEN UE TEST LOOP COMPLETE message.

9.1.1.3.4.3 Message contents

Message contents are according to TS 38.508-1 [14] clause 7.3 with the following exceptions: Table 9.1.1.3.4.3-1: Common Exception messages for NR SA FR1 UE transmit timing accuracy for FR1 NR cell as synchronization reference source

Default Message Contents	
Common contents of system information blocks exceptions	
Default RRC messages and information elements contents exceptions	Table H.3.1-2 Table H.3.1-3 with Condition INTRA-FREQ MO and Synchronous cells, where smtc1 field is set to SSB-MTC specified in 38.508-1 [14] Table 7.3.1-3: with condition SMTC.2.

Table 9.1.1.3.4.3-2: SIB12-IEs-r16 (Preamble and test procedure, Cell 1)

Derivation Path: TS 38.508-1 [14], Table 4.6.2-14A			
Information Element	**Value/remark**	**Comment**	**Condition**
SIB12-IEs-r16 ::= SEQUENCE {			
sl-ConfigCommonNR-r16 SEQUENCE {			
sl-FreqInfoList-r16 SEQUENCE (SIZE (1..maxNrofFreqSL-r16)) OF SL-FreqConfigCommon-r16 {	1 entry		
SL-FreqConfigCommon-r16[1] SEQUENCE {		entry 1	
sl-SyncPriority-r16	gnbEnb		
}			
}			
}			
}			

Table 9.1.1.3.4.3-3: +CCUTLE (Test procedure, step 2)

Derivation Path: 38.508-1[14] Table 4.7B-1 with condition Close and Transmit

Table 9.1.1.3.4.3-4: +CCUTLE (Test procedure, step 5)

Derivation Path: 38.508-1[14] Table 4.7B-1 with condition Open

Table 9.1.1.3.4.3-5: RRCReconfiguration (Test procedure, step 7)

Derivation Path: TS 38.508-1 [14], Table 4.6.1-13 with condition NR_MEAS and SIDELINK			
Information Element	**Value/remark**	**Comment**	**Condition**
RRCReconfiguration ::= SEQUENCE {			
criticalExtensions CHOICE {			
rrcReconfiguration SEQUENCE {			
nonCriticalExtension SEQUENCE {			
nonCriticalExtension SEQUENCE {			
nonCriticalExtension SEQUENCE {			
nonCriticalExtension SEQUENCE {			
sl-ConfigDedicatedNR-r16 CHOICE {			
setup	SL-ConfigDedicatedNR	Table 9.1.1.3.4.3-5	
}			
}			
}			
}			
}			
}			
}			
}			

Table 9.1.1.3.4.3-6: SL-ConfigDedicatedNR (Table 9.1.1.3.4.3-3)

Derivation Path: TS 38.508-1 [14], Table 4.6.6-7 with condition SELECTED			
Information Element	**Value/remark**	**Comment**	**Condition**
SL-ConfigDedicatedNR-r16 ::= SEQUENCE {			
sl-PHY-MAC-RLC-Config-r16 SEQUENCE {			
sl-FreqInfoToAddModList-r16 SEQUENCE (SIZE (1..maxNrofFreqSL-r16)) OF SL-FreqConfig-r16 {	1 entry		
SL-FreqConfig-r16[1] SEQUENCE {		entry 1	
sl-SyncPriority-r16	gnbEnb		
}			
}			
}			
}			

Table 9.1.1.3.4.3-7: CLOSE UE TEST LOOP (Test procedure, step 9)

Derivation Path: 36.508 [25] Table 4.7A-3 with condition UE TEST LOOP MODE E(V2X Transmission)			
Information Element	**Value/remark**	**Comment**	**Condition**
UE test loop mode E LB setup			
Communication Transmit or Receive	0 0 0 0 0 0 0 1	'01' indicates V2X UE triggered to transmit NR sidelink communication with single spatial layer.	

9.1.1.3.5 Test requirement

The sidelink transmissions takes place $\left(N_{\mathrm{TA,SL}} + N_{\mathrm{TA\,offset}}\right) \times T_c$ before the subframe starting boundary determined by the reception of the first detected path (in time) of the corresponding downlink frame from the Cell 1, where $N_{\mathrm{TA\,offset}} = 0$ and $N_{\mathrm{TA,SL}} = 0$.

The transmission timing error for sidelink transmissions shall be less than or equal to $\pm T_e$ where the timing error limit value T_e is defined in Table 9.1.1.3.5-1.

Table 9.1.1.3.5-1: T_e Timing Error Limit

Frequency Range of sidelink	SCS of SSB signals (kHz)	SCS of sidelink signals (kHz)	T_e Note2
FR1	15	30	15*64*T_c
	30	30	13*64*Tc
Note 1: T_c is the basic timing unit defined in TS 38.211 [7]. Note 2: Including the test tolerance given in Annex F.			

9.1.2 Initiation/Cease of S-SSB transmission

9.1.2.0 Minimum conformance requirements

9.1.2.0.1 Minimum conformance requirements for FR1 NR cell as synchronization reference source

The requirements apply when the NR Cell is used as synchronization reference source and when the UE is

- out of coverage on the NR sidelink carrier and in-coverage with a serving cell on a NR non-sidelink carrier,

and when the conditions for SLSS transmissions specified in TS 38.331[13] are met; *networkControlledSyncTx* is not configured; and *syncTxThreshIC* is included in *SIB12*. The UE shall be capable of measuring the RSRP of the cell used as synchronization reference source to evaluate to initiate/cease SLSS transmissions within $T_{evaluate,SLSS}$

where,

- $T_{evaluate,SLSS}$ is as specified in Table 9.1.2.0.1-1 when UE performs SSB based measurements without measurement gaps.

- $T_{evaluate,SLSS}$ is as specified in Table 9.1.2.0.1-2 when UE performs SSB based measurements with measurement gaps.

Table 9.1.2.0.1-1: $T_{evaluate,SLSS}$ for measurements without measurement gaps when NR cell is used as synchronization reference source (FR1)

DRX cycle in NR cell	$T_{evaluate,SLSS}$
No DRX	max(400ms, ceil(2 x 5 x K_p) x SMTC period)Note 1
DRX cycle≤ 320ms	max(400ms, ceil(1.5 x 2 x 5 x K_p) x max(SMTC period, DRX cycle))
DRX cycle>320ms	ceil(7 x K_p) x DRX cycle
NOTE 1: If different SMTC periodicities are configured for different cells, the SMTC period in the requirement is the one used by the cell being identified	

Table 9.1.2.0.1-2: $T_{evaluate,SLSS}$ for measurements with measurement gaps when NR cell is used as synchronization reference source (FR1)

DRX cycle in NR cell	$T_{evaluate,SLSS}$
No DRX	max(400ms, 2 x 5 x max(MGRP, SMTC period)) x $CSSF_{intra}$
DRX cycle≤ 320ms	max(400ms, ceil(2 x 1.5x 5) x max(MGRP, SMTC period,DRX cycle)) x $CSSF_{intra}$
DRX cycle>320ms	7 x max(MGRP, DRX cycle) x $CSSF_{intra}$

If higher layer filtering is configured, an additional delay in evaluation to initiate/cease SLSS transmissions can be expected.

For the NR cell as synchronization reference source:

- SS-RSRP related side conditions given in 38.133[6] clauses 10.1.2 for FR1, respectively, for a corresponding Band,
- SS-RSRQ related side conditions given in 38.133[6] clauses 10.1.7 for FR1, respectively, for a corresponding Band,
- SS-SINR related side conditions given in 38.133[6] clauses 10.1.12 for FR1, respectively, for a corresponding Band,
- SSB_RP and SSB Ês/Iot according to Annex B.2.2 for a corresponding Band.

The normative reference for this requirement is TS 38.133 [6] clause 12.3.1.1.

9.1.1.0.2 Minimum conformance requirements for SyncRef UE as synchronization reference source

The requirements apply when SyncRef UE is used as synchronization reference source and when the UE is

- in any cell selection state, or
- out of coverage on the NR sidelink carrier and is associated with a serving cell on a non-sidelink carrier,

and when the conditions for SLSS transmissions specified in TS 38.331[13] are met and when SyncRef UE is used as synchronization reference source and if *syncTxThreshOoC* is included in the pre-configuration parameters.

The UE shall be capable of measuring the PSBCH-RSRP of the selected SyncRef UE used as synchronization reference source and evaluate it to initiate/cease SLSS transmissions within $T_{evaluate,SLSS}$ = 4 S-SSB periods.

If higher layer filtering for PSBCH-RSRP measurements is pre-configured, an additional delay in evaluation to initiate/cease SLSS transmissions can be expected.

For the selected SyncRef UE as defined in TS 38.331 [2] used to derive transmission timing for NR sidelink communication:

- PSBCH-RSRP related side conditions given in 38.133[6] clause 10.4 for a corresponding Band are fulfilled,
- NR S-SSB_RP and S-SSB Ês/Iot according to Annex B.4 for a corresponding Band are fulfilled.

The requirements for absolute accuracy of PSBCH-RSRP apply to a NR sidelink synchronization source on the same frequency as that of the own NR sidelink UE performing the measurement in FR1.

The accuracy requirements in Table 9.1.1.0.2-1 are valid under the following conditions:

- Demodulation reference signals are transmitted from one port.
- Conditions defined in Clause 7.3E of TS 38.101-1 [2] for reference sensitivity are fulfilled.
- Conditions for PSBCH-RSRP measurements are fulfilled according to Annex B.4.2 for a corresponding Band for each relevant PSBCH-DMRS.

Table 9.1.1.0.2-1: Intra-frequency PSBCH-RSRP absolute accuracy in FR1

Accuracy		Conditions						
			Io [Note 1] range					
Normal condition	Extreme condition	Ês/Iot [Note 3]	NR sidelink operating band groups [Note 2]	Minimum Io				Maximum Io
				dBm / SCS_{SL}				
dB	dB	dB		SCS_{SL} = 15 kHz	SCS_{SL} = 30 kHz	SCS_{SL} = 60 kHz	$dBm/BW_{Channel}$	$dBm/BW_{Channel}$
±4.5	±9	≥-6	NR_TDD_FR1_B	-120.5	-117.5	-114.5	N/A	-70
			NR_TDD_FR1_J	-116.5	-113.5	-110.5	N/A	-70
±8	±11	≥-6	NR_TDD_FR1_B,	N/A	N/A	N/A	-70	-50

			NR_TDD_FR1_J					
NOTE 1: Io is assumed to have constant EPRE across the bandwidth. NOTE 2: NR sidelink operating band groups in FR1 are as defined in clause 3.5.2. NOTE 3: Ês/Iot for a SyncRef UE is the Ês/Iot of PSBCH-DMRS.								

The relative accuracy of PSBCH-RSRP is defined as the PSBCH-RSRP measured from one NR sidelink synchronization source compared to the PSBCH-RSRP measured from another NR sidelink synchronization source on the same frequency in FR1.

The accuracy requirements in Table 9.1.1.0.2-2 are valid under the following conditions:

- Demodulation reference signals are transmitted from one port.
- Conditions defined in Clause 7.3E of TS 38.101-1 [2] for reference sensitivity are fulfilled.
- Conditions for PSBCH-RSRP accuracy measurements are fulfilled according to Annex B.4.2 for a corresponding Band for each relevant PSBCH-DMRS.

Table 9.1.1.0.2-2: Intra-frequency PSBCH-RSRP relative accuracy in FR1

Accuracy		**Conditions**						
			Io [Note 1] range					
Normal condition	**Extreme condition**	**Ês/Iot [Note 3]**	**NR sidelink operating band groups [Note 2]**	**Minimum Io**				**Maximum Io**
				dBm / SCS_{SL}				
dB	**dB**	**dB**		**SCS_{SL} = 15 kHz**	**SCS_{SL} = 30 kHz**	**SCS_{SL} = 60 kHz**	**$dBm/BW_{Channel}$**	**$dBm/BW_{Channel}$**
±2	±3	≥-3	NR_TDD_FR1_B	-120.5	-117.5	-114.5	N/A	-50
			NR_TDD_FR1_J	-116.5	-113.5	-110.5	N/A	-50
±3	±3	≥-6	Note 4	Note 4	Note 4	Note 4	N/A	Note 4
NOTE 1: Io is assumed to have constant EPRE across the bandwidth. NOTE 2: NR sidelink operating band groups in FR1 are as defined in clause 3A.4.1. NOTE 3: Ês/Iot for a SyncRef UE is the Ês/Iot of PSBCH-DMRS. NOTE 4: The same bands and the same Io conditions for each band apply for this requirement as for the corresponding highest accuracy requirement.								

The normative references for this requirement are TS 38.133 [6] clause 10.4.2 and 12.3.1.4.

9.1.2.1 NR SA FR1 initiation/cease of S-SSB transmission for FR1 NR cell as synchronization reference source

9.1.2.1.1 Test purpose

The purpose of this test is to verify that the NR sidelink UE meets the requirements related to the maximum evaluation time allowed to initiate and cease S-SSB transmissions defined in TS 38.133 [6] clause 12.3.1.1, when the reference timing used for sidelink transmissions is a NR serving cell in FR1 on a non-sidelink carrier.

9.1.2.1.2 Test applicability

This test applies to all types of NR UEs from release 16 onwards and supporting NR Uu and sidelink communication.

9.1.2.1.3 Minimum conformance requirements

The minimum conformance requirements are defined in clause 9.1.2.0.1

The normative reference for this requirement is TS 38.133 [6] clause A.9.1.2.1.

9.1.2.1.4 Test description

9.1.2.1.4.1 Initial conditions

This test shall be tested using any of the test configurations in Table 9.1.2.1.4.1-1.

Table 9.1.2.1.4.1-1: Supported test configurations for FR1 NR Cell

Configuration	Description
9.1.2.1-1	NR Uu: FDD, SSB SCS 15 kHz, data SCS 15 kHz, BW 10 MHz
9.1.2.1-2	NR Uu: TDD, SSB SCS 15 kHz, data SCS 15 kHz, BW 10 MHz
9.1.2.1-3	NR Uu: TDD, SSB SCS 30 kHz, data SCS 30 kHz, BW 40 MHz
Note: The UE is only required to pass in one of the supported test configurations in FR1	

Configure the test equipment and the DUT according to the parameters in Table 9.1.2.1.4.1-2.

Table 9.1.2.1.4.1-2: Initial conditions for Initiation/Cease of S-SSB Transmission Test for FR1 NR cell as synchronization reference source

Parameter	Value		Comment
Test environment	NC		As specified in TS 38.508-1 [14] clause 4.1.
Test frequencies	Uu & PC5: As specified in TS 38.508-1 [14] clause 4.3.1.8.2.1		
Channel bandwidth	Uu: As specified by the test configuration selected from Table 9.1.1.3.4.1-1 PC5: As specified by the test configuration selected from Table 9.1.1.3.4.1-2.		
Propagation conditions	AWGN		As specified in Annex C.2.2.
Connection Diagram	TE Part	A.3.1.9.3	As specified in TS 38.508-1 [14] Annex A.
	DUT Part	A.3.2.7.3	
Exceptions to connection diagram	N/A		

1. The parameter settings for the NR sidelink communication are configured according to Table 9.1.2.1.4.1-3.
2. Message content exceptions are given in clause 9.1.2.1.4.3
3. There is one NR Uu carrier and one NR Cell (Cell 1) specified in this test. Cell 1 is configured according to Annex C.1.1 and C.1.2.
4. General test parameters for Cell 1 are given in Table 9.1.2.1.4.1-3.

Table 9.1.2.1.4.1-3: NR sidelink test parameters and NR Cell general test parameters for Initiation/Cease of S-SSB Transmission Test for FR1 NR cell as synchronization reference source

Parameter	Unit	Value	Comment
SCS	kHz	30	
Active cell		Cell 1	Serving cell on RF channel number 1
Active SyncRef UE		None	
Active NR sidelink UE		NR sidelink UE	Transmitting S-SSB on RF channel number 2(HD carrier in Band n47 or n38)
NR sidelink communication configuration		As specified in A.11.2	IE values unless specified otherwise in this test
networkControlledSyncTx		Not configured	
syncTxThreshIC	dBm/SCS	-110	In SIB12
DRX		OFF	
T1	s	3	
T2	s	5.24	
T3	s	5.24	

9.1.2.1.4.2 Test procedure

In this test there is one active cell (Cell 1). The test consists of three successive time periods, with time duration of T1, T2 and T3 respectively.

1. Ensure the UE is in state 1N-B with generic procedure parameters Test Mode = *On* according to TS 38.508-1 [14] clause 4.4A.2.
2. The SS shall set parameters according to T1 in Table 9.1.2.1.5-1. T1 starts.
3. If the SS observes that no SL SSB is transmitted by the UE until T1 expires then count a success for the event "No S-SSB transmission", otherwise count a fail for the event "No S-SSB transmission".
4. When T1 expires, the SS shall switch the power setting from T1 to T2 in Table 9.1.2.1.5-1. T2 starts.
5. If the UE starts to send S-SSB within 560 ms from the start of T2 then count a success for the event "S-SSB transmission initiation", otherwise count a fail for the event "S-SSB transmission initiation".
6. When T2 expires, the SS shall switch the power setting from T2 to T3 in Table 9.1.2.1.5-1. T3 starts.
7. If the UE stops to send S-SSB within 560 ms from the start of T3 then count a success for the event "S-SSB transmission cease", otherwise count a fail for the event "S-SSB transmission cease".
8. Repeat step 2-7 until the confidence level according to Tables G.2.3-1 in Annex G clause G.2 is achieved.

Each of the events "No S-SSB transmission", "S-SSB transmission initiation" and "S-SSB transmission cease" is evaluated independently for the statistic, resulting in an event verdict pass or fail. Different events may require different times for a verdict.

If all events pass, the test passes. If one event fails, the test fails.

9.1.2.1.4.3 Message contents

Message contents are according to TS 38.508-1 [14] clause 7.3 with the following exceptions:

Table 9.1.2.1.4.3-1: Common Exception messages for NR SA FR1 initiation/cease of S-SSB transmission for FR1 NR cell as synchronization reference source

Default Message Contents	
Common contents of system information blocks exceptions	Table H.2.1-1 with condition SMTC.2 and Asynchronous cells for test configuration 9.1.2.1-1 Table H.2.1-1 with condition SMTC.1 and Synchronous cells for test configuration 9.1.2.1-2 and 9.1.2.1-3

Table 9.1.2.1.4.3-2: SIB12-IEs-r16 (Preamble and test procedure, Cell 1)

Derivation Path: TS 38.508-1 [14], Table 4.6.2-14A			
Information Element	**Value/remark**	**Comment**	**Condition**
SIB12-IEs-r16 ::= SEQUENCE {			
sl-ConfigCommonNR-r16 SEQUENCE {			
sl-FreqInfoList-r16 SEQUENCE (SIZE (1..maxNrofFreqSL-r16)) OF SL-FreqConfigCommon-r16 {	1 entry		
SL-FreqConfigCommon-r16[1] SEQUENCE {		entry 1	
sl-SyncPriority-r16	gnbEnb		
sl-SyncConfigList-r16 SEQUENCE (SIZE (1..maxSL-SyncConfig-r16)) OF SL-SyncConfig-r16 {	1 entry		
SL-SyncConfig-r16[1]	SL-SyncConfig	entry 1 Table 9.1.2.1.4.3-3	
}			
}			

}			
}			
}			

Table 9.1.2.1.4.3-3: SL-SyncConfig (Table 9.1.2.1.4.3-2)

Derivation Path: TS 38.508-1 [14], Table 4.6.6-31			
Information Element	**Value/remark**	**Comment**	**Condition**
SL-SyncConfig-r16 ::= SEQUENCE {			
sl-filterCoefficient-r16	fc0	L3 filtering is not used to avoid introducing additional delay	
txParameters-r16 SEQUENCE {			
syncTxThreshIC-r16	2	actual threshold is -120+2*5 = -110 dBm	
syncTxThreshOoC-r16	Not present		
}			
}			

9.1.2.1.5 Test requirement

Cell specific test parameters for NR Cell 1 is given in Table 9.1.2.1.5-1.

Table 9.1.2.1.5-1: FR1 NR Cell-specific test parameters for Initiation/Cease of S-SSB Transmission Test for FR1 NR cell as synchronization reference source

Parameter		**Unit**	**Cell1**		
			T1	**T2**	**T3**
NR RF Channel Number			1		
Duplex Mode	Config 1		FDD		
	Config 2,3		TDD		
TDD configuration	Config 1		Not applicable		
	Config 2		TDDConf.1.1		
	Config 3		TDDConf.2.1		
Channel Bandwidth ($BW_{channel}$)	Config 1,2	MHz	10:$N_{RB,c}$ = 52		
	Config 3		40:$N_{RB,c}$ = 106		
Initial BWP Configuration			DLBWP.0.1 ULBWP.0.1		
Dedicated BWP Configuration			DLBWP.1.1 ULBWP.1.1		
DRX Cycle		ms	N/A		
PDSCH Reference measurement channel	Config 1		SR.1.1 FDD		
	Config 2		SR.1.1 TDD		
	Config 3		SR.2.1 TDD		
CORESET Reference Channel	Config 1		CR.1.1 FDD		
	Config 2		CR.1.1 TDD		
	Config 3		CR.2.1 TDD		
Dedicated CORESET Reference Channel	Config 1		CCR.1.1 FDD		
	Config 2		CCR.1.1 TDD		
	Config 3		CCR.2.1 TDD		
SSB configuration	Config 1,2		SSB.1 FR1		
	Config 3		SSB.2 FR1		
SMTC Configuration	Config 1		SMTC.2		
	Config 2,3		SMTC.1		
TRS configuration	Config 1		TRS.1.1 FDD		
	Config 2		TRS.1.1 TDD		
	Config 3		TRS.1.2 TDD		

OCNG Patterns			OP.1		
EPRE ratio of PSS to SSS		dB	0		
EPRE ratio of PBCH DMRS to SSS					
EPRE ratio of PBCH to PBCH DMRS					
EPRE ratio of PDCCH DMRS to SSS					
EPRE ratio of PDCCH to PDCCH DMRS					
EPRE ratio of PDSCH DMRS to SSS					
EPRE ratio of PDSCH to PDSCH					
EPRE ratio of OCNG DMRS to SSS Note 1					
EPRE ratio of OCNG to OCNG DMRS Note 1					
Noc Note2		Config 1,2	dBm/15 kHz		
		Config 3			
		Config 1,2,3	dBm/SCS		
Ês/Noc		dB	7.6 Note 5	-4.5	7.6 Note 5
Ês/Iot		dB	7.6	-4.5	7.6
SS-RSRP Note3	Config 1,2	dBm/SCS	-103.95	116.05	-103.95
	Config 3		-103.95	-116.05	-103.95
Io Note3	Config 1,2	dBm/9.36MHz	-75.30	-82.28	-75.30
	Config 3	dBm/38.16MHz	-72.20	-79.18	-72.20
Propagation condition			AWGN		

Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.
Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for Noc to be fulfilled.
Note 3: SS-RSRP and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.
Note 4: SS-RSRP minimum requirements are specified assuming independent interference and noise at each receiver antenna port.
Note 5: Including the test tolerance given in Annex F.

During T1, the SS-RSRP of the PCell is above *syncTxThreshIC* and the UE is not expected to be transmitting S-SSB.

During T2, the SS-RSRP of the PCell is lowered below *syncTxThreshIC* and the UE is expected to initiate S-SSB transmissions.

During T3, the SS-RSRP of the PCell is increased back to be above *syncTxThreshIC* and the UE is expected to cease S-SSB transmissions.

The S-SSB transmission initiation delay is defined as the time from the beginning of time period T2 up to the moment when the UE initiates the S-SSB transmission.

The S-SSB transmission initiation delay shall be less than $T_{evaluate,SLSS}$ + S-SSB period = 560ms, where,

$T_{evaluate,SLSS}$ = max(400 ms, ceil (10 · Kp) · SMTC period) = 400 ms, is the evaluation time specified in 38.133 [6] Table 12.3.1.1-1, where

SMTC period = 20ms according to Table 9.1.2.1.5-1.

K_p = 1 according to Table 9.1.2.1.5-1.

S-SSB period = 160 ms.

The S-SSB transmission cease delay is defined as the time from the beginning of time period T3 up to the moment when the UE ceases the S-SSB transmission.

The S-SSB transmission cease delay shall be less than $T_{evaluate,SLSS}$ + S-SSB period = 560ms.

The rate of correct initiation/cease delay of S-SSB transmissions observed during repeated tests shall be at least 90%.

9.1.2.2 NR SA FR1 initiation/cease of S-SSB transmission for SyncRef UE as synchronization reference source

9.1.2.2.1 Test purpose

The purpose of this test is to verify that the NR sidelink UE meets the requirements related to the maximum evaluation time allowed to initiate and cease S-SSB transmissions defined in TS 38.133 [6] clause 12.3.1.4, when the reference timing used for sidelink transmissions is a SyncRef UE.

9.1.2.2.2 Test applicability

This test applies to all types of NR UEs from release 16 onwards and supporting NR sidelink communication.

9.1.2.2.3 Minimum conformance requirements

The minimum conformance requirements are defined in clause 9.1.2.0.2

The normative reference for this requirement is TS 38.133 [6] clause A.9.1.2.2.

9.1.2.2.4 Test description

9.1.2.2.4.1 Initial conditions

Configure the test equipment and the DUT according to the parameters in Table 9.1.2.2.4.1-1.

Table 9.1.2.2.4.1-1: Initial conditions for NR SA FR1 initiation/cease of S-SSB transmission for SyncRef UE as synchronization reference source

Parameter	Value		Comment
Test environment	NC		As specified in TS 38.508-1 [14] clause 4.1.
Test frequencies	PC5: As specified in TS 38.508-1 [14] clause 4.3.1.8.		
Channel bandwidth	PC5: As specified by the test configuration selected from Table 9.1.1.3.4.1-2.		
Propagation conditions	AWGN		As specified in Annex C.2.2.
Connection Diagram	TE Part	A.3.1.9.1	As specified in TS 38.508-1 [14] Annex A.
	DUT Part	A.3.2.7.1	
Exceptions to connection diagram	GNSS System Simulator is not used.		

1. The parameter settings for the NR sidelink communication are configured according to Table 9.1.2.2.4.1-2.
2. Message content exceptions are given in clause 9.1.2.2.4.3
3. There is one NR-SS-UE (SyncRef UE 1) specified in this test. SyncRef UE 1 is configured according to the parameters in Table 9.1.1.2.4.1-2.

Table 9.1.2.2.4.1-2: NR sidelink test parameters for NR SA FR1 initiation/cease of S-SSB transmission for SyncRef UE as synchronization reference source

Parameter	Unit	Value	Comment
SCS	kHz	30	
Active cell		None	
Active SyncRef UE		SyncRef UE 1	Transmitting S-SSB on RF channel number 1(HD carrier in Band n47 or n38)

Active NR sidelink UE		NR sidelink UE	Transmitting S-SSB on RF channel number 1(HD carrier in Band n47 or n38)
NR sidelink communication preconfiguration		As specified in section A.11.2	IE values unless specified otherwise in this test
networkControlledSyncTx		Not configured	
syncTxThreshOoC	dBm/30kHz	-100	
T1	s	3	
T2	s	5.24	
T3	s	5.24	

9.1.2.2.4.2 Test procedure

In this test there is one active NR-SS-UE (SyncRef UE 1) and no serving cell nor GNSS signals. The test system shall emulate SyncRef UE 1 to transmit S-SSB every synchronization period with the SLSSID and inCoverage indicator as specified in Table 9.1.2.2.5-1.

The test consists of three successive time periods, with time duration of T1, T2 and T3 respectively.

1. Ensure the UE is in state 4-A with generic procedure parameters Test Mode = *On* according to TS 38.508-1 [14] clause 4.4A.2.
2. The SS powers on SyncRef UE 1, sets parameters according to T3 in Table 9.1.2.2.5-1. Then the SS waits at least 8 seconds for the UE to be synchronized to SyncRef UE 1.
3. The SS sets parameters according to T1 in Table 9.1.2.2.5-1, T1 starts.
4. During T1, if the SS observes that no SL SSB is transmitted by the UE until T1 expires, then count a success for the event "No S-SSB transmission", otherwise count a fail for the event "No S-SSB transmission".
5. When T1 expires, the SS shall switch the power setting from T1 to T2 in Table 9.1.2.2.5-1. T2 starts.
6. If the UE

   a) starts to send S-SSB within 800 ms from the start of T2, and

   b) uses SLSSID = 30, and

   c) *inCoverage* = FALSE in *MasterInformationBlockSidelink*

   then count a success for the event "S-SSB transmission initiation", otherwise count a fail for the event "S-SSB transmission initiation".
7. When T2 expires, the SS shall switch the power setting from T2 to T3 in Table 9.1.2.2.5-1. T3 starts.
8. If the UE transmits no SL SSB from 800 ms after the start of T3 then count a success for the event "S-SSB transmission cease", otherwise count a fail for the event "S-SSB transmission cease".
9. Repeat step 3-8 until the confidence level according to Tables G.2.3-1 in Annex G clause G.2 is achieved.

Each of the events "No S-SSB transmission", "S-SSB transmission initiation" and "S-SSB transmission cease" is evaluated independently for the statistic, resulting in an event verdict pass or fail. Different events may require different times for a verdict.

If all events pass, the test passes. If one event fails, the test fails.

9.1.2.2.4.3 Message contents

Message contents are according to TS 38.508-1 [14] clause 7.3 with the following exceptions:

Table 9.1.2.2.4.3-1: MasterInformationBlockSidelink (SyncRef UE 1)

Derivation Path: TS 38.508-1 [14], Table 4.6.1A-1 with condition NB_SYNC and RX

Table 9.1.2.2.4.3-2: SL-ConfigDedicatedNR (SyncRef UE 1)

Derivation Path: TS 38.508-1 [14], Table 4.6.6-7 with condition SELECTED			
Information Element	**Value/remark**	**Comment**	**Condition**
SL-ConfigDedicatedNR-r16 ::= SEQUENCE {			
sl-PHY-MAC-RLC-Config-r16 SEQUENCE {			
sl-FreqInfoToAddModList-r16 SEQUENCE (SIZE (1..maxNrofFreqSL-r16)) OF SL-FreqConfig-r16 {	1 entry		
SL-FreqConfig-r16[1] SEQUENCE {		entry 1	
sl-SyncConfigList-r16 SEQUENCE (SIZE (1..maxSL-SyncConfig-r16)) OF SL-SyncConfig-r16 {	1 entry		
SL-SyncConfig-r16[1]	SL-SyncConfig	entry 1 Table 9.1.2.2.4.3-3	
}			
sl-SyncPriority-r16	gnbEnb		
}			
}			
networkControlledSyncTx-r16	on		
}			
}			

Table 9.1.2.2.4.3-3: SL-SyncConfig (Table 9.1.2.2.4.3-2)

Derivation Path: TS 38.508-1 [14], Table 4.6.6-31			
Information Element	**Value/remark**	**Comment**	**Condition**
SL-SyncConfig-r16 ::= SEQUENCE {			
sl-SSID-r16	30		
}			
}			

9.1.2.2.5 Test requirement

SyncRef UE Specific test parameters for SyncRef UE 1 is given in Table 9.1.2.2.5-1.

Table 9.1.2.2.5-1: SyncRef UE Specific test parameters for NR SA FR1 initiation/cease of S-SSB transmission for SyncRef UE as synchronization reference source

Parameter	Unit	SyncRef UE 1		
		T1	T2	T3
NR RF Channel Number		1		
V2X SL communication resource pool configuration		As specified in section A.11.2		
Channel Bandwidth ($BW_{channel}$) Note3	MHz	20($N_{RB,c}$ = 50) or 40($N_{RB,c}$ = 100)		
SLSSID		30		
inCoverage		TRUE		
networkControlledSyncTx		ON		
Noc Note1	dBm/30 kHz	-99.35 Note 5	-102.55 Note 5	-99.35 Note 5
Ês/Noc	dB	5.5	-3.5	5.5
PSBCH Ês/Noc	dB	5.5	-3.5	5.5
PSBCH-RSRP Note2	dBm/30 kHz	-93.85	-106.05	-93.85
Io Note2	dBm /18MHz	-71.57	-79.74	-71.57
	dBm /36MHz	-71.57	-79.74	-71.57
Propagation condition		AWGN		

Note 1: Interference from other UEs and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for Noc to be fulfilled.

Note 2: PSBCH-RSRP and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves. Io level is based on the allocated RBs for S-PSS/S-SSS/PSBCH symbols.

Note 3:	The UE is only required to be tested in one of the supported test configurations.
Note 4:	S-PSS Es/Noc and S-SSS Es/Noc are set the same as PSBCH Es/Noc.
Note 5:	Including the test tolerance given in Annex F.

During T1, the PSBCH-RSRP of SyncRef UE 1 is above *syncTxThreshOOC* and the UE is not expected to be transmitting S-SSB.

During T2, the PSBCH-RSRP of SyncRef UE 1 is lowered below *syncTxThreshOOC* and the UE is expected to initiate S-SSB transmissions.

During T3, the PSBCH-RSRP of SyncRef UE 1 is increased back to be above *syncTxThreshOOC* and the UE is expected to cease S-SSB transmissions.

The S-SSB transmission initiation delay is defined as the time from the beginning of time period T2 up to the moment when the UE initiates the S-SSB transmission.

The S-SSB transmission initiation delay shall be less than $T_{evaluate,SLSS}$ + S-SSB period = 800 ms, where,

$T_{evaluate,SLSS}$ = 4 · S-SSB period, is the evaluation time specified in 38.133 [6] clause 12.3.1.4,

S-SSB period = 160 ms.

The S-SSB transmission cease delay is defined as the time from the beginning of time period T3 up to the moment when the UE ceases the S-SSB transmission.

The S-SSB transmission cease delay shall be less than $T_{evaluate,SLSS}$ + S-SSB period = 800 ms.

The rate of correct initiation/cease delay of S-SSB transmissions observed during repeated tests shall be at least 90%.

9.1.3 Synchronization reference selection/reselection

9.1.3.0 Minimum conformance requirements

9.1.3.0.1 Minimum conformance requirements for GNSS configured as the highest priority synchronization reference source

The requirements defined in this clause do not apply to the UEs that do not support transmission and reception of SLSS.

A SyncRef UE is considered to be detectable when

- PSBCH-RSRP related side conditions given in 38.133 [6] clause 10.4 are fulfilled for a corresponding Band,
- S-SSB_RP and S-SSBÊs/Iot according to Annex B.4.3 for a corresponding Band are fulfilled.

When GNSS synchronization reference source is configured as the highest priority and

- UE is synchronized to GNSS directly,
  - UE shall not drop any NR SLSS and data transmission for the purpose of selection/reselection to the SyncRef UE.
- UE is synchronized to a SyncRef UE that is synchronized to GNSS directly or in-directly,
  - UE shall not drop any NR sidelink data transmission for the purpose of selection/reselection to the SyncRef UE. The UE shall be able to identify newly detectable intra-frequency SyncRef UE within $T_{detect,SyncRef\ UE_V2X}$ seconds if the SyncRef UE meets the selection / reselection criterion defined in TS 38.331[13]. $T_{detect,SyncRef\ UE_V2X}$ is defined as 1.6 seconds at S-SSB Ês/Iot ≥ 0 dB, provided that the UE is allowed to drop a maximum of 30% of its SLSS transmissions during $T_{detect,SyncRef\ UE_V2X}$ for the purpose of selection / reselection to the SyncRef UE.
- in other case
  - The UE shall be able to identify newly detectable intra-frequency SyncRef UE within $T_{detect,SyncRef\ UE_V2X}$ seconds if the SyncRef UE meets the selection / reselection criterion defined in TS 38.331[13]. $T_{detect,SyncRef}$

T_{UE_V2X} is defined as 8 seconds at S-SSB $\hat{E}s/Iot \geq 0$ dB, provided that the UE is allowed to drop a maximum of 6 % of its NR sidelink data and SLSS transmissions during $T_{detect,SyncRef\ UE_V2X}$ for the purpose of selection / reselection to the SyncRef UE.

- UE is allowed to drop up to 2 slots of its NR sidelink data reception per PSBCH monitoring occasion and overall drop rate shall not exceed 0.3% of its NR sidelink data reception during $T_{detect,SyncRef\ UE_V2X}$ for the purpose of selection / reselection to the SyncRef UE.

UE shall be capable of performing PSBCH-RSRP measurements for 3 identified intra-frequency SyncRef UEs with the measurement period of 320 ms. It is assumed that the SyncRef UE do not drop or delay any SLSS transmission within the measurement period. Otherwise, the measurement period may be extended.

When UE is synchronized to GNSS directly, before selection / reselection of the new synchronization reference source UE shall evaluate the GNSS synchronization source reliability for at least 20 seconds before changing the synchronization reference from GNSS to another synchronization reference source. UE shall be always synchronized to GNSS directly during the evaluation of GNSS synchronization source reliability.

The requirements for absolute accuracy of PSBCH-RSRP apply to a NR sidelink synchronization source on the same frequency as that of the own NR sidelink UE performing the measurement in FR1.

The accuracy requirements in Table 9.1.3.0.1-1 are valid under the following conditions:

- Demodulation reference signals are transmitted from one port.
- Conditions defined in Clause 7.3E of TS 38.101-1 [2] for reference sensitivity are fulfilled.
- Conditions for PSBCH-RSRP measurements are fulfilled according to Annex B.4.2 for a corresponding Band for each relevant PSBCH-DMRS.

Table 9.1.3.0.1-1: Intra-frequency PSBCH-RSRP absolute accuracy in FR1

Accuracy		Conditions						
			Io [Note 1] range					
Normal condition	Extreme condition	Ês/Iot [Note 3]	NR Sidelink operating band groups [Note 2]	Minimum Io				Maximum Io
				dBm / SCS_{SL}				
dB	dB	dB		SCS_{SL} = 15 kHz	SCS_{SL} = 30 kHz	SCS_{SL} = 60 kHz	$dBm/BW_{Channel}$	$dBm/BW_{Channel}$
±4.5	±9	≥-6	NR_TDD_FR1_B	-120.5	-117.5	-114.5	N/A	-70
			NR_TDD_FR1_J	-116.5	-113.5	-110.5	N/A	-70
±8	±11	≥-6	NR_TDD_FR1_B, NR_TDD_FR1_J	N/A	N/A	N/A	-70	-50
NOTE 1: Io is assumed to have constant EPRE across the bandwidth. NOTE 2: NR sidelink operating band groups in FR1 are as defined in clause 3.5.2. NOTE 3: Ês/Iot for a SyncRef UE is the Ês/Iot of PSBCH-DMRS.								

The relative accuracy of PSBCH-RSRP is defined as the PSBCH-RSRP measured from one NR sidelink synchronization source compared to the PSBCH-RSRP measured from another NR sidelink synchronization source on the same frequency in FR1.

The accuracy requirements in Table 9.1.3.0.1-2 are valid under the following conditions:

- Demodulation reference signals are transmitted from one port.
- Conditions defined in Clause 7.3E of TS 38.101-1 [2] for reference sensitivity are fulfilled.
- Conditions for PSBCH-RSRP accuracy measurements are fulfilled according to Annex B.4.2 for a corresponding Band for each relevant PSBCH-DMRS.

Table 9.1.3.0.1-2: Intra-frequency PSBCH-RSRP relative accuracy in FR1

Accuracy	Conditions

Normal condition	Extreme condition	Ês/Iot Note 3	Io Note 1 range					
			NR sidelink operating band groups Note 2	Minimum Io				Maximum Io
dB	dB	dB		dBm / SCS_{SL}			dBm/$BW_{Channel}$	dBm/$BW_{Channel}$
				SCS_{SL} = 15 kHz	SCS_{SL} = 30 kHz	SCS_{SL} = 60 kHz		
±2	±3	≥-3	NR_TDD_FR1_B	-120.5	-117.5	-114.5	N/A	-50
			NR_TDD_FR1_J	-116.5	-113.5	-110.5	N/A	-50
±3	±3	≥-6	Note 4	Note 4	Note 4	Note 4	N/A	Note 4

NOTE 1: Io is assumed to have constant EPRE across the bandwidth.
NOTE 2: NR sidelink operating band groups in FR1 are as defined in clause 3A.4.1.
NOTE 3: Ês/Iot for a SyncRef UE is the Ês/Iot of PSBCH-DMRS.
NOTE 4: The same bands and the same Io conditions for each band apply for this requirement as for the corresponding highest accuracy requirement.

The normative references for this requirement are TS 38.133 [6] clause 10.4.2 and 12.4.

9.1.3.0.2 Minimum conformance requirements for eNB/gNB configured as the highest priority synchronization reference source

The requirements defined in this clause do not apply to the UEs that do not support transmission and reception of SLSS.

A SyncRef UE is considered to be detectable when

- PSBCH-RSRP related side conditions given in 38.133 [6] clause 10.4 are fulfilled for a corresponding Band,
- S-SSB_RP and S-SSB Ês/Iot according to Annex B.4.3 for a corresponding Band are fulfilled.

When serving cell/PCell synchronization reference source is configured as the highest priority,

- UE shall be able to identify newly detectable intra-frequency SyncRef UE within $T_{detect,SyncRef\ UE_V2X}$ seconds if the SyncRef UE meets the selection / reselection criterion defined in TS 38.331 [13]. $T_{detect,SyncRef\ UE_V2X}$ is defined as 8 seconds at S-SSB Ês/Iot $\geq$ 0 dB, provided that the NR sidelink UE is allowed to drop a maximum of 6 % of its NR sidelink data and SLSS transmissions for the purpose of selection / reselection to the SyncRef UE.
- UE is allowed to drop up to 2 slots of its NR sidelink data reception per PSBCH monitoring occasion and overall drop rate shall not exceed 0.3% of its NR sidelink data reception during $T_{detect,SyncRef\ UE_V2X}$ for the purpose of selection / reselection to the SyncRef UE.

UE shall be capable of performing PSBCH-RSRP measurements for 3 identified intra-frequency SyncRef UEs with the measurement period of 320 ms. It is assumed that the SyncRef UE do not drop or delay any SLSS transmission within the measurement period. Otherwise, the measurement period may be extended.

The requirements for absolute accuracy of PSBCH-RSRP apply to a NR sidelink synchronization source on the same frequency as that of the own NR sidelink UE performing the measurement in FR1.

The accuracy requirements in Table 9.1.3.0.2-1 are valid under the following conditions:

- Demodulation reference signals are transmitted from one port.
- Conditions defined in Clause 7.3E of TS 38.101-1 [2] for reference sensitivity are fulfilled.
- Conditions for PSBCH-RSRP measurements are fulfilled according to Annex B.4.2 for a corresponding Band for each relevant PSBCH-DMRS.

Table 9.1.3.0.2-1: Intra-frequency PSBCH-RSRP absolute accuracy in FR1

Accuracy		Conditions	
			Io Note 1 range

Normal condition	Extreme condition	Ês/Iot Note 3	NR Sidelink operating band groups Note 2	Minimum Io				Maximum Io
				dBm / SCS_{SL}				
dB	dB	dB		SCS_{SL} = 15 kHz	SCS_{SL} = 30 kHz	SCS_{SL} = 60 kHz	$dBm/BW_{Channel}$	$dBm/BW_{Channel}$
±4.5	±9	≥-6	NR_TDD_FR1_B	-120.5	-117.5	-114.5	N/A	-70
			NR_TDD_FR1_J	-116.5	-113.5	-110.5	N/A	-70
±8	±11	≥-6	NR_TDD_FR1_B, NR_TDD_FR1_J	N/A	N/A	N/A	-70	-50
NOTE 1: Io is assumed to have constant EPRE across the bandwidth. NOTE 2: NR sidelink operating band groups in FR1 are as defined in clause 3.5.2. NOTE 3: Ês/Iot for a SyncRef UE is the Ês/Iot of PSBCH-DMRS.								

The relative accuracy of PSBCH-RSRP is defined as the PSBCH-RSRP measured from one NR sidelink synchronization source compared to the PSBCH-RSRP measured from another NR sidelink synchronization source on the same frequency in FR1.

The accuracy requirements in Table 9.1.3.0.2-2 are valid under the following conditions:

- Demodulation reference signals are transmitted from one port.
- Conditions defined in Clause 7.3E of TS 38.101-1 [2] for reference sensitivity are fulfilled.
- Conditions for PSBCH-RSRP accuracy measurements are fulfilled according to Annex B.4.2 for a corresponding Band for each relevant PSBCH-DMRS.

Table 9.1.3.0.2-2: Intra-frequency PSBCH-RSRP relative accuracy in FR1

Accuracy		Conditions						
			Io Note 1 range					
Normal condition	Extreme condition	Ês/Iot Note 3	NR sidelink operating band groups Note 2	Minimum Io				Maximum Io
				dBm / SCS_{SL}				
dB	dB	dB		SCS_{SL} = 15 kHz	SCS_{SL} = 30 kHz	SCS_{SL} = 60 kHz	$dBm/BW_{Channel}$	$dBm/BW_{Channel}$
±2	±3	≥-3	NR_TDD_FR1_B	-120.5	-117.5	-114.5	N/A	-50
			NR_TDD_FR1_J	-116.5	-113.5	-110.5	N/A	-50
±3	±3	≥-6	Note 4	Note 4	Note 4	Note 4	N/A	Note 4
NOTE 1: Io is assumed to have constant EPRE across the bandwidth. NOTE 2: NR sidelink operating band groups in FR1 are as defined in clause 3A.4.1. NOTE 3: Ês/Iot for a SyncRef UE is the Ês/Iot of PSBCH-DMRS. NOTE 4: The same bands and the same Io conditions for each band apply for this requirement as for the corresponding highest accuracy requirement.								

9.1.3.1 NR SA FR1 synchronization reference selection/reselection for GNSS configured as the highest priority synchronization reference source

9.1.3.1.1 Test purpose

The purpose of this test is to verify the requirements related to SyncRef UE (re)selection as specified in TS 38.133 [6] clause 12.4, when GNSS is configured as the highest priority.

9.1.3.1.2 Test applicability

This test applies to all types of NR UEs from release 16 onwards and supporting NR sidelink communication.

9.1.3.1.3 Minimum conformance requirements

The minimum conformance requirements are defined in clause 9.1.3.0.1

The normative reference for this requirement is TS 38.133 [6] clause A.9.1.3.1.

9.1.3.1.4 Test description

9.1.3.1.4.1 Initial conditions

Configure the test equipment and the DUT according to the parameters in Table 9.1.3.1.4.1-1.

Table 9.1.3.1.4.1-1: Initial conditions for NR SA FR1 synchronization reference selection/reselection for GNSS configured as the highest priority synchronization reference source

Parameter	Value		Comment
Test environment	NC		As specified in TS 38.508-1 [14] clause 4.1.
Test frequencies	PC5: As specified in TS 38.508-1 [14] clause 4.3.1.8.		
Channel bandwidth	PC5: As specified by the test configuration selected from Table 9.1.3.1.4.1-2.		
Propagation conditions	AWGN		As specified in Annex C.2.2.
Connection Diagram	TE Part	A.3.1.9.1	As specified in TS 38.508-1 [14] Annex A.
	DUT Part	A.3.2.7.1	
Exceptions to connection diagram	GNSS System Simulator is not used.		

1. The parameter settings for the NR sidelink communication are pre-configured according to TS 38.508-1 [14] clause 4.10.1.
2. Message content exceptions are given in clause 9.1.3.1.4.3
3. There are three NR-SS-UEs (SyncRef UE 1, SyncRef UE 2 and SyncRef UE 3) specified in this test. SyncRef UE 1, SyncRef UE 2 and SyncRef UE 3 are configured according to the generic parameters in Table 9.1.3.1.4.1-2.

Table 9.1.3.1.4.1-2: NR sidelink test parameters for NR SA FR1 synchronization reference selection/reselection for GNSS configured as the highest priority synchronization reference source

Parameter		Unit	Value	Comment
Initial condition	Active synchronization source		Sync Ref UE 1	DUT transmits for NR Sidelink Communication and S-SSB with SLSS ID = 30 and in-coverage set as FALSE in MIB-SL.
T2 end condition	Active synchronization source		Sync Ref UE 2	DUT transmits for NR Sidelink Communication and S-SSB with SLSS ID = 336 and in-coverage set as FALSE in MIB-SL.
Final condition	Active synchronization source		Sync Ref UE 3	UE transmits for NR Sidelink Communication and S-SSB with SLSS ID = 0 and in-coverage set as FALSE in MIB-SL.
Active SyncRef UEs			SyncRef UE 1 SyncRef UE 2 SyncRef UE 3	Transmitting S-SSB on RF channel number 1 (HD carrier in Band n47 or n38)
Timing offset among SyncRef UEs		µs	CP/2	Synchronous
Frequency offset of SyncRef UE 1,2 and 3		ppm	0	
NR sidelink Communication configuration			As specified in clause A.11.2	IE values unless specified otherwise in this test.
sl-SyncPriority			gnss	
syncTxThreshOoC			+infinity	
T1		s	24	
T2		s	16	

T3	s	3.2	

9.1.3.1.4.2 Test procedure

In this test there are three active SyncRef UEs (SyncRef UE 1, SyncRef UE 2 and SyncRef UE 3) and no GNSS signals nor Cells. The test system shall emulate SyncRef UE 1, SyncRef UE 2 and SyncRef UE 3 to transmit S-SSB every S-SSB period with the SLSSIDs and inCoverage indicators specified in Table 9.1.3.1.5-1.

The test consists of three successive time periods, with time duration of T1, T2 and T3 respectively. SyncRef UE 1, SyncRef UE 2 and SyncRef UE 3 are all switched off before starting the test. For this test, the UE is triggered by the test loop function or the upper layers to transmit for V2X Sidelink Communication.

1. Ensure the UE is in state 4-A with generic procedure parameters Test Mode = *On* according to TS 38.508-1 [14] clause 4.4A.2.
2. The UE transmits S-SSB with SLSSID belonging to id_oon set and *inCoverage* = false in SL MIB.
3. The SS sends AT command +CCUTLE to close test loop function and trigger UE to transmit.
4. The SS sets parameters according to T1 in Table 9.1.3.1.5-1. T1 starts.
5. If the UE

   a) starts to transmit S-SSB within 8800 ms from the start of T1 with SLSSID = 30 and *inCoverage* = false in *MasterInformationBlockSidelink*, and

   b) drops no more than 6 % of its PSSCH and S-SSB transmissions within 8000 ms from the start of T1.

   then count a success for the event "select SyncRef UE 1", otherwise count a fail for the event "select SyncRef UE 1".
6. When T1 expires, the SS shall switch the power setting from T1 to T2 in Table 9.1.3.1.5-1. T2 starts.
7. If the UE

   a) starts to transmit S-SSB within 8800 ms from the start of T2 with SLSSID = 336 and *inCoverage* = false in *MasterInformationBlockSidelink*, and

   b) drops no more than 6 % of its PSSCH and S-SSB transmissions within 8000 ms from the start of T2.

   then count a success for the event "reselect SyncRef UE 2", otherwise count a fail for the event "reselect SyncRef UE 2".
8. When T2 expires, the SS shall switch the power setting from T2 to T3 in Table 9.1.3.1.5-1. T3 starts.
9. If the UE

   a) starts to transmit S-SSB within 2400 ms from the start of T3 with SLSSID = 0 and *inCoverage* = false in *MasterInformationBlockSidelink*, and

   b) drops no more than 30 % of its S-SSB transmissions within 1600 ms from the start of T3.

   then count a success for the event "reselect SyncRef UE 3", otherwise count a fail for the event" reselect SyncRef UE 3".
10. When T3 expires, the SS shall switch off all three SyncRef UEs and wait at least 8 seconds.
11. The SS sends AT command +CCUTLE to open test loop function and trigger UE to stop transmitting.
12. Repeat step 2-11 until the confidence level according to Tables G.2.3-1 in Annex G clause G.2 is achieved.

Each of the events " select SyncRef UE 1", " reselect SyncRef UE 2" and " reselect SyncRef UE 3" is evaluated independently for the statistic, resulting in an event verdict pass or fail. Different events may require different times for a verdict.

If all events pass, the test passes. If one event fails, the test fails.

9.1.3.1.4.3 Message contents

Message contents are according to TS 38.508-1 [14] clause 7.3 with the following exceptions:

Table 9.1.3.1.4.3-1: SL-ConfigDedicatedNR (SyncRef UE 1 and SyncRef UE 3)

Derivation Path: TS 38.508-1 [14], Table 4.6.6-7 with condition SELECTED			
Information Element	**Value/remark**	**Comment**	**Condition**
SL-ConfigDedicatedNR-r16 ::= SEQUENCE {			
sl-PHY-MAC-RLC-Config-r16 SEQUENCE {			
sl-FreqInfoToAddModList-r16 SEQUENCE (SIZE (1..maxNrofFreqSL-r16)) OF SL-FreqConfig-r16 {	1 entry		
SL-FreqConfig-r16[1] SEQUENCE {		entry 1	
sl-SyncConfigList-r16 SEQUENCE (SIZE (1..maxSL-SyncConfig-r16)) OF SL-SyncConfig-r16 {	1 entry		
SL-SyncConfig-r16[1]	SL-SyncConfig	entry 1 Table 9.1.3.1.4.3-3	
}			
sl-SyncPriority-r16	gnbEnb		SyncRef UE 1
	gnss		SyncRef UE 3
}			
}			
networkControlledSyncTx-r16	on		
}			
}			

Table 9.1.3.1.4.3-2: SL-PreconfigurationNR (SyncRef UE 2)

Derivation Path: TS 38.508-1 [14], Table 4.10.1-1			
Information Element	**Value/remark**	**Comment**	**Condition**
SL-PreconfigurationNR-r16 ::= SEQUENCE {			
sidelinkPreconfigNR-r16 SEQUENCE {			
sl-PreconfigFreqInfoList-r16 SEQUENCE (SIZE (1..maxNrofFreqSL-r16)) OF {	1 entry		
SL-FreqConfigCommon-r16[1] SEQUENCE {		entry 1	
sl-SyncConfigList-r16 SEQUENCE (SIZE (1..maxSL-SyncConfig-r16)) OF SL-SyncConfig-r16 {	1 entry		
SL-SyncConfig-r16[1]	SL-SyncConfig	entry 1 Table 9.1.3.1.4.3-3	
}			
}			
}			
}			
}			

Table 9.1.3.1.4.3-3: SL-SyncConfig (Table 9.1.3.1.4.3-1 and Table 9.1.3.1.4.3-2)

Derivation Path: TS 38.508-1 [14], Table 4.6.6-31			
Information Element	**Value/remark**	**Comment**	**Condition**
SL-SyncConfig-r16 ::= SEQUENCE {			
sl-SSID-r16	30		SyncRef UE 1
txParameters-r16 SEQUENCE {			SyncRef UE 2
syncTxThreshOoC-r16	13	the special value corresponding to +infinity	
}			
gnss-Sync-r16	true		SyncRef UE 2 SyncRef UE 3
}			

Table 9.1.3.1.4.3-4: SL-PreconfigurationNR (The UE under test)

Derivation Path: TS 38.508-1 [14], Table 4.10.1-1			
Information Element	**Value/remark**	**Comment**	**Condition**
SL-PreconfigurationNR-r16 ::= SEQUENCE {			
sidelinkPreconfigNR-r16 SEQUENCE {			
sl-PreconfigFreqInfoList-r16 SEQUENCE (SIZE (1..maxNrofFreqSL-r16)) OF {	1 entry		
SL-FreqConfigCommon-r16[1] SEQUENCE {		entry 1	
sl-SyncConfigList-r16 SEQUENCE (SIZE (1..maxSL-SyncConfig-r16)) OF SL-SyncConfig-r16 {	1 entry		
SL-SyncConfig-r16[1] SEQUENCE {		entry 1	
sl-SyncRefMinHyst-r16	dB0		
sl-filterCoefficient-r16	fc0		
txParameters-r16 SEQUENCE {			
syncTxThreshOoC-r16	13	the special value corresponding to +infinity	
}			
}			
}			
}			
}			
}			
}			

Table 9.1.3.1.4.3-5: MasterInformationBlockSidelink (SyncRef UE 1, SyncRef UE 2 and SyncRef UE 3)

Derivation Path: TS 38.508-1 [14], Table 4.6.1A-1			
Information Element	**Value/remark**	**Comment**	**Condition**
MasterInformationBlockSidelink ::= SEQUENCE {			
inCoverage-r16	true		SyncRef UE 1, SyncRef UE 3
	false		SyncRef UE 2
}			

Table 9.1.3.1.4.3-6: MasterInformationBlockSidelink (Test procedure, step 2,5 and 7, the UE under test)

Derivation Path: TS 38.508-1 [14], Table 4.6.1A-1 with condition TX			
Information Element	**Value/remark**	**Comment**	**Condition**
MasterInformationBlockSidelink ::= SEQUENCE {			
inCoverage-r16	false		
}			

Table 9.1.3.1.4.3-7: +CCUTLE (Test procedure, step 2)

Derivation Path: 38.508-1[14] Table 4.7B-1 with condition Close and Transmit

Table 9.1.3.1.4.3-8: +CCUTLE (Test procedure, step 11)

Derivation Path: 38.508-1[14] Table 4.7B-1 with condition Open

9.1.3.1.5 Test requirement

SyncRef UE Specific test parameters for SyncRef UEs are given in Table 9.1.3.1.5-1.

Table 9.1.3.1.5-1: SyncRef UE Specific Test Parameters for NR SA FR1 synchronization reference selection/reselection for GNSS configured as the highest priority synchronization reference source

Parameter	Unit	SyncRef UE 1			SyncRef UE 2			SyncRef UE 3		
		T1	T2	T3	T1	T2	T3	T1	T2	T3
NR RF Channel Number		1(HD carrier in Band n47 or n38)								
Channel Bandwidth ($BW_{channel}$) Note 4	MHz	20 ($N_{RB,c}$ = 50) or 40 ($N_{RB,c}$ = 100)								
V2X Sidelink Communication resource pool configuration		As specified in Table A.11.2-2								
networkControlledSyncTx		ON			N/A			ON		
syncTxThreshOoC	dBm/SCS	N/A			+∞			N/A		
SLSSID		30			0			0		
inCoverage (in MIB-SL)		TRUE			FALSE			TRUE		
N_{oc} Note1	dBm/SCS	-95								
$\hat{E}_s/N_{oc}$ Note2	dB	0.35 Note 5	0	0	−∞	0.35 Note 5	0	−∞	−∞	3.35 Note 5
$\hat{E}_s/I_{ot}$	dB	0.35	0	-5.00	−∞	0.35	0	−∞	−∞	0.34
Io Note2	dBm/18 MHz	-70.61	-70.78	-67.60	-73.79	-70.61	-70.78	-70.61	-70.78	-67.60
	dBm/36 MHz	-70.61	-70.78	-67.60	-73.79	-70.61	-70.78	-70.61	-70.78	-67.60
PSBCH-RSRP Note2, Note 3	dBm/SCS	-94.65	-95	-95	−∞	-94.65	-95	−∞	−∞	-91.65
Propagation Condition		AWGN								

Note 1: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for N_{oc} to be fulfilled.
Note 2: $\hat{E}_s/I_{ot}$, Io, PSBCH-RSRP levels have been derived from other parameters for information purposes. They are not settable parameters themselves.
Note 3: S-PSS/S-SSS Es/Iot is set the same as PSBCH Es/Iot.
Note 4: The UE is only required to be tested in one of the supported test configurations.
Note 5: Including test tolerance given in Annex F.

During T1, the UE shall detect, evaluate and select SyncRef UE 1 as synchronization source. Then it shall change its S-SSB transmission timing with SLSSID = 30 and *inCoverage* = FALSE in *MasterInformationBlockSidelink* after SyncRef UE selection delay from start of T1.

During T2, the UE shall detect, evaluate and reselect SyncRef UE 2 as synchronization source. Then it shall change its S-SSB transmission timing with SLSSID = 336 and *inCoverage* = FALSE in *MasterInformationBlockSidelink* after SyncRef UE reselection delay from start of T2.

During T3, the UE will detect, evaluate and reselect SyncRef UE 3 as synchronization source. Then it shall change its S-SSB transmission timing with SLSSID = 0 and *inCoverage* = FALSE in *MasterInformationBlockSidelink* after SyncRef UE reselection delay from start of T2.

SyncRef UE (re)selection delay is defined as the time from the beginning of corresponding time instant to the time UE is synchronized to SyncRef UE and changes its S-SSB transmissions timing and SLSSID to follow SyncRef UE as the synchronization source. The SyncRef UE (re)selection delay can be expressed as:

SyncRef UE selection delay = $T_{detect,SyncRef\ UE}$ + $T_{evaluate,SLSS}$ + S-SSB period

- $T_{detect,SyncRef\ UE}$ = 1.6 seconds, is the time to identify newly detectable intra-frequency SyncRef UE as specified in 38.133 [6] clause 12.4 when UE is synchronized to a SyncRef UE that is synchronized to GNSS directly or in-directly, otherwise $T_{detect,SyncRef\ UE}$ = 8 seconds if UE is not directly synchronized to GNSS.

- $T_{evaluate,SLSS}$ = 4 S-SSB periods, is the time to measure the PSBCH-RSRP of the selected SyncRef UE used as synchronization reference source and evaluate it to initiate/cease S-SSB transmissions.

- S-SSB period = 160 ms.

Which gives SyncRef UE (re)selection delay = 8800 ms for T1 and T2, and 2400 ms for T3.

The test system will also verify that the UE does not drop or delay more than 6% of its sidelink data and S-SSB transmissions during the duration of T1 and T2, and does not drop or delay more than 30% of its S-SSB transmissions during the duration of T3.

The rate of correct SyncRef UE (re)selection observed during repeated tests shall be at least 90%.

9.1.3.2 NR SA FR1 synchronization reference selection/reselection for FR1 NR Cell configured as the highest priority synchronization reference source

9.1.3.2.1 Test purpose

The purpose of this test is to verify the requirements related to SyncRef UE (re)selection as specified in TS 38.133 [6] clause 12.4, when gNB is configured as the highest priority.

9.1.3.2.2 Test applicability

This test applies to all types of NR UEs from release 16 onwards and supporting gNB as synchronization source and NR sidelink communication.

9.1.3.2.3 Minimum conformance requirements

The minimum conformance requirements are defined in clause 9.1.3.0.2

The normative reference for this requirement is TS 38.133 [6] clause A.9.1.3.2.

9.1.3.2.4 Test description

9.1.3.2.4.1 Initial conditions

Configure the test equipment and the DUT according to the parameters in Table 9.1.3.2.4.1-1.

Table 9.1.3.2.4.1-1: Initial conditions for NR SA FR1 synchronization reference selection/reselection for FR1 NR Cell configured as the highest priority synchronization reference source

Parameter	Value		Comment
Test environment	NC		As specified in TS 38.508-1 [14] clause 4.1.
Test frequencies	PC5: As specified in TS 38.508-1 [14] clause 4.3.1.8.		
Channel bandwidth	PC5: As specified by the test configuration selected from Table 9.1.3.2.4.1-2.		
Propagation conditions	AWGN		As specified in Annex C.2.2.
Connection Diagram	TE Part	A.3.1.9.1	As specified in TS 38.508-1 [14] Annex A.
	DUT Part	A.3.2.7.1	
Exceptions to connection diagram	N/A		

1. The parameter settings for the NR sidelink communication are pre-configured according to TS 38.508-1 [14] clause 4.10.1.
2. Message content exceptions are given in clause 9.1.3.2.4.3
3. There are two NR-SS-UEs (SyncRef UE 1 and SyncRef UE 2) specified in this test. SyncRef UE 1 and SyncRef UE 2 are configured according to the generic parameters in Table 9.1.3.2.4.1-2.
4. The GNSS simulator is configured for Scenario #1: static in Geographical area #1, as defined in TS 38.508-1 [14] Table 4.11.2-2.

Table 9.1.3.2.4.1-2: NR sidelink test parameters for NR SA FR1 synchronization reference selection/reselection for FR1 NR Cell configured as the highest priority synchronization reference source

Parameter		Unit	Value	Comment
SCS		kHz	30	
Initial condition	Active synchronization source		GNSS	DUT transmits for NR Sidelink Communication and S-SSB with SLSSID = 0 and inCoverage set as TRUE in MIB-SL.
T2 end condition	Active synchronization source		Sync Ref UE 1	DUT transmits for NR Sidelink Communication and S-SSB with SLSSID = 395 and inCoverage set as FALSE in MIB-SL.
Final condition	Active synchronization source		Sync Ref UE 2	DUT transmits for V2X Sidelink Communication and S-SSB with SLSSID = 30 and inCoverage set as FALSE in MIB-SL.
Active cell			None	
Active SyncRef UEs			SyncRef UE 1 SyncRef UE 2	Transmitting S-SSB on RF channel number 1
Timing offset between SyncRef UE 1 and SyncRef UE 2		ms	3	Asynchronous
Frequency offset of SyncRef UE 1 and 2		ppm	0	
NR sidelink Communication preconfiguration			As specified in Clause A.11.2	IE values unless specified otherwise in this test.
syncPriority			gnb	
syncTxThreshOoC			13 (+infinity)	
T1		s	24	
T2		s	16	
T3		s	16	

9.1.3.2.4.2 Test procedure

In this test there are two active SyncRef UEs (SyncRef UE 1 and SyncRef UE 2). There are no active cells and GNSS is reliable during the whole test. The test system can emulate and send the GNSS signal to the test UE. The test system shall emulate SyncRef UE 1 and SyncRef UE 2 to transmit S-SSB every S-SSB period with the SLSSIDs and inCoverage indicators specified in Table 9.1.3.2.5-1.

The test consists of three successive time periods with time duration of T1, T2 and T3 respectively. SyncRef UE 1 and SyncRef UE 2 are all switched off before starting the test. For this test, the UE is triggered by the test loop function or the upper layers to transmit for V2X Sidelink Communication.

1. Ensure the UE is in state 4-A with generic procedure parameters Test Mode = *On* according to TS 38.508-1 [14] clause 4.4A.2.
2. The GNSS simulator is triggered to start step 1 of Scenario #1 to simulate a location in the centre of Geographical area #1.
3. Wait at least 20 seconds for the UE to acquire the GNSS signal.
4. The SS sends AT command +CCUTLE to close test loop function and trigger UE to transmit.
5. The SS sets parameters according to T1 in Table 9.1.3.2.5-1. T1 starts.
6. The UE transmits S-SSB with SLSSID = 0 and *inCoverage* = true in *MasterInformationBlockSidelink*.
7. When T1 expires, the SS shall switch the power setting from T1 to T2 in Table 9.1.3.2.5-1. T2 starts.
8. If the UE
   a) starts to transmit S-SSB within 8800 ms from the start of T2 with SLSSID = 395 and *inCoverage* = false in *MasterInformationBlockSidelink*, and
   b) drops no more than 6 % of its PSSCH and S-SSB transmissions within 8000 ms from the start of T2

then count a success for the event "reselect SyncRef UE 1", otherwise count a fail for the event "reselect SyncRef UE 1".

9 When T2 expires, the SS shall switch the power setting from T2 to T3 in Table 9.1.3.2.5-1. T3 starts.

10. If the UE

    a) starts to transmit S-SSB within 8800 ms from the start of T3 with SLSSID = 30 and *inCoverage* = false in *MasterInformationBlockSidelink*, and

    b) drops no more than 6 % of its PSSCH and S-SSB transmissions within 8000 ms from the start of T2

    then count a success for the event "reselect SyncRef UE 2", otherwise count a fail for the event" reselect SyncRef UE 2".

11. When T3 expires, the SS shall switch off all SyncRef UEs.

12. The SS sends AT command +CCUTLE to open test loop function and trigger UE to stop transmitting.

13. Repeat step 3-12 until the confidence level according to Tables G.2.3-1 in Annex G clause G.2 is achieved.

Each of the events " reselect SyncRef UE 1" and " reselect SyncRef UE 2" is evaluated independently for the statistic, resulting in an event verdict pass or fail. Different events may require different times for a verdict.

If all events pass, the test passes. If one event fails, the test fails.

9.1.3.2.4.3 Message contents

Message contents are according to TS 38.508-1 [14] clause 7.3 with the following exceptions:

Table 9.1.3.2.4.3-1: SL-PreconfigurationNR (SyncRef UE 1)

Derivation Path: TS 38.508-1 [14], Table 4.10.1-1			
Information Element	**Value/remark**	**Comment**	**Condition**
SL-PreconfigurationNR-r16 ::= SEQUENCE {			
sidelinkPreconfigNR-r16 SEQUENCE {			
sl-PreconfigFreqInfoList-r16 SEQUENCE (SIZE (1..maxNrofFreqSL-r16)) OF {	1 entry		
SL-FreqConfigCommon-r16[1] SEQUENCE {		entry 1	
sl-SyncPriority-r16	gnbEnb		
sl-SyncConfigList-r16 SEQUENCE (SIZE (1..maxSL-SyncConfig-r16)) OF SL-SyncConfig-r16 {	1 entry		
SL-SyncConfig-r16[1]	SL-SyncConfig	entry 1 Table 9.1.3.2.4.3-3	
}			
}			
}			
}			
}			

Table 9.1.3.2.4.3-2: SL-ConfigDedicatedNR (SyncRef UE 2)

Derivation Path: TS 38.508-1 [14], Table 4.6.6-7 with condition SELECTED			
Information Element	**Value/remark**	**Comment**	**Condition**
SL-ConfigDedicatedNR-r16 ::= SEQUENCE {			
sl-PHY-MAC-RLC-Config-r16 SEQUENCE {			
sl-FreqInfoToAddModList-r16 SEQUENCE (SIZE (1..maxNrofFreqSL-r16)) OF SL-FreqConfig-r16 {	1 entry		
SL-FreqConfig-r16[1] SEQUENCE {		entry 1	
sl-SyncConfigList-r16 SEQUENCE (SIZE (1..maxSL-SyncConfig-r16)) OF SL-SyncConfig-r16 {	1 entry		
SL-SyncConfig-r16[1]	SL-SyncConfig	entry 1 Table 9.1.3.2.4.3-3	

}			
sl-SyncPriority-r16	gnbEnb		
}			
}			
networkControlledSyncTx-r16	on		
}			
}			

Table 9.1.3.2.4.3-3: SL-SyncConfig (Table 9.1.3.2.4.3-1 and Table 9.1.3.2.4.3-2)

Derivation Path: TS 38.508-1 [14], Table 4.6.6-31			
Information Element	**Value/remark**	**Comment**	**Condition**
SL-SyncConfig-r16 ::= SEQUENCE {			
sl-SSID-r16	30		SyncRef UE 2
txParameters-r16 SEQUENCE {			SyncRef UE 1
syncTxThreshOoC-r16	13	the special value corresponding to +infinity	
}			
}			

Table 9.1.3.2.4.3-4: SL-PreconfigurationNR (The UE under test)

Derivation Path: TS 38.508-1 [14], Table 4.10.1-1			
Information Element	**Value/remark**	**Comment**	**Condition**
SL-PreconfigurationNR-r16 ::= SEQUENCE {			
sidelinkPreconfigNR-r16 SEQUENCE {			
sl-PreconfigFreqInfoList-r16 SEQUENCE (SIZE (1..maxNrofFreqSL-r16)) OF {	1 entry		
SL-FreqConfigCommon-r16[1] SEQUENCE {		entry 1	
sl-SyncPriority-r16	gnbEnb		
sl-SyncConfigList-r16 SEQUENCE (SIZE (1..maxSL-SyncConfig-r16)) OF SL-SyncConfig-r16 {	1 entry		
SL-SyncConfig-r16[1] SEQUENCE {		entry 1	
sl-SyncRefMinHyst-r16	dB0		
sl-filterCoefficient-r16	fc0		
txParameters-r16 SEQUENCE {			
syncTxThreshOoC-r16	13	the special value corresponding to +infinity	
}			
}			
}			
}			
}			
}			
}			

Table 9.1.3.2.4.3-5: MasterInformationBlockSidelink (SyncRef UE 1 and SyncRef UE 2)

Derivation Path: TS 38.508-1 [14], Table 4.6.1A-1			
Information Element	**Value/remark**	**Comment**	**Condition**
MasterInformationBlockSidelink ::= SEQUENCE {			
inCoverage-r16	true		SyncRef UE 2,
	false		SyncRef UE 1
}			

Table 9.1.3.2.4.3-6: MasterInformationBlockSidelink (Test procedure, step 6,8 and 10, the UE under test)

Derivation Path: TS 38.508-1 [14], Table 4.6.1A-1 with condition TX			
Information Element	**Value/remark**	**Comment**	**Condition**
MasterInformationBlockSidelink ::= SEQUENCE {			
inCoverage-r16	true		Step 6
	false		Step 8, Step 10
}			

Table 9.1.3.2.4.3-7: +CCUTLE (Test procedure, step 4)

Derivation Path: 38.508-1[14] Table 4.7B-1 with condition Close and Transmit

Table 9.1.3.2.4.3-8: +CCUTLE (Test procedure, step 12)

Derivation Path: 38.508-1[14] Table 4.7B-1 with condition Open

9.1.3.2.5 Test requirement

SyncRef UE Specific test parameters for SyncRef UEs are given in Table 9.1.3.2.5-1.

Table 9.1.3.2.5-1: SyncRef UE Specific Test Parameters for NR SA FR1 synchronization reference selection/reselection for FR1 NR Cell configured as the highest priority synchronization reference source

Parameter	Unit	SyncRef UE 1			SyncRef UE 2		
		T1	T2	T3	T1	T2	T3
NR RF Channel Number		1(HD carrier in Band n47 or n38)					
Channel Bandwidth ($BW_{channel}$) Note 4	MHz	20($N_{RB,c}$ = 50) or 40($N_{RB,c}$ = 100)					
NR Sidelink Communication resource pool configuration		As specified in Table A.11.2-2			As specified in Table A.11.2-2		
networkControlledSyncTx		N/A			ON		
syncTxThreshOoC	dBm/15 kHz	+infinity			N/A		
SLSSID		59			30		
inCoverage (in MIB-SL)		FALSE			TRUE		
Noc Note1	dBm/30 kHz	-95					
Ês/Noc	dB	-∞	0	0	-∞	-∞	0
$\hat{E}_s / I_{ot}$	dB	-∞	0	0	-∞	-∞	0
PSBCH-RSRP Note2, Note 3	dBm/30 kHz	-∞	-95	-95	-∞	-∞	-95
Propagation Condition		AWGN					
Note 1: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for Noc to be fulfilled. Note 2: PSBCH-RSRP levels have been derived from other parameters for information purposes. They are not settable parameters themselves. Note 3: S-PSS Es/Iot and S-SSS Es/Iot are set the same as PSBCH Es/Iot. Note 4: The UE is only required to be tested in one of the supported test configurations.							

During T1, both SyncRef UE 1 and SyncRef UE 2 are powered off. The UE will select GNSS as synchronization source.

During T2, the UE shall detect, evaluate and reselect SyncRef UE 1 as synchronization source. Then it shall change its S-SSB transmission timing with SLSSID = 395 and *inCoverage* = false in *MasterInformationBlockSidelink* after SyncRef UE reselection delay from start of T2.

During T3, the UE will detect, evaluate and reselect SyncRef UE 2 as synchronization source. Then it shall change its S-SSB transmission timing with SLSSID = 30 and *inCoverage* = false in *MasterInformationBlockSidelink* after SyncRef UE reselection delay from start of T2.

SyncRef UE reselection delay is defined as the time from the beginning of corresponding time instant to the time UE is synchronized to SyncRef UE and changes its S-SSB transmissions timing and SLSSID to follow SyncRef UE as the synchronization source. The SyncRef UE (re)selection delay can be expressed as:

SyncRef UE reselection delay = $T_{detect,SyncRef\ UE}$ + $T_{evaluate,SLSS}$ + S-SSB period

- $T_{detect,SyncRef\ UE}$ = 8 seconds, is the time to identify newly detectable intra-frequency SyncRef UE as specified in 38.133 [6] clause 12.4 when UE is not directly synchronized to GNSS.

- $T_{evaluate,SLSS}$ = 4 S-SSB periods, is the time to measure the PSBCH-RSRP of the selected SyncRef UE used as synchronization reference source and evaluate it to initiate/cease S-SSB transmissions.

- S-SSB period = 160 ms.

Which gives SyncRef UE reselection delay = 8800 ms.

The test system will also verify that the UE does not drop or delay more than 6% of its sidelink data and S-SSB transmissions during the duration of T1 and T2.

The rate of correct SyncRef UE reselection observed during repeated tests shall be at least 90%.

9.1.4 L1 SL-RSRP measurements

9.1.4.0 Minimum conformance requirements

9.1.4.0.1 Minimum conformance requirements for resource selection/reselection, re-evaluation and pre-emption

The UE physical layer shall be capable of performing the L1 SL-RSRP measurements on the carrier operating NR sidelink communication for determining the subset of resources to be excluded in PSSCH resource selection in sidelink transmission mode 2. The L1 SL-RSRP measurement period corresponds to one slot and the measurement shall meet the L1 SL-RSRP measurement accuracy requirement in 38.133 [6] clause 10.4.4. After resource (re-)selection procedure, re-evaluation is performed on the reserved resources by L1 SL-RSRP measurements before transmission of SCI with reservation when the conditions specified in TS 38.214 [9] are satisfied.

When the pre-emption mechanism is enabled for the resource pool that UE is monitoring and selecting resource from, after UE selects from the resource not excluded based on L1 SL-RSRP measurement procedure, the UE shall be capable of triggering reselection of already signalled resource(s) as a resource reservation when the conditions specified in TS 38.214 [9] are satisfied.

The requirements for absolute accuracy of L1 SL-RSRP in this clause apply to a UE performing PSCCH-RSRP and/or PSSCH-RSRP measurements on the same frequency as used by operating NR sidelink communication.

The accuracy requirements in Table 9.1.4.0.1-1 are valid under the following conditions:

- Demodulation reference signals for PSCCH and/or PSSCH are transmitted from one port.
- Conditions defined in clause 7.3E of TS 38.101-1 [2] for reference sensitivity are fulfilled.
- PSCCH-RSRP|dBm and/or PSSCH-RSRP|dBm according to Annex B.4.4 for a corresponding Band are fulfilled.

Table 9.1.4.0.1-1: Intra-frequency L1 SL-RSRP absolute accuracy for UE capable of NR sidelink communication

Accuracy		Conditions						
			Io [Note 1] range					
Normal condition	Extreme condition	Ês/Iot [Note 3]	NR Sidelink operating band groups [Note 2]	Minimum Io				Maximum Io
				dBm/SCS			dBm/$BW_{Channel}$	dBm/$BW_{Channel}$
dB	dB	dB		SCS = 15kHz	SCS = 30kHz	SCS = 60kHz		
± 4.5	± 9	≥0 dB	NR_TDD_FR1_B	-120.5	-117.5	-114.5	N/A	-70

			NR_TDD_FR1_J	-116.5	-113.5	-110.5	N/A	-70
± 8	± 11	≥0 dB	NR_TDD_FR1_B NR_TDD_FR1_J	N/A	N/A	N/A	-70	-50
NOTE 1: Io is assumed to have constant EPRE across the bandwidth. NOTE 2: NR sidelink operating band groups are as defined in Section 3.5 for the corresponding NR operating bands. NOTE 3: The parameter Ês/Iot is the Ês/Iot of PSCCH-DMRS and/or PSSCH-DMRS.								

The normative references for this requirement are TS 38.133 [6] clause 10.4.4 and 12.5.

9.1.4.1 NR SA FR1 L1 SL-RSRP measurement for autonomous resource selection/reselection

9.1.4.1.1 Test purpose

The purpose of this test is to verify the requirements related to autonomous resource selection / reselection for NR sidelink UE in mode 2 defined in TS 38.133 [6] clause 12.5.

9.1.4.1.2 Test applicability

This test applies to all types of NR UEs from release 16 onwards and supporting and NR sidelink communication.

9.1.4.1.3 Minimum conformance requirements

The minimum conformance requirements are defined in clause 9.1.4.0.1

The normative reference for this requirement is TS 38.133 [6] clause A.9.1.4.1.

9.1.4.1.4 Test description

9.1.4.1.4.1 Initial conditions

Configure the test equipment and the DUT according to the parameters in Table 9.1.4.1.4.1-1.

Table 9.1.4.1.4.1-1: Initial conditions for NR SA FR1 L1 SL-RSRP measurement for autonomous resource selection/reselection

Parameter	Value		Comment
Test environment	NC		As specified in TS 38.508-1 [14] clause 4.1.
Test frequencies	PC5: As specified in TS 38.508-1 [14] clause 4.3.1.8.		
Channel bandwidth	PC5: As specified by the test configuration selected from Table 9.1.4.1.4.1-2.		
Propagation conditions	AWGN		As specified in Annex C.2.2.
Connection Diagram	TE Part	A.3.1.9.1	As specified in TS 38.508-1 [14] Annex A.
	DUT Part	A.3.2.7.1	
Exceptions to connection diagram	N/A		

1. The parameter settings for the NR sidelink communication are pre-configured according to TS 38.508-1 [14] clause 4.10.1.
2. Message content exceptions are given in clause 9.1.4.1.4.3
3. There are 50 NR-SS-UEs (active sidelink UE i, i=0,1,...,49) specified in this test. active sidelink UE i, i=0,1,...,49, is configured according to the generic parameters in Table 9.1.4.1.4.1-2.

4. The GNSS simulator is configured for Scenario #1: static in Geographical area #1, as defined in TS 38.508-1 [14] Table 4.11.2-2.

Table 9.1.4.1.4.1-2: NR sidelink test parameters for NR SA FR1 L1 SL-RSRP measurement for autonomous resource selection/reselection

Parameter		Unit	Value	Comment
NR RF Channel Number			1	HD carrier in Band n47 or n38
Channel Bandwidth ($BW_{channel}$) Note 2		MHz	20 ($N_{RB,c}$ = 50) or 40 ($N_{RB,c}$ = 100)	
SCS		kHz	30	
NR sidelink communication pre-configuration			As specified in clause A.11.2	IE values unless specified otherwise in this test.
sl-TimeResource-r16 included in SL-ResourcePool			1111111111	Indicates the bitmap of the TX and Rx resource pool, which is defined by repeating the bitmap within a SFN cycle (see TS 38.213 [8])
sl-NumSubchannel-r16 included in SL-ResourcePool			5	Indicates the number of sub-channels for TX resource pool
sl-SubchannelSize-r16 included in SL-ResourcePool			10	Indicates the minimum granularity in frequency domain for the sensing for PSSCH resource selection in the unit of PRB
Number of Active Sidelink UEs			50	Active Sidelink UE i = 0, .., 49
SL-Thres-RSRP			15 Note 3	Corresponding -100 dBm as defined in Section 6.3.5 in TS 38.331[13] Same for all priority level pairs.
Active Sidelink UEs (UE i = 0, .., 49)	NR sidelink Communication preconfiguration		As specified in clause A.11.2	IE values unless specified otherwise in this test.
	sl-TimeResource-r16 included in SL-ResourcePool		{1_i} Note1	Indicates the bitmap of the TX and Rx resource pool, which is defined by repeating the bitmap within a SFN cycle (see TS 38.213 [8])
	sl-NumSubchannel-r16 included in SL-ResourcePool		1	Indicates the number of sub-channels for TX resource pool
	sl-StartRB-Subchannel-r16 included in SL-ResourcePool		floor(i/10)x10	Indicates the lowest RB index of the subchannel with the lowest index. UE 0~9 start RB=0; UE 10~19 start RB=10; UE 20~29 start RB=20; UE 30~39 start RB=30; UE 40~49 start RB=40;
	sl-SubchannelSize-r16 included in SL-ResourcePool		10	Indicates the minimum granularity in frequency domain for the sensing for PSSCH resource selection in the unit of PRB
Timing offset among Active Sidelink UEs		μs	CP/2	Synchronous

Note 1: {1_i} is a sequence of nine 0's with one 1 in (mod(i,10)+1'th position.
Note 2: The UE is only required to be tested in one of the supported test configurations.
Note 3: Including test tolerance given in Annex F.

9.1.4.1.4.2 Test procedure

In this test there are 50 active sidelink UEs (UE i, i=0,1,...,49). There are no active cells and GNSS is reliable during the whole test. The test system can emulate and send the GNSS signal to the test UE. DUT and all active sidelink UEs select GNSS as synchronization reference source. The test system shall emulate the active sidelink UEs to transmit PSCCH/PSSCH every 5ms as specified in Table 9.1.4.1.4.1-2.

The test consists of two successive time periods with time duration of T1, T2 respectively. T1 and T2 should be long enough. For this test, the UE is triggered by the test loop function or the upper layers to transmit for V2X Sidelink Communication.

1. Ensure the UE is in state 4-A with generic procedure parameters Test Mode = *On* according to TS 38.508-1 [14] clause 4.4A.2.
2. The GNSS simulator is triggered to start step 1 of Scenario #1 to simulate a location in the centre of Geographical area #1.
3. Wait at least 20 seconds for the UE to acquire the GNSS signal.
4. The SS sends AT command +CCUTLE to close test loop function and trigger UE to transmit.
5. The SS switches on all sidelink UEs and sets parameters according to T1 in Table 9.1.4.1.5-1. T1 starts.
6. During T1, the SS records:

   - $N_{resource,\ total}$: the number of resources occupied by the PSSCH transmissions of the DUT on all subchannels.
   - $N_{resource,\ subch\ 2}$ the number of resources occupied by the PSSCH transmissions of the DUT on subchannel #2.

   If $N_{resource,\ subch\ 2}$ (corresponds to the "ne" in Annex G.2.3) and $N_{resource,\ total}$ (corresponds to the "ns" in Annex G.2.3) achieve the confidence level according to Tables G.2.3-1, T1 expires.
7. If the ratio $N_{resource,\ subch\ 2}$/ $N_{resource,\ total}$ is less than 10%, count a success for the event "subchannel #2 resource not available", otherwise count a fail for the event "subchannel #2 resource not available ".
8. When T1 expires, the SS shall switch the power setting from T1 to T2 in Table 9.1.4.1.5-1. T2 starts.
9. During T2, the SS records:

   - $N_{resource,\ total}$: the number of resources occupied by PSSCH transmission of the DUT on all subchannels.

   - $N_{resource,\ non\text{-}subch\ 2}$ the number of resources occupied by PSSCH transmission of the DUT on subchannels other than subchannel #2.

   If $N_{resource,\ non\text{-}subch\ 2}$ (corresponds to the "ne" in Annex G.2.3) and $N_{resource,\ total}$ (corresponds to the "ns" in Annex G.2.3) achieve the confidence level according to Tables G.2.3-1, T2 expires.
10. If the ratio $N_{resource,\ non\text{-}subch\ 2}$/ $N_{resource,\ total}$ is less than 10%, count a success for the event "subchannel #2 resource available", otherwise count a fail for the event " subchannel #2 resource available ".
12. When T2 expires, the SS sends AT command +CCUTLE to open test loop function and trigger UE to stop transmitting.

Each of the events " subchannel #2 resource not available" and " subchannel #2 resource available" is evaluated independently, resulting in an event verdict pass or fail. If all events pass, the test passes. If one event fails, the test fails.

9.1.4.1.4.3 Message contents

Message contents are according to TS 38.508-1 [14] clause 7.3 with the following exceptions:

Table 9.1.4.1.4.3-1: SL-ResourcePool (UE under test)

Derivation Path: TS 38.508-1 [14] Table 7.3.2-3			
Information Element	**Value/remark**	**Comment**	**Condition**
SL-ResourcePool-r16 ::= SEQUENCE {			
sl-NumSubchannel-r16	5		

sl-UE-SelectedConfigRP-r16 SEQUENCE {			
sl-Thres-RSRP-List-r16 SEQUENCE (SIZE (64)) OF SL-Thres-RSRP-r16 {	64 entries		
SL-Thres-RSRP-r16[k, k=1,..64]	15	entry k actual value is -130 +2*15 = -100 dBm	
}			
}			
sl-PreemptionEnable-r16	Not present		
sl-TimeResource-r16	1111111111		
}			

Table 9.1.4.1.4.3-2: SL-ResourcePool (active sidelink UE 0 ~ 49)

Derivation Path: TS 38.508-1 [14] Table 7.3.2-3			
Information Element	**Value/remark**	**Comment**	**Condition**
SL-ResourcePool-r16 ::= SEQUENCE {			
sl-StartRB-Subchannel-r16	floor(i/10)x10	i is the index of active sidelink UE, i = 0, 1,..., 49	active sidelink UE i
sl-UE-SelectedConfigRP-r16 SEQUENCE {			
sl-Thres-RSRP-List-r16 SEQUENCE (SIZE (64)) OF SL-Thres-RSRP-r16 {	64 entries		
SL-Thres-RSRP-r16[k, k=1,..64]	0	entry k special value corresponds to -infinity	
}			
}			
sl-PreemptionEnable-r16	Not present		
sl-TimeResource-r16	{1_i}	{1_i} is a sequence of nine 0's with one 1 in (mod(i,10)+1'th position.	active sidelink UE i
}			

Table 9.1.4.1.4.3-3: +CCUTLE (Test procedure, step 4)

Derivation Path: 38.508-1[14] Table 4.7B-1 with condition Close and Transmit

Table 9.1.4.1.4.3-4: +CCUTLE (Test procedure, step 12)

Derivation Path: 38.508-1[14] Table 4.7B-1 with condition Open

9.1.4.1.5 Test requirement

Active sidelink UE specific test parameters are given in Table 9.1.4.1.5-1.

Table 9.1.4.1.5-1: SyncRef UE Specific Test Parameters for NR SA FR1 L1 SL-RSRP measurement for autonomous resource selection/reselection

Parameter	Unit	Active Sidelink UE i (i = 0, .., 49)	
		T1	T2
NR RF Channel Number	-	1	
Channel Bandwidth ($BW_{channel}$) Note 5	MHz	20 ($N_{RB,c}$ = 50) or 40 ($N_{RB,c}$ = 100)	
PSCCH RMC	-	CC.1A HD	
PSSCH RMC	-	CD.1A HD	

Noc Note1	dBm/30 kHz	-111	-121
Ês/Noc Note3	dB	10	
Ês/Iot Note2,3	dB	10	
Ês/Noc Note3	dB	20.55 Note 6	10
Ês/Iot Note2,3	dB	20.55	10.00
Ês/Noc Note4	dB	0.35 Note 6	30.55 Note 6
Ês/Iot Note2,4	dB	0	30.55
PSSCH-RSRP1 Note 2,3	dBm/SCS	-90.45	-111
PSSCH-RSRP2 Note 2,4	dBm/SCS	-110.65	-90.45
Io Note 2	dBm/18 MHz	-69.31	-63.62
	dBm/36 MHz	-69.31	-63.62
Antenna Configuration	-	1x2	
Propagation Condition	-	AWGN	

Note 1: Interference from other UEs and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for Noc to be fulfilled.
Note 2: Es/Iot, PSSCH-RSRP and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.
Note 3: For UE 20 to 29, occupying subchannel #2
Note 4: For UE 0 to 19 and 30 to 49, occupying subchannel #0/1/3/4
Note 5: The UE is only required to be tested in one of the supported test configurations.
Note 6 Including test tolerance given in Annex F.

During T1, the signal from test equipment are configured such that

- The measured PSSCH-RSRP for 10 active NR sidelink UEs(UE 20~UE 29) is above *SL-Thres-RSRP*. Then the resources occupied by these 10 active NR sidelink UEs (resources on subchannel #2) are expected to be excluded in the resource selection procedure and,

- The measured PSSCH-RSRP for other 40 active NR sidelink UEs(UE 0~UE 19, UE 30~UE 49) is below the *SL-Thres-RSRP*, and the resources occupied by these 40 active NR sidelink UEs (resources on subchannels other than subchannel #2) are expected to be included in the resource selection procedure.

The rate of PSSCH transmissions on the resources on subchannel #2 shall be less than 10% during T1.

During T2, the signal from test equipment are configured such that

- the measured PSSCH-RSRP for the 10 active NR sidelink UEs (UE 20~UE 29) is below *SL-Thres-RSRP*. Then the resources occupied by these 10 active NR sidelink UEs (resources on subchannel #2) are expected to be included in the resource selection procedure and,

- the measured PSSCH-RSRP for other 40 active NR sidelink UEs (UE 0~UE 19, UE 30~UE 49) is above *SL-Thres-RSRP*, and the resources occupied by these 40 active NR sidelink UEs (subchannels other than subchannel #2) are expected to be excluded in the resource selection procedure.

The rate of PSSCH transmissions on the resources on subchannel #2 shall be larger than 90% during T2.

Figure 9.1.4.1.5-2 shows the two different time durations and the corresponding variation of the power level in the active sidelink UEs to emulate change of candidate resource set.

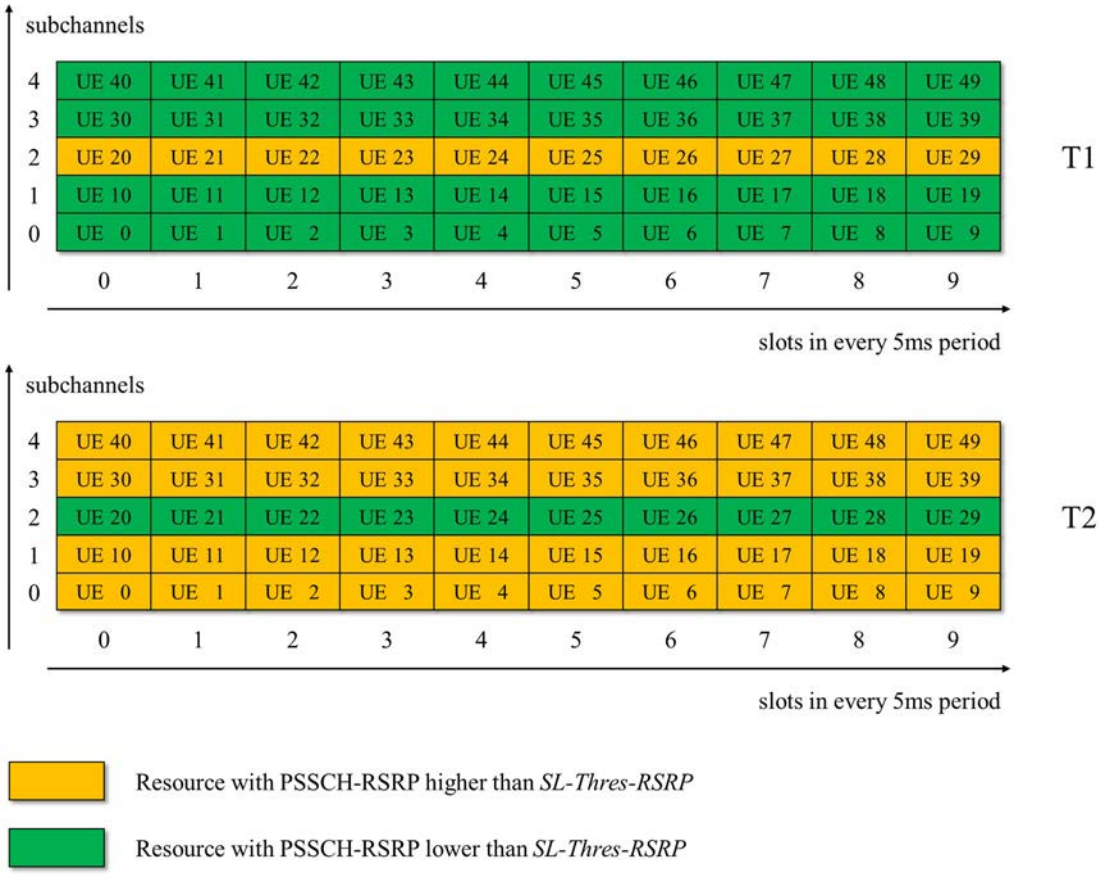


Figure 9.1.4.1.5-2: Power level variation of active sidelink UEs for NR SA FR1 L1 SL-RSRP measurement for autonomous resource selection/reselection

9.1.4.2 NR SA FR1 L1 SL-RSRP measurement for resource pre-emption

9.1.4.2.1 Test purpose

The purpose of this test is to verify the requirements related to autonomous resource pre-emption for NR sidelink UE in mode 2 defined in TS 38.133 [6] clause 12.5.

9.1.4.2.2 Test applicability

This test applies to all types of NR UEs from release 16 onwards and supporting and NR sidelink communication.

9.1.4.2.3 Minimum conformance requirements

The minimum conformance requirements are defined in clause 9.1.4.0.1

The normative reference for this requirement is TS 38.133 [6] clause A.9.1.4.2.

9.1.4.2.4 Test description

9.1.4.2.4.1 Initial conditions

Configure the test equipment and the DUT according to the parameters in Table 9.1.4.2.4.1-1.

Table 9.1.4.2.4.1-1: Initial conditions for NR SA FR1 L1 SL-RSRP measurement for resource pre-emption

Parameter	Value		Comment
Test environment	NC		As specified in TS 38.508-1 [14] clause 4.1.
Test frequencies	PC5: As specified in TS 38.508-1 [14] clause 4.3.1.8.		
Channel bandwidth	PC5: As specified by the test configuration selected from Table 9.1.4.2.4.1-2.		
Propagation conditions	AWGN		As specified in Annex C.2.2.
Connection Diagram	TE Part	A.3.1.9.1	As specified in TS 38.508-1 [14] Annex A.
	DUT Part	A.3.2.7.1	
Exceptions to connection diagram	N/A		

1. The parameter settings for the NR sidelink communication are pre-configured according to TS 38.508-1 [14] clause 4.10.1.
2. Message content exceptions are given in clause 9.1.4.2.4.3
3. There are 1 NR-SS-UEs (active NR sidelink UE) specified in this test. active NR sidelink UE is configured according to the generic parameters in Table 9.1.4.2.4.1-2.
4. The GNSS simulator is configured for Scenario #1: static in Geographical area #1, as defined in TS 38.508-1 [14] Table 4.11.2-2.

Table 9.1.4.2.4.1-2: NR sidelink test parameters for NR SA FR1 L1 SL-RSRP measurement for resource pre-emption

Parameter	Unit	Value	Comment
NR RF Channel Number		1	HD carrier in Band n47 and n38
Channel Bandwidth ($BW_{channel}$) Note 1	MHz	20 ($N_{RB,c}$ = 50) or 40 ($N_{RB,c}$ = 100)	
SCS	kHz	30	
V2X sidelink communication pre-configuration		As specified in Annex A.11.2	IE values unless specified otherwise in this test.
sl-TimeResource-r16 included in SL-ResourcePool in SL-ResourcePool in sl-TxPoolSelectedNormal-r16		10000000000000000000	Indicates the time resource of resource pool within *sl-Period*. (see TS 38.213 [8]) Note that this is for Tx pool.
sl-TimeResource-r16 included in SL-ResourcePool in sl-RxPool-r16		11111111111111111111	Indicates the time resource of resource pool within *sl-Period*. (see TS 38.213 [8]) Note that this is for Rx pool.
sl-NumSubchannel-r16 included in SL-ResourcePool		1	Indicates the number of subchannels in the corresponding resource pool, which consists of contiguous PRBs only
sl-SubchannelSize-r16 included in SL-ResourcePool		10	Indicates the minimum granularity in frequency domain for the sensing for PSSCH resource selection in the unit of PRB
sl-StartRB-Subchannel-r16 included in SL-ResourcePool		10	Indicates the lowest RB index of the subchannel with the lowest index.
Number of Active Sidelink UEs		1	
SL-Thres-RSRP		12	Corresponding -106 dBm as defined in Section 6.3.8 in TS38.331[13]

Active Sidelink UEs	V2X sidelink Communication preconfiguration		As specified in Annex A.11.2	IE values unless specified otherwise in this test.
	sl-TimeResource-r16 included in SL-ResourcePool		1111111111111111111	Indicates the bitmap of the TX and Rx resource pool, which is defined by repeating the bitmap within a SFN cycle (see TS 38.213[8])
	sl-NumSubchannel-r16 included in SL-ResourcePool		1	Indicates the number of sub-channels for TX resource pool
	sl-StartRB-Subchannel-r16 included in SL-ResourcePool		0	Indicates the lowest RB index of the subchannel with the lowest index.
	Sl-SubchannelSize-r16 included in SL-ResourcePool		10	Indicates the minimum granularity in frequency domain for the sensing for PSSCH resource selection in the unit of PRB
Timing offset among Active Sidelink Ues		μs	CP/2	Synchronous
Note 1: The UE is only required to be tested in one of the supported test configurations.				

9.1.4.2.4.2 Test procedure

In this test there is one active sidelink UE. There are no active cells and GNSS is reliable during the whole test. The test system can emulate and send the GNSS signal to the test UE. Both DUT and active sidelink UE select GNSS as synchronization reference source.

The test consists of two successive time periods with time duration of T1, T2 respectively. T1 and T2 should be long enough. For this test, the UE is triggered by the test loop function or the upper layers to transmit for V2X Sidelink Communication.

1. Ensure the UE is in state 4-A with generic procedure parameters Test Mode = *On* according to TS 38.508-1 [14] clause 4.4A.2.
2. The GNSS simulator is triggered to start step 1 of Scenario #1 to simulate a location in the centre of Geographical area #1.
3. Wait at least 20 seconds for the UE to acquire the GNSS signal.
4. The SS sends AT command +CCUTLE to close test loop function and trigger UE to transmit.
5. The SS switches on active sidelink UE and sets parameters according to T1 in Table 9.1.4.2.5-1. T1 starts.
6. The SS keeps monitoring PSCCH sent by the UE. If the SS detecting a PSCCH sent by the UE which reserves multiple PSSCH resources, T1 expires.
7. When T1 expires, the SS shall switch the power setting from T1 to T2 in Table 9.1.4.2.5-1. T2 starts.
8. Denoting the slot occupied by the second PSCCH scheduled by the PSSCH in step 6 as "slot n". The active sidelink UE shall send PSCCH no later than slot n-5 which:
   - indicates higher priority than the PSCCH in step 6, and
   - schedules the same resource in slot n as the PSCCH in step 6.
9. If the UE sends no PSSCH on the resource in slot n, count a success for the test, otherwise count a fail for the test. T2 expires.
10. When T2 expires, the SS sends AT command +CCUTLE to open test loop function and trigger UE to stop transmitting
11. Repeat step 4-10 until the confidence level according to Tables G.2.3-1 in Annex G clause G.2 is achieved

9.1.4.2.4.3 Message contents

Message contents are according to TS 38.508-1 [14] clause 7.3 with the following exceptions:

Table 9.1.4.2.4.3-1: SL-BWP-PoolConfigCommon (UE under test)

Derivation Path: TS 38.508-1 [14] Table 7.3.2-2			
Information Element	**Value/remark**	**Comment**	**Condition**
SL-BWP-PoolConfigCommon-r16 ::= SEQUENCE {			
sl-RxPool-r16 SEQUENCE (SIZE (1..maxNrofRXPool-r16)) OF SL-ResourcePool-r16 {	1 entry		
SL-ResourcePool-r16[1]	SL-ResourcePool-TX	entry 1 Table 9.1.4.2.4.3-2	
}			
sl-TxPoolSelectedNormal-r16 SEQUENCE (SIZE (1..maxNrofTXPool-r16)) OF SL-ResourcePoolConfig-r16 {	1 entry		
SL-ResourcePoolConfig-r16[1] SEQUENCE {		entry 1	
sl-ResourcePool-r16	SL-ResourcePool-RX	Table 9.1.4.2.4.3-3	
}			
}			
}			

Table 9.1.4.2.4.3-2: SL-ResourcePool-TX (Table 9.1.4.2.4.3-1)

Derivation Path: TS 38.508-1 [14] Table 7.3.2-3			
Information Element	**Value/remark**	**Comment**	**Condition**
SL-ResourcePool-r16 ::= SEQUENCE {			
sl-UE-SelectedConfigRP-r16 SEQUENCE {			
sl-Thres-RSRP-List-r16 SEQUENCE (SIZE (64)) OF SL-Thres-RSRP-r16 {	64 entries		
SL-Thres-RSRP-r16[k, k=1,..64]	12	entry k actual value is -130 +2*12 = -106 dBm	
}			
sl-MultiReserveResource-r16	enabled		
}			
sl-TimeResource-r16	10000000000000000000		
}			

Table 9.1.4.2.4.3-3: SL-ResourcePool-RX (Table 9.1.4.2.4.3-1)

Derivation Path: TS 38.508-1 [14] Table 7.3.2-3			
Information Element	**Value/remark**	**Comment**	**Condition**
SL-ResourcePool-r16 ::= SEQUENCE {			
sl-UE-SelectedConfigRP-r16 SEQUENCE {			
sl-Thres-RSRP-List-r16 SEQUENCE (SIZE (64)) OF SL-Thres-RSRP-r16 {	64 entries		
SL-Thres-RSRP-r16[k, k=1,..64]	12	entry k actual value is -130 +2*12 = -106 dBm	
}			
sl-MultiReserveResource-r16	enabled		
}			
sl-TimeResource-r16	11111111111111111111		
}			

Table 9.1.4.2.4.3-4: SL-LogicalChannelConfig (UE under test)

Derivation Path: TS 38.508-1 [14], Table 4.6.6-12 with condition LO			
Information Element	**Value/remark**	**Comment**	**Condition**

SL-LogicalChannelConfig-r16 ::= SEQUENCE {			
sl-Priority-r16	8	PSSCH sents from DUT has the lowest priority	
}			

Table 9.1.4.2.4.3-5: SL-ResourcePool (active sidelink UE)

Derivation Path: TS 38.508-1 [14] Table 7.3.2-3			
Information Element	**Value/remark**	**Comment**	**Condition**
SL-ResourcePool-r16 ::= SEQUENCE {			
sl-TimeResource-r16	11111111111111111111		
}			

Table 9.1.4.2.4.3-6: +CCUTLE (Test procedure, step 4)

Derivation Path: 38.508-1[14] Table 4.7B-1 with condition Close and Transmit

Table 9.1.4.2.4.3-7: +CCUTLE (Test procedure, step 10)

Derivation Path: 38.508-1[14] Table 4.7B-1 with condition Open

9.1.4.2.5 Test requirement

Active sidelink UE specific test parameters are given in Table 9.1.4.2.5-1.

Table 9.1.4.2.5-1: SyncRef UE Specific Test Parameters for NR SA FR1 L1 SL-RSRP measurement for resource pre-emption

Parameter	Unit	Active Sidelink UE	
		T1	T2
NR RF Channel Number	-	1	
Channel Bandwidth ($BW_{channel}$) Note 3	MHz	20 ($N_{RB,c}$ = 50) or 40 ($N_{RB,c}$ = 100)	
PSCCH RMC	-	CC.1A HD	
PSSCH RMC	-	CD.1A HD	
Noc Note1	dBm/30 kHz	N/A	-100
PSCCH Ês/Noc	dB		5
PSSCH Ês/Noc	dB		5
PSCCH Ês/Iot Note2	dB		5
PSSCH Ês/Iot Note2	dB		5
PSSCH-RSRP Note 2	dBm/30kHz		-95
Io Note 2	dBm/18MHz		-73.01
	dBm/36MHz		-73.01
Antenna Configuration	-	1x2	
Propagation Condition	-	AWGN	
Note 1: Interference from other Ues and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for Noc to be fulfilled. Note 2: Es/Iot, PSSCH-RSRP and Io have been derived from other parameters for information purposes. They are not settable parameters themselves. Note 3: The UE is only required to be tested in one of the supported test configurations.			

During T1, The UE under test keep transmitting PSCCH/PSSCH and reserve resources in slot n for future transmission.

During T2, The UE under test is required to trigger resource reselection and not to transmit on the reserved resource at slot n when the high priority reservation is transmitted by the active sidelink UE before n-$T_{pre-empt}$, where,

$T_{pre-empt} = T_3+T_{proc,0}$

- T_3 = 5 slots, is given in 38.214 Table 8.1.4-2.
- $T_{proc,0}$ = 1 slot, is given in 38.214 Table 8.1.4-1.

Which gives a total of $T_{pre-empt}$ = 6 slots.

The rate of PSSCH transmissions on the resources at slot n shall be less than 10% during repeated tests.

Figure 9.1.4.2.5-2 shows the two different time durations and the corresponding variation of the power level in the active sidelink UE to emulate resource pre-emption.

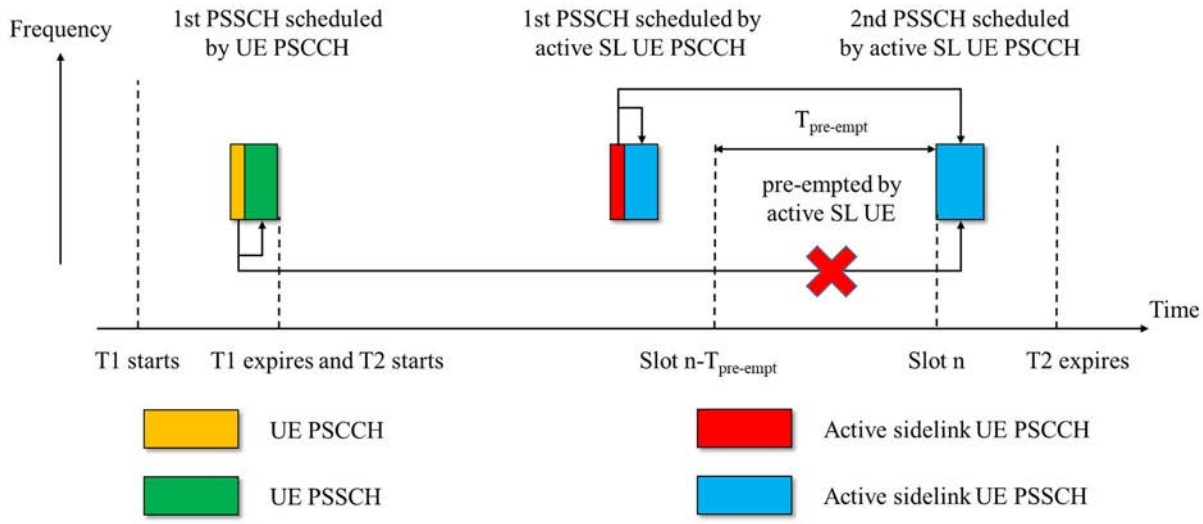


Figure 9.1.4.2.5-2: Power level variation of active sidelink UE for NR SA FR1 L1 SL-RSRP measurement for resource pre-emption

9.1.4.3 NR SA FR1 L1 SL-RSRP measurement for resource re-evaluation

9.1.4.3.1 Test purpose

The purpose of this test is to verify the requirements related to autonomous resource re-evaluation for NR sidelink UE in mode 2 defined in TS 38.133 [6] clause 12.5.

9.1.4.3.2 Test applicability

This test applies to all types of NR UEs from release 16 onwards and supporting and NR sidelink communication.

9.1.4.3.3 Minimum conformance requirements

The minimum conformance requirements are defined in clause 9.1.4.0.1

The normative reference for this requirement is TS 38.133 [6] clause A.9.1.4.3.

9.1.4.3.4 Test description

9.1.4.3.4.1 Initial conditions

Configure the test equipment and the DUT according to the parameters in Table 9.1.4.3.4.1-1.

Table 9.1.4.3.4.1-1: Initial conditions for NR SA FR1 L1 SL-RSRP measurement for resource re-evaluation

Parameter	Value		Comment
Test environment	NC		As specified in TS 38.508-1 [14] clause 4.1.
Test frequencies	PC5: As specified in TS 38.508-1 [14] clause 4.3.1.8.		
Channel bandwidth	PC5: As specified by the test configuration selected from Table 9.1.4.3.4.1-2.		
Propagation conditions	AWGN		As specified in Annex C.2.2.
Connection Diagram	TE Part	A.3.1.9.1	As specified in TS 38.508-1 [14] Annex A.
	DUT Part	A.3.2.7.1	
Exceptions to connection diagram	N/A		

1. The parameter settings for the NR sidelink communication are pre-configured according to TS 38.508-1 [14] clause 4.10.1.
2. Message content exceptions are given in clause 9.1.4.3.4.3
3. There are 130 NR-SS-UEs (active NR sidelink UE i, i = 0, 1, ..., 129) specified in this test. Active NR sidelink UEs are configured according to the generic parameters in Table 9.1.4.3.4.1-2.
4. The GNSS simulator is configured for Scenario #1: static in Geographical area #1, as defined in TS 38.508-1 [14] Table 4.11.2-2.

Table 9.1.4.3.4.1-2: NR sidelink test parameters for NR SA FR1 L1 SL-RSRP measurement for resource re-evaluation

Parameter		Unit	Value	Comment
NR RF Channel Number			1	HD carrier in Band n47 and n38
Channel Bandwidth ($BW_{channel}$) Note 2		MHz	20 ($N_{RB,c}$ = 50) or 40 ($N_{RB,c}$ = 100)	
SCS		kHz	30	
V2X sidelink communication pre-configuration			As specified in Annex A.11.2	IE values unless specified otherwise in this test.
sl-TimeResource-r16 included in SL-ResourcePool			1111111111111111111 1111111111111111111 1111111111111111111 1111111111111111111 1111111111111111111	Indicates the bitmap of the TX and Rx resource pool, which is defined by repeating the bitmap within a SFN cycle (see TS 38.213[3])
sl-NumSubchannel-r16 included in SL-ResourcePool			1	Indicates the number of sub-channels for TX resource pool
sl-SubchannelSize-r16 included in SL-ResourcePool			10	
sl-StartRB-Subchannel-r16			0	
Number of Active Sidelink UEs			130	Active Sidelink UE i = 0, .., 129
SL-Thres-RSRP-r16			14 Note 3	Corresponding -102 dBm as defined in Section 6.3.5 in TS38.331[2]
Active Sidelink UEs(UE i=0-99)	V2X sidelink Communication preconfiguration		As specified in Annex A.11.2	IE values unless specified otherwise in this test.
	sl-TimeResource-r16 included in SL-ResourcePool		{1_i} Note1	Indicates the bitmap of the TX resource pool, which is defined by repeating the bitmap within a SFN cycle (see TS 38.213 [3])
	sl-NumSubchannel-r16 included in SL-ResourcePool		1	Indicates the number of sub-channels for TX resource pool
	sl-SubchannelSize-r16 included in SL-ResourcePool		10	Indicates the size of sub-channels for TX resource pool

	sl-ResourceReservePeriod2-r16	ms	50	
Active Sidelink UEs(UE i= 100-129)	V2X sidelink Communication preconfiguration		As specified in Annex A.11.2	IE values unless specified otherwise in this test.
	sl-TimeResource-r16 included in SL-ResourcePool		$\{1_i\}^{Note1}$	Indicates the bitmap of the TX resource pool, which is defined by repeating the bitmap within a SFN cycle (see TS 38.213 [3])
	sl-NumSubchannel-r16 included in SL-ResourcePool		1	Indicates the number of sub-channels for TX resource pool
	sl-SubchannelSize included in SL-ResourcePool		10	Indicates the size of sub-channels for TX resource pool
	sl-MultiReserveResource-r16		enabled	
	sl-MaxNumPerReserve-r16		n2	
	sl-ResourceReservePeriod2-r16		0	Unit:ms
Timing offset among Active Sidelink UEs		µs	CP/2	Synchronous
T0		s	1	
T1		ms	50	
T2		ms	50	
Note 1: $\{1_i\}$ is a sequence of ninety-nine 0's with one 1 in (mod(i,100)+1)'th position. Note 2: The UE is only required to be tested in one of the supported test configurations. Note 3: Including the test tolerance given in Annex F.				

9.1.4.3.4.2 Test procedure

In this test there is 130 active sidelink UEs (denoted as UE i, i = 0,1,...,129). There are no active cells and GNSS is reliable during the whole test. The test system can emulate and send the GNSS signal to the test UE. DUT and all active sidelink UEs select GNSS as synchronization reference source. The first 100 active sidelink UEs are scheduled to send with 50ms periodicity. The last 30 active sidelink UEs are aperiodic service UE with reservation period of 15ms.

The test consists of three successive time periods with time duration of T0, T1 and T2 respectively. For this test, the UE is triggered by the test loop function or the upper layers to transmit for V2X Sidelink Communication.

1. Ensure the UE is in state 4-A with generic procedure parameters Test Mode = *On* according to TS 38.508-1 [14] clause 4.4A.2.
2. The GNSS simulator is triggered to start step 1 of Scenario #1 to simulate a location in the centre of Geographical area #1.
3. Wait at least 20 seconds for the UE to acquire the GNSS signal.
4. The SS switches on UE 0~UE 99, triggers UE 0 ~UE 99 to transmit PSCCH/PSSCH with 50ms periodicity, and set power level of UE 0~UE 99 to ensure their measured PSSCH-RSRP is higher than *SL-Thres-RSRP*. T0 starts.
5. When T0 expires, the SS sets parameters according to T1 in Table 9.1.4.3.5-1. T1 starts.
6. The SS sends AT command +CCUTLE to close test loop function and trigger UE to transmit at the end of T1.
7. When T1 expires, the SS shall switch the power setting from T1 to T2 in Table 9.1.4.3.5-1. T2 starts.
8. The SS switches off UE 0~UE 29, switches on UE 101~UE 129, and triggers UE 101~UE 129 to transmit PSCCH/PSSCH aperiodically with a time resource assignment interval of 15ms.
9. During T2, the SS accumulates:

- $N_{resource, total}$: the number of resources occupied by the PSSCH transmissions of the DUT during T2 since the beginning of the test.

- $N_{resource, 65-84}$ the number of resources in slot (i mod 100 = 65,66...,84) occupied by the PSSCH transmissions of the DUT during T2 since the beginning of the test.

10. When T2 expires, the SS sends AT command +CCUTLE to open test loop function and trigger UE to stop transmitting

11. The SS switches off all active sidelink UEs.

12. Repeat step 4-11 until $N_{resource, total}$ - $N_{resource, 65-84}$ (corresponds to the "ne" in Annex G.2.3) and $N_{resource, total}$ (corresponds to the "ns" in Annex G.2.3) achieve the confidence level according to Tables G.2.3-1.

If the ratio $N_{resource, 65-84}$/ $N_{resource, total}$ is larger than 90%, count a success for the test, otherwise count a fail for the test.

9.1.4.3.4.3 Message contents

Message contents are according to TS 38.508-1 [14] clause 7.3 with the following exceptions:

Table 9.1.4.3.4.3-1: SL-ResourcePool (UE under test)

Derivation Path: TS 38.508-1 [14] Table 7.3.2-3			
Information Element	**Value/remark**	**Comment**	**Condition**
SL-ResourcePool-r16 ::= SEQUENCE {			
sl-UE-SelectedConfigRP-r16 SEQUENCE {			
sl-Thres-RSRP-List-r16 SEQUENCE (SIZE (64)) OF SL-Thres-RSRP-r16 {	64 entries		
SL-Thres-RSRP-r16[k, k=1,..64]	14	entry k actual value is -130 +2*14 = -102 dBm	
}			
sl-ResourceReservePeriodList-r16 SEQUENCE (SIZE (1..16)) OF SL-ResourceReservePeriod-r16 {	2 entries		
SL-ResourceReservePeriod-r16[1] CHOICE {		entry 1	
sl-ResourceReservePeriod1-r16	ms0		
}			
SL-ResourceReservePeriod-r16[2] CHOICE {		entry 2	
sl-ResourceReservePeriod2-r16	50		
}			
}			
}			
sl-PreemptionEnable-r16	Not present		
sl-TimeResource-r16	ones(1,100)	ones(1,100) is a sequence of 100 "1"s	
}			

Table 9.1.4.3.4.3-2: SL-ResourcePool (active sidelink UE 0~129)

Derivation Path: TS 38.508-1 [14] Table 7.3.2-3			
Information Element	**Value/remark**	**Comment**	**Condition**
SL-ResourcePool-r16 ::= SEQUENCE {			
sl-UE-SelectedConfigRP-r16 SEQUENCE {			
sl-Thres-RSRP-List-r16 SEQUENCE (SIZE (64)) OF SL-Thres-RSRP-r16 {	64 entries		
SL-Thres-RSRP-r16[k, k=1,..64]	14	entry k actual value is -130 +2*14 = -102 dBm	
}			
sl-MultiReserveResource-r16	Not present		sidelink UE 0~99

	enabled		sidelink UE 100~129
sl-ResourceReservePeriodList-r16 SEQUENCE (SIZE (1..16)) OF SL-ResourceReservePeriod-r16 {	2 entries		
SL-ResourceReservePeriod-r16[1] CHOICE {		entry 1	
sl-ResourceReservePeriod1-r16	ms0		
}			
SL-ResourceReservePeriod-r16[2] CHOICE {		entry 2	
sl-ResourceReservePeriod2-r16	50		
}			
}			
}			
sl-PreemptionEnable-r16	Not present		
sl-TimeResource-r16	$\{1_i\}$	$\{1_i\}$ is a sequence of ninety-nine 0's with one 1 in (mod(i,100)+1)'th position i = 0,1,...,129	sidelink UE i
}			

Table 9.1.4.3.4.3-3: Physical layer parameters for SCI format 1-A (Sidelink UE 0~129)

Derivation Path: TS 38.508-1 [14] Table 4.3.6.2.1.1-1			
Parameter	**Value**	**Value in binary**	**Condition**
Frequency resource assignment	Not present	-	
Time domain resource assignment	Indicates only one resource is scheduled	"00000"B	Sidelink UE 0~99
	Indicate 2 resources are scheduled and the time interval between the 1st resource and 2nd resource is 30 slot (i.e. 15ms)	"11110"B	Sidelink UE 10~129
Resource reservation period	Indicates the 2nd entry in sl-ResourceReservePeriodList, i.e. 50 ms	"1"B	Sidelink UE 0~99
	Indicates the 1st entry in sl-ResourceReservePeriodList, i.e. 0 ms	"0"B	Sidelink UE 10~129

Table 9.1.4.3.4.3-4: +CCUTLE (Test procedure, step 6)

Derivation Path: 38.508-1[14] Table 4.7B-1 with condition Close and Transmit

Table 9.1.4.3.4.3-5: +CCUTLE (Test procedure, step 10)

Derivation Path: 38.508-1[14] Table 4.7B-1 with condition Open

9.1.4.3.5 Test requirement

Active sidelink UE specific test parameters for UE 0~UE 99 and UE 100~UE 129 are given in Table 9.1.4.3.5-1 and Table 9.1.4.3.5-2 respectively.

Table 9.1.4.3.5-1: SyncRef UE Specific Test Parameters for NR SA FR1 L1 SL-RSRP measurement for resource re-evaluation (UE #0...99)

Parameter	**Unit**	**Active Sidelink UE i (i = 0, .., 99)**	
		T1	**T2**
NR RF Channel Number	-	1	
Channel Bandwidth ($BW_{channel}$) Note 7	MHz	20 ($N_{RB,c}$ = 50) or 40 ($N_{RB,c}$ = 100)	

PSCCH RMC	-	CC.1A HD	
PSSCH RMC	-	CD.1A HD	
Noc Note1	dBm/SCS	-110.05 Note 13	
PSSCH1 Ês/Noc Note 3	dB	32.60 Note 13	32.60 Note 13
PSSCH2 Ês/Noc Note 4	dB	2	2
PSSCH3 Ês/Noc Note 5	dB	14.10 Note 13	-infinity
PSSCH4 Ês/Noc Note 6	dB	14.1 Note 13	14.10 Note 13
PSSCH1 Ês/Iot Note2,3,10	dB	32.60	-0.45
PSSCH1 Ês/Iot Note2,3,11		32.60	32.60
PSSCH2 Ês/Iot Note2,4	dB	2	-31.05
PSSCH3 Ês/Iot Note2,5	dB	14.10	-infinity
PSSCH4 Ês/Iot Note2,6	dB	14.10	14.10
PSSCH -RSRP1 Note 2, 3	dBm/SCS	-77.45	-77.45
PSSCH -RSRP2 Note 2, 4	dBm/SCS	-108.05	-108.05
PSSCH -RSRP3 Note 2, 5	dBm/SCS	-95.95	-infinity
PSSCH -RSRP4 Note 2, 6	dBm/SCS	-95.95	-95.95
Io Note 2, 8	dBm/18 MHz	-74.99	-56.21
	dBm/36 MHz	-74.99	-56.21
Io Note 2, 9	dBm/18 MHz	-85.13	-56.20
	dBm/36 MHz	-85.13	-56.20
Io Note 2, 10	dBm/18 MHz	-56.66	-53.42
	dBm/36 MHz	-56.66	-53.42
Io Note 2, 11	dBm/18 MHz	-56.66	-56.66
	dBm/36 MHz	-56.66	-56.66
Io Note 2, 12	dBm/18 MHz	-74.99	-74.99
	dBm/36 MHz	-74.99	-74.99
Antenna Configuration	-	1x2	
Propagation Condition	-	AWGN	

Note 1: Interference from other UEs and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for Noc to be fulfilled.
Note 2: Ês/Iot, PSSCH-RSRP and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.
Note 3: UE #50~64 and UE #85~99 will periodically occupy the subchannels on the slot with "#slot index mod 100" = #50-64 and #85-99.
Note 4: UE #30~49 will periodically occupy the subchannels on the slot with “#slot index mod 100” = #30-49.
Note 5: UE #0~29 will periodically occupy the subchannels on the slot with “#slot index mod 100” = #0-29.
Note 6: UE #65~84 will periodically occupy the subchannels on the slot with “#slot index mod 100” = #65-84.
Note 7: The UE is only required to be tested in one of the supported configurations.
Note 8: Calculated on slot with “#slot index mod 100” = #0~29.
Note 9: Calculated on slot with “#slot index mod 100” = #30~49.
Note 10: Calculated on slot with “#slot index mod 100” = #50~59.
Note 11: Calculated on slot with “#slot index mod 100” = #60~64 and slot #85~99.
Note 12: Calculated on slot with “#slot index mod 100” = #65~84.
Note 13 Including test tolerance given in Annex F.

Table 9.1.4.3.5-2: SyncRef UE Specific Test Parameters for NR SA FR1 L1 SL-RSRP measurement for resource re-evaluation (UE #100...129)

Parameter	Unit	Active Sidelink UE i (i = 100, ..., 129)	
		T1	T2
NR RF Channel Number	-	1	
Channel Bandwidth ($BW_{channel}$) Note 4	MHz	20 ($N_{RB,c}$ = 50) or 40 ($N_{RB,c}$ = 100)	
PSCCH RMC	-	CC.1A HD	
PSSCH RMC	-	CD.1 A HD	
Noc Note1	dBm/SCS	-110.05 Note 8	
PSSCH Ês/Noc	dB	-infinity	33.05 Note 8
PSSCH Ês/Iot Note2,5	dB	-infinity	33.05
PSSCH Ês/Iot Note2,6		-infinity	28.93

PSSCH Ês/Iot Note2,7		-infinity	0.45
PSSCH-RSRP Note 2, Note 3	dBm/SCS	-infinity	-77.0
Io Note 2, 5	dBm/18 MHz	-74.99	-56.21
	dBm/36 MHz	-74.99	-56.21
Io Note 2, 6	dBm/18 MHz	-85.13	-56.20
	dBm/36 MHz	-85.13	-56.20
Io Note 2, 7	dBm/18 MHz	-56.66	-53.42
	dBm/36 MHz	-56.66	-53.42
Antenna Configuration	-	1x2	
Propagation Condition	-	AWGN	

Note 1: Interference from other UEs and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for Noc to be fulfilled.
Note 2: Es/Iot, PSSCH-RSRP and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.
Note 3: UE #100~129 will occupy the subchannels on the slots with “#slot index mod 100”= #0-29 during T2.
Note 4: The UE is only required to be tested in one of the supported configurations.
Note 5: Calculated on slot with “#slot index mod 100” = #0~29.
Note 6: Calculated on slot with “#slot index mod 100” = #30~49.
Note 7: Calculated on slot with “#slot index mod 100” = #50~59.
Note 8: Including the test tolerance given in Annex F.

During T0, the SS shall configure UE 0~UE 99 to transmit PSCCH/PSSCH every 50ms. The measured PSSCH-RSRP of UE 0 ~UE 99 is above *SL-Thres-RSRP*. Hence the resources occupied by UE 0 ~UE 99 are expected to be excluded in the resource selection procedure.

During T1, the SS shall configure UE 0~UE 99 to transmit PSCCH/PSSCH every 50ms. The measured PSSCH-RSRP of UE 0~UE 29, UE 50 ~ UE 99 is above *SL-Thres-RSRP*, and the measured PSSCH-RSRP of UE 30~UE 49 is below *SL-Thres-RSRP*. Hence the resource occupied by UE 30 ~UE 49 are expected to be included in the resource selection procedure and other resources are expected to be excluded in the resource selection procedure.

At the end of T1, the UE under test shall be triggered to periodically transmit PSCCH/PSSCH.

During T2, the SS switches off UE 0~UE 29. and switches on UE 100~UE 129. UE 100~UE 129 transmit PSCCH/PSSCH with the maximum number of reserved PSCCH/PSSCH resources equalling n2 and time resource assignment interval as 15ms in the beginning 30 slots. The measured PSSCH-RSRP of UE 100~UE 129 is above *SL-Thres-RSRP*. Hence the resource occupied by UE 100 ~UE 129 are expected to be excluded in the resource re-evaluation procedure. The UE under test is expected to reselect the resources and transmit the PSCCH/PSSCH in the newly re-evaluated resources.

The rate of PSSCH transmissions on the resources which are occupied by UE #65-84 shall be more than 90% during T2.

Figure 9.1.4.3.5-3 shows the two different time durations and the corresponding variation of the power level in the active sidelink UEs to emulate change of candidate resource set.

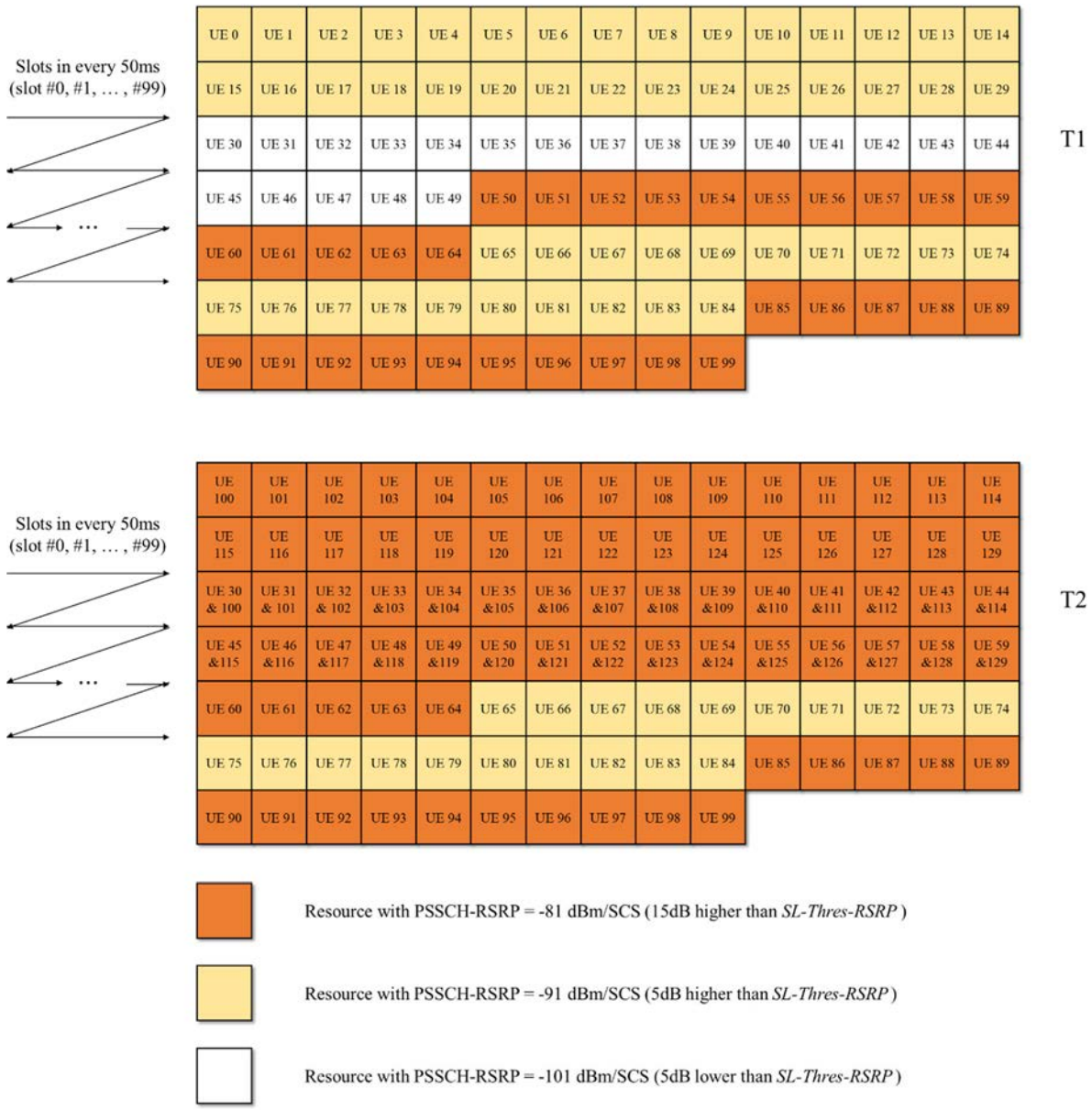


Figure 9.1.4.3.5-3: Power level variation of active sidelink UEs for NR SA FR1 L1 SL-RSRP measurement for resource re-evaluation

9.1.5 Congestion control measurement

9.1.5.0 Minimum conformance requirements

9.1.5.0.1 Minimum conformance requirements for congestion control measurements

The UE shall be capable of estimating the channel busy ratio for one or more transmission pools indicated by higher layers in TS 38.331[13], based on SL-RSSI measurements provided by the physical layer.

When no sidelink transmissions occur, the UE physical layer shall perform a single-shot SL-RSSI measurement for each sub-channel included in all the slots configured as transmission pools.

The SL-RSSI measurement performed according to this clause shall meet the SL-RSSI measurement accuracy requirements defined in 38.133 [6] clause 10.4.

The UE shall perform channel busy ratio (CBR) measurement based on SL-RSSI measurements as described in TS 38.215 [10].

The intra-frequency SL-RSSI requirements are specified in Table 9.1.5.0.1-1. The requirements apply for measurement period of 1 slot and for any configured measurement bandwidth larger than 10 RBs, provided that:

- All symbols during each RSSI measurement duration are available for RSSI sampling within the same measurement interval.

Table 9.1.5.0.1-1: Intra-frequency SL-RSSI absolute accuracy

Accuracy		Conditions				
		Io Note 1 range				
Normal condition	Extreme condition	NR sidelink operating band groups Note 2	Minimum Io			Maximum Io
			dBm/SCS_{SL}			
dB	dB		SCS_{SL} = 15kHz	SCS_{SL} = 30kHz	SCS_{SL} = 60kHz	dBm/$BW_{Channel}$
±2.5	±5.5	NR_TDD_FR1_B	-120.5	-117.5	-114.5	-50
		NR_TDD_FR1_J	-116.5	-113.5	-110.5	-50
±4.5	±7.5	Note 3	Note 3	Note 3	Note 3	Note 3
NOTE 1: Io is assumed to have constant EPRE across the bandwidth. NOTE 2: NR sidelink operating band groups are as defined in Section 3A.4 for the corresponding NR operating bands. NOTE 3: The same bands and the same Io conditions for each band apply for this requirement as for the corresponding highest accuracy requirement.						

The normative references for this requirement are TS 38.133 [6] clause 10.4.3 and 12.6.

9.1.5.1 NR SA FR1 congestion control measurement for concurrent operation

9.1.5.1.1 Test purpose

The purpose of this test is to verify the congestion control measurement requirements in TS 38.133 [6] clause 12.6. This test will also verify that UE makes correct reporting of an event for CBR measurement.

9.1.5.1.2 Test applicability

This test applies to all types of NR UEs from release 16 onwards and supporting both Uu and sidelink communication.

9.1.5.1.3 Minimum conformance requirements

The minimum conformance requirements are defined in clause 9.1.5.0.1

The normative reference for this requirement is TS 38.133 [6] clause A.9.1.5.

9.1.5.1.4 Test description

9.1.5.1.4.1 Initial conditions

This test shall be tested using any of the test configurations in Table 9.1.5.1.4.1-1.

Table 9.1.5.1.4.1-1: Supported test configurations for FR1 NR Cell

Configuration	Description
9.1.5.1-1	NR Uu: FDD, SSB SCS 15 kHz, data SCS 15 kHz, BW 10 MHz

9.1.5.1-2	NR Uu: TDD, SSB SCS 15 kHz, data SCS 15 kHz, BW 10 MHz
9.1.5.1-3	NR Uu: TDD, SSB SCS 30 kHz, data SCS 30 kHz, BW 40 MHz
Note: The UE is only required to pass in one of the supported test configurations in FR1	

Configure the test equipment and the DUT according to the parameters in Table 9.1.5.1.4.1-2.

Table 9.1.5.1.4.1-2: Initial conditions for NR SA FR1 congestion control measurement for concurrent operation

Parameter	Value		Comment
Test environment	NC		As specified in TS 38.508-1 [14] clause 4.1.
Test frequencies	Uu&PC5: As specified in TS 38.508-1 [14] clause 4.3.1.8.2.1.		
Channel bandwidth	Uu: As specified by the test configuration selected from Table 9.1.5.1.4.1-1 PC5: As specified by the test configuration selected from Table 9.1.5.1.4.1-3.		
Propagation conditions	AWGN		As specified in Annex C.2.2.
Connection Diagram	TE Part	A.3.1.9.3	As specified in TS 38.508-1 [14] Annex A.
	DUT Part	A.3.2.7.3	
Exceptions to connection diagram	N/A		

1. The parameter settings for the NR sidelink communication are pre-configured according to TS 38.508-1 [14] clause 4.10.1.
2. Message content exceptions are given in clause 9.1.5.1.4.3
3. There is one NR Uu carrier and one NR Cell (Cell 1) specified in this test. Cell 1 is configured according to Annex C.1.1 and C.1.2.
4. Test parameters for Cell 1 are given in Table 9.1.5.1.5-2.
5. There are 4 NR-SS-UEs (active NR sidelink UE i, i = 0,1,2,3) specified in this test. Active NR sidelink UEs are configured according to the generic parameters in Table 9.1.5.1.4.1-3.

Table 9.1.5.1.4.1-3: NR sidelink test parameters for NR SA FR1 congestion control measurement for concurrent operation

Parameter	Unit	Value	Comment
NR RF Channel Number		1	HD carrier in Band n47 or n38
Channel Bandwidth ($BW_{channel}$)[Note 2]	MHz	20 ($N_{RB,c}$ = 50) or 40 ($N_{RB,c}$ = 100)	
SCS	kHz	30	
V2X sidelink communication configuration		As specified in Annex A.11.2	IE values unless specified otherwise in this test.
sl-TimeResource-r16 included in SL-ResourcePool		1111111111111111111 1111111111111111111 1111111111111111111 1111111111111111111 1111111111111111111	Indicates the bitmap of the TX and Rx resource pool, which is defined by repeating the bitmap within a SFN cycle (see TS 38.213[8])
sl-NumSubchannel-r16 included in SL-ResourcePool		1	ENUMERATED {n1}
sl-SubchannelSize included in SL-ResourcePool		10	ENUMERATED {n10}
sl-StartRB-Subchannel-r16		0	
threshS-RSSI-CBR		19	Corresponding -74dBm as defined in Section 6.3.8 in TS38.331[13]
Number of Active Sidelink UEs every 50ms		4	Active Sidelink UE i, where i = 0, 1, 2, 3

Active Sidelink UEs (i = 0,1,2,3)	V2X sidelink Communication configuration		As specified in Table A.3.21.2-1 and A.3.21.2-3	IE values unless specified otherwise in this test.
	sl-TimeResource-r16 included in SL-ResourcePool		$\{1_i\}^{Note1}$	Indicates the bitmap of the TX and Rx resource pool, which is defined by repeating the bitmap within a SFN cycle (see TS 38.213[8])
	sl-NumSubchannel-r16 included in SL-ResourcePool		1	
	sl-SubchannelSize included in SL-ResourcePool		10	
Timing offset between V2X UE and Active Sidelink UEs		μs	CP/2	Synchronous
c1-Threshold-r16			2	Corresponding 0.02 as defined in Section 6.3.2 in TS38.331[13]
Hysteresis			0	
Time To Trigger		s	0	
Filter coefficient			0	L3 filtering is not used
T1		s	5	
T2		s	5	
Note 1: $\{1_i\}$ is a sequence of ninety nine 0's with one 1 in i+1'th position. Note 2: The UE is only required to be tested in one of the channel bandwidths.				

9.1.5.1.4.2 Test procedure

In this test there is 4 active sidelink UEs (denoted as UE i, i = 0,1,2,3). There are 1 active cells (Cell 1) and no GNSS during the whole test. DUT and all active sidelink UEs select Cell 1 as synchronization reference source. All active sidelink UEs are scheduled to transmit PSCCH/PSSCH with 50ms periodicity.

The test consists of two successive time periods with time duration of T1 and T2 respectively.

1. Ensure the UE is in state 3N-B with generic procedure parameters Test Mode = *On* according to TS 38.508-1 [14] clause 4.4A.2.
2. The SS switches on all active sidelink UEs, triggers all active sidelink UEs to transmit PSCCH/PSSCH with 50ms periodicity.
3. The SS sets parameters according to T1 in Table 9.1.5.1.5-1. T1 starts.
4. The SS sends a *RRCReconfiguration* message with *sl-ConfigDedicatedNR* and *measConfig* to configure event C1 triggered CBR measurement and reporting.
5. The UE sends a *RRCReconfigurationComplete* message.
6. If the UE send no *measurmentReport* message before T1 expires, then count a success for the event "entry condition is not satisfied", otherwise count a fail for the event "entry condition is not satisfied".
7. When T1 expires, the SS shall switch the power setting from T1 to T2 in Table 9.1.5.1.5-1. T2 starts.
8. If the UE sends a *measurmentReport* message before T2 expires, then count a success for the event "entry condition is satisfied", otherwise count a fail for the event "entry condition is satisfied".
9. The SS sends a *RRCReconfiguration* message with *measConfig* to release configure event C1 triggered CBR measurement and reporting.
10. The UE sends a *RRCReconfigurationComplete* message.
11. Repeat step 3-10 until the confidence level according to Table G.3.3-1 is achieved.

9.1.5.1.4.3 Message contents

Message contents are according to TS 38.508-1 [14] clause 7.3 with the following exceptions:

Table 9.1.5.1.4.3-1: RRCReconfiguration (Test procedure, step 4 and step 9)

Derivation Path: TS 38.508-1 [14], Table 4.6.1-13 with condition NR_MEAS and SIDELINK			
Information Element	**Value/remark**	**Comment**	**Condition**
RRCReconfiguration ::= SEQUENCE {			
criticalExtensions CHOICE {			
rrcReconfiguration SEQUENCE {			
measConfig	MeasConfig	Table 9.1.5.1.4.3-2	
nonCriticalExtension SEQUENCE {			
nonCriticalExtension SEQUENCE {			
nonCriticalExtension SEQUENCE {			
nonCriticalExtension SEQUENCE {			
sl-ConfigDedicatedNR-r16	SL-ConfigDedicatedNR specified in 38.508-1 [14] Table 4.6.6-7 with condition SELECTED		Step 4
	Not present		Step 9
}			
}			
}			
}			
}			
}			
}			

Table 9.1.5.1.4.3-2: MeasConfig (Table 9.1.5.1.4.3-1)

Derivation Path: TS 38.508-1 [14], Table 4.6.3-69			
Information Element	**Value/remark**	**Comment**	**Condition**
MeasConfig ::= SEQUENCE {			
measObjectToAddModList	Not present		step 9
measObjectToAddModList SEQUENCE (SIZE (1..maxNrofMeasId)) OF MeasObjectToAddMod {	2 entries		step 4
MeasObjectToAddMod[1] SEQUENCE {		entry 1	
measObjectId	1		
measObject CHOICE {			
measObjectNR	MeasObjectNR-DEFAULT specified in Table H.3.1-3 with condition INTRA-FREQ MO	MO for PCell	
}			
}			
MeasObjectToAddMod[2] SEQUENCE {		entry 2	
measObjectId	2		
measObject CHOICE {			
measObjectNR-SL-r16	MeasObjectNR-SL specified in 38.508-1 [14] Table 4.6.3-76A	MO for CBR	
}			
}			
}			
reportConfigToAddModList	Not present		step 9
reportConfigToAddModList SEQUENCE(SIZE (1..maxReportConfigId)) OF ReportConfigToAddMod {	1 entry		step 4
ReportConfigToAddMod[1] SEQUENCE {		entry 1	
reportConfigId	1		
reportConfig CHOICE {			

reportConfigNR-SL-r16	ReportConfigNR-SL	Table 9.1.5.1.4.3-3	
}			
}			
}			
measIdToRemoveList	Not present		step 4
measIdToRemoveList SEQUENCE (SIZE (1..maxNrofMeasId)) OF MeasId {	1 entry		step 9
MeasId[1]	1	entry 1	
}			
measIdToAddModList	Not present		step 9
measIdToAddModList SEQUENCE (SIZE (1..maxNrofMeasId)) OF MeasIdToAddMod {	1 entry		step 4
MeasIdToAddMod[1] SEQUENCE {		entry 1	
measId	1		
measObjectId	2		
reportConfigId	1		
}			
}			

Table 9.1.5.1.4.3-3: ReportConfigNR-SL (Table 9.1.5.1.4.3-2)

Derivation Path: TS 38.508-1 [14] Table 4.6.3-142A with condition EVENT_C1			
Information Element	**Value/remark**	**Comment**	**Condition**
ReportConfigNR-SL-r16 ::= SEQUENCE {			
reportType-r16 CHOICE {			
eventTriggered-r16 SEQUENCE {			
eventId-r16 CHOICE {			
eventC1 SEQUENCE {			
c1-Threshold-r16	2	actual CBR threshold value is 2*0.01 = 2%	
hysteresis-r16	0		
timeToTrigger-r16	ms0		
}			
}			
}			
}			
}			

Table 9.1.5.1.4.3-4: SL-ResourcePool (UE under test)

Derivation Path: TS 38.508-1 [14] Table 7.3.2-3			
Information Element	**Value/remark**	**Comment**	**Condition**
SL-ResourcePool-r16 ::= SEQUENCE {			
sl-ThreshS-RSSI-CBR-r16	19	actual value is -112 + 2*19 = -74 dBm	
sl-UE-SelectedConfigRP-r16 SEQUENCE {			
sl-ResourceReservePeriodList-r16 SEQUENCE (SIZE (1..16)) OF SL-ResourceReservePeriod-r16 {	2 entries		
SL-ResourceReservePeriod-r16[1] CHOICE {		entry 1	
sl-ResourceReservePeriod1-r16	ms0		
}			
SL-ResourceReservePeriod-r16[2] CHOICE {		entry 2	
sl-ResourceReservePeriod2-r16	50		
}			
}			
}			
sl-FilterCoefficient-r16	fc0	L3 filtering is disabled	
sl-TimeResource-r16	ones(1,100)	ones(1,100) is a sequence of 100 "1"s	

}			

Table 9.1.5.1.4.3-5: SL-ResourcePool (active sidelink UE 0~3)

Derivation Path: TS 38.508-1 [14] Table 7.3.2-3			
Information Element	**Value/remark**	**Comment**	**Condition**
SL-ResourcePool-r16 ::= SEQUENCE {			
sl-UE-SelectedConfigRP-r16 SEQUENCE {			
sl-ResourceReservePeriodList-r16 SEQUENCE (SIZE (1..16)) OF SL-ResourceReservePeriod-r16 {	2 entries		
SL-ResourceReservePeriod-r16[1] CHOICE {		entry 1	
sl-ResourceReservePeriod1-r16	ms0		
}			
SL-ResourceReservePeriod-r16[2] CHOICE {		entry 2	
sl-ResourceReservePeriod2-r16	50		
}			
}			
}			
sl-TimeResource-r16	{1_i}	{1_i} is a sequence of ninety-nine 0's with one 1 in (mod(i,100)+1)'th position i = 0,1,2,3	sidelink UE i
}			

Table 9.1.5.1.4.3-6: Physical layer parameters for SCI format 1-A (Sidelink UE 0~3)

Derivation Path: TS 38.508-1 [14] Table 4.3.6.2.1.1-1			
Parameter	**Value**	**Value in binary**	**Condition**
Frequency resource assignment	Not present	-	
Time domain resource assignment	Indicates only one resource is scheduled	"00000"B	
Resource reservation period	Indicates the 2nd entry in sl-ResourceReservePeriodList, i.e. 50 ms	"1"B	

Table 9.1.5.1.4.3-7: MeasurementReport (Test procedure, step 8)

Derivation Path: TS 38.38.508-1[14] Table 4.6.1-5A			
Information Element	**Value/remark**	**Comment**	**Condition**
MeasurementReport ::= SEQUENCE {			
criticalExtensions CHOICE {			
measurementReport SEQUENCE {			
measResults SEQUENCE {	MeasResults		
measId	1		
measResultServingMOList	Not checked		
measResultsSL-r16 SEQUENCE {			
measResultsListSL-r16 CHOICE {			
measResultNR-SL-r16 SEQUENCE {			
measResultListCBR-NR-r16 SEQUENCE (SIZE (1.. maxNrofSL-PoolToMeasureNR-r16)) OF MeasResultCBR-NR-r16 {	1 entry		
MeasResultCBR-NR-r16[1] SEQUENCE {		entry 1	
sl-poolReportIdentity-r16	1		
sl-CBR-ResultsNR-r16	(3..4)		
}			
}			
}			
}			
}			
}			

}			
}			
}			

9.1.5.1.5 Test requirement

Active sidelink UE specific test parameters for UE 0~UE 4 are given in Table 9.1.5.1.5-1. Cell specific test parameters for Cell 1 are given in Table 9.1.5.1.5-2.

Table 9.1.5.1.5-1: SyncRef UE Specific Test Parameters for NR SA FR1 congestion control measurement for concurrent operation

Parameter	Unit	Active Sidelink UE *i* (*i* = 0, 1, 2, 3)	
		T1	T2
NR RF Channel Number		1	
Channel Bandwidth ($BW_{channel}$) Note 7	MHz	20 ($N_{RB,c}$ = 50) or 40 ($N_{RB,c}$ = 100)	
PSCCH RMC (defined in A.3.21.3)		CC.1A HD	
PSSCH RMC (defined in A.3.21.3)		CD.1A HD	
Noc Note1	dBm/30 kHz	-104.55 Note 8	
Ês/Noc	dB	4.35	13.62 Note 8
SL-RSSI1 Note 2,3	dBm/3.6 MHz	-78.05	-69.95
SL-RSSI2 Note 2,4	dBm/3.6 MHz	-83.76	-83.76
Io1 Note 2,5	dBm/18 MHz	-78.05	-69.95
	dBm/36 MHz	-78.05	-69.95
Io2 Note 2,6	dBm/18 MHz	-83.76	-83.76
	dBm/36 MHz	-83.76	-83.76
Propagation Condition	-	AWGN	

Note 1: Interference from other UEs and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for Noc to be fulfilled.
Note 2: SL-RSSI1, SL-RSSI2, Io1 and Io2 levels have been derived from other parameters for information purposes. They are not settable parameters themselves.
Note 3: SL-RSSI1 is the SL-RSSI level measured on the slot# 0 - 3 with “SFN mod 5 = 0”.
Note 4: SL-RSSI2 is the SL-RSSI level measured on the slot# 4-9 with “SFN mod 5 = 0” and the slot# 0-9 with “SFN mod 5 = 1,…, 4”.
Note 5: Io1 is the Io level measured on the slot# 0 - 3 with “SFN mod 5 = 0”.
Note 6: Io2 is the Io level measured on the slot# 4-9 with “SFN mod 5 = 0” and the slot# 0-9 with “SFN mod 5 = 1,…, 4”.
Note 7: The UE is only required to be tested in one of the supported test configurations.
Note 8: Including test tolerance given in Annex F.

Table 9.1.5.1.5-2: Cell specific Test Parameters for NR SA FR1 congestion control measurement for concurrent operation

Parameter		Unit	Cell 1
RF Channel Number			2
Duplex Mode	Config 1		FDD
	Config 2,3		TDD
TDD configuration	Config 1		Not Applicable
	Config 2		TDDConf.1.1
	Config 3		TDDConf.2.1
Channel Bandwidth ($BW_{channel}$)	Config 1,2	MHz	10: $N_{RB,c}$ = 52
	Config 3		40: $N_{RB,c}$ = 106
Initial BWP Configuration			DLBWP.0.1 ULBWP.0.1
Dedicated BWP Configuration			DLBWP.1.1 ULBWP.1.1
DRX Cycle			N/A
PDSCH Reference measurement channel	Config 1		SR.1.1 FDD
	Config 2		SR.1.1 TDD
	Config 3		SR.2.1 TDD

CORESET Reference Channel	Config 1		CR.1.1 FDD
	Config 2		CR.1.1 TDD
	Config 3		CR.2.1 TDD
Dedicated CORESET Reference Channel	Config 1		CCR.1.1 FDD
	Config 2		CCR.1.1 TDD
	Config 3		CCR.2.1 TDD
SSB configuration	Config 1,2		SSB.1 FR1
	Config 3		SSB.2 FR1
SMTC Configuration			SMTC.2
OCNG Patterns			OP.1
EPRE ratio of PSS to SSS		dB	0
EPRE ratio of PBCH DMRS to SSS			
EPRE ratio of PBCH to PBCH DMRS			
EPRE ratio of PDCCH DMRS to SSS			
EPRE ratio of PDCCH to PDCCH DMRS			
EPRE ratio of PDSCH DMRS to SSS			
EPRE ratio of PDSCH to PDSCH			
EPRE ratio of OCNG DMRS to SSS(Note 1)			
EPRE ratio of OCNG to OCNG DMRS (Note 1)			
Noc Note2	Config 1,2,3	dBm/15 kHz	-98
Noc Note2	Config 1,2	dBm/SCS	-98
	Config 3		-95
Ês/Noc		dB	3
SS-RSRP Note3	Config 1,2	dBm/SCS	-95
	Config 3		-92
Io Note 3	Config 1,2	dBm/9.36 MHz	-65.2
	Config 3	dBm/38.1 MHz	-59.2
Propagation Condition			AWGN

Note 1: OCNG shall be used such that cell is fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.
Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for Noc to be fulfilled.
Note 3: SS-RSRP levels have been derived from other parameters for information purposes. They are not settable parameters themselves.

During T1, all of active sidelink UEs are configured to transmit PSCCH/PSSCH every 50ms such that the SL-RSSI on the resources occupied by active sidelink UEs is lower than *threshS-RSSI-CBR*. Then the measured CBR is lower than *c1-Threshold*. No CBR measurement reporting shall be triggered.

During T2, all of active sidelink UEs are configured to transmit PSCCH/PSSCH every 50ms such that the SL-RSSI on the resources occupied by active sidelink UEs is higher than *threshS-RSSI-CBR*. Then the measured CBR is higher than *c1-Threshold*. CBR measurement reporting shall be triggered.

The rate of correct events observed during repeated tests shall be at least 98%.

9.1.5.2 NR SA FR1 congestion control measurement for PC5-only operation

9.1.5.2.1 Test purpose

The purpose of this test is to verify the congestion control measurement requirements in TS 38.133 [6] clause 12.6.

9.1.5.2.2 Test applicability

This test applies to all types of NR UEs from release 16 onwards and supporting only sidelink communication.

9.1.5.2.3 Minimum conformance requirements

The minimum conformance requirements are defined in clause 9.1.5.0.1

The normative reference for this requirement is TS 38.133 [6] clause A.9.1.5.

9.1.5.2.4 Test description

9.1.5.2.4.1 Initial conditions

Configure the test equipment and the DUT according to the parameters in Table 9.1.5.2.4.1-1.

Table 9.1.5.2.4.1-1: Initial conditions for NR SA FR1 congestion control measurement for PC5-only operation

Parameter	Value		Comment
Test environment	NC		As specified in TS 38.508-1 [14] clause 4.1.
Test frequencies	PC5: As specified in TS 38.508-1 [14] clause 4.3.1.8.		
Channel bandwidth	PC5: As specified by the test configuration selected from Table 9.1.5.2.4.1-2.		
Propagation conditions	AWGN		As specified in Annex C.2.2.
Connection Diagram	TE Part	A.3.1.9.1FFS	As specified in TS 38.508-1 [14] Annex A.
	DUT Part	A.3.2.7.1FFS	
Exceptions to connection diagram	N/A		

1. The parameter settings for the NR sidelink communication are pre-configured according to TS 38.508-1 [14] clause 4.10.1.
2. Message content exceptions are given in clause 9.1.5.2.4.3
3. There are 4 NR-SS-UEs (active NR sidelink UE i, i = 0,1,2,3) specified in this test. Active NR sidelink UEs are configured according to the generic parameters in Table 9.1.5.2.4.1-2.

Table 9.1.5.2.4.1-2: NR sidelink test parameters for NR SA FR1 congestion control measurement for PC5-only operation

Parameter		Unit	Value	Comment
NR RF Channel Number			1	HD carrier in Band n47 or n38
Channel Bandwidth ($BW_{channel}$)[Note 2]		MHz	20 ($N_{RB,c}$ = 50) or 40 ($N_{RB,c}$ = 100)	
SCS		kHz	30	
V2X sidelink communication configuration			As specified in Annex A.11.2	IE values unless specified otherwise in this test.
sl-TimeResource-r16 included in SL-ResourcePool			11111111111111111111 11111111111111111111 11111111111111111111 11111111111111111111 11111111111111111111	Indicates the bitmap of the TX and Rx resource pool, which is defined by repeating the bitmap within a SFN cycle (see TS 38.213[8])
sl-NumSubchannel-r16 included in SL-ResourcePool			1	ENUMERATED {n1}
sl-SubchannelSize included in SL-ResourcePool			10	ENUMERATED {n10}
sl-StartRB-Subchannel-r16			0	
threshS-RSSI-CBR			19	Corresponding -74dBm as defined in Section 6.3.8 in TS38.331[13]
Number of Active Sidelink UEs every 50ms			4	Active Sidelink UE i, where i = 0, 1, 2, 3
Active Sidelink UEs (i = 0,1,2,3)	V2X sidelink Communication configuration		As specified in Table A.3.21.2-1 and A.3.21.2-3	IE values unless specified otherwise in this test.
	sl-TimeResource-r16 included in SL-ResourcePool		$\{1_i\}$[Note1]	Indicates the bitmap of the TX and Rx resource pool, which is defined by repeating the bitmap within a SFN cycle (see TS 38.213[8])

	sl-NumSubchannel-r16 included in SL-ResourcePool		1	
	sl-SubchannelSize included in SL-ResourcePool		10	
Timing offset between V2X UE and Active Sidelink UEs		µs	CP/2	Synchronous
sl-CBR-RangeConfigList-r16			[2 100]	Two ranges are defined by this list: 0 to 0.02 and 0.02 to 1
sl-CR-Limit-r16			10000 and 10	Corresponding to the two CBR ranges: if CBR > 0.02, CR ≤ 0.001, otherwise CR > 0.001
sl-Thres-RSRP-r16			12	Configure threshold <-98.64dBm/30kHz to ensure not blocking transmission
Hysteresis			0	
Time To Trigger		s	0	
Filter coefficient			0	L3 filtering is not used
T1		s	5	
T2		s	5	
Note 1: $\{1_i\}$ is a sequence of ninety nine 0's with one 1 in i+1'th position. Note 2: The UE is only required to be tested in one of the channel bandwidths.				

9.1.5.2.4.2 Test procedure

In this test there is 4 active sidelink UEs (denoted as UE i, i = 0,1,2,3). There are 1 active cells (Cell 1) and no GNSS during the whole test. DUT and all active sidelink UEs select Cell 1 as synchronization reference source. All active sidelink UEs are scheduled to transmit PSCCH/PSSCH with 50ms periodicity.

The test consists of two successive time periods with time duration of T1 and T2 respectively.

1. Ensure the UE is in state 4-A with generic procedure parameters Test Mode = *On* according to TS 38.508-1 [14] clause 4.4A.2.
2. The SS switches on all active sidelink UEs, triggers all active sidelink UEs to transmit PSCCH/PSSCH with 50ms periodicity.
3. The SS sends AT command +CCUTLE to close test loop function and trigger UE to transmit.
4. The SS sets parameters according to T1 in Table 9.1.5.2.5-1. T1 starts.
5. During T1, the SS recodes the number of resources occupied by the PSSCH transmission of the UE under test (denoted as $N_{resource,\ low\ CBR}$:) until T1 expires. If $N_{resource,\ low\ CBR} > 10$, then count as success for the event "high CR limit", otherwise count a fail for the event "high CR limit".
6. When T1 expires, the SS shall switch the power setting from T1 to T2 in Table 9.1.5.2.5-1. T2 starts.
7. During T2, the SS recodes the number of resources occupied by the PSSCH transmission of the UE under test (denoted as $N_{resource,\ high\ CBR}$:) until T2 expires. If $N_{resource,\ low\ CBR} \leq 10$, then count as success for the event "low CR limit", otherwise count a fail for the event "low CR limit".
8. When T2 expires, the SS sends AT command +CCUTLE to open test loop function and trigger UE to stop transmitting.
9. Repeat step 3-7 until the confidence level according to Table G.3.3-1 is achieved.

9.1.5.2.4.3 Message contents

Message contents are according to TS 38.508-1 [14] clause 7.3 with the following exceptions:

Table 9.1.5.2.4.3-1: SL-ResourcePool (UE under test)

Derivation Path: TS 38.508-1 [14] Table 7.3.2-3			
Information Element	**Value/remark**	**Comment**	**Condition**
SL-ResourcePool-r16 ::= SEQUENCE {			
sl-ThreshS-RSSI-CBR-r16	19	actual value is -112 + 2*19 = -74 dBm	
sl-UE-SelectedConfigRP-r16 SEQUENCE {			
sl-CBR-PriorityTxConfigList-r16	SL-CBR-PriorityTxConfigList	Table 9.1.5.2.4.3-2	
sl-ResourceReservePeriodList-r16 SEQUENCE (SIZE (1..16)) OF SL-ResourceReservePeriod-r16 {	2 entries		
SL-ResourceReservePeriod-r16[1] CHOICE {		entry 1	
sl-ResourceReservePeriod1-r16	ms0		
}			
SL-ResourceReservePeriod-r16[2] CHOICE {		entry 2	
sl-ResourceReservePeriod2-r16	50		
}			
}			
}			
sl-FilterCoefficient-r16	fc0	L3 filtering is disabled	
sl-TimeResource-r16	ones(1,100)	ones(1,100) is a sequence of 100 "1"s	
}			

Table 9.1.5.2.4.3-2: SL-CBR-PriorityTxConfigList (Table 9.1.5.2.4.3-1)

Derivation Path: TS 38.508-1 [14] Table 4.6.6-5			
Information Element	**Value/remark**	**Comment**	**Condition**
SL-CBR-PriorityTxConfigList -r16 ::= SEQUENCE (SIZE (1..8)) OF SL-PriorityTxConfigIndex-r16 {	8 entries		
SL-PriorityTxConfigIndex-r16[k, k=1..8] SEQUENCE {		entry k	
sl-DefaultTxConfigIndex-r16	Not present		
sl-Tx-ConfigIndexList-r16 SEQUENCE (SIZE (1..maxCBR-Level-r16)) OF SL-TxConfigIndex-r16 {	2 entries		
SL-TxConfigIndex-r16[1]	0	entry 1 First entry in sl-CBR-PSSCH-TxConfigList is used for the first CBR range in sl-CBR-RangeConfigList, i.e. 0<=CBR<0.02	
SL-TxConfigIndex-r16[2]	1	entry 2 Second entry in sl-CBR-PSSCH-TxConfigList is used for the second CBR range in sl-CBR-RangeConfigList, i.e. 0.02<=CBR<1	
}			
}			
}			

Table 9.1.5.2.4.3-3: SL-CBR-CommonTxConfigList (UE under test)

Derivation Path: TS 38.508-1 [14], Table 4.6.6-6

Information Element	Value/remark	Comment	Condition
SL-CBR-CommonTxConfigList-r16 ::= SEQUENCE {			
sl-CBR-RangeConfigList-r16 SEQUENCE (SIZE (1..maxCBR-Config-r16)) OF SL-CBR-LevelsConfig-r16 {	1 entry		
SL-CBR-LevelsConfig-r16[1] SEQUENCE (SIZE (1..maxCBR-Level-r16)) OF SL-CBR-r16 {	2 entries	entry 1	
SL-CBR-r16[1]	2	entry 1 0<=CBR<0.02	
SL-CBR-r16[2]	100	entry 2 0.02<=CBR<1	
}			
}			
sl-CBR-PSSCH-TxConfigList-r16 SEQUENCE (SIZE (1.. maxTxConfig-r16)) OF SL-CBR-PSSCH-TxConfig-r16 {	2 entries		
SL-CBR-PSSCH-TxConfig-r16[1] SEQUENCE {		entry 1	
sl-CR-Limit-r16	10000	0.001 <CR <=1	
sl-TxParameters-r16	Not present		
}			
SL-CBR-PSSCH-TxConfig-r16[2] SEQUENCE {		entry 2	
sl-CR-Limit-r16	10	CR <=0.001	
sl-TxParameters-r16	Not present		
}			
}			
}			

Table 9.1.5.2.4.3-4: SL-ResourcePool (active sidelink UE 0~3)

Derivation Path: TS 38.508-1 [14] Table 7.3.2-3			
Information Element	**Value/remark**	**Comment**	**Condition**
SL-ResourcePool-r16 ::= SEQUENCE {			
sl-UE-SelectedConfigRP-r16 SEQUENCE {			
sl-ResourceReservePeriodList-r16 SEQUENCE (SIZE (1..16)) OF SL-ResourceReservePeriod-r16 {	2 entries		
SL-ResourceReservePeriod-r16[1] CHOICE {		entry 1	
sl-ResourceReservePeriod1-r16	ms0		
}			
SL-ResourceReservePeriod-r16[2] CHOICE {		entry 2	
sl-ResourceReservePeriod2-r16	50		
}			
}			
}			
sl-TimeResource-r16	$\{1_i\}$	$\{1_i\}$ is a sequence of ninety-nine 0's with one 1 in (mod(i,100)+1)'th position i = 0,1,2,3	sidelink UE i
}			

Table 9.1.5.2.4.3-5: Physical layer parameters for SCI format 1-A (Sidelink UE 0~3)

Derivation Path: TS 38.508-1 [14] Table 4.3.6.2.1.1-1			
Parameter	**Value**	**Value in binary**	**Condition**
Frequency resource assignment	Not present	-	
Time domain resource assignment	Indicates only one resource is scheduled	"00000"B	
Resource reservation period	Indicates the 2nd entry in sl-ResourceReservePeriodList, i.e. 50 ms	"1"B	

Table 9.1.5.2.4.3-6: +CCUTLE (Test procedure, step 3)

Derivation Path: 38.508-1[14] Table 4.7B-1 with condition Close and Transmit

Table 9.1.5.2.4.3-7: +CCUTLE (Test procedure, step 8)

Derivation Path: 38.508-1[14] Table 4.7B-1 with condition Open

9.1.5.2.5 Test requirement

Active sidelink UE specific test parameters for UE 0~UE 4 are given in Table 9.1.5.2.5-1.

Table 9.1.5.2.5-1: SyncRef UE Specific Test Parameters for NR SA FR1 congestion control measurement for PC5-only operation

Parameter	Unit	Active Sidelink UE *i* (*i* = 0, 1, 2, 3)	
		T1	T2
NR RF Channel Number		1	
Channel Bandwidth ($BW_{channel}$) Note 7	MHz	20 ($N_{RB,c}$ = 50) or 40 ($N_{RB,c}$ = 100)	
PSCCH RMC (defined in A.3.21.3)		CC.1A HD	
PSSCH RMC (defined in A.3.21.3)		CD.1A HD	
Noc Note1	dBm/30 kHz	-104.55 Note 8	
Ês/Noc	dB	4.35	13.62 Note 8
SL-RSSI1 Note 2,3	dBm/3.6 MHz	--78.05	-69.95
SL-RSSI2 Note 2,4	dBm/3.6 MHz	-83.76	-83.76
Io1 Note 2,5	dBm/18 MHz	-78.05	-69.95
	dBm/36 MHz	-78.05	-69.95
Io2 Note 2,6	dBm/18 MHz	-83.76	-83.76
	dBm/36 MHz	-83.76	-83.76
Propagation Condition	-	AWGN	

Note 1: Interference from other UEs and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for Noc to be fulfilled.
Note 2: SL-RSSI1, SL-RSSI2, Io1 and Io2 levels have been derived from other parameters for information purposes. They are not settable parameters themselves.
Note 3: SL-RSSI1 is the SL-RSSI level measured on the slot# 0 - 3 with “SFN mod 5 = 0”.
Note 4: SL-RSSI2 is the SL-RSSI level measured on the slot# 4-9 with “SFN mod 5 = 0” and the slot# 0-9 with “SFN mod 5 = 1,…, 4”.
Note 5: Io1 is the Io level measured on the slot# 0 - 3 with “SFN mod 5 = 0”.
Note 6: Io2 is the Io level measured on the slot# 4-9 with “SFN mod 5 = 0” and the slot# 0-9 with “SFN mod 5 = 1,…, 4”.
Note 7: The UE is only required to be tested in one of the supported test configurations.
Note 8: Including test tolerance given in Annex F.

During T1, all of active sidelink UEs are configured to transmit PSCCH/PSSCH every 50ms such that the SL-RSSI on the resources occupied by active sidelink UEs is lower than *threshS-RSSI-CBR*. Then the measured CBR is lower than 2%. The UE needs to ensure its channel occupancy ratio higher than 1% in T1.

During T2, all of active sidelink UEs are configured to transmit PSCCH/PSSCH every 50ms such that the SL-RSSI on the resources occupied by active sidelink UEs is higher than *threshS-RSSI-CBR*. Then the measured CBR is higher than 2%. The UE needs to ensure its channel occupancy ratio lower than 1% in T2.

The rate of correct events observed during repeated tests shall be at least 98%.

9.1.6 Congestion control measurement

9.1.6.0 Minimum conformance requirements

9.1.6.0.1 Minimum conformance requirements for interruption to WAN due to NR sidelink communication

This clause contains the requirements related to the interruptions on the PCell/serving cell due to NR sidelink communication.

A UE capable of NR sidelink communication may indicate its interest (initiation or termination) in NR sidelink communication to the connected gNB using IE *SidelinkUEInformationNR* in TS 38.331 [13].

The UE is allowed an interruption of up to the duration shown in Table 9.1.6.0.1-1 on the PCell/serving cell during the RRC reconfiguration procedure that includes the V2X sidelink communication configuration message *SL-ConfigDedicatedNR* in TS 38.331 [13] (setup and release). This interruption is for both uplink and downlink of the PCell/serving cell.

Table 9.1.6.0.1-1: Interruption length at V2X RRC reconfiguration

μ	NR Slot length (ms)	Interruption length (number of slots)
0	1	2
1	0.5	3
2	0.25	5
3	0.125	9

The normative references for this requirement are TS 38.133 [6] clause 12.7.

9.1.6.1 NR SA FR1 interruption to WAN due to NR sidelink communication

9.1.6.1.1 Test purpose

The purpose of this test is to verify the requirements related to interruptions due to NR sidelink communication as specified in TS 38.133 [6] clause 12.7.1, when UE is out of coverage on the NR sidelink carrier and is associated with a serving cell on a non-sidelink carrier.

9.1.6.1.2 Test applicability

This test applies to all types of NR UEs from release 16 onwards and supporting NR Uu and sidelink communication.

9.1.6.1.3 Minimum conformance requirements

The minimum conformance requirements are defined in clause 9.1.6.0.1

The normative reference for this requirement is TS 38.133 [6] clause A.9.1.6.1.

9.1.6.1.4 Test description

9.1.6.1.4.1 Initial conditions

This test shall be tested using any of the test configurations in Table 9.1.6.1.4.1-1.

Table 9.1.6.1.4.1-1: Supported test configurations for FR1 NR Cell

Configuration	Description
9.1.6.1-1	NR Uu: FDD, SSB SCS 15 kHz, data SCS 15 kHz, BW 10 MHz
9.1.6.1-2	NR Uu: TDD, SSB SCS 15 kHz, data SCS 15 kHz, BW 10 MHz

9.1.6.1-3	NR Uu: TDD, SSB SCS 30 kHz, data SCS 30 kHz, BW 40 MHz
Note: The UE is only required to pass in one of the supported test configurations in FR1	

Configure the test equipment and the DUT according to the parameters in Table 9.1.6.1.4.1-2.

Table 9.1.6.1.4.1-2: Initial conditions for NR SA FR1 interruption to WAN due to NR sidelink communication

Parameter	Value		Comment
Test environment	NC		As specified in TS 38.508-1 [14] clause 4.1.
Test frequencies	Uu&PC5: As specified in TS 38.508-1 [14] clause 4.3.1.8.2.1.		
Channel bandwidth	Uu: As specified by the test configuration selected from Table 9.1.6.1.4.1-1 PC5: As specified by the test configuration selected from Table 9.1.6.1.4.1-4		
Propagation conditions	AWGN		As specified in Annex C.2.2.
Connection Diagram	TE Part	A.3.1.9.3	As specified in TS 38.508-1 [14] Annex A.
	DUT Part	A.3.2.7.3	
Exceptions to connection diagram	N/A		

1. The parameter settings for the NR sidelink communication are pre-configured according to TS 38.508-1 [14] clause 4.10.1.
2. Message content exceptions are defined in clause 9.1.6.1.4.3
3. There is one NR Uu carrier and one NR Cell (Cell 1) specified in this test. Cell 1 is configured according to Annex C.1.1 and C.1.2.
4. Test parameters for Cell 1 are given in Table 9.1.6.1.4.1-3.
5. There are 8 active sidelink UEs (UE i, i=0,1,...,7) in this test. Test parameters for active sidelink UEs are given in Table 9.1.6.1.4.1-3 and Table 9.1.6.1.4.1-4.

Table 9.1.6.1.4.1-3: General test parameters for NR SA FR1 interruption to WAN due to NR sidelink communication

Parameter	Unit	Value	Comment
RF Channel Number	-	1, 2	RF channel 1 is non-sidelink carrier RF channel 2 is sidelink carrier
SCS	kHz	30	
Active cell	-	Cell 1	PCell on RF channel number 1
CP length of Cell 1	-	Normal	
T1	s	5.12	
T2	s	Up to receiving RRC reconfiguration setup complete from the UE, or up to 2 second if UE does not transmit *SidelinkUEInformationNR* during this period.	
T3	s	10	

Table 9.1.6.1.4.1-4: Sidelink test parameters for NR SA FR1 interruption to WAN due to NR sidelink communication

Parameter	Unit	Value	Comment
RF Channel Number	-	2	HD carrier in Band n47 or n38
Channel Bandwidth ($BW_{channel}$) Note 1	MHz	20 ($N_{RB,c}$ = 50) or 40 ($N_{RB,c}$ = 100)	

Sidelink Communication configuration		-	As specified in Annex A.11.2	IE values unless specified otherwise in this test.
Number of Active Sidelink UEs		-	8	Active Sidelink UE i = 0, .., 7
Active Sidelink UEs (UE i = 0, .., 7)	Sidelink Communication configuration	-	As specified in Annex A.11.2	IE values unless specified otherwise in this test.
	PSCCH Reference Measurement Channel	-	CC.1A HD	As specified in Table A.11.2.2-1
	PSSCH Reference Measurement Channel	-	CD.1A HD	As specified in Table A.11.2.2-2
	sl-NumSubchannel-r16 included in SL-ResourcePool	-	1	Indicates the number of sub-channels for TX resource pool
	sl-StartRB-Subchannel-r16 included in SL-ResourcePool	-	i	Indicates the lowest RB index of the subchannel with the lowest index for active Sidelink UE i = 0, .., 7.
	PSBCH-RSRP	dBm/30kHz	-95	
Note 1: The UE is only required to be tested in one of the supported test configurations.				

9.1.6.1.4.2 Test procedure

In this test there is one active cell (Cell 1) and 8 active sidelink UEs transmitting sidelink communication. The UE under test and all active sidelink UEs select the active cell as synchronization source.

The test consists of three successive time periods, with time duration of T1, T2 and T3 respectively.

For this test, the UE is triggered by the test loop function or the upper layers to monitor NR sidelink communication.

1. Ensure the UE is in state 1N-B with generic procedure parameters Test Mode = *On* according to TS 38.508-1 [14] clause 4.4A.2.
2. The SS switches on all active sidelink UEs. Active sidelink UEs are configured to transmit PSCCH/PSSCH according to the parameters specified in Table 9.1.6.1.4.1-4.
3. The SS sends AT command +CCUTLE to close test loop function and trigger UE to receive.
4. The SS sets parameters according to T1 in Table 9.1.6.1.5-1. T1 starts.
5, When T1 expires, the SS sends a paging message including matched *ng-5G-S-TMSI*.
6. The UE sends an *RRCSetupRequest* message.
7. The SS sends an *RRCSetup* message.
8. The UE sends an *RRCSetupComplete* message.
9. The SS shall switch the power setting from T1 to T2 in Table 9.1.6.1.5-1 upon receiving the *RRCSetupComplete* message sent by the UE, T2 starts.
10. If the UE sends a *SidelinkUEInformationNR* message within 2 seconds from the beginning of T2. continues with step 11, otherwise skips to step 13.
11. The SS sends an *RRCReconfiguration* message with *SL-ConfigDedicatedNR* to provide sidelink communication configuration to the UE.
12. The UE sends a *RRCReconfigurationComplete* message.
13. T2 expires. The SS shall switch the power setting from T2 to T3 in Table 9.1.6.1.5-1. T3 starts.
14. During T3, The SS continuously schedules the UE to perform DL reception in every DL slots and monitoring corresponding ACK/NACK feedback in UL slots.

15. If the SS observes on missing ACK/NACKs until T3 expiring, then count a success for the test, otherwise count a fail for the test.

16. When T3 expires, the SS sends AT command +CCUTLE to open test loop function.

9.1.6.1.4.3 Message contents

Message contents are according to TS 38.508-1 [14] clause 7.3 with the following exceptions:

Table 9.1.6.1.4.3-1: +CCUTLE (Test procedure, step 3)

Derivation Path: 38.508-1[14] Table 4.7B-1 with condition Close and Receive

Table 9.1.6.1.4.3-2: +CCUTLE (Test procedure, step 16)

Derivation Path: 38.508-1[14] Table 4.7B-1 with condition Open

9.1.6.1.5 Test requirement

Cell-specific test parameters for Cell 1 are given in Table 9.1.6.1.5-1.

Table 9.1.6.1.5-1: Cell specific test parameters for NR SA FR1 interruption to WAN due to NR sidelink communication

Parameter		Unit	Cell 1		
			T1	T2	T3
RF Channel Number			1		
UE RRC state			IDLE	CONNECTED	
Duplex Mode	Config 1		FDD		
	Config 2,3		TDD		
TDD configuration	Config 1		Not Applicable		
	Config 2		TDDConf.1.1		
	Config 3		TDDConf.2.1		
Channel Bandwidth ($BW_{channel}$)	Config 1,2	MHz	10: $N_{RB,c}$ = 52		
	Config 3		40: $N_{RB,c}$ = 106		
Initial BWP Configuration			DLBWP.0.1 ULBWP.0.1		
Dedicated BWP Configuration			DLBWP.1.1 ULBWP.1.1		
DRX Cycle			N/A		
PDSCH Reference measurement channel	Config 1		N/A	None	SR.1.1 FDD
	Config 2		N/A	None	SR.1.1 TDD
	Config 3		N/A	None	SR.2.1 TDD
CORESET Reference Channel	Config 1		CR.1.1 FDD		
	Config 2		CR.1.1 TDD		
	Config 3		CR.2.1 TDD		
Dedicated CORESET Reference Channel	Config 1		CCR.1.1 FDD		
	Config 2		CCR.1.1 TDD		
	Config 3		CCR.2.1 TDD		
SSB configuration	Config 1,2		SSB.1 FR1		
	Config 3		SSB.2 FR1		
SMTC Configuration			SMTC.2		
OCNG Patterns			OP.1		
EPRE ratio of PSS to SSS		dB	0		
EPRE ratio of PBCH DMRS to SSS					
EPRE ratio of PBCH to PBCH DMRS					
EPRE ratio of PDCCH DMRS to SSS					
EPRE ratio of PDCCH to PDCCH DMRS					
EPRE ratio of PDSCH DMRS to SSS					
EPRE ratio of PDSCH to PDSCH					
EPRE ratio of OCNG DMRS to SSS(Note 1)					
EPRE ratio of OCNG to OCNG DMRS (Note 1)					

Noc Note2	Config 1,2,3	dBm/15 kHz	-98
Noc Note2	Config 1,2	dBm/SCS	-98
	Config 3		-95
Ês/Noc		dB	3
SS-RSRP Note3	Config 1,2	dBm/SCS	-95
	Config 3		-92
Io Note 3	Config 1,2	dBm/9.36 MHz	-65.3
	Config 3	dBm/38.1 MHz	-59.2
Antenna Configuration			1x2
Propagation Condition			AWGN
Note 1: OCNG shall be used such that cell is fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols. Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for Noc to be fulfilled. Note 3: SS-RSRP levels have been derived from other parameters for information purposes. They are not settable parameters themselves.			

During T1, the UE is in RRC_IDLE and monitoring the sidelink communication transmission from other active Sidelink UEs on the sidelink communication resources.

During T2, the test system establishes a RRC connection with the UE. No PDSCH is scheduled for UE, and the UE is expected to transmit *SidelinkUEInformationNR* indicating *sl-RxInterestedFreqList*. On reception of *SidelinkUEInformationNR*, the test system shall send *RRCReconfiguration* message to the UE and wait for the UE to respond with *RRCReconfigurationComplete* message before transitioning to T3. If the UE does not transmit *SidelinkUEInformationNR* for up to 2 second, the test system shall transition to T3.

During T3, the UE is continuously scheduled with PDSCH on PCell downlink. The test system will count the missed ACK/NACKs during T3 to verify the allowed interruptions during NR sidelink communication. 100% of all expected ACK/NACKs shall be transmitted by the UE.

10 EN-DC Tests with NR PSCell under CCA and Other NR Cells in FR1

Editor's note: Test cases for EN-DC with NR PSCell under CCA and SCell under CCA are also included here.

10.1 RRC_CONNECTED state mobility

FFS

10.2 Timing

FFS

10.3 Signalling characteristics

10.3.1 Radio link monitoring

10.3.1.0 General

The requirements in this section apply for radio link monitoring on a carrier frequency with CCA for the following cells:

- PCell in SA NR operation mode,
- PSCell in EN-DC operation mode.

- PSCell in NR-DC operation mode.

The UE shall monitor the downlink radio link quality based on the reference signal configured as RLM-RS resource(s) in order to detect the downlink radio link quality of the PCell and PSCell as specified in TS 38.213 [8]. The configured RLM-RS resources can be all SSBs, or all CSI-RSs, or a mix of SSBs and CSI-RSs. UE is not required to perform RLM outside the active DL BWP.

On each RLM-RS resource, the UE shall estimate the downlink radio link quality and compare it to the thresholds $Q_{out,CCA}$ and $Q_{in,CCA}$ for the purpose of monitoring downlink radio link quality of the cell.

The threshold $Q_{out,CCA}$ is defined as the level at which the downlink radio link cannot be reliably received and shall correspond to the out-of-sync block error rate ($BLER_{out,CCA}$) as defined in Table 10.3.1.0-1. For SSB based radio link monitoring, $Q_{out_SSB,CCA}$ is derived based on the hypothetical PDCCH transmission parameters listed in Table 10.3.1.0.1-1.

The threshold $Q_{in,CCA}$ is defined as the level at which the downlink radio link quality can be received with significantly higher reliability than at $Q_{out,CCA}$ and shall correspond to the in-sync block error rate ($BLER_{in}$) as defined in Table 10.3.1.0-1. For SSB based radio link monitoring, $Q_{in_SSB,CCA}$ is derived based on the hypothetical PDCCH transmission parameters listed in Table 10.3.1.0.1-2.

The out-of-sync block error rate ($BLER_{out,CCA}$) and in-sync block error rate ($BLER_{in,CCA}$) are determined from the network configuration via parameter *rlmInSyncOutOfSyncThreshold* signalled by higher layers. When UE is not configured with *rlmInSyncOutOfSyncThreshold* from the network, UE determines out-of-sync and in-sync block error rates from Configuration #0 in Table 10.3.1.0-1 as default. All requirements in clause 10.3.1.0 are applicable for BLER Configuration #0 in Table 10.3.1.0-1.

Table 10.3.1.0-1: Out-of-sync and in-sync block error rates

Configuration	$BLER_{out,CCA}$	$BLER_{in,CCA}$
0	10%	2%

UE shall be able to monitor up to N_{RLM} RLM-RS resources of the same or different types in each corresponding carrier frequency range, depending on a maximum number L_{max} of SSBs per half frame according to TS 38.213 [8], where N_{RLM} is specified in Table 10.3.1.0-2, and meet the requirements as specified in clause 10.3.1.0. UE is not required to meet the requirements in clause 10.3.1.0 if RLM-RS is not configured and no TCI state for PDCCH is activated.

Table 10.3.1.0-2: Maximum number of RLM-RS resources N_{RLM}

Carrier frequency range of PCell/PSCell	L_{max}	Maximum number of RLM-RS resources, N_{RLM}
FR1	8	4

In the requirements of clause 10.3.1.0, the term RLM-RS SSB occasion not available at the UE refers to when the RLM-RS SSB is configured by gNB in a cell on a carrier frequency subject to CCA, but the first two successive candidate SSB positions for the same SSB index within the set of configured RLM-RS resources are not available at the UE due to DL CCA failures at gNB during the corresponding evaluation period; otherwise the RLM-RS SSB is considered as available at the UE.

The requirements in clause 10.3.1.0 apply for any *channelAccessMode* configuration [TS 38.331, 13].

The normative reference for this requirement is TS 38.133 [6] clause 8.1A.1.

10.3.1.0.1 Minimum conformance requirements for SSB based Radio Link Monitoring under CCA

The requirements in this clause apply for each SSB based RLM-RS resource configured for PCell or PSCell, provided that the SSB configured for RLM are actually configured to be transmitted within UE active DL BWP during the entire evaluation period specified in clause 10.3.1.0.1.1 but occasionally may not be transmitted due to CCA operation.

Table 10.3.1.0.1-1: PDCCH transmission parameters for out-of-sync evaluation

Attribute	Value for BLER Configuration #0

DCI format	1-0
Number of control OFDM symbols	2
Aggregation level (CCE)	8
Ratio of hypothetical PDCCH RE energy to average SSS RE energy	4 dB
Ratio of hypothetical PDCCH DMRS energy to average SSS RE energy	4 dB
Bandwidth (PRBs)	24
Sub-carrier spacing (kHz)	SCS of the active DL BWP
DMRS precoder granularity	REG bundle size
REG bundle size	6
CP length	Normal
Mapping from REG to CCE	Distributed

Table 10.3.1.0.1-2: PDCCH transmission parameters for in-sync evaluation

Attribute	Value for BLER Configuration #0
DCI payload size	1-0
Number of control OFDM symbols	2
Aggregation level (CCE)	4
Ratio of hypothetical PDCCH RE energy to average SSS RE energy	0dB
Ratio of hypothetical PDCCH DMRS energy to average SSS RE energy	0dB
Bandwidth (PRBs)	24
Sub-carrier spacing (kHz)	SCS of the active DL BWP
DMRS precoder granularity	REG bundle size
REG bundle size	6
CP length	Normal
Mapping from REG to CCE	Distributed

The normative reference for this requirement is TS 38.133 [6] clause 8.1A.2.1.

10.3.1.0.1.1 Minimum requirement for SSB based Radio Link Monitoring under CCA

UE shall be able to evaluate whether the downlink radio link quality on the configured RLM-RS resource estimated over the last $T_{Evaluate_out_SSB,CCA}$ [ms] period becomes worse than the threshold $Q_{out_SSB,CCA}$ within $T_{Evaluate_out_SSB,CCA}$ [ms] evaluation period.

UE shall be able to evaluate whether the downlink radio link quality on the configured RLM-RS resource estimated over the last $T_{Evaluate_in_SSB,CCA}$ [ms] period becomes better than the threshold $Q_{in_SSB,CCA}$ within $T_{Evaluate_in_SSB,CCA}$ [ms] evaluation period. During the in-sync evaluation procedure, layer 1 of the UE shall not send any in-sync indication for the cell to the higher layers when L_{in} exceeds $L_{in,max}$, where L_{in} and $L_{in,max}$ are defined in Table 10.3.1.0.1.1-1.

$T_{Evaluate_out_SSB,CCA}$ and $T_{Evaluate_in_SSB,CCA}$ are defined in Table 10.3.1.0.1.1-1 for FR1.

When concurrent gaps are configured,

- P value for an RLM-RS resource to be measured is defined as N_{total} / $N_{outside_MG}$
- For a window W of duration max(T_{L1}, MGRP_max), where MGRP max is the maximum MGRP across all configured per-UE measurement gap and per-FR measurement gap within the same FR as serving cell, and starting at the beginning of any RLM-RS resource occasion:
  - N_{total} is the total number of RLM-RS resource occasions within the window, including those overlapped with measurement gap occasions within the window, and

- $N_{outside_MG}$ is the number of RLM-RS resource occasions that are not overlapped with any measurement gap occasion within the window W

Otherwise, for a UE not supporting *concurrentMeasGap-r17* or when concurrent gaps are not configured,

For FR1,

- $P = \frac{1}{1-\frac{T_{SSB}}{xGP}}$, when in the monitored cell there are GAPs configured for intra-frequency, inter-frequency or inter-RAT measurements, and these GAPs are overlapping with some but not all occasions of the SSB RLM-RS resources; and
- P=1 when in the monitored cell there are no GAPs overlapping with any occasion of the SSB RLM-RS resources.

When a measurement gap is configured and the measurement gap is not NCSG,

- an RLM-RS resource is considered to be overlapped with the GAP f it overlaps a measurement gap occasion, and
- xRP = MGRP

Otherwise, when NCSG measurement gap is configured,

- an RLM-RS resource is considered to be overlapped with the GAP if it overlaps the VIL1 or VIL2 of NCSG, and
- xRP = VIRP

If the UE is configured with Pre-MG, an RLM-RS resource is only considered to be overlapped by the Pre-MG if the Pre-MG is activated.

When concurrent gaps are configured, an RLM-RS is not considered to be overlapped by a gap occasion if the gap occasion is dropped according to 38.133 [6] section 9.1.8.

Longer evaluation period would be expected if the combination of RLM-RS resource, SMTC occasion and GAP configurations does not meet previous conditions.

Table 10.3.1.0.1.1-1: Evaluation period $T_{Evaluate_out_SSB,CCA}$ and $T_{Evaluate_in_SSB,CCA}$ for FR1

Configuration	$T_{Evaluate_out_SSB,CCA}$ (ms)		$T_{Evaluate_in_SSB,CCA}$ (ms)
	RLM-RS SSB Es/Iot Note4 ≥-7 dB	RLM-RS SSB Es/Iot Note4 <-7 dB	
no DRX	Max(200, Ceil(17*P)*T_{SSB})	Max(200, Ceil(24*P)*T_{SSB})	Max(100, Ceil((5+L_{in})*P)*T_{SSB})
DRX cycle≤320	Max(200, Ceil(1.5*15*P)*Max(T_{DRX},T_{SSB}))	Max(200, Ceil(1.5*20*P)*Max(T_{DRX},T_{SSB}))	Max(100, Ceil(1.5*(5+L_{in})*P)*Max(T_{DRX},T_{SSB}))
DRX cycle>320	Ceil(13*P)*T_{DRX}	Ceil(16*P)*T_{DRX}	Ceil((5+L_{in})*P)*T_{DRX}

NOTE 1: T_{SSB} is the periodicity of the SSB configured for RLM. T_{DRX} is the DRX cycle length.
NOTE 2: When DRX is not configured, L_{in} is the number of RLM-RS SSB occasions which are not available at the UE during $T_{Evaluate_in_SSB,CCA}$, where $L_{in} \le L_{in,max}$. When DRX is configured, L_{in} is the number of DRX cycles in which at least one RLM-RS SSB occasion is not available at the UE during $T_{Evaluate_in_SSB,CCA}$, where $L_{in} \le L_{in,max}$. The UE is not required to determine the availability of SSB occasions more frequent than
Once per Max(10ms, P * T_{SSB}) if no DRX is used,
Once per Max(10ms, Ceil(1.5 * P) * Max(T_{DRX}, T_{SSB})) if DRX cycle ≤ 320ms,
Once per P * T_{DRX} if DRX cycle > 320ms.
NOTE 3: $L_{in,max}$=7 for Max(T_{DRX},T_{SSB}) ≤ 40 assuming T_{DRX}=0 for non-DRX case,
$L_{in,max}$=5 for 40<Max(T_{DRX},T_{SSB})≤320,
$L_{in,max}$=3 for T_{DRX}>320.
NOTE 4: RLM-RS SSB Es/Iot is the averaged Es/Iot over the most recent previous out-of-sync evaluation period.

The normative reference for this requirement is TS 38.133 [6] clause 8.1A.2.2.

10.3.1.0.1.2 Measurement restrictions for SSB based RLM under CCA

The UE is required to be capable of measuring SSB for RLM without measurement gaps. The UE is required to perform the SSB measurements with measurement restrictions as described in the following clauses.

For FR1, when the SSB for RLM is in the same OFDM symbol as CSI-RS for RLM, BFD, CBD or L1-RSRP measurement,

- If SSB and CSI-RS have same SCS, UE shall be able to measure the SSB for RLM without any restriction;
- If SSB and CSI-RS have different SCS,
  - If UE supports *simultaneousRxDataSSB-DiffNumerology*, UE shall be able to measure the SSB for RLM without any restriction;
  - If UE does not support *simultaneousRxDataSSB-DiffNumerology*, UE is required to measure SSB for RLM.

The normative reference for this requirement is TS 38.133 [6] clause 8.1A.2.3.

10.3.1.1 Requirements for determining UE in-sync or out-of-sync status

In the test cases specified in clause 10.3.1, any uplink signal transmitted by the UE is used for detecting the in-/out-of-sync state of the UE. In terms of measurement, the uplink signal is verified based on the UE output power:

- UE output power higher than Transmit OFF power -50 dBm (as defined in TS 38.101-3 [4]) means uplink signal
- UE output power equal to or less than Transmit OFF power -50 dBm (as defined in TS 38.101-3 [4]) means no uplink signal.

For intra-band contiguous carrier aggregation, transmit OFF power is measured as the mean power per component carrier.

For UE with multiple transmit antennas, transmit OFF power is measured as the mean power at each transmit connector.

The normative reference for this requirement is TS 38.133 [6] clause A.10.3.1.1.

10.3.1.2 EN-DC FR1 Radio link monitoring out-of-sync test for PSCell configured with SSB-based RLM RS in non-DRX mode under CCA

Editor's Note:

- MU and TT analysis is incomplete
- Message contents may need to be updated
- Call setup and test procedure may need to be updated
- Statistical analysis to determine test case verdict is FFS

10.3.1.2.1 Test purpose

The purpose of this test is to verify that the UE properly detects the out-of-sync and in-sync for the purpose of monitoring downlink radio link quality of the PSCell. This test will partly verify the FR1 PSCell radio link monitoring requirements in clause 10.3.1.0

10.3.1.2.2 Test applicability

This test applies to all types of E-UTRA UE release 16 and forward, supporting EN-DC, supporting NR-U and supporting UL and SSB-based RLM on shared channel access

10.3.1.2.3 Minimum conformance requirement

The minimum requirements are specified in clause 10.3.1.0.1. The measurement restrictions for SSB based RLM under CCA are specified in clause 10.3.1.0.2. DRX configuration is not used for this test.

The normative reference for this requirement is TS 38.133 [6] clause A.10.3.1.2.

10.3.1.2.4 Test description

In the test, UE is configured to perform RLM based on SSB, with *detectionResource* included in *RadioLinkMonitoringRS* set to SSB#0 and SSB#1, and *purpose* set to '*rlf*'. Supported test configurations are shown in Table 10.3.1.2.4.1-1. The test parameters are given in Tables 10.3.1.2.4.1-3, 10.3.1.2.5-1, and 10.3.1.2.5-2 below.

The test consists of three successive time periods, with time duration of T1, T2 and T3, respectively. Figure 10.3.1.2.4-1 shows the variation of the downlink SNR in the active Cell 2 to emulate out-of-sync and in-sync states. Prior to the start of the time duration T1, the UE shall be fully synchronized to Cell 1 and Cell 2. The UE shall be configured for periodic CSI reporting with a reporting periodicity of 5 ms. The UE transmits according to UL CCA model. The UE is configured to perform inter-frequency measurements using Gap Pattern ID #0 (40 ms) in the test.

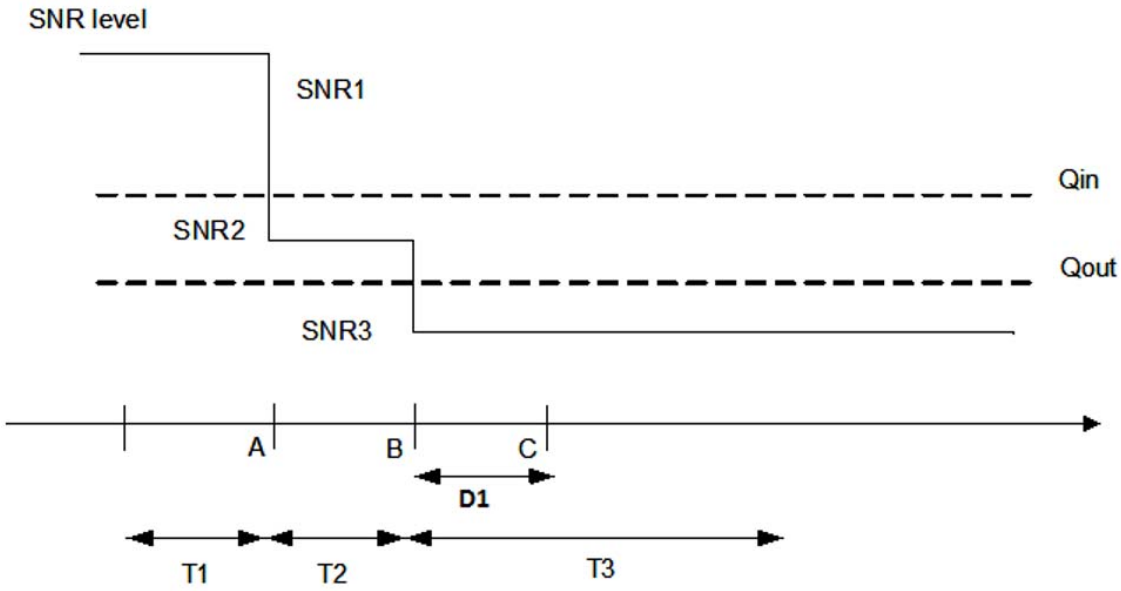


Figure 10.3.1.2.4-1: SNR variation for EN-DC FR1 Radio link monitoring out-of-sync test for PSCell configured with SSB-based RLM RS in non-DRX mode under CCA

10.3.1.2.4.1 Initial conditions

This test shall be tested using any of the test configurations in Table 10.3.1.2.4.1-1.

Table 10.3.1.2.4.1-1:Supported test configurations for EN-DC FR1 Radio link monitoring out-of-sync test for PSCell configured with SSB-based RLM RS in non-DRX mode under CCA

Configuration	Description
10.3.1.2-1	LTE FDD; NR: TDD, SSB SCS 30 kHz, data SCS 30 kHz, BW 40 MHz
10.3.1.2-2	LTE TDD; NR: TDD, SSB SCS 30 kHz, data SCS 30 kHz, BW 40 MHz
NOTE: The UE is only required to pass in one of the supported test configurations above.	

Configure the test equipment and the DUT according to the parameters in Table 10.3.1.2.4.1-2.

Table 10.3.1.2.4.1-2: Initial conditions for EN-DC FR1 Radio link monitoring out-of-sync test for PSCell configured with SSB-based RLM RS in non-DRX mode under CCA

Parameter	Value		Comment
Test environment	NC		As specified in TS 38.508-1 [14] clause 4.1.
Test frequencies	As specified in Annex E, table E.2-1 and TS 38.508-1 [14] clause 4.3.1 and 4.4.2.		
Channel bandwidth	As specified by the test configuration selected from Table 10.3.1.2.4.1-1.		
Propagation conditions	AWGN		As specified in clause C.2.2.
Connection Diagram	TE Part	A.3.1.7.1	As specified in TS 38.508-1 [14] Annex A.
	DUT Part	A.3.2.3.4	
Exceptions to connection diagram	For 4Rx capable UEs without any 2 Rx RF bands use A.3.2.5.2 for DUT part and A.3.1.8.4 for TE Part		

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1. Message contents are defined in clause 10.3.1.2.4.3.
2. The power levels and settings for Cell 1 are set according to Annex A.6. Cell 2 is NR FR1 PSCell. The connection setup is done according to the settings in clause C.1.3, and the downlink signal levels as per clause C.1.2.
3. The test parameters are given in Table 10.3.1.2.4.1-3 below.
4. Downlink signals for NR cell are initially set up according to clauses C.1.2 and C.1.3.

Table 10.3.1.2.4.1-3: General test parameters for EN-DC FR1 Radio link monitoring out-of-sync test for PSCell configured with SSB-based RLM RS in non-DRX mode under CCA

Parameter		Unit	Value
			Test 1
Active E-UTRA PCell			Cell 1
E-UTRA RF Channel Number			1
Active PSCell			Cell 2
RF Channel Number			2
DL CCA model			As specified in clause D.7.2.1
UL CCA model			As specified in clause D.7.2.2
Duplex mode	Config 1,2		TDD
$BW_{channel}$	Config 1,2	MHz	40: $N_{RB,c}$ = 106
DL initial BWP configuration	Config 1,2		[DLBWP.0.1]
DL dedicated BWP configuration	Config 1,2		[DLBWP.1.1]
UL initial BWP configuration	Config 1,2		[ULBWP.0.1]
UL dedicated BWP configuration	Config 1,2		[ULBWP.1.1]
TDD configuration	Config 1,2		TDDConf.1.1 CCA
CORESET Reference Channel	Config 1,2		CR.1.1 CCA
SSB configuration for semi-static channel access Note 4, 6	Config 1,2		SSB.1 CCA
SSB configuration for dynamic channel access Note 5, 6	Config 1,2		SSB.2 CCA
DBT window configuration	Config 1,2		DBT.1
PDSCH/PDCCH subcarrier spacing	Config 1,2		30 kHz
PRACH Configuration	Config 1,2		FR1 PRACH configuration 1 under CCA
SSB index assigned as RLM RS			0
OCNG parameters			[OP.1]
CP length			Normal

Correlation Matrix and Antenna Configuration			2x2 Low
Out of sync transmission parameters	DCI format		[1-0]
	Number of Control OFDM symbols		[2]
	Aggregation level	CCE	[8]
	Ratio of hypothetical PDCCH RE energy to average SSS RE energy	dB	[4]
	Ratio of hypothetical PDCCH DMRS energy to average SSS RE energy	dB	[4]
	DMRS precoder granularity		REG bundle size
	REG bundle size		[6]
DRX			OFF
Gap pattern ID			gp0
Layer 3 filtering			Enabled
T310 timer		ms	0
T311 timer		ms	1000
N310			1
N311			1
CSI-RS configuration for CSI reporting	Config 1,2		[CSI-RS.2.1 TDD]
CSI-RS for tracking	Config 1,2		[TRS.1.2 TDD]
T1		s	0.2
T2		s	1.04
T3		s	1.04
D1		s	1
NOTE 1: All configurations are assigned to the UE prior to the start of time period T1. NOTE 2: UE-specific PDCCH is not transmitted after T1 starts. NOTE 3: E-UTRAN is in non-DRX mode under test. NOTE 4: For UE supporting semi-static channel access and network configuring semi-static channel occupancy. NOTE 5: For UE supporting dynamic channel access and network configuring dynamic channel occupancy. NOTE 6: For a UE supporting both semi-static and dynamic channel access, the UE can be tested under dynamic channel occupancy only.			

10.3.1.2.4.2 Test Procedure

There are two cells, cell 1 is the E-UTRAN PCell, and cell 2 is the PSCell which operates on a carrier frequency with CCA and transmits SSBs in DBT windows according to DL CCA model.

Prior to the start of the time duration T1, the UE shall be fully synchronized to PSCell. The UE shall be configured for periodic CSI reporting in PUCCH format 2 with a reporting periodicity as mentioned in the above table 10.3.1.2.4.1-4. The UE transmits the reporting according to UL CCA model. In the test, DRX configuration is not enabled. The UE is configured to perform inter-frequency measurements using GP ID #0 (40 ms) in test 1.

1. Ensure the UE is in [state RRC_CONNECTED with generic procedure parameters *Connectivity* EN-DC, DC bearer MCG and SCG, Connected without release *On* and Test Mode *On*] according to TS 38.508-1 [6] clause 4.5.

2. The SS shall transmit an *RRCConnectionReconfiguration* message (embedded in *RRCConnectionReconfiguration* message) configuring the UE for inter-frequency measurements with the corresponding gap pattern and periodic CSI reporting.

3. The UE shall transmit *RRCReconfigurationComplete* message (embedded in *RRCConnectionReconfigurationComplete* message).

4. Set the parameters according to T1 in Table 10.3.1.2.5-1. Propagation conditions are set according to clause C.2.3. T1 starts.

5. When T1 expires the SS shall change the SNR value to T2 as specified in Table 10.3.1.2.5-1

6. When T2 expires the SS shall change the SNR value to T3 as specified in Table 10.3.1.2.5-1

7. If the SS:

   a) detects uplink power equal to or higher than minimum output power, according to section 10.3.1.1, in each subframe configured for CSI transmission (according to configured CSI periodicity on PUCCH format 2) during the period from time point A to time point B; and

   b) does not detect any uplink power higher than OFF power, according to section 10.3.1.1, from time point C (D1 after the start of T3) until T3 expires, the number of successful tests is increased by one.

   Otherwise, the number of failed tests is increased by one and proceed to step 10.

8. When T3 expires the SS shall change the SNR value to T1 as specified in Table 10.3.1.2.5-1.

9. If the UE has re-established the connection within [2] seconds, proceed with step 11. Otherwise, proceed with step 10.

10. The SS shall switch off and then on the UE and then proceed with step 1.

11. Repeat steps 14-9 until the confidence level according to [Tables G TBD in Annex G clause G. TBD] is achieved.

10.3.1.2.4.3 Message Contents

Message contents are according to TS 38.508-1 [14] clauses 4.6.1 and 7.3 with the following exceptions:

Table 10.3.1.2.4.3-1: Common Exception messages for EN-DC FR1 Radio link monitoring out-of-sync test for PSCell configured with SSB-based RLM RS in non-DRX mode under CCA

Default Message Contents	
Common contents of system information blocks exceptions	
Default RRC messages and information elements contents exceptions	Table H.3.1-1 Table H.3.1-2 with Condition INTER-FREQ, L3 FILTERING NEEDED, Table H.3.1-3 with Condition INTER-FREQ MO (where ssbFrequency is set to the ARFCN value of carrier centre of [High] range) Table H.3.1-4 with A3-offset = 0 Table H.3.1-6 with conditions gapUE and RLM Table H.3.1-8 with Condition SSB RLM Table H.3.4-4 with Condition gapUE Table H.3.5-4 Table H.3.5-9 [Table 7.3.1-3 in TS 38.508-1 [14] with condition DBT.1]

Table 10.3.1.2.4.3-2: *RLF-TimersAndConstants* for EN-DC FR1 Radio link monitoring out-of-sync test for PSCell configured with SSB-based RLM RS in non-DRX mode under CCA

Derivation Path: TS 38.508-1 [14], Table 4.6.3-150			
Information Element	**Value/remark**	**Comment**	**Condition**
RLF-TimersAndConstants ::= SEQUENCE {			
t310	ms0		
n310	n1		
t311	ms1000		
n311	n1		
}			

10.3.1.2.5 Test Requirement

Table 10.3.1.2.5-1 and Table 10.3.1.2.5-2 define the cell specific primary level settings including test tolerances and the measurement gap configuration for EN-DC FR1 Radio link monitoring out-of-sync test for PSCell configured with SSB-based RLM RS in non-DRX mode under CCA.

Table 10.3.1.2.5-1: Cell-specific test parameters for EN-DC FR1 Radio link monitoring out-of-sync test for PSCell configured with SSB-based RLM RS in non-DRX mode under CCA

Parameter		Unit	Test 1		
			T1	T2	T3
DL CCA probability P_{CCA_DL}	Note 6,8		P_{CCA_DL}=0.9375		
	Note 7,8		$P_{CCA_DL_1}$=0.75 $P_{CCA_DL_2}$=0.75		
UL CCA probability P_{CCA_UL}			1		
EPRE ratio of PDCCH DMRS to SSS		dB	4		
EPRE ratio of PDCCH to PDCCH DMRS		dB	0		
EPRE ratio of PBCH DMRS to SSS		dB	0		
EPRE ratio of PBCH to PBCH DMRS		dB			
EPRE ratio of PSS to SSS		dB			
EPRE ratio of PDSCH DMRS to SSS		dB			
EPRE ratio of PDSCH to PDSCH DMRS		dB			
EPRE ratio of OCNG DMRS to SSS		dB			
EPRE ratio of OCNG to OCNG DMRS		dB			
SNR[Note 3,4] on RLM-RS	Config 1,2	dB	1+TT	[-7] +TT	-15+TT
SNR on other channels and signals	Config 1,2	dB	1+TT		
N_{oc}	Config 1,2	dBm/ SCS	-95+TT		
Propagation condition			TDL-C 300 ns 100 Hz		

NOTE 1: OCNG shall be used such that the resources in Cell 1 are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols. For cells with CCA model, OCNG is transmitted only in slots with RMC burst transmission and is not transmitted during muted slots or during DBT windows.
NOTE 2: The signal contains PDCCH for UEs other than the device under test as part of OCNG.
NOTE 3: SNR levels correspond to the signal to noise ratio over the transmitted SSS REs during DBT windows.
NOTE 4: The SNR in time periods T1, T2 and T3 is denoted as SNR1, SNR2 and SNR3, respectively, in Figure A.10.3.1.2.1-1.
NOTE 5: The SNR values are specified for testing a UE which supports 2 RX on at least one band. For testing of a UE which supports 4 RX on all bands, the SNR during T3 is A.3.6.
NOTE 6: For UE supporting semi-static channel access and network configuring semi-static channel occupancy.
NOTE 7: For UE supporting dynamic channel access and network configuring dynamic channel occupancy.
NOTE 8: For UE supporting both semi-static and dynamic channel access, the UE can be tested under dynamic channel occupancy only.

Table 10.3.1.2.5-2: Measurement gap configuration for EN-DC FR1 Radio link monitoring out-of-sync test for PSCell configured with SSB-based RLM RS in non-DRX mode under CCA

Field	Test 1
	Value
gapOffset	0

NOTE 1: E-UTRAN PCell and PSCell are SFN-synchronous and frame boundary aligned.
NOTE 2: Ensure that RLM RS is partially overlapped with measurement gap.

The UE behaviour in each test during time durations T1, T2 and T3 shall be as follows.

During the period from time point A to time point B the UE shall transmit uplink signal at least in all uplink slots configured for CSI transmission according to the configured periodic CSI reporting.

The UE shall stop transmitting uplink signal no later than time point C (D1 second after the start of the time duration T3).

The rate of correct events observed during repeated tests shall be at least 90 %.

10.3.1.3 EN-DC FR1 Radio link monitoring in-sync test for PSCell configured with SSB-based RLM RS in non-DRX mode under CCA

Editor's Note:

- MU and TT analysis is incomplete
- Message contents may need to be updated
- Call setup and test procedure may need to be updated
- Statistical analysis to determine test case verdict is FFS

10.3.1.3.1 Test purpose

The purpose of this test is to verify that the UE properly detects the out of sync and in sync for the purpose of monitoring downlink radio link quality of the PSCell. This test will partly verify the FR1 PSCell radio link monitoring requirements in clause 10.3.1.0.

10.3.1.3.2 Test applicability

This test applies to all types of E-UTRA UE release 16 and forward, supporting EN-DC, supporting NR-U and supporting UL and SSB-based RLM on shared channel access

10.3.1.3.3 Minimum conformance requirements

The minimum requirements are specified in clause 10.3.1.0.1. The measurement restrictions for SSB based RLM under CCA are specified in clause 10.3.1.0.2. DRX configuration is not used for this test.

The normative reference for this requirement is TS 38.133 [6] clause A.10.3.1.3.

10.3.1.3.4 Test description

In the test, UE is configured to perform RLM on SSB, with *detectionResource* included in *RadioLinkMonitoringRS* set to SSB#0 and SSB#1, and *purpose* set to '*rlf*'. Supported test configurations are shown in table10.3.1.3.4.1-1. The test parameters are given in Tables10.3.1.3.4.1-3, and 10.3.1.3.5-1 below.

The test consists of five successive time periods, with time duration of T1, T2, T3, T4 and T5 respectively. Figure 10.3.1.3.4.1-1 shows the variation of the downlink SNR in the active cell to emulate out-of-sync and in-sync states. Prior to the start of the time duration T1, the UE shall be fully synchronized to Cell 1. The UE shall be configured for periodic CSI reporting with a reporting periodicity of 5 ms. The UE transmits according to UL CCA model.

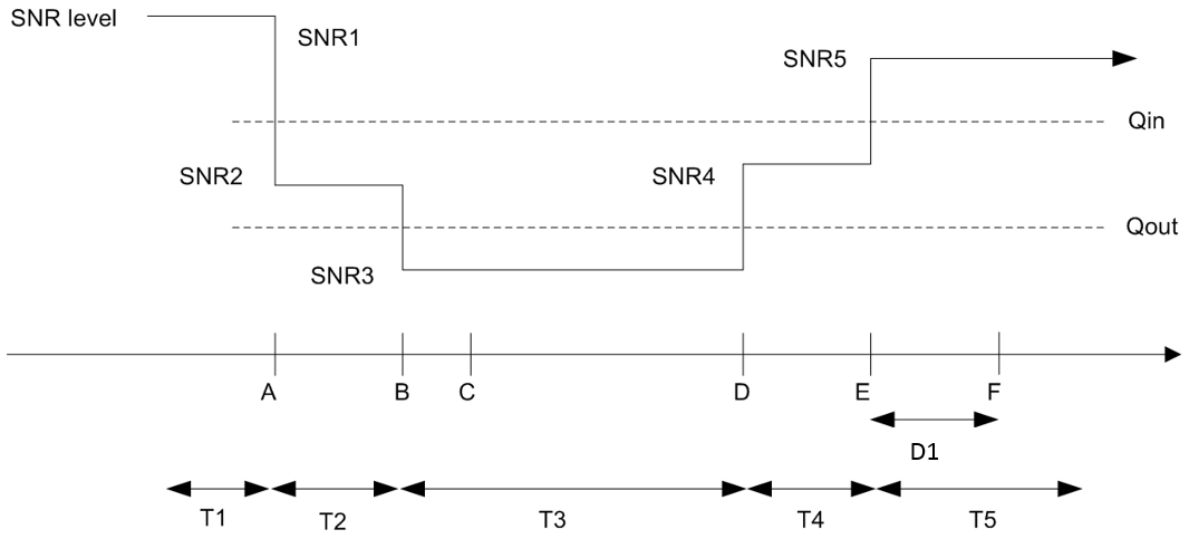

Figure 10.3.1.3.4-1: SNR variation for EN-DC FR1 Radio link monitoring in-sync test for PSCell configured with SSB-based RLM RS in non-DRX mode under CCA

10.3.1.3.4.1 Initial conditions

This test shall be tested using any of the test configurations in Table 10.3.1.3.4.1-1.

Table 10.3.1.3.4.1-1: Supported test configurations for EN-DC FR1 Radio link monitoring in-sync test for PSCell configured with SSB-based RLM RS in non-DRX mode under CCA

Configuration	Description
10.3.1.3-1	LTE FDD; NR: TDD, SSB SCS 30 kHz, data SCS 30 kHz, BW 40 MHz
10.3.1.3-2	LTE TDD; NR: TDD, SSB SCS 30 kHz, data SCS 30 kHz, BW 40 MHz
NOTE: The UE is only required to pass in one of the supported test configurations above.	

Configure the test equipment and the DUT according to the parameters in Table 10.3.1.3.4.1-2.

Table 10.3.1.3.4.1-2: Initial conditions for EN-DC FR1 Radio link monitoring in-sync test for PSCell configured with SSB-based RLM RS in non-DRX mode under CCA

Parameter	Value		Comment
Test environment	NC		As specified in TS 38.508-1 [14] clause 4.1.
Test frequencies	As specified in Annex E, table E.2-1 and TS 38.508-1 [14] clause 4.3.1 and 4.4.2.		
Channel bandwidth	As specified by the test configuration selected from Table 10.3.1.3.4.1-1.		
Propagation conditions	AWGN		As specified in clause C.2.2.
Connection Diagram	TE Part	A.3.1.7.1	As specified in TS 38.508-1 [14] Annex A.
	DUT Part	A.3.2.3.4	
Exceptions to connection diagram	For 4Rx capable UEs without any 2 Rx RF bands use A.3.2.5.2 for DUT part and A.3.1.8.4 for TE Part		

1. Message contents are defined in clause 10.3.1.3.4.3.

2. The power levels and settings for Cell 1 are set according to Annex A.6. Cell 2 is NR FR1 PSCell. The connection setup is done according to the settings in clause C.1.3, and the downlink signal levels as per clause C.1.2

3. The general test parameters are given in Table 10.3.1.3.4.1-4.

4. Downlink signals for NR cell are initially set up according to clauses C.1.2 and C.1.3.

Table 10.3.1.3.4.1-4: General test parameters for EN-DC FR1 Radio link monitoring in-sync test for PSCell configured with SSB-based RLM RS in non-DRX mode under CCA

Parameter			Unit	Value
				Test 1
Active E-UTRA PCell				Cell 1
E-UTRA RF Channel Number				1
Active PSCell				Cell 2
RF Channel Number				2
DL CCA model				As specified in clause D.7.2.1
UL CCA model				As specified in clause D.7.2.2
Duplex mode		Config 1,2		TDD
$BW_{channel}$		Config 1,2	MHz	40: $N_{RB,c}$ = 106
DL initial BWP configuration		Config 1,2		[DLBWP.0.1]
DL dedicated BWP configuration		Config 1,2		[DLBWP.1.1]
UL initial BWP configuration		Config 1,2		[ULBWP.0.1]
UL dedicated BWP configuration		Config 1,2		[ULBWP.1.1]
TDD Configuration		Config 1,2		TDDConf.1.1 CCA
CORESET Reference Channel		Config 1,2		CR.1.1 CCA
SSB configuration for semi-static channel access Note 3, 5		Config 1,2		SSB.1 CCA
SSB configuration for dynamic channel access Note 4,5		Config 1,2		SSB.2 CCA
DBT window configuration		Config 1,2		DBT.1
PDSCH/PDCCH subcarrier spacing		Config 1,2		30 kHz
PRACH Configuration		Config 1,2		FR1 PRACH configuration 1 under CCA
SSB index assigned as RLM RS				0
OCNG parameters				OP.1
CP length				Normal
Correlation Matrix and Antenna Configuration				2x2 Low
In sync transmission parameters	DCI format			1-0
	Number of Control OFDM symbols			2
	Aggregation level		CCE	4
	Ratio of hypothetical PDCCH RE energy to average SSS RE energy		dB	0
	Ratio of hypothetical PDCCH DMRS energy to average SSS RE energy		dB	0
	DMRS precoder granularity			REG bundle size
	REG bundle size			6
Out of sync transmission parameters	DCI format			1-0
	Number of Control OFDM symbols			2
	Aggregation level		CCE	8

	Ratio of hypothetical PDCCH RE energy to average SSS RE energy	dB	4
	Ratio of hypothetical PDCCH DMRS energy to average SSS RE energy	dB	4
	DMRS precoder granularity		REG bundle size
	REG bundle size		6
DRX			*OFF*
Gap pattern ID			N/A
Layer 3 filtering			*Enabled*
T310 timer		ms	2000
T311 timer		ms	1000
N310			1
N311			1
CSI-RS configuration for CSI reporting	Config 1,2		CSI-RS.2.1 TDD
CSI-RS for tracking	Config 1,2		TRS.1.2 TDD
T1		s	0.2
T2		s	0.2
T3		s	0.52
T4		s	0.2
T5		s	2.04
D1		s	2
NOTE 1: All configurations are assigned to the UE prior to the start of time period T1. NOTE 2: UE-specific PDCCH is not transmitted after T1 starts. NOTE 3: For UE supporting semi-static channel access and network configuring semi-static channel occupancy. NOTE 4: For UE supporting dynamic channel access and network configuring dynamic channel occupancy. NOTE 5: For a UE supporting both semi-static and dynamic channel access, the UE can be tested under dynamic channel occupancy only.			

10.3.1.3.4.2 Test procedure

There are two cells, cell 1 is the E-UTRAN PCell, and cell 2 is the PSCell which operates on a carrier frequency with CCA and transmits SSBs in DBT windows according to DL CCA model.

Prior to the start of the time duration T1, the UE shall be fully synchronized to PSCell. The UE shall be configured for periodic CSI reporting in PUCCH format 2 with a reporting periodicity as mentioned in the above table 10.3.1.3.4.1-4. The UE transmits the reporting according to UL CCA model. In the test, DRX configuration is not enabled.

1. Ensure the UE is in [state RRC_CONNECTED with generic procedure parameters *Connectivity* EN-DC, DC bearer MCG and SCG, Connected without release *On* and Test Mode *On*] according to TS 38.508-1 [6] clause 4.5.

2. The SS shall transmit an *RRCConnectionReconfiguration* message (embedded in *RRCConnectionReconfiguration* message) to configure periodic CSI reporting.

3. The UE shall transmit *RRCReconfigurationComplete* message (embedded in *RRCConnectionReconfigurationComplete* message).

4. Set the parameters of NR Cell according to T1 in Table 10.3.1.3.5-1. Propagation conditions are set according to clause C.2.3. T1 starts.

5. When T1 expires the SS shall change the SNR value to T2 as specified in Table 10.3.1.2.5-1. T2 starts.

6. When T2 expires the SS shall change the SNR value to T3 as specified in Table 10.3.1.2.5-1. T3 starts.

7. When T3 expires the SS shall change the SNR value to T4 as specified in Table 10.3.1.3.5-1. T4 starts.

8. When T4 expires the SS shall change the SNR value to T5 as specified in Table 10.3.1.3.5-1. T5 starts.

9. If the SS detects uplink power equal to or higher than minimum output power, according to section 10.3.1.1, in each subframe configured for CSI transmission (according to configured CSI periodicity on [PUCCH format 2]) during the period from time point A to time point F (D1 seconds after the start of time duration T5), the number of successful tests is increased by one. After the expiration of T5, the SS shall proceed with step 11 for the next iteration, or with step 10.

   Otherwise, the number of failed tests is increased by one and proceed with step 10.

10. The SS shall switch off and then on the UE and then proceed with step 11.

11. Repeat steps 1-9 until the confidence level according to [Tables G.TBD in Annex G clause G.TBD] is achieved.

10.3.1.3.4.3 Message Contents

Message contents are according to TS 38.508-1 [14] clauses 4.6.1 and 7.3 with the following exceptions:

Table 10.3.1.3.4.3-1: Common Exception messages for EN-DC FR1 Radio link monitoring in-sync test for PSCell configured with SSB-based RLM RS in non-DRX mode under CCA

Default Message Contents	
Common contents of system information blocks exceptions	
Default RRC messages and information elements contents exceptions	Table H.3.1-1 Table H.3.1-2 with Condition INTER-FREQ, L3 FILTERING NEEDED, Table H.3.1-3 with Condition INTER-FREQ MO (where ssbFrequency is set to the ARFCN value of carrier centre of [High] range) Table H.3.1-4 with A3-offset = 0 Table H.3.1-8 with Condition SSB RLM Table H.3.5-4 Table H.3.5-9 [Table 7.3.1-3 in TS 38.508-1 [14] with condition DBT.1]

Table 10.3.1.3.4.3-2: *RLF-TimersAndConstants* for EN-DC FR1 Radio link monitoring in-sync test for PSCell configured with SSB-based RLM RS in non-DRX mode under CCA

Derivation Path: TS 38.508-1 [14], Table 4.6.3-150			
Information Element	**Value/remark**	**Comment**	**Condition**
RLF-TimersAndConstants ::= SEQUENCE {			
t310	ms2000		
n310	n1		
t311	ms1000		
n311	n1		
}			

10.3.1.3.5 Test Requirement

Table 10.3.1.3.5-1 defines the cell specific primary level settings including test tolerances for EN-DC FR1 Radio link monitoring in-sync test for PSCell configured with SSB-based RLM RS in non-DRX mode under CCA.

Table 10.3.1.3.5-1: Cell-specific test parameters for EN-DC FR1 Radio link monitoring in-sync test for PSCell configured with SSB-based RLM RS in non-DRX mode under CCA

Parameter		Unit	Test 1				
			T1	T2	T3	T4	T5
DL CCA probability P_{CCA_DL}	Note 6,8		P_{CCA_DL}=0.9375				
	Note 7,8		$P_{CCA_DL_1}$=0.75 $P_{CCA_DL_2}$=0.75				
UL CCA probability P_{CCA_UL}			1				

L_{CCA_DL}			7				
W_{CCA_DL}		ms	$T_{Evaluate_in_SSB,CCA}$ NOTE 9				
EPRE ratio of PDCCH DMRS to SSS		dB	4				
EPRE ratio of PDCCH to PDCCH DMRS		dB	0				
EPRE ratio of PBCH DMRS to SSS		dB	0				
EPRE ratio of PBCH to PBCH DMRS		dB					
EPRE ratio of PSS to SSS		dB					
EPRE ratio of PDSCH DMRS to SSS		dB					
EPRE ratio of PDSCH to PDSCH DMRS		dB					
EPRE ratio of OCNG DMRS to SSS		dB					
EPRE ratio of OCNG to OCNG DMRS		dB					
SNR on RLM-RS	Config 1,2	dB	1+TT	[-7] +TT	[-15] +TT	[-4.5] +TT	1+TT
SNR on other channels and signals	Config 1,2	dB	1+TT				
N_{oc}	Config 1,2	dBm/ SCS	-95+TT				
Propagation condition			TDL-C 300ns 100Hz				

NOTE 1: OCNG shall be used such that the resources in Cell 1 are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols. For cells with CCA model, OCNG is transmitted only in slots with RMC burst transmission and is not transmitted during muted slots or during DBT windows.
NOTE 2: The signal contains PDCCH for UEs other than the device under test as part of OCNG.
NOTE 3: SNR levels correspond to the signal to noise ratio over the transmitted SSS REs during DBT windows.
NOTE 4: The SNR in time periods T1, T2, T3, T4 and T5 is denoted as SNR1, SNR2, SNR3, SNR4 and SNR5 respectively in Figure 10.3.1.3.4-1.
NOTE 5: The SNR values are specified for testing a UE which supports 2RX on at least one band. For testing of a UE which supports 4 RX on all bands, the SNR during T3 and T4 is modified as specified in clause D.4A.
NOTE 6: For UE supporting semi-static channel access and network configuring semi-static channel occupancy.
NOTE 7: For UE supporting dynamic channel access and network configuring dynamic channel occupancy.
NOTE 8: For UE supporting both semi-static and dynamic channel access, the UE can be tested under dynamic channel occupancy only.
NOTE 9: As defined in Table 10.3.1.0.1.1-1.

The UE behaviour in each test during time durations T1, T2, T3, T4 and T5 shall be as follows:

During the period from time point A to time point F (D1 second after the start of time duration T5) the UE shall transmit uplink signal at least in all uplink slots configured for CSI transmission according to the configured periodic CSI reporting.

The rate of correct events observed during repeated tests shall be at least 90% with a confidence interval of 95 %.

10.3.1.4 EN-DC FR1 Radio link monitoring out-of-sync test for PSCell under CCA configured with SSB-based RLM RS in DRX mode

FFS

10.3.1.5 EN-DC FR1 radio link monitoring in-sync test for PSCell under CCA configured with SSB-based RLM RS in DRX mode

FFS

10.3.2 Interruption

FFS

10.3.3 SCell activation and deactivation delay

FFS

10.3.4 Beam failure detection and link recovery procedures

10.3.4.0 General

The requirements for link recovery procedure in the clause apply when CCA is used on a serving frequency on the downlink.

The UE shall assess the downlink radio link quality of a serving cell based on the reference signal in the set $\bar{q}_0$ as specified in TS 38.213 [8] in order to detect beam failure on:

- PCell in SA operation mode,
- PSCell in EN-DC operation mode.
- PSCell in NR-DC operation mode.

The RS resource configurations in the set $\bar{q}_0$ can be periodic SSBs. UE is not required to perform beam failure detection outside the active DL BWP. UE is not required to meet the requirements in clause 10.3.4.0.1 and 10.3.4.0.2 if UE does not have set $\bar{q}_0$.

On each RS resource configuration in the set $\bar{q}_0$, the UE shall estimate the radio link quality and compare it to the threshold $Q_{out_LR,CCA}$ for the purpose of accessing downlink radio link quality of the serving cell beams.

The threshold $Q_{out_LR,CCA}$ is defined as the level at which the downlink radio level link of a given resource configuration on set $\bar{q}_0$ cannot be reliably received and shall correspond to the $BLER_{out,CCA}$ = 10% block error rate of a hypothetical PDCCH transmission. For SSB based beam failure detection, $Q_{out_LR_SSB,CCA}$ is derived based on the hypothetical PDCCH transmission parameters listed in Table 10.3.4.0.1-1.

Upon request the UE shall deliver configuration indexes from the set $\bar{q}_1$ as specified in TS 38.213 [8] , to higher layers, and the corresponding L1-RSRP measurement provided that the measured L1-RSRP is equal to or better than the threshold $Q_{in_LR,CCA}$, which is indicated by higher layer parameter *rsrp-ThresholdSSB*. The UE applies the $Q_{in_LR,CCA}$ threshold to the L1-RSRP measurement obtained from an SSB. The RS resource configurations in the set $\bar{q}_1$ can be periodic SSBs. UE is not required to perform candidate beam detection outside the active DL BWP.

In the requirements of this clause, the term CBD-RS SSB occasions not available at the UE refers to when the CBD-RS SSB is configured by gNB in a cell on a carrier frequency subject to CCA, but the first two successive candidate SSB positions for the same SSB index within the set of configured CBD-RS resources are not available at the UE due to DL CCA failures at gNB during the corresponding evaluation period; otherwise the CBD-RS SSB is considered as available at the UE.

The requirements in this clause apply for any *channelAccessMode* configuration [TS 38.331, 13].

The normative reference for this requirement is TS 38.133 [6] clause 8.5A.1.

10.3.4.0.1 Minimum conformance requirements for SSB based Beam Failure Detection under CCA

The requirements in this clause apply for each SSB resource in the set $\bar{q}_0$ configured for a serving cell, provided that the SSB configured for beam failure detection is actually transmitted within the UE active DL BWP during the entire evaluation period specified in clause 10.3.4.0.1, but occasionally may not be transmitted due to CCA operation.

Table 10.3.4.0.1-1: PDCCH transmission parameters for beam failure instance under CCA

Attribute	Value for BLER
DCI format	1-0
Number of control OFDM symbols	2

Aggregation level (CCE)	8
Ratio of hypothetical PDCCH RE energy to average SSS RE energy	0dB
Ratio of hypothetical PDCCH DMRS energy to average SSS RE energy	0dB
Bandwidth (PRBs)	24
Sub-carrier spacing (kHz)	Same as the SCS of RMSI CORESET
DMRS precoder granularity	REG bundle size
REG bundle size	6
CP length	Normal
Mapping from REG to CCE	Distributed

The normative reference for this requirement is TS 38.133 [6] clause 8.5A.2.

10.3.4.0.1.1 Minimum requirement for SSB based Beam Failure Detection under CCA

UE shall be able to evaluate whether the downlink radio link quality on the configured BFD-RS SSB resource in set $\bar{q}_0$ estimated over the last $T_{Evaluate_BFD_SSB_CCA}$ ms period becomes worse than the threshold $Q_{out_LR_SSB,CCA}$ within $T_{Evaluate_BFD_SSB_CCA}$ ms period.

The value of $T_{Evaluate_BFD_SSB_CCA}$ is defined in Table 10.3.4.0.1.1-1 for FR1.

When concurrent gaps are configured,

- P value for a BFD-RS resource to be measured is defined as N_{total} / $N_{outside_MG}$
- For a window W of duration max(T_{L1}, MGRP_max), where MGRP max is the maximum MGRP across all configured per-UE measurement gap and per-FR measurement gap within the same FR as serving cell, and starting at the beginning of any BFD-RS resource occasion:
  - N_{total} is the total number of BFD-RS resource occasions within the window, including those overlapped with measurement gap occasions within the window, and
  - $N_{outside_MG}$ is the number of BFD-RS resource occasions that are not overlapped with any measurement gap occasion within the window W
- Otherwise, for a UE not supporting *concurrentMeasGap-r17* or when concurrent gaps are not configured,
  - $P = \frac{1}{1-\frac{T_{SSB}}{xGP}}$, when in the monitored cell there are GAPs configured for intra-frequency, inter-frequency or inter-RAT measurements, which are overlapping with some but not all occasions of the BFD-RS SSB.
  - P=1 when in the monitored cell there are no GAPs overlapping with any occasion of the BFD-RS SSB.
- When a measurement gap is configured and the measurement gap is not NCSG,
  - a BFD-RS resource is considered to be overlapped with the GAP if it overlaps a measurement gap occasion, and
  - xRP = MGRP
- Otherwise, when NCSG measurement gap is configured,
  - a BFD-RS resource is considered to be overlapped with the GAP if it overlaps the VIL1 or VIL2 of NCSG, and
  - xRP = VIRP
- When concurrent gaps are configured, a BFD-RS is not considered to be overlapped by a gap occasion if the gap occasion is dropped according to 38.133 [6] section 9.1.8.

Longer evaluation period would be expected if the combination of BFD-RS SSB resource, SMTC occasion and GAP configurations does not meet pervious conditions.

Table 10.3.4.0.1-1: Evaluation period $T_{Evaluate_BFD_SSB_CCA}$ for FR1

Configuration	$T_{Evaluate_BFD_SSB_CCA}$ (ms)	
	BFD-RS SSB Es/Iot Note2 ≥ -7 dB	BFD-RS SSB Es/Iot Note2 < -7 dB
no DRX	Max(50, Ceil((10 × P) × T_{SSB}))	Max(50, Ceil((12 × P) × T_{SSB}))
DRX cycle ≤ 320ms	Max(50, Ceil(1.5 × 8 × P) × Max(T_{DRX},T_{SSB}))	Max(50, Ceil(1.5 × 10 × P) × Max(T_{DRX},T_{SSB}))
DRX cycle > 320ms	Ceil(7 × P) × T_{DRX}	Ceil(8 × P) × T_{DRX}
Note 1: T_{SSB} is the periodicity of SSB in the set $\bar{q}_0$. T_{DRX} is the DRX cycle length. Note 2: BFD-RS SSB Es/Iot is the averaged BFD-RS SSB Es/Iot over the most recent previous evaluation period.		

The normative reference for this requirement is TS 38.133 [6] clause 8.5A.2.2.

10.3.4.0.1.2 Measurement restriction for SSB based Beam Failure Detection under CCA

The UE is required to be capable of measuring SSB for BFD without measurement gaps. The UE is required to perform the SSB measurements with measurement restrictions as described in the following clauses.

For FR1, when the SSB for BFD measurement is in the same OFDM symbol as CSI-RS for BFD, CBD or L1-RSRP measurement,

- If SSB and CSI-RS have same SCS, UE shall be able to measure the SSB for BFD measurement without any restriction;
- If SSB and CSI-RS have different SCS,
  - If UE supports *simultaneousRxDataSSB-DiffNumerology*, UE shall be able to measure the SSB for BFD measurement without any restriction;
  - If UE does not support *simultaneousRxDataSSB-DiffNumerology*, UE is required to measure SSB for BFD measurement.

The normative reference for this requirement is TS 38.133 [6] clause 8.5A.2.3.

10.3.4.0.2 Void

10.3.4.0.3 Scheduling availability of UE during beam failure detection under CCA

10.3.4.0.3.1 Scheduling availability of UE performing beam failure detection under CCA with a same subcarrier spacing as PDSCH/PDCCH

In this clause, the same requirements apply as in Clause 4.5.5.0.3.

The normative reference for this requirement is TS 38.133 [6] clause 8.5A.7.1.

10.3.4.0.4 Scheduling availability of UE during candidate beam detection under CCA

10.3.4.0.4.1 Scheduling availability of UE performing L1-RSRP measurement under CCA with a same subcarrier spacing as PDSCH/PDCCH on FR1

In this clause, the same requirements apply as in Clause 4.5.5.0.3.

The normative reference for this requirement is TS 38.133 [6] clause 8.5A.8.1.

10.3.4.1 EN-DC Beam Failure Detection and Link Recovery Test for FR1 PSCell configured with SSB-based BFD and LR in non-DRX mode

Editor's Note:

- MU and TT analysis is incomplete

- Message contents may need to be updated
- Call setup and test procedure may need to be updated
- Applicability may need to be updated
- Statistical analysis to determine test case verdict is FFS

10.3.4.1.1 Test purpose

The purpose of this test is to verify that the UE properly detects SSB-based beam failure in the set q0 configured for a serving PSCell and that the UE performs correct SSB-based link recovery based on beam candidate set q1. The purpose is to test the downlink monitoring for beam failure detection within the UEs active DL BWP of the PSCell, during the evaluation period, and link recovery, when no DRX is used. This test will partly verify the SSB based beam failure detection and link recovery for an FR1 serving cell requirements in clause 10.3.4.0.1.

10.3.4.1.2 Test applicability

This test applies to all types of E-UTRA UE release 16 and forward, supporting EN-DC, supporting NR-U and supporting UL and SSB-based RLM and link recovery on shared channel access

10.3.4.1.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 10.3.4.0.1.

The normative reference for this requirement is TS 38.133 [6] clause A.10.3.4.1.

10.3.4.1.4 Test description

The test consists of five successive time periods, with time duration of T1, T2, T3, T4 and T5 respectively. Figure 10.3.4.1.4-1 shows the variation of the downlink SNR of the PSCell and the SNR of the SSB in set q_0 in the active PSCell to emulate SSB based beam failure. Figure 10.3.4.1.4-1 additionally shows the variation of the downlink L1-RSRP of the SSB in set q_1 of the candidate beam used for link recovery.

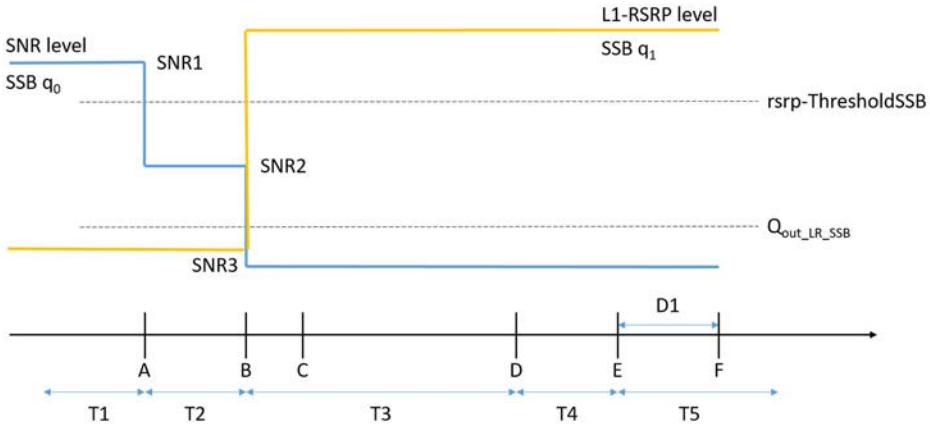

Figure 10.3.4.1.4-1: SNR and L1-RSRP variation for EN-DC Beam Failure Detection and Link Recovery Test for FR1 PSCell configured with SSB-based BFD and LR in non-DRX mode

10.3.4.1.4.1 Initial conditions

This test shall be tested using any of the test configurations in Table 10.3.4.1.4.1-1.

Table 10.3.4.1.4.1-1: Supported test configurations for EN-DC Beam Failure Detection and Link Recovery Test for FR1 PSCell configured with SSB-based BFD and LR in non-DRX mode

Configuration	Description

10.3.4.1-1	LTE FDD, NR 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode
10.3.4.1-2	LTE TDD, NR 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode
Note: The UE is only required to pass in one of the supported test configurations in FR1	

Configure the test equipment and the DUT according to the parameters in Table 10.3.4.1.4.1-2.

Table 10.3.4.1.4.1-2: Initial conditions for EN-DC Beam Failure Detection and Link Recovery Test for FR1 PSCell configured with SSB-based BFD and LR in non-DRX mode

Parameter	Value		Comment
Test environment	NC		As specified in TS 38.508-1 [14] clause 4.1.
Test frequencies	As specified in Annex E, table E.2-1 and TS 38.508-1 [14] clause 4.3.1 and 4.4.2.		
Channel bandwidth	As specified by the test configuration selected from Table 10.3.4.1.4.1-1.		
Propagation conditions	AWGN		As specified in clause C.2.2.
Connection Diagram	TE Part	A.3.1.7.1	As specified in TS 38.508-1 [14] Annex A.
	DUT Part	A.3.2.3.4	
Exceptions to connection diagram	For 4Rx capable UEs without any 2 Rx RF bands use A.3.2.5.2 for DUT part and A.3.1.8.4 for TE Part		

1. The general test parameter settings are set up according to Table 10.3.4.1.4.1-3.
2. Message contents are defined in clause 10.3.4.1.4.3.
3. Cell 1 is the E-UTRA serving cell (PCell) for the EN-DC setup. The power levels and settings for Cell 1 are set according to Annex A.6. Cell 2 is the NR cell (PSCell) with the power level set according to clauses C.1.2 and C.1.3 for this test

Table 10.3.4.1.4.1-3: General test parameters for EN-DC Beam Failure Detection and Link Recovery Test for FR1 PSCell configured with SSB-based BFD and LR in non-DRX mode

Parameter		Unit	Value	Comment
			Test 1	
Active E-UTRA PCell			Cell 1	
E-UTRA RF Channel Number			1	
Active PSCell			Cell 2	
RF Channel Number			2	
DL CCA model			As specified in D.7.2.1	
UL CCA model			As specified in D.7.2.2	
Duplex mode	Config 1, 2		TDD	
BWchannel	Config 1, 2	MHz	40: NRB,c = 106	
DL initial BWP configuration	Config 1, 2		DLBWP.0.1	
DL dedicated BWP configuration	Config 1, 2		DLBWP.1.1	
UL initial BWP configuration	Config 1, 2		ULBWP.0.1	
UL dedicated BWP configuration	Config 1, 2		ULBWP.1.1	
TDD configuration	Config 1, 2		TDDConf.1.1 CCA	
CORESET Reference Channel	Config 1, 2		CR.1.1 CCA	
SSB Configuration	Config 1, 2		SSB.3 CCA for semi-static channel access	

			SSB.4 CCA for dynamic channel access	
DBT Window Configuration	Config 1, 2		DBT.1	
PDSCH/PDCCH subcarrier spacing	Config 1, 2		30 KHz	
PRACH Configuration	Config 1, 2		PRACH.2 FR1	
SSB Index assigned as BFD RS (q_0)			0	
SSB Index assigned as CBD RS (q_1)			1	
OCNG parameters			OP.1	
CP length			Normal	
Correlation Matrix and Antenna Configuration			2x2 Low	
Beam failure detection transmission parameters	DCI format		1-0	
	Number of Control OFDM symbols		2	
	Aggregation level	CCE	8	
	Ratio of hypothetical PDCCH RE energy to average SSS RE energy	dB	0	
	Ratio of hypothetical PDCCH DMRS energy to average SSS RE energy	dB	0	
	DMRS precoder granularity		REG bundle size	
	REG bundle size		6	
DRX			OFF	
Gap pattern ID			gp0	
gapOffset			0	
rlmInSyncOutOfSyncThreshold			absent	When the field is absent, the UE applies the value 0. (38.133 [6] Table 8.1.1-1).
rsrp-ThresholdSSB	Config 1, 2	dBm/SCS kHz	-95	Threshold used for $Q_{in_LR_SSB}$
powerControlOffsetSS			db0	Used for deriving rsrp-ThresholdCSI-RS
beamFailureInstanceMaxCount			n1	see TS 38.321 [12], clause 5.17
beamFailureDetectionTimer			pbfd4	see TS 38.321 [12], clause 5.17
CSI-RS configuration for CSI reporting	Config 1, 2		CSI-RS.2.1 TDD	
CSI-RS for tracking	Config 1, 2		TRS.1.2 TDD	
SSB Index assigned as RLM RS			0,1	
T310 timer		ms	1000	
N310			2	

T1	s	0.2	During this time the UE shall be fully synchronized to cell 1
T2	s	0.93	
T3	s	0.52	
T4	s	0	
T5	s	0.45	
D1	s	0.41	
Note 1: All configurations are assigned to the UE prior to the start of time period T1. Note 2: UE-specific PDCCH is not transmitted after T1 starts. Note 3: E-UTRAN is in non-DRX mode under test.			

10.3.4.1.4.2 Test procedure

There are two cells, cell 1 is the E-UTRAN PCell, and cell 2 is the PSCell which operates on a carrier frequency with CCA and transmits SSBs in DBT windows according to DL CCA model.

Prior to the start of the time duration T1, the UE shall be fully synchronized to cell 1 and cell 2. The UE shall be configured for periodic CSI reporting with a reporting periodicity of 2 ms. The UE transmits the reporting according to UL CCA model. In the test, DRX configuration is not enabled. The UE is configured to perform inter-frequency measurements using GP ID #0 (40 ms) in test 1.

1. Ensure the UE is in [state RRC_CONNECTED with generic procedure parameters Connectivity *EN-DC*, DC bearer MCG and SCG, Connected without release *On* and Test Mode *On*] according to TS 38.508-1 [14] clause 4.5.

2. The SS sends an *RRCReconfiguration* (embedded in *RRCConnectionReconfiguration* message) message to the UE to configure inter-frequency measurement with the corresponding gap pattern.

3. The UE sends an RRCReconfigurationComplete (embedded in RRCConnectionReconfigurationComplete message) message.

4. Set the parameters of NR Cell according to T1 in Table 10.3.4.1.5-1. Propagation conditions are set according to clause C.2.3. T1 starts.

5. When T1 expires the SS shall change the SNR value to T2 as specified in Table 10.3.4.1.5-1. T2 starts.

6. When T2 expires the SS shall change the SNR value to T3 as specified in Table 10.3.4.1.5-1. T3 starts.

7. When T3 expires the SS shall change the SNR value to T4 as specified in Table 10.3.4.1.5-1. T4 starts.

8. When T4 expires the SS shall change the SNR value to T5 as specified in Table 10.3.4.1.5-1. T5 starts.

9. If the SS:

   a) detects uplink power on NR carrier equal to or higher than minimum output power defined in TS 38.521-1 [17] clause 6.3.1.5 in each slot configured for CSI transmission (according to CSI reporting on PUCCH) during the period from time point A to time point B; and

   b) does not detect preamble on a beam associated with the candidate beam set q_1 before time point B; and

   c) detects preamble on a beam associated with the candidate beam set q_1 before time point F (D1 after the start of T5), the number of successful tests is increased by one.

   Otherwise, the number of failed tests is increased by one.

10. If the iteration or random access procedure for BFD fails, the SS shall first attempt to release and add the PSCell, by ensuring the UE is in [state RRC_CONNECTED with generic procedure parameters *Connectivity* EN-DC, DC bearer MCG and SCG, Connected without release *On* and Test Mode *On*] according to TS 38.508-1 [6] clause 4.5. If that also fails, then the UE is switched OFF/ON to proceed with the next iteration.

11. Repeat steps 2-10 for all subtests until the confidence level according to [Tables G.TBD in Annex G clause G.TBD] is achieved.

10.3.4.1.4.3 Message contents

Message contents are according to TS 38.508-1 [14] clause 7.3 with the following exceptions:

Table 10.3.4.1.4.3-1: Common Exception messages for EN-DC Beam Failure Detection and Link Recovery Test for FR1 PSCell configured with SSB-based BFD and LR in non-DRX mode

Default Message Contents	
Common contents of system information blocks exceptions	
Default RRC messages and information elements contents exceptions	Table H.3.1-1 Table H.3.1-2 with Condition INTER-FREQ, L3 FILTERING NEEDED, Table H.3.1-3 with Condition INTER-FREQ MO (where ssbFrequency is set to the ARFCN value of carrier centre of High range) Table H.3.1-4 with A3-offset = 0 Table H.3.1-8 with Condition SSB BFD Table H.3.1-10 with Condition SSB Table H.3.1-10A Table H.3.4-4 with Condition gapUE Table H.3.4-5 with Condition BFD Table H.3.5-4 [Table 7.3.1-3 in TS 38.508-1 [14] with condition DBT.1]

Table 10.3.4.1.4.3-2: PDCCH *Search Space* for EN-DC Beam Failure Detection and Link Recovery Test for FR1 PSCell configured with SSB-based BFD and LR in non-DRX mode

Derivation Path: TS 38.508-1 [14], Table 4.6.3-162			
Information Element	**Value/remark**	**Comment**	**Condition**
SearchSpace ::= SEQUENCE {			
searchSpaceId	3	BFR	
controlResourceSetId	2	BFR	
monitoringSlotPeriodicityAndOffset CHOICE {			
sl1	NULL		
}			
monitoringSymbolsWithinSlot	10000000000000	Symbols 0 and 1	
nrofCandidates SEQUENCE {			
aggregationLevel1	n0		
aggregationLevel2	n0		
aggregationLevel4	n0		
aggregationLevel8	n1	AL8	
aggregationLevel16	n0		
}			
searchSpaceType CHOICE {			
ue-Specific SEQUENCE {			USS
dci-Formats	formats0-0-And-1-0	DCI Format 1_0	
}			
}			
}			

Table 10.3.4.1.4.3-3: *RLF-TimersAndConstants* for EN-DC Beam Failure Detection and Link Recovery Test for FR1 PSCell configured with SSB-based BFD and LR in non-DRX mode

Derivation Path: TS 38.508-1 [14], Table 4.6.3-150			
Information Element	**Value/remark**	**Comment**	**Condition**
RLF-TimersAndConstants ::= SEQUENCE {			
n310	n2		
}			

Table 10.3.4.1.4.3-4: *PDCCH-Config* for EN-DC Beam Failure Detection and Link Recovery Test for FR1 PSCell configured with SSB-based BFD and LR in non-DRX mode

Derivation Path: TS 38.501-1 [14],Table 4.6.3-95			
Information Element	**Value/remark**	**Comment**	**Condition**
PDCCH-Config ::= SEQUENCE {			
controlResourceSetToAddModList SEQUENCE(SIZE (1..3)) OF ControlResourceSet {	2 entries		
ControlResourceSet[2]	ControlResourceSet	entry 2, BFR	
}			
controlResourceSetToReleaseList	Not present		
searchSpacesToAddModList SEQUENCE(SIZE (1..10)) OF SearchSpace {	2 entries		
SearchSpace[2]	SearchSpace	entry 2, BFR	
}			
searchSpacesToReleaseList	Not present		
downlinkPreemption	Not present		
tpc-PUSCH	Not present		
tpc-PUCCH	Not present		
tpc-SRS	Not present		
}			

Table 10.3.4.1.4.3-5: *ControlResourceSet* for EN-DC Beam Failure Detection and Link Recovery Test for FR1 PSCell configured with SSB-based BFD and LR in non-DRX mode

Derivation Path: TS 38.501-1 [14],Table 7.3.1-15			
Information Element	**Value/remark**	**Comment**	**Condition**
ControlResourceSet ::= SEQUENCE {			
controlResourceSetId	2		
duration	2		
cce-REG-MappingType CHOICE {			
interleaved ::= SEQUENCE {			
reg-BundleSize	n6		
interleaverSize	n2		
shiftIndex	0		
}			
tci-StatesPDCCH-ToAddList	Not present		
}			

10.3.4.1.5 Test requirements

Tables 10.3.4.1.4.1-3 and 10.3.4.1.5-1 define the primary level settings including test tolerances for EN-DC Beam Failure Detection and Link Recovery Test for FR1 PSCell configured with SSB-based BFD and LR in non-DRX mode

Table 10.3.4.1.5-1: Cell specific test parameters for EN-DC Beam Failure Detection and Link Recovery Test for FR1 PSCell configured with SSB-based BFD and LR in non-DRX mode

Parameter		**Unit**	**Test 1**				
			T1	**T2**	**T3**	**T4**	**T5**
DL CCA probability $P_{CCA,DL}$	Note 10, 12		1.0	0.9375	0.9375	0.9375	0.9375
	Note 11, 12		1.0/1.0	0.75/0.75	0.75/0.75	0.75/0.75	0.75/0.75
UL CCA probability $P_{CCA,UL}$			1.0	1.0	1.0	1.0	1.0
L_{CCA_DL}			N/A	7			
W_{CCA_DL}		ms	N/A	$T_{Evaluate_CBD_SSB_CCA}$ Note 13			
EPRE ratio of PDCCH DMRS to SSS		dB	0				
EPRE ratio of PDCCH to PDCCH DMRS		dB					
EPRE ratio of PBCH DMRS to SSS		dB					
EPRE ratio of PBCH to PBCH DMRS		dB					
EPRE ratio of PSS to SSS		dB					
EPRE ratio of PDSCH DMRS to SSS		dB					
EPRE ratio of PDSCH to PDSCH DMRS		dB					

EPRE ratio of OCNG DMRS to SSS		dB					
EPRE ratio of OCNG to OCNG DMRS		dB					
SNR_SSB of set q_0	Config 1, 2	dB	5+TT	-3+TT	-12+TT	-12+TT	-12+TT
SNR_SSB of set q_1	Config 1, 2	dB	-10+TT	-10+TT	10+TT	10+TT	10+TT
SSB_RP of set q_1	Config 1, 2	dBm/SCS kHz	-105+TT	-105+TT	-85+TT	-85+TT	-85+TT
N_{oc}	Config 1, 2	dBm/15 KHz	-98+TT				
Propagation condition			TDL-C 300ns 100Hz				

Note 1: OCNG shall be used such that the resources in Cell 1 are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols. For cells with CCA model, OCNG is transmitted only in the slots with downlink transmission burst and is not transmitted during the muted slots or during DBT window.
Note 2: The uplink resources for CSI reporting are assigned to the UE prior to the start of time period T1.
Note 3: NZP CSI-RS resource set configuration for CSI reporting are assigned to the UE prior to the start of time period T1.
Note 4: Measurement gap configuration is assigned to the UE prior to the start of time period T1.
Note 5: The timers and layer 3 filtering related parameters are configured prior to the start of time period T1.
Note 6: The signal contains PDCCH for UEs other than the device under test as part of OCNG.
Note 7: SNR levels correspond to the signal to noise ratio over the transmitted SSS REs during DBT window.
Note 8: The SNR in time periods T1, T2, T3, T4 and T5 is denoted as SNR1, SNR2 and SNR3 respectively in figure 10.3.4.1.4-1.
Note 9: The SNR values are specified for testing a UE which supports 2RX on at least one band. For testing of a UE which supports 4RX on all bands, the SNR during T3 is modified as specified in clause D.4A.
Note 10: For UE supporting semi-static channel access and network configuring semi-static channel occupancy.
Note 11: For UE supporting dynamic channel access and network configuring dynamic channel occupancy. The first value corresponds P_{CCA_DL1} and the second value corresponds to the P_{CCA_DL2}.
Note 12: For UE supporting both semi-static and dynamic cannel access, the UE can be tested under dynamic channel occupancy only.
Note 13: As defined in 38.133 [6] Table 8.5A.5.2-1.

The UE behaviour during time durations T1, T2, T3, T4 and T5 shall be as follows:

During the time duration T1 and T2, the UE shall transmit uplink signal at least in all subframes configured for CSI transmission on Cell 1.

During the period from time point A to time point B the UE shall transmit uplink signal in Cell 1 in all uplink slots configured for CSI transmission according to the configured periodic CSI reporting for Cell 1.

During T3 the UE shall detect beam failure and initiate link recovery. During T4 and T5 the UE measures and evaluate beam candidate from beam candidate set q_1.

No later than time point F occurring no later than D1 = 410 ms after the start of T5, the UE shall transmit preamble on a beam associated with the candidate beam set q_1. The UE shall not transmit preamble on a beam associated with the candidate beam set q_1 earlier than time point B.

Test is concluded once the test equipment has received the initial preamble transmission from the UE. The rate of correct events observed during repeated tests shall be at least 90%.

10.3.4.2 EN-DC Beam Failure Detection and Link Recovery Test for FR1 PSCell configured with SSB-based BFD and LR in DRX mode

Editor's Note:

- MU and TT analysis is incomplete
- Message contents may need to be updated
- Call setup and test procedure may need to be updated
- Applicability may need to be updated
- Statistical analysis to determine test case verdict is FFS

10.3.4.2.1 Test purpose

The purpose of this test is to verify that the UE properly detects SSB-based beam failure in the set q_0 configured for a serving PSCell and that the UE performs correct SSB-based link recovery based on beam candidate set q_1. The purpose is to test the downlink monitoring for beam failure detection within the UEs active DL BWP of the PSCell, during the evaluation period, and link recovery, when DRX is used. This test will partly verify the SSB based beam failure detection and link recovery for an FR1 serving cell requirements in clause 10.3.4.0.1.

10.3.4.2.2 Test applicability

This test applies to all types of E-UTRA UE release 16 and forward, supporting EN-DC, supporting NR-U and supporting UL and SSB-based RLM and link recovery on shared channel access

10.3.4.2.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 10.3.4.0.1.

The normative reference for this requirement is TS 38.133 [6] clause A.10.3.4.2.

10.3.4.2.4 Test description

The test consists of five successive time periods, with time duration of T1, T2, T3, T4 and T5 respectively. Figure 10.3.4.2.4-1 shows the variation of the downlink SNR of the PCell and the SNR of the SSB in set q_0 in the active PSCell to emulate SSB based beam failure. Figure 10.3.4.2.4-1 additionally shows the variation of the downlink L1-RSRP of the SSB in set q_1 of the candidate beam used for link recovery.

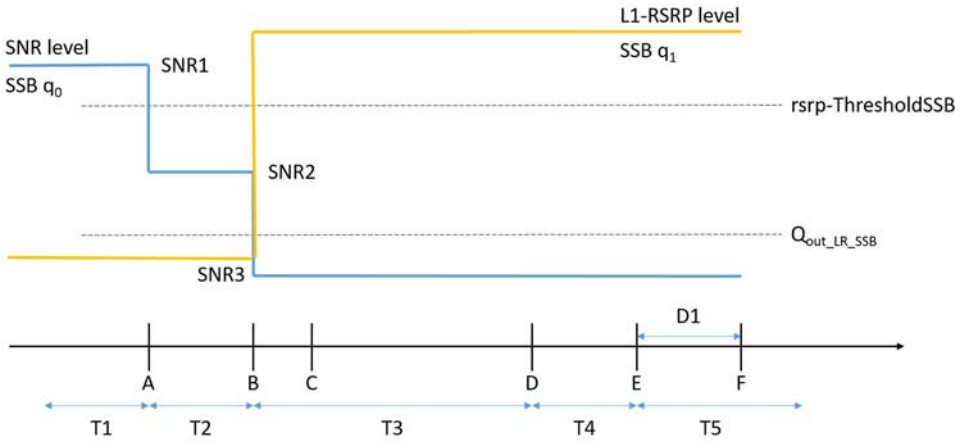

Figure 10.3.4.2.4-1: SNR and L1-RSRP variation for EN-DC Beam Failure Detection and Link Recovery Test for FR1 PSCell configured with SSB-based BFD and LR in DRX mode

10.3.4.2.4.1 Initial conditions

This test shall be tested using any of the test configurations in Table 10.3.4.2.4.1-1.

Table 10.3.4.2.4.1-1: Supported test configurations for EN-DC Beam Failure Detection and Link Recovery Test for FR1 PSCell configured with SSB-based BFD and LR in DRX mode

Configuration	Description
10.3.4.2-1	LTE FDD, NR 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode
10.3.4.2-2	LTE TDD, NR 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode
Note: The UE is only required to pass in one of the supported test configurations in FR1	

Configure the test equipment and the DUT according to the parameters in Table 10.3.4.2.4.1-2.

Table 10.3.4.2.4.1-2: Initial conditions for EN-DC Beam Failure Detection and Link Recovery Test for FR1 PSCell configured with SSB-based BFD and LR in DRX mode

Parameter	Value		Comment
Test environment	NC		As specified in TS 38.508-1 [14] clause 4.1.
Test frequencies	As specified in Annex E, table E.2-1 and TS 38.508-1 [14] clause 4.3.1 and 4.4.2.		
Channel bandwidth	As specified by the test configuration selected from Table 10.3.4.2.4.1-1.		
Propagation conditions	AWGN		As specified in clause C.2.2.
Connection Diagram	TE Part	A.3.1.7.1	As specified in TS 38.508-1 [14] Annex A.
	DUT Part	A.3.2.3.4	
Exceptions to connection diagram	For 4Rx capable UEs without any 2 Rx RF bands use A.3.2.5.2 for DUT part and A.3.1.8.4 for TE Part		

1. The general test parameter settings are set up according to Table 10.3.4.2.4.1-3.
2. Message contents are defined in clause 10.3.4.2.4.3.
3. Cell 1 is the E-UTRA serving cell (PCell) for the EN-DC setup. The power levels and settings for Cell 1 are set according to Annex A.6. Cell 2 is the NR cell (PSCell) with the power level set according to clauses C.1.2 and C.1.3 for this test

Table 10.3.4.2.4.1-3: General test parameters for EN-DC Beam Failure Detection and Link Recovery Test for FR1 PSCell configured with SSB-based BFD and LR in DRX mode

Parameter		Unit	Value	Comment
			Test 1	
Active E-UTRA PCell			Cell 1	
E-UTRA RF Channel Number			1	
Active PSCell			Cell 2	
RF Channel Number			2	
DL CCA model			As specified in D.7.2.1	
UL CCA model			As specified in D.7.2.2	
Duplex mode	Config 1, 2		TDD	
BWchannel	Config 1, 2	MHz	40: NRB,c = 106	
DL initial BWP configuration	Config 1, 2		DLBWP.0.1	
DL dedicated BWP configuration	Config 1, 2		DLBWP.1.1	
UL initial BWP configuration	Config 1, 2		ULBWP.0.1	
UL dedicated BWP configuration	Config 1, 2		ULBWP.1.1	
TDD configuration	Config 1, 2		TDDConf.1.1 CCA	
CORESET Reference Channel	Config 1, 2		CR.1.1 CCA	
SSB Configuration	Config 1, 2		SSB.3 CCA for semi-static channel access SSB.4 CCA for dynamic channel access	
DBT Window Configuration	Config 1, 2		DBT.1	
PDSCH/PDCCH subcarrier spacing	Config 1, 2		30 KHz	

PRACH Configuration	Config 1, 2		PRACH.2 FR1	
SSB Index assigned as BFD RS (q_0)			0	
SSB Index assigned as CBD RS (q_1)			1	
OCNG parameters			OP.1	
CP length			Normal	
Correlation Matrix and Antenna Configuration			2x2 Low	
Beam failure detection transmission parameters	DCI format		1-0	
	Number of Control OFDM symbols		2	
	Aggregation level	CCE	8	
	Ratio of hypothetical PDCCH RE energy to average SSS RE energy	dB	0	
	Ratio of hypothetical PDCCH DMRS energy to average SSS RE energy	dB	0	
	DMRS precoder granularity		REG bundle size	
	REG bundle size		6	
DRX			DRX.7	Table A.5-1
Gap pattern ID			N.A.	
gapOffset			N.A.	
rlmInSyncOutOfSyncThreshold			absent	When the field is absent, the UE applies the value 0. (38.133 [6] Table 8.1.1-1).
rsrp-ThresholdSSB	Config 1, 2	dBm/SCS kHz	-95	Threshold used for $Q_{in_LR_SSB}$
powerControlOffsetSS			db0	Used for deriving rsrp-ThresholdCSI-RS
beamFailureInstanceMaxCount			n1	see TS 38.321 [12], clause 5.17
beamFailureDetectionTimer			pbfd4	see TS 38.321 [12], clause 5.17
CSI-RS configuration for CSI reporting	Config 1, 2		CSI-RS.2.1 TDD	
CSI-RS for tracking	Config 1, 2		TRS.1.2 TDD	
SSB Index assigned as RLM RS			0,1	
T310 timer		ms	1000	
N310			2	
T1		s	1	During this time the UE shall be fully synchronized to cell 1
T2		s	9.01	
T3		s	5.16	
T4		s	0	
T5		s	3.89	
D1		s	3.85	

Note 1: All configurations are assigned to the UE prior to the start of time period T1. Note 2: UE-specific PDCCH is not transmitted after T1 starts. Note 3: E-UTRAN is in non-DRX mode under test.

10.3.4.2.4.2 Test procedure

There are two cells, cell 1 is the E-UTRAN PCell, and cell 2 is the PSCell which operates on a carrier frequency with CCA and transmits SSBs in DBT windows according to DL CCA model.

Prior to the start of the time duration T1, the UE shall be fully synchronized to cell 1 and cell 2. The UE shall be configured for periodic CSI reporting with a reporting periodicity of 2 ms. The UE transmits the reporting according to UL CCA model. In the test, DRX configuration is enabled in PSCell and DRX inactivity timer has already been expired, i.e. UE tries to decode PDCCH and to send periodic CQI during the period when On-duration timer is running. Time alignment timers shall be set to "infinity" so that UL timing alignment is maintained during the test. No inter-frequency gap is configured on the UE.

1. Ensure the UE is in [state RRC_CONNECTED with generic procedure parameters Connectivity *EN-DC*, DC bearer MCG and SCG, Connected without release *On* and Test Mode *On*] according to TS 38.508-1 [14] clause 4.5.

2. Set the parameters of NR Cell according to T1 in Table 10.3.4.2.5-1. Propagation conditions are set according to clause C.2.3. T1 starts.

3. When T1 expires the SS shall change the SNR value to T2 as specified in Table 10.3.4.2.5-1. T2 starts.

4. When T2 expires the SS shall change the SNR value to T3 as specified in Table 10.3.4.2.5-1. T3 starts.

5. When T3 expires the SS shall change the SNR value to T4 as specified in Table 10.3.4.2.5-1. T4 starts.

6. When T4 expires the SS shall change the SNR value to T5 as specified in Table 10.3.4.2.5-1. T5 starts.

7. If the SS:

   a) detects uplink power on NR carrier equal to or higher than minimum output power defined in TS 38.521-1 [17] clause 6.3.1.5 in each slot configured for CSI transmission (according to CSI reporting on PUCCH) during the period from time point A to time point B; and

   b) does not detect preamble on a beam associated with the candidate beam set q_1 before time point B; and

   c) detects preamble on a beam associated with the candidate beam set q_1 before time point F (D1 after the start of T5), the number of successful tests is increased by one.

   Otherwise, the number of failed tests is increased by one.

8. If the iteration or random access procedure for BFD fails, the SS shall first attempt to release and add the PSCell, by ensuring the UE is in [state RRC_CONNECTED with generic procedure parameters *Connectivity* EN-DC, DC bearer MCG and SCG, Connected without release *On* and Test Mode *On*] according to TS 38.508-1 [6] clause 4.5. If that also fails, then the UE is switched OFF/ON to proceed with the next iteration.

9. Repeat steps 2-8 for all subtests until the confidence level according to [Tables G.TBD in Annex G clause G.TBD] is achieved.

10.3.4.2.4.3 Message contents

Message contents are according to TS 38.508-1 [14] clause 7.3 with the following exceptions:

Table 10.3.4.2.4.3-1: Common Exception messages for EN-DC Beam Failure Detection and Link Recovery Test for FR1 PSCell configured with SSB-based BFD and LR in DRX mode

Default Message Contents	
Common contents of system information blocks exceptions	

Default RRC messages and information elements contents exceptions	Table H.3.1-8 with Condition SSB BFD Table H.3.1-10 with Condition SSB Table H.3.1-10A Table H.3.4-5 with Condition BFD Table H.3.5-4 Table H.3.7-1 with Condition DRX.7 [Table 7.3.1-3 in TS 38.508-1 [14] with condition DBT.1]

Table 10.3.4.2.4.3-2: PDCCH *Search Space* for EN-DC Beam Failure Detection and Link Recovery Test for FR1 PSCell configured with SSB-based BFD and LR in DRX mode

Derivation Path: TS 38.508-1 [14], Table 4.6.3-162			
Information Element	**Value/remark**	**Comment**	**Condition**
SearchSpace ::= SEQUENCE {			
searchSpaceId	3	BFR	
controlResourceSetId	2	BFR	
monitoringSlotPeriodicityAndOffset CHOICE {			
sl1	NULL		
}			
monitoringSymbolsWithinSlot	10000000000000	Symbols 0 and 1	
nrofCandidates SEQUENCE {			
aggregationLevel1	n0		
aggregationLevel2	n0		
aggregationLevel4	n0		
aggregationLevel8	n1	AL8	
aggregationLevel16	n0		
}			
searchSpaceType CHOICE {			
ue-Specific SEQUENCE {			USS
dci-Formats	formats0-0-And-1-0	DCI Format 1_0	
}			
}			
}			

Table 10.3.4.2.4.3-3: *RLF-TimersAndConstants* for EN-DC Beam Failure Detection and Link Recovery Test for FR1 PSCell configured with SSB-based BFD and LR in DRX mode

Derivation Path: TS 38.508-1 [14], Table 4.6.3-150			
Information Element	**Value/remark**	**Comment**	**Condition**
RLF-TimersAndConstants ::= SEQUENCE {			
n310	n2		
}			

Table 10.3.4.2.4.3-4: *PDCCH-Config* for EN-DC Beam Failure Detection and Link Recovery Test for FR1 PSCell configured with SSB-based BFD and LR in DRX mode

Derivation Path: TS 38.501-1 [14],Table 4.6.3-95			
Information Element	**Value/remark**	**Comment**	**Condition**
PDCCH-Config ::= SEQUENCE {			
controlResourceSetToAddModList SEQUENCE(SIZE (1..3)) OF ControlResourceSet {	2 entries		
ControlResourceSet[2]	ControlResourceSet	entry 2, BFR	
}			
controlResourceSetToReleaseList	Not present		
searchSpacesToAddModList SEQUENCE(SIZE (1..10)) OF SearchSpace {	2 entries		
SearchSpace[2]	SearchSpace	entry 2, BFR	
}			
searchSpacesToReleaseList	Not present		
downlinkPreemption	Not present		
tpc-PUSCH	Not present		

tpc-PUCCH	Not present		
tpc-SRS	Not present		
}			

Table 10.3.4.2.4.3-5: *ControlResourceSet* for EN-DC Beam Failure Detection and Link Recovery Test for FR1 PSCell configured with SSB-based BFD and LR in DRX mode

Derivation Path: TS 38.501-1 [14],Table 7.3.1-15			
Information Element	**Value/remark**	**Comment**	**Condition**
ControlResourceSet ::= SEQUENCE {			
controlResourceSetId	2		
duration	2		
cce-REG-MappingType CHOICE {			
interleaved ::= SEQUENCE {			
reg-BundleSize	n6		
interleaverSize	n2		
shiftIndex	0		
}			
tci-StatesPDCCH-ToAddList	Not present		
}			

10.3.4.2.5 Test requirements

Tables 10.3.4.2.4.1-3 and 10.3.4.2.5-1 define the primary level settings including test tolerances for EN-DC Beam Failure Detection and Link Recovery Test for FR1 PSCell configured with SSB-based BFD and LR in DRX mode .

Table 10.3.4.2.5-1: Cell specific test parameters for EN-DC Beam Failure Detection and Link Recovery Test for FR1 PSCell configured with SSB-based BFD and LR in DRX mode

Parameter		**Unit**	**Test 1**				
			T1	**T2**	**T3**	**T4**	**T5**
DL CCA probability $P_{CCA,DL}$	Note 10, 12		1.0	0.9375	0.9375	0.9375	0.9375
	Note 11, 12		1.0/1.0	0.75/0.75	0.75/0.75	0.75/0.75	0.75/0.75
UL CCA probability $P_{CCA,UL}$			1.0	1.0	1.0	1.0	1.0
EPRE ratio of PDCCH DMRS to SSS		dB	0				
EPRE ratio of PDCCH to PDCCH DMRS		dB					
EPRE ratio of PBCH DMRS to SSS		dB					
EPRE ratio of PBCH to PBCH DMRS		dB					
EPRE ratio of PSS to SSS		dB					
EPRE ratio of PDSCH DMRS to SSS		dB					
EPRE ratio of PDSCH to PDSCH DMRS		dB					
EPRE ratio of OCNG DMRS to SSS		dB					
EPRE ratio of OCNG to OCNG DMRS		dB					
SNR_SSB of set q_0	Config 1, 2	dB	5+TT	-3+TT	-12+TT	-12+TT	-12+TT
SNR_SSB of set q_1	Config 1, 2	dB	-10+TT	-10+TT	10+TT	10+TT	10+TT
SSB_RP of set q_1	Config 1, 2	dBm/SCS kHz	-105+TT	-105+TT	-85+TT	-85+TT	-85+TT
N_{oc}	Config 1, 2	dBm/15 KHz	-98+TT				
Propagation condition			TDL-C 300ns 100Hz				

Note 1:	OCNG shall be used such that the resources in Cell 1 are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols. For cells with CCA model, OCNG is transmitted only in the slots with downlink transmission burst and is not transmitted during the muted slots or during DBT window.
Note 2:	The uplink resources for CSI reporting are assigned to the UE prior to the start of time period T1.
Note 3:	NZP CSI-RS resource set configuration for CSI reporting are assigned to the UE prior to the start of time period T1.
Note 4:	Measurement gap configuration is assigned to the UE prior to the start of time period T1.
Note 5:	The timers and layer 3 filtering related parameters are configured prior to the start of time period T1.
Note 6:	The signal contains PDCCH for UEs other than the device under test as part of OCNG.
Note 7:	SNR levels correspond to the signal to noise ratio over the transmitted SSS REs during DBT window.
Note 8:	The SNR in time periods T1, T2, T3, T4 and T5 is denoted as SNR1, SNR2 and SNR3 respectively in figure 10.3.4.2.4-1.
Note 9:	The SNR values are specified for testing a UE which supports 2RX on at least one band. For testing of a UE which supports 4RX on all bands, the SNR during T3 is modified as specified in clause D.4A.
Note 10:	For UE supporting semi-static channel access and network configuring semi-static channel occupancy.
Note 11:	For UE supporting dynamic channel access and network configuring dynamic channel occupancy. The first value corresponds P_{CCA_DL1} and the second value corresponds to the P_{CCA_DL2}.
Note 12:	For UE supporting both semi-static and dynamic cannel access, the UE can be tested under dynamic channel occupancy only.

The UE behaviour during time durations T1, T2, T3, T4 and T5 shall be as follows:

During the time duration T1 and T2, the UE shall transmit uplink signal at least in all subframes configured for CSI transmission on Cell 1.

During the period from time point A to time point B the UE shall transmit uplink signal in Cell 1 in all uplink slots configured for CSI transmission according to the configured periodic CSI reporting for Cell 1.

During T3 the UE shall detect beam failure and initiate link recovery. During T4 and T5 the UE measures and evaluate beam candidate from beam candidate set q_1.

No later than time point F occurring no later than D1 = 3850 ms after the start of T5, the UE shall transmit preamble on a beam associated with the candidate beam set q_1. The UE shall not transmit preamble on a beam associated with the candidate beam set q_1 earlier than time point B.

Test is concluded once the test equipment has received the initial preamble transmission from the UE. The rate of correct events observed during repeated tests shall be at least 90%.

10.4 Measurement procedures

10.4.1 Intra-frequency measurements

10.4.1.0 Minimum conformance requirements

10.4.1.0.1 Minimum conformance requitements for intra-frequency measurements without measurement gaps

10.4.1.0.1.1 Intra-frequency cell identification

The UE shall be able to identify a new detectable intra frequency cell within $T_{identify_intra_without_index_CCA}$ if UE is not indicated to report SSB based RRM measurement result with the associated SSB index(*reportQuantityRsIndexes* or *maxNrofRSIndexesToReport* is not configured), or the UE is indicated that the neighbour cell is synchronous with the serving cell (*deriveSSB-IndexFromCell* is enabled). Otherwise UE shall be able to identify a new detectable intra frequency cell within $T_{identify_intra_with_index_CCA}$. The UE shall be able to identify a new detectable intra frequency SS block of an already detected cell within $T_{identify_intra_without_index_CCA}$.

$$T_{identify_intra_without_index_CCA} = (T_{PSS/SSS_sync_intra_CCA} + T_{SSB_measurement_period_intra_CCA}) \text{ ms}$$

$$T_{identify_intra_with_index\ CCA} = (T_{PSS/SSS_sync_intra_CCA} + T_{SSB_measurement_period_intra_CCA} + T_{SSB_time_index_intra_CCA}) \text{ ms}$$

Where:

$T_{PSS/SSS_sync_intra_CCA}$: it is the time period used in PSS/SSS detection given in table 10.4.1.0.1.1-1, 10.4.1.0.1.1-3 (deactivated Scell) .

$T_{SSB_time_index_intra_CCA}$: it is the time period used to acquire the index of the SSB being measured given in table 10.4.1.0.1.1-2 or 10.4.1.0.1.1-4 (deactivated SCell).

$T_{SSB_measurement_period_intra_CCA}$: equal to a measurement period of SSB based measurement given in table 10.4.1.0.1.2-1, 10.4.1.0.1.2-2 (deactivated Scell). $CSSF_{intra}$: it is a carrier specific scaling factor and is determined

- according to $CSSF_{outside_gap,i}$ in 38.133 [6] clause 9.1.5.1 for measurement conducted outside measurement gaps, i.e. when intra-frequency SMTC is fully non overlapping or partially overlapping with measurement gaps, or according to $CSSF_{within_gap,i}$ in 38.133 [6] clause 9.1.5.2 for measurement conducted within measurement gaps, i.e. when intra-frequency SMTC is fully overlapping with measurement gaps.

- $M_{pss/sss_sync_w/o_gaps_CCA}$: For a UE supporting FR2-2 power class 1, $M_{pss/sss_sync_w/o_gaps\ CCA}$ = 60. For a UE supporting FR2-2 power class 2, $M_{pss/sss_sync_w/o_gaps\ CCA}$ = 36. For a UE supporting FR2-2 power class 3, $M_{pss/sss_sync_w/o_gaps\ CCA}$ = 36.

- $M_{meas_period_w/o_gaps_CCA}$: For a UE supporting FR2-2 power class 1, $M_{meas_period_w/o_gaps\ CCA}$ = 60. For a UE supporting FR2-2 power class 2, $M_{meas_period_w/o_gaps\ CCA}$ = 36. For a UE supporting FR2-2 power class 3, $M_{meas_period_w/o_gaps\ CCA}$ = 36.

- $M_{SSB_index_intra_CCA}$: For a UE supporting FR2-2 power class 1, $M_{SSB_index_intra\ CCA}$ = 72 samples. For a UE supporting FR2-2 power class 2, $M_{SSB_index_intra\ CCA}$ = 48 samples. For a UE supporting FR2 power class 3, $M_{SSB_index_intra\ CCA}$ = 48 samples.

  N: is the UE Rx beam sweeping scaling factor. N = 12.

  When intra-frequency SMTC is fully non overlapping with measurement gaps or intra-frequency SMTC is fully overlapping with MGs, Kp=1

  When intra-frequency SMTC is partially overlapping with measurent gaps, Kp = 1/(1- (SMTC period /MGRP)), where SMTC period < MGRP.

For FR2-2,

$K_{layer1_measurement}$=TBD

If MCG DRX is in use, intra-frequency cell identification requirements specified in Table 10.4.1.0.1.1-1, Table 10.4.1.0.1.1-2, Table 10.4.1.0.1.1-3, Table 10.4.1.0.1.1-4, Table 10.4.1.0.1.1-5 and Table 10.4.1.0.1.1-6 shall depend on the MCG DRX cycle. If SCG DRX is in use, intra-frequency cell identification requirements specified in Table 10.4.1.0.1.1-1, Table 10.4.1.0.1.1-2, Table 10.4.1.0.1.1-3, Table 10.4.1.0.1.1-4, Table 10.4.1.0.1.1-5 and Table 10.4.1.0.1.1-6 shall depend on the SCG DRX cycle. Otherwise, the requirements for when DRX is not in use shall apply.

The requirements apply provided any two closest SMTC occasions available at the UE for the measurement shall be separated by no more than the maximum time requirement for the cell to remain known defined in 38.133 [6] clause 9.2A.4.3.

Table 10.4.1.0.1.1-1: Time period for PSS/SSS detection (FR1)

Condition	$T_{PSS/SSS_sync_intra_CCA}$
No DRX	max(600ms, ceil((5+$L_{PSS/SSS}$) x K_p) x SMTC period)[Note 1] x $CSSF_{intra}$
DRX cycle≤ 320ms	max(600ms, ceil(1.5x (5+$L_{PSS/SSS}$) x K_p) x max(SMTC period,DRX cycle)) x $CSSF_{intra}$
DRX cycle>320ms	ceil((5+$L_{PSS/SSS}$) x K_p) x DRX cycle x $CSSF_{intra}$
NOTE 1: If different SMTC periodicities are configured for different cells, the SMTC period in the requirement is the one used by the cell being identified	
NOTE 2: When DRX is not configured, $L_{PSS/SSS}$ is the number of SMTC occasions not available at the UE during $T_{PSS/SSS_sync_intra_CCA}$ for PSS/SSS detection, where $L_{PSS/SSS} < L_{PSS/SSS,max}$. When DRX is configured, $L_{PSS/SSS}$ is the number of DRX cycles in which at least one SMTC occasion is not available at the UE during $T_{PSS/SSS_sync_intra_CCA}$ for PSS/SSS detection, where $L_{PSS/SSS} < L_{PSS/SSS,max}$. When configured with DRX, the UE is not required to determine the availability of SMTC occasions more frequent than once	

per DRX cycle. FFS: The UE is not required to determine the availability of SMTC occasions more frequent than what is required by $CSSF_{intra}$.

NOTE 3: $L_{PSS/SSS,max}$ =7 for Max(DRX cycle,SMTC period)≤40ms where DRX cycle is 0 for non-DRX, $L_{PSS/SSS,max}$ =5 for 40ms<Max(DRX cycle,SMTC period)≤320ms, $L_{PSS/SSS,max}$ = 3 for DRX cycle>320ms.

NOTE 4: Upon exceeding $L_{PSS/SSS,max}$, the UE is not required to meet the requirements for PSS/SSS detection.

Table 10.4.1.0.1.1-2: Time period for time index detection (FR1)

Condition	$T_{SSB_time_index_intra_CCA}$
No DRX	max(120ms, ceil((3+L_{ind}) x K_p) x SMTC period)[Note 1] x $CSSF_{intra}$
DRX cycle≤ 320ms	max(120ms, ceil (1.5 x (3+L_{ind}) x K_p) x max(SMTC period,DRX cycle)) x $CSSF_{intra}$
DRX cycle>320ms	Ceil((3+L_{ind}) x K_p) x DRX cycle x $CSSF_{intra}$

NOTE 1: If different SMTC periodicities are configured for different cells, the SMTC period in the requirement is the one used by the cell being identified

NOTE 2: When DRX is not configured, L_{ind} is the number of SMTC occasions not available at the UE during $T_{SSB_time_index_intra_CCA}$ for index detection, where $L_{ind} \leq L_{ind,max}$. When DRX is configured, L_{ind} is the number of DRX cycles in which at least one SMTC occasion is not available at the UE during $T_{SSB_time_index_intra_CCA}$ for index detection, where $L_{ind} \leq L_{ind,max}$. When configured with DRX, the UE is not required to determine the availability of SMTC occasions more frequent than once per DRX cycle. FFS: The UE is not required to determine the availability of SMTC occasions more frequent than what is required by $CSSF_{intra}$.

NOTE 3: $L_{ind,max}$ = 5 for Max(DRX cycle,SMTC period)≤40ms where DRX cycle is 0 for non-DRX, $L_{ind,max}$ = 3 for 40ms<Max(DRX cycle,SMTC period)≤320ms, $L_{ind,max}$ =2 for DRX cycle>320ms.

NOTE 4: Upon exceeding $L_{ind,max}$ over the period of time $T_{SSB_time_index_intra_CCA}$, the UE has to restart the time index detection procedure.

Table 10.4.1.0.1.1-3: Time period for PSS/SSS detection, deactivated SCell (FR1)

Condition	$T_{PSS/SSS_sync_intra_CCA}$
No DRX	(5 + $L_{PSS/SSS,deact}$) x measCycleSCell x $CSSF_{intra}$
DRX cycle≤ 320ms	(5 + $L_{PSS/SSS,\ deact}$) x max(measCycleSCell, 1.5xDRX cycle) x $CSSF_{intra}$
DRX cycle>320ms	(5 + $L_{PSS/SSS,\ deact}$) x max(measCycleSCell, DRX cycle) x $CSSF_{intra}$

NOTE 1: When DRX is not configured, $L_{PSS/SSS,\ deact}$ is the number of SMTC occasions not available at the UE during $T_{PSS/SSS_sync_intra_CCA}$ for PSS/SSS detection, where $L_{PSS/SSS,\ deact} < L_{PSS/SSS,\ deact,max}$. When DRX is configured, $L_{PSS/SSS,\ deact}$ is the number of DRX cycles in which at least one SMTC occasion is not available at the UE during $T_{PSS/SSS_sync_intra_CCA}$ for PSS/SSS detection, where $L_{PSS/SSS,\ deact} < L_{PSS/SSS,\ deact,max}$.When configured with DRX, the UE is not required to determine the availability of SMTC occasions more frequent than once per DRX cycle. When configured with measurement cycles, the UE is not required to determine the availability of SMTC occasions more frequent than once per measurement cycle. FFS: The UE is not required to determine the availability of SMTC occasions more frequent than what is required by $CSSF_{intra}$.

NOTE 2: $L_{PSS/SSS,\ deact,max,}$ = 7 for Max(DRX cycle, measCycleSCell)≤40ms where DRX cycle is 0 for non-DRX, $L_{PSS/SSS,\ deact,max}$ = 5 for 40ms<Max(DRX cycle, measCycleSCell)≤320ms, $L_{PSS/SSS,\ deact,max}$ = 3 for DRX cycle>320ms.

NOTE 3: Upon exceeding $L_{PSS/SSS,\ deact,max,}$, the UE is not required to meet the requirements for PSS/SSS detection.

Table 10.4.1.0.1.1-4: Time period for time index detection, deactivated SCell (FR1)

Condition	$T_{SSB_time_index_intra_CCA}$
No DRX	(3+$L_{ind,deact}$) x measCycleSCell x $CSSF_{intra}$
DRX cycle≤ 320ms	(3+$L_{ind,deact}$) x max(measCycleSCell, 1.5xDRX cycle) x $CSSF_{intra}$
DRX cycle>320ms	(3+$L_{ind,deact}$) x max(measCycleSCell, DRX cycle) x $CSSF_{intra}$

NOTE 1: When DRX is not configured, $L_{ind,deact}$ is the number of SMTC occasions not available at the UE during $T_{SSB_time_index_intra_CCA}$ for index detection, where $L_{ind,deact} < L_{ind,deact,max}$. When DRX is configured, $L_{ind,deact}$ is the number of DRX cycles in which at least one SMTC occasion is not available at the UE during $T_{SSB_time_index_intra_CCA}$ for index detection, where $L_{ind,deact} < L_{ind,deact,max}$. When configured with DRX, the UE is not required to determine the availability of SMTC occasions more frequent than once per DRX

	cycle. When configured with measurement cycles, the UE is not required to determine the availability of SMTC occasions more frequent than once per measurement cycle. FFS: The UE is not required to determine the availability of SMTC occasions more frequent than what is required by $CSSF_{intra}$.
NOTE 2:	$L_{ind,deact,max,}$ = 5 for Max(DRX cycle, measCycleSCell)≤40ms where DRX cycle is 0 for non-DRX, $L_{ind,deact,max}$ = 3 for 40ms<Max(DRX cycle, measCycleSCell)≤320ms, $L_{ind,deact,max}$ = 2 for DRX cycle>320ms.
NOTE 3:	Upon exceeding $L_{ind,deact,max}$ over the period of time $T_{SSB_time_index_intra_CCA}$, the UE has to restart the time index detection procedure.

Table 10.4.1.0.1.1-5: Time period for PSS/SSS detection, (Frequency range FR2-2)

Condition	$T_{PSS/SSS_sync_intra_CCA}$
No DRX	max(600ms, ceil(($M_{pss/sss_sync_w/o_gaps_CCA}$ x K_{FR} + N x $L_{PSS/SSS}$) x K_p x $K_{layer1_measurement}$) x SMTC period)[Note 1] x $CSSF_{intra}$
DRX cycle≤ 320ms	max(600ms, ceil(1.5 x ($M_{pss/sss_sync_w/o_gaps_CCA}$ x K_{FR} + N x $L_{PSS/SSS}$) x K_p x $K_{layer1_measurement}$) x max(SMTC period,DRX cycle)) x $CSSF_{intra}$
DRX cycle>320ms	ceil(($M_{pss/sss_sync_w/o_gaps_CCA}$ x K_{FR} + N x $L_{PSS/SSS}$) x K_p x $K_{layer1_measurement}$) x DRX cycle x $CSSF_{intra}$
NOTE 1:	If different SMTC periodicities are configured for different cells, the SMTC period in the requirement is the one used by the cell being identified
NOTE 2:	When DRX is not configured, $L_{PSS/SSS}$ is the number of SMTC occasion groups not available at the UE during $T_{PSS/SSS_sync_intra_CCA}$ for PSS/SSS detection, where $L_{PSS/SSS}$< $L_{PSS/SSS,max}$. A SMTC occasion group consists of N consecutive SMTC occasions. An SMTC occasion group is not available, when at least one SMTC occasion in the group is not transmitted by the gNB. When DRX is configured, $L_{PSS/SSS}$ is the number of [DRX cycle groups] in which at least one SMTC occasion is not available at the UE during $T_{PSS/SSS_sync_intra_CCA}$ for PSS/SSS detection, where $L_{PSS/SSS}$< $L_{PSS/SSS,max}$. [A [DRX occasion group consists of N consecutive DRX cycles. A DRX occasion group occasion group is not available, when at least one SMTC occasion in the group is not transmitted by the gNB.] When configured with DRX, the UE is not required to determine the availability of SMTC occasions more frequent than once per DRX cycle.
NOTE 3:	$L_{PSS/SSS,max}$ =[7] for Max(DRX cycle,SMTC period)≤40ms where DRX cycle is 0 for non-DRX, $L_{PSS/SSS,max}$ =[5] for 40ms<Max(DRX cycle,SMTC period)≤320ms, $L_{PSS/SSS,max}$ = [3] for DRX cycle>320ms.
NOTE 4:	Upon exceeding $L_{PSS/SSS,max}$, the UE is not required to meet the requirements for PSS/SSS detection.
NOTE 5:	K_{FR} is a scaling factor depending on the frequency range and SSB SCS. K_{FR} = 1 if the SCS of the SSB of the cell being detected is 120 kHz, K_{FR} = 2 if the SCS of the SSB of the cell being detected is 480 kHz, and K_{FR}= 3 if the SCS of the SSB of the cell being detected is 960 kHz.

Table 10.4.1.0.1.1-6: Time period for PSS/SSS detection, deactivated SCell (FR2-2)

DRX cycle	$T_{PSS/SSS_sync_intra_CCA}$
No DRX	Ceil(($M_{pss/sss_sync_w/o_gaps}$ x K_{FR} + N x $L_{PSS/SSS,deact}$) x K_p) x measCycleSCell x $CSSF_{intra}$
DRX cycle≤ 320ms	Ceil(($M_{pss/sss_sync_w/o_gaps}$ x K_{FR} + N x $L_{PSS/SSS,deact}$) x K_p) x max(measCycleSCell, 1.5xDRX cycle) x $CSSF_{intra}$
DRX cycle> 320ms	Ceil(($M_{pss/sss_sync_w/o_gaps}$ x K_{FR} + N x $L_{PSS/SSS,deact}$) x K_p) x max(measCycleSCell, DRX cycle) x $CSSF_{intra}$
NOTE 1:	When DRX is not configured, $L_{PSS/SSS,\ deact}$ is the number of SMTC occasions groups not available at the UE during $T_{PSS/SSS_sync_intra_CCA}$ for PSS/SSS detection, where $L_{PSS/SSS,\ deact}$< $L_{PSS/SSS,\ deact,max}$. A SMTC occasion group consists of N consecutive SMTC occasions. An SMTC occasion group is not available, when at least one SMTC occasion in the group is not transmitted by the gNB. When DRX is configured, $L_{PSS/SSS,\ deact}$ is the number of [DRX cycle groups] in which at least one SMTC occasion is not available at the UE during $T_{PSS/SSS_sync_intra_CCA}$ for PSS/SSS detection, where $L_{PSS/SSS,\ deact}$< $L_{PSS/SSS,\ deact,max}$.When configured with DRX, the UE is not required to determine the availability of SMTC occasions more frequent than once per DRX cycle. [A DRX occasion group consists of N consecutive DRX cycles. A DRX occasion group occasion group is not available, when at least one SMTC occasion in the group is not transmitted by the gNB.] When configured with measurement cycles, the UE is not required to determine the availability of SMTC occasions more frequent than once per measurement cycle.
NOTE 2:	$L_{PSS/SSS,\ deact,max,}$ = [7] for Max(DRX cycle, measCycleSCell)≤40ms where DRX cycle is 0 for non-DRX, $L_{PSS/SSS,\ deact,max}$ = [5] for 40ms<Max(DRX cycle, measCycleSCell)≤320ms, $L_{PSS/SSS,\ deact,max}$ = [3] for DRX cycle>320ms.

NOTE 3: Upon exceeding $L_{PSS/SSS, deact,max,}$, the UE is not required to meet the requirements for PSS/SSS detection.
NOTE 4: Void
NOTE 5: K_{FR} is a scaling factor depending on the frequency range and SSB SCS. K_{FR} = 1 if the SCS of the SSB of the cell being detected is 120 kHz, K_{FR} = 2 if the SCS of the SSB of the cell being detected is 480 kHz, and K_{FR}= 3 if the SCS of the SSB of the cell being detected is 960 kHz.

Table 10.4.1.0.1.1-7: Time period for time index detection (FR2-2)

DRX cycle	$T_{SSB_time_index_intra_CCA}$
No DRX	$Max(200ms, ceil((M_{SSB_index_intra_CCA} + N \times L_{ind}) \times K_p) \times SMTC\ period) \times CSSF_{intra}$
DRX cycle≤ 320ms	$Max(200ms, ceil(1.5 \times ((M_{SSB_index_intra} + N \times L_{ind}) \times K_p) \times Max(SMTC\ period, DRX\ cycle)) \times CSSF_{intra}$
DRX cycle> 320ms	$ceil((M_{SSB_index_intra} + N \times L_{ind}) \times K_p) \times DRX\ cycle \times CSSF_{intra}$
NOTE 1: If different SMTC periodicities are configured for different cells, the SMTC period in the requirement is the one used by the cell being identified	
NOTE 2: When DRX is not configured, L_{ind} is the number of SMTC occasion groups not available at the UE during $T_{SSB_time_index_intra_CCA}$ for index detection, where $L_{ind} \le L_{ind,max}$. When DRX is configured, L_{ind} is the number of DRX cycles groups in which at least one SMTC occasion is not available at the UE during $T_{SSB_time_index_intra_CCA}$ for index detection, where $L_{ind} \le L_{ind,max}$. When configured with DRX, the UE is not required to determine the availability of SMTC occasions more frequent than once per DRX cycle.	
NOTE 3: $L_{ind,max}$ = 5 for Max(DRX cycle,SMTC period)≤40ms where DRX cycle is 0 for non-DRX, $L_{ind,max}$ = 3 for 40ms<Max(DRX cycle,SMTC period)≤320ms, $L_{ind,max}$ =2 for DRX cycle>320ms.	
NOTE 4: Upon exceeding $L_{ind,max}$ over the period of time $T_{SSB_time_index_intra_CCA}$, the UE has to restart the time index detection procedure.	

Table 10.4.1.0.1.1-8: Time period for time index detection, deactivated SCell (FR2-2)

DRX cycle	$T_{SSB_time_index_intra_CCA}$
No DRX	$Max(200ms, ceil((M_{SSB_index_intra_CCA} + N \times L_{ind,deact}) \times K_p) \times SMTC\ period) \times CSSF_{intra}$
DRX cycle≤ 320ms	$Max(200ms, ceil(1.5 \times ((M_{SSB_index_intra} + N \times L_{ind,deact}) \times K_p) \times Max(SMTC\ period, DRX\ cycle)) \times CSSF_{intra}$
DRX cycle> 320ms	$ceil((M_{SSB_index_intra} + N \times L_{ind,deact}) \times K_p) \times DRX\ cycle \times CSSF_{intra}$
NOTE 1: If different SMTC periodicities are configured for different cells, the SMTC period in the requirement is the one used by the cell being identified	
NOTE 2: When DRX is not configured, Lind,deact is the number of SMTC occasion groups not available at the UE during $T_{SSB_time_index_intra_CCA}$ for index detection, where $L_{ind,deact} \le L_{ind,deact,max}$. When DRX is configured, $L_{ind,deact}$ is the number of DRX cycles groups in which at least one SMTC occasion is not available at the UE during $T_{SSB_time_index_intra_CCA}$ for index detection, where $L_{ind,deact} \le L_{ind,deact,max}$. When configured with DRX, the UE is not required to determine the availability of SMTC occasions more frequent than once per DRX cycle.	
NOTE 3: $L_{ind,deact,max}$ = 5 for Max(DRX cycle,SMTC period)≤40ms where DRX cycle is 0 for non-DRX, $L_{ind,deact,max}$ = 3 for 40ms<Max(DRX cycle,SMTC period)≤320ms, $L_{ind,deact,max}$ =2 for DRX cycle>320ms.	
NOTE 4: Upon exceeding $L_{ind,deact,max}$ over the period of time $T_{SSB_time_index_intra_CCA}$, the UE has to restart the time index detection procedure.	

The normative reference for this requirement is TS 38.133 [6] clause 9.2A.5.1.

10.4.1.0.1.2 Measurement period

The measurement period for intra-frequency measurements without gaps is as shown in table 10.4.1.0.1.2-1, 10.4.1.0.1.2-2 (deactivated SCell).

If SCG DRX is in use, intra-frequency measurement period requirements specified in Table 10.4.1.0.1.2-1, Table 10.4.1.0.1.2-2 shall depend on the SCG DRX cycle. Otherwise, the requirements for when DRX is not in use shall apply.

The requirements apply provided any two closest SMTC occasions available at the UE for the measurement shall be separated by no more than the maximum time requirement for the cell to remain known defined in 38.133 [6] clause 9.2A.4.3.

When the time period of unsuccessful measurement attempts due to exceeding the maximum number of unavailable at the UE SMTC occasions of an already identified cell exceeds the maximum time requirement for the cell to remain known defined in 38.133 [6] clause 9.2A.4.3, UE shall stop the measurement attempts on this SSB and perform the detection procedure again like for any other SSB.

Table 10.4.1.0.1.2-1: Measurement period for intra-frequency measurements without gaps (FR1)

Condition	$T_{SSB_measurement_period_intra_CCA}$
No DRX	max(200ms, ceil((5+L_{meas}) x K_p) x SMTC period)[Note 1] x $CSSF_{intra}$
DRX cycle≤ 320ms	max(200ms, ceil(1.5x (5+L_{meas}) x K_p) x max(SMTC period,DRX cycle)) x $CSSF_{intra}$
DRX cycle>320ms	ceil((5+L_{meas}) x K_p) x DRX cycle x $CSSF_{intra}$
NOTE 1: If different SMTC periodicities are configured for different cells, the SMTC period in the requirement is the one used by the cell being identified	
NOTE 2: When DRX is not configured, L_{meas} is the number of SMTC occasions not available at the UE during $T_{SSB_measurement_period_intra_CCA}$ for measurement, where $L_{meas} < L_{meas,max}$. When DRX is configured, L_{meas} is the number of DRX cycles in which at least one SMTC occasion is not available at the UE during $T_{SSB_measurement_period_intra_CCA}$ for measurement, where $L_{meas} < L_{meas,max}$. When configured with DRX, the UE is not required to determine the availability of SMTC occasions more frequent than once per DRX cycle. FFS: The UE is not required to determine the availability of SMTC occasions more frequent than what is required by $CSSF_{intra}$.	
NOTE 3: $L_{meas,max}$ = 7 for Max(DRX cycle,SMTC period)≤40ms where DRX cycle is 0 for non-DRX, $L_{meas,max}$ = 5 for 40ms<Max(DRX cycle,SMTC period)≤320ms, $L_{meas,max}$ = 3 for DRX cycle>320ms.	
NOTE 4: Upon exceeding $L_{meas,max}$ over the period of time $T_{SSB_measurement_period_intra_CCA}$, the UE has to restart the measurement procedure.	

Table 10.4.1.0.1.2-2: Measurement period for intra-frequency measurements without gaps, deactivated SCell (FR1)

Condition	$T_{SSB_measurement_period_intra_CCA}$
No DRX	(5+$L_{meas,deact}$) x measCycleSCell x $CSSF_{intra}$
DRX cycle≤ 320ms	(5+$L_{meas,\ deact}$) x max(measCycleSCell, 1.5xDRX cycle) x $CSSF_{intra}$
DRX cycle>320ms	(5+$L_{meas,\ deact}$) x max(measCycleSCell, DRX cycle) x $CSSF_{intra}$
NOTE 1: When DRX is not configured, $L_{meas,deact}$ is the number of SMTC occasions not available at the UE during $T_{SSB_measurement_period_intra_CCA}$ for measurement, where $L_{meas,deact} < L_{meas,\ ,deact\ ,max}$. When DRX is configured, $L_{meas,deact}$ is the number of DRX cycles in which at least one SMTC occasion is not available at the UE during $T_{SSB_measurement_period_intra_CCA}$ for measurement, where $L_{meas,deact} < L_{meas,\ ,deact\ ,max}$. When configured with DRX, the UE is not required to determine the availability of SMTC occasions more frequent than once per DRX cycle. When configured with measurement cycles, the UE is not required to determine the availability of SMTC occasions more frequent than once per measurement cycle. FFS: The UE is not required to determine the availability of SMTC occasions more frequent than what is required by $CSSF_{intra}$.	
NOTE 2: $L_{meas,\ ,deact\ ,max,}$ = 7 for Max(DRX cycle, measCycleSCell)≤40ms where DRX cycle is 0 for non-DRX, $L_{meas,\ ,deact\ ,max}$ = 5 for 40ms<Max(DRX cycle, measCycleSCell)≤320ms, $L_{meas,\ ,deact\ ,max}$ = 3 for DRX cycle>320ms.	
NOTE 3: Upon exceeding $L_{meas,deact,max}$ over the period of time $T_{SSB_measurement_period_intra_CCA}$, the UE has to restart the measurement procedure.	

Table 10.4.1.0.1.2-3: Measurement period for intra-frequency measurements without gaps (FR2-2)

DRX cycle	$T_{SSB_measurement_period_intra_CCA}$
No DRX	max(400ms, ceil(($M_{meas_period_w/o_gaps_CCA}$ + N x L_{meas}) x K_p x $K_{layer1_measurement}$) x SMTC period)[Note 1] x $CSSF_{intra}$
DRX cycle≤ 320ms	max(400ms, ceil(1.5x ($M_{meas_period_w/o_gaps_CCA}$ + N x L_{meas}) x K_p x $K_{layer1_measurement}$) x max(SMTC period,DRX cycle)) x $CSSF_{intra}$

DRX cycle>320ms	ceil((M$_{meas_period_w/o_gaps_CCA}$ + N x L$_{meas}$) x K$_p$ x K$_{layer1_measurement}$) x DRX cycle x CSSF$_{intra}$
NOTE 1: If different SMTC periodicities are configured for different cells, the SMTC period in the requirement is the one used by the cell being identified	
NOTE 2: When DRX is not configured, L$_{meas}$ is the number of SMTC occasion groups not available at the UE during T $_{SSB_measurement_period_intra_CCA}$ for measurement, where L$_{meas}$ <L$_{meas,max}$. A SMTC occasion group consists of N consecutive SMTC occasions. An SMTC occasion group is not available, when at least one SMTC occasion in the group is not transmitted by the gNB. When DRX is configured, L$_{meas}$ is the number of [DRX cycle groups] in which at least one SMTC occasion is not available at the UE during T $_{SSB_measurement_period_intra_CCA}$ for measurement, where L$_{meas}$ <L$_{meas,max}$. . [A DRX occasion group consists of N consecutive DRX cycles. A DRX occasion group occasion group is not available, when at least one SMTC occasion in the group is not transmitted by the gNB.] When configured with DRX, the UE is not required to determine the availability of SMTC occasions more frequent than once per DRX cycle.	
NOTE 3: L$_{meas,max}$ = [7] for Max(DRX cycle,SMTC period)≤40ms where DRX cycle is 0 for non-DRX, L$_{meas,max}$ = [5] for 40ms<Max(DRX cycle,SMTC period)≤320ms, L$_{meas,max}$ = [3] for DRX cycle>320ms.	
NOTE 4: Upon exceeding L$_{meas,max}$ over the period of time T $_{SSB_measurement_period_intra_CCA}$, the UE has to restart the measurement procedure.	

Table 10.4.1.0.1.2-4: Measurement period for intra-frequency measurements without gaps, deactivated Scell (FR2-2)

DRX cycle	T $_{SSB_measurement_period_intra_CCA}$
No DRX	Ceil((M$_{meas_period_w/o_gaps_CCA}$ + N x L$_{meas,deact}$) x K$_p$) x measCycleSCell x CSSF$_{intra}$
DRX cycle≤ 320ms	Ceil((M$_{meas_period_w/o_gaps_CCA}$ + N x L$_{meas,deact}$) x K$_p$) x max(measCycleSCell, 1.5xDRX cycle) x CSSF$_{intra}$
DRX cycle> 320ms	Ceil((M$_{meas_period_w/o_gaps_CCA}$ + N x L$_{meas,deact}$) x K$_p$) x max(measCycleSCell, DRX cycle) x CSSF$_{intra}$
NOTE 1: When DRX is not configured, L$_{meas,deact}$ is the number of SMTC occasion groups not available at the UE during T $_{SSB_measurement_period_intra_CCA}$ for measurement, where L$_{meas,deact}$ <L$_{meas, ,deact ,max}$. A SMTC occasion group consists of N consecutive SMTC occasions. An SMTC occasion group is not available, when at least one SMTC occasion in the group is not transmitted by the gNB. When DRX is configured, L$_{meas,deact}$ is the number of [DRX cycle groups] in which at least one SMTC occasion is not available at the UE during T $_{SSB_measurement_period_intra_CCA}$ for measurement, where L$_{meas,deact}$ <L$_{meas, ,deact ,max}$. [A DRX occasion group consists of N consecutive DRX cycles. A DRX occasion group occasion group is not available, when at least one SMTC occasion in the group is not transmitted by the gNB.] When configured with DRX, the UE is not required to determine the availability of SMTC occasions more frequent than once per DRX cycle. When configured with measurement cycles, the UE is not required to determine the availability of SMTC occasions more frequent than once per measurement cycle. FFS: The UE is not required to determine the availability of SMTC occasions more frequent than what is required by CSSF$_{intra}$.	
NOTE 2: L$_{meas, ,deact ,max,}$ = [7] for Max(DRX cycle, measCycleSCell)≤40ms where DRX cycle is 0 for non-DRX, L$_{meas, ,deact ,max}$ = [5] for 40ms<Max(DRX cycle, measCycleSCell)≤320ms, L$_{meas, ,deact ,max}$ = [3] for DRX cycle>320ms.	
NOTE 3: Upon exceeding L$_{meas,deact,max}$ over the period of time T $_{SSB_measurement_period_intra_CCA}$, the UE has to restart the measurement procedure.	

The normative reference for this requirement is TS 38.133 [6] clause 9.2A.5.2.

10.4.1.0.2 Minimum conformance requitements for intra-frequency measurements with measurement gaps

10.4.1.0.2.1 Intra-frequency cell identification

The UE shall be able to identify a new detectable intra frequency cell within T$_{identify_intra_without_index_CCA}$ if UE is not indicated to report SSB based RRM measurement result with the associated SSB index (*reportQuantityRsIndexes* or *maxNrofRSIndexesToReport* is not configured), or the UE has been indicated that the neighbour cell is synchronous with the serving cell (*deriveSSB-IndexFromCell* is enabled). Otherwise UE shall be able to identify a new detectable intra frequency cell within T$_{identify_intra_with_index_CCA}$. The UE shall be able to identify a new detectable intra frequency SS block of an already detected cell within T$_{identify_intra_without_index\ CCA}$.

$$T_{identify_intra_without_index\ CCA} = T_{PSS/SSS_sync_intra_CCA} + T_{SSB_measurement_period_intra_CCA}\ \text{ms}$$

$$T_{identify_intra_with_index_CCA} = T_{PSS/SSS_sync_intra_CCA} + T_{SSB_measurement_period_intra_CCA} + T_{SSB_time_index_intra_CCA}$$

Where:

$T_{PSS/SSS_sync_intra_CCA}$: it is the time period used in PSS/SSS detection given in table 10.4.1.0.2.1-1.

$T_{SSB_time_index_intra_CCA}$: it is the time period used to acquire the index of the SSB being measured given in table 10.4.1.0.2.1-2.

$T_{SSB_measurement_period_intra_CCA}$: equal to a measurement period of SSB based measurement given in table 10.4.1.0.2.2-1 or 10.4.1.0.2.1-3.

$CSSF_{intra}$: it is a carrier specific scaling factor and is determined according to $CSSF_{within_gap,i}$ in 38.133 [6] clause 9.1.5.2 for measurement conducted within measurement gaps.

$M_{pss/sss_sync_w/o_gaps_CCA}$: For a UE supporting FR2-2 power class 1, $M_{pss/sss_sync_w/o_gaps\ CCA} = 60$. For a UE supporting FR2-2 power class 2, $M_{pss/sss_sync_w/o_gaps\ CCA} = 36$. For a UE supporting FR2-2 power class 3, $M_{pss/sss_sync_w/o_gaps\ CCA} = 36$.

$M_{meas_period_w/o_gaps_CCA}$: For a UE supporting FR2-2 power class 1, $M_{meas_period_w/o_gaps\ CCA} = 60$. For a UE supporting FR2-2 power class 2, $M_{meas_period_w/o_gaps\ CCA} = 36$. For a UE supporting FR2-2 power class 3, $M_{meas_period_w/o_gaps\ CCA} = 36$.

- $M_{SSB_index_intra_CCA}$: For a UE supporting FR2-2 power class 1, $M_{SSB_index_intra\ CCA} = 72$ samples. For a UE supporting FR2-2 power class 2, $M_{SSB_index_intra\ CCA} = 48$ samples. For a UE supporting FR2 power class 3, $M_{SSB_index_intra\ CCA} = 48$ samples.

N: is the UE Rx beam sweeping scaling factor. N = 12.

If MCG DRX is in use, intra-frequency cell identification requirements specified in Table 10.4.1.0.2.1-1, Table 10.4.1.0.2.1-2 and Table 10.4.1.0.2.1-3 shall depend on the MCG DRX cycle. If SCG DRX is in use, intra-frequency cell identification requirements specified in Table 10.4.1.0.2.1-1, Table 10.4.1.0.2.1-2 and Table 10.4.1.0.2.1-3 shall depend on the SCG DRX cycle. Otherwise, the requirements for when DRX is not in use shall apply.

The requirements apply provided any two closest SMTC occasions available at the UE for the measurement shall be separated by no more than the maximum time requirement for the cell to remain known defined in 38.133 [6] clause 9.2A.4.3.

Table 10.4.1.0.2.1-1: Time period for PSS/SSS detection (FR1)

Condition	$T_{PSS/SSS_sync_intra_CCA}$
No DRX	max(600ms, (5+$L_{PSS/SSS,gaps}$) x max(MGRP, SMTC period)) x $CSSF_{intra}$
DRX cycle≤ 320ms	max(600ms, ceil(1.5x (5+$L_{PSS/SSS,gaps}$)) x max(DRX cycle, MGRP, SMTC period)) x $CSSF_{intra}$
DRX cycle>320ms	(5+$L_{PSS/SSS,gaps}$) x (MGRP, DRX cycle) x $CSSF_{intra}$
NOTE 1: When DRX is not configured, $L_{PSS/SSS,gaps}$ is the number of SMTC occasions not available at the UE during $T_{PSS/SSS_sync_intra_CCA}$ for PSS/SSS detection, where $L_{PSS/SSS,gaps} < L_{PSS/SSS,gaps,max}$. When DRX is configured, $L_{PSS/SSS,gaps}$ is the number of DRX cycles in which at least one SMTC occasion is not available at the UE during $T_{PSS/SSS_sync_intra_CCA}$ for PSS/SSS detection, where $L_{PSS/SSS,gaps} < L_{PSS/SSS,gaps,max}$. When configured with DRX, the UE is not required to determine the availability of SMTC occasions more frequent than once per DRX cycle. When configured with measurement gaps, the UE is not required to determine the availability of SMTC occasions more frequent than once during MGRP. FFS: The UE is not required to determine the availability of SMTC occasions more frequent than what is required by $CSSF_{intra}$.	
NOTE 2: $L_{PSS/SSS,gaps,max,}$ =7 for Max(DRX cycle, SMTC period, MGRP)≤40ms where DRX cycle is 0 for non-DRX, $L_{PSS/SSS,gaps,max}$ =5 for 40ms<Max(DRX cycle, SMTC period, MGRP)≤320ms, $L_{PSS/SSS,gaps,max}$ =3 for DRX cycle>320ms.	
NOTE 3: Upon exceeding $L_{PSS/SSS,gaps,max}$, the UE is not required to meet the requirements for PSS/SSS detection.	

Table 10.4.1.0.2.1-2: Time period for time index detection (FR1)

Condition	$T_{SSB_time_index_intra_CCA}$
No DRX	max(120ms, (3+$L_{ind,gaps}$) x max(MGRP, SMTC period)) x $CSSF_{intra}$

DRX cycle≤ 320ms	max(120ms, ceil(1.5x (3+$L_{ind,gaps}$)) x max(MGRP, SMTC period,DRX cycle) x $CSSF_{intra}$)
DRX cycle>320ms	(3+$L_{ind,gaps}$) x (MGRP, DRX cycle) x $CSSF_{intra}$
NOTE 1:	When DRX is not configured, $L_{ind,gaps}$ is the number of SMTC occasions not available at the UE during $T_{SSB_time_index_intra_CCA}$ for index detection where $L_{ind,gaps} < L_{ind,gaps,max}$. When DRX is configured, $L_{ind,gaps}$ is the number of DRX cycles in which at least one SMTC occasion is not available at the UE during $T_{SSB_time_index_intra_CCA}$ for index detection where $L_{ind,gaps} < L_{ind,gaps,max}$. When configured with DRX, the UE is not required to determine the availability of SMTC occasions more frequent than once per DRX cycle. When configured with measurement gaps, the UE is not required to determine the availability of SMTC occasions more frequent than once during MGRP. FFS: The UE is not required to determine the availability of SMTC occasions more frequent than what is required by $CSSF_{intra}$.
NOTE 2:	$L_{ind,gaps,max,}$ = 5 for Max(DRX cycle, SMTC period, MGRP)≤40ms where DRX cycle is 0 for non-DRX, $L_{ind,gaps,max}$ = 3 for 40ms<Max(DRX cycle, SMTC period, MGRP)≤320ms, $L_{ind,gaps,max}$ = 2 for DRX cycle>320ms.
NOTE 3:	Upon exceeding $L_{ind,gaps,max}$ over the $T_{SSB_time_index_intra_CCA}$ period of time, the UE has to restart the time index detection procedure.

Table 10.4.1.0.2.1-3: Time period for PSS/SSS detection (FR2-2)

DRX cycle	$T_{PSS/SSS_sync_intra_CCA}$
No DRX	max(600ms, ($M_{pss/sss_sync_with_gaps_CCA}$ x K_{FR} + N x $L_{ind,gaps}$) x max(MGRP, SMTC period)) x $CSSF_{intra}$
DRX cycle≤ 320ms	max(600ms, ceil(1.5x ($M_{pss/sss_sync_with_gaps_CCA}$ x K_{FR} + N x $L_{ind,gaps}$)) x max(MGRP, SMTC period, DRX cycle)) x $CSSF_{intra}$
DRX cycle>320ms	($M_{pss/sss_sync_with_gaps_CCA}$ x K_{FR} + N x $L_{ind,gaps}$) x max(MGRP, DRX cycle) x $CSSF_{intra}$
NOTE 1:	When DRX is not configured, $L_{ind,gaps}$ is the number of SMTC occasion groups not available at the UE during $T_{SSB_time_index_intra_CCA}$ for index detection where $L_{ind,gaps} < L_{ind,gaps,max}$. A SMTC occasion group consists of N consecutive SMTC occasions. An SMTC occasion group is not available, when at least one SMTC occasion in the group is not transmitted by the gNB. When DRX is configured, $L_{ind,gaps}$ is the number of [DRX cycle groups] in which at least one SMTC occasion is not available at the UE during $T_{SSB_time_index_intra_CCA}$ for index detection where $L_{ind,gaps} < L_{ind,gaps,max}$.[A DRX occasion group consists of N consecutive DRX cycles. A DRX occasion group occasion group is not available, when at least one SMTC occasion in the group is not transmitted by the gNB.] When configured with DRX, the UE is not required to determine the availability of SMTC occasions more frequent than once per DRX cycle. When configured with measurement gaps, the UE is not required to determine the availability of SMTC occasions more frequent than once during MGRP.
NOTE 2:	$L_{ind,gaps,max,}$ = [5] for Max(DRX cycle, SMTC period, MGRP)≤40ms where DRX cycle is 0 for non-DRX, $L_{ind,gaps,max}$ = [3] for 40ms<Max(DRX cycle, SMTC period, MGRP)≤320ms, $L_{ind,gaps,max}$ = [2] for DRX cycle>320ms.
NOTE 3:	Upon exceeding $L_{ind,gaps,max}$ over the $T_{SSB_time_index_intra_CCA}$ period of time, the UE has to restart the time index detection procedure.
NOTE 4:	K_{FR} is a scaling factor depending on the frequency range and SSB SCS. K_{FR} = 1 if the SCS of the SSB of the cell being detected is 120 kHz, K_{FR} = 2 if the SCS of the SSB of the cell being detected is 480 kHz, and K_{FR} = 3 if the SCS of the SSB of the cell being detected is 960 kHz.

The normative reference for this requirement is TS 38.133 [6] clause 9.2A.6.1.

10.4.1.0.2.2 Intra-frequency measurement period

The measurement period for intra-frequency measurements with gaps is as shown in table 10.4.1.0.2.2-1.

If MCG DRX is in use, intra-frequency cell identification requirements specified in Table 10.4.1.0.2.2-1 and 10.4.1.0.2.2-2 shall depend on the MCG DRX cycle. If SCG DRX is in use, intra-frequency measurement period requirements specified in Table 10.4.1.0.2.2-1 and 10.4.1.0.2.2-2 shall depend on the SCG DRX cycle. Otherwise, the requirements for when DRX is not in use shall apply.

The requirements apply provided any two closest SMTC occasions available at the UE for the measurement shall be separated by no more than the maximum time requirement for the cell to remain known defined in 38.133 [6] clause 9.2A.4.3.

When the time period of unsuccessful measurement attempts due to exceeding the maximum number of unavailable at the UE SMTC occasions of an already identified cell exceeds the maximum time requirement for the cell to remain

known defined in 38.133 [6] clause 9.2A.4.3, UE shall stop the measurement attempts on this SSB and perform the detection procedure again like for any other SSB.

Table 10.4.1.0.2.2-1: Measurement period for intra-frequency measurements with gaps (FR1)

Condition	$T_{SSB_measurement_period_intra_CCA}$
No DRX	max(200ms, (5+$L_{meas,gaps}$) x max(MGRP, SMTC period)) x $CSSF_{intra}$
DRX cycle≤ 320ms	max(200ms, ceil(1.5x (5+$L_{meas,gaps}$)) x max(MGRP, SMTC period,DRX cycle)) x $CSSF_{intra}$
DRX cycle>320ms	(5+$L_{meas,gaps}$) x (MGRP, DRX cycle) x $CSSF_{intra}$
NOTE 1: When DRX is not configured, $L_{meas,gaps}$ is the number of SMTC occasions not available at the UE during $T_{SSB_time_index_intra_CCA}$ for measurement where $L_{meas,gaps} < L_{meas,gaps,max}$. When DRX is configured, $L_{meas,gaps}$ is the number of DRX cycles in which at least one SMTC occasion is not available at the UE during $T_{SSB_time_index_intra_CCA}$ for measurement where $L_{meas,gaps} < L_{meas,gaps,max}$. When configured with DRX, the UE is not required to determine the availability of SMTC occasions more frequent than once per DRX cycle. When configured with measurement gaps, the UE is not required to determine the availability of SMTC occasions more frequent than once during MGRP. FFS: The UE is not required to determine the availability of SMTC occasions more frequent than what is required by $CSSF_{intra}$.		
NOTE 2: $L_{meas,gaps,max}$ = 7 for Max(DRX cycle, SMTC period, MGRP)≤40ms where DRX cycle is 0 for non-DRX, $L_{meas,gaps,max}$ = 5 for 40ms<Max(DRX cycle, SMTC period, MGRP)≤320ms, $L_{meas,gaps,max}$ = 3 for DRX cycle>320ms.		
NOTE 3: Upon exceeding $L_{meas,gaps,max}$ over the $T_{SSB_measurement_period_intra_CCA}$ period of time, the UE has to restart the measurement procedure.		

Table 10.4.1.0.2.2-2: Measurement period for intra-frequency measurements with gaps (FR2-2)

DRX cycle	$T_{SSB_measurement_period_intra_CCA}$
No DRX	max(400ms, ($M_{meas_period\ with_gaps_CCA}$ + N x $L_{meas,gaps}$) x max(MGRP, SMTC period)) x $CSSF_{intra}$
DRX cycle≤ 320ms	max(400ms, ceil(1.5 x ($M_{meas_period\ with_gaps_CCA}$ + N x $L_{meas,gaps}$)) x max(MGRP, SMTC period, DRX cycle)) Note 1 x $CSSF_{intra}$
DRX cycle>320ms	($M_{meas_period\ with_gaps_CCA}$ + N x $L_{meas,gaps}$) x max(MGRP, DRX cycle) x $CSSF_{intra}$
NOTE 1: When DRX is not configured, $L_{meas,gaps}$ is the number of SMTC occasion groups not available at the UE during $T_{SSB_time_index_intra_CCA}$ for measurement where $L_{meas,gaps} < L_{meas,gaps,max}$. A SMTC occasion group consists of N consecutive SMTC occasions. An SMTC occasion group is not available, when at least one SMTC occasion in the group is not transmitted by the gNB. When DRX is configured, $L_{meas,gaps}$ is the number of DRX cycle groups in which at least one SMTC occasion is not available at the UE during $T_{SSB_time_index_intra_CCA}$ for measurement where $L_{meas,gaps} < L_{meas,gaps,max}$. A DRX occasion group consists of N consecutive DRX cycles. A DRX occasion group occasion group is not available, when at least one SMTC occasion in the group is not transmitted by the gNB. When configured with DRX, the UE is not required to determine the availability of SMTC occasions more frequent than once per DRX cycle. When configured with measurement gaps, the UE is not required to determine the availability of SMTC occasions more frequent than once during MGRP.		
NOTE 2: $L_{meas,gaps,max}$ = 7 for Max(DRX cycle, SMTC period, MGRP)≤40ms where DRX cycle is 0 for non-DRX, $L_{meas,gaps,max}$ = 5 for 40ms<Max(DRX cycle, SMTC period, MGRP)≤320ms, $L_{meas,gaps,max}$ = 3 for DRX cycle>320ms.		
NOTE 3: Upon exceeding $L_{meas,gaps,max}$ over the $T_{SSB_measurement_period_intra_CCA}$ period of time, the UE has to restart the measurement procedure.		

The normative reference for this requirement is TS 38.133 [6] clause 9.2A.6.2.

10.4.1.0.3 Minimum conformance requitements for intra-frequency RSSI and channel occupancy measurements

10.4.1.0.3.1 Intra-frequency RSSI measurements

An RSSI measurement is defined as an intra-frequency measurement provided that the RSSI measurement bandwidth is fully contained within the current carrier bandwidth of the UE.

The UE physical layer shall be capable of performing the RSSI measurements, defined in TS 38.215 [10] on one or more serving carriers operating with CCA, TS 37.213 [37], if the carrier(s) are indicated by higher layers [2], and report

the RSSI measurements to higher layers. The UE physical layer shall provide to higher layers a single RSSI sample for each OFDM symbol within each configured RSSI measurement duration [2] occurring with a configured RSSI measurement timing configuration periodicity [2], *rmtc-Periodicity*.

The UE can perform RSSI measurements without measurement gaps if RSSI measurement bandwidth is fully within the active DL BWP of the UE.

For performing intra-frequency RSSI measurement in FR2-2, UE shall assume the configured RSSI measurement resources are QCL-ed with TypeD to the DL RS associated with the TCI state provided in the RMTC configuration. If no TCI state is provided in the RMTC configuration, UE shall assume the configured RSSI measurement resources are QCL-ed with TypeD to one of the latest received PDSCH and the latest monitored CORESET in the active BWP of the current carrier in FR2-2.

For RSSI measurement in FR2-2 with SCS of 480 kHz or 960 kHz, the RSSI measurement results shall be derived based on symbols configured by RMTC except for the first symbol and the last symbol in RMTC, and there is no requirement when *measDurationSymbols* is configured as 1.

The measurement period for intra-frequency RSSI measurements without measurement gaps is as shown in Table 10.4.1.0.3.1-1 and Table 10.4.1.0.3.1-2, for FR1, and in 38.133 [6] Table 9.2A.7.4-1 and 38.133 [6] Table 9.2A.7.5-1 for FR2-2. The measurement period for intra-frequency RSSI measurements with measurement gaps is as shown in Table 10.4.1.0.3.1-3, for FR1 and in Table 10.4.1.0.3.1-6 for FR2-2.

Table 10.4.1.0.3.1-1: Measurement period for intra-frequency RSSI measurements without measurement gaps when SMTC and RMTC are overlapping (FR1)

Condition NOTE1,2	$T_{RSSI_measurement_period_intra_cca}$
No DRX	max(*reportInterval*, *rmtc-Periodicity**$CSSF_{outside_gap,i}$)
DRX	max(*reportInterval*, max(*rmtc-Periodicity*, DRX cycle) *$CSSF_{outside_gap,i}$)
NOTE 1: DRX or non DRX requirements apply according to the conditions described in 38.133 [6] clause 3.6.1 NOTE 2: $CSSF_{outside_gap,i}$ is a carrier specific scaling factor and is determined according to $CSSF_{outside_gap,i}$ in 38.133 [6] clause 9.1.5.1 for measurement conducted outside measurement gap.	

Table 10.4.1.0.3.1-2: Measurement period for intra-frequency RSSI measurements without measurement gaps when SMTC and RMTC are not overlapping (FR1)

Condition NOTE1,2	$T_{RSSI_measurement_period_intra_cca}$
No DRX	max(*reportInt*erval, $N_{intra-MO}$**rmtc-Periodicity*)
DRX	max(*reportInt*erval, $N_{intra-MO}$*max(*rmtc-Periodicity*, DRXcycle length))
NOTE 1: DRX or non DRX requirements apply according to the conditions described in 38.133 [6] clause 3.6.1 NOTE 2: $N_{intra-MO}$ is defined as the number of measurement objects that can be measured without gaps	

Table 10.4.1.0.3.1-3: Measurement period for intra-frequency RSSI measurements with measurement gaps (FR1)

Condition NOTE1,2	$T_{RSSI_measurement_period_intra_cca}$
No DRX	max(*reportInterval*, max(*rmtc-Periodicity, MGRP*) x $CSSF_{intra}$)
DRX	max(*reportInterval*, max(*rmtc-Periodicity*, MGRP,DRX cycle length) x $CSSF_{intra}$)
NOTE 1: DRX or non DRX requirements apply according to the conditions described in 38.133 [6] clause 3.6.1 NOTE 2: $CSSF_{intra}$ is a carrier specific scaling factor and is determined according to $CSSF_{within_gap,i}$ in 38.133 [6] clause 9.1.5.2 for measurement conducted within measurement gaps.	

Table 10.4.1.0.3.1-4: Measurement period for intra-frequency RSSI measurements without measurement gaps when SMTC and RMTC are overlapping (FR2-2)

Condition NOTE1,2	$T_{RSSI_measurement_period_intra_cca}$
No DRX	max(*reportInterval*, *rmtc-Periodicity**$CSSF_{outside_gap,i}$)
DRX	max(*reportInterval*, max(*rmtc-Periodicity*, DRX cycle) *$CSSF_{outside_gap,i}$)
NOTE 1: DRX or non DRX requirements apply according to the conditions described in 38.133 [6] clause 3.6.1 NOTE 2: $CSSF_{outside_gap,i}$ is a carrier specific scaling factor and is determined according to $CSSF_{outside_gap,i}$ in 38.133 [6] clause 9.1.5.1 for measurement conducted outside measurement gap.	

Table 10.4.1.0.3.1-5: Measurement period for intra-frequency RSSI measurements without measurement gaps when SMTC and RMTC are not overlapping (FR2-2)

Condition NOTE1,2	$T_{RSSI_measurement_period_intra_cca}$
No DRX	max(*reportInt*erval, $N_{intra-MO}$**rmtc-Periodicity*)
DRX	max(*reportInt*erval, $N_{intra-MO}$*max(*rmtc-Periodicity*, DRX cycle))
NOTE 1: DRX or non DRX requirements apply according to the conditions described in 38.133 [6] clause 3.6.1 NOTE 2: $N_{intra-MO}$ is defined as the number of measurement objects that can be measured without gaps	

Table 10.4.1.0.3.1-6: Measurement period for intra-frequency RSSI measurements with measurement gaps (FR2-2)

Condition NOTE1,2	$T_{RSSI_measurement_period_intra_cca}$
No DRX	max(*reportInterval*, max(*rmtc-Periodicity, MGRP*) x $CSSF_{intra}$)
DRX	max(*reportInterval*, max(*rmtc-Periodicity*, MGRP,DRX cycle) x $CSSF_{intra}$)
NOTE 1: DRX or non DRX requirements apply according to the conditions described in 38.133 [6] clause 3.6.1 NOTE 2: $CSSF_{intra}$ is a carrier specific scaling factor and is determined according to $CSSF_{within_gap,i}$ in 38.133 [6] clause 9.1.5.2 for measurement conducted within measurement gaps.	

If the UE requires measurement gaps to perform intra-frequency measurements, a single measurement gap pattern is used for all concurrent intra-frequency measurements, including intra-frequency RSSI measurements. The RSSI measurement duration and the measurement gap should be aligned, and the following additional condition should be fulfilled:

- Entire RSSI measurement duration should be contained in the measurement gap.

The RSSI measurement performed and reported according to this clause shall meet the RSSI measurement accuracy requirement in 38.133 [6] clause 10.1.34.1. The reported RSSI measurement values contained in measurement reports shall be based on the measurement report mapping requirements specified in 38.133 [6] clause 10.1.34.3.

The normative reference for this requirement is TS 38.133 [6] clause 9.2A.7.1.

10.4.1.0.3.2 Intra-frequency channel occupancy measurements

The UE shall be capable of estimating the channel occupancy on one or more serving carrier frequencies indicated by higher layers [2], based on RSSI samples provided by the physical layer.

The UE can perform channel occupancy measurements without measurement gaps if RSSI measurement bandwidth is fully within the active DL BWP of the UE.

The measurement period for intra-frequency channel occupancy measurements without measurement gap is as shown in Table 10.4.1.0.3.2-1 and Table 10.4.1.0.3.1-2 for FR1, and in Table 10.4.1.0.3.2-4 and Table 10.4.1.0.3.1-5 for FR2-2. The measurement period for intra-frequency RSSI measurements with measurement gaps is as shown in Table 10.4.1.0.3.2-3 for FR1, and in Table 10.4.1.0.3.2-6 for FR2-2 .

Table 10.4.1.0.3.2-1: Measurement period for intra-frequency Channel Occupancy measurements without measurement gaps when SMTC and RMTC are overlapping (FR1)

Condition NOTE1,2	$T_{RSSI_measurement_period_intra_cca}$
No DRX	max(*reportInterval*, *rmtc-Periodicity**$CSSF_{outside_gap,i}$)
DRX	max(*reportInterval*, max(*rmtc-Periodicity*, DRX cycle) *$CSSF_{outside_gap,i}$)
NOTE 1: DRX or non DRX requirements apply according to the conditions described in 38.133 [6] clause 3.6.1 NOTE 2: $CSSF_{outside_gap,i}$ is a carrier specific scaling factor and is determined according to $CSSF_{within_gap,i}$ in 38.133 [6] clause 9.1.5.1 for measurement conducted outside measurement gap.	

Table 10.4.1.0.3.2-2: Measurement period for intra-frequency Channel Occupancy measurements without measurement gaps when SMTC and RMTC are not overlapping (FR1)

Condition NOTE1,2	$T_{RSSI_measurement_period_intra_cca}$
No DRX	max(*reportInt*erval, $N_{intra-MO}$**rmtc-Periodicity*)
DRX	max(*reportInt*erval, $N_{intra-MO}$*max(*rmtc-Periodicity*, DRXcycle length))
NOTE 1: DRX or non DRX requirements apply according to the conditions described in 38.133 [6] clause 3.6.1	

NOTE 2: $N_{intra-MO}$ is defined as the number of measurement objects that can be measured without gaps

Table 10.4.1.0.3.2-3: Measurement period for intra-frequency Channel Occupancy measurements with measurement gaps (FR1)

Condition NOTE1,2	$T_{RSSI_measurement_period_intra_cca}$
No DRX	max(*reportInterval*, max(*rmtc-Periodicity, MGRP*) x $CSSF_{intra}$)
DRX	max(*reportInterval*, max(*rmtc-Periodicity*, MGRP,DRX cycle length) x $CSSF_{intra}$)
NOTE 1: DRX or non DRX requirements apply according to the conditions described in 38.133 [6] clause 3.6.1 NOTE 2: $CSSF_{intra}$ is a carrier specific scaling factor and is determined according to $CSSF_{within_gap,i}$ in 38.133 [6] clause 9.1.5.2 for measurement conducted within measurement gaps.	

Table 10.4.1.0.3.2-4: Measurement period for intra-frequency Channel Occupancy measurements without measurement gaps when SMTC and RMTC are overlapping (FR2-2)

Condition NOTE1,2	$T_{RSSI_measurement_period_intra_cca}$
No DRX	max(*reportInterval*, *rmtc-Periodicity**$CSSF_{outside_gap,i}$)
DRX	max(*reportInterval*, max(*rmtc-Periodicity*, DRX cycle) *$CSSF_{outside_gap,i}$)
NOTE 1: DRX or non DRX requirements apply according to the conditions described in 38.133 [6] clause 3.6.1 NOTE 2: $CSSF_{outside_gap,\ i}$ is a carrier specific scaling factor and is determined according to $CSSF_{outside_gap,i}$ in 38.133 [6] clause 9.1.5.1 for measurement conducted outside measurement gap.	

Table 10.4.1.0.3.2-5: Measurement period for intra-frequency Channel Occupancy measurements without measurement gaps when SMTC and RMTC are not overlapping (FR2-2)

Condition NOTE1,2	$T_{RSSI_measurement_period_intra_cca}$
No DRX	max(*reportInt*erval, $N_{intra-MO}$**rmtc-Periodicity*)
DRX	max(*reportInt*erval, $N_{intra-MO}$*max(*rmtc-Periodicity*, DRX cycle))
NOTE 1: DRX or non DRX requirements apply according to the conditions described in 38.133 [6] clause 3.6.1 NOTE 2: $N_{intra-MO}$ is defined as the number of measurement objects that can be measured without gaps	

Table 10.4.1.0.3.2-6: Measurement period for intra-frequency Channel Occupancy measurements with measurement gaps (FR2-2)

Condition NOTE1,2	$T_{RSSI_measurement_period_intra_cca}$
No DRX	max(*reportInterval*, max(*rmtc-Periodicity, MGRP*) x $CSSF_{intra}$)
DRX	max(*reportInterval*, max(*rmtc-Periodicity*, MGRP,DRX cycle) x $CSSF_{intra}$)
NOTE 1: DRX or non DRX requirements apply according to the conditions described in clause 3.6.1 NOTE 2: $CSSF_{intra}$ is a carrier specific scaling factor and is determined according to $CSSF_{within_gap,i}$ in 38.133 [6] clause 9.1.5.2 for measurement conducted within measurement gaps.	

If the UE requires measurement gaps to perform intra-frequency measurements, a single measurement gap pattern is used for all concurrent intra-frequency measurements, including intra-frequency RSSI measurements. The RSSI measurement duration and the measurement gap should be aligned, and the following additional condition should be fulfilled:

- Entire RSSI measurement duration should be contained in the measurement gap.

The channel occupancy measurement performed and reported according to this clause shall meet the channel occupancy measurement accuracy requirements in Clause 10.1.35.1. The reported channel occupancy measurement values contained in measurement reports shall be based on the measurement reporting range specified in TS 38.331 [13].

The normative reference for this requirement is TS 38.133 [6] clause 9.2A.7.2.

10.4.1.1 EN-DC FR1 Event-triggered reporting tests on PSCC without gaps under non-DRX and CCA

Editor's Note:

- MU and TT analysis is incomplete
- Message contents are FFS
- Call setup and test procedure may need to be updated
- Applicability may need to be updated
- Statistical analysis to determine test case verdict is FFS
- Test description, general test parameters and cell-specific test parameters are still FFS or TBD in 38.133 [6]

10.4.1.1.1 Test purpose

The purpose of this test is to verify that the UE makes correct reporting of an event. This test will partly verify the intra-frequency cell search requirements in clauses 10.4.1.0.1.1 and 10.4.1.0.1.2.

10.4.1.1.2 Test applicability

This test applies to all types of E-UTRA UE release 16 and forward, supporting EN-DC, supporting NR-U and [supporting intra-freq measurements on shared channel access].

10.4.1.1.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 10.4.1.0.

The normative reference for this requirement is TS 38.133 [6] clause A.10.4.1.1.

10.4.1.1.4 Test description

Three cells are deployed in the test, which are E-UTRAN PCell (Cell 1) and two cells on the same carrier frequency with CCA transmitting SSBs in DBT windows according to DL CCA model: PSCell (Cell 2) and a neighbour cell (Cell 3). The test parameters for the three cells are given in Table 10.4.1.1.4.1-1 and 10.4.1.1.4.1-3 below. In the measurement control information, a measurement object is configured for the frequency of the PSCell, and it is indicated to the UE that event-triggered reporting with Event A3 is used.

FFS: The same test is applicable for UE supporting any one or both semi-static channel access or dynamic channel access and for network configuring any of semi-static channel occupancy or dynamic channel occupancy.

The test is conducted for SS-RSRP, SS-RSRQ, and SS-SINR:

- In the first test (Test 1), the UE is configured with SS-RSRP as Event A3 measurement quantity.
- In the second test (Test 2), the UE is configured with SS-RSRQ as Event A3 measurement quantity.
- In the third test (Test 3), the UE is configured with SS-SINR as Event A3 measurement quantity.

10.4.1.1.4.1 Initial conditions

This test shall be tested using any of the test configurations in Table 10.4.1.1.4.1-1.

Table 10.4.1.1.4.1-1: Supported test configurations for EN-DC FR1 Event-triggered reporting tests on PSCC without gaps under non-DRX and CCA

Configuration	Description
10.4.1.1-1	LTE FDD, NR 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode
10.4.1.1-2	LTE TDD, NR 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode
Note: The UE is only required to pass in one of the supported test configurations in FR1	

Configure the test equipment and the DUT according to the parameters in Table 10.4.1.1.4.1-2.

Table 10.4.1.1.4.1-2: Initial conditions for EN-DC FR1 Event-triggered reporting tests on PSCC without gaps under non-DRX and CCA

Parameter	Value		Comment
Test environment	NC		As specified in TS 38.508-1 [14] clause 4.1.
Test frequencies	As specified in Annex E, table E.2-1 and TS 38.508-1 [14] clause 4.3.1 and 4.4.2.		
Channel bandwidth	As specified by the test configuration selected from Table 10.4.1.1.4.1-1.		
Propagation conditions	AWGN		As specified in clause C.2.2.
Connection Diagram	TE Part	A.3.1.7.1	As specified in TS 38.508-1 [14] Annex A.
	DUT Part	A.3.2.3.4	
Exceptions to connection diagram	For 4Rx capable UEs without any 2 Rx RF bands use A.3.2.5.2 for DUT part and A.3.1.8.4 for TE Part		

1. The general test parameter settings are set up according to Table 10.4.1.1.4.1-3.

2. Message contents are defined in clause 10.4.1.1.4.3.

3. Cell 1 is the E-UTRA serving cell (PCell) for the EN-DC setup. The power levels and settings for Cell 1 are set according to Annex A.6. Cell 2 and Cell 3 are NR cells (PSCell and neighbor cell, respectively) with the power level set according to clauses C.1.2 and C.1.3 for this test.

Table 10.4.1.1.4.1-3: General test parameters for EN-DC FR1 Event-triggered reporting tests on PSCC without gaps under non-DRX and CCA

TBD

10.4.1.1.4.2 Test procedure

The test consists of two successive time periods, with time duration of T1 and T2, respectively. During time duration T1, the UE shall not have any timing information of Cell 3.

1. Ensure the UE is in [state RRC_CONNECTED with generic procedure parameters *Connectivity EN-DC*, *DC bearer MCG and SCG*, *Connected without release On* and *Test Mode On*] according to TS 38.508-1 [14] clause 4.5.

2. Set the parameters according to T1 in Table 10.4.1.1.5-1.

3. SS shall transmit an *RRCConnectionReconfiguration* message with event A3 configured with *MeasTriggerQuantityOffset* set to *rsrp* for Test 1, *rsrq* for Test 2 and *sinr* for Test 3, with the corresponding offset according to Table 10.4.1.1.4.1-3.

4. The UE shall transmit *RRCConnectionReconfigurationComplete* message. T1 starts.

5. When T1 expires, the SS shall switch the power setting from T1 to T2 as specified in Table 10.4.1.1.5-1. T2 starts.

6. UE shall transmit a *MeasurementReport* message triggered by Event A3 embedded in E-UTRA RRC message *ULInformationTransferMRDC*. If the overall delays measured from the beginning of time period T2 is less than [FFS1 ms for Test 1, FFS2 ms for Test 2, or FFS3 ms for Test 3], then the number of successful tests is increased by one for the corresponding Test. If the UE fails to report the event within the overall delays measured requirement, then the number of failure tests is increased by one for the corresponding Test.

7. After the SS receives the *MeasurementReport* message in step 6 or when T2 expires, the SS shall transmit *RRCConnectionReconfiguration* message with condition EN-DC PSCell release according to TS 36.508 [25] Table 4.6.1-8 to release NR cell (PSCell). The UE shall transmit *RRCConnectionReconfigurationComplete* message.

8. Set Cell 3 physical cell identity = ((current cell 3 physical cell identity + 1) mod 1008) for next iteration of the test procedure loop.

9. The SS then shall transmit *RRCConnectionReconfiguration* message with condition *MCG_and_SCG* according to TS 36.508 [25] Table 4.6.1-8 to add NR Cell 2 (PSCell). The UE shall transmit

RRCConnectionReconfigurationComplete message. If any the reconfiguration fails, switch off and on the UE and proceed with step 1.

10. Repeat steps 2-9 until the confidence level according to Tables G.TBD in Annex G clause G.TBD is achieved.

11. Repeat steps 1-10 for each Test in Table 10.4.1.1.4.1-3 as appropriate.

10.4.1.1.4.3 Message contents

Message contents are according to TS 38.508-1 [14] clause 7.3 with the following exceptions:

Table 10.4.1.1.4.3-1: Common Exception messages for EN-DC FR1 Event-triggered reporting tests on PSCC without gaps under non-DRX and CCA

Default Message Contents	
Common contents of system information blocks exceptions	
Default RRC messages and information elements contents exceptions	Table H.3.1-1 Table H.3.1-2 Table H.3.1-3 with Condition INTRA-FREQ MO Table H.3.1-4 with A3-offset = FFS [Table H.3.1-4 will require updates to enable RSRQ and SINR trigger quantities] Table H.3.1-5 Table H.3.1-7 [Table Table H.3.1-7 will require updates to enable SINR measurement reports] Table H.3.4-1 Table H.3.4-1a Table H.3.4-3 Table H.3.4-4 Table H.3.4-6 [Table H.3.4-6 will require updates to enable DBT window configuration] [Table 7.3.1-3 in TS 38.508-1 [14] with condition DBT.1]

10.4.1.1.5 Test requirements

Tables 10.4.1.1.4.1-3 and 10.4.1.1.5-1 define the primary level settings including test tolerances for EN-DC FR1 Event-triggered reporting tests on PSCC without gaps under non-DRX and CCA.

Table 10.4.1.1.5-1: Cell specific test parameters for EN-DC FR1 Event-triggered reporting tests on PSCC without gaps under non-DRX and CCA

TBD

The UE shall send one Event A3 triggered measurement report (SS-RSRP in Test 1, SS-RSRQ in Test 2, SS-SINR in Test 3), with a measurement reporting delay less than D1 ms from the beginning of time period T2.

D1=TBD

The UE is not required to read the neighbour cell SSB index in this test.

The UE shall not send event triggered measurement reports, as long as the reporting criteria are not fulfilled.

The rate of correct events observed during repeated tests shall be at least 90%.

FFS: NOTE: The actual overall delays measured in the test may be up to $2xTTI_{DCCH}$ higher than the measurement reporting delays above because of TTI insertion uncertainty of the measurement report in DCCH.

10.4.1.2 EN-DC FR1 Event-triggered reporting tests on PSCC without gaps under DRX and CCA

Editor's Note:

- MU and TT analysis is incomplete

- Message contents are FFS
- Call setup and test procedure may need to be updated
- Applicability may need to be updated
- Statistical analysis to determine test case verdict is FFS
- Test description, general test parameters and cell-specific test parameters are still FFS or TBD in 38.133 [6]

10.4.1.2.1 Test purpose

The purpose of this test is to verify that the UE makes correct reporting of an event. This test will partly verify the intra-frequency cell search requirements in clauses 10.4.1.0.1.1 and 10.4.1.0.1.2.

10.4.1.2.2 Test applicability

This test applies to all types of E-UTRA UE release 16 and forward, supporting EN-DC, supporting NR-U, [supporting intra-freq measurements on shared channel access] and long DRX.

10.4.1.2.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 10.4.1.0.

The normative reference for this requirement is TS 38.133 [6] clause A.10.4.1.2.

10.4.1.2.4 Test description

Three cells are deployed in the test, which are E-UTRAN PCell (Cell 1) and two cells on the same carrier frequency with CCA transmitting SSBs in DBT windows according to DL CCA model: PSCell (Cell 2) and a neighbour cell (Cell 3). The test parameters for the three cells are given in Table 10.4.1.2.4.1-1 and 10.4.1.2.4.1-3 below. In the measurement control information, a measurement object is configured for the frequency of the PSCell, and it is indicated to the UE that event-triggered reporting with Event A3 is used. DRX is configured on the UE.

FFS: The same test is applicable for UE supporting any one or both semi-static channel access or dynamic channel access and for network configuring any of semi-static channel occupancy or dynamic channel occupancy.

The test is conducted for SS-RSRP, SS-RSRQ, and SS-SINR:

- In the first set of tests (Tests 1 and 2), the UE is configured with SS-RSRP as Event A3 measurement quantity.
- In the second set of tests (Test 3 and 4), the UE is configured with SS-RSRQ as Event A3 measurement quantity.
- In the third set of tests (Tests 5 and 6), the UE is configured with SS-SINR as Event A3 measurement quantity.

10.4.1.2.4.1 Initial conditions

This test shall be tested using any of the test configurations in Table 10.4.1.2.4.1-1.

Table 10.4.1.2.4.1-1: Supported test configurations for EN-DC FR1 Event-triggered reporting tests on PSCC without gaps under DRX and CCA

Configuration	Description
10.4.1.2-1	LTE FDD, NR 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode
10.4.1.2-2	LTE TDD, NR 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode
Note: The UE is only required to pass in one of the supported test configurations in FR1	

Configure the test equipment and the DUT according to the parameters in Table 10.4.1.2.4.1-2.

Table 10.4.1.2.4.1-2: Initial conditions for EN-DC FR1 Event-triggered reporting tests on PSCC without gaps under DRX and CCA

Parameter	Value		Comment
Test environment	NC		As specified in TS 38.508-1 [14] clause 4.1.
Test frequencies	As specified in Annex E, table E.2-1 and TS 38.508-1 [14] clause 4.3.1 and 4.4.2.		
Channel bandwidth	As specified by the test configuration selected from Table 10.4.1.2.4.1-1.		
Propagation conditions	AWGN		As specified in clause C.2.2.
Connection Diagram	TE Part	A.3.1.7.1	As specified in TS 38.508-1 [14] Annex A.
	DUT Part	A.3.2.3.4	
Exceptions to connection diagram	For 4Rx capable UEs without any 2 Rx RF bands use A.3.2.5.2 for DUT part and A.3.1.8.4 for TE Part		

1. The general test parameter settings are set up according to Table 10.4.1.2.4.1-3.
2. Message contents are defined in clause 10.4.1.2.4.3.
3. Cell 1 is the E-UTRA serving cell (PCell) for the EN-DC setup. The power levels and settings for Cell 1 are set according to Annex A.6. Cell 2 and Cell 3 are NR cells (PSCell and neighbor cell, respectively) with the power level set according to clauses C.1.2 and C.1.3 for this test.

Table 10.4.1.2.4.1-3: General test parameters for EN-DC FR1 Event-triggered reporting tests on PSCC without gaps under DRX and CCA

TBD

10.4.1.2.4.2 Test procedure

The test consists of two successive time periods, with time duration of T1 and T2, respectively. During time duration T1, the UE shall not have any timing information of Cell 3.

1. Ensure the UE is in [state RRC_CONNECTED with generic procedure parameters *Connectivity EN-DC*, *DC bearer MCG and SCG*, *Connected without release On* and *Test Mode On*] according to TS 38.508-1 [14] clause 4.5.
2. Set the parameters according to T1 in Table 10.4.1.2.5-1.
3. SS shall transmit an *RRCConnectionReconfiguration* message with event A3 configured with *MeasTriggerQuantityOffset* set to *rsrp* for Test 1, *rsrq* for Test 2 and *sinr* for Test 3, with the corresponding offset according to Table 10.4.1.2.4.1-3.
4. The UE shall transmit *RRCConnectionReconfigurationComplete* message. T1 starts.
5. When T1 expires, the SS shall switch the power setting from T1 to T2 as specified in Table 10.4.1.2.5-1. T2 starts.
6. UE shall transmit a *MeasurementReport* message triggered by Event A3 embedded in E-UTRA RRC message *ULInformationTransferMRDC*. If the overall delays measured from the beginning of time period T2 is less than [FFS1 ms for Test 1, FFS2 ms for Test 2, FFS3 ms for Test 3, FFS4 ms for Test 4, FFS5 ms for Test 5 or FFS6 ms for Test 6], then the number of successful tests is increased by one for the corresponding Test. If the UE fails to report the event within the overall delays measured requirement, then the number of failure tests is increased by one for the corresponding Test.
7. After the SS receives the *MeasurementReport* message in step 6 or when T2 expires, the SS shall transmit *RRCConnectionReconfiguration* message with condition EN-DC PSCell release according to TS 36.508 [25] Table 4.6.1-8 to release NR cell (PSCell). The UE shall transmit *RRCConnectionReconfigurationComplete* message.
8. Set Cell 3 physical cell identity = ((current cell 3 physical cell identity + 1) mod 1008) for next iteration of the test procedure loop.

9. The SS then shall transmit *RRCConnectionReconfiguration* message with condition *MCG_and_SCG* according to TS 36.508 [25] Table 4.6.1-8 to add NR Cell 2 (PSCell). The UE shall transmit *RRCConnectionReconfigurationComplete* message. If any the reconfiguration fails, switch off and on the UE and proceed with step 1.

10. Repeat steps 2-9 until the confidence level according to Tables G.TBD in Annex G clause G.TBD is achieved.

11. Repeat steps 1-10 for each Test in Table 10.4.1.2.4.1-3 as appropriate.

10.4.1.2.4.3 Message contents

Message contents are according to TS 38.508-1 [14] clause 7.3 with the following exceptions:

Table 10.4.1.2.4.3-1: Common Exception messages for EN-DC FR1 Event-triggered reporting tests on PSCC without gaps under DRX and CCA

Default Message Contents	
Common contents of system information blocks exceptions	
Default RRC messages and information elements contents exceptions	Table H.3.1-1 Table H.3.1-2 Table H.3.1-3 with Condition INTRA-FREQ MO Table H.3.1-4 with A3-offset = FFS [Table H.3.1-4 will require updates to enable RSRQ and SINR trigger quantities] Table H.3.1-5 Table H.3.1-7 [Table Table H.3.1-7 will require updates to enable SINR measurement reports] Table H.3.4-1 Table H.3.4-1a Table H.3.4-3 Table H.3.4-4 Table H.3.4-6 [Table H.3.4-6 will require updates to enable DBT window configuration] Table H.3.7-1 with condition DRX.TBD and Offset for test TBD [Table 7.3.1-3 in TS 38.508-1 [14] with condition DBT.1]

10.4.1.2.5 Test requirements

Tables 10.4.1.2.4.1-3 and 10.4.1.2.5-1 define the primary level settings including test tolerances for EN-DC FR1 Event-triggered reporting tests on PSCC without gaps under DRX and CCA.

Table 10.4.1.2.5-1: Cell specific test parameters for EN-DC FR1 Event-triggered reporting tests on PSCC without gaps under DRX and CCA

TBD

The UE shall send one Event A3 triggered measurement report (SS-RSRP in Test 1 and Test 2, SS-RSRQ in Test 3 and Test 4, SS-SINR in Test 5 and Test 6), with a measurement reporting delay less than D1 ms from the beginning of time period T2.

D1=TBD (Editor's note: D1 is different for different DRX configurations)

The UE is not required to read the neighbour cell SSB index in this test.

The UE shall not send event triggered measurement reports, as long as the reporting criteria are not fulfilled.

The rate of correct events observed during repeated tests shall be at least 90%.

FFS: NOTE: The actual overall delays measured in the test may be up to $2xTTI_{DCCH}$ higher than the measurement reporting delays above because of TTI insertion uncertainty of the measurement report in DCCH.

10.4.1.3 EN-DC FR1 Event-triggered reporting tests on PSCC with per-UE gaps under non-DRX and CCA

Editor's Note:

- MU and TT analysis is incomplete
- Message contents are FFS
- Call setup and test procedure may need to be updated
- Applicability may need to be updated
- Statistical analysis to determine test case verdict is FFS
- Test description, general test parameters and cell-specific test parameters are still FFS or TBD in 38.133 [6]

10.4.1.3.1 Test purpose

The purpose of this test is to verify that the UE makes correct reporting of an event. This test will partly verify the intra-frequency cell search requirements in clauses 10.4.1.0.2.1 and 10.4.1.0.2.2.

10.4.1.3.2 Test applicability

This test applies to all types of E-UTRA UE release 16 and forward, supporting EN-DC, supporting NR-U, [supporting inter-freq measurements on shared channel access] and [gap pattern TBD, in case of non-mandatory].

10.4.1.3.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 10.4.1.0.

The normative reference for this requirement is TS 38.133 [6] clause A.10.4.1.3.

10.4.1.3.4 Test description

Three cells are deployed in the test, which are E-UTRAN PCell (Cell 1) and two cells on the same carrier frequency with CCA transmitting SSBs in DBT windows according to DL CCA model: PSCell (Cell 2) and a neighbour cell (Cell 3). The test parameters for the three cells are given in Table 10.4.1.3.4.1-1 and 10.4.1.3.4.1-3 below. In the measurement control information, a measurement object is configured for the frequency of the PSCell, and it is indicated to the UE that event-triggered reporting with Event A3 is used. Gap pattern TBD is configured on the UE.

FFS: The same test is applicable for UE supporting any one or both semi-static channel access or dynamic channel access and for network configuring any of semi-static channel occupancy or dynamic channel occupancy.

The test is conducted for SS-RSRP, SS-RSRQ, and SS-SINR:

- In the first test (Test 1), the UE is configured with SS-RSRP as Event A3 measurement quantity.
- In the second test (Test 2), the UE is configured with SS-RSRQ as Event A3 measurement quantity.
- In the third test (Test 3), the UE is configured with SS-SINR as Event A3 measurement quantity.

10.4.1.3.4.1 Initial conditions

This test shall be tested using any of the test configurations in Table 10.4.1.3.4.1-1.

Table 10.4.1.3.4.1-1: Supported test configurations for EN-DC FR1 Event-triggered reporting tests on PSCC with per-UE gaps under non-DRX and CCA

Configuration	Description
10.4.1.3-1	LTE FDD, NR 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode
10.4.1.3-2	LTE TDD, NR 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode
Note: The UE is only required to pass in one of the supported test configurations in FR1	

Configure the test equipment and the DUT according to the parameters in Table 10.4.1.3.4.1-2.

Table 10.4.1.3.4.1-2: Initial conditions for EN-DC FR1 Event-triggered reporting tests on PSCC with per-UE gaps under non-DRX and CCA

Parameter	Value		Comment
Test environment	NC		As specified in TS 38.508-1 [14] clause 4.1.
Test frequencies	As specified in Annex E, table E.2-1 and TS 38.508-1 [14] clause 4.3.1 and 4.4.2.		
Channel bandwidth	As specified by the test configuration selected from Table 10.4.1.3.4.1-1.		
Propagation conditions	AWGN		As specified in clause C.2.2.
Connection Diagram	TE Part	A.3.1.7.1	As specified in TS 38.508-1 [14] Annex A.
	DUT Part	A.3.2.3.4	
Exceptions to connection diagram	For 4Rx capable UEs without any 2 Rx RF bands use A.3.2.5.2 for DUT part and A.3.1.8.4 for TE Part		

1. The general test parameter settings are set up according to Table 10.4.1.3.4.1-3.

2. Message contents are defined in clause 10.4.1.3.4.3.

3. Cell 1 is the E-UTRA serving cell (PCell) for the EN-DC setup. The power levels and settings for Cell 1 are set according to Annex A.6. Cell 2 and Cell 3 are NR cells (PSCell and neighbor cell, respectively) with the power level set according to clauses C.1.2 and C.1.3 for this test.

Table 10.4.1.3.4.1-3: General test parameters for EN-DC FR1 Event-triggered reporting tests on PSCC with per-UE gaps under non-DRX and CCA

TBD

10.4.1.3.4.2 Test procedure

The test consists of two successive time periods, with time duration of T1 and T2, respectively. During time duration T1, the UE shall not have any timing information of Cell 3.

1. Ensure the UE is in [state RRC_CONNECTED with generic procedure parameters *Connectivity EN-DC*, *DC bearer MCG and SCG*, *Connected without release On* and *Test Mode On*] according to TS 38.508-1 [14] clause 4.5.

2. Set the parameters according to T1 in Table 10.4.1.3.5-1.

3. SS shall transmit an *RRCConnectionReconfiguration* message with gap pattern TBD and event A3 configured with *MeasTriggerQuantityOffset* set to *rsrp* for Test 1, *rsrq* for Test 2 and *sinr* for Test 3, with the corresponding offset according to Table 10.4.1.3.4.1-3.

4. The UE shall transmit *RRCConnectionReconfigurationComplete* message. T1 starts.

5. When T1 expires, the SS shall switch the power setting from T1 to T2 as specified in Table 10.4.1.3.5-1. T2 starts.

6. UE shall transmit a *MeasurementReport* message triggered by Event A3 embedded in E-UTRA RRC message *ULInformationTransferMRDC*. If the overall delays measured from the beginning of time period T2 is less than [FFS1 ms for Test 1, FFS2 ms for Test 2, or FFS3 ms for Test 3], then the number of successful tests is increased by one for the corresponding Test. If the UE fails to report the event within the overall delays measured requirement, then the number of failure tests is increased by one for the corresponding Test.

7. After the SS receives the *MeasurementReport* message in step 6 or when T2 expires, the SS shall transmit *RRCConnectionReconfiguration* message with condition EN-DC PSCell release according to TS 36.508 [25] Table 4.6.1-8 to release NR cell (PSCell). The UE shall transmit *RRCConnectionReconfigurationComplete* message.

8. Set Cell 3 physical cell identity = ((current cell 3 physical cell identity + 1) mod 1008) for next iteration of the test procedure loop.

9. The SS then shall transmit *RRCConnectionReconfiguration* message with condition *MCG_and_SCG* according to TS 36.508 [25] Table 4.6.1-8 to add NR Cell 2 (PSCell). The UE shall transmit

RRCConnectionReconfigurationComplete message. If any the reconfiguration fails, switch off and on the UE and proceed with step 1.

10. Repeat steps 2-9 until the confidence level according to Tables G.TBD in Annex G clause G.TBD is achieved.

11. Repeat steps 1-10 for each Test in Table 10.4.1.3.4.1-3 as appropriate.

10.4.1.3.4.3 Message contents

Message contents are according to TS 38.508-1 [14] clause 7.3 with the following exceptions:

Table 10.4.1.3.4.3-1: Common Exception messages for EN-DC FR1 Event-triggered reporting tests on PSCC with per-UE gaps under non-DRX and CCA

Default Message Contents	
Common contents of system information blocks exceptions	
Default RRC messages and information elements contents exceptions	Table H.3.1-1 Table H.3.1-2 with Condtion GAP NEEDED Table H.3.1-3 with Condition INTRA-FREQ MO Table H.3.1-4 with A3-offset = FFS [Table H.3.1-4 will require updates to enable RSRQ and SINR trigger quantities] Table H.3.1-5 Table H.3.1-6 with Conditions gapUE, Pattern TBD and gap offset TBD [Table H.3.1-6 may need to be updated, depending on the gap config] Table H.3.1-7 [Table Table H.3.1-7 will require updates to enable SINR measurement reports] Table H.3.4-1 Table H.3.4-1a Table H.3.4-3 Table H.3.4-4 Table H.3.4-6 [Table H.3.4-6 will require updates to enable DBT window configuration] [Table 7.3.1-3 in TS 38.508-1 [14] with condition DBT.1]

10.4.1.3.5 Test requirements

Tables 10.4.1.3.4.1-3 and 10.4.1.3.5-1 define the primary level settings including test tolerances for EN-DC FR1 Event-triggered reporting tests on PSCC with per-UE gaps under non-DRX and CCA.

Table 10.4.1.3.5-1: Cell specific test parameters for EN-DC FR1 Event-triggered reporting tests on PSCC with per-UE gaps under non-DRX and CCA

TBD

The UE shall send one Event A3 triggered measurement report (SS-RSRP in Test 1, SS-RSRQ in Test 2, SS-SINR in Test 3), with a measurement reporting delay less than D1 ms from the beginning of time period T2.

D1=TBD

The UE is not required to read the neighbour cell SSB index in this test.

The UE shall not send event triggered measurement reports, as long as the reporting criteria are not fulfilled.

The rate of correct events observed during repeated tests shall be at least 90%.

FFS: NOTE: The actual overall delays measured in the test may be up to $2xTTI_{DCCH}$ higher than the measurement reporting delays above because of TTI insertion uncertainty of the measurement report in DCCH.

10.4.1.4 EN-DC FR1 Event-triggered reporting tests on PSCC with per-UE gaps under DRX and CCA

Editor's Note:

- MU and TT analysis is incomplete
- Message contents are FFS
- Call setup and test procedure may need to be updated
- Applicability may need to be updated
- Statistical analysis to determine test case verdict is FFS
- Test description, general test parameters and cell-specific test parameters are still FFS or TBD in 38.133 [6]

10.4.1.4.1 Test purpose

The purpose of this test is to verify that the UE makes correct reporting of an event. This test will partly verify the intra-frequency cell search requirements in clauses 10.4.1.0.2.1 and 10.4.1.0.2.2.

10.4.1.4.2 Test applicability

This test applies to all types of E-UTRA UE release 16 and forward, supporting EN-DC, supporting NR-U, [supporting intra-freq measurements on shared channel access], [gap pattern TBD, in case of non-mandatory] and long DRX.

10.4.1.4.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 10.4.1.0.

The normative reference for this requirement is TS 38.133 [6] clause A.10.4.1.4.

10.4.1.4.4 Test description

Three cells are deployed in the test, which are E-UTRAN PCell (Cell 1) and two cells on the same carrier frequency with CCA transmitting SSBs in DBT windows according to DL CCA model: PSCell (Cell 2) and a neighbour cell (Cell 3). The test parameters for the three cells are given in Table 10.4.1.4.4.1-1 and 10.4.1.4.4.1-3 below. In the measurement control information, a measurement object is configured for the frequency of the PSCell, and it is indicated to the UE that event-triggered reporting with Event A3 is used. Gap pattern TBD and DRX are configured on the UE.

FFS: The same test is applicable for UE supporting any one or both semi-static channel access or dynamic channel access and for network configuring any of semi-static channel occupancy or dynamic channel occupancy.

The test is conducted for SS-RSRP, SS-RSRQ, and SS-SINR:

- In the first set of tests (Tests 1 and 2), the UE is configured with SS-RSRP as Event A3 measurement quantity.
- In the second set of tests (Test 3 and 4), the UE is configured with SS-RSRQ as Event A3 measurement quantity.
- In the third set of tests (Tests 5 and 6), the UE is configured with SS-SINR as Event A3 measurement quantity.

10.4.1.4.4.1 Initial conditions

This test shall be tested using any of the test configurations in Table 10.4.1.4.4.1-1.

Table 10.4.1.4.4.1-1: Supported test configurations for EN-DC FR1 Event-triggered reporting tests on PSCC with per-UE gaps under DRX and CCA

Configuration	Description
10.4.1.4-1	LTE FDD, NR 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode
10.4.1.4-2	LTE TDD, NR 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode
Note: The UE is only required to pass in one of the supported test configurations in FR1	

Configure the test equipment and the DUT according to the parameters in Table 10.4.1.4.4.1-2.

Table 10.4.1.4.4.1-2: Initial conditions for EN-DC FR1 Event-triggered reporting tests on PSCC with per-UE gaps under DRX and CCA

Parameter	Value		Comment
Test environment	NC		As specified in TS 38.508-1 [14] clause 4.1.
Test frequencies	As specified in Annex E, table E.2-1 and TS 38.508-1 [14] clause 4.3.1 and 4.4.2.		
Channel bandwidth	As specified by the test configuration selected from Table 10.4.1.4.4.1-1.		
Propagation conditions	AWGN		As specified in clause C.2.2.
Connection Diagram	TE Part	A.3.1.7.1	As specified in TS 38.508-1 [14] Annex A.
	DUT Part	A.3.2.3.4	
Exceptions to connection diagram	For 4Rx capable UEs without any 2 Rx RF bands use A.3.2.5.2 for DUT part and A.3.1.8.4 for TE Part		

1. The general test parameter settings are set up according to Table 10.4.1.4.4.1-3.

2. Message contents are defined in clause 10.4.1.4.4.3.

3. Cell 1 is the E-UTRA serving cell (PCell) for the EN-DC setup. The power levels and settings for Cell 1 are set according to Annex A.6. Cell 2 and Cell 3 are NR cells (PSCell and neighbor cell, respectively) with the power level set according to clauses C.1.2 and C.1.3 for this test.

Table 10.4.1.4.4.1-3: General test parameters for EN-DC FR1 Event-triggered reporting tests on PSCC with per-UE gaps under DRX and CCA

TBD

10.4.1.4.4.2 Test procedure

The test consists of two successive time periods, with time duration of T1 and T2, respectively. During time duration T1, the UE shall not have any timing information of Cell 3.

1. Ensure the UE is in [state RRC_CONNECTED with generic procedure parameters *Connectivity EN-DC*, *DC bearer MCG and SCG*, *Connected without release On* and *Test Mode On*] according to TS 38.508-1 [14] clause 4.5.

2. Set the parameters according to T1 in Table 10.4.1.4.5-1.

3. SS shall transmit an *RRCConnectionReconfiguration* message with gap pattern TBD and event A3 configured with *MeasTriggerQuantityOffset* set to *rsrp* for Test 1, *rsrq* for Test 2 and *sinr* for Test 3, with the corresponding offset according to Table 10.4.1.4.4.1-3.

4. The UE shall transmit *RRCConnectionReconfigurationComplete* message. T1 starts.

5. When T1 expires, the SS shall switch the power setting from T1 to T2 as specified in Table 10.4.1.4.5-1. T2 starts.

6. UE shall transmit a *MeasurementReport* message triggered by Event A3 embedded in E-UTRA RRC message *ULInformationTransferMRDC*. If the overall delays measured from the beginning of time period T2 is less than [FFS1 ms for Test 1, FFS2 ms for Test 2, FFS3 ms for Test 3, FFS4 ms for Test 4, FFS5 ms for Test 5 or FFS6 ms for Test 6], then the number of successful tests is increased by one for the corresponding Test. If the UE fails to report the event within the overall delays measured requirement, then the number of failure tests is increased by one for the corresponding Test.

7. After the SS receives the *MeasurementReport* message in step 6 or when T2 expires, the SS shall transmit *RRCConnectionReconfiguration* message with condition EN-DC PSCell release according to TS 36.508 [25] Table 4.6.1-8 to release NR cell (PSCell). The UE shall transmit *RRCConnectionReconfigurationComplete* message.

8. Set Cell 3 physical cell identity = ((current cell 3 physical cell identity + 1) mod 1008) for next iteration of the test procedure loop.

9. The SS then shall transmit *RRCConnectionReconfiguration* message with condition *MCG_and_SCG* according to TS 36.508 [25] Table 4.6.1-8 to add NR Cell 2 (PSCell). The UE shall transmit *RRCConnectionReconfigurationComplete* message. If any the reconfiguration fails, switch off and on the UE and proceed with step 1.

10. Repeat steps 2-9 until the confidence level according to Tables G.TBD in Annex G clause G.TBD is achieved.

11. Repeat steps 1-10 for each Test in Table 10.4.1.4.4.1-3 as appropriate.

10.4.1.4.4.3 Message contents

Message contents are according to TS 38.508-1 [14] clause 7.3 with the following exceptions:

Table 10.4.1.4.4.3-1: Common Exception messages for EN-DC FR1 Event-triggered reporting tests on PSCC with per-UE gaps under DRX and CCA

Default Message Contents	
Common contents of system information blocks exceptions	
Default RRC messages and information elements contents exceptions	Table H.3.1-1 Table H.3.1-2 with Condition GAP NEEDED Table H.3.1-3 with Condition INTRA-FREQ MO Table H.3.1-4 with A3-offset = FFS [Table H.3.1-4 will require updates to enable RSRQ and SINR trigger quantities] Table H.3.1-5 Table H.3.1-6 with Conditions gapUE, Pattern TBD and gap offset TBD [Table H.3.1-6 may needed to be updated, depending on the gap config] Table H.3.1-7 [Table Table H.3.1-7 will require updates to enable SINR measurement reports] Table H.3.4-1 Table H.3.4-1a Table H.3.4-3 Table H.3.4-4 Table H.3.4-6 [Table H.3.4-6 will require updates to enable DBT window configuration] Table H.3.7-1 with condition DRX.TBD and Offset for test TBD [Table 7.3.1-3 in TS 38.508-1 [14] with condition DBT.1]

10.4.1.4.5 Test requirements

Tables 10.4.1.4.4.1-3 and 10.4.1.4.5-1 define the primary level settings including test tolerances for EN-DC FR1 Event-triggered reporting tests on PSCC with per-UE gaps under DRX and CCA.

Table 10.4.1.4.5-1: Cell specific test parameters for EN-DC FR1 Event-triggered reporting tests on PSCC with per-UE gaps under DRX and CCA

TBD

The UE shall send one Event A3 triggered measurement report (SS-RSRP in Test 1 and Test 2, SS-RSRQ in Test 3 and Test 4, SS-SINR in Test 5 and Test 6), with a measurement reporting delay less than D1 ms from the beginning of time period T2.

D1=TBD (Editor's note: D1 is different for different DRX configurations).

The UE is not required to read the neighbour cell SSB index in this test.

The UE shall not send event triggered measurement reports, as long as the reporting criteria are not fulfilled.

The rate of correct events observed during repeated tests shall be at least 90%.

FFS: NOTE: The actual overall delays measured in the test may be up to $2xTTI_{DCCH}$ higher than the measurement reporting delays above because of TTI insertion uncertainty of the measurement report in DCCH.

11 NR Standalone Tests with NR PCell under CCA and Other NR Cells in FR1

Editor's note: Test cases for NR SA with NR PCell under CCA and SCell under CCA are also included here.

11.1 RRC_IDLE state mobility

FFS

11.2 RRC_CONNECTED state mobility

FFS

11.3 Timing

FFS

11.4 Signalling characteristics

11.4.1 Radio link monitoring

11.4.1.0 General

Same as in clause 10.3.1.0.

11.4.1.0.1 Minimum conformance requirements for SSB based radio link monitoring under CCA

Same as in clause 10.3.1.0.1.

11.4.1.0.1.1 Minimum requirement for SSB based Radio Link Monitoring under CCA

Same as in clause 10.3.1.0.1.1.

11.4.1.0.1.2 Measurement restrictions for SSB based RLM under CCA

Same as in clause 10.3.1.0.1.2.

11.4.1.1 Requirements for determining UE in-sync or out-of-sync status

In the test cases specified in clause 11.4.1, any uplink signal transmitted by the UE is used for detecting the in-/out-of-sync state of the UE. In terms of measurement, the uplink signal is verified based on the UE output power:

- UE output power higher than Transmit OFF power -50 dBm (as defined in TS 38.101-1 [2]) means uplink signal.
- UE output power equal to or less than Transmit OFF power -50 dBm (as defined in TS 38.101-1 [2]) means no uplink signal.

For intra-band contiguous carrier aggregation, transmit OFF power is measured as the mean power per component carrier.

For UE with multiple transmit antennas, transmit OFF power is measured as the mean power at each transmit connector.

The normative reference for this requirement is TS 38.133 [6] clause A.11.4.1.1.

11.4.1.2 NR SA FR1 Radio link monitoring out-of-sync test for PCell configured with SSB-based RLM RS in non-DRX mode under CCA

Editor's Note:

- MU and TT analysis is incomplete
- Message contents may need to be updated
- Call setup and test procedure may need to be updated
- Applicability may need to be updated
- Statistical analysis to determine test case verdict is FFS
- Some test parameters are still in brackets

11.4.1.2.1 Test purpose

The purpose of this test is to verify that the UE properly detects the out-of-sync and in-sync for the purpose of monitoring downlink radio link quality of the PCell. This test will partly verify the FR1 PCell radio link monitoring requirements in clause 11.4.1.0.

11.4.1.2.2 Test applicability

This test applies to all types of NR UE release 16 and forward, supporting standalone NR-U and supporting UL and SSB-based RLM on shared channel access.

11.4.1.2.3 Minimum conformance requirement

The minimum requirements are specified in clause 11.4.1.0.1. The measurement restrictions for SSB based RLM under CCA are specified in clause 11.4.1.0.2. DRX configuration is not used for this test.

The normative reference for this requirement is TS 38.133 [6] clause A.11.4.1.2.

11.4.1.2.4 Test description

In the test, UE is configured to perform RLM based on SSB, with *detectionResource* included in *RadioLinkMonitoringRS* set to SSB#0 and SSB#1, and *purpose* set to '*rlf*'. Supported test configurations are shown in Table 11.4.1.2.4.1-1. The test parameters are given in Tables 11.4.1.2.4.1-3, 11.4.1.2.5-1, and 11.4.1.2.5-2 below. There is one cell (Cell 1), which is the active NR cell in FR1, in the test. Cell 1 operates on a carrier frequency with CCA and transmits SSBs in DBT windows according to DL CCA model.

The test consists of three successive time periods, with time duration of T1, T2 and T3, respectively. Figure 11.4.1.2.4-1 shows the variation of the downlink SNR in the active cell to emulate out-of-sync and in-sync states. Prior to the start of the time duration T1, the UE shall be fully synchronized to Cell 1. The UE shall be configured for periodic CSI reporting with a reporting periodicity of 5 ms. The UE transmits according to UL CCA model. The UE is configured to perform inter-frequency measurements using Gap Pattern ID #0 (40 ms) in the test.

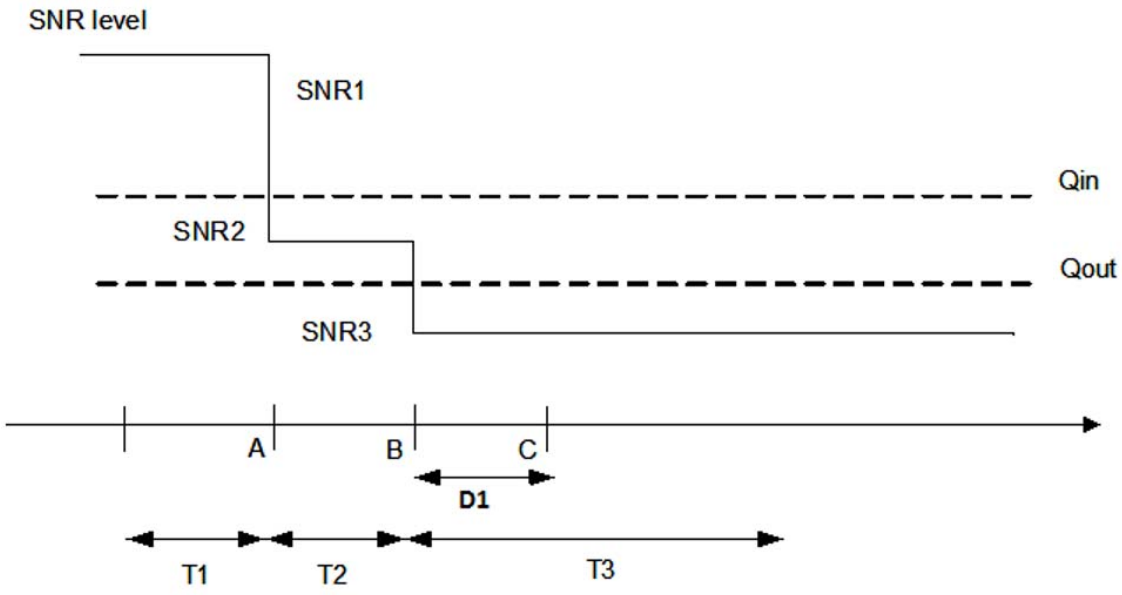

Figure 11.4.1.2.4-1: SNR variation for NR SA FR1 Radio link monitoring out-of-sync test for PCell configured with SSB-based RLM RS in non-DRX mode under CCA

11.4.1.2.4.1 Initial conditions

This test shall be tested using any of the test configurations in Table 11.4.1.2.4.1-1.

Table 11.4.1.2.4.1-1: Supported test configurations for NR SA FR1 Radio link monitoring out-of-sync test for PCell configured with SSB-based RLM RS in non-DRX mode under CCA

Configuration	Description
11.4.1.2-1	TDD, SSB SCS 30 kHz, data SCS 30 kHz, bandwidth 40 MHz

Configure the test equipment and the DUT according to the parameters in Table 11.4.1.2.4.1-2.

Table 11.4.1.2.4.1-2: Initial conditions for NR SA FR1 Radio link monitoring out-of-sync test for PCell configured with SSB-based RLM RS in non-DRX mode under CCA

Parameter	Value		Comment
Test environment	NC		As specified in TS 38.508-1 [14] clause 4.1.
Test frequencies	As specified in Annex E, table E.2-1 and TS 38.508-1 [14] clause 4.3.1 and 4.4.2.		
Channel bandwidth	As specified by the test configuration selected from Table 11.4.1.2.4.1-1.		
Propagation conditions	AWGN		As specified in clause C.2.2.
Connection Diagram	TE Part	A.3.1.7.1	As specified in TS 38.508-1 [14] Annex A.
	DUT Part	A.3.2.3.4	
Exceptions to connection diagram	For 4Rx capable UEs without any 2 Rx RF bands use A.3.2.5.2 for DUT part and A.3.1.8.4 for TE Part		

1. Message contents are defined in clause 11.4.1.2.4.3.
2. The power levels and settings for Cell 1 are set according to Annex C.1.2 and C.1.3.
3. The test parameters are given in Table 11.4.1.2.4.1-3.

Table 11.4.1.2.4.1-3: General test parameters for NR SA FR1 Radio link monitoring out-of-sync test for PCell configured with SSB-based RLM RS in non-DRX mode under CCA

Parameter			Unit	Value
				Test 1
Active PCell				Cell 1
RF Channel Number				1
DL CCA model				As specified in clause D.7.2.1
UL CCA model				As specified in clause D.7.2.2
Duplex mode		Config 1		TDD
$BW_{channel}$		Config 1	MHz	40: $N_{RB,c}$ = 106
DL initial BWP configuration		Config 1		[DLBWP.0.1]
DL dedicated BWP configuration		Config 1		[DLBWP.1.1]
UL initial BWP configuration		Config 1		[ULBWP.0.1]
UL dedicated BWP configuration		Config 1		[ULBWP.1.1]
TDD configuration		Config 1		TDDConf.1.1 CCA
CORESET Reference Channel		Config 1		CR.1.1 CCA
SSB configuration for semi-static channel access Note 3, 5		Config 1		SSB.1 CCA
SSB configuration for dynamic channel access Note 4, 5		Config 1		SSB.2 CCA
DBT window configuration		Config 1		DBT.1
PDSCH/PDCCH subcarrier spacing		Config 1		30 kHz
PRACH Configuration		Config 1		FR1 PRACH configuration 1 under CCA
SSB index assigned as RLM RS				0
OCNG parameters				[OP.1]
CP length				Normal
Correlation Matrix and Antenna Configuration				2x2 Low
Out of sync transmission parameters	DCI format			[1-0]
	Number of Control OFDM symbols			[2]
	Aggregation level		CCE	[8]
	Ratio of hypothetical PDCCH RE energy to average SSS RE energy		dB	[4]
	Ratio of hypothetical PDCCH DMRS energy to average SSS RE energy		dB	[4]
	DMRS precoder granularity			REG bundle size
	REG bundle size			[6]
DRX				OFF
Gap pattern ID				gp0
Layer 3 filtering				Enabled
T310 timer			ms	0
T311 timer			ms	1000
N310				1
N311				1
CSI-RS configuration for CSI reporting		Config 1		[CSI-RS.2.1 TDD]
CSI-RS for tracking		Config 1		[TRS.1.2 TDD]
T1			s	0.2
T2			s	1.04
T3			s	1.04
D1			s	1

Note 1: All configurations are assigned to the UE prior to the start of time period T1.
Note 2: UE-specific PDCCH is not transmitted after T1 starts.
Note 4: For UE supporting semi-static channel access and network configuring semi-static channel occupancy.

Note 5:	For UE supporting dynamic channel access and network configuring dynamic channel occupancy.
Note 6:	For a UE supporting both semi-static and dynamic channel access, the UE can be tested under dynamic channel occupancy only.

11.4.1.2.4.2 Test Procedure

The test consists of a single NR cell (PCell). Prior to the start of the time duration T1, the UE shall be fully synchronized to the PCell. The UE shall be configured for periodic CSI reporting in PUCCH format 2 with a reporting periodicity as mentioned in the above table 11.4.1.2.4.1-3.

1. Ensure the UE is in [State RRC_CONNECTED with generic procedure parameters Connectivity *NR*, Connected without release *On*] according to TS 38.508-1 [14] clause 4.5. Cell 1 is the active cell.
2. The SS sends an *RRCReconfiguration* message to the UE to configure inter-frequency measurement with the corresponding gap pattern and periodic CSI reporting.
3. The UE sends an *RRCReconfigurationComplete* message.
4. Set the parameters of NR Cell according to T1 in Table 11.4.1.2.5-1. Propagation conditions are set according to clause C.2.3. T1 starts.
5. When T1 expires the SS shall change the SNR value to T2 as specified in Table 11.4.1.2.5-1. T2 starts.
6. When T2 expires the SS shall change the SNR value to T3 as specified in Table 11.4.1.2.5-1. T3 starts.
7. If the SS:

   a) detects uplink power equal to or higher than minimum output power, according to section 11.4.1.1, in each subframe configured for CSI transmission (according to configured CSI periodicity on [PUCCH format 2]) during the period from time point A to time point B; and

   b) does not detect any uplink power higher than OFF power, according to section 11.4.1.1, from time point C (D1 after the start of T3) until T3 expires, the number of successful tests is increased by one.

   Otherwise, the number of failed tests is increased by one and proceed with step 10.
8. When T3 expires the SS shall change the SNR value to T1 as specified in Table 11.4.1.2.5-1.
9. If the UE has re-established the connection within [2] seconds, proceed with step 11. Otherwise, proceed with step 10.
10. The SS shall switch off and then on the UE and then proceed with step 1.
11. Repeat steps 1-9 until the confidence level according to [Tables G.TBD in Annex G clause G.TBD] is achieved.

11.4.1.2.4.3 Message Contents

Message contents are according to TS 38.508-1 [14] clauses 4.6.1 and 7.3 with the following exceptions:

Table 11.4.1.2.4.3-1: Common Exception messages for NR SA FR1 Radio link monitoring out-of-sync test for PCell configured with SSB-based RLM RS in non-DRX mode under CCA

Default Message Contents	
Common contents of system information blocks exceptions	

Default RRC messages and information elements contents exceptions	Table H.3.1-1 Table H.3.1-2 with Condition INTER-FREQ, L3 FILTERING NEEDED, Table H.3.1-3 with Condition INTER-FREQ MO (where ssbFrequency is set to the ARFCN value of carrier centre of [High] range) Table H.3.1-4 with A3-offset = 0 Table H.3.1-6 with conditions gapUE and RLM Table H.3.1-8 with Condition SSB RLM Table H.3.5-4 Table H.3.5-9 [Table 7.3.1-3 in TS 38.508-1 [14] with condition DBT.1]

Table 11.4.1.2.4.3-2: *RLF-TimersAndConstants* for NR SA FR1 Radio link monitoring out-of-sync test for PCell configured with SSB-based RLM RS in non-DRX mode under CCA

Derivation Path: TS 38.508-1 [14], Table 4.6.3-150			
Information Element	**Value/remark**	**Comment**	**Condition**
RLF-TimersAndConstants ::= SEQUENCE {			
t310	ms0		
n310	n1		
t311	ms1000		
n311	n1		
}			

11.4.1.2.5 Test Requirement

Table 11.4.1.2.5-1 defines the cell specific primary level settings including test tolerances for NR SA FR1 Radio link monitoring out-of-sync test for PCell configured with SSB-based RLM RS in non-DRX mode under CCA.

Table 11.4.1.2.5-1: Cell-specific test parameters for NR SA FR1 Radio link monitoring out-of-sync test for PCell configured with SSB-based RLM RS in non-DRX mode under CCA

Parameter		**Unit**	**Test 1**		
			T1	**T2**	**T3**
DL CCA probability P_{CCA_DL}	Note 6,8		P_{CCA_DL}=0.9375		
	Note 7,8		$P_{CCA_DL_1}$=0.75 $P_{CCA_DL_2}$=0.75		
UL CCA probability P_{CCA_UL}			1		
EPRE ratio of PDCCH DMRS to SSS		dB	4		
EPRE ratio of PDCCH to PDCCH DMRS		dB	0		
EPRE ratio of PBCH DMRS to SSS		dB	0		
EPRE ratio of PBCH to PBCH DMRS		dB			
EPRE ratio of PSS to SSS		dB			
EPRE ratio of PDSCH DMRS to SSS		dB			
EPRE ratio of PDSCH to PDSCH DMRS		dB			
EPRE ratio of OCNG DMRS to SSS		dB			
EPRE ratio of OCNG to OCNG DMRS		dB			
SNR[Note 3,4] on RLM-RS	Config 1	dB	1+TT	[-7]+TT	-15+TT
SNR on other channels and signals	Config 1	dB	1+TT		
N_{oc}	Config 1	dBm/SCS	-95+TT		
Propagation condition			TDL-C 300 ns 100 Hz		

NOTE 1: OCNG shall be used such that the resources in Cell 1 are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols. For cells with CCA model, OCNG is transmitted only in slots with RMC burst transmission and is not transmitted during muted slots or during DBT windows.
NOTE 2: The signal contains PDCCH for UEs other than the device under test as part of OCNG.
NOTE 3: SNR levels correspond to the signal to noise ratio over the transmitted SSS REs during DBT windows.
NOTE 4: The SNR in time periods T1, T2 and T3 is denoted as SNR1, SNR2 and SNR3, respectively, in Figure 11.4.1.2.4-1.
NOTE 5: The SNR values are specified for testing a UE which supports 2 RX on at least one band. For testing of a UE which supports 4 RX on all bands, the SNR during T3 is D.4A.
NOTE 6: For UE supporting semi-static channel access and network configuring semi-static channel occupancy.
NOTE 7: For UE supporting dynamic channel access and network configuring dynamic channel occupancy.
NOTE 8: For UE supporting both semi-static and dynamic channel access, the UE can be tested under dynamic channel occupancy only.

Table 11.4.1.2.5-2: Measurement gap configuration for NR SA FR1 Radio link monitoring out-of-sync test for PCell configured with SSB-based RLM RS in non-DRX mode under CCA

Field	Test 1	
	Value	
gapOffset	0	
NOTE: Ensure that RLM RS is partially overlapped with measurement gap0		

The UE behaviour in each test during time durations T1, T2 and T3 shall be as follows:

- During the period from time point A to time point B the UE shall transmit uplink signal at least in all uplink slots configured for CSI transmission according to the configured periodic CSI reporting.
- The UE shall stop transmitting uplink signal no later than time point C (D1 second after the start of the time duration T3).

The rate of correct events observed during repeated tests shall be at least 90%.

11.4.1.3 NR SA FR1 Radio link monitoring in-sync test for PCell configured with SSB-based RLM RS in non-DRX mode under CCA

Editor's Note:

- MU and TT analysis is incomplete
- Message contents may need to be updated
- Call setup and test procedure may need to be updated
- Applicability may need to be updated
- Statistical analysis to determine test case verdict is FFS
- Some test parameters are still in brackets

11.4.1.3.1 Test purpose

The purpose of this test is to verify that the UE properly detects the out-of-sync and in-sync for the purpose of monitoring downlink radio link quality of the PCell. This test will partly verify the FR1 PCell radio link monitoring requirements in clause 11.4.1.0.

11.4.1.3.2 Test applicability

This test applies to all types of NR UE release 16 and forward, supporting standalone NR-U and supporting UL and SSB-based RLM on shared channel access.

11.4.1.3.3 Minimum conformance requirement

The minimum requirements are specified in clause 11.4.1.0.1. The measurement restrictions for SSB based RLM under CCA are specified in clause 11.4.1.0.2. DRX configuration is not used for this test.

The normative reference for this requirement is TS 38.133 [6] clause A.11.4.1.3.

11.4.1.3.4 Test description

In the test, UE is configured to perform RLM based on SSB, with *detectionResource* included in *RadioLinkMonitoringRS* set to SSB#0 and SSB#1, and *purpose* set to '*rlf*'. Supported test configurations are shown in table 11.4.1.3.4.1-1. The test parameters are given in Tables 11.4.1.3.4.1-3 and 11.4.1.3.5-1. There is one cell (Cell 1), which is the active NR cell in FR1, in the test. Cell 1 operates on a carrier frequency with CCA and transmits SSBs in DBT windows according to DL CCA model.

The test consists of five successive time periods, with time duration of T1, T2, T3, T4 and T5, respectively. Figure 11.4.1.3.4-1 shows the variation of the downlink SNR in the active cell to emulate out-of-sync and in-sync states. Prior to the start of the time duration T1, the UE shall be fully synchronized to Cell 1. The UE shall be configured for periodic CSI reporting with a reporting periodicity of 5 ms. The UE transmits according to UL CCA model.

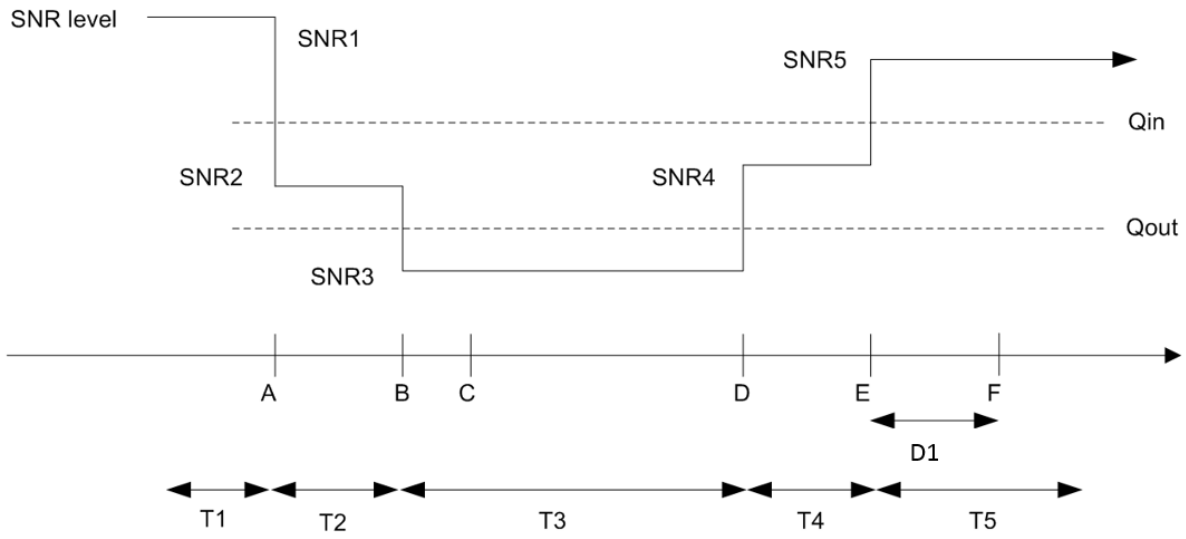

Figure 11.4.1.3.4-1: SNR variation for NR SA FR1 Radio link monitoring in-sync test for PCell configured with SSB-based RLM RS in non-DRX mode under CCA

11.4.1.3.4.1 Initial conditions

This test shall be tested using any of the test configurations in Table 11.4.1.3.4.1-1.

Table 11.4.1.3.4.1-1: Supported test configurations for NR SA FR1 Radio link monitoring in-sync test for PCell configured with SSB-based RLM RS in non-DRX mode under CCA

Configuration	Description
11.4.1.3-1	TDD, SSB SCS 30 kHz, data SCS 30 kHz, bandwidth 40 MHz

Configure the test equipment and the DUT according to the parameters in Table 11.4.1.3.4.1-2.

Table 11.4.1.3.4.1-2: Initial conditions for NR SA FR1 Radio link monitoring in-sync test for PCell configured with SSB-based RLM RS in non-DRX mode under CCA

Parameter	Value	Comment

Test environment	NC		As specified in TS 38.508-1 [14] clause 4.1.
Test frequencies	As specified in Annex E, table E.2-1 and TS 38.508-1 [14] clause 4.3.1 and 4.4.2.		
Channel bandwidth	As specified by the test configuration selected from Table 11.4.1.3.4.1-1.		
Propagation conditions	AWGN		As specified in clause C.2.2.
Connection Diagram	TE Part	A.3.1.7.1	As specified in TS 38.508-1 [14] Annex A.
	DUT Part	A.3.2.3.4	
Exceptions to connection diagram	For 4Rx capable UEs without any 2 Rx RF bands use A.3.2.5.2 for DUT part and A.3.1.8.4 for TE Part		

1. Message contents are defined in clause 11.4.1.3.4.3.
2. The power levels and settings for Cell 1 are set according to Annex C.1.2 and C.1.3.
3. The test parameters are given in Table 11.4.1.3.4.1-3.

Table 11.4.1.3.4.1-3: General test parameters for NR SA FR1 Radio link monitoring in-sync test for PCell configured with SSB-based RLM RS in non-DRX mode under CCA

Parameter			Unit	Value
				Test 1
Active PCell				Cell 1
RF Channel Number				1
DL CCA model				As specified in clause D.7.2.1
UL CCA model				As specified in clause D.7.2.2
Duplex mode		Config 1		TDD
$BW_{channel}$		Config 1	MHz	40: $N_{RB,c}$ = 106
DL initial BWP configuration		Config 1		[DLBWP.0.1]
DL dedicated BWP configuration		Config 1		[DLBWP.1.1]
UL initial BWP configuration		Config 1		[ULBWP.0.1]
UL dedicated BWP configuration		Config 1		[ULBWP.1.1]
TDD Configuration		Config 1		TDDConf.1.1 CCA
CORESET Reference Channel		Config 1		CR.1.1 CCA
SSB configuration for semi-static channel access Note 3, 5		Config 1		SSB.1 CCA
SSB configuration for dynamic channel access Note 4,5		Config 1		SSB.2 CCA
DBT window configuration		Config 1		DBT.1
PDSCH/PDCCH subcarrier spacing		Config 1		30 kHz
PRACH Configuration		Config 1		FR1 PRACH configuration 1 under CCA
SSB index assigned as RLM RS				0
OCNG parameters				[OP.1]
CP length				Normal
Correlation Matrix and Antenna Configuration				2x2 Low
In sync transmission parameters	DCI format			[1-0]
	Number of Control OFDM symbols			[2]
	Aggregation level		CCE	[4]
	Ratio of hypothetical PDCCH RE energy to average SSS RE energy		dB	[0]

	Ratio of hypothetical PDCCH DMRS energy to average SSS RE energy	dB	[0]
	DMRS precoder granularity		REG bundle size
	REG bundle size		[6]
Out of sync transmission parameters	DCI format		[1-0]
	Number of Control OFDM symbols		[2]
	Aggregation level	CCE	[8]
	Ratio of hypothetical PDCCH RE energy to average SSS RE energy	dB	[4]
	Ratio of hypothetical PDCCH DMRS energy to average SSS RE energy	dB	[4]
	DMRS precoder granularity		REG bundle size
	REG bundle size		[6]
DRX			OFF
Gap pattern ID			N/A
Layer 3 filtering			Enabled
T310 timer		ms	2000
T311 timer		ms	1000
N310			1
N311			1
CSI-RS configuration for CSI reporting	Config 1		CSI-RS.2.1 TDD
CSI-RS for tracking	Config 1		TRS.1.2 TDD
T1		s	0.2
T2		s	0.2
T3		s	0.52
T4		s	0.2
T5		s	2.04
D1		s	2
NOTE 1: All configurations are assigned to the UE prior to the start of time period T1. NOTE 2: UE-specific PDCCH is not transmitted after T1 starts. NOTE 4: For UE supporting semi-static channel access and network configuring semi-static channel occupancy. NOTE 5: For UE supporting dynamic channel access and network configuring dynamic channel occupancy. NOTE 6: For a UE supporting both semi-static and dynamic channel access, the UE can be tested under dynamic channel occupancy only.			

11.4.1.3.4.2 Test Procedure

The test consists of a single NR cell (PCell). Prior to the start of the time duration T1, the UE shall be fully synchronized to the PCell. The UE shall be configured for periodic CSI reporting in PUCCH format 2 with a reporting periodicity as mentioned in the above table 11.4.1.3.4.1-3.

1. Ensure the UE is in [State RRC_CONNECTED with generic procedure parameters Connectivity *NR*, Connected without release *On*] according to TS 38.508-1 [14] clause 4.5. Cell 1 is the active cell.

2. The SS sends an *RRCReconfiguration* message to the UE to configure periodic CSI reporting.

3. The UE sends an *RRCReconfigurationComplete* message.

4. Set the parameters of NR Cell according to T1 in Table 11.4.1.3.5-1. Propagation conditions are set according to clause C.2.3. T1 starts.

5. When T1 expires the SS shall change the SNR value to T2 as specified in Table 11.4.1.3.5-1. T2 starts.
6. When T2 expires the SS shall change the SNR value to T3 as specified in Table 11.4.1.3.5-1. T3 starts.
7. When T3 expires the SS shall change the SNR value to T4 as specified in Table 11.4.1.3.5-1. T4 starts.
8. When T4 expires the SS shall change the SNR value to T5 as specified in Table 11.4.1.3.5-1. T5 starts.
9. If the SS detects uplink power equal to or higher than minimum output power, according to section 11.4.1.1, in each subframe configured for CSI transmission (according to configured CSI periodicity on [PUCCH format 2]) during the period from time point A to time point F (D1 seconds after the start of time duration T5), the number of successful tests is increased by one. After the expiration of T5, the SS shall proceed with step 11 for the next iteration, or with step 10.

   Otherwise, the number of failed tests is increased by one and proceed with step 10.
10. The SS shall switch off and then on the UE and then proceed with step 11.
11. Repeat steps 1-9 until the confidence level according to [Tables G.TBD in Annex G clause G.TBD] is achieved.

11.4.1.3.4.3 Message Contents

Message contents are according to TS 38.508-1 [14] clauses 4.6.1 and 7.3 with the following exceptions:

Table 11.4.1.3.4.3-1: Common Exception messages for NR SA FR1 Radio link monitoring in-sync test for PCell configured with SSB-based RLM RS in non-DRX mode under CCA

Default Message Contents	
Common contents of system information blocks exceptions	
Default RRC messages and information elements contents exceptions	Table H.3.1-1 Table H.3.1-2 with Condition L3 FILTERING NEEDED, Table H.3.1-3 with Condition RLM Table H.3.1-4 with A3-offset = 0 Table H.3.1-8 with Condition SSB RLM Table H.3.5-4 Table H.3.5-9 [Table 7.3.1-3 in TS 38.508-1 [14] with condition DBT.1]

Table 11.4.1.3.4.3-2: *RLF-TimersAndConstants* for NR SA FR1 Radio link monitoring in-sync test for PCell configured with SSB-based RLM RS in non-DRX mode under CCA

Derivation Path: TS 38.508-1 [14], Table 4.6.3-150			
Information Element	**Value/remark**	**Comment**	**Condition**
RLF-TimersAndConstants ::= SEQUENCE {			
t310	ms2000		
n310	n1		
t311	ms1000		
n311	n1		
}			

11.4.1.3.5 Test Requirement

Table 11.4.1.3.5-1 defines the cell specific primary level settings including test tolerances for NR SA FR1 Radio link monitoring in-sync test for PCell configured with SSB-based RLM RS in non-DRX mode under CCA.

Table 11.4.1.3.5-1: Cell-specific test parameters for NR SA FR1 Radio link monitoring in-sync test for PCell configured with SSB-based RLM RS in non-DRX mode under CCA

Parameter	Unit	Test 1				
		T1	T2	T3	T4	T5

DL CCA probability P_{CCA_DL}	Note 6,8		P_{CCA_DL}=0.9375				
	Note 7,8		$P_{CCA_DL_1}$=0.75 $P_{CCA_DL_2}$=0.75				
UL CCA probability P_{CCA_UL}			1				
L_{CCA_DL}			7				
W_{CCA_DL}		ms	$T_{Evaluate_in_SSB,CCA}$ NOTE 9				
EPRE ratio of PDCCH DMRS to SSS		dB	4				
EPRE ratio of PDCCH to PDCCH DMRS		dB	0				
EPRE ratio of PBCH DMRS to SSS		dB	0				
EPRE ratio of PBCH to PBCH DMRS		dB					
EPRE ratio of PSS to SSS		dB					
EPRE ratio of PDSCH DMRS to SSS		dB					
EPRE ratio of PDSCH to PDSCH DMRS		dB					
EPRE ratio of OCNG DMRS to SSS		dB					
EPRE ratio of OCNG to OCNG DMRS		dB					
SNR on RLM-RS	Config 1	dB	1+TT	[-7]+TT	[-15] +TT	[-4.5] +TT	1+TT
SNR on other channels and signals	Config 1	dB	1+TT				
N_{oc}	Config 1	dBm/SCS	-95+TT				
Propagation condition			TDL-C 300ns 100Hz				

NOTE 1: OCNG shall be used such that the resources in Cell 1 are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols. For cells with CCA model, OCNG is transmitted only in slots with RMC burst transmission and is not transmitted during muted slots or during DBT windows.
NOTE 2: The signal contains PDCCH for UEs other than the device under test as part of OCNG.
NOTE 3: SNR levels correspond to the signal to noise ratio over the transmitted SSS REs during DBT windows.
NOTE 4: The SNR in time periods T1, T2, T3, T4 and T5 is denoted as SNR1, SNR2, SNR3, SNR4 and SNR5 respectively in Figure 11.4.1.3.4-1.
NOTE 5: The SNR values are specified for testing a UE which supports 2RX on at least one band. For testing of a UE which supports 4 RX on all bands, the SNR during T3 and T4 is modified as specified in clause D.4A.
NOTE 6: For UE supporting semi-static channel access and network configuring semi-static channel occupancy.
NOTE 7: For UE supporting dynamic channel access and network configuring dynamic channel occupancy.
NOTE 8: For UE supporting both semi-static and dynamic channel access, the UE can be tested under dynamic channel occupancy only.
NOTE 9: As defined in Table 11.4.1.0.1-1.

The UE behaviour in each test during time durations T1, T2, T3, T4 and T5 shall be as follows:

- During the period from time point A to time point F (D1 second after the start of time duration T5) the UE shall transmit uplink signal at least in all uplink slots configured for CSI transmission according to the configured periodic CSI reporting.

The rate of correct events observed during repeated tests shall be at least 90%.

11.4.2 Interruptions

FFS

11.4.3 SCell activation and deactivation delay

FFS

11.4.4 Beam failure detection and link recovery procedures

11.4.4.0 General

Same as in clause 10.3.4.0.

11.4.4.0.1 Minimum conformance requirements for SSB based Beam Failure Detection under CCA

Same as in clause 10.3.4.0.1.

11.4.4.0.1.1 Minimum requirement for SSB based Beam Failure Detection under CCA

Same as in clause 10.3.4.0.1.1.

11.4.4.0.1.2 Measurement restriction for SSB based Beam Failure Detection under CCA

Same as in clause 10.3.4.0.1.2.

11.4.4.0.2 Void

Same as in clause 10.3.4.0.2.

11.4.4.0.3 Scheduling availability of UE during beam failure detection under CCA

Same as in clause 10.3.4.0.3.

11.4.4.0.3.1 Scheduling availability of UE performing beam failure detection under CCA with a same subcarrier spacing as PDSCH/PDCCH

Same as in clause 10.3.4.0.3.1.

11.4.4.0.4 Scheduling availability of UE during candidate beam detection under CCA

Same as in clause 10.3.4.0.4.

11.4.4.0.4.1 Scheduling availability of UE performing L1-RSRP measurement under CCA with a same subcarrier spacing as PDSCH/PDCCH on FR1

Same as in clause 10.3.4.0.4.1.

11.4.4.1 NR SA FR1 Beam Failure Detection and Link Recovery Test for FR1 PCell configured with SSB-based BFD and LR in non-DRX mode under CCA

Editor's Note:

- MU and TT analysis is incomplete
- Message contents may need to be updated
- Call setup and test procedure may need to be updated
- Applicability may need to be updated
- Statistical analysis to determine test case verdict is FFS
- Some test parameters are still in brackets

11.4.4.1.1 Test purpose

The purpose of this test is to verify that the UE properly detects SSB-based beam failure in the set q_0 configured for a serving cell and that the UE performs correct SSB-based link recovery based on beam candidate set q_1. The purpose is to test the downlink monitoring for beam failure detection within the UEs active DL BWP, during the evaluation period, and link recovery, when no DRX is used. This test will partly verify the SSB based beam failure detection and link recovery for an FR1 serving cell requirements in clause 11.4.4.0.1.

11.4.4.1.2 Test applicability

This test applies to all types of NR UE release 16 and forward, supporting standalone NR-U and supporting UL and SSB-based RLM and link recovery on shared channel access.

11.4.4.1.3 Minimum conformance requirement

The minimum requirements are specified in clause 11.4.4.0.1. DRX configuration is not used for this test.

The normative reference for this requirement is TS 38.133 [6] clause A.11.4.4.1.

11.4.4.1.4 Test description

The test parameters are given in Tables 11.4.4.1.4.1-3 and 11.4.4.1.5-1 below. The test consists of five successive time periods, with time duration of T1, T2, T3, T4 and T5 respectively. Figure 11.4.4.1.4-1 shows the variation of the downlink SNR of the SSB in set q_0 in the active cell to emulate SSB based beam failure. Figure 11.4.4.1.4-1 additionally shows the variation of the downlink L1-RSRP of the SSB in set q_1 of the candidate beam used for link recovery.

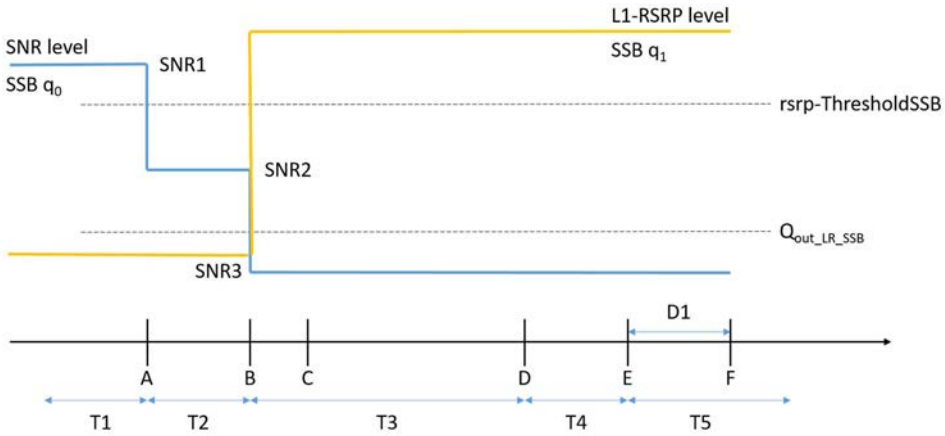

Figure 11.4.4.1.4-1: SNR variation for NR SA FR1 Beam Failure Detection and Link Recovery Test for FR1 PCell configured with SSB-based BFD and LR in non-DRX mode under CCA

11.4.4.1.4.1 Initial conditions

This test shall be tested using any of the test configurations in Table 11.4.4.1.4.1-1.

Table 11.4.4.1.4.1-1: Supported test configurations for NR SA FR1 Beam Failure Detection and Link Recovery Test for FR1 PCell configured with SSB-based BFD and LR in non-DRX mode under CCA

Configuration	Description
11.4.4.1-1	TDD, SSB SCS 30 kHz, data SCS 30 kHz, bandwidth 40 MHz

Configure the test equipment and the DUT according to the parameters in Table 11.4.4.1.4.1-2.

Table 11.4.4.1.4.1-2: Initial conditions for NR SA FR1 Beam Failure Detection and Link Recovery Test for FR1 PCell configured with SSB-based BFD and LR in non-DRX mode under CCA

Parameter	Value		Comment
Test environment	NC		As specified in TS 38.508-1 [14] clause 4.1.
Test frequencies	As specified in Annex E, table E.2-1 and TS 38.508-1 [14] clause 4.3.1 and 4.4.2.		
Channel bandwidth	As specified by the test configuration selected from Table 11.4.4.1.4.1-1.		
Propagation conditions	AWGN		As specified in clause C.2.2.
Connection Diagram	TE Part	A.3.1.7.1	As specified in TS 38.508-1 [14] Annex A.
	DUT Part	A.3.2.3.4	

Exceptions to connection diagram	For 4Rx capable UEs without any 2 Rx RF bands use A.3.2.5.2 for DUT part and A.3.1.8.4 for TE Part	

1. Message contents are defined in clause 11.4.4.1.4.3.
2. The power levels and settings for Cell 1 are set according to Annex C.1.2 and C.1.3.
3. The test parameters are given in Table 11.4.4.1.4.1-3.

Table 11.4.4.1.4.1-3: General test parameters for NR SA FR1 Beam Failure Detection and Link Recovery Test for FR1 PCell configured with SSB-based BFD and LR in non-DRX mode under CCA

Parameter			Unit	Value	Comment
				Test 1	
Active PSCell				Cell 1	
RF Channel Number				1	
DL CCA model				As specified in D.7.2.1	
UL CCA model				As specified in D.7.2.2	
Duplex mode		Config 1		TDD	
BWchannel		Config 1	MHz	40: NRB,c = 106	
DL initial BWP configuration		Config 1		DLBWP.0.1	
DL dedicated BWP configuration		Config 1		DLBWP.1.1	
UL initial BWP configuration		Config 1		ULBWP.0.1	
UL dedicated BWP configuration		Config 1		ULBWP.1.1	
TDD Configuration		Config 1		TDDConf.1.1 CCA	
CORESET Reference Channel		Config 1		CR.1.1 CCA	
SSB Configuration		Config 1		SSB.3 CCA for semi-static channel access SSB.4 CCA for dynamic channel access	
DBT Window Configuration		Config 1		DBT.1	
PDSCH/PDCCH subcarrier spacing		Config 1		30 KHz	
PRACH Configuration		Config 1		[FR1 PRACH configuration 2]	
SSB Index assigned as BFD RS (q_0)				0	
SSB Index assigned as CBD RS (q_1)				1	
OCNG parameters				OP.1	
CP length				Normal	
Correlation Matrix and Antenna Configuration				2x2 Low	
Beam failure detection transmission parameters	DCI format			1-0	
	Number of Control OFDM symbols			2	
	Aggregation level		CCE	8	
	Ratio of hypothetical PDCCH RE energy to average SSS RE energy		dB	0	
	Ratio of hypothetical PDCCH DMRS energy to		dB	0	

	average SSS RE energy			
	DMRS precoder granularity		REG bundle size	
	REG bundle size		6	
DRX			OFF	
Gap pattern ID			gp0	
gapOffset			0	
rlmInSyncOutOfSyncThreshold			absent	When the field is absent, the UE applies the value 0. (TS 38.133 [6] Table 8.1.1-1).
rsrp-ThresholdSSB	Config 1	dBm /SCS kHz	-95	Threshold used for $Q_{in_LR_SSB}$
powerControlOffsetSS			db0	Used for deriving rsrp-ThresholdCSI-RS
beamFailureInstanceMaxCount			n1	see clause 5.17 of TS 38.321 [12]
beamFailureDetectionTimer			pbfd4	see clause 5.17 of TS 38.321 [12]
CSI-RS configuration for CSI reporting	Config 1		CSI-RS.2.1 TDD	
CSI-RS for tracking	Config 1		TRS.1.2 TDD	
SSB Index assigned as RLM RS			0,1	
T310 Timer		ms	1000	
N310			2	
T1		s	0.2	During this time the UE shall be fully synchronized to cell 1
T2		s	0.93	
T3		s	0.52	
T4		s	0	
T5		s	0.45	
D1		s	0.41	
Note 1: All configurations are assigned to the UE prior to the start of time period T1. Note 2: UE-specific PDCCH is not transmitted after T1 starts.				

11.4.4.1.4.2 Test Procedure

There is one cell, cell 1 which is the active cell, in the test. Cell 1 operates on a carrier frequency with CCA and transmits SSBs in DBT windows according to DL CCA model.

Prior to the start of the time duration T1, the UE shall be fully synchronized to cell 1. The UE shall be configured for periodic CSI reporting with a reporting periodicity of 2 ms. The UE transmits the reporting according to UL CCA mode. In the test, DRX configuration is not enabled. The UE is configured to perform inter-frequency measurements using GP ID #0 (40 ms) in test 1.

1. Ensure the UE is in [State RRC_CONNECTED with generic procedure parameters Connectivity *NR*, Connected without release *On*] according to TS 38.508-1 [14] clause 4.5. Cell 1 is the active cell.

2. The SS sends an *RRCReconfiguration* message to the UE to configure inter-frequency measurement with the corresponding gap pattern and periodic CSI reporting.

3. The UE sends an *RRCReconfigurationComplete* message.

4. Set the parameters of NR Cell according to T1 in Table 11.4.4.1.5-1. Propagation conditions are set according to clause C.2.3. T1 starts.

5. When T1 expires the SS shall change the SNR value to T2 as specified in Table 11.4.4.1.5-1. T2 starts.
6. When T2 expires the SS shall change the SNR value to T3 as specified in Table 11.4.4.1.5-1. T3 starts.
7. When T3 expires the SS shall change the SNR value to T4 as specified in Table 11.4.4.1.5-1. T4 starts.
8. When T4 expires the SS shall change the SNR value to T5 as specified in Table 11.4.4.1.5-1. T5 starts.
9. If the SS:

   a) detects uplink power on NR carrier equal to or higher than minimum output power defined in TS 38.521-1 [17] clause 6.3.1.5 in each slot configured for CSI transmission (according to CSI reporting on PUCCH) during the period from time point A to time point B; and

   b) does not detect preamble on a beam associated with the candidate beam set q_1 before time point B; and

   c) detects preamble on a beam associated with the candidate beam set q_1 before time point F (D1 after the start of T5), the number of successful tests is increased by one. Proceed with step 10.

   Otherwise, the number of failed tests is increased by one. Switch off and then on the UE and proceed with step 1.

10. Repeat steps 2-9 for all subtests until the confidence level according to [Tables G.TBD in Annex G clause G.TBD] is achieved.

11.4.4.1.4.3 Message Contents

Message contents are according to TS 38.508-1 [14] clauses 4.6.1 and 7.3 with the following exceptions:

Table 11.4.4.1.4.3-1: Common Exception messages for NR SA FR1 Beam Failure Detection and Link Recovery Test for FR1 PCell configured with SSB-based BFD and LR in non-DRX mode under CCA

Default Message Contents	
Common contents of system information blocks exceptions	
Default RRC messages and information elements contents exceptions	Table H.3.1-1 Table H.3.1-2 with Condition INTER-FREQ, L3 FILTERING NEEDED, Table H.3.1-3 with Condition INTER-FREQ MO (where ssbFrequency is set to the ARFCN value of carrier centre of [High] range) Table H.3.1-4 with A3-offset = 0 Table H.3.1-6 with conditions gapUE and BFD Table H.3.1-8 with Condition SSB BFD Table H.3.1-10 with Condition SSB Table H.3.1-10A Table H.3.5-4 Table H.3.5-9 [Table 7.3.1-3 in TS 38.508-1 [14] with condition DBT.1]

Table 11.4.4.1.4.3-2: PDCCH *Search Space* for NR SA FR1 Beam Failure Detection and Link Recovery Test for FR1 PCell configured with SSB-based BFD and LR in non-DRX mode under CCA

Derivation Path: TS 38.508-1 [14], Table 4.6.3-162			
Information Element	**Value/remark**	**Comment**	**Condition**
SearchSpace ::= SEQUENCE {			
searchSpaceId	3	BFR	
controlResourceSetId	2	BFR	
monitoringSlotPeriodicityAndOffset CHOICE {			
sl1	NULL		
}			
monitoringSymbolsWithinSlot	10000000000000	Symbols 0 and 1	
nrofCandidates SEQUENCE {			
aggregationLevel1	n0		
aggregationLevel2	n0		
aggregationLevel4	n0		
aggregationLevel8	n1	AL8	
aggregationLevel16	n0		

Derivation Path: TS 38.508-1 [14], Table 4.6.3-162			
Information Element	**Value/remark**	**Comment**	**Condition**
}			
searchSpaceType CHOICE {			
ue-Specific SEQUENCE {			USS
dci-Formats	formats0-0-And-1-0	DCI Format 1_0	
}			
}			
}			

Table 11.4.4.1.4.3-3: *RLF-TimersAndConstants* for NR SA FR1 Beam Failure Detection and Link Recovery Test for FR1 PCell configured with SSB-based BFD and LR in non-DRX mode under CCA

Derivation Path: TS 38.508-1 [14], Table 4.6.3-150			
Information Element	**Value/remark**	**Comment**	**Condition**
RLF-TimersAndConstants ::= SEQUENCE {			
t310	ms1000		
n310	n2		
}			

Table 11.4.4.1.4.3-4: *PDCCH-Config* for NR SA FR1 Beam Failure Detection and Link Recovery Test for FR1 PCell configured with SSB-based BFD and LR in non-DRX mode under CCA

Derivation Path: TS 38.501-1 [14],Table 4.6.3-95			
Information Element	**Value/remark**	**Comment**	**Condition**
PDCCH-Config ::= SEQUENCE {			
controlResourceSetToAddModList SEQUENCE(SIZE (1..3)) OF ControlResourceSet {	2 entries		
ControlResourceSet[2]	ControlResourceSet	entry 2, BFR	
}			
controlResourceSetToReleaseList	Not present		
searchSpacesToAddModList SEQUENCE(SIZE (1..10)) OF SearchSpace {	2 entries		
SearchSpace[2]	SearchSpace	entry 2, BFR	
}			
searchSpacesToReleaseList	Not present		
downlinkPreemption	Not present		
tpc-PUSCH	Not present		
tpc-PUCCH	Not present		
tpc-SRS	Not present		
}			

Table 11.4.4.1.4.3-5: *ControlResourceSet* for NR SA FR1 Beam Failure Detection and Link Recovery Test for FR1 PCell configured with SSB-based BFD and LR in non-DRX mode under CCA

Derivation Path: TS 38.501-1 [14],Table 7.3.1-15			
Information Element	**Value/remark**	**Comment**	**Condition**
ControlResourceSet ::= SEQUENCE {			
controlResourceSetId	2		
duration	2		
cce-REG-MappingType CHOICE {			
interleaved ::= SEQUENCE {			
reg-BundleSize	n6		
interleaverSize	n2		
shiftIndex	0		
}			
tci-StatesPDCCH-ToAddList	Not present		
}			

11.4.4.1.5 Test Requirement

Table 11.4.4.1.5-1 defines the cell specific primary level settings including test tolerances for NR SA FR1 Beam Failure Detection and Link Recovery Test for FR1 PCell configured with SSB-based BFD and LR in non-DRX mode under CCA.

Table 11.4.4.1.5-1: Cell-specific test parameters for NR SA FR1 Beam Failure Detection and Link Recovery Test for FR1 PCell configured with SSB-based BFD and LR in non-DRX mode under CCA

Parameter		Unit	Test 1				
			T1	T2	T3	T4	T5
DL CCA probability $P_{CCA,DL}$	Note 10, 12		1.0	0.9375	0.9375	0.9375	0.9375
	Note 11, 12		1.0/1.0	0.75/0.75	0.75/0.75	0.75/0.75	0.75/0.75
UL CCA probability $P_{CCA,UL}$			1.0	1.0	1.0	1.0	1.0
L_{CCA_DL}			N/A	7			
W_{CCA_DL}		ms	N/A	$T_{Evaluate_CBD_SSB_CCA}$ Note 13			
EPRE ratio of PDCCH DMRS to SSS		dB	0				
EPRE ratio of PDCCH to PDCCH DMRS		dB					
EPRE ratio of PBCH DMRS to SSS		dB					
EPRE ratio of PBCH to PBCH DMRS		dB					
EPRE ratio of PSS to SSS		dB					
EPRE ratio of PDSCH DMRS to SSS		dB					
EPRE ratio of PDSCH to PDSCH DMRS		dB					
EPRE ratio of OCNG DMRS to SSS		dB					
EPRE ratio of OCNG to OCNG DMRS		dB					
SNR_SSB of set q_0	Config 1	dB	5+TT	-3+TT	-12+TT	-12+TT	-12+TT
SNR_SSB of set q_1	Config 1	dB	-10+TT	-10+TT	10+TT	10+TT	10+TT
SSB_RP of set q_1	Config 1	dBm/SCS kHz	-105+TT	-105+TT	-85+TT	-85+TT	-85+TT
N_{oc}	Config 1	dBm/15 KHz	-98+TT				
Propagation condition			TDL-C 300ns 100Hz				

Note 1: OCNG shall be used such that the resources in Cell 1 are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols. For cells with CCA model, OCNG is transmitted only in the slots with downlink transmission burst and is not transmitted during the muted slots or during DBT window.
Note 2: The uplink resources for CSI reporting are assigned to the UE prior to the start of time period T1.
Note 3: NZP CSI-RS resource set configuration for CSI reporting are assigned to the UE prior to the start of time period T1.
Note 4: Measurement gap configuration is assigned to the UE prior to the start of time period T1.
Note 5: The timers and layer 3 filtering related parameters are configured prior to the start of time period T1.
Note 6: The signal contains PDCCH for UEs other than the device under test as part of OCNG.
Note 7: SNR levels correspond to the signal to noise ratio the transmitted SSS REs during DBT window.
Note 8: The SNR in time periods T1, T2, T3, T4 and T5 is denoted as SNR1, SNR2 and SNR3 respectively in figure 11.4.4.1.4-1.
Note 9: The SNR values are specified for testing a UE which supports 2RX on at least one band. For testing of a UE which supports 4RX on all bands, the SNR during T3 is modified as specified in clause D.4A.
Note 10: For UE supporting semi-static channel access and network configuring semi-static channel occupancy.
Note 11: For UE supporting dynamic channel access and network configuring dynamic channel occupancy. The first value corresponds P_{CCA_DL1} and the second value corresponds to the P_{CCA_DL2}.
Note 12: For UE supporting both semi-static and dynamic cannel access, the UE can be tested under dynamic channel occupancy only.
Note 13: As defined in TS 38.133 [6] Table 8.5A.5.2-1.

The UE behaviour during time durations T1, T2, T3, T4 and T5 shall be as follows:

During the time duration T1 and T2, the UE shall transmit uplink signal at least in all subframes configured for CSI transmission on Cell 1.

During the period from time point A to time point B the UE shall transmit uplink signal in Cell 1 in all uplink slots configured for CSI transmission according to the configured periodic CSI reporting for Cell 1.

During T3 the UE shall detect beam failure and initiate link recovery. During T4 and T5 the UE measures and evaluate beam candidate from beam candidate set q_1.

No later than time point F occurring no later than D1 = 410 ms after the start of T5, the UE shall transmit preamble on a beam associated with the candidate beam set q_1. The UE shall not transmit preamble on a beam associated with the candidate beam set q_1 earlier than time point B.

Test is concluded once the test equipment has received the initial preamble transmission from the UE. The rate of correct events observed during repeated tests shall be at least 90%.

11.4.4.2 NR SA FR1 Beam Failure Detection and Link Recovery Test for FR1 PCell configured with SSB-based BFD and LR in DRX mode under CCA

Editor's Note:

- MU and TT analysis is incomplete
- Message contents may need to be updated
- Call setup and test procedure may need to be updated
- Applicability may need to be updated
- Statistical analysis to determine test case verdict is FFS
- Some test parameters are still in brackets

11.4.4.2.1 Test purpose

The purpose of this test is to verify that the UE properly detects SSB-based beam failure in the set q_0 configured for a serving cell and that the UE performs correct SSB-based link recovery based on beam candidate set q_1. The purpose is to test the downlink monitoring for beam failure detection within the UEs active DL BWP, during the evaluation period, and link recovery, when DRX is used. This test will partly verify the SSB based beam failure detection and link recovery for an FR1 serving cell requirements in clause 11.4.4.0.

The purpose of this test is to verify that the UE properly detects SSB-based beam failure in the set q_0 configured for a serving cell and that the UE performs correct SSB-based link recovery based on beam candidate set q_1. The purpose is to test the downlink monitoring for beam failure detection within the UEs active DL BWP, during the evaluation period, and link recovery, when no DRX is used. This test will partly verify the SSB based beam failure detection and link recovery for an FR1 serving cell requirements in clause 11.4.4.0.

11.4.4.2.2 Test applicability

This test applies to all types of NR UE release 16 and forward, supporting standalone NR-U and supporting UL and SSB-based RLM and link recovery on shared channel access.

11.4.4.2.3 Minimum conformance requirement

The minimum requirements are specified in clause 11.4.4.0. DRX configuration is not used for this test.

The normative reference for this requirement is TS 38.133 [6] clause A.11.4.4.2.

11.4.4.2.4 Test description

The test parameters are given in Tables 11.4.4.2.4.1-3 and 11.4.4.2.5-1 below. The test consists of five successive time periods, with time duration of T1, T2, T3, T4 and T5 respectively. Figure 11.4.4.2.4-1 shows the variation of the downlink SNR of the SSB in set q_0 in the active cell to emulate SSB based beam failure. Figure 11.4.4.2.4-1 additionally shows the variation of the downlink L1-RSRP of the SSB in set q_1 of the candidate beam used for link recovery.

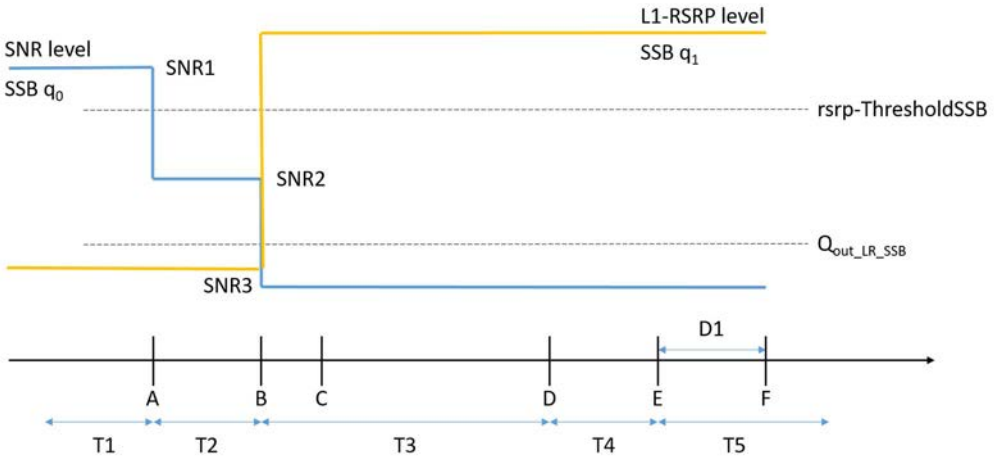

Figure 11.4.4.2.4-1: SNR variation for NR SA FR1 Beam Failure Detection and Link Recovery Test for FR1 PCell configured with SSB-based BFD and LR in DRX mode under CCA

11.4.4.2.4.1 Initial conditions

This test shall be tested using any of the test configurations in Table 11.4.4.2.4.1-1.

Table 11.4.4.2.4.1-1: Supported test configurations for NR SA FR1 Beam Failure Detection and Link Recovery Test for FR1 PCell configured with SSB-based BFD and LR in DRX mode under CCA

Configuration	Description
11.4.4.2-1	TDD, SSB SCS 30 kHz, data SCS 30 kHz, bandwidth 40 MHz

Configure the test equipment and the DUT according to the parameters in Table 11.4.4.2.4.1-2.

Table 11.4.4.2.4.1-2: Initial conditions for NR SA FR1 Beam Failure Detection and Link Recovery Test for FR1 PCell configured with SSB-based BFD and LR in DRX mode under CCA

Parameter	Value		Comment
Test environment	NC		As specified in TS 38.508-1 [14] clause 4.1.
Test frequencies	As specified in Annex E, table E.2-1 and TS 38.508-1 [14] clause 4.3.1 and 4.4.2.		
Channel bandwidth	As specified by the test configuration selected from Table 11.4.4.2.4.1-1.		
Propagation conditions	AWGN		As specified in clause C.2.2.
Connection Diagram	TE Part	A.3.1.7.1	As specified in TS 38.508-1 [14] Annex A.
	DUT Part	A.3.2.3.4	
Exceptions to connection diagram	For 4Rx capable UEs without any 2 Rx RF bands use A.3.2.5.2 for DUT part and A.3.1.8.4 for TE Part		

1. Message contents are defined in clause 11.4.4.2.4.3.
2. The power levels and settings for Cell 1 are set according to Annex C.1.2 and C.1.3.
3. The test parameters are given in Table 11.4.4.2.4.1-3.

Table 11.4.4.2.4.1-3: General test parameters for NR SA FR1 Beam Failure Detection and Link Recovery Test for FR1 PCell configured with SSB-based BFD and LR in DRX mode under CCA

Parameter	Unit	Value	Comment
		Test 1	
Active PSCell		Cell 1	
RF Channel Number		1	
DL CCA model		As specified in D.7.2.1	

UL CCA model			As specified in D.7.2.2	
Duplex mode	Config 1		TDD	
BWchannel	Config 1	MHz	40: NRB,c = 106	
DL initial BWP configuration	Config 1		DLBWP.0.1	
DL dedicated BWP configuration	Config 1		DLBWP.1.1	
UL initial BWP configuration	Config 1		ULBWP.0.1	
UL dedicated BWP configuration	Config 1		ULBWP.1.1	
TDD Configuration	Config 1		TDDConf.1.1 CCA	
CORESET Reference Channel	Config 1		CR.1.1 CCA	
SSB Configuration	Config 1		SSB.3 CCA for semi-static channel access SSB.4 CCA for dynamic channel access	
DBT Window Configuration	Config 1		DBT.1	
PDSCH/PDCCH subcarrier spacing	Config 1		30 KHz	
PRACH Configuration	Config 1		[FR1 PRACH configuration 2]	
SSB Index assigned as BFD RS (q_0)			0	
SSB Index assigned as CBD RS (q_1)			1	
OCNG parameters			OP.1	
CP length			Normal	
Correlation Matrix and Antenna Configuration			2x2 Low	
Beam failure detection transmission parameters	DCI format		1-0	
	Number of Control OFDM symbols		2	
	Aggregation level	CCE	8	
	Ratio of hypothetical PDCCH RE energy to average SSS RE energy	dB	0	
	Ratio of hypothetical PDCCH DMRS energy to average SSS RE energy	dB	0	
	DMRS precoder granularity		REG bundle size	
	REG bundle size		6	
DRX			DRX.7	
Gap pattern ID			N.A.	
gapOffset			N.A.	
rlmInSyncOutOfSyncThreshold			absent	When the field is absent, the UE applies the value 0. (38.133 [6] Table 8.1.1-1).
rsrp-ThresholdSSB	Config 1	dBm/SCS kHz	-95	Threshold used for $Q_{in_LR_SSB}$
powerControlOffsetSS			db0	Used for deriving rsrp-ThresholdCSI-RS

beamFailureInstanceMaxCount			n1	see clause 5.17 of TS 38.321 [12]
beamFailureDetectionTimer			pbfd4	see clause 5.17 of TS 38.321 [12]
CSI-RS configuration for CSI reporting	Config 1		CSI-RS.2.1 TDD	
CSI-RS for tracking	Config 1		TRS.1.2 TDD	
SSB Index assigned as RLM RS			0,1	
T310 Timer		ms	1000	
N310			2	
T1		s	1	During this time the UE shall be fully synchronized to cell 1
T2		s	9.01	
T3		s	5.16	
T4		s	0	
T5		s	3.89	
D1		s	3.85	
Note 1: All configurations are assigned to the UE prior to the start of time period T1. Note 2: UE-specific PDCCH is not transmitted after T1 starts.				

11.4.4.2.4.2 Test Procedure

There is one cell, cell 1 which is the active cell, in the test. Cell 1 operates on a carrier frequency with CCA and transmits SSBs in DBT windows according to DL CCA model.

Prior to the start of the time duration T1, the UE shall be fully synchronized to cell 1. The UE shall be configured for periodic CSI reporting with a reporting periodicity of 2 ms. The UE transmits the reporting according to UL CCA mode. In the test, DRX configuration is enabled in PCell and DRX inactivity timer has already been expired, i.e. UE tries to decode PDCCH and to send periodic CQI during the period when On-duration timer is running. Time alignment timers shall be set to “infinity” so that UL timing alignment is maintained during the test.

1. Ensure the UE is in [State RRC_CONNECTED with generic procedure parameters Connectivity *NR*, Connected without release *On*] according to TS 38.508-1 [14] clause 4.5. Cell 1 is the active cell.
2. The SS sends an *RRCReconfiguration* message to the UE to configure DRX and periodic CSI reporting.
3. The UE sends an *RRCReconfigurationComplete* message.
4. Set the parameters of NR Cell according to T1 in Table 11.4.4.2.5-1. Propagation conditions are set according to clause C.2.3. T1 starts.
5. When T1 expires the SS shall change the SNR value to T2 as specified in Table 11.4.4.2.5-1. T2 starts.
6. When T2 expires the SS shall change the SNR value to T3 as specified in Table 11.4.4.2.5-1. T3 starts.
7. When T3 expires the SS shall change the SNR value to T4 as specified in Table 11.4.4.2.5-1. T4 starts.
8. When T4 expires the SS shall change the SNR value to T5 as specified in Table 11.4.4.2.5-1. T5 starts.
9. If the SS:

   a) detects uplink power on NR carrier equal to or higher than minimum output power defined in TS 38.521-1 [17] clause 6.3.1.5 in each slot configured for CSI transmission (according to CSI reporting on PUCCH) during the period from time point A to time point B; and

   b) does not detect preamble on a beam associated with the candidate beam set q_1 before time point B; and

   c) detects preamble on a beam associated with the candidate beam set q_1 before time point F (D1 after the start of T5), the number of successful tests is increased by one. Proceed with step 10.

Otherwise, the number of failed tests is increased by one. Switch off and then on the UE and proceed with step 1.

10. Repeat steps 2-9 for all subtests until the confidence level according to [Tables G.TBD in Annex G clause G.TBD] is achieved.

11.4.4.2.4.3 Message Contents

Message contents are according to TS 38.508-1 [14] clauses 4.6.1 and 7.3 with the following exceptions:

Table 11.4.4.2.4.3-1: Common Exception messages for NR SA FR1 Beam Failure Detection and Link Recovery Test for FR1 PCell configured with SSB-based BFD and LR in DRX mode under CCA

Default Message Contents	
Common contents of system information blocks exceptions	
Default RRC messages and information elements contents exceptions	Table H.3.1-8 with Condition SSB BFD Table H.3.1-10 with Condition SSB Table H.3.1-10A Table H.3.5-4 Table H.3.5-9 Table H.3.7-1 with Condition DRX.7 [Table 7.3.1-3 in TS 38.508-1 [14] with condition DBT.1]

Table 11.4.4.2.4.3-2: PDCCH *Search Space* for NR SA FR1 Beam Failure Detection and Link Recovery Test for FR1 PCell configured with SSB-based BFD and LR in DRX mode under CCA

Derivation Path: TS 38.508-1 [14], Table 4.6.3-162			
Information Element	**Value/remark**	**Comment**	**Condition**
SearchSpace ::= SEQUENCE {			
searchSpaceId	3	BFR	
controlResourceSetId	2	BFR	
monitoringSlotPeriodicityAndOffset CHOICE {			
sl1	NULL		
}			
monitoringSymbolsWithinSlot	10000000000000	Symbols 0 and 1	
nrofCandidates SEQUENCE {			
aggregationLevel1	n0		
aggregationLevel2	n0		
aggregationLevel4	n0		
aggregationLevel8	n1	AL8	
aggregationLevel16	n0		
}			
searchSpaceType CHOICE {			
ue-Specific SEQUENCE {			USS
dci-Formats	formats0-0-And-1-0	DCI Format 1_0	
}			
}			
}			

Table 11.4.4.2.4.3-3: *RLF-TimersAndConstants* for NR SA FR1 Beam Failure Detection and Link Recovery Test for FR1 PCell configured with SSB-based BFD and LR in DRX mode under CCA

Derivation Path: TS 38.508-1 [14], Table 4.6.3-150			
Information Element	**Value/remark**	**Comment**	**Condition**
RLF-TimersAndConstants ::= SEQUENCE {			
t310	ms1000		
n310	n2		
}			

Table 11.4.4.2.4.3-4: *PDCCH-Config* for NR SA FR1 Beam Failure Detection and Link Recovery Test for FR1 PCell configured with SSB-based BFD and LR in DRX mode under CCA

Derivation Path: TS 38.501-1 [14],Table 4.6.3-95			
Information Element	**Value/remark**	**Comment**	**Condition**
PDCCH-Config ::= SEQUENCE {			
controlResourceSetToAddModList SEQUENCE(SIZE (1..3)) OF ControlResourceSet {	2 entries		
ControlResourceSet[2]	ControlResourceSet	entry 2, BFR	
}			
controlResourceSetToReleaseList	Not present		
searchSpacesToAddModList SEQUENCE(SIZE (1..10)) OF SearchSpace {	2 entries		
SearchSpace[2]	SearchSpace	entry 2, BFR	
}			
searchSpacesToReleaseList	Not present		
downlinkPreemption	Not present		
tpc-PUSCH	Not present		
tpc-PUCCH	Not present		
tpc-SRS	Not present		
}			

Table 11.4.4.2.4.3-5: *ControlResourceSet* for NR SA FR1 Beam Failure Detection and Link Recovery Test for FR1 PCell configured with SSB-based BFD and LR in DRX mode under CCA

Derivation Path: TS 38.501-1 [14],Table 7.3.1-15			
Information Element	**Value/remark**	**Comment**	**Condition**
ControlResourceSet ::= SEQUENCE {			
controlResourceSetId	2		
duration	2		
cce-REG-MappingType CHOICE {			
interleaved ::= SEQUENCE {			
reg-BundleSize	n6		
interleaverSize	n2		
shiftIndex	0		
}			
tci-StatesPDCCH-ToAddList	Not present		
}			

11.4.4.2.5 Test Requirement

Table 11.4.4.2.5-1 defines the cell specific primary level settings including test tolerances for NR SA FR1 Beam Failure Detection and Link Recovery Test for FR1 PCell configured with SSB-based BFD and LR in DRX mode under CCA.

Table 11.4.4.2.5-1: Cell-specific test parameters for NR SA FR1 Beam Failure Detection and Link Recovery Test for FR1 PCell configured with SSB-based BFD and LR in DRX mode under CCA

Parameter		**Unit**	**Test 1**				
			T1	**T2**	**T3**	**T4**	**T5**
DL CCA probability $P_{CCA,DL}$	Note 10, 12		1.0	0.9375	0.9375	0.9375	0.9375
	Note 11, 12		1.0/1.0	0.75/0.75	0.75/0.75	0.75/0.75	0.75/0.75
UL CCA probability $P_{CCA,UL}$			1.0	1.0	1.0	1.0	1.0
L_{CCA_DL}			N/A	7			
W_{CCA_DL}		ms	N/A	$T_{Evaluate_CBD_SSB_CCA}$ Note 13			
EPRE ratio of PDCCH DMRS to SSS		dB	0				
EPRE ratio of PDCCH to PDCCH DMRS		dB					
EPRE ratio of PBCH DMRS to SSS		dB					
EPRE ratio of PBCH to PBCH DMRS		dB					
EPRE ratio of PSS to SSS		dB					
EPRE ratio of PDSCH DMRS to SSS		dB					
EPRE ratio of PDSCH to PDSCH DMRS		dB					

EPRE ratio of OCNG DMRS to SSS		dB					
EPRE ratio of OCNG to OCNG DMRS		dB					
SNR_SSB of set q_0	Config 1	dB	5+TT	-3+TT	-12+TT	-12+TT	-12+TT
SNR_SSB of set q_1	Config 1	dB	-10+TT	-10+TT	10+TT	10+TT	10+TT
SSB_RP of set q_1	Config 1	dBm/SCS kHz	-105+TT	-105+TT	-85+TT	-85+TT	-85+TT
N_{oc}	Config 1	dBm/15 KHz	-98+TT				
Propagation condition			TDL-C 300ns 100Hz				

Note 1: OCNG shall be used such that the resources in Cell 1 are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols. For cells with CCA model, OCNG is transmitted only in the slots with downlink transmission burst and is not transmitted during the muted slots or during DBT window.
Note 2: The uplink resources for CSI reporting are assigned to the UE prior to the start of time period T1.
Note 3: NZP CSI-RS resource set configuration for CSI reporting are assigned to the UE prior to the start of time period T1.
Note 4: Measurement gap configuration is assigned to the UE prior to the start of time period T1.
Note 5: The timers and layer 3 filtering related parameters are configured prior to the start of time period T1.
Note 6: The signal contains PDCCH for UEs other than the device under test as part of OCNG.
Note 7: SNR levels correspond to the signal to noise ratio the transmitted SSS REs during DBT window.
Note 8: The SNR in time periods T1, T2, T3, T4 and T5 is denoted as SNR1, SNR2 and SNR3 respectively in figure 11.4.4.2.4-1.
Note 9: The SNR values are specified for testing a UE which supports 2RX on at least one band. For testing of a UE which supports 4RX on all bands, the SNR during T3 is modified as specified in clause D.4A.
Note 10: For UE supporting semi-static channel access and network configuring semi-static channel occupancy.
Note 11: For UE supporting dynamic channel access and network configuring dynamic channel occupancy. The first value corresponds P_{CCA_DL1} and the second value corresponds to the P_{CCA_DL2}.
Note 12: For UE supporting both semi-static and dynamic cannel access, the UE can be tested under dynamic channel occupancy only.
Note 13: As defined in TS 38.133 [6] Table 8.5A.5.2-1.

The UE behaviour during time durations T1, T2, T3, T4 and T5 shall be as follows:

During the time duration T1 and T2, the UE shall transmit uplink signal at least in all subframes configured for CSI transmission on Cell 1.

During the period from time point A to time point B the UE shall transmit uplink signal in Cell 1 in all uplink slots configured for CSI transmission according to the configured periodic CSI reporting for Cell 1.

During T3 the UE shall detect beam failure and initiate link recovery. During T4 and T5 the UE measures and evaluate beam candidate from beam candidate set q_1.

No later than time point F occurring no later than D1 = 410 ms after the start of T5, the UE shall transmit preamble on a beam associated with the candidate beam set q_1. The UE shall not transmit preamble on a beam associated with the candidate beam set q_1 earlier than time point B.

Test is concluded once the test equipment has received the initial preamble transmission from the UE. The rate of correct events observed during repeated tests shall be at least 90%.

12 to 15 FFS

16 NR standalone tests with all NR cells in FR1 for RedCap

16.0 General

This clause contains test scenarios for NR standalone for Reduced Capability UE. All NR cells are in Frequency Range 1.

16.1 RRC_IDLE state mobility

16.1.1 NR cell re-selection

16.1.1.0 Minimum conformance requirements

16.1.1.0.1 Minimum conformance requirements for intra-frequency cell re-selection for RedCap

The UE shall be able to identify new intra-frequency cells and perform SS-RSRP and SS-RSRQ measurements of the identified intra-frequency cells without an explicit intra-frequency neighbour list containing physical layer cell identities.

The UE shall be able to evaluate whether a newly detectable intra-frequency cell meets the reselection criteria defined in TS 38.304 [30] within $T_{detect,NR_Intra_RedCap}$ when that Treselection= 0 . An intra frequency cell is considered to be detectable according to the conditions defined in TS 38.133 [6] Annex B.x.y for a corresponding Band.

The UE shall measure SS-RSRP and SS-RSRQ at least every $T_{measure,NR_Intra_RedCap}$ for intra-frequency cells that are identified and measured according to the measurement rules.

The UE shall filter SS-RSRP and SS-RSRQ measurements of each measured intra-frequency cell using at least 2 measurements. Within the set of measurements used for the filtering, at least two measurements shall be spaced by at least $T_{measure,NR_Intra_RedCap}/2$.

The UE shall not consider a NR neighbour cell in cell reselection, if it is indicated as not allowed in the measurement control system information of the serving cell.

For an intra-frequency cell that has been already detected, but that has not been reselected to, the filtering shall be such that the UE shall be capable of evaluating that the intra-frequency cell has met reselection criterion defined in TS 38.304 [30] within $T_{evaluate,NR_Intra_RedCap}$ when $T_{reselection}$ = 0 provided that:

when *rangeToBestCell* is not configured:

- the cell is at least 3dB better ranked in FR1 for 2 Rx RedCap.
- the cell is at least 4dB better ranked in FR1 for 1 Rx RedCap.

when *rangeToBestCell* is configured:

- the cell has the highest number of beams above the threshold *absThreshSS-BlocksConsolidation* among all detected cells whose cell-ranking criterion R value in TS 38.304 [30] is within *rangeToBestCell* of the cell-ranking criterion R value of the highest ranked cell.
  - if there are multiple such cells, the cell has the highest rank among them.
    - the cell is at least 3dB better ranked in FR1 if the current serving cell is among them for 2 Rx RedCap.
    - the cell is at least 4dB better ranked in FR1 if the current serving cell is among them for 1 Rx RedCap.

The 1 Rx RedCap UE applies *absThreshSS-BlocksConsolidation* as the signalled value of *absThreshSS-BlocksConsolidation* [2] + 1 dB.

When evaluating cells for reselection, the SSB side conditions apply to both serving and non-serving intra-frequency cells.

If $T_{reselection}$ timer has a non-zero value and the intra-frequency cell is satisfied with the reselection criteria which are defined in TS 38.304 [30], the UE shall evaluate this intra-frequency cell for the $T_{reselection}$ time. If this cell remains satisfied with the reselection criteria within this duration, then the UE shall reselect that cell.

For 1 Rx RedCap not configured with eDRX_IDLE cycle, $T_{detect,NR_Intra_RedCap}$, $T_{measure,NR_Intra_RedCap}$ and $T_{evaluate,NR_Intra_RedCap}$ are specified in Table 16.1.1.0.1-1. For 2 Rx RedCap not configured with eDRX_IDLE cycle, $T_{detect,NR_Intra_RedCap}$, $T_{measure,NR_Intra_RedCap}$ and $T_{evaluate,NR_Intra_RedCap}$ are same as T_{detect,NR_Intra}, $T_{measure,NR_Intra}$ and $T_{evaluate,NR_Intra}$ specified in TS 38.133 [6] in Table 4.2.2.3-1.

For 1 Rx RedCap and 2 Rx RedCap configured with eDRX_IDLE cycle, $T_{detect,NR_Intra_RedCap}$, $T_{measure,NR_Intra_RedCap}$ and $T_{evaluate,NR_Intra_RedCap}$ are specified in Table 16.1.1.0.1-2 for FR1, where the requirements apply provided that the serving cell is configured with eDRX_IDLE and is the same in all PTWs during any of $T_{detect,NR_Intra_RedCap}$, $T_{measure,NR_Intra_RedCap}$ and $T_{evaluate,NR_Intra_RedCap}$ when multiple PTWs are used.

Table 16.1.1.0.1-1: $T_{detect,NR_Intra_RedCap}$, $T_{measure,NR_Intra_RedCap}$ and $T_{evaluate,NR_Intra_RedCap}$

DRX cycle length [s]	Scaling Factor (N1)		$T_{detect,NR_Intra_RedCap}$ [s] (number of DRX cycles)	$T_{measure,NR_Intra_RedCap}$ [s] (number of DRX cycles)	$T_{evaluate,NR_Intra_RedCap}$ [s] (number of DRX cycles)
	FR1	FR2[Note1]			
0.32	1	8	11.52 x N1 x M2 (36 x N1 x M2)	1.28 x N1 x M2 (4 x N1 x M2)	5.12 x N1 x M2 (16 x N1 x M2)
0.64		5	17.92 x N1 (28 x N1)	1.28 x N1 (2 x N1)	5.12 x N1 (8 x N1)
1.28		4	32 x N1 (25 x N1)	1.28 x N1 (1 x N1)	6.4 x N1 (5 x N1)
2.56		3	58.88 x N1 (23 x N1)	2.56 x N1 (1 x N1)	7.68 x N1 (3 x N1)

Note 1: Applies for RedCap UE of all FR2 power class.
Note 2: M2 = 1.5 if SMTC periodicity of measured intra-frequency cell > 20 ms; otherwise M2=1. If different SMTC periodicities are configured for different cells, the SMTC periodicity in this note is the one used by the cell being identified. During PSS/SSS detection, the periodicity of the SMTC configured for the intra-frequency carrier is assumed, and if the actual SSB transmission periodicity is greater than the SMTC configured for the intra-frequency carrier, longer $T_{detect, NR_intra_RedCap}$ is expected.

Table 16.1.1.0.1-2: $T_{detect,NR_Intra_RedCap}$, $T_{measure,NR_Intra_RedCap}$ and $T_{evaluate,NR_Intra_RedCap}$ for UE configured with eDRX_IDLE cycle (Frequency range FR1)

eDRX_IDLE cycle length [s]	DRX cycle length [s]	PTW length [s] (number of 1.28s periods)	$T_{detect,NR_Intra_RedCap}$ [s] (number of DRX cycles or eDRX cycles [Note 3])	$T_{measure,NR_Intra_RedCap}$ [s] (number of DRX cycles or eDRX cycles [Note 3])	$T_{evaluate,NR_Intra_RedCap}$ [s] (number of DRX cycles or eDRX cycles [Note 3])
2.56	-	-	58.88 (23)	2.56 (1)	7.68 (3)
5.12	-	-	117.76 (23)	5.12 (1)	10.24 (2)
10.24	-	-	235.52 (23)	10.24 (1)	20.48 (2)
20.48 ≤ eDRX_IDLE cycle length ≤10485.76	0.32	≥[1.28] ([1])	$eDRX_cycle_length \times \left\lceil \frac{23}{PTW/DRX_cycle_length} \right\rceil$ (23)	0.32 x M2 (1 x M2)	0.64 x M2 (2 x M2)
	0.64	≥[1.28] ([1])		0.64 (1)	1.28 (2)
	1.28	≥[2.56] ([2])		1.28 (1)	2.56 (2)
	2.56	≥[5.12] ([4])		2.56 (1)	5.12 (2)

Note 1: The number of DRX cycles in this table is given for the DRX cycles within PTWs.
Note 2: The eDRX_IDLE cycle lengths are as specified in Section 10.5.5.32 of TS 24.008 [34].

Note 3:	Number of eDRX cycles when eDRX_IDLE cycle length equals 2.56s, 5.12s and 10.24s. Otherwise, number of DRX cycles.
Note 4:	The lower bound of PTW length is derived based on $\left\lceil \frac{Tevaluate,NR_Intra_RedCap * DRX_cycle}{1.28} \right\rceil * 1.28$.
Note 5:	M2 = 1.5 if SMTC periodicity of measured intra-frequency cell > 20 ms; otherwise M2=1.

For any requirement in this section, when the UE transitions between any two states when being configured with eDRX_IDLE, being configured with eDRX_IDLE cycle, changing eDRX_IDLE cycle length, or changing PTW configuration, the UE shall meet the transition requirement, which is the less stringent requirement of the two requirements corresponding to the first state and the second state, during the transition time interval which is the time corresponding to the transition requirement. After the transition time interval, the UE shall meet the requirement corresponding to the second state.

16.1.1.0.2 Minimum conformance requirements for inter-frequency cell re-selection for RedCap

The UE shall be able to identify new inter-frequency cells and perform SS-RSRP or SS-RSRQ measurements of identified inter-frequency cells if carrier frequency information is provided by the serving cell, even if no explicit neighbour list with physical layer cell identities is provided.

If Srxlev > $S_{nonIntraSearchP}$ and Squal > $S_{nonIntraSearchQ}$ then the UE shall search for inter-frequency layers of higher priority at least every $T_{higher_priority_search}$ where $T_{higher_priority_search}$ is described in clause 4.2.2.7.

If Srxlev ≤ $S_{nonIntraSearchP}$ or Squal ≤ $S_{nonIntraSearchQ}$ then the UE shall search for and measure inter-frequency layers of higher, equal or lower priority in preparation for possible reselection. In this scenario, the minimum rate at which the UE is required to search for and measure higher priority layers shall be the same as that defined below in this clause.

The UE shall be able to evaluate whether a newly detectable inter-frequency cell meets the reselection criteria defined in TS 38.304 [30] within $K_{carrier_RedCap} * T_{detect,NR_Inter_RedCap}$ if at least carrier frequency information is provided for inter-frequency neighbour cells by the serving cells when $T_{reselection}$ = 0 provided that the reselection criteria is met

For 2 Rx RedCap by a margin of at least

5 dB in FR1 for reselections based on ranking or

6 dB in FR1 for SS-RSRP reselections based on absolute priorities or

4 dB in FR1 for SS-RSRQ reselections based on absolute priorities

For 1 Rx RedCap by a margin of at least

[5 dB] in FR1 or for reselections based on ranking or

[6 dB] in FR1 for SS-RSRP reselections based on absolute priorities or

[4 dB] in FR1 for SS-RSRQ reselections based on absolute priorities.

The parameter $K_{carrier_RedCap}$ is the number of NR inter-frequency carriers indicated by the serving cell. An inter-frequency cell is considered to be detectable according to the conditions defined in Annex B.x.y for a corresponding Band. When higher priority cells are found by the higher priority search, they shall be measured at least every $T_{measure,NR_Inter_RedCap}$. If, after detecting a cell in a higher priority search, it is determined that reselection has not occurred then the UE is not required to continuously measure the detected cell to evaluate the ongoing possibility of reselection. However, the minimum measurement filtering requirements specified later in this clause shall still be met by the UE before it makes any determination that it may stop measuring the cell. If the UE detects on a NR carrier a cell whose physical identity is indicated as not allowed for that carrier in the measurement control system information of the serving cell, the UE is not required to perform measurements on that cell.

The UE shall measure SS-RSRP or SS-RSRQ at least every $K_{carrier_RedCap} * T_{measure,NR_Inter_RedCap}$ for identified lower or equal priority inter-frequency cells. If the UE detects on a NR carrier a cell whose physical identity is indicated as not allowed for that carrier in the measurement control system information of the serving cell, the UE is not required to perform measurements on that cell.

The UE shall filter SS-RSRP or SS-RSRQ measurements of each measured higher, lower and equal priority inter-frequency cell using at least 2 measurements. Within the set of measurements used for the filtering, at least two measurements shall be spaced by at least $T_{measure,NR_Inter}/2$.

The UE shall not consider a NR neighbour cell in cell reselection, if it is indicated as not allowed in the measurement control system information of the serving cell.

For an inter-frequency cell that has been already detected, but that has not been reselected to, the filtering shall be such that the UE shall be capable of evaluating that the inter-frequency cell has met reselection criterion defined TS 38.304 [1] within $K_{carrier} * T_{evaluate,NR_Inter_RedCap}$ when $T_{reselection} = 0$ provided that the reselection criteria is met by

- the condition when performing equal priority reselection and
  - when *rangeToBestCell* is not configured:
    - the cell is at least 5dB better ranked in FR1 for 2 Rx RedCap.
    - the cell is at least [5dB] better ranked in FR1 for 1 Rx RedCap.
  - when *rangeToBestCell* is configured:
    - the cell has the highest number of beams above the threshold *absThreshSS-BlocksConsolidation* among all detected cells whose cell-ranking criterion R value defined in TS38.304 [1] is within *rangeToBestCell* of the cell-ranking criterion R value of the highest ranked cell.
      - if there are multiple such cells, the cell has the highest rank among them
      - the cell is at least 5dB better ranked in FR1 or 6.5dB better ranked in FR2 if the current serving cell is among them, or 6dB in FR1 or 7.5dB in FR2 for SS-RSRP reselections based on absolute priorities for 2 Rx RedCap or 4dB in FR1 or 4dB in FR2 for SS-RSRQ reselections based on absolute priorities for 2 Rx RedCap.
      - the cell is at least [5dB] better ranked in FR1 if the current serving cell is among them, or [6dB] in FR1 for SS-RSRP reselections based on absolute priorities or [4dB] in FR1 for SS-RSRQ reselections based on absolute priorities for 1 Rx RedCap.

The 1 Rx RedCap UE applies *absThreshSS-BlocksConsolidation* as the signalled value of *absThreshSS-BlocksConsolidation* [2] + 1 dB.

When evaluating cells for reselection, the SSB side conditions apply to both serving and inter-frequency cells.

If $T_{reselection}$ timer has a non-zero value and the inter-frequency cell is satisfied with the reselection criteria, the UE shall evaluate this inter-frequency cell for the $T_{reselection}$ time. If this cell remains satisfied with the reselection criteria within this duration, then the UE shall reselect that cell.

The UE is not expected to meet the measurement requirements for an inter-frequency carrier under DRX cycle=320 ms defined in Table 4.2B.2.4-1 or Table 4.2.2.4-1 for 1 Rx RedCap and 2 Rx RedCap respectively, under the following conditions:

- $T_{SMTC_intra} = T_{SMTC_inter} = 160$ ms; where T_{SMTC_intra} and T_{SMTC_inter} are periodicities of the SMTC occasions configured for the intra-frequency carrier and the inter-frequency carrier respectively, and
- SMTC occasions configured for the inter-frequency carrier occur up to 1 ms before the start or up to 1 ms after the end of the SMTC occasions configured for the intra-frequency carrier, and
- SMTC occasions configured for the intra-frequency carrier and for the inter-frequency carrier occur up to 1 ms before the start or up to 1 ms after the end of the paging occasion defined in TS38.304 [1].

For UE not configured with eDRX_IDLE cycle, $T_{detect,NR_Inter_RedCap,}$ $T_{measure,NR_Inter_RedCap}$ and $T_{evaluate,NR_Inter_RedCap}$ are specified in Table 4.2B.2.4.1-1.

For 1 Rx RedCap configured with eDRX_IDLE cycle, $T_{detect,NR_Inter_RedCap,}$ $T_{measure,NR_Inter_RedCap}$ and $T_{evaluate,NR_Inter_RedCap}$ are specified in Table 4.2B.2.4-2 for FR1. For 1 Rx RedCap and 2 Rx RedCap configured with eDRX_IDLE cycle, $T_{detect,NR_Inter_RedCap,}$ $T_{measure,NR_Inter_RedCap}$ and $T_{evaluate,NR_Inter_RedCap}$ are specified in Table 4.2B.2.4-2 and Table 4.2B.2.4-3 for FR1 and FR2 respectively. The requirements apply provided that the serving cell is configured with

eDRX_IDLE and is the same in all PTWs during any of $T_{detect,NR_Inter_RedCap}$, $T_{measure,NR_Inter_RedCap}$ and $T_{evaluate,NR_Inter_RedCap}$ when multiple PTWs are used.

Table 4.2B.2.4-1: $T_{detect,NR_Inter_RedCap}$, $T_{measure,NR_Inter_RedCap}$ and $T_{evaluate,NR_Inter_RedCap}$

DRX cycle length [s]	Scaling Factor (N1)		$T_{detect,NR_Inter_RedCap}$ [s] (number of DRX cycles)	$T_{measure,NR_Inter_RedCap}$ [s] (number of DRX cycles)	$T_{evaluate,NR_Inter_RedCap}$ [s] (number of DRX cycles)
	FR1	FR2[Note1]			
0.32	1	8	11.52 x N1 x 1.5 (36 x N1 x 1.5)	1.28 x N1 x 1.5 (4 x N1 x 1.5)	5.12 x N1 x 1.5 (16 x N1 x 1.5)
0.64		5	17.92x N1 (28 x N1)	1.28 x N1 (2 x N1)	5.12 x N1 (8 x N1)
1.28		4	32 x N1 (25 x N1)	1.28 x N1 (1 x N1)	6.4 x N1 (5 x N1)
2.56		3	58.88 x N1 (23 x N1)	2.56 x N1 (1 x N1)	7.68 x N1 (3 x N1)
Note 1: Applies for RedCap UE of all FR2 power class.					

Table 4.2B.2.4-2: $T_{detect,NR_Inter_RedCap}$, $T_{measure,NR_Inter_RedCap}$ and $T_{evaluate,NR_Inter_RedCap}$ for UE configured with eDRX_IDLE cycle (Frequency range FR1)

eDRX_IDLE cycle length [s]	DRX cycle length [s]	PTW length [s] (number of 1.28s periods)	$T_{detect,NR_Inter_RedCap}$ [s] (number of DRX cycles or eDRX cycles [Note 3])	$T_{measure,NR_Inter_RedCap}$ [s] (number of DRX cycles or eDRX cycles [Note 3])	$T_{evaluate,NR_Inter_RedCap}$ [s] (number of DRX cycles or eDRX cycles [Note 3])
2.56	-	-	58.88 (23)	2.56 (1)	7.68 (3)
5.12	-	-	117.76 (23)	5.12 (1)	10.24 (2)
10.24	-	-	235.52 (23)	10.24 (1)	20.48 (2)
20.48 ≤ eDRX_IDLE cycle length ≤10485.76	0.32	≥1.28 (1)	$\frac{eDRX_cycle_length}{23} \times \left\lceil \frac{23}{PTW/DRX_cycle_length} \right\rceil$ (23)	0.32 x 1.5 (1 x 1.5)	0.64 x 1.5 (2 x 1.5)
	0.64	≥1.28 (1)		0.64 (1)	1.28 (2)
	1.28	≥2.56 (2)		1.28 (1)	2.56 (2)
	2.56	≥5.12 (4)		2.56 (1)	5.12 (2)
NOTE 1: The number of DRX cycles in this table is given for the DRX cycles within PTWs. NOTE 2: The eDRX_IDLE cycle lengths are as specified in Section 10.5.5.32 of TS 24.008 [34]. NOTE 3: Number of eDRX cycles when eDRX_IDLE cycle length equals 2.56s, 5.12s and 10.24s. Otherwise, number of DRX cycles. NOTE 4: The lower bound of PTW length is derived based on $\left\lceil \frac{Tevaluate,NR_Inter_RedCap * DRX_cycle}{1.28} \right\rceil * 1.28$.					

Table 4.2B.2.4-3: $T_{detect,NR_Inter_RedCap}$, $T_{measure,NR_Inter_RedCap}$ and $T_{evaluate,NR_Inter_RedCap}$ for UE configured with eDRX_IDLE cycle (Frequency range FR2)

eDRX_IDLE cycle length [s]	DRX cycle length [s]	PTW length [s] (number of 1.28s periods)	Scaling Factor (N1) [Note1]	$T_{detect,NR_Inter_RedCap}$ [s] (number of DRX cycles or eDRX cycles [Note 3])	$T_{measure,NR_Inter_RedCap}$ [s] (number of DRX cycles or eDRX cycles [Note 3])	$T_{evaluate,NR_Inter_RedCap}$ [s] (number of DRX cycles or eDRX cycles [Note 3])
2.56	-	-	3	58.88 x N1 (23 x N1)	2.56 x N1 (1 x N1)	7.68 x N1 (3 x N1)
5.12	-	-	3	117.76 x N1 (23 x N1)	5.12 x N1 (1 x N1)	10.24 x N1 (2 x N1)
10.24	-	-	3	235.52 x N1 (23 x N1)	10.24 x N1 (1 x N1)	20.48 x N1 (2 x N1)

20.48 ≤ eDRX_IDLE cycle length ≤10485.76	0.32	≥5.12 (4)	8	$eDRX_cycle_length - \left\lceil \frac{23 \times N1}{PTW/DRX_cycle_length} \right\rceil$ (23 x N1)	0.32 x N1 (1 x N1)	0.64 x N1 (2 x N1)
	0.64	≥6.4 (5)	5		0.64 x N1 (1 x N1)	1.28 x N1 (2 x N1)
	1.28	≥10.24 (8)	4		1.28 x N1 (1 x N1)	2.56 x N1 (2 x N1)
	2.56	≥15.36 (12)	3		2.56 x N1 (1 x N1)	5.12 x N1 (2 x N1)
NOTE 1: Applies for RedCap UE of all power class. NOTE 2: The number of DRX cycles in this table is given for the DRX cycles within PTWs. NOTE 3: The eDRX_IDLE cycle lengths are as specified in Section 10.5.5.32 of TS 24.008 [34]. NOTE 4: Number of eDRX cycles when eDRX_IDLE cycle length equals 2.56s, 5.12s and 10.24s. Otherwise, number of DRX cycles. NOTE 5: The lower bound of PTW length is derived based on $\left\lceil \frac{T_{evaluate,NR_Inter_RedCap} * DRX_cycle}{1.28} \right\rceil * 1.28$.						

For any requirement in this section, when the UE transitions between any two states when being configured with eDRX_IDLE, being configured with eDRX_IDLE cycle, changing eDRX_IDLE cycle length, or changing PTW configuration, the UE shall meet the transition requirement, which is the less stringent requirement of the two requirements corresponding to the first state and the second state, during the transition time interval which is the time corresponding to the transition requirement. After the transition time interval, the UE shall meet the requirement corresponding to the second state.

16.1.1.0.3 Minimum conformance requirements for intra-frequency cell re-selection for RedCap UE configured with stationary relaxed measurement criterion

This clause contains the requirements for measurements on intra-frequency NR cells when Srxlev ≤ $S_{IntraSearchP}$ or Squal ≤ $S_{IntraSearchQ}$ and when the UE is configured any of the following relaxed measurement criteria:

- Relaxed measurement criterion for a stationary UE defined in clause 5.2.4.9.3 in TS 38.304 [30],
- Relaxed measurement criterion for a stationary UE not at cell edge defined in clause 5.2.4.9.4 in 38.304 [30],
- Both low mobility criterion and stationary criterion as defined in clause 5.2.4.9.1 and 5.2.4.9.3 or 5.2.4.9.4 in 38.304 [30] respectively.

The 1 Rx RedCap UE for the evaluation of one or more relaxed measurement criteria defined in clause 5.2.4.9 38.304 [30] applies:

- *s-SearchDeltaP-r16* as the signalled value of *s-SearchDeltaP-r16* [2] - 1 dB.
- *s-SearchDeltaP-Stationary-r17* as the signalled value of *s-SearchDeltaP-Stationary-r17* [2] - 1 dB.
- *s-SearchThresholdP-r16* as the signalled value of *s-SearchThresholdP-r16* [2] + 1 dB.
- *s-SearchThresholdQ-r16* as the signalled value of *s-SearchThresholdQ-r16* [2] + 1 dB.
- *s-SearchThresholdP2-r17* as the signalled value of *s-SearchThresholdP2-r17* [2] + 1 dB.
- *s-SearchThresholdQ2-r17* as the signalled value of *s-SearchThresholdQ2-r17* [2] + 1 dB.

This clause contains requirements for measurements on intra-frequency NR cells provided that:

- UE is configured with *stationaryMobilityEvaluation* [2] criterion and UE has fulfilled that criterion, or
- UE is configured with both *stationaryMobilityEvaluation* [2] criterion and *cellEdgeEvaluationWhileStationary* [2] criterion and *combineRelaxedMeasCondition2* [2] not configured, and UE has fulfilled only the *stationaryMobilityEvaluation* [2] criterion

The requirements defined in clause 4.2B.2.3 apply for this clause except that:

- $T_{detect,NR_Intra_RedCap_Relax}$ as specified in Table 4.2B.2.9.2-1 and Table 4.2B.2.9.2-2 for 1 Rx RedCap and 2 Rx RedCap respectively.

- $T_{measure,NR_Intra_RedCap_Relax}$ as specified in Table 4.2B.2.9.2-1 and Table 4.2B.2.9.2-2 for 1 Rx RedCap and 2 Rx RedCap respectively.

- $T_{evaluate,NR_Intra_RedCap_Relax}$ as specified in Table 4.2B.2.9.2-1 and Table 4.2B.2.9.2-2 for 1 Rx RedCap and 2 Rx RedCap respectively.

If the UE is configured with eDRX_IDLE cycle then the requirements in Table 4.2B.2.9.2-3 and Table 4.2B.2.9.2-4 are applicable for eDRX cycle up to 10.24 s in FR1 and FR2 respectively.

If the UE is configured with eDRX_IDLE cycle greater than 10.24 s in FR1 and FR2, then the requirements in Table 4.2B.2.9.2-5 and Table 4.2B.2.9.2-6 respectively apply provided eDRX cycle is ≤ [163.84] sec and evaluation/measurement time with relaxation on one carrier is not greater than single PTW window length.

Table 4.2B.2.9.2-1: $T_{detect,NR_Intra_RedCap_Relax}$, $T_{measure,NR_Intra_RedCap_Relax}$ and $T_{evaluate,NR_Intra_RedCap_Relax}$ for UEs fulfilling stationary criterion for 1 Rx RedCap UE

DRX cycle length [s]	$T_{detect,NR_Intra_RedCap_Relax}$ [s] (number of DRX cycles)	$T_{measure,NR_Intra_RedCap_Relax}$ [s] (number of DRX cycles)	$T_{evaluate,NR_Intra_RedCap_Relax}$ [s] (number of DRX cycles)
0.32	11.52 x M2 x K3 (36 x M2 x K3)	1.28 x M2 x K3 (4 x M2 x K3)	5.12 x M2 x K3 (16 x M2 x K3)
0.64	17.92 x K3 (28 x K3)	1.28 x K3 (2 x K3)	5.12 x K3 (8 x K3)
1.28	32 x K3 (25 x K3)	1.28x K3 (1 x K3)	6.4 x K3 (5 x K3)
2.56	58.88 x K3 (23 x K3)	2.56 x K3 (1 x K3)	7.68 x K3 (3 x K3)

Note 1: M2 = 1.5 if SMTC periodicity of measured intra-frequency cell > 20 ms; otherwise M2=1. If different SMTC periodicities are configured for different cells, the SMTC periodicity in this note is the one used by the cell being identified. During PSS/SSS detection, the periodicity of the SMTC configured for the intra-frequency carrier is assumed, and if the actual SSB transmission periodicity is greater than the SMTC configured for the intra-frequency carrier, longer T_{detect, NR_intra} is expected.

Note 2: K3 = 6 is the measurement relaxation factor applicable for UE fulfilling the *stationaryMobilityEvaluation* [2] criterion.

Table 4.2B.2.9.2-2: $T_{detect,NR_Intra_RedCap_Relax}$, $T_{measure,NR_Intra_RedCap_Relax}$ and $T_{evaluate,NR_Intra_RedCap_Relax}$ for UEs fulfilling stationary criterion for 2 Rx RedCap UE

DRX cycle length [s]	Scaling Factor (N1)		$T_{detect,NR_Intra_RedCap_Relax}$ [s] (number of DRX cycles)	$T_{measure,NR_Intra_RedCap_Relax}$ [s] (number of DRX cycles)	$T_{evaluate,NR_Intra_RedCap_Relax}$ [s] (number of DRX cycles)
	FR1	FR2[Note1]			
0.32	1	8	11.52 x N1 x M2 x K3 (36 x N1 x M2 x K3)	1.28 x N1 x M2 x K3 (4 x N1 x M2 x K3)	5.12 x N1 x M2 x K3 (16 x N1 x M2 x K3)
0.64		5	17.92 x N1 x K3 (28 x N1 x K3)	1.28 x N1 x K3 (2 x N1 x K3)	5.12 x N1 x K3 (8 x N1 x K3)
1.28		4	32 x N1 x K3 (25 x N1 x K3)	1.28 x N1 x K3 (1 x N1 x K3)	6.4 x N1 x K3 (5 x N1 x K3)
2.56		3	58.88 x N1 x K3 (23 x N1 x K3)	2.56 x N1 x K3 (1 x N1 x K3)	7.68 x N1 x K3 (3 x N1 x K3)

Note 1: Applies for RedCap UE of all supporting FR2 power classes.

Note 2: M2 = 1.5 if SMTC periodicity of measured intra-frequency cell > 20 ms; otherwise M2=1. If different SMTC periodicities are configured for different cells, the SMTC periodicity in this note is the one used by the cell being identified. During PSS/SSS detection, the periodicity of the SMTC configured for the intra-frequency carrier is assumed, and if the actual SSB transmission periodicity is greater than the SMTC configured for the intra-frequency carrier, longer T_{detect, NR_intra} is expected.

Note 3: K3 = 6 is the measurement relaxation factor applicable for UE fulfilling the *stationaryMobilityEvaluation* [2] criterion.

Table 4.2B.2.9.2-3: $T_{detect,NR_Intra_RedCap_Relax}$, $T_{measure,NR_Intra_RedCap_Relax}$ and $T_{evaluate,NR_Intra_RedCap_Relax}$ for UE configured with eDRX_IDLE cycle (Frequency range FR1) for eDRX_IDLE cycle up to 10.24 s

eDRX_IDLE cycle length [s]	$T_{detect,NR_Intra_RedCap_Relax}$ [s] (number of eDRX IDLE cycles)	$T_{measure,NR_Intra_RedCap_Relax}$ [s] (number of eDRX IDLE cycles)	$T_{evaluate,NR_Intra_RedCap_Relax}$ [s] (number of eDRX IDLE cycles)
2.56	58.88 x K3 (23 x K3)	2.56 x K3 (1 x K3)	7.68 x K3 (3 x K3)
5.12	117.76 x K3 (23 x K3)	5.12 x K3 (1 x K3)	10.24 x K3 (2 x K3)
10.24	235.52 x K3 (23 x K3)	10.24 x K3 (1 x K3)	20.48 x K3 (2 x K3)
Note 1: K3 = 6 is the measurement relaxation factor applicable for UE fulfilling the *stationaryMobilityEvaluation* [2] criterion.			

Table 4.2B.2.9.2-4: $T_{detect,NR_Intra_RedCap_Relax}$, $T_{measure,NR_Intra_RedCap_Relax}$ and $T_{evaluate,NR_Intra_RedCap_Relax}$ for UE configured with eDRX_IDLE cycle (Frequency range FR2) for eDRX_IDLE cycle up to 10.24 s

eDRX_IDLE cycle length [s]	$T_{detect,NR_Intra_RedCap_Relax}$ [s] (number of eDRX IDLE cycles)	$T_{measure,NR_Intra_RedCap_Relax}$ [s] (number of eDRX IDLE cycles)	$T_{evaluate,NR_Intra_RedCap_Relax}$ [s] (number of eDRX IDLE cycles)
2.56	58.88 x N1 x K3 (23 x N1 x K3)	2.56 x N1 x K3 (1 x K3)	7.68 x N1 x K3 (3 x N1 x K3)
5.12	117.76 x N1 x K3 (23 x N1 x K3)	5.12 x N1 x K3 (1 x N1 x K3)	10.24 x N1 x K3 (2 x N1 x K3)
10.24	235.52 x N1 x K3 (23 x N1 x K3)	10.24 x N1 x K3 (1 x N1 x K3)	20.48 x N1 x K3 (2 x N1 x K3)
Note 1: K3 = 6 is the measurement relaxation factor applicable for UE fulfilling the *stationaryMobilityEvaluation* [2] criterion.			

Table 4.2B.2.9.2-5: $T_{detect,NR_Intra_RedCap_Relax}$, $T_{measure,NR_Intra_RedCap_Relax}$ and $T_{evaluate,NR_Intra_RedCap_Relax}$ for UE configured with eDRX_IDLE cycle (Frequency range FR1)

eDRX_IDLE cycle length [s]	DRX cycle length [s]	PTW length [s] (number of 1.28s periods)	$T_{detect,NR_Intra_RedCap_Relax}$ [s] (number of DRX cycles or eDRX cycles Note 3)	$T_{measure,NR_Intra_RedCap_Relax}$ [s] (number of DRX cycles or eDRX cycles Note 3)	$T_{evaluate,NR_Intra_RedCap_Relax}$ [s] (number of DRX cycles or eDRX cycles Note 3)
20.48 ≤ eDRX_IDLE cycle length ≤[163.84]	0.32	≥[6.4] ([5])	$eDRX_cycle_length \times \left\lceil \frac{23}{PTW/DRX_cycle_length} \right\rceil$ x K3 (23 x K3)	0.32 x M2 x K3 (1 x M2 x K3)	0.64 x M2 x K3 (2 x M2 x K3)
	0.64	≥[12.8] ([10])		0.64 x K3 (1 x K3)	1.28 x K3 (2 x K3)
	1.28	≥[15.36] ([12])		1.28 x K3 (1 x K3)	2.56 x K3 (2 x K3)
	2.56	≥[30.72] ([24])		2.56 x K3 (1 x K3)	5.12 x K3 (2 x K3)
Note 1: The number of DRX cycles in this table is given for the DRX cycles within PTWs.					
Note 2: The eDRX_IDLE cycle lengths are as specified in Section 10.5.5.32 of TS 24.008 [34].					
Note 3: The lower bound of PTW length is derived based on $\left\lceil \frac{Tevaluate,NR_Intra_RedCap * DRX_cycle}{1.28} \right\rceil * 1.28$.					
Note 4: M2 = 1.5 if SMTC periodicity of measured intra-frequency cell > 20 ms; otherwise M2=1. If different SMTC periodicities are configured for different cells, the SMTC periodicity in this note is the one used by the cell being identified. During PSS/SSS detection, the periodicity of the SMTC configured for the intra-frequency carrier is assumed, and if the actual SSB transmission periodicity is greater than the SMTC configured for the intra-frequency carrier, longer $T_{detect,\ NR_intra_RedCap}$ is expected.					
Note 5: K3 = 6 is the measurement relaxation factor applicable for UE fulfilling the stationaryMobilityEvaluation [2] criterion.					

Table 4.2B.2.9.2-6: $T_{detect,NR_Intra_RedCap_Relax}$, $T_{measure,NR_Intra_RedCap_Relax}$ and $T_{evaluate,NR_Intra_RedCap_Relax}$ for UE configured with eDRX_IDLE cycle (Frequency range FR2)

eDRX_IDLE cycle length [s]	DRX cycle length [s]	PTW length [s] (number of 1.28s periods)	Scaling Factor (N1) Note1	$T_{detect,NR_Intra_RedCap_Relax}$ [s] (number of DRX cycles or eDRX cycles Note 3)	$T_{measure,NR_Intra_RedCap_Relax}$ [s] (number of DRX cycles or eDRX cycles Note 3)	$T_{evaluate,NR_Intra_RedCap_Relax}$ [s] (number of DRX cycles or eDRX cycles Note 3)
20.48 ≤ eDRX_IDLE cycle length ≤[163.84]	0.32	≥30.72 (24)	8	K3 x $eDRX_cycle_length \times \left\lceil \frac{23 \times N1}{PTW/DRX_cycle_length} \right\rceil$ (23 x N1 x K3)	0.32 x N1 x K3 (1 x N1 x K3)	0.64 x N1 x K3 (2 x N1 x K3)
	0.64	≥38.4 (30)	5		0.64 x N1 x K3 (1 x N1 x K3)	1.28 x N1 x K3 (2 x N1 x K3)
	1.28	≥61.44 (48)	4		1.28 x N1 x K3 (1 x N1 x K3)	2.56 x N1 x K3 (2 x N1 x K3)
	2.56	≥92.16 (72)	3		2.56 x N1 x K3 (1 x N1 x K3)	5.12 x N1 x K3 (2 x N1 x K3)

Note 1: Applies for RedCap UE of all supporting FR2 power classes.
Note 2: The number of DRX cycles in this table is given for the DRX cycles within PTWs.
Note 3: The eDRX_IDLE cycle lengths are as specified in Section 10.5.5.32 of TS 24.008 [34].
Note 4: The lower bound of PTW length is derived based on $\left\lceil \frac{Tevaluate,NR_Intra_RedCap * DRX_cycle}{1.28} \right\rceil * 1.28$.
Note 5: The measurement shall not be performed across PTW's. In this case the measurement is performed in the next available PTW.
Note 6: The evaluation shall not be performed across PTW's. In this case the evaluation is performed in the next available PTW.
Note 7: K3 = 6 is the measurement relaxation factor applicable for UE fulfilling the stationaryMobilityEvaluation [2] criterion.

16.1.1.0.4 Minimum conformance requirements for inter-frequency cell re-selection for RedCap UE configured with stationary relaxed measurement criterion

This clause contains the requirements for measurements on inter-frequency NR cells when Srxlev ≤ $S_{IntraSearchP}$ or Squal ≤ $S_{IntraSearchQ}$ and when the UE is configured any of the following relaxed measurement criteria:

- Relaxed measurement criterion for a stationary UE defined in clause 5.2.4.9.3 in 38.304 [30],
- Relaxed measurement criterion for a stationary UE not at cell edge defined in clause 5.2.4.9.4 in 38.304 [30],
- Both low mobility criterion and stationary criterion as defined in clause 5.2.4.9.1 and 5.2.4.9.3 or 5.2.4.9.4 in 38.304 [30] respectively.

The 1 Rx RedCap UE for the evaluation of one or more relaxed measurement criteria defined in clause 5.2.4.9 38.304 [30] applies:

- *s-SearchDeltaP-r16* as the signalled value of *s-SearchDeltaP-r16* [2] - 1 dB.
- *s-SearchDeltaP-Stationary-r17* as the signalled value of *s-SearchDeltaP-Stationary-r17* [2] - 1 dB.
- *s-SearchThresholdP-r16* as the signalled value of *s-SearchThresholdP-r16* [2] + 1 dB.
- *s-SearchThresholdQ-r16* as the signalled value of *s-SearchThresholdQ-r16* [2] + 1 dB.
- *s-SearchThresholdP2-r17* as the signalled value of *s-SearchThresholdP2-r17* [2] + 1 dB.
- *s-SearchThresholdQ2-r17* as the signalled value of *s-SearchThresholdQ2-r17* [2] + 1 dB.

This clause contains requirements for measurements on inter-frequency NR cells provided that:

- UE is configured with *stationaryMobilityEvaluation* [2] criterion and UE has fulfilled that criterion, or

- UE is configured with both *stationaryMobilityEvaluation* [2] criterion and *cellEdgeEvaluationWhileStationary* [2] criterion and *combineRelaxedMeasCondition2* [2] not configured, and UE has fulfilled only the *stationaryMobilityEvaluation* [2] criterion, and

The requirements defined in TS 38.133 [6] in clause 4.2B.2.4 apply for this clause except that:

- $T_{detect,NR_Inter_RedCap_Relax}$ as specified in Table 4.2B.2.10.2-1 and Table 4.2B.2.10.2-2 for 1 Rx RedCap and 2 Rx RedCap respectively.

- $T_{measure,NR_Inter_RedCap_Relax}$ as specified in Table 4.2B.2.10.2-1 and Table 4.2B.2.10.2-2 for 1 Rx RedCap and 2 Rx RedCap respectively.

- $T_{evaluate,NR_Inter_RedCap_Relax}$ as specified in Table 4.2B.2.10.2-1 and Table 4.2B.2.10.2-2 for 1 Rx RedCap and 2 Rx RedCap respectively.

- When Srxlev > $S_{nonIntraSearchP}$ and Squal > $S_{nonIntraSearchQ}$ then the UE shall search for inter-frequency layers of higher priority at least every K2*$T_{higher_priority_search}$ where $T_{higher_priority_search}$ is described in clause 4.2.2.7 and, K2 = 240.

If the UE is configured with eDRX_IDLE cycle then the requirements in Table 4.2B.2.10.2-3 and Table 4.2B.2.10.2-4 are applicable for eDRX cycle up to 10.24 s in FR1 and FR2 respectively.

If the UE is configured with eDRX_IDLE cycle greater than 10.24 s in FR1 and FR2, then the requirements in Table 4.2B.2.10.2-5 and Table 4.2B.2.10.2-6 respectively apply provided that eDRX cycle is ≤ [163.84] sec and evaluation/measurement time with relaxation on one carrier is not greater than single PTW window length.

Table 4.2B.2.10.2-1: $T_{detect,NR_Inter_RedCap_Relax}$, $T_{measure,NR_Inter_RedCap_Relax}$ and $T_{evaluate,NR_Inter_RedCap_Relax}$ for 1 Rx RedCap UE

DRX cycle length [s]	$T_{detect,NR_Inter_RedCap_Relax}$ [s] (number of DRX cycles)	$T_{measure,NR_Inter_RedCap_Relax}$ [s] (number of DRX cycles)	$T_{evaluate,NR_Inter_RedCap_Relax}$ [s] (number of DRX cycles)
0.32	11.52 x 1.5 x K4(36 x 1.5 x K4)	1.28 x 1.5 x K4 (4 x 1.5 x K4)	5.12 x 1.5 x K4 (16 x 1.5 x K4)
0.64	17.92 x K4 (28 x K4)	1.28x K4 (2 x K4)	5.12 x K4 (8 x K4)
1.28	32 x K4 (25 x K4)	1.28x K4 (1 x K4)	6.4 x K4 (5 x K4)
2.56	58.88 x K4 (23 x K4)	2.56 x K4 (1 x K4)	7.68 x K4 (3 x K4)
Note 1: K4 = 6 is the measurement relaxation factor applicable for UE fulfilling the *stationaryMobilityEvaluation* [2] criterion.			

Table 4.2B.2.10.2-2: $T_{detect,NR_Inter_RedCap_Relax}$, $T_{measure,NR_Inter_RedCap_Relax}$ and $T_{evaluate,NR_Inter_RedCap_Relax}$ for 2 Rx RedCap UE

DRX cycle length [s]	Scaling Factor (N1)		$T_{detect,NR_Inter_Relax}$ [s] (number of DRX cycles)	$T_{measure,NR_Inter_Relax}$ [s] (number of DRX cycles)	$T_{evaluate,NR_Inter_Relax}$ [s] (number of DRX cycles)
	FR1	FR2[Note1]			
0.32	1	8	11.52 x N1 x 1.5 x K4 (36 x N1 x 1.5 x K4)	1.28 x N1 x 1.5 x K4 (4 x N1 x 1.5 x K4)	5.12 x N1 x 1.5 x K4 (16 x N1 x 1.5 x K4)
0.64		5	17.92x N1 x K4 (28 x N1 x K4)	1.28 x N1 x K4 (2 x N1 x K4)	5.12 x N1 x K4 (8 x N1 x K4)
1.28		4	32 x N1 x K4 (25 x N1 x K4)	1.28 x N1 x K4 (1 x N1 x K4)	6.4 x N1 x K4 (5 x N1 x K4)
2.56		3	58.88 x N1 x K4 (23 x N1 x K4)	2.56 x N1 x K4 (1 x N1 x K4)	7.68 x N1 x K4 (3 x N1 x K4)
Note 1: Applies for RedCap UE of all supporting power class. Note 2: K4 = 6 is the measurement relaxation factor applicable for UE fulfilling the *stationaryMobilityEvaluation* [2] criterion.					

Table 4.2B.2.10.2-3: $T_{detect,E-UTRAN_RedCap_Relax}$, $T_{measure,NR_,E-UTRAN_RedCap_Relax}$ and $T_{evaluate,NR_,E-UTRAN_RedCap_Relax}$ for UE configured with eDRX_IDLE cycle

eDRX_IDLE cycle length [s]	$T_{detect,NR_E-UTRAN_RedCap_Relax}$ [s] (number of DRX cycles)	$T_{measure,NR_E-UTRAN_RedCap_Relax}$ [s] (number of DRX cycles)	$T_{evaluate,NR_E-UTRAN_RedCap_Relax}$ [s] (number of DRX cycles)
2.56	58.88 x K3 (23 x K3)	2.56 x K3 (1 x K3)	5.12 x K3 (2 x K3)
5.12	117.76 x K3 (23 x K3)	5.12 x K3 (1 x K3)	10.24 x K3 (2 x K3)

Note 1: M2 = 1.5 if SMTC periodicity of measured intra-frequency cell > 20 ms; otherwise M2=1. If different SMTC periodicities are configured for different cells, the SMTC periodicity in this note is the one used by the cell being identified. During PSS/SSS detection, the periodicity of the SMTC configured for the intra-frequency carrier is assumed, and if the actual SSB transmission periodicity is greater than the SMTC configured for the intra-frequency carrier, longer T_{detect, NR_intra} is expected.

Note 2: K3 = 6 is the measurement relaxation factor applicable for UE fulfilling the *stationaryMobilityEvaluation* [2] criterion.

Table 4.2B.2.10.2-4: $T_{detect,NR_Inter_RedCap_Relax}$, $T_{measure,NR_Inter_RedCap_Relax}$ and $T_{evaluate,NR_Inter_RedCap_Relax}$ for UE configured with eDRX_IDLE cycle (Frequency range FR2) for eDRX_IDLE cycle up to 10.24 s

eDRX_IDLE cycle length [s]	$T_{detect,NR_Inter_RedCap_Relax}$ [s] (number of DRX cycles)	$T_{measure,NR_Inter_RedCap_Relax}$ [s] (number of DRX cycles)	$T_{evaluate,NR_Inter_RedCap_Relax}$ [s] (number of DRX cycles)
2.56	58.88 x N1 x K3 (23 x N1 x K3)	2.56 x N1 x K3 (1 x K3)	7.68 x N1 x K3 (3 x N1 x K3)
5.12	117.76 x N1 x K3 (23 x N1 x K3)	5.12 x N1 x K3 (1 x N1 x K3)	10.24 x N1 x K3 (2 x N1 x K3)
10.24	235.52 x N1 x K3 (23 x N1 x K3)	10.24 x N1 x K3 (1 x N1 x K3)	20.48 x N1 x K3 (2 x N1 x K3)

Note 1: K3 = 6 is the measurement relaxation factor applicable for UE fulfilling the *stationaryMobilityEvaluation* [2] criterion.

able 4.2B.2.10.2-5: $T_{detect,NR_Inter_RedCap_Relax}$, $T_{measure,NR_Inter_RedCap_Relax}$ and $T_{evaluate,NR_Inter_RedCap_Relax}$ for UE configured with eDRX_IDLE cycle (Frequency range FR1) for eDRX_IDLE cycle larger than 10.24 s

eDRX_IDLE cycle length [s]	DRX cycle length [s]	PTW length [s] (number of 1.28s periods)	$T_{detect,NR_Inter_RedCap_Relax}$ [s] (number of DRX cycles or eDRX cycles Note 3)	$T_{measure,NR_Inter_RedCap_Relax}$ [s] (number of DRX cycles or eDRX cycles Note 3)	$T_{evaluate,NR_Inter_RedCap_Relax}$ [s] (number of DRX cycles or eDRX cycles Note 3)
20.48 ≤ eDRX_IDLE cycle length ≤[163.84]	0.32	≥[6.4] ([5])	$eDRX_cycle_length \times \left\lceil \frac{23}{PTW/DRX_cycle_length} \right\rceil$ x K3 (23 x K3)	0.32 x M2 x K3 (1 x M2 x K3)	0.64 x M2 x K3 (2 x M2 x K3)
	0.64	≥[12.8] ([10])		0.64 x K3 (1 x K3)	1.28 x K3 (2 x K3)
	1.28	≥[15.36] ([12])		1.28 x K3 (1 x K3)	2.56 x K3 (2 x K3)
	2.56	≥[30.72] ([4])		2.56 x K3 (1 x K3)	5.12 x K3 (2 x K3)

Note 1: The number of DRX cycles in this table is given for the DRX cycles within PTWs.

Note 2: The eDRX_IDLE cycle lengths are as specified in Section 10.5.5.32 of TS 24.008 [34].

Note 3: The lower bound of PTW length is derived based on $\left\lceil \frac{Tevaluate,NR_Inter_RedCap * DRX_cycle}{1.28} \right\rceil * 1.28$.

Note 4: K4 = 6 is the measurement relaxation factor applicable for UE fulfilling the stationaryMobilityEvaluation [2] criterion.

Table 4.2B.2.10.2-6: $T_{detect,NR_Inter_RedCap_Relax}$, $T_{measure,NR_Inter_RedCap_Relax}$ and $T_{evaluate,NR_Inter_RedCap_Relax}$ for UE configured with eDRX_IDLE cycle (Frequency range FR2) for eDRX_IDLE cycle larger than 10.24 s

eDRX_IDLE cycle length [s]	DRX cycle length [s]	PTW length [s] (number of 1.28s periods)	Scaling Factor (N1) Note1	$T_{detect,NR_Inter_RedCap_Relax}$ [s] (number of DRX cycles or eDRX cycles Note 3)	$T_{measure,NR_Inter_RedCap_Relax}$ [s] (number of DRX cycles or eDRX cycles Note 3)	$T_{evaluate,NR_Inter_RedCap_Relax}$ [s] (number of DRX cycles or eDRX cycles Note 3)
20.48 ≤ eDRX_IDLE cycle length ≤[163.84]	0.32	≥30.72 (24)	8	K3 x $eDRX_cycle_length \times \left\lceil \frac{23 \times N1}{PTW/DRX_cycle_length} \right\rceil$ (23 x N1 x K3)	0.32 x N1 x K3 (1 x N1 x K3)	0.64 x N1 x K3 (2 x N1 x K3)
	0.64	≥38.4 (30)	5		0.64 x N1 x K3 (1 x N1 x K3)	1.28 x N1 x K3 (2 x N1 x K3)
	1.28	≥61.44 (48)	4		1.28 x N1 x K3 (1 x N1 x K3)	2.56 x N1 x K3 (2 x N1 x K3)
	2.56	≥92.16 (72)	3		2.56 x N1 x K3 (1 x N1 x K3)	5.12 x N1 x K3 (2 x N1 x K3)

Note 1: Applies for RedCap UE of all supporting FR2 power classes.
Note 2: The number of DRX cycles in this table is given for the DRX cycles within PTWs.
Note 3: The eDRX_IDLE cycle lengths are as specified in Section 10.5.5.32 of TS 24.008 [34].
Note 4: The lower bound of PTW length is derived based on $\left\lceil \frac{Tevaluate,NR_Inter_RedCap * DRX_cycle}{1.28} \right\rceil * 1.28$.
Note 5: K4 = 6 is the measurement relaxation factor applicable for UE fulfilling the stationaryMobilityEvaluation [2] criterion.

16.1.1.1 NR SA FR1 Cell reselection for 1 Rx UE

Editor's Note: This test case is incomplete in following aspects:

- TT analysis is missing.

16.1.1.1.1 Test purpose

The purpose of this test is to verify the requirement for the intra frequency NR cell reselection for 1Rx RedCap UEs. The requirements are specified in TS 38.133 [6] in clause 4.2B.2.3.

16.1.1.1.2 Test applicability

This test applies to all types of NR RedCap UE with 1Rx from release 17 and forward.

16.1.1.1.3 Minimum conformance requirements

The minimum conformance requirements are defined in clause 16.1.1.0.1.

The normative reference for this requirement is TS 38.133 [6] clause A.16.1.1.1.

16.1.1.1.4 Test description

16.1.1.1.4.1 Initial conditions

This test shall be tested using any of the test configurations in Table 16.1.1.1.4.1-1.

Table 16.1.1.1.4.1-1: Supported test configurations for NR SA FR1 Cell reselection to FR1 intra-frequency NR case for 1 Rx UE

Configuration	Description
16.1.1.1.1-1	15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode
16.1.1.1.1-2	15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode
16.1.1.1.1-3	30 kHz SSB SCS, 20 MHz bandwidth, TDD duplex mode
16.1.1.1.1-4	15 kHz SSB SCS, 10 MHz bandwidth, HD-FDD duplex mode

Note:	The UE is only required to be tested in one of the supported test configurations.

Configure the test equipment and the DUT according to the parameters in Table 16.1.1.1.4.1-2.

Table 16.1.1.1.4.1-2: Initial conditions for NR SA FR1 Cell reselection to FR1 intra-frequency NR case for 1 Rx UE

Parameter	Value		Comment
Test environment	NC		As specified in TS 38.508-1 [14] clause 4.1.
Test frequencies	As specified in Annex E, table E.14-1 and TS 38.508-1 [14] clause 4.3.1.		
Channel bandwidth	As specified by the test configuration selected from Table 6.1.1.2.4.1-1.		
Propagation conditions	AWGN		As specified in Annex C.2.2.
Connection Diagram	TE Part	A.3.1.8.1	As specified in TS 38.508-1 [14] Annex A.
	DUT Part	A.3.2.2.1	
Exceptions to connection diagram	Without faders. Without LTE link.		

1. The general test parameter settings are set up according to Table 16.1.1.1.4.1-3.
2. Message contents are defined in clause 16.1.1.1.4.3.
3. There is 1 NR carrier, and 2 cells specified in the test. Only cell 1 is already identified by the UE prior to the start of the test. Cell 1 and cell 2 belong to different tracking areas. Furthermore, UE has not registered with network for the tracking area containing cell 2.

Table 16.1.1.1.4.1-3: General test parameters for intra frequency NR cell re-selection test case for 1 Rx UE

Parameter		Unit	Test configuration	Value	Comment
Initial condition	Active cell		1, 2, 3, 4	Cell1	
T2 end condition	Active cell		1, 2, 3, 4	Cell2	
	Neighbour cells		1, 2, 3, 4	Cell1	
Final condition	Active cell		1, 2, 3, 4	Cell1	
	Neighbour cells		1, 2, 3, 4	Cell2	
RF Channel Number			1, 2, 3, 4	1	
Time offset between cells			1, 4	3 ms	Asynchronous cells
			2	3 μs	Synchronous cells
			3	3 μs	Synchronous cells
Access Barring Information		-	1, 2, 3, 4	Not Sent	No additional delays in random access procedure.
SSB configuration			1, 4	SSB.1 FR1	
			2	SSB.1 FR1	
			3	SSB.1 RedCap FR1	
SMTC configuration			1, 4	SMTC.2	Configured in SIB2 of Cell 1
				SMTC.6	Configured in SIB2 of Cell 2
			2	SMTC.1	
			3	SMTC.1	
DRX cycle length		s	1, 2, 3, 4	1.28	The value shall be used for all cells in the test.
PRACH configuration index			1, 2, 3, 4	102	The detailed configuration is specified in TS 38.211 clause 6.3.3.2
rangeToBestCell			1, 2, 3, 4	Not configured	

T1	s	1, 2, 3, 4	>7	During T1, Cell 2 shall be powered off, and during the off time the physical cell identity shall be changed, The intention is to ensure that Cell 2 has not been detected by the UE prior to the start of period T2
T2	s	1, 2, 3, 4	[40]	T2 needs to be defined so that cell re-selection reaction time is taken into account.
T3	s	1, 2, 3, 4	15	T3 needs to be defined so that cell re-selection reaction time is taken into account.

16.1.1.1.4.2 Test procedure

Two cells are deployed in the test, which are one FR1 NR PCell (Cell 1) and an NR neighbour cell (Cell 2) on the same frequency. The test consists of 3 successive time periods, with time duration of T1, T2, and T3 respectively.

In the following test procedure "UE responds" means "UE starts transmitting preamble on PRACH for sending the *RRCSetupRequest* message to perform a registration procedure for mobility.

1. Ensure the UE is in state RRC_IDLE with generic procedure parameters connectivity *NR* with Test Mode *On* according to TS 38.508-1 [14] clause 4.5 on Cell 1. Set Cell 2 physical cell identity = initial cell 2 physical cell identity.

2. Set the parameters according to T1 in Table 16.1.1.1.5-1. T1 starts.

3. Set Cell 2 physical cell identity = ((current Cell 2 physical cell identity + 1) mod 14 + 2) for one iteration of the test procedure loop.

4. When T1 expires, the SS shall switch the power setting from T1 to T2 as specified in Table 16.1.1.1.5-1. T2 starts.

5. The SS waits for random access requests information from the UE to perform cell re-selection to a newly detectable cell, Cell 2.

6. If the UE responds on the newly detectable cell, Cell 2 during time duration T2 within 34 seconds from the beginning of time period T2, then count a success for the event “Re-select newly detected Cell 2”. Otherwise count a fail for the event “Re-select newly detected Cell 2”.

7. If the UE has re-selected Cell 2 within T2, after the re-selection or when T2 expires, continue with step 7a. Otherwise, if T2 expires and the UE has not yet re-selected Cell 2, the TE shall switch off and on the UE and skip to step 12.

7a The SS shall send an *RRCRelease* message to ensure that the UE is in state RRC_IDLE on Cell 2.

8. The SS shall switch the power setting from T2 to T3 as specified in Table 6.1.1.1.5-1. T3 starts.

9. The SS waits for random access requests information from the UE to perform cell re-selection to an already detected cell, Cell 1.

10. If the UE responds on the already detected cell, Cell 1 during time duration T3 within 8 seconds from the beginning of time period T3, then count a success for the event “Re-select already detected Cell 1”. Otherwise count a fail for the event “Re-select already detected Cell 1”.

11. If the UE has re-selected Cell 1 within T3, after the re-selection or when T3 expires, continue with step 11a. Otherwise, if T3 expires and the UE has not yet re-selected Cell 1, the TE shall switch off and on the UE and skip to step 12.

11a. The SS shall send an *RRCRelease* message to ensure that the UE is in state RRC_IDLE on Cell 1.12.
Ensure the UE is in state RRC_IDLE with generic procedure parameters connectivity *NR* according to TS 38.508-1 [14] clause 4.5 in Cell 1.

13. Repeat step 2-12 until a test verdict has been achieved.
Each of the events “Re-select newly detected Cell 2” and “Re-select already detected Cell 1” is evaluated

independently for the statistic, resulting in an event verdict: pass or fail. Each event is evaluated only until the confidence level according to Table G.2.3-1 in Annex G clause G.2 is achieved. Different events may require different times for a verdict.
If both events pass, the test passes. If one event fails, the test fails.

16.1.1.1.4.3 Message contents

Message contents are according to TS 38.508-1 [14] clause 7.3 with the following exceptions:

Table 16.1.1.1.4.3-1: Common Exception messages

Default Message Contents	
Common contents of system information blocks exceptions	Table H.2.1-2
Default RRC messages and information elements contents exceptions	

z

Table 16.1.1.1.4.3-2: SIB1 (Cell 1 and Cell 2)

Derivation Path: Table H.2.1-3			
Information Element	**Value/remark**	**Comment**	**Condition**
SIB1 ::= SEQUENCE {			
cellSelectionInfo SEQUENCE {			
q-RxLevMin	-65	-130 is actual value in dBm (-65 * 2 dBm)	16.1.1.1-1, 16.1.1.1-2
	-64	-128 is actual value in dBm (-64 * 2dBm)	16.1.1.1-3
}			
}			

Table 16.1.1.1.4.3-3: SIB2 (Cell 1 and Cell 2)

Derivation Path: Table H.2.1-1			
Information Element	**Value/remark**	**Comment**	**Condition**
SIB2 ::= SEQUENCE {			
intraFreqCellReselectionInfo SEQUENCE {			
q-RxLevMin	-65	Actual value is -65*2 = -130dBm	16.1.1.1-1, 6.1.1.1-2
	-64	Actual value is -64*2 = -128dBm	16.1.1.1-3
smtc	SSB-MTC specified in TS 38.508-1 [14] Table 7.3.1-3 with condition SMTC.2		16.1.1.1-1 AND Cell 1
	SSB-MTC specified in TS 38.508-1 [14] Table 7.3.1-3 with condition SMTC.6		16.1.1.1-1 AND Cell 2
	SSB-MTC specified in TS 38.508-1 [14] Table 7.3.1-3 with condition SMTC.2		16.1.1.1-2, 6.1.1.1-3
deriveSSB-IndexFromCell	false		16.1.1.1-1
	true		16.1.1.1-2, 6.1.1.1-3
}			

}			

16.1.1.1.5 Test requirement

Table 16.1.1.1.5-1 defines the primary level settings including test tolerances for intra frequency NR cell re-selection test case in AWGN for 1 Rx UE.

Table 16.1.1.1.5-1: NR cell specific test parameters for intra frequency NR cell re-selection test case in AWGN for 1 Rx UE

Parameter	Unit	Test configuration	Cell 1			Cell 2		
			T1	T2	T3	T1	T2	T3
TDD configuration		1, 4	N/A			N/A		
		2	TDDConf.1.1			TDDConf.1.1		
		3	TDDConf.2.1			TDDConf.2.1		
PDSCH RMC configuration		1, 4	SR.1.1 FDD			SR.1.1 FDD		
		2	SR.1.1 TDD			SR.1.1 TDD		
		3	SR.2.1 TDD			SR.2.1 TDD		
RMSI CORESET RMC configuration		1, 4	CR.1.1 FDD			CR.1.1 FDD		
		2	CR.1.1 TDD			CR.1.1 TDD		
		3	CR.2.1 TDD			CR.2.1 TDD		
Dedicated CORESET RMC configuration		1, 4	CCR.1.1 FDD			CCR.1.1 FDD		
		2	CCR.1.1 TDD			CCR.1.1 TDD		
		3	CCR.2.1 TDD			CCR.2.1 TDD		
OCNG Pattern		1, 2, 3, 4	OP.1 defined in A.2.1-1			OP.1 defined in A.2.1-1		
Initial DL BWP configuration		1, 2, 3, 4	DLBWP.0.1			DLBWP.0.1		
Initial UL BWP configuration		1, 2, 3, 4	ULBWP.0.1			ULBWP.0.1		
RLM-RS		1, 2, 3, 4	SSB			SSB		
Qrxlevmin	dBm/SCS	1, 2, 4	-130			-130		
		3	-127			-127		
Pcompensation	dB	1, 2, 3, 4	0			0		
$Qhyst_s$	dB	1, 2, 3, 4	0			0		
$Qoffset_{s,n}$	dB	1, 2, 3, 4	0			0		
Cell_selection_and_reselection_quality_measurement		1, 2, 3, 4	SS-RSRP			SS-RSRP		
$\hat{E}_s / I_{ot}$	dB	1, , 4	16+TT	-3.11+TT	2.79+TT	-infinity	2.79+TT	-3.11+TT
		2						
		3						
N_{oc} Note2	dBm/SCS	1, 4	-98+TT					
		2	-98+TT					
		3	-95+TT					
N_{oc} Note2	dBm/15 kHz	1, 4	-98+TT					
		2						
		3						
$\hat{E}_s / N_{oc}$	dB	1, 4	16+TT	13+TT	16+TT	-infinity	16+TT	13+TT
		2						
		3						
SS-RSRP Note3	dBm/SCS	1, 4	-82	-85	-82	-infinity	-82	-85+TT
		2	-82	-85	-82	-infinity	-82	-85+TT
		3	-79	-82	-79	-infinity	-79	-82+TT
Io	dBm/9.36 MHz	1, 4	-53.94	-52.21	-52.21	Same as parameters specified in Cell 1 columns-		

	dBm/9.36 MHz	2	-53.94	-52.21	-52.21			
	dBm/18.36 MHz	3	-51.02	-49.30	-49.30			
Treselection	s	1, 2, 3, 4	0	0	0	0	0	0
SintrasearchP	dB	1, 2, 3, 4	60			60		
Propagation Condition		1, 2, 3, 4	AWGN					
Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols. Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for N_{oc} to be fulfilled. Note 3: SS-RSRP levels have been derived from other parameters for information purposes. They are not settable parameters themselves.								

During T2 the cell re-selection delay to a newly detectable cell shall be less than 34 s.

The cell reselection delay to a newly detectable cell is defined as the time from the beginning of time period T2, to the moment when the UE camps on Cell 2 and starts to send preambles on the PRACH for sending the *RRCSetupRequest* message to perform a registration procedure for mobility and periodic registration update on Cell 2.

During T3 the cell re-selection delay to an already detected cell shall be less than 8 s.

The cell reselection delay to an already detected cell is defined as the time from the beginning of time period T3, to the moment when the UE camps on cell 1 and starts to send preambles on the PRACH for sending the *RRCSetupRequest* message to perform a registration procedure for mobility and periodic registration update on cell 1.

The rate of correct events observed during repeated tests shall be at least 90% with the confidence level of 95%.

16.1.1.2 NR SA FR1 Cell reselection for 2 Rx UE

16.1.1.2.1 Test purpose

The purpose of this test is to verify the requirement for the intra frequency NR cell reselection for 2Rx RedCap UEs. The requirements are specified in TS 38.133 [6] in clause 4.2B.2.3.

16.1.1.2.2 Test applicability

This test applies to all types of NR RedCap UE with 2Rx from release 17 and forward.

16.1.1.2.3 Minimum conformance requirements

The minimum conformance requirements are defined in clause 16.1.1.0.1.

The normative reference for this requirement is TS 38.133 [6] clause A.16.1.1.2.

16.1.1.2.4 Test description

16.1.1.2.4.1 Initial conditions

This test shall be tested using any of the test configurations in Table 16.1.1.2.4.1-1.

Table 16.1.1.2.4.1-1: Supported test configurations for NR SA FR1 Cell reselection to FR1 intra-frequency NR case for 2 Rx UE

Configuration	Description
16.1.1.2.1-1	15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode
16.1.1.2.1-2	15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode
16.1.1.2.1-3	30 kHz SSB SCS, 20 MHz bandwidth, TDD duplex mode
16.1.1.2.1-4	15 kHz SSB SCS, 10 MHz bandwidth, HD-FDD duplex mode
Note: The UE is only required to be tested in one of the supported test configurations.	

Configure the test equipment and the DUT according to the parameters in Table 16.1.1.2.4.1-2.

Table 16.1.1.2.4.1-2: Initial conditions for NR SA FR1 Cell reselection to FR1 intra-frequency NR case for 2 Rx UE

Parameter	Value		Comment
Test environment	NC		As specified in TS 38.508-1 [14] clause 4.1.
Test frequencies	As specified in Annex E, table E.14-1 and TS 38.508-1 [14] clause 4.3.1.		
Channel bandwidth	As specified by the test configuration selected from Table 16.1.1.2.4.1-1.		
Propagation conditions	AWGN		As specified in Annex C.2.2.
Connection Diagram	TE Part	A.3.1.8.2	As specified in TS 38.508-1 [14] Annex A.
	DUT Part	A.3.2.3.4	
Exceptions to connection diagram	Without faders. Without LTE link.		

1. The general test parameter settings are set up according to Table 16.1.1.2.4.1-3.
2. Message contents are defined in clause 16.1.1.2.4.3.
3. There is 1 NR carrier, and 2 cells specified in the test. Only cell 1 is already identified by the UE prior to the start of the test. Cell 1 and cell 2 belong to different tracking areas. Furthermore, UE has not registered with network for the tracking area containing cell 2.

Table 16.1.1.2.4.1-3: General test parameters for intra frequency NR cell re-selection test case for 2 Rx UE

Parameter		Unit	Test configuration	Value	Comment
Initial condition	Active cell		1, 2, 3, 4	Cell1	
T2 end condition	Active cell		1, 2, 3, 4	Cell2	
	Neighbour cells		1, 2, 3, 4	Cell1	
Final condition	Active cell		1, 2, 3, 4	Cell1	
	Neighbour cells		1, 2, 3, 4	Cell2	
RF Channel Number			1, 2, 3, 4	1	
Time offset between cells			1, , 4	3 ms	Asynchronous cells
			2	3 μs	Synchronous cells
			3	3 μs	Synchronous cells
Access Barring Information		-	1, 2, 3, 4	Not Sent	No additional delays in random access procedure.
SSB configuration			1, 4	SSB.1 FR1	
			2	SSB.1 FR1	
			3	SSB.1 RedCap FR1	
SMTC configuration			1, 4	SMTC.2	Configured in SIB2 of Cell 1
				SMTC.6	Configured in SIB2 of Cell 2
			2	SMTC.1	
			3	SMTC.1	
DRX cycle length		s	1, 2, 3, 4	1.28	The value shall be used for all cells in the test.
PRACH configuration index			1, 2, 3, 4	102	The detailed configuration is specified in TS 38.211 clause 6.3.3.2
rangeToBestCell			1, 2, 3, 4	Not configured	
T1		s	1, 2, 3, 4	>7	During T1, Cell 2 shall be powered off, and during the off time the physical cell identity shall be changed, The intention is to ensure that Cell 2 has not been detected by the UE prior to the start of period T2

T2	s	1, 2, 3, 4	[40]	T2 needs to be defined so that cell re-selection reaction time is taken into account.
T3	s	1, 2, 3, 4	15	T3 needs to be defined so that cell re-selection reaction time is taken into account.

16.1.1.2.4.2 Test procedure

Same test procedure as in 16.1.1.1.4.2.

16.1.1.2.4.3 Message contents

Same message contents as in 16.1.1.1.4.3.

16.1.1.2.5 Test requirement

Table 16.1.1.2.5-1 defines the primary level settings including test tolerances for intra frequency NR cell re-selection test case in AWGN for 1 Rx UE.

Table 16.1.1.2.5-1: NR cell specific test parameters for intra frequency NR cell re-selection test case in AWGN for 2 Rx UE

Parameter	Unit	Test configuration	Cell 1			Cell 2		
			T1	T2	T3	T1	T2	T3
TDD configuration		1, 4	N/A			N/A		
		2	TDDConf.1.1			TDDConf.1.1		
		3	TDDConf.2.1			TDDConf.2.1		
PDSCH RMC configuration		1, 4	SR.1.1 FDD			SR.1.1 FDD		
		2	SR.1.1 TDD			SR.1.1 TDD		
		3	SR.2.1 TDD			SR.2.1 TDD		
RMSI CORESET RMC configuration		1, 4	CR.1.1 FDD			CR.1.1 FDD		
		2	CR.1.1 TDD			CR.1.1 TDD		
		3	CR.2.1 TDD			CR.2.1 TDD		
Dedicated CORESET RMC configuration		1, 4	CCR.1.1 FDD			CCR.1.1 FDD		
		2	CCR.1.1 TDD			CCR.1.1 TDD		
		3	CCR.2.1 TDD			CCR.2.1 TDD		
OCNG Pattern		1, 2, 3, 4	OP.1 defined in A.2.1-1			OP.1 defined in A.2.1-1		
Initial DL BWP configuration		1, 2, 3, 4	DLBWP.0.1			DLBWP.0.1		
Initial UL BWP configuration		1, 2, 3, 4	ULBWP.0.1			ULBWP.0.1		
RLM-RS		1, 2, 3, 4	SSB			SSB		
Qrxlevmin	dBm/SCS	1, 2, 4	-130			-130		
		3	-127			-127		
Pcompensation	dB	1, 2, 3, 4	0			0		
$Qhyst_s$	dB	1, 2, 3	0			0		
$Qoffset_{s,n}$	dB	1, 2, 3, 4	0			0		
Cell_selection_and_reselection_quality_measurement		1, 2, 3, 4	SS-RSRP			SS-RSRP		
$\hat{E}_s / I_{ot}$	dB	1, 4	16	-3.55	3.24	-infinity	3.24	-3.55
		2						
		3						
N_{oc} Note2	dBm/SCS	1, 4	-98					
		2	-98					
		3	-95					
N_{oc} Note2	dBm/15 kHz	1, 4	-98					
		2						
		3						

$\hat{E}_s/N_{oc}$	dB	1, 4	16	13	16.45	-infinity	16.45	13
		2						
		3						
SS-RSRP Note3	dBm/SCS	1, 4	-82	-85	-81.55	-infinity	-81.55	-85
		2	-82	-85	-81.55	-infinity	-81.55	-85
		3	-79	-82	-78.54	-infinity	-78.54	-82
Io	dBm/9.36 MHz	1, 4	-53.94	-51.91	-51.91	Same as parameters specified in Cell 1 columns-		
	dBm/9.36 MHz	2	-53.94	-51.91	-51.91			
	dBm/18.36 MHz	3	-51.01	-48.99	-48.99			
Treselection	s	1, 2, 3, 4	0	0	0	0	0	0
SintrasearchP	dB	1, 2, 3, 4	60			60		
Propagation Condition		1, 2, 3, 4	AWGN					

Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.
Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for N_{oc} to be fulfilled.
Note 3: SS-RSRP levels have been derived from other parameters for information purposes. They are not settable parameters themselves.

During T2 the cell re-selection delay to a newly detectable cell shall be less than 34 s.

The cell reselection delay to a newly detectable cell is defined as the time from the beginning of time period T2, to the moment when the UE camps on Cell 2 and starts to send preambles on the PRACH for sending the *RRCSetupRequest* message to perform a registration procedure for mobility and periodic registration update on Cell 2.

During T3 the cell re-selection delay to an already detected cell shall be less than 8 s.

The cell reselection delay to an already detected cell is defined as the time from the beginning of time period T3, to the moment when the UE camps on cell 1 and starts to send preambles on the PRACH for sending the *RRCSetupRequest* message to perform a registration procedure for mobility and periodic registration update on cell 1.

The rate of correct events observed during repeated tests shall be at least 90% with the confidence level of 95%.

16.1.1.3 NR SA FR1-FR1 Cell reselection for 1 Rx UE

Editor's Note: This test case is incomplete in following aspects:

- Minimum conformance requirements contain square brackets
- TT analysis is missing.

16.1.1.3.1 Test purpose

The purpose of this test is to verify the requirement for the inter frequency NR cell reselection for 1 Rx RedCap UEs. The requirements are specified in TS 38.133 [6] in clause 4.2B.2.4.

16.1.1.3.2 Test applicability

This test applies to all types of NR RedCap UE with 1Rx from release 17 and forward.

16.1.1.3.3 Minimum conformance requirements

The minimum conformance requirements are defined in clause 16.1.1.0.2.

The normative reference for this requirement is TS 38.133 [6] clause A.16.1.1.3.

16.1.1.3.4 Test description

16.1.1.3.4.1 Initial conditions

This test shall be tested using any of the test configurations in Table 16.1.1.3.4.1-1.

Table 16.1.1.3.4.1-1: Supported test configurations for FR1-FR1 Cell reselection for 1 Rx UE

Configuration	Description of serving cell	Description of target cell
16.1.1.3.1-1	15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode	15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode
16.1.1.3.1-2	15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode	15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode
16.1.1.3.1-3	30 kHz SSB SCS, 20 MHz bandwidth, TDD duplex mode	30 kHz SSB SCS, 20 MHz bandwidth, TDD duplex mode
16.1.1.3.1-4	15 kHz SSB SCS, 10 MHz bandwidth, HD-FDD duplex mode	15 kHz SSB SCS, 10 MHz bandwidth, HD-FDD duplex mode
Note: The UE is only required to be tested in one of the supported test configurations.		

Configure the test equipment and the DUT according to the parameters in Table 16.1.1.3.4.1-2.

Table 16.1.1.3.4.1-2: Initial conditions for FR1-FR1 Cell reselection for 1 Rx UE

Parameter	Value		Comment
Test environment	NC		As specified in TS 38.508-1 [14] clause 4.1.
Test frequencies	As specified in Annex E, table E.14-1 and TS 38.508-1 [14] clause 4.3.1.		
Channel bandwidth	As specified by the test configuration selected from Table 16.1.1.3.4.1-1.		
Propagation conditions	AWGN		As specified in Annex C.2.2.
Connection Diagram	TE Part	A.3.1.8.1	As specified in TS 38.508-1 [14] Annex A.
	DUT Part	A.3.2.2.1	
Exceptions to connection diagram	Without faders. Without LTE link.		

1. The general test parameter settings are set up according to Table 16.1.1.3.4.1-3.
2. Message contents are defined in clause 16.1.1.3.4.3.
3. There are 2 NR carriers, and 2 cells specified in the test. Both cell 1 and cell 2 are already identified by the UE prior to the start of the test. Cell 1 and cell 2 belong to different tracking areas and cell 2 is of higher priority than cell 1.

Table 16.1.1.3.4.1-3: General test parameters for FR1-FR1 Cell reselection for 1 Rx UE

Parameter		Unit	Test configuration	Value	Comment
Initial condition	Active cell		1, 2, 3, 4	Cell2	The UE camps on cell 2 in the initial phase and during T1 period the UE reselects to cell 1
	Neighbour cell		1, 2, 3, 4	Cell 1	
T1 end condition	Active cell		1, 2, 3, 4	Cell1	The UE shall perform reselection to cell 1 during T1
	Neighbour cells		1, 2, 3, 4	Cell2	
T3 end condition	Active cell		1, 2, 3, 4	Cell2	The UE shall perform reselection to cell 2 with higher priority during T3
	Neighbour cell		1, 2, 3, 4	Cell 1	
RF Channel Number			1, 2, 3, 4	1, 2	
Time offset between cells			1, 4	3 ms	Asynchronous cells
			2	3 μs	Synchronous cells
			3	3 μs	Synchronous cells
Access Barring Information		-	1, 2, 3, 4	Not Sent	No additional delays in random access procedure.
SSB configuration			1, 4	SSB.1 FR1	
			2	SSB.1 FR1	
			3	SSB.1 RedCap FR1	

SMTC configuration		1, 4	SMTC.2	Configured in SIB4 of Cell 1
			SMTC.6	Configured in SIB4 of Cell 2
		2	SMTC.1	
		3	SMTC.1	
DRX cycle length	s	1, 2, 3, 4	1.28	The value shall be used for all cells in the test.
PRACH configuration index		1, 2, 3, 4	102	The detailed configuration is specified in TS 38.211 clause 6.3.3.2
rangeToBestCell		1, 2, 3, 4	Not configured	
T1	s	1, 2, 3, 4	15	T1 needs to be defined so that cell re-selection reaction time is taken into account.
T2	s	1, 2, 3, 4	>7	During T2, cell 2 shall be powered off, and during the off time the physical cell identity shall be changed. The intention is to ensure that cell 2 has not been detected by the UE prior to the start of period T3.
T3	s	1, 2, 3, 4	75	T3 needs to be defined so that cell re-selection reaction time is taken into account.

16.1.1.3.4.2 Test procedure

The test consists of one active cell and one neighbour cell. The UE is requested to monitor the neighbouring cell on one of the NR carriers. The test consists of three successive time periods, with time duration of T1, T2, and T3 respectively.

In the following test procedure “UE responds” means “UE starts transmitting preamble on PRACH for sending the *RRCSetupRequest* message to perform a Registration procedure for mobility.

1. Ensure the UE is in state RRC_IDLE with generic procedure parameters connectivity *NR* with Test Mode *On* according to TS 38.508-1 [14] clause 4.5 on Cell 2.

2. Set the parameters according to T1 in Table 16.1.1.3.5-1. T1 starts.

3. The SS waits for random access requests information from the UE to perform cell re-selection on the lower priority cell, Cell 1.

4. If the UE responds on lower priority cell, Cell 1 during time duration T1 within 8 seconds from the beginning of time period T1, then count a success for the event “Re-select lower priority Cell 1”. Otherwise count a fail for the event “Re-select lower priority Cell 1”.

5. If the UE has re-selected Cell 1 within T1, after the re-selection or when T1 expires, continue with step 5a. Otherwise, if T1 expires and the UE has not yet re-selected Cell 1, the TE shall switch off and on the UE and skip to step 11.

5a. The SS shall send an *RRCRelease* message to ensure that the UE is in state RRC_IDLE on Cell 1.

6. The SS shall switch the power setting from T1 to T2 as specified in Table 16.1.1.3.5-1. T2 starts. During time duration T2, Cell 2 shall be powered OFF and the physical cell identity = ((current Cell 2 physical cell identity + 1) mod 1008) shall be changed to ensure Cell 2 is not detected by the UE.

7. When T2 expires, the SS shall switch the power setting from T2 to T3 as specified in Table 16.1.1.3.5-1. T3 starts.

8. The SS waits for random access requests information from the UE to perform cell re-selection on the higher priority cell, Cell 2.

9. If the UE responds on higher priority cell, Cell 2 during time duration T3 within 68 seconds from the beginning of time period T3, then count a success for the event “Re-select higher priority Cell 2”. Otherwise count a fail for the event “Re-select higher priority Cell 2”.

10. If the UE has re-selected Cell 2 within T3, after the re-selection or when T3 expires, continue with step 10a. Otherwise, if T3 expires and the UE has not yet re-selected Cell 2, the TE shall switch off and on the UE and skip to step 11.

10a. The SS shall send an *RRCRelease* message to ensure that the UE is in state RRC_IDLE on Cell 2.

11. Ensure the UE is in state RRC_IDLE with generic procedure parameters connectivity *NR* according to TS 38.508-1 [14] clause 4.5 on Cell 2.

12. Repeat step 2-11 until a test verdict has been achieved.
Each of the events "Re-select lower priority Cell 1" and "Re-select higher priority Cell 2" is evaluated independently for the statistic, resulting in an event verdict: pass or fail. Each event is evaluated only until the confidence level according to Table G.2.3-1 in Annex G clause G.2 is achieved. Different events may require different times for a verdict.
If both events pass, the test passes. If one event fails, the test fails.

16.1.1.3.4.3 Message contents

Message contents are according to TS 38.508-1 [14] clause 7.3 with the following exceptions:

Table 16.1.1.3.4.3-1: Common Exception messages

Default Message Contents	
Common contents of system information blocks exceptions	Table H.2.2-1 Table H.2.2-2 with Condition SSB.1 FR1, SMTC.2 and Asynchronous cells for configuration 16.1.1.2-1/4 and Cell 1 Table H.2.2-2 with Condition SSB.1 FR1, SMTC.6 and Asynchronous cells for configuration 16.1.1.2-1/4 and Cell 2 Table H.2.2-2 with Condition SSB.1 FR1, SMTC.1 and synchronous cells for configuration 16.1.1.2-2 Table H.2.2-2 with Condition SSB.1 RedCap FR1, SMTC.1 and synchronous cells for configuration 16.1.1.2-3 Table H.2.2-3
Default RRC messages and information elements contents exceptions	

16.1.1.3.5 Test requirement

Table 16.1.1.3.5-1 defines the primary level settings including test tolerances for FR1-FR1 Cell reselection for 1 Rx UE

Table 16.1.1.3.5-1: NR cell specific test parameters for FR1-FR1 Cell reselection for 1 Rx UE

Parameter	Unit	Test configuration	Cell 1			Cell 2		
			T1	T2	T3	T1	T2	T3
TDD configuration		1, 4	N/A			N/A		
		2	TDDConf.1.1			TDDConf.1.1		
		3	TDDConf.2.1			TDDConf.2.1		
PDSCH RMC configuration		1, 4	SR.1.1 FDD			SR.1.1 FDD		
		2	SR.1.1 TDD			SR.1.1 TDD		
		3	SR.2.1 TDD			SR.2.1 TDD		
RMSI CORESET RMC configuration		1, 4	CR.1.1 FDD			CR.1.1 FDD		
		2	CR.1.1 TDD			CR.1.1 TDD		
		3	CR.2.1 TDD			CR.2.1 TDD		
Dedicated CORESET RMC configuration		1, 4	CCR.1.1 FDD			CCR.1.1 FDD		
		2	CCR.1.1 TDD			CCR.1.1 TDD		
		3	CCR.2.1 TDD			CCR.2.1 TDD		
OCNG Pattern		1, 2, 3, 4	OP.1 defined in A.2.1-1			OP.1 defined in A.2.1-1		
Initial DL BWP configuration		1, 2, 3, 4	DLBWP.0.1			DLBWP.0.1		

Initial UL BWP configuration		1, 2, 3, 4	ULBWP.0.1			ULBWP.0.1		
RLM-RS		1, 2, 3, 4	SSB			SSB		
Qrxlevmin	dBm/SCS	1, 2, 4	-140			-140		
		3	-137			-137		
Pcompensation	dB	1, 2, 3, 4	0			0		
Cell_selection_and_reselection_quality_measurement		1, 2, 3, 4	SS-RSRP			SS-RSRP		
$\hat{E}_s / I_{ot}$	dB	1, 4	14	14	14	-4	-infinity	12
		2						
		3						
N_{oc} Note2	dBm/SCS	1, 4	-98+TT					
		2	-98+TT					
		3	-95+TT					
N_{oc} Note2	dBm/15 kHz	1, 4	-98+TT					
		2						
		3						
$\hat{E}_s / N_{oc}$	dB	1, 4	14+TT	14+TT	14+TT	-4+TT	-infinity	12+TT
		2						
		3						
SS-RSRP Note3	dBm/SCS	1, 4	-84+TT	-84+TT	-84+TT	-102+TT	-infinity	-86+TT
		2	-84+TT	-84+TT	-84+TT	-102+TT	-infinity	-86+TT
		3	-81+TT	-81+TT	-81+TT	-99+TT	-infinity	-83+TT
Io	dBm/9.36 MHz	1, 4	-55.88+TT	-55.88+TT	-55.88+TT	-68.60+TT	-70.05+TT	-57.78+TT
	dBm/9.36 MHz	2	-55.88+TT	-55.88+TT	-55.88+TT	-68.60+TT	-70.05+TT	-57.78+TT
	dBm/18.36 MHz	3	-52.95+TT	-52.95+TT	-52.95+TT	-65.67+TT	-67.13+TT	-54.86+TT
Treselection	s	1, 2, 3, 4	0	0	0	0	0	0
SnonintrasearchP	dB	1, 2, 3, 4	50			50		
$Thresh_{x, highP}$	dB	1, 2, 3, 4	48			48		
$Thresh_{serving, lowP}$	dB	1, 2, 3, 4	44			44		
$Thresh_{x, lowP}$	dB	1, 2, 3, 4	50			50		
Propagation Condition		1, 2, 3, 4	AWGN					

Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.

Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for N_{oc} to be fulfilled.

Note 3: SS-RSRP levels have been derived from other parameters for information purposes. They are not settable parameters themselves.

During T1, The cell re-selection delay to a lower priority cell shall be less than 8 s.

The cell reselection delay to a lower priority cell is defined as the time from the beginning of time period T1, to the moment when the UE camps on cell 1, and starts to send preambles on the PRACH for sending the *RRCSetupRequest* message to perform a Registration procedure for mobility and periodic registration update on cell 1.

During T3, the cell re-selection delay to a higher priority cell shall be less than 68 s.

The cell reselection delay to a higher priority cell is defined as the time from the beginning of time period T3, to the moment when the UE camps again on cell 2, and starts to send preambles on the PRACH for sending the *RRCSetupRequest* message to perform a Registration procedure for mobility and periodic registration update on cell 2.

The rate of correct events observed during repeated tests shall be at least 90% with the confidence level of 95%.

16.1.1.4 NR SA FR1-FR1 Cell reselection for 2 Rx UE

16.1.1.4.1 Test purpose

The purpose of this test is to verify the requirement for the inter frequency NR cell reselection for 2 Rx RedCap UEs. The requirements are specified in TS 38.133 [6] in clause 4.2B.2.4.

16.1.1.4.2 Test applicability

This test applies to all types of NR RedCap UE with 2Rx from release 17 and forward.

16.1.1.4.3 Minimum conformance requirements

The minimum conformance requirements are defined in clause 16.1.1.0.2.

The normative reference for this requirement is TS 38.133 [6] clause A.16.1.1.4.

16.1.1.4.4 Test description

16.1.1.4.4.1 Initial conditions

This test shall be tested using any of the test configurations in Table 16.1.1.4.4.1-1.

Table 16.1.1.4.4.1-1: Supported test configurations for NR SA FR1-FR1 Cell reselection for 2 Rx UE

Configuration	Description of serving cell	Description of target cell
16.1.1.4.1-1	15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode	15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode
16.1.1.4.1-2	15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode	15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode
16.1.1.4.1-3	30 kHz SSB SCS, 20 MHz bandwidth, TDD duplex mode	30 kHz SSB SCS, 20 MHz bandwidth, TDD duplex mode
16.1.1.4.1-4	15 kHz SSB SCS, 10 MHz bandwidth, HD-FDD duplex mode	15 kHz SSB SCS, 10 MHz bandwidth, HD-FDD duplex mode
Note: The UE is only required to be tested in one of the supported test configurations.		

Configure the test equipment and the DUT according to the parameters in Table 16.1.1.4.4.1-2.

Table 16.1.1.4.4.1-2: Initial conditions for FR1-FR1 Cell reselection for 2 Rx UE

Parameter	Value		Comment
Test environment	NC		As specified in TS 38.508-1 [14] clause 4.1.
Test frequencies	As specified in Annex E, table E.14-1 and TS 38.508-1 [14] clause 4.3.1.		
Channel bandwidth	As specified by the test configuration selected from Table 16.1.1.4.4.1-1.		
Propagation conditions	AWGN		As specified in Annex C.2.2.
Connection Diagram	TE Part	A.3.1.8.2	As specified in TS 38.508-1 [14] Annex A.
	DUT Part	A.3.2.3.4	
Exceptions to connection diagram	Without faders. Without LTE link.		

1. The general test parameter settings are set up according to Table 16.1.1.4.4.1-3.
2. Message contents are defined in clause 16.1.1.4.4.3.

3. There are 2 NR carriers, and 2 cells specified in the test. Both cell 1 and cell 2 are already identified by the UE prior to the start of the test. Cell 1 and cell 2 belong to different tracking areas and cell 2 is of higher priority than cell 1.

Table 16.1.1.4.4.1-3: General test parameters for FR1-FR1 Cell reselection for 2 Rx UE

Parameter		Unit	Test configuration	Value	Comment
Initial condition	Active cell		1, 2, 3, 4	Cell2	The UE camps on cell 2 in the initial phase and during T1 period the UE reselects to cell 1
	Neighbour cell		1, 2, 3, 4	Cell 1	
T1 end condition	Active cell		1, 2, 3, 4	Cell1	The UE shall perform reselection to cell 1 during T1
	Neighbour cells		1, 2, 3, 4	Cell2	
T3 end condition	Active cell		1, 2, 3, 4	Cell2	The UE shall perform reselection to cell 2 with higher priority during T3
	Neighbour cell		1, 2, 3, 4	Cell 1	
RF Channel Number			1, 2, 3, 4	1, 2	
Time offset between cells			1, 4	3 ms	Asynchronous cells
			2	3 μs	Synchronous cells
			3	3 μs	Synchronous cells
Access Barring Information		-	1, 2, 3, 4	Not Sent	No additional delays in random access procedure.
SSB configuration			1, 4	SSB.1 FR1	
			2	SSB.1 FR1	
			3	SSB.1 RedCap FR1	
SMTC configuration			1, 4	SMTC.2	Configured in SIB4 of Cell 1
				SMTC.6	Configured in SIB4 of Cell 2
			2	SMTC.1	
			3	SMTC.1	
DRX cycle length		s	1, 2, 3, 4	1.28	The value shall be used for all cells in the test.
PRACH configuration index			1, 2, 3, 4	102	The detailed configuration is specified in TS 38.211 clause 6.3.3.2
rangeToBestCell			1, 2, 3, 4	Not configured	
T1		s	1, 2, 3, 4	15	T1 needs to be defined so that cell re-selection reaction time is taken into account.
T2		s	1, 2, 3, 4	>7	During T2, cell 2 shall be powered off, and during the off time the physical cell identity shall be changed. The intention is to ensure that cell 2 has not been detected by the UE prior to the start of period T3.
T3		s	1, 2, 3	75	T3 needs to be defined so that cell re-selection reaction time is taken into account.

16.1.1.4.4.2 Test procedure

Same test procedure as in 16.1.1.3.4.2

16.1.1.4.4.3 Message contents

Same message contents as in 16.1.1.3.4.3.

16.1.1.4.5 Test requirement

Table 16.1.1.4.5-1 defines the primary level settings including test tolerances for FR1-FR1 Cell reselection for 2 Rx UE

Table 16.1.1.4.5-1: NR cell specific test parameters for FR1-FR1 Cell reselection for 2 Rx UE

Parameter	Unit	Test configuration	Cell 1			Cell 2		
			T1	T2	T3	T1	T2	T3
TDD configuration		1, 4	N/A			N/A		
		2	TDDConf.1.1			TDDConf.1.1		
		3	TDDConf.2.1			TDDConf.2.1		
PDSCH RMC configuration		1, 4	SR.1.1 FDD			SR.1.1 FDD		
		2	SR.1.1 TDD			SR.1.1 TDD		
		3	SR.2.1 TDD			SR.2.1 TDD		
RMSI CORESET RMC configuration		1, 4	CR.1.1 FDD			CR.1.1 FDD		
		2	CR.1.1 TDD			CR.1.1 TDD		
		3	CR.2.1 TDD			CR.2.1 TDD		
Dedicated CORESET RMC configuration		1, 4	CCR.1.1 FDD			CCR.1.1 FDD		
		2	CCR.1.1 TDD			CCR.1.1 TDD		
		3	CCR.2.1 TDD			CCR.2.1 TDD		
OCNG Pattern		1, 2, 3, 4	OP.1 defined in A.2.1-1			OP.1 defined in A.2.1-1		
Initial DL BWP configuration		1, 2, 3, 4	DLBWP.0.1			DLBWP.0.1		
Initial UL BWP configuration		1, 2, 3, 4	ULBWP.0.1			ULBWP.0.1		
RLM-RS		1, 2, 3, 4	SSB			SSB		
Qrxlevmin	dBm/SCS	1, 2, 4	-140			-140		
		3	-137			-137		
Pcompensation	dB	1, 2, 3, 4	0			0		
Cell_selection_and_reselection_quality_measurement		1, 2, 3, 4	SS-RSRP			SS-RSRP		
$\hat{E}_s/I_{ot}$	dB	1, 4	15.6	15.6	15.6	-4	-infinity	12
		2						
		3						
N_{oc} Note2	dBm/SCS	1, 4	-98			-100	-98	-98
		2	-98			-100	-98	-98
		3	-95			-97	-95	-95
N_{oc} Note2	dBm/15 kHz	1, 4	-98			-100	-98	-98
		2						
		3						
$\hat{E}_s/N_{oc}$	dB	1, 4	15.60	15.60	15.60	-3.60	-infinity	13.60
		2						
		3						
SS-RSRP Note3	dBm/SCS	1, 4	-82.40	-82.40	-82.40	-103.60	-infinity	-84.40
		2	-82.40	-82.40	-82.40	-103.60	-infinity	-84.40
		3	-79.40	-79.40	-79.40	-100.60	-infinity	-81.40
Io	dBm/9.36 MHz	1, 4	-54.33	-54.33	-54.33	-70.48	-70.05	-56.26
	dBm/9.36 MHz	2	-54.33	-54.33	-54.33	-70.48	-70.05	-56.26
	dBm/18.36 MHz	3	-51.40	-51.40	-51.40	-70.56	-70.13	-56.35
Treselection	s	1, 2, 3, 4	0	0	0	0	0	0
SnonintrasearchP	dB	1, 2, 3, 4	50			50		
$Thresh_{x, highP}$	dB	1, 2, 3, 4	48			48		
$Thresh_{serving, lowP}$	dB	1, 2, 3, 4	44			44		
$Thresh_{x, lowP}$	dB	1, 2, 3, 4	50			50		
Propagation Condition		1, 2, 3, 4	AWGN					

Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.

Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for N_{oc} to be fulfilled.

Note 3: SS-RSRP levels have been derived from other parameters for information purposes. They are not settable parameters themselves.

During T1, The cell re-selection delay to a lower priority cell shall be less than 8 s.

The cell reselection delay to a lower priority cell is defined as the time from the beginning of time period T1, to the moment when the UE camps on cell 1, and starts to send preambles on the PRACH for sending the *RRCSetupRequest* message to perform a Registration procedure for mobility and periodic registration update on cell 1.

During T3, the cell re-selection delay to a higher priority cell shall be less than 68 s.

The cell reselection delay to a higher priority cell is defined as the time from the beginning of time period T3, to the moment when the UE camps again on cell 2, and starts to send preambles on the PRACH for sending the *RRCSetupRequest* message to perform a Registration procedure for mobility and periodic registration update on cell 2.

The rate of correct events observed during repeated tests shall be at least 90% with the confidence level of 95%.

16.1.1.5 NR SA FR1 Cell reselection for UE fulfilling stationary relaxed measurement criterion for 1 Rx UE

Editor's Note: This test case is incomplete in following aspects:

- TT analysis is missing.

16.1.1.5.1 Test purpose

The purpose of this test is to verify the requirement for the intra frequency NR cell reselection requirements for UE fulfilling stationary relaxed measurement criterion. The requirements are specified in TS 38.133 [6] in clause 4.2B.2.9.2.

16.1.1.5.2 Test applicability

This test applies to all types of NR RedCap UE with 1Rx from release 17 and forward fulfilling stationary relaxed measurement criterion.

16.1.1.5.3 Minimum conformance requirements

The minimum conformance requirements are defined in clause 16.1.1.0.3.

The normative reference for this requirement is TS 38.133 [6] clause A.16.1.1.5.

16.1.1.5.4 Test description

16.1.1.5.4.1 Initial conditions

This test shall be tested using any of the test configurations in Table 16.1.1.5.4.1-1.

Table 16.1.1.5.4.1-1: Supported test configurations for NR SA FR1 Cell reselection for UE fulfilling stationary relaxed measurement criterion for 1 Rx UE

Configuration	Description
16.1.1.5.1-1	15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode
16.1.1.5.1-2	15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode
16.1.1.5.1-3	30 kHz SSB SCS, 20 MHz bandwidth, TDD duplex mode
16.1.1.5.1-4	15 kHz SSB SCS, 10 MHz bandwidth, HD-FDD duplex mode
Note: The UE is only required to be tested in one of the supported test configurations.	

Configure the test equipment and the DUT according to the parameters in Table 16.1.1.5.4.1-2.

Table 16.1.1.5.4.1-2: Initial conditions for NR SA FR1 Cell reselection for UE fulfilling stationary relaxed measurement criterion for 1 Rx UE

Parameter	Value	Comment

Test environment	NC		As specified in TS 38.508-1 [14] clause 4.1.
Test frequencies	As specified in Annex E, table E.1-1 and TS 38.508-1 [14] clause 4.3.1.		
Channel bandwidth	As specified by the test configuration selected from Table 16.1.1.5.4.1-1.		
Propagation conditions	AWGN		As specified in Annex C.2.2.
Connection Diagram	TE Part	A.3.1.8.1	As specified in TS 38.508-1 [14] Annex A.
	DUT Part	A.3.2.2.1	
Exceptions to connection diagram	Without faders. Without LTE link.		

1. The general test parameter settings are set up according to Table 16.1.1.5.4.1-3.
2. Message contents are defined in clause 16.1.1.5.4.3.
3. There is 1 NR carrier, and 2 cells specified in the test. Both cell 1 and cell 2 are already identified by the UE prior to the start of the test. Cell 1 and cell 2 belong to different tracking areas. Furthermore, UE has not registered with network for the tracking area containing cell 2.

Table 16.1.1.5.4.1-3: General test parameters for NR SA FR1 Cell reselection for UE fulfilling stationary relaxed measurement criterion for 1 Rx UE

Parameter		Unit	Test configuration	Value	Comment
Initial condition	Active cell		1, 2, 3, 4	Cell1	The UE camps on cell 1 in the initial phase
	Neighbour cells		1, 2, 3, 4	Cell2	
T1 end condition	Active cell		1, 2, 3, 4	Cell2	The UE reselects to cell 2 during T1 period
	Neighbour cells		1, 2, 3, 4	Cell1	
Final condition	Active cell		1, 2, 3, 4	Cell1	The UE reselects to cell 1 during T2 period
	Neighbour cells		1, 2, 3, 4	Cell2	
RF Channel Number			1, 2, 3, 4	1	
Time offset between cells			1, 4	3 ms	Asynchronous cells
			2	3 μs	Synchronous cells
			3	3 μs	Synchronous cells
Access Barring Information		-	1, 2, 3, 4	Not Sent	No additional delays in random access procedure.
SSB configuration			1, 4	SSB.1 FR1	
			2	SSB.1 FR1	
			3	SSB.1 RedCap FR1	
SMTC configuration			1, 4	SMTC.2	Configured in SIB2 of Cell 1
				SMTC.6	Configured in SIB2 of Cell 2
			2	SMTC.1	
			3	SMTC.1	
DRX cycle length		s	1, 2, 3, 4	0.64	The value shall be used for all cells in the test.
PRACH configuration index			1, 2, 3, 4	102	The detailed configuration is specified in TS 38.211 clause 6.3.3.2
rangeToBestCell			1, 2, 3, 4	Not configured	
T1		s	1, 2, 3, 4	32	T1 needs to be defined so that cell re-selection reaction time is taken into account.

T2	s	1, 2, 3, 4	32	T2 needs to be defined so that cell re-selection reaction time is taken into account.

16.1.1.5.4.2 Test procedure

Two cells are deployed in the test, which are one FR1 NR PCell (Cell 1) and an NR neighbour cell (Cell 2) on the same frequency. The test consists of 2 successive time periods, with time duration of T1, and T2 respectively. Both cell 1 and cell 2 are already identified by the UE prior to the start of the test. Cell 1 and cell 2 belong to different tracking areas. Furthermore, UE has not registered with network for the tracking area containing cell 2.

In the following test procedure "UE responds" means "UE starts transmitting preamble on PRACH for sending the *RRCSetupRequest* message to perform a registration procedure for mobility.

Ensure the UE is in state RRC_IDLE with generic procedure parameters connectivity *NR* with Test Mode *On* according to TS 38.508-1 [14] clause 4.5 on Cell 1. *lowMobilityEvaluation-r16* is provided in SIB2 of Cell 1 and Cell 2. Set Cell 2 physical cell identity = initial cell 2 physical cell identity.

1. Set the parameters according to T2 in Table 16.1.1.3.5-1. Then wait 54s to ensure that Cell 2 has been detected by the UE.
2. Set the parameters according to T1 in Table 16.1.1.3.5-1. T1 starts.
3. The SS waits for random access requests information from the UE to perform cell re-selection to Cell 2.
4. If the UE responds on Cell 2 within 17 seconds from the beginning of time period T1, then count a success for the event “Re-select Cell 2”. Otherwise count a fail for the event “Re-select Cell 2”.
5. If the UE has re-selected Cell 2 within T1, after the re-selection or when T1 expires, continue with step 7. Otherwise, if T2 expires and the UE has not yet re-selected Cell 2, the TE shall switch off and on the UE and skip to step 13.
6. The SS shall send an *RRCRelease* message to ensure that the UE is in state RRC_IDLE on Cell 2.
7. The SS shall switch the power setting from T1 to T2 as specified in Table 6.1.1.3.5-1. T2 starts.
8. The SS waits for random access requests information from the UE to perform cell re-selection to Cell 1.
9. If the UE responds on Cell 1 within 32 seconds from the beginning of time period T2, then count a success for the event “Re-select Cell 1”. Otherwise count a fail for the event “Re-select Cell 1”.
10. If the UE has re-selected Cell 1 within T2, after the re-selection or when T2 expires, continue with step 12. Otherwise, if T2 expires and the UE has not yet re-selected Cell 1, the TE shall switch off and on the UE and skip to step 13.
11. The SS shall send an *RRCRelease* message to ensure that the UE is in state RRC_IDLE on Cell 1. skip to 15
12. Ensure the UE is in state RRC_IDLE with generic procedure parameters connectivity *NR* according to TS 38.508-1 [14] clause 4.5 in Cell 1.
13. Set the parameters according to T2 in Table 6.1.1.3.5-1. Then wait 54s to ensure that Cell 2 has been detected by the UE.
14. Repeat step 2-14 until a test verdict has been achieved. Each of the events “Re-select Cell 2” and “Re-select Cell 1” is evaluated independently for the statistic, resulting in an event verdict: pass or fail. Each event is evaluated only until the confidence level according to Table G.2.3-1 in Annex G clause G.2 is achieved. Different events may require different times for a verdict. If both events pass, the test passes. If one event fails, the test fails.

16.1.1.5.4.3 Message contents

Message contents are according to TS 38.508-1 [14] clause 7.3 with the following exceptions:

Table 16.1.1.5.4.3-1: Common Exception messages

Default Message Contents	
Common contents of system information blocks exceptions	Table H.2.1-2
Default RRC messages and information elements contents exceptions	

Table 16.1.1.5.4.3-2: SIB1 (Cell 1 and Cell 2)

Derivation Path: Table H.2.1-3			
Information Element	**Value/remark**	**Comment**	**Condition**
SIB1 ::= SEQUENCE {			
cellSelectionInfo SEQUENCE {			
q-RxLevMin	-68	-136 is actual value in dBm (-68 * 2 dBm)	Config 16.1.1.5.1-3
}			
servingCellConfigCommon SEQUENCE {			
downlinkConfigCommon SEQUENCE {			
pcch-Config SEQUENCE {			
defaultPagingCycle	rf64		
}			
}			
}			
}			

Table 16.1.1.5.4.3-3: SIB2 (Cell 1)

Derivation Path: Table H.2.1-1			
Information Element	**Value/remark**	**Comment**	**Condition**
SIB2 ::= SEQUENCE {			
intraFreqCellReselectionInfo SEQUENCE {			
smtc	SSB-MTC specified in 38.508-1 [14] Table 7.3.1-3 with condition SMTC.2		16.1.1.3-1, 16.1.1.3-4
	SSB-MTC specified in 38.508-1 [14] Table 7.3.1-3 with condition SMTC.1		16.1.1.3-2, 6.1.1.3-3
deriveSSB-IndexFromCell	false		6.1.1.3-1
	true		6.1.1.3-2, 6.1.1.3-3
}			
relaxedMeasurement-r16 SEQUENCE {			
lowMobilityEvaluation-r16 SEQUENCE {			
s-SearchDeltaP-r16	dB3		
t-SearchDeltaP-r16	s5		
}			
cellEdgeEvaluation-r16	Not present		
combineRelaxedMeasCondition-r16	Not present		
highPriorityMeasRelax-r16	Not present		
}			
}			

Table 16.1.1.5.4.3-4: SIB2 (Cell 2)

Derivation Path: Table H.2.1-1			
Information Element	**Value/remark**	**Comment**	**Condition**
SIB2 ::= SEQUENCE {			
intraFreqCellReselectionInfo SEQUENCE {			

smtc	SSB-MTC specified in 38.508-1 [14] Table 7.3.1-3 with condition SMTC.6		16.1.1.5-1, 16.1.1.5-4
	SSB-MTC specified in 38.508-1 [14] Table 7.3.1-3 with condition SMTC.1		16.1.1.5-2, 6.1.1.3-3
deriveSSB-IndexFromCell	false		16.1.1.5-1
	true		16.1.1.5-2, 6.1.1.3-3
}			
relaxedMeasurement-r16 SEQUENCE {			
lowMobilityEvaluation-r16 SEQUENCE {			
s-SearchDeltaP-r16	dB3		
t-SearchDeltaP-r16	s5		
}			
cellEdgeEvaluation-r16	Not present		
combineRelaxedMeasCondition-r16	Not present		
highPriorityMeasRelax-r16	Not present		
}			
}			

16.1.1.5.5 Test requirement

Table 16.1.1.5.5-1 defines the primary level settings including test tolerances for FR1-FR1 Cell reselection for 2 Rx UE

Table 16.1.1.5.5-1: NR cell specific test parameters for NR SA FR1 Cell reselection for UE fulfilling stationary relaxed measurement criterion for 1 Rx UE

Parameter	Unit	Test configuration	Cell 1		Cell 2	
			T1	T2	T1	T2
TDD configuration		1, 4	N/A		N/A	
		2	TDDConf.1.1		TDDConf.1.1	
		3	TDDConf.2.1		TDDConf.2.1	
PDSCH RMC configuration		1, 4	SR.1.1 FDD		SR.1.1 FDD	
		2	SR.1.1 TDD		SR.1.1 TDD	
		3	SR.2.1 TDD		SR.2.1 TDD	
RMSI CORESET RMC configuration		1, 4	CR.1.1 FDD		CR.1.1 FDD	
		2	CR.1.1 TDD		CR.1.1 TDD	
		3	CR.2.1 TDD		CR.2.1 TDD	
Dedicated CORESET RMC configuration		1, 4	CCR.1.1 FDD		CCR.1.1 FDD	
		2	CCR.1.1 TDD		CCR.1.1 TDD	
		3	CCR.2.1 TDD		CCR.2.1 TDD	
OCNG Pattern		1, 2, 3, 4	OP.1 defined in A.2.1-1		OP.1 defined in A.2.1-1	
Initial DL BWP configuration		1, 2, 3, 4	DLBWP.0.1		DLBWP.0.1	
Initial UL BWP configuration		1, 2, 3, 4	ULBWP.0.1		ULBWP.0.1	
RLM-RS		1, 2, 3, 4	SSB		SSB	
Qrxlevmin	dBm/SCS	1, 2, 4	-140		-140	
		3	-137		-137	
Pcompensation	dB	1, 2, 3, 4	0		0	
$Qhyst_s$	dB	1, 2, 3, 4	0		0	
$Qoffset_{s,n}$	dB	1, 2, 3, 4	0		0	
$S_{SearchDeltaP-Stationary}$	dB	1, 2, 3, 4	3		3	
$T_{SearchDeltaP-Stationary}$	s	1, 2, 3, 4	5		5	

Cell_selection_and_ reselection_quality_ measurement		1, 2, 3, 4	SS-RSRP		SS-RSRP	
$\hat{E}_s/I_{ot}$	dB	1, 2, 3, 4	-3.11+TT	2.79+TT	2.79+TT	-3.11+TT
N_{oc} Note2	dBm/SCS	1, 4	-98+TT			
		2	-98+TT			
		3	-95+TT			
N_{oc} Note2	dBm/15 kHz	1, 2, 3, 4	-98+TT			
$\hat{E}_s/N_{oc}$	dB	1, 2, 3, 4	13+TT	16+TT	16+TT	13+TT
SS-RSRP Note3	dBm/SCS	1, 4	-85+TT	-82+TT	-82+TT	-85+TT
		2	-85+TT	-82+TT	-82+TT	-85+TT
		3	-82+TT	-79+TT	-79+TT	-82+TT
Io	dBm/9.36 MHz	1, 4	-52.21+TT	-52.21+TT	specified in Cell 1 columns-	
	dBm/9.36 MHz	2	-52.21+TT	-52.21+TT		
	dBm/18.36 MHz	3	-49.28+TT	-49.28+TT		
Treselection	s	1, 2, 3, 4	0	0	0	0
SintrasearchP	dB	1, 2, 3, 4	60		60	
Propagation Condition		1, 2, 3, 4	AWGN			

Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.

Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for N_{oc} to be fulfilled.

Note 3: SS-RSRP levels have been derived from other parameters for information purposes. They are not settable parameters themselves.

During T1, the cell re-selection delay to an already detected cell shall be less than 32 s.

The cell reselection delay to an already detected cell is defined as the time from the beginning of time period T1, to the moment when the UE camps on Cell 2, and starts to send preambles on the PRACH for sending the *RRCSetupRequest* message to perform a Tracking Area Update procedure on Cell 2.

During T2, the cell re-selection delay to an already detected cell shall be less than 32 s.

The cell reselection delay to an already detected cell is defined as the time from the beginning of time period T2, to the moment when the UE camps on Cell 1, and starts to send preambles on the PRACH for sending the *RRCSetupRequest* message to perform a Tracking Area Update procedure on cell 1.

The rate of correct events observed during repeated tests shall be at least 90% with the confidence level of 95%.

16.1.1.6 NR SA FR1 Cell reselection for UE fulfilling stationary relaxed measurement criterion for 2 Rx UE

16.1.1.6.1 Test purpose

The purpose of this test is to verify the requirement for the intra frequency NR cell reselection requirements for UE fulfilling stationary relaxed measurement criterion. The requirements are specified in TS 38.133 [6] in clause 4.2B.2.9.2.

16.1.1.6.2 Test applicability

This test applies to all types of NR RedCap UE with 2Rx from release 17 and forward fulfilling stationary relaxed measurement criterion.

16.1.1.6.3 Minimum conformance requirements

The minimum conformance requirements are defined in clause 16.1.1.0.3.

The normative reference for this requirement is TS 38.133 [6] clause A.16.1.1.6.

16.1.1.6.4 Test description

16.1.1.6.4.1 Initial conditions

This test shall be tested using any of the test configurations in Table 16.1.1.6.4.1-1.

Table 16.1.1.6.4.1-1: Supported test configurations for NR SA FR1 Cell reselection for UE fulfilling stationary relaxed measurement criterion for 2 RxUE

Configuration	Description
16.1.1.6.1-1	15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode
16.1.1.6.1-2	15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode
16.1.1.6.1-3	30 kHz SSB SCS, 20MHz bandwidth, TDD duplex mode
16.1.1.6.1-4	15 kHz SSB SCS, 10 MHz bandwidth, HD-FDD duplex mode
Note: The UE is only required to be tested in one of the supported test configurations.	

Configure the test equipment and the DUT according to the parameters in Table 16.1.1.6.4.1-2.

Table 16.1.1.6.4.1-2: Initial conditions for NR SA FR1 Cell reselection for UE fulfilling stationary relaxed measurement criterion for 2 RxUE

Parameter	Value		Comment
Test environment	NC		As specified in TS 38.508-1 [14] clause 4.1.
Test frequencies	As specified in Annex E, table E.14-1 and TS 38.508-1 [14] clause 4.3.1.		
Channel bandwidth	As specified by the test configuration selected from Table 16.1.1.6.4.1-1.		
Propagation conditions	AWGN		As specified in Annex C.2.2.
Connection Diagram	TE Part	A.3.1.8.2	As specified in TS 38.508-1 [14] Annex A.
	DUT Part	A.3.2.3.4	
Exceptions to connection diagram	Without faders. Without LTE link.		

1. The general test parameter settings are set up according to Table 16.1.1.6.4.1-3.
2. Message contents are defined in clause 16.1.1.6.4.3.
3. There is 1 NR carrier, and 2 cells specified in the test. Both cell 1 and cell 2 are already identified by the UE prior to the start of the test. Cell 1 and cell 2 belong to different tracking areas. Furthermore, UE has not registered with network for the tracking area containing cell 2.

Table 16.1.1.6.4.1-3: General test parameters for NR SA FR1 Cell reselection for UE fulfilling stationary relaxed measurement criterion for 2 RxUE

Parameter		Unit	Test configuration	Value	Comment
Initial condition	Active cell		1, 2, 3, 4	Cell1	The UE camps on cell 1 in the initial phase
	Neighbour cells		1, 2, 3, 4	Cell2	
T1 end condition	Active cell		1, 2, 3, 4	Cell2	The UE reselects to cell 2 during T1 period
	Neighbour cells		1, 2, 3, 4	Cell1	

Final condition	Active cell		1, 2, 3, 4	Cell1	The UE reselects to cell 1 during T2 period
	Neighbour cells		1, 2, 3, 4	Cell2	
RF Channel Number			1, 2, 3, 4	1	
Time offset between cells			1, 4	3 ms	Asynchronous cells
			2	3 μs	Synchronous cells
			3	3 μs	Synchronous cells
Access Barring Information		-	1, 2, 3	Not Sent	No additional delays in random access procedure.
SSB configuration			1, 4	SSB.1 FR1	
			2	SSB.1 FR1	
			3	SSB.1 RedCap FR1	
SMTC configuration			1, 4	SMTC.2	Configured in SIB2 of Cell 1
				SMTC.6	Configured in SIB2 of Cell 2
			2	SMTC.1	
			3	SMTC.1	
DRX cycle length		s	1, 2, 3, 4	0.64	The value shall be used for all cells in the test.
PRACH configuration index			1, 2, 3, 4	102	The detailed configuration is specified in TS 38.211 clause 6.3.3.2
rangeToBestCell			1, 2, 3, 4	Not configured	
T1		s	1, 2, 3, 4	32	T1 needs to be defined so that cell re-selection reaction time is taken into account.
T2		s	1, 2, 3, 4	32	T2 needs to be defined so that cell re-selection reaction time is taken into account.

16.1.1.6.4.2 Test procedure

Same test procedure as in 16.1.1.5.4.2.

16.1.1.6.4.3 Message contents

Same message content as in 16.1.1.5.4.3.

16.1.1.6.5 Test requirement

Table 16.1.1.6.5-1 defines the primary level settings including test tolerances for FR1-FR1 Cell reselection for 2 Rx UE

Table 16.1.1.6.5-1: NR cell specific test parameters for NR SA FR1 Cell reselection for UE fulfilling stationary relaxed measurement criterion for 2 RxUE

Parameter	Unit	Test configuration	Cell 1		Cell 2	
			T1	T2	T1	T2
TDD configuration		1, 4	N/A		N/A	
		2	TDDConf.1.1		TDDConf.1.1	
		3	TDDConf.2.1		TDDConf.2.1	
PDSCH RMC configuration		1, 4	SR.1.1 FDD		SR.1.1 FDD	
		2	SR.1.1 TDD		SR.1.1 TDD	
		3	SR.2.1 TDD		SR.2.1 TDD	
RMSI CORESET RMC configuration		1, 4	CR.1.1 FDD		CR.1.1 FDD	

		2	CR.1.1 TDD		CR.1.1 TDD	
		3	CR.2.1 TDD		CR.2.1 TDD	
Dedicated CORESET RMC configuration		1, 4	CCR.1.1 FDD		CCR.1.1 FDD	
		2	CCR.1.1 TDD		CCR.1.1 TDD	
		3	CCR.2.1 TDD		CCR.2.1 TDD	
OCNG Pattern		1, 2, 3, 4	OP.1 defined in A.2.1-1		OP.1 defined in A.2.1-1	
Initial DL BWP configuration		1, 2, 3, 4	DLBWP.0.1		DLBWP.0.1	
Initial UL BWP configuration		1, 2, 3, 4	ULBWP.0.1		ULBWP.0.1	
RLM-RS		1, 2, 3, 4	SSB		SSB	
Qrxlevmin	dBm/SCS	1, 2, 4	-140		-140	
		3	-137		-137	
Pcompensation	dB	1, 2, 3, 4	0		0	
$Qhyst_s$	dB	1, 2, 3, 4	0		0	
$Qoffset_{s,n}$	dB	1, 2, 3, 4	0		0	
$S_{SearchDeltaP-Stationary}$ Note4	dB	1, 2, 3, 4	6		6	
$T_{SearchDeltaP-Stationary}$	s	1, 2, 3, 4	5		5	
Cell_selection_and_reselection_quality_measurement		1, 2, 3, 4	SS-RSRP		SS-RSRP	
$\hat{E}_s / I_{ot}$	dB	1, 2, 3, 4	-3.56	3.22	3.22	-3.56
N_{oc} Note2	dBm/SCS	1, 4	-98			
		2	-98			
		3	-95			
N_{oc} Note2	dBm/15 kHz	1, 2, 3, 4	-98			
$\hat{E}_s / N_{oc}$	dB	1, 2, 3, 4	12.55	16	16	12.55
SS-RSRP Note3	dBm/SCS	1, 4	-85.45	-82	-82	-85.45
		2	-85.45	-82	-82	-85.45
		3	-82.45	-79	-79	-82.45
Io	dBm/9.36 MHz	1, 4	-52.44	-52.44	specified in Cell 1 columns-	
	dBm/9.36 MHz	2	-52.44	-52.44		
	dBm/18.36 MHz	3	-49.43	-49. 43		
Treselection	s	1, 2, 3, 4	0	0	0	0
SintrasearchP	dB	1, 2, 3, 4	60		60	
Propagation Condition		1, 2, 3, 4	AWGN			

Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.
Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for N_{oc} to be fulfilled.
Note 3: SS-RSRP levels have been derived from other parameters for information purposes. They are not settable parameters themselves.
Note 4: SSearchDeltaP includes Test Tolerance applied to fulfil the low mobility criterion.

During T1, the cell re-selection delay to an already detected cell shall be less than 32 s.

The cell reselection delay to an already detected cell is defined as the time from the beginning of time period T1, to the moment when the UE camps on Cell 2, and starts to send preambles on the PRACH for sending the *RRCSetupRequest* message to perform a Tracking Area Update procedure on Cell 2.

During T2, the cell re-selection delay to an already detected cell shall be less than 32 s.

The cell reselection delay to an already detected cell is defined as the time from the beginning of time period T2, to the moment when the UE camps on Cell 1, and starts to send preambles on the PRACH for sending the *RRCSetupRequest* message to perform a Tracking Area Update procedure on cell 1.

The rate of correct events observed during repeated tests shall be at least 90% with the confidence level of 95%.

16.1.1.7 NR SA FR1-FR1 Cell reselection for UE fulfilling stationary relaxed measurement criterion for 1 Rx UE

Editor's Note: This test case is incomplete in following aspects:

- TT analysis is missing.

16.1.1.7.1 Test purpose

The purpose of this test is to verify the requirement for the inter frequency NR cell reselection requirements for UE fulfilling stationary relaxed measurement criterion. The requirements are specified in TS 38.133 [6] in clause 4.2B.2.10.2.

16.1.1.7.2 Test applicability

This test applies to all types of NR RedCap UE with 1Rx from release 17 and forward fulfilling stationary relaxed measurement criterion.

16.1.1.7.3 Minimum conformance requirements

The minimum conformance requirements are defined in clause 16.1.1.0.4.

The normative reference for this requirement is TS 38.133 [6] clause A.16.1.1.7.

16.1.1.7.4 Test description

16.1.1.7.4.1 Initial conditions

This test shall be tested using any of the test configurations in Table 16.1.1.7.4.1-1.

Table 16.1.1.7.4.1-1: Supported test configurations for NR SA FR1-FR1 Cell reselection for UE fulfilling stationary relaxed measurement criterion for 1 Rx UE

Configuration	Description of serving cell	Description of target cell
16.1.1.7.1-1	15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode	15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode
16.1.1.7.1-2	15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode	15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode
16.1.1.7.1-3	30 kHz SSB SCS, 20 MHz bandwidth, TDD duplex mode	30 kHz SSB SCS, 20 MHz bandwidth, TDD duplex mode
16.1.1.7.1-4	15 kHz SSB SCS, 10 MHz bandwidth, HD-FDD duplex mode	15 kHz SSB SCS, 10 MHz bandwidth, HD-FDD duplex mode
Note: The UE is only required to be tested in one of the supported test configurations.		

Configure the test equipment and the DUT according to the parameters in Table 16.1.1.7.4.1-2.

Table 16.1.1.7.4.1-2: Initial conditions for NR SA FR1-FR1 Cell reselection for UE fulfilling stationary relaxed measurement criterion for 1 Rx UE

Parameter	Value		Comment
Test environment	NC		As specified in TS 38.508-1 [14] clause 4.1.
Test frequencies	As specified in Annex E, table E.14-1 and TS 38.508-1 [14] clause 4.3.1.		
Channel bandwidth	As specified by the test configuration selected from Table 16.1.1.7.4.1-1.		
Propagation conditions	AWGN		As specified in Annex C.2.2.
	TE Part	A.3.1.8.1	As specified in TS 38.508-1 [14] Annex A.

Connection Diagram	DUT Part	A.3.2.2.1	
Exceptions to connection diagram	Without faders. Without LTE link.		

1. The general test parameter settings are set up according to Table 16.1.1.7.4.1-3.
2. Message contents are defined in clause 16.1.1.7.4.3.
3. There is 1 NR carrier, and 2 cells specified in the test. Both cell 1 and cell 2 are already identified by the UE prior to the start of the test. Cell 1 and cell 2 belong to different tracking areas. Furthermore, UE has not registered with network for the tracking area containing cell 2.

Table 16.1.1.7.4.1-3: General test parameters for NR SA FR1-FR1 Cell reselection for UE fulfilling stationary relaxed measurement criterion for 1 Rx UE

Parameter		Unit	Test configuration	Value	Comment
Initial condition	Active cell		1, 2, 3, 4	Cell2	The UE camps on cell 2 in the initial phase, it fulfils stationary relaxation measurements criterion, and during T1 period the UE reselects to cell 1
	Neighbour cells		1, 2, 3, 4	Cell1	
T1 end condition	Active cell		1, 2, 3, 4	Cell1	The UE shall perform reselection to cell 1 during T1
	Neighbour cells		1, 2, 3, 4	Cell2	
T2 end condition	Active cell		1, 2, 3, 4	Cell2	The UE shall perform reselection to cell 2 with higher priority during T2
	Neighbour cells		1, 2, 3, 4	Cell1	
RF Channel Number			1, 2, 3, 4	1, 2	
Time offset between cells			1, 4	3 ms	Asynchronous cells
			2	3 µs	Synchronous cells
			3	3 µs	Synchronous cells
Access Barring Information		-	1, 2, 3, 4	Not Sent	No additional delays in random access procedure.
SSB Configuration			1, 4	SSB.1 FR1	
			2	SSB.1 FR1	
			3	SSB.1 RedCap FR1	
SMTC configuration			1, 4	SMTC.2	Configured in SIB4 of Cell 1
				SMTC.6	Configured in SIB4 of Cell 2
			2	SMTC.1	
			3	SMTC.1	
DRX cycle length		s	1, 2, 3, 4	0.64	The value shall be used for all cells in the test.
PRACH configuration index			1, 2, 3, 4	102	The detailed configuration is specified in TS 38.211 clause 6.3.3.2
rangeToBestCell			1, 2, 3, 4	Not configured	
T1		s	1, 2, 3, 4	32	T1 is defined so that cell re-selection reaction time is taken into account.
T2		s	1, 2, 3, 4	32	T2 is defined so that cell re-selection reaction time is taken into account.

16.1.1.7.4.2 Test procedure

Two cells are deployed in the test, which are one FR1 NR Cell 1 and Cell 2 on different frequencies. The test consists of 2 successive time periods, with time duration of T1, and T2 respectively. Both cell 1 and cell 2 are already identified by the UE prior to the start of the test. Cell 1 and cell 2 belong to different tracking areas and Cell 2 is of higher priority than Cell 1. Furthermore, UE has not registered with network for the tracking area containing cell 1.

In the following test procedure "UE responds" means "UE starts transmitting preamble on PRACH for sending the *RRCSetupRequest* message to perform a Registration procedure for mobility.

1. Ensure the UE is in state RRC_IDLE with generic procedure parameters connectivity *NR* with Test Mode *On* according to TS 38.508-1 [14] clause 4.5 on Cell 2. SIB2 of Cell 1 and Cell 2 are configured as in 16.1.1.7.4.3.
2. Set the parameters according to T1 in Table 16.1.1.7.5-1. T1 starts.
3. The SS waits for random access requests information from the UE to perform cell re-selection to Cell 1.
4. If the UE responds on Cell 1 within 32 seconds from the beginning of time period T1, then count a success for the event “Re-select Cell 1”. Otherwise count a fail for the event “Re-select Cell 1”.
5. If the UE has re-selected Cell 1 within T1, after the re-selection or when T1 expires, continue with step 6. Otherwise, if T2 expires and the UE has not yet re-selected Cell 1, the TE shall switch off and on the UE and skip to step 12.
6. The SS shall send an *RRCRelease* message to ensure that the UE is in state RRC_IDLE on Cell 1.
7. The SS shall switch the power setting from T1 to T2 as specified in Table 16.1.1.7.5-1. T2 starts.
8. The SS waits for random access requests information from the UE to perform cell re-selection to Cell 2.
9. If the UE responds on Cell 2 within 32 seconds from the beginning of time period T2, then count a success for the event “Re-select Cell 2”. Otherwise count a fail for the event “Re-select Cell 2”.
10. If the UE has re-selected Cell 2 within T2, after the re-selection or when T2 expires, continue with step 11. Otherwise, if T2 expires and the UE has not yet re-selected Cell 2, the TE shall switch off and on the UE and skip to step 12.
11. The SS shall send an *RRCRelease* message to ensure that the UE is in state RRC_IDLE on Cell 2. skip to 13
12. Ensure the UE is in state RRC_IDLE with generic procedure parameters connectivity *NR* according to TS 38.508-1 [14] clause 4.5 in Cell 2.
13. Repeat step 2-12 until a test verdict has been achieved. Each of the events “Re-select Cell 2” and “Re-select Cell 1” is evaluated independently for the statistic, resulting in an event verdict: pass or fail. Each event is evaluated only until the confidence level according to Table G.2.3-1 in Annex G clause G.2 is achieved. Different events may require different times for a verdict. If both events pass, the test passes. If one event fails, the test fails.

16.1.1.7.4.3 Message contents

Message contents are according to TS 38.508-1 [14] clause 7.3 with the following exceptions:

Table 16.1.1.7.4.3-1: SIB1 (Cell 1 and Cell 2)

Derivation Path: TS 38.508-1 [14], Table 4.6.1-28			
Information Element	**Value/remark**	**Comment**	**Condition**
SIB1 ::= SEQUENCE {			
servingCellConfigCommon SEQUENCE {			
downlinkConfigCommon SEQUENCE {			
pcch-Config SEQUENCE {			
defaultPagingCycle	rf64		
}			
}			
}			
}			

Table 16.1.1.7.4.3-2: SIB2 (Cell 1)

Derivation Path: Table H.2.2-1			
Information Element	**Value/remark**	**Comment**	**Condition**
SIB2 ::= SEQUENCE {			
cellReselectionServingFreqInfo SEQUENCE {			
s-NonIntraSearchP	Not present		
threshServingLowP	22	Actual value = 22*2 = 44dB	
}			

relaxedMeasurement-r16 SEQUENCE {			
lowMobilityEvaluation-r16 SEQUENCE {			
s-SearchDeltaP-r16	dB3		
t-SearchDeltaP-r16	s5		
}			
cellEdgeEvaluation-r16	Not present		
combineRelaxedMeasCondition-r16	Not present		
highPriorityMeasRelax-r16	Not present		
}			
}			

Table 16.1.1.7.4.3-3: SIB2 (Cell 2)

Derivation Path: Table H.2.2-1			
Information Element	**Value/remark**	**Comment**	**Condition**
SIB2 ::= SEQUENCE {			
cellReselectionServingFreqInfo SEQUENCE {			
s-NonIntraSearchP	Not present		
threshServingLowP	22	Actual value = 22*2 = 44dB	Cell 2
}			
relaxedMeasurement-r16 SEQUENCE {			
lowMobilityEvaluation-r16 SEQUENCE {			
s-SearchDeltaP-r16	dB3		Cell 2
t-SearchDeltaP-r16	s5		
}			
cellEdgeEvaluation-r16	Not present		
combineRelaxedMeasCondition-r16	Not present		
highPriorityMeasRelax-r16	Not present		
}			
}			

Table 16.1.1.7.4.3-4: SIB4 (Cell 1)

Derivation Path: Table H.2.2-2			
Information Element	**Value/remark**	**Comment**	**Condition**
SIB4 ::= SEQUENCE {			
interFreqCarrierFreqList SEQUENCE (SIZE (1..maxFreq)) OF InterFreqCarrierFreqInfo {	1 entry		
InterFreqCarrierFreqInfo[1] SEQUENCE {		entry 1	
dl-CarrierFreq	ARFCN-ValueNR for Cell 2		
smtc	SSB-MTC specified in 38.508-1 [14] Table 7.3.1-3 with condition SMTC.2		16.1.1.7-1, 16.1.1.7-4
	SSB-MTC specified in 38.508-1 [14] Table 7.3.1-3 with condition SMTC.1		16.1.1.7-2, 16.1.1.7-3
deriveSSB-IndexFromCell	false		16.1.1.7-1, 16.1.1.7-4
	true		16.1.1.7-2, 16.1.1.7-3
threshX-HighP	24	Actual value = 24*2 = 48dB	
threshX-LowP	25	Actual value = 24*2 = 48dB	
cellReselectionPriority	5	Same as the priority in SIB 2 of Cell 2.	
}			
}			
}			

Table 16.1.1.7.4.3-5: SIB4 (Cell 2)

Derivation Path: Table H.2.2-2			
Information Element	**Value/remark**	**Comment**	**Condition**
SIB4 ::= SEQUENCE {			
interFreqCarrierFreqList SEQUENCE (SIZE (1..maxFreq)) OF InterFreqCarrierFreqInfo {	1 entry		
InterFreqCarrierFreqInfo[1] SEQUENCE {		entry 1	
dl-CarrierFreq	ARFCN-ValueNR for Cell 1 SSB		Cell 2
smtc	SSB-MTC specified in 38.508-1 [14] Table 7.3.1-3 with condition SMTC.6		16.1.1.7-1, 16.1.1.7-4
	SSB-MTC specified in 38.508-1 [14] Table 7.3.1-3 with condition SMTC.1		16.1.1.7-2, 16.1.1.7-3
deriveSSB-IndexFromCell	false		16.1.1.7-1, 16.1.1.7-4
	true		16.1.1.7-2, 16.1.1.7-3
threshX-HighP	24	Actual value = 24*2 = 48dB	Cell 2
threshX-LowP	25	Actual value = 25*2 = 50dB	Cell 2
cellReselectionPriority	4	Same as the priority in SIB 2 of Cell 1.	Cell 2
}			
}			
}			

16.1.1.7.5 Test requirement

Table 16.1.1.7.5-1 defines the primary level settings including test tolerances for FR1-FR1 Cell reselection for 2 Rx UE

Table 16.1.1.7.5-1: NR cell specific test parameters for NR SA FR1-FR1 Cell reselection for UE fulfilling stationary relaxed measurement criterion for 1 Rx UE

Parameter	Unit	Test configuration	Cell 1		Cell 2	
			T1	T2	T1	T2
TDD configuration		1, 4	N/A		N/A	
		2	TDDConf.1.1		TDDConf.1.1	
		3	TDDConf.2.1		TDDConf.2.1	
PDSCH RMC configuration		1, 4	SR.1.1 FDD		SR.1.1 FDD	
		2	SR.1.1 TDD		SR.1.1 TDD	
		3	SR.2.1 TDD		SR.2.1 TDD	
RMSI CORESET RMC configuration		1, 4	CR.1.1 FDD		CR.1.1 FDD	
		2	CR.1.1 TDD		CR.1.1 TDD	
		3	CR.2.1 TDD		CR.2.1 TDD	
Dedicated CORESET RMC configuration		1, 4	CCR.1.1 FDD		CCR.1.1 FDD	
		2	CCR.1.1 TDD		CCR.1.1 TDD	
		3	CCR.2.1 TDD		CCR.2.1 TDD	
OCNG Pattern		1, 2, 3, 4	OP.1 defined in A.2.1-1		OP.1 defined in A.2.1-1	
Initial DL BWP configuration		1, 2, 3, 4	DLBWP.0.1		DLBWP.0.1	
Initial UL BWP configuration		1, 2, 3, 4	ULBWP.0.1		ULBWP.0.1	
RLM-RS		1, 2, 3, 4	SSB		SSB	
Qrxlevmin	dBm/SCS	1, 2, 4	-140		-140	
		3	-137		-137	
Pcompensation	dB	1, 2, 3, 4	0		0	
$Qhyst_s$	dB	1, 2, 3, 4	0		0	
$Qoffset_{s,n}$	dB	1, 2, 3, 4	0		0	
Cell_selection_and_reselection_quality_measurement		1, 2, 3, 4	SS-RSRP		SS-RSRP	
$\hat{E}_s/I_{ot}$	dB	1, 4	14+TT	14+TT	-4+TT	12+TT
		2				
		3				
N_{oc} Note2	dBm/SCS	1, 4	-98+TT			
		2	-98+TT			
		3	-95+TT			
N_{oc} Note2	dBm/15 kHz	1, 4	-98+TT			
		2				
		3				
$\hat{E}_s/N_{oc}$	dB	1, 4	14+TT	14+TT	-4+TT	12+TT
		2				
		3				
SS-RSRP Note3	dBm/SCS	1, 4	-84+TT	-84+TT	-102+TT	-86+TT
		2	-84+TT	-84+TT	-102+TT	-86+TT
		3	-81+TT	-81+TT	-99+TT	-83+TT
Io	dBm/9.36 MHz	1, 4	-55.88+TT	-55.88+TT	-68.60+TT	-57.78+TT
	dBm/9.36 MHz	2	-55.88+TT	-55.88+TT	-68.60+TT	-57.78+TT
	dBm/18.36 MHz	3	-52.96+TT	-52.96+TT	65.67+TT	-65.67+TT
Treselection	s	1, 2, 3, 4	0	0	0	0
SnonintrasearchP	dB	1, 2, 3, 4	Not sent		Not sent	
$Thresh_{x,highP}$	dB	1, 2, 3, 4	48		48	
$Thresh_{serving,lowP}$	dB	1, 2, 3, 4	44		44	
$Thresh_{x,lowP}$	dB	1, 2, 3, 4	50		50	
$S_{SearchDeltaP-Stationary}$	dB	1, 2, 3	3		3	

$T_{SearchDeltaP-Stationary}$	s	1, 2, 3	5	5
Propagation Condition		1, 2, 3	AWGN	

Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.

Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for N_{oc} to be fulfilled.

Note 3: SS-RSRP levels have been derived from other parameters for information purposes. They are not settable parameters themselves.

During T1, the cell re-selection delay to a lower priority cell for UE fulfilling stationary relaxed measurements shall be less than 32 s.

The cell reselection delay to an already detected lower priority cell for UE fulfilling stationary relaxed measurements is defined as the time from the beginning of time period T1, to the moment when the UE camps on cell 1, and starts to send preambles on the PRACH for sending the *RRCSetupRequest* message to perform a Tracking Area Update procedure on cell 1.

During T2, the cell re-selection delay to an already detected higher priority cell for UE fulfilling stationary relaxed measurements shall be less than 32 s.

The cell reselection delay to an already detected higher priority cell for UE fulfilling stationary relaxed measurements is defined as the time from the beginning of time period T2, to the moment when the UE camps on cell 2, and starts to send preambles on the PRACH for sending the RRCSetupRequest message to perform a Tracking Area Update procedure on cell 2.

The rate of correct events observed during repeated tests shall be at least 90% with the confidence level of 95%.

16.1.1.8 NR SA FR1-FR1 Cell reselection for UE fulfilling stationary relaxed measurement criterion for 2 Rx UE

16.1.1.8.1 Test purpose

The purpose of this test is to verify the requirement for the inter frequency NR cell reselection requirements for UE fulfilling stationary relaxed measurement criterion. The requirements are specified in TS 38.133 [6] in clause 4.2B.2.10.2.

16.1.1.8.2 Test applicability

This test applies to all types of NR RedCap UE with 2Rx from release 17 and forward fulfilling stationary relaxed measurement criterion.

16.1.1.8.3 Minimum conformance requirements

The minimum conformance requirements are defined in clause 16.1.1.0.4.

The normative reference for this requirement is TS 38.133 [6] clause A.16.1.1.8.

16.1.1.8.4 Test description

16.1.1.8.4.1 Initial conditions

This test shall be tested using any of the test configurations in Table 16.1.1.8.4.1-1.

Table 16.1.1.8.4.1-1: Supported test configurations for NR SA FR1-FR1 Cell reselection for UE fulfilling stationary relaxed measurement criterion for 2 Rx UE

Configuration	Description of serving cell	Description of target cell
16.1.1.8.1-1	15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode	15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode

16.1.1.8.1-2	15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode	15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode
16.1.1.8.1-3	30 kHz SSB SCS, 20 MHz bandwidth, TDD duplex mode	30 kHz SSB SCS, 20 MHz bandwidth, TDD duplex mode
16.1.1.8.1-4	15 kHz SSB SCS, 10 MHz bandwidth, HD-FDD duplex mode	15 kHz SSB SCS, 10 MHz bandwidth, HD-FDD duplex mode
Note: The UE is only required to be tested in one of the supported test configurations.		

Configure the test equipment and the DUT according to the parameters in Table 16.1.1.8.4.1-2.

Table 16.1.1.8.4.1-2: Initial conditions for NR SA FR1-FR1 Cell reselection for UE fulfilling stationary relaxed measurement criterion for 2 Rx UE

Parameter	Value		Comment
Test environment	NC		As specified in TS 38.508-1 [14] clause 4.1.
Test frequencies	As specified in Annex E, table E.14-1 and TS 38.508-1 [14] clause 4.3.1.		
Channel bandwidth	As specified by the test configuration selected from Table 16.1.1.8.4.1-1.		
Propagation conditions	AWGN		As specified in Annex C.2.2.
Connection Diagram	TE Part	A.3.1.8.2	As specified in TS 38.508-1 [14] Annex A.
	DUT Part	A.3.2.3.4	
Exceptions to connection diagram	Without faders. Without LTE link.		

1. The general test parameter settings are set up according to Table 16.1.1.8.4.1-3.
2. Message contents are defined in clause 16.1.1.8.4.3.
3. There are 2 NR carriers, and 2 cells specified in the test. Both cell 1 and cell 2 are already identified by the UE prior to the start of the test. Cell 1 and cell 2 belong to different tracking areas. Furthermore, UE has not registered with network for the tracking area containing cell 2.

Table 16.1.1.8.4.1-3: General test parameters for NR SA FR1-FR1 Cell reselection for UE fulfilling stationary relaxed measurement criterion for 2 Rx UE

Parameter		Unit	Test configuration	Value	Comment
Initial condition	Active cell		1, 2, 3, 4	Cell2	The UE camps on cell 2 in the initial phase, it fulfils stationary relaxation measurements criterion, and during T1 period the UE reselects to cell 1
	Neighbour cells		1, 2, 3, 4	Cell1	
T1 end condition	Active cell		1, 2, 3, 4	Cell1	The UE shall perform reselection to cell 1 during T1
	Neighbour cells		1, 2, 3, 4	Cell2	
T2 end condition	Active cell		1, 2, 3, 4	Cell2	The UE shall perform reselection to cell 2 with higher priority during T2
	Neighbour cells		1, 2, 3, 4	Cell1	
RF Channel Number			1, 2, 3, 4	1, 2	
Time offset between cells			1, 4	3 ms	Asynchronous cells
			2	3 μs	Synchronous cells
			3	3 μs	Synchronous cells
Access Barring Information		-	1, 2, 3, 4	Not Sent	No additional delays in random access procedure.
SSB Configuration			1, 4	SSB.1 FR1	
			2	SSB.1 FR1	
			3	SSB.1 RedCap FR1	
SMTC configuration			1, 4	SMTC.2	Configured in SIB4 of Cell 1
				SMTC.6	Configured in SIB4 of Cell 2
			2	SMTC.1	
			3	SMTC.1	
DRX cycle length		s	1, 2, 3, 4	0.64	The value shall be used for all cells in the test.

PRACH configuration index		1, 2, 3, 4	102	The detailed configuration is specified in TS 38.211 clause 6.3.3.2
rangeToBestCell		1, 2, 3, 4	Not configured	
T1	s	1, 2, 3, 4	32	T1 is defined so that cell re-selection reaction time is taken into account.
T2	s	1, 2, 3, 4	32	T2 is defined so that cell re-selection reaction time is taken into account.

16.1.1.8.4.2 Test procedure

16.1.1.8.4.3 Message contents

Message contents are according to TS 38.508-1 [14] clause 7.3 with the following exceptions:

Table 16.1.1.8.4.3-1: SIB1 (Cell 1 and Cell 2)

Derivation Path: TS 38.508-1 [14], Table 4.6.1-28			
Information Element	**Value/remark**	**Comment**	**Condition**
SIB1 ::= SEQUENCE {			
servingCellConfigCommon SEQUENCE {			
downlinkConfigCommon SEQUENCE {			
pcch-Config SEQUENCE {			
defaultPagingCycle	rf64		
}			
}			
}			
}			

Table 16.1.1.8.4.3-2: SIB2 (Cell 1)

Derivation Path: Table H.2.2-1			
Information Element	**Value/remark**	**Comment**	**Condition**
SIB2 ::= SEQUENCE {			
cellReselectionServingFreqInfo SEQUENCE {			
s-NonIntraSearchP	Not present		
threshServingLowP	22	Actual value = 22*2 = 44dB	
}			
relaxedMeasurement-r16 SEQUENCE {			
lowMobilityEvaluation-r16 SEQUENCE {			
s-SearchDeltaP-r16	dB3		
t-SearchDeltaP-r16	s5		
}			
cellEdgeEvaluation-r16	Not present		
combineRelaxedMeasCondition-r16	Not present		
highPriorityMeasRelax-r16	Not present		
}			
}			

Table 16.1.1.8.4.3-3: SIB2 (Cell 2)

Derivation Path: Table H.2.2-1			
Information Element	**Value/remark**	**Comment**	**Condition**
SIB2 ::= SEQUENCE {			
cellReselectionServingFreqInfo SEQUENCE {			
s-NonIntraSearchP	Not present		
threshServingLowP	23	Actual value = 23*2 = 46dB	Cell 2
}			
relaxedMeasurement-r16 SEQUENCE {			

lowMobilityEvaluation-r16 SEQUENCE {			
s-SearchDeltaP-r16	dB15		Cell 2
t-SearchDeltaP-r16	s5		
}			
cellEdgeEvaluation-r16	Not present		
combineRelaxedMeasCondition-r16	Not present		
highPriorityMeasRelax-r16	Not present		
}			
}			

Table 16.1.1.8.4.3-4: SIB4 (Cell 1)

Derivation Path: Table H.2.2-2			
Information Element	**Value/remark**	**Comment**	**Condition**
SIB4 ::= SEQUENCE {			
interFreqCarrierFreqList SEQUENCE (SIZE (1..maxFreq)) OF InterFreqCarrierFreqInfo {	1 entry		
InterFreqCarrierFreqInfo[1] SEQUENCE {		entry 1	
dl-CarrierFreq	ARFCN-ValueNR for Cell 2		
smtc	SSB-MTC specified in 38.508-1 [14] Table 7.3.1-3 with condition SMTC.2		16.1.1.8-1, 16.1.1.8-4
	SSB-MTC specified in 38.508-1 [14] Table 7.3.1-3 with condition SMTC.1		16.1.1.8-2, 16.1.1.8-3
deriveSSB-IndexFromCell	false		16.1.1.8-1, 16.1.1.8-4
	true		16.1.1.8-2, 16.1.1.8-3
threshX-HighP	24	Actual value = 24*2 = 48dB	
threshX-LowP	25	Actual value = 25*2 = 50dB	
cellReselectionPriority	5	Same as the priority in SIB 2 of Cell 2.	
}			
}			
}			

Table 16.1.1.8.4.3-5: SIB4 (Cell 2)

Derivation Path: Table H.2.2-2			
Information Element	**Value/remark**	**Comment**	**Condition**
SIB4 ::= SEQUENCE {			
interFreqCarrierFreqList SEQUENCE (SIZE (1..maxFreq)) OF InterFreqCarrierFreqInfo {	1 entry		
InterFreqCarrierFreqInfo[1] SEQUENCE {		entry 1	
dl-CarrierFreq	ARFCN-ValueNR for Cell 1 SSB		Cell 2
smtc	SSB-MTC specified in 38.508-1 [14] Table 7.3.1-3 with condition SMTC.6		16.1.1.7-1, 16.1.1.7-4
	SSB-MTC specified in 38.508-1 [14] Table 7.3.1-3 with condition SMTC.1		16.1.1.7-2, 16.1.1.7-3
deriveSSB-IndexFromCell	false		16.1.1.7-1, 16.1.1.7-4

	true		16.1.1.7-2, 16.1.1.7-3
threshX-HighP	22	Actual value = 22*2 = 44dB	Cell 2
threshX-LowP	25	Actual value = 25*2 = 50dB	Cell 2
cellReselectionPriority	4	Same as the priority in SIB 2 of Cell 1.	Cell 2
}			
}			
}			

16.1.1.8.5 Test requirement

Table 16.1.1.8.5-1 defines the primary level settings including test tolerances for FR1-FR1 Cell reselection for 2 Rx UE

Table 16.1.1.8.5-1: NR cell specific test parameters for NR SA FR1-FR1 Cell reselection for UE fulfilling stationary relaxed measurement criterion for 2 Rx UE

Parameter	Unit	Test configuration	Cell 1		Cell 2	
			T1	T2	T1	T2
TDD configuration		1, 4	N/A		N/A	
		2	TDDConf.1.1		TDDConf.1.1	
		3	TDDConf.2.1		TDDConf.2.1	
PDSCH RMC configuration		1, 4	SR.1.1 FDD		SR.1.1 FDD	
		2	SR.1.1 TDD		SR.1.1 TDD	
		3	SR.2.1 TDD		SR.2.1 TDD	
RMSI CORESET RMC configuration		1, 4	CR.1.1 FDD		CR.1.1 FDD	
		2	CR.1.1 TDD		CR.1.1 TDD	
		3	CR.2.1 TDD		CR.2.1 TDD	
Dedicated CORESET RMC configuration		1, 4	CCR.1.1 FDD		CCR.1.1 FDD	
		2	CCR.1.1 TDD		CCR.1.1 TDD	
		3	CCR.2.1 TDD		CCR.2.1 TDD	
OCNG Pattern		1, 2, 3, 4	OP.1 defined in A.2.1-1		OP.1 defined in A.2.1-1	
Initial DL BWP configuration		1, 2, 3, 4	DLBWP.0.1		DLBWP.0.1	
Initial UL BWP configuration		1, 2, 3, 4	ULBWP.0.1		ULBWP.0.1	
RLM-RS		1, 2, 3, 4	SSB		SSB	
Qrxlevmin	dBm/SCS	1, 2, 4	-140		-140	
		3	-137		-137	
Pcompensation	dB	1, 2, 3, 4	0		0	
$Qhyst_s$	dB	1, 2, 3, 4	0		0	
$Qoffset_{s,n}$	dB	1, 2, 3, 4	0		0	
Cell_selection_and_reselection_quality_measurement		1, 2, 3, 4	SS-RSRP		SS-RSRP	
$\hat{E}_s/I_{ot}$	dB	1, 4	14	14	-3.7	9.75
		2				
		3				
N_{oc} Note2	dBm/SCS	1, 4	-98			
		2	-98			
		3	-95			
N_{oc} Note2	dBm/15 kHz	1, 4	-98			
		2				
		3				
$\hat{E}_s/N_{oc}$	dB	1, 4	14	14	-3.70	9.75
		2				
		3				
SS-RSRP Note3	dBm/SCS	1, 4	-84	-84	-101.70	-88.25
		2	-84	-84	-101.70	-88.25
		3	-81	-81	-98.7	-85.25
Io	dBm/9.36 MHz	1, 4	-55.96	-55.96	-68.60	-59.95
	dBm/9.36 MHz	2	-55.96	-55.96	-68.60	-59.95
	dBm/18.36 MHz	3	-52.95	-52.95	-65.58	-56.93
Treselection	s	1, 2, 3, 4	0	0	0	0
SnonintrasearchP	dB	1, 2, 3, 4	Not sent		Not sent	
$Thresh_{x,highP}$ Note 4	dB	1, 2, 3, 4	48		44	
$Thresh_{serving,lowP}$ Note 4	dB	1, 2, 3, 4	44		46	
$Thresh_{x,lowP}$ Note 4	dB	1, 2, 3, 4	48		50	
$S_{SearchDeltaP-Stationary}$ Note 4	dB	1, 2, 3	3		15	

$T_{SearchDeltaP-Stationary}$	s	1, 2, 3	5	5
Propagation Condition		1, 2, 3	AWGN	

Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.

Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for N_{oc} to be fulfilled.

Note 3: SS-RSRP levels have been derived from other parameters for information purposes. They are not settable parameters themselves.

Note 4: Thresholds include Test Tolerance applied to fulfil the cell re-selection criterion.

During T1, the cell re-selection delay to a lower priority cell for UE fulfilling stationary relaxed measurements shall be less than 32 s.

The cell reselection delay to an already detected lower priority cell for UE fulfilling stationary relaxed measurements is defined as the time from the beginning of time period T1, to the moment when the UE camps on cell 1, and starts to send preambles on the PRACH for sending the *RRCSetupRequest* message to perform a Tracking Area Update procedure on cell 1.

During T2, the cell re-selection delay to an already detected higher priority cell for UE fulfilling stationary relaxed measurements shall be less than 32 s.

The cell reselection delay to an already detected higher priority cell for UE fulfilling stationary relaxed measurements is defined as the time from the beginning of time period T2, to the moment when the UE camps on cell 2, and starts to send preambles on the PRACH for sending the RRCSetupRequest message to perform a Tracking Area Update procedure on cell 2.

The rate of correct events observed during repeated tests shall be at least 90% with the confidence level of 95%.

16.1.2 NR – E-UTRA cell re-selection

16.1.2.0 Minimum conformance requirements

16.1.2.0.1 Minimum conformance requirements for NR SA FR1 - E-UTRA cell re-selection for 1 Rx

If Srxlev > $S_{nonIntraSearchP}$ and Squal > $S_{nonIntraSearchQ}$ then the UE shall search for inter-RAT E-UTRAN layers of higher priority at least every $T_{higher_priority_search}$ where $T_{higher_priority_search}$ is described in TS 38.133 [6] in clause 4.2B.2.7.

If Srxlev ≤ $S_{nonIntraSearchP}$ or Squal ≤ $S_{nonIntraSearchQ}$ then the UE shall search for and measure inter-RAT E-UTRAN layers of higher, lower priority in preparation for possible reselection. In this scenario, the minimum rate at which the UE is required to search for and measure higher priority inter-RAT E-UTRAN layers shall be the same as that defined below for lower priority RATs.

The requirements in this clause apply for inter-RAT E-UTRAN FDD measurements and E-UTRA TDD measurements. When the measurement rules indicate that inter-RAT E-UTRAN cells are to be measured, the UE shall measure RSRP and RSRQ of detected E-UTRA cells in the neighbour frequency list at the minimum measurement rate specified in this clause.

The parameter $N_{EUTRA_carrier_RedCap}$ is the total number of configured E-UTRA carriers in the neighbour frequency list. The UE shall filter RSRP and RSRQ measurements of each measured E-UTRA cell using at least 2 measurements. Within the set of measurements used for the filtering, at least two measurements shall be spaced by at least $T_{measure,EUTRAN_RedCap}/2$.

An inter-RAT E-UTRA cell is considered to be detectable provided the following conditions are fulfilled:

- the same conditions as for inter-frequency RSRP measurements specified in TS 36.133 [15, Annex B.x.y] are fulfilled for a corresponding Band, and

- the same conditions as for inter-frequency RSRQ measurements specified in TS 36.133 [15, Annex B.x.y] are fulfilled for a corresponding Band.

- SCH conditions specified in TS 36.133 [15, Annex B.x.y] are fulfilled for a corresponding Band

The UE shall be able to evaluate whether a newly detectable inter-RAT E-UTRAN cell meets the reselection criteria defined in TS38.304 [30] within ($N_{EUTRA_carrier_RedCap}$) * $T_{detect,EUTRAN_RedCap}$ when Srxlev ≤ $S_{nonIntraSearchP}$ or Squal ≤ $S_{nonIntraSearchQ}$ when $T_{reselection}$ = 0 provided that the reselection criteria are met by a margin of at least 6dB for RSRP reselections based on absolute priorities or 4dB for RSRQ reselections based on absolute priorities for 2 Rx RedCap and at least [6dB] for RSRP reselections based on absolute priorities or [4dB] for RSRQ reselections based on absolute priorities for 1 Rx RedCap.

Cells which have been detected shall be measured at least every ($N_{EUTRA_carrier_RedCap}$) * $T_{measure,EUTRAN_RedCap}$ when Srxlev ≤ $S_{nonIntraSearchP}$ or Squal ≤ $S_{nonIntraSearchQ}$.

When higher priority cells are found by the higher priority search, they shall be measured at least every $T_{measure,EUTRAN_RedCap}$. If, after detecting a cell in a higher priority search, it is determined that reselection has not occurred then the UE is not required to continuously measure the detected cell to evaluate the ongoing possibility of reselection. However, the minimum measurement filtering requirements specified later in this clause shall still be met by the UE before it makes any determination that it may stop measuring the cell.

If the UE detects on an inter-RAT E-UTRAN carrier a cell whose physical identity is indicated as not allowed for that carrier in the measurement control system information of the serving cell, the UE is not required to perform measurements on that cell.

The UE shall not consider an inter-RAT E-UTRA cell in cell reselection, if it is indicated as not allowed in the measurement control system information of the serving cell.

For a cell that has been already detected, but that has not been reselected to, the filtering shall be such that the UE shall be capable of evaluating that an already identified inter-RAT E-UTRA cell has met reselection criterion defined in TS 38.304 [30] within ($N_{EUTRA_carrier_RedCap}$) * $T_{evaluate,EUTRAN_RedCap}$ when $T_{reselection}$ = 0 provided that the reselection criteria are met by a margin of at least 6dB for RSRP reselections based on absolute priorities or 4dB for RSRQ reselections based on absolute priorities for 2 Rx RedCap and at least [6dB] for RSRP reselections based on absolute priorities or [4dB] for RSRQ reselections based on absolute priorities for 1 Rx RedCap.

If $T_{reselection}$ timer has a non-zero value and the inter-RAT E-UTRA cell is satisfied with the reselection criteria which are defined in TS 38.304 [1], the UE shall evaluate this E-UTRA cell for the $T_{reselection}$ time. If this cell remains satisfied with the reselection criteria within this duration, then the UE shall reselect that cell.

For 1 Rx RedCap and 2 Rx RedCap not configured with eDRX_IDLE cycle, $T_{detect,EUTRAN_RedCap}$, $T_{measure,EUTRAN_RedCap}$ and $T_{evaluate,\ E\text{-}UTRAN_RedCap}$ are specified in Table 4.2B.2.5-1 and Table 4.2.2.5-1 respectively.

For 1 Rx RedCap and 2 Rx RedCap configured with eDRX_IDLE cycle, $T_{detect,EUTRAN_RedCap}$, $T_{measure,EUTRAN_RedCap}$ and $T_{evaluate,\ E\text{-}UTRAN_RedCap}$ are specified in Table 4.2B.2.5-2, where the requirements apply provided that the serving cell is configured with eDRX_IDLE and is the same in all PTWs during any of $T_{detect,EUTRAN_RedCap}$, $T_{measure,EUTRAN_RedCap}$ and $T_{evaluate,\ E\text{-}UTRAN_RedCap}$ when multiple PTWs are used.

Table 4.2B.2.5-1: $T_{detect,EUTRAN_RedCap}$, $T_{measure,EUTRAN_RedCap}$, and $T_{evaluate,EUTRAN_RedCap}$ for 1 Rx RedCap

DRX cycle length [s]	$T_{detect,EUTRAN}$ [s] (number of DRX cycles)	$T_{measure,EUTRAN}$ [s] (number of DRX cycles)	$T_{evaluate,EUTRAN}$ [s] (number of DRX cycles)
0.32	11.52 (36)	1.28 (4)	5.12 (16)
0.64	17.92 (28)	1.28 (2)	5.12 (8)
1.28	32(25)	1.28 (1)	6.4 (5)
2.56	58.88 (23)	2.56 (1)	7.68 (3)

Table 4.2B.2.5-2: $T_{detect,EUTRAN_RedCap}$, $T_{measure,EUTRAN_RedCap}$, and $T_{evaluate,EUTRAN_RedCap}$ for UE configured with eDRX_IDLE cycle

eDRX_IDLE cycle length [s]	DRX cycle length [s]	PTW length [s] (number of 1.28s periods)	$T_{detect,EUTRAN_RedCap}$ [s] (number of DRX or eDRX cycles Note 3)	$T_{measure,EUTRAN_RedCap}$ [s] (number of DRX or eDRX cycles Note 3)	$T_{evaluate,E-UTRAN_RedCap}$ [s] (number of DRX or eDRX cycles Note 3)
2.56	N/A	N/A	58.88 (23)	2.56 (1)	7.68 (3)
5.12	N/A	N/A	117.76 (23)	5.12 (1)	10.24 (2)
10.24 ≤ eDRX_IDLE cycle length ≤ 2621.444	0.32	≥1.28 (1)	$eDRX_cycle_length \times \left\lceil \frac{23}{\lceil PTW / DRX_cycle_length \rceil} \right\rceil$ (23)	0.32 (1)	0.64 (2)
	0.64	≥1.28 (1)		0.64 (1)	1.28 (2)
	1.28	≥2.56 (2)		1.28 (1)	2.56 (2)
	2.56	≥5.12 (4)		2.56 (1)	5.12 (2)

NOTE 1: The number of DRX cycles in this table is given for the DRX cycles within PTWs.
NOTE 2: The eDRX_IDLE cycle lengths are as specified in Section 10.5.5.32 of TS 24.008 [34].
NOTE 3: Number of eDRX cycles when eDRX_IDLE cycle length equals 5.12s, number of DRX cycles otherwise.
NOTE 4: The lower bound of PTW length is derived based on $\left\lceil \frac{T_{evaluate,E-UTRAN_RedCap} * DRX_cycle}{1.28} \right\rceil * 1.28$.

For any requirement in this section, when the UE transitions between any two states when being configured with eDRX_IDLE, being configured with eDRX_IDLE cycle, changing eDRX_IDLE cycle length, or changing PTW configuration, the UE shall meet the transition requirement, which is the less stringent requirement of the two requirements corresponding to the first state and the second state, during the transition time interval which is the time corresponding to the transition requirement. After the transition time interval, the UE shall meet the requirement corresponding to the second state.

16.1.2.0.2 Minimum conformance requirements for NR SA FR1 - E-UTRA cell re-selection for 2 Rx

Same Minimum conformance requirements as in clause 6.1.2.0.1.

16.1.2.0.3 Minimum conformance requirements for NR SA FR1 - E-UTRA cell re-selection

This clause contains requirements for measurements on inter-RAT E-UTRAN cells provided that:

- UE is configured with *stationaryMobilityEvaluation* [2] criterion and UE has fulfilled that criterion, or
- UE is configured with both *stationaryMobilityEvaluation* [2] criterion and *cellEdgeEvaluationWhileStationary* [2] criterion and *combineRelaxedMeasCondition2* [2] not configured, and UE has fulfilled only the *stationaryMobilityEvaluation* [2] criterion, and

The requirements defined in clause 4.2B.2.5 apply for this clause except that:

- $T_{detect,EUTRAN_RedCap\ Relax}$ as specified in Table 16.1.2.0.3-1 and Table 16.1.2.0.3-2 for 1 Rx RedCap and 2 Rx RedCap respectively.
- $T_{measure,EUTRAN\ RedCap\ Relax}$ as specified in Table 16.1.2.0.3-1 and Table 16.1.2.0.3-2 for 1 Rx RedCap and 2 Rx RedCap respectively.
- $T_{evaluate,EUTRAN\ RedCap\ Relax}$ as specified in Table 16.1.2.0.3-1 and Table 16.1.2.0.3-2 for 1 Rx RedCap and 2 Rx RedCap respectively.

If the UE is configured with eDRX_IDLE cycle then the requirements in Table 16.1.2.0.3-3 are applicable for eDRX cycle < 10.24 s.

If the UE is configured with eDRX_IDLE cycle ≥ 10.24 s, then the requirements in Table 16.1.2.0.3-4 apply provided that filtering of a measurement is done within a single PTW and provided that the eDRX cycle is ≤ [163.84] sec and evaluation/measurement time with relaxation on one carrier is not greater than single PTW window length.

Table 16.1.2.0.3-1: $T_{detect,EUTRAN_RedCap_Relax}$, $T_{measure,EUTRAN_RedCap_Relax}$, and $T_{evaluate,EUTRAN_RedCap_Relax}$ for 1 Rx RedCap

DRX cycle length [s]	$T_{detect,EUTRAN_Relax}$ [s] (number of DRX cycles)	$T_{measure,EUTRAN_Relax}$ [s] (number of DRX cycles)	$T_{evaluate,EUTRAN_Relax}$ [s] (number of DRX cycles)
0.32	11.52 x K5 (36 x K5)	1.28 x K5 (4 x K5)	5.12 x K5 (16 x K5)
0.64	17.92 x K5 (28 x K5)	1.28 x K5 (2 x K5)	5.12 x K5 (8 x K5)
1.28	32 x K5 (25 x K5)	1.28 x K5 (1 x K5)	6.4 x K5 (5 x K5)
2.56	58.88 x K5 (23 x K5)	2.56 x K5 (1 x K5)	7.68 x K5 (3 x K5)
Note 1: K5 = 6 is the measurement relaxation factor applicable for UE fulfilling the *stationaryMobilityEvaluation* [2] criterion.			

Table 16.1.2.0.3-2: $T_{detect,EUTRAN_Relax}$, $T_{measure,EUTRAN_Relax}$, and $T_{evaluate,EUTRAN_Relax}$ for 2 Rx RedCap

DRX cycle length [s]	$T_{detect,EUTRAN_Relax}$ [s] (number of DRX cycles)	$T_{measure,EUTRAN_Relax}$ [s] (number of DRX cycles)	$T_{evaluate,EUTRAN_Relax}$ [s] (number of DRX cycles)
0.32	11.52 x K5 (36 x K5)	1.28 x K5 (4 x K5)	5.12 x K5 (16 x K5)
0.64	17.92 x K5 (28 x K5)	1.28 x K5 (2 x K5)	5.12 x K5 (8 x K5)
1.28	32 x K5 (25 x K5)	1.28 x K5 (1 x K5)	6.4 x K5 (5 x K5)
2.56	58.88 x K5 (23 x K5)	2.56 x K5 (1 x K5)	7.68 x K5 (3 x K5)

Table 16.1.2.0.3-3: $T_{detect,E\text{-}UTRAN_RedCap_Relax}$, $T_{measure,NR_,E\text{-}UTRAN_RedCap_Relax}$ and $T_{evaluate,NR_,E\text{-}UTRAN_RedCap_Relax}$ for UE configured with eDRX_IDLE cycle

eDRX_IDLE cycle length [s]	$T_{detect,NR_E\text{-}UTRAN_RedCap_Relax}$ [s] (number of DRX cycles)	$T_{measure,NR_E\text{-}UTRAN_RedCap_Relax}$ [s] (number of DRX cycles)	$T_{evaluate,NR_E\text{-}UTRAN_RedCap_Relax}$ [s] (number of DRX cycles)
5.12	117.76 x K3 (23 x K3)	5.12 x K3 (1 x K3)	10.24 x K3 (2 x K3)
Note 1: M2 = 1.5 if SMTC periodicity of measured intra-frequency cell > 20 ms; otherwise M2=1. If different SMTC periodicities are configured for different cells, the SMTC periodicity in this note is the one used by the cell being identified. During PSS/SSS detection, the periodicity of the SMTC configured for the intra-frequency carrier is assumed, and if the actual SSB transmission periodicity is greater than the SMTC configured for the intra-frequency carrier, longer $T_{detect,\ NR_intra}$ is expected. Note 2: K3 = 6 is the measurement relaxation factor applicable for UE fulfilling the *stationaryMobilityEvaluation* [2] criterion.			

Table 16.1.2.0.3-4: $T_{detect,E\text{-}UTRAN_RedCap_Relax}$, $T_{measure,NR_,E\text{-}UTRAN_RedCap_Relax}$ and $T_{evaluate,NR_,E\text{-}UTRAN_RedCap_Relax}$ for UE configured with eDRX_IDLE cycle

eDRX_IDLE cycle length [s]	DRX cycle length [s]	PTW length [s] (number of 1.28s periods)	$T_{detect,EUTRAN_RedCap_Relax}$ [s] (number of DRX or eDRX cycles Note 3)	$T_{measure,EUTRAN_RedCap_Relax}$ [s] (number of DRX or eDRX cycles Note 3)	$T_{evaluate,E\text{-}UTRAN_RedCap_Relax}$ [s] (number of DRX or eDRX cycles Note 3)
10.24 ≤ eDRX_IDLE cycle length ≤ 2621.444	0.32	≥1.28 (1)	$eDRX_cycle_length \times \left\lceil \frac{23}{\lceil PTW / DRX_cycle_length \rceil} \right\rceil$ (23 x K3)	0.32 x K3 (1 x K3)	0.64 x K3 (2 x K3)
	0.64	≥1.28 (1)		0.64 x K3 (1 x K3)	1.28 x K3 (2 x K3)
	1.28	≥2.56 (2)		1.28 x K3 (1 x K3)	2.56 x K3 (2 x K3)
	2.56	≥5.12 (4)		2.56 x K3 (1 x K3)	5.12 x K3 (2 x K3)

NOTE 1: The number of DRX cycles in this table is given for the DRX cycles within PTWs.
NOTE 2: The eDRX_IDLE cycle lengths are as specified in Section 10.5.5.32 of TS 24.008 [34].
NOTE 3: Number of eDRX cycles when eDRX_IDLE cycle length equals 5.12s, number of DRX cycles otherwise.
NOTE 4: The lower bound of PTW length is derived based on $\left\lceil \frac{T_{evaluate,E-UTRAN_RedCap} * DRX_cycle}{1.28} \right\rceil * 1.28$.

16.1.2.1 NR SA FR1 - E-UTRA Cell reselection to higher priority E-UTRA for 1RX

Editor's Note: This test case is incomplete in following aspects:

- Message contents are missing.
- TT analysis is missing.

16.1.2.1.1 Test purpose

The purpose of this test is to verify the requirement for the NR – E-UTRA inter-RAT cell reselection to higher priority E-UTRA cell, for 1 Rx RedCap UEs. The requirements are specified in TS 38.133 [6] in clause 4.2B.2.5.

16.1.2.1.2 Test applicability

This test applies to all types of NR RedCap UEwith 1Rx from release 17 and forward.

16.1.2.1.3 Minimum conformance requirements

The minimum conformance requirements are defined in clause 16.1.2.0.

The normative reference for this requirement is TS 38.133 [6] clause A.16.1.2.1.

16.1.2.1.4 Test description

16.1.2.1.4.1 Initial conditions

This test shall be tested using any of the test configurations in Table 16.1.2.1.4.1-1.

Table 16.1.2.1.4.1-1: Supported test configurations for NR SA FR1 - E-UTRA Cell reselection to higher priority E-UTRA for 1RX

Configuration	Description of serving cell	Description of target cell
16.1.2.1.1-1	NR 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode	LTE 10 MHz bandwidth, TDD duplex mode
16.1.2.1.1-2	NR 15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode	LTE 10 MHz bandwidth, TDD duplex mode
16.1.2.1.1-3	NR 30 kHz SSB SCS, 20 MHz bandwidth, TDD duplex mode	LTE 10 MHz bandwidth, TDD duplex mode
16.1.2.1.1-4	NR 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode	LTE 10 MHz bandwidth, FDD duplex mode
16.1.2.1.1-5	NR 15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode	LTE 10 MHz bandwidth, FDD duplex mode
16.1.2.1.1-6	NR 30 kHz SSB SCS, 20 MHz bandwidth, TDD duplex mode	LTE 10 MHz bandwidth, FDD duplex mode
16.1.2.1.1-7	NR 15 kHz SSB SCS, 10 MHz bandwidth, HD-FDD duplex mode	LTE 10 MHz bandwidth, TDD duplex mode
16.1.2.1.1-8	NR 15 kHz SSB SCS, 10 MHz bandwidth, HD-FDD duplex mode	LTE 10 MHz bandwidth, FDD duplex mode
Note: The UE is only required to be tested in one of the supported test configurations.		

Configure the test equipment and the DUT according to the parameters in Table 16.1.2.1.4.1-2.

Table 16.1.2.1.4.1-2: Initial conditions for NR SA FR1 - E-UTRA Cell reselection to higher priority E-UTRA for 1RX

Parameter	Value		Comment
Test environment	NC		As specified in TS 38.508-1 [14] clause 4.1.
Test frequencies	As specified in Annex E, table E.14-1 and TS 38.508-1 [14] clause 4.3.1.		
Channel bandwidth	As specified by the test configuration selected from Table 6.1.1.2.4.1-1.		
Propagation conditions	AWGN		As specified in Annex C.2.2.
Connection Diagram	TE Part	A.3.1.8.1	As specified in TS 38.508-1 [14] Annex A.
	DUT Part	A.3.2.2.1	
Exceptions to connection diagram	Without faders.		

1. The general test parameter settings are set up according to Table 16.1.2.1.4.1-3.

2. Message contents are defined in clause 16.1.2.1.4.3.

3. There are two cells in the test on two carriers. Cell 1 is the NR PCell and Cell 2 is the E-UTRA neighbour cell. Cell 1 is configured according to Annex C.1.1 and C.1.2, Cell 2 is configured according to TS 36.521-3 [26] Annex C.1.0 and C.1.1. E-UTRAN cell 2 is of higher priority than cell 1.

Table 16.1.2.1.4.1-3: General test parameters for NR SA FR1 - E-UTRA Cell reselection to higher priority E-UTRA for 1RX

Parameter		Unit	Test configuration	Value	Comment
Initial condition	Active cell		1, 2, 3, 4, 5, 6, 7, 8	Cell1	The UE camps on cell 1 in the initial phase and during T2 period the UE reselects to cell 2.
T2 end condition	Active cell		1, 2, 3, 4, 5, 6, 7, 8	Cell2	The UE shall perform reselection to cell 2 during T2.
	Neighbour cell		1, 2, 3, 4, 5, 6, 7, 8	Cell1	
T3 end condition	Active cell		1, 2, 3, 4, 5, 6, 7, 8	Cell1	The UE shall perform reselection to cell 1 during T3 for iteration of the tests.
	Neighbour cell		1, 2, 3, 4, 5, 6, 7, 8	Cell2	
Access Barring Information		-	1, 2, 3, 4, 5, 6, 7, 8	Not Sent	No additional delays in random access procedure.
DRX cycle length		s	1, 2, 3, 4, 5, 6, 7, 8	1.28	The value shall be used for all cells in the test.
NR PRACH configuration index			1, 2, 3, 4, 5, 6, 7, 8	102	The detailed configuration is specified in TS 38.211 clause 6.3.3.2
E-UTRAN PRACH configuration index			1, 2, 3, 7	53	As specified in table 5.7.1-2 in TS 36.211 [23]
			4, 5, 6, 8	4	
E-UTRAN PRACH			1, 2, 3	53	As specified in table 5.7.1-2 in TS 36.211 [23]
configuration index			4, 5, 6	4	
T1		s	1, 2, 3, 4, 5, 6, 7, 8	>7	During T1, cell 2 shall be powered off, and during the off time the physical cell identity shall be changed. The intention is to ensure that cell 2 has not been detected by the UE prior to the start of period T2.
T2		s	1, 2, 3, 4, 5, 6, 7, 8	75	T2 needs to be defined so that cell re-selection reaction time is taken into account.
T3		s	1, 2, 3, 4, 5, 6, 7, 8	15	T3 needs to be defined so that cell re-selection reaction time is taken into account.

16.1.2.1.4.2 Test procedure

Two cells are deployed in the test, which are one FR1 NR PCell (Cell 1) and an E-UTRA neighbour cell (Cell 2). The test consists of three successive time periods, with time duration of T1, T2, and T3 respectively.

Before T1 the UE is camped on to cell 1. During T1, cell 2 shall be powered off. At the start of T2 the UE is expected to detect cell 2, send preambles on the PRACH for sending the RRC CONNECTION REQUEST message to perform a Tracking Area Update procedure on cell 2. At the start of T3 cell 2 becomes weaker than cell 1, and the UE reselects to Cell 1.

In the following test procedure “UE responds” means “UE starts transmitting preamble on PRACH for sending the RRC CONNECTION REQUEST message to perform a Tracking Area Update procedure.

1. Ensure the UE is in state RRC_IDLE with generic procedure parameters connectivity *NR* with Test Mode *On* according to TS 38.508-1 [14] clause 4.5 on Cell 1.
2. Set the parameters according to T1 in Table 16.1.2.1.5-1 and 16.1.2.1.5-2. T1 starts.
3. During T1, Cell 2 shall be powered off and set Cell 2 physical cell identity = ((current Cell 2 physical cell identity + 1) mod 1008 for one iteration of the test procedure loop.
4. When T1 expires, the SS shall switch the power setting from T1 to T2 as specified in Table 16.1.2.1.5-1 and 16.1.2.1.5-2. T2 starts.
5. The SS waits for random access requests information from the UE to perform cell re-selection to a higher priority Cell 2.
6. If the UE responds on Cell 2 during time duration T2 within 68 seconds from the beginning of time period T2, then count a success for the event “re-select higher priority E-UTRA Cell 2”, continue with step 7. Otherwise, if T2 expires and the UE has not yet re-selected Cell 2, count a fail for the event “re-select higher priority E-UTRA Cell 2”, and the TE shall switch off and, on the UE, and skip to step 14.
7. The SS shall send an *RRCConnectionRelease* message to ensure that the UE is in state RRC_IDLE on Cell 2.
8. The SS shall switch the power setting from T2 to T3 as specified in Table 16.1.2.1.5-1 and 16.1.2.1.5-2. T3 starts.
9. The SS waits for random access requests information from the UE to perform cell re-selection to a lower priority Cell 1.
10. If the UE has re-selected Cell 1 within T3, then count a success for the event “re-select lower priority NR Cell 1” and continue with step 11. Otherwise, if T3 expires and the UE has not yet re-selected Cell 1, count a fail for the event “re-select lower priority NR Cell 1” and the TE shall switch off and, on the UE and skip to step 12.
11. The SS shall send an *RRCRelease* message to ensure that the UE is in state RRC_IDLE on Cell 1.
12. Ensure the UE is in state RRC_IDLE with generic procedure parameters connectivity *NR* according to TS 38.508-1 [14] clause 4.5.
13. Repeat step 2-12 until a test verdict has been achieved. Each of the events “re-select higher priority E-UTRA Cell 2” and “re-select lower priority NR Cell 1” is evaluated independently for the statistic, resulting in an event verdict: pass or fail. Each event is evaluated only until the confidence level according to Table G.2.3-1 in Annex G clause G.2 is achieved. Different events may require different times for a verdict.
    If both events pass, the test passes. If one event fails, the test fails.

16.1.2.1.4.3 Message contents

Message contents are according to TS 38.508-1 [14] clause 7.3 with the following exceptions:

Table 16.1.2.1.4.3-1: Common Exception messages

Default Message Contents	
Common contents of system information blocks exceptions	TBD
Default RRC messages and information elements contents exceptions	

Table 16.1.2.1.4.3-2: TBD

TBD

16.1.2.1.5 Test requirement

Table 16.1.2.1.5-1 defines the primary level settings including test tolerances for NR – E-UTRA cell re-selection test case in AWGN for 1 Rx UE.

Table 16.1.2.1.5-1: NR cell specific test parameters for NR SA FR1 - E-UTRA Cell reselection to higher priority E-UTRA for 1RX

Parameter	Unit	Test configuration	Cell 1		
			T1	T2	T3
TDD configuration		1, 4, 7, 8	N/A		
		2, 5	TDDConf.1.1		
		3, 6	TDDConf.2.1		
PDSCH parameters		1, 4, 7, 8	SR.1.1 FDD		
		2, 5	SR.1.1 TDD		
		3, 6	SR.2.1 TDD		
RMSI CORESET parameters		1, 4, 7, 8	CR.1.1 FDD		
		2, 5	CR.1.1 TDD		
		3, 6	CR.2.1 TDD		
Dedicated CORESET parameters		1, 4, 7, 8	CCR.1.1 FDD		
		2, 5	CCR.1.1 TDD		
		3, 6	CCR.2.1 TDD		
SSB parameters		1, 4, 7, 8	SSB.1 FR1		
		2, 5	SSB.1 FR1		
		3, 6	SSB.1 RedCap FR1		
NR SMTC parameters		1, 4, 7, 8	SMTC.2		
		2, 5	SMTC.1		
		3, 6	SMTC.1		
OCNG Pattern		1, 2, 3, 4, 5, 6, 7, 8	OP.1 defined in A.3.2.1		
Initial DL BWP configuration		1, 2, 3, 4, 5, 6, 7, 8	DLBWP.0.1		
Initial UL BWP configuration		1, 2, 3, 4, 5, 6, 7, 8	ULBWP.0.1		
RLM-RS		1, 2, 3, 4, 5, 6, 7, 8	SSB		
Qrxlevmin	dBm/SCS	1, 2, 4, 5	-140		
		3, 6	-137		
N_{oc}	dBm/SCS	1, 4, 7, 8	-98		
		2, 5	-98		
		3, 6	-95		
N_{oc}	dBm/15 kHz	1, 2, 3, 4, 5, 6, 7, 8	-98		
SS-RSRP	dBm/SCS	1, 4, 7, 8	-84	-84	-84
		2, 5	-84	-84	-84
		3, 6	-81	-81	-81
$\hat{E}_s/I_{ot}$	dB	1, 4, 7, 8	14	14	14
		2, 5			
		3, 6			
$\hat{E}_s/N_{oc}$	dB	1, 4, 7, 8	14	14	14
		2, 5			
		3, 6			
Io	dBm/9.36 MHz	1, 4, 7, 8	-55.88	-55.88	-55.88
	dBm/9.36 MHz	2, 5	-55.88	-55.88	-55.88
	dBm/18.36 MHz	3, 6	-52.95	-52.95	-52.95
Treselection	S	1, 2, 3, 4, 5, 6, 7, 8	0		
SnonintrasearchP	dB	1, 2, 3, 4, 5, 6, 7, 8	50		
$Thresh_{x, highP}$ (Note 2)	dB	1, 2, 3, 4, 5, 6, 7, 8	48		
$Thresh_{serving, lowP}$	dB	1, 2, 3, 4, 5, 6, 7, 8	44		
$Thresh_{x, lowP}$	dB	1, 2, 3, 4, 5, 6, 7, 8	50		

Propagation Condition		1, 2, 3, 4, 5, 6, 7, 8	AWGN
Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols. Note 2: This refers to the value of $Thresh_{x, high}$ which is included in NR system information, and is a threshold for the E-UTRA target cell			

Table 16.1.2.1.5-2: E-UTRA Cell specific test parameters for NR SA FR1 - E-UTRA Cell reselection to higher priority E-UTRA for 1RX

Parameter	Unit	Cell 2		
		T1	T2	T3
E-UTRA RF Channel number		1		
$BW_{channel}$	MHz	10		
OCNG Patterns defined in TS 36.133 [15] clause A.3.2		OP.2 TDD for test configuration 1, 2, 3; OP.2 FDD for test configuration 4, 5, 6		
PBCH_RA	dB	0		
PBCH_RB	dB			
PSS_RA	dB			
SSS_RA	dB			
PCFICH_RB	dB			
PHICH_RA	dB			
PHICH_RB	dB			
PDCCH_RA	dB			
PDCCH_RB	dB			
PDSCH_RA	dB			
PDSCH_RB	dB			
OCNG_RA Note 1	dB			
OCNG_RB Note 1	dB			
Qrxlevmin	dBm	-140		
N_{oc}	dBm/15 kHz	-98		
RSRP	dBm/15 KHz	-infinity	-86	-102
$\hat{E}_s / I_{ot}$	dB	-infinity	12	-4
$\hat{E}_s / N_{oc}$	dB	-infinity	12	-4
$Treselection_{EUTRAN}$	S	0		
SnonintrasearchP	dB	Not sent		
$Thresh_{x, highP}$	dB	48		
$Thresh_{serving, lowP}$	dB	44		
$Thresh_{x, lowP (Note 2)}$	dB	50		
Propagation Condition		AWGN		
Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols. Note 2: This refers to the value of $Thresh_{x, Low}$ which is included in E-UTRA system information, and is a threshold for the NR target cell				

The cell reselection delay to a higher priority E-UTRAN cell is defined as the time from the beginning of time period T2, to the moment when the UE camps on cell 2, and starts to send preambles on the PRACH for sending the *RRCSetupRequest* message to perform a Tracking Area Update procedure on cell 2.

The cell re-selection delay to a higher priority cell shall be less than 68 s.

The rate of correct events observed during repeated tests shall be at least 90% with the confidence level of 95%.

16.1.2.2 NR SA FR1 - E-UTRA Cell reselection to higher priority E-UTRA for 2RX

Editor's Note: This test case is incomplete in following aspects:

- Message contents are missing.

16.1.2.2.1 Test purpose

The purpose of this test is to verify the requirement for the NR – E-UTRA inter-RAT cell reselection to higher priority E-UTRA cell, for 2 Rx RedCap UEs. The requirements are specified in TS 38.133 [6] in clause 4.2.2.5.

16.1.2.2.2 Test applicability

This test applies to all types of NR RedCap UE with 2Rx from release 17 and forward.

16.1.2.2.3 Minimum conformance requirements

The minimum conformance requirements are defined in clause 16.1.2.0.1.

The normative reference for this requirement is TS 38.133 [6] clause A.16.1.2.2.

16.1.2.2.4 Test description

16.1.2.2.4.1 Initial conditions

This test shall be tested using any of the test configurations in Table 16.1.2.2.4.1-1.

Table 16.1.2.2.4.1-1: Supported test configurations for NR SA FR1 - E-UTRA Cell reselection to higher priority E-UTRA for 2 RX

Configuration	Description of serving cell	Description of target cell
16.1.2.1.2-1	NR 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode	LTE 10 MHz bandwidth, TDD duplex mode
16.1.2.1.2-2	NR 15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode	LTE 10 MHz bandwidth, TDD duplex mode
16.1.2.1.2-3	NR 30 kHz SSB SCS, 20 MHz bandwidth, TDD duplex mode	LTE 10 MHz bandwidth, TDD duplex mode
16.1.2.1.2-4	NR 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode	LTE 10 MHz bandwidth, FDD duplex mode
16.1.2.1.2-5	NR 15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode	LTE 10 MHz bandwidth, FDD duplex mode
16.1.2.1.2-6	NR 30 kHz SSB SCS, 20 MHz bandwidth, TDD duplex mode	LTE 10 MHz bandwidth, FDD duplex mode
16.1.2.1.2-7	NR 15 kHz SSB SCS, 10 MHz bandwidth, HD-FDD duplex mode	LTE 10 MHz bandwidth, TDD duplex mode
16.1.2.1.2-8	NR 15 kHz SSB SCS, 10 MHz bandwidth, HD-FDD duplex mode	LTE 10 MHz bandwidth, FDD duplex mode
Note: The UE is only required to be tested in one of the supported test configurations.		

Configure the test equipment and the DUT according to the parameters in Table 16.1.2.2.4.1-2.

Table 16.1.2.2.4.1-2: Initial conditions for NR SA FR1 - E-UTRA Cell reselection to higher priority E-UTRA for 2RX

Parameter	Value		Comment
Test environment	NC		As specified in TS 38.508-1 [14] clause 4.1.
Test frequencies	As specified in Annex E, table E.14-1 and TS 38.508-1 [14] clause 4.3.1.		
Channel bandwidth	As specified by the test configuration selected from Table 6.1.1.2.4.1-1.		
Propagation conditions	AWGN		As specified in Annex C.2.2.
Connection Diagram	TE Part	A.3.1.6.1	As specified in TS 38.508-1 [14] Annex A.
	DUT Part	A.3.2.3.2	
Exceptions to connection diagram	Without faders.		

1. The general test parameter settings are set up according to Table 16.1.2.2.4.1-3.
2. Message contents are defined in clause 16.1.2.2.4.3.
3. There are two cells in the test on two carriers. Cell 1 is the NR PCell and Cell 2 is the E-UTRA neighbour cell. Cell 1 is configured according to Annex C.1.1 and C.1.2, Cell 2 is configured according to TS 36.521-3 [26] Annex C.1.0 and C.1.1.

Table 16.1.2.2.4.1-3: General test parameters for NR SA FR1 - E-UTRA Cell reselection to higher priority E-UTRA for 2 RX

Parameter		Unit	Test configuration	Value	Comment
Initial condition	Active cell		1, 2, 3, 4, 5, 6, 7, 8	Cell1	The UE camps on cell 1 in the initial phase and during T2 period the UE reselects to cell 2.
T2 end condition	Active cell		1, 2, 3, 4, 5, 6, 7, 8	Cell2	The UE shall perform reselection to cell 2 during T2.
	Neighbour cell		1, 2, 3, 4, 5, 6, 7, 8	Cell1	
T3 end condition	Active cell		1, 2, 3, 4, 5, 6, 7, 8	Cell1	The UE shall perform reselection to cell 1 during T3 for iteration of the tests.
	Neighbour cell		1, 2, 3, 4, 5, 6, 7, 8	Cell2	
Access Barring Information		-	1, 2, 3, 4, 5, 6, 7, 8	Not Sent	No additional delays in random access procedure.
DRX cycle length		s	1, 2, 3, 4, 5, 6, 7, 8	1.28	The value shall be used for all cells in the test.
NR PRACH configuration index			1, 2, 3, 4, 5, 6, 7, 8	102	The detailed configuration is specified in TS 38.211 clause 6.3.3.2
E-UTRAN PRACH configuration index			1, 2, 3, 7	53	As specified in table 5.7.1-2 in TS 36.211 [23]
			4, 5, 6, 8	4	
E-UTRAN PRACH			1, 2, 3	53	As specified in table 5.7.1-2 in TS 36.211 [23]
configuration index			4, 5, 6	4	
T1		s	1, 2, 3, 4, 5, 6, 7, 8	>7	During T1, cell 2 shall be powered off, and during the off time the physical cell identity shall be changed. The intention is to ensure that cell 2 has not been detected by the UE prior to the start of period T2.
T2		s	1, 2, 3, 4, 5, 6, 7, 8	75	T2 needs to be defined so that cell re-selection reaction time is taken into account.
T3		s	1, 2, 3, 4, 5, 6, 7, 8	15	T3 needs to be defined so that cell re-selection reaction time is taken into account.

16.1.2.2.4.2 Test procedure

Same test procedure as in 16.1.2.1.4.2.

16.1.2.2.4.3 Message contents

Message contents are according to TS 38.508-1 [14] clause 7.3 with the following exceptions:

Table 16.1.2.2.4.3-1: Common Exception messages

Default Message Contents	
Common contents of system information blocks exceptions	TBD
Default RRC messages and information elements contents exceptions	

Table 16.1.2.2.4.3-2: TBD

TBD

16.1.2.2.5 Test requirement

Table 16.1.2.2.5-1 defines the primary level settings including test tolerances for NR – E-UTRA cell re-selection test case in AWGN for 2 Rx UE.

Table 16.1.2.2.5-1: NR cell specific test parameters for NR SA FR1 - E-UTRA Cell reselection to higher priority E-UTRA for 2 RX

Parameter	Unit	Test configuration	Cell 1		
			T1	T2	T3
TDD configuration		1, 4, 7, 8	N/A		
		2, 5	TDDConf.1.1		
		3, 6	TDDConf.2.1		
PDSCH parameters		1, 4, 7, 8	SR.1.1 FDD		
		2, 5	SR.1.1 TDD		
		3, 6	SR.2.1 TDD		
RMSI CORESET parameters		1, 4, 7, 8	CR.1.1 FDD		
		2, 5	CR.1.1 TDD		
		3, 6	CR.2.1 TDD		
Dedicated CORESET parameters		1, 4, 7, 8	CCR.1.1 FDD		
		2, 5	CCR.1.1 TDD		
		3, 6	CCR.2.1 TDD		
SSB parameters		1, 4, 7, 8	SSB.1 FR1		
		2, 5	SSB.1 FR1		
		3, 6	SSB.1 RedCap FR1		
NR SMTC parameters		1, 4, 7, 8	SMTC.2		
		2, 5	SMTC.1		
		3, 6	SMTC.1		
OCNG Pattern		1, 2, 3, 4, 5, 6, 7, 8	OP.1 defined in A.3.2.1		
Initial DL BWP configuration		1, 2, 3, 4, 5, 6, 7, 8	DLBWP.0.1		
Initial UL BWP configuration		1, 2, 3, 4, 5, 6, 7, 8	ULBWP.0.1		
RLM-RS		1, 2, 3, 4, 5, 6, 7, 8	SSB		
Qrxlevmin	dBm/SCS	1, 2, 4, 5	-140		
		3, 6	-137		
N_{oc}	dBm/SCS	1, 4, 7, 8	-98		
		2, 5	-98		
		3, 6	-95		
N_{oc}	dBm/15 kHz	1, 2, 3, 4, 5, 6, 7, 8	-98		
SS-RSRP	dBm/SCS	1, 4, 7, 8	-84	-82.40	-82.40
		2, 5	-84	-82.40	-82.40
		3, 6	-81	-79.40	-79.40
$\hat{E}_s/I_{ot}$	dB	1, 4, 7, 8	14	15.60	15.60
		2, 5			
		3, 6			
$\hat{E}_s/N_{oc}$	dB	1, 4, 7, 8	14	15.60	15.60
		2, 5			
		3, 6			
Io	dBm/9.36 MHz	1, 4, 7, 8	-55.88	-54.33	-54.33
	dBm/9.36 MHz	2, 5	-55.88	-54.33	-54.33
	dBm/18.36 MHz	3, 6	-52.95	-51.40	-51.40
Treselection	S	1, 2, 3, 4, 5, 6, 7, 8	0		
SnonintrasearchP	dB	1, 2, 3, 4, 5, 6, 7, 8	50		
$Thresh_{x, highP}$ (Note 2)	dB	1, 2, 3, 4, 5, 6, 7, 8	48		
$Thresh_{serving, lowP}$	dB	1, 2, 3, 4, 5, 6, 7, 8	44		
$Thresh_{x, lowP}$	dB	1, 2, 3, 4, 5, 6, 7, 8	50		

Propagation Condition		1, 2, 3, 4, 5, 6, 7, 8	AWGN
Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols. Note 2: This refers to the value of $Thresh_{x, high}$ which is included in NR system information, and is a threshold for the E-UTRA target cell			

Table 16.1.2.2.5-2: E-UTRA Cell specific test parameters for for NR SA FR1 - E-UTRA Cell reselection to higher priority E-UTRA for 2 RX

Parameter	Unit	Cell 2		
		T1	T2	T3
E-UTRA RF Channel number		1		
$BW_{channel}$	MHz	10		
OCNG Patterns defined in TS 36.133 [15] clause A.3.2		OP.2 TDD for test configuration 1, 2, 3; OP.2 FDD for test configuration 4, 5, 6		
PBCH_RA	dB	0		
PBCH_RB	dB			
PSS_RA	dB			
SSS_RA	dB			
PCFICH_RB	dB			
PHICH_RA	dB			
PHICH_RB	dB			
PDCCH_RA	dB			
PDCCH_RB	dB			
PDSCH_RA	dB			
PDSCH_RB	dB			
OCNG_RA Note 1	dB			
OCNG_RB Note 1	dB			
Qrxlevmin	dBm	-140		
N_{oc}	dBm/15 kHz	-98	-98	-100
RSRP	dBm/15 KHz	-infinity	-84.4	-103.6
$\hat{E}_s / I_{ot}$	dB	-infinity	13.6	-3.6
$\hat{E}_s / N_{oc}$	dB	-infinity	13.6	-3.6
$Treselection_{EUTRAN}$	S	0		
SnonintrasearchP	dB	Not sent		
$Thresh_{x, highP}$	dB	48		
$Thresh_{serving, lowP}$	dB	44		
$Thresh_{x, lowP (Note 2)}$	dB	50		
Propagation Condition		AWGN		
Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols. Note 2: This refers to the value of $Thresh_{x, Low}$ which is included in E-UTRA system information, and is a threshold for the NR target cell				

The cell reselection delay to a higher priority E-UTRAN cell is defined as the time from the beginning of time period T2, to the moment when the UE camps on cell 2 and starts to send preambles on the PRACH for sending the *RRCSetupRequest* message to perform a Tracking Area Update procedure on cell 2.

The cell re-selection delay to a higher priority cell shall be less than 68 s.

The rate of correct events observed during repeated tests shall be at least 90% with the confidence level of 95%.

16.1.2.3 NR SA FR1 - E-UTRA Cell reselection to lower priority E-UTRA for 1RX

Editor's Note: This test case is incomplete in following aspects:

- Message contents are missing.
- TT analysis is missing.

16.1.2.3.1 Test purpose

The purpose of this test is to verify the requirement for the NR – E-UTRA inter-RAT cell reselection to lower priority E-UTRA cell, for 1 Rx RedCap UEs. The requirements are specified in TS 38.133 [6] in clause 4.2B.2.5.

16.1.2.3.2 Test applicability

This test applies to all types of NR RedCap UE with 1Rx from release 17 and forward.

16.1.2.3.3 Minimum conformance requirements

The minimum conformance requirements are defined in clause 16.1.2.0.1.

The normative reference for this requirement is TS 38.133 [6] clause A.16.1.2.3.

16.1.2.3.4 Test description

16.1.2.3.4.1 Initial conditions

This test shall be tested using any of the test configurations in Table 16.1.2.3.4.1-1.

Table 16.1.2.3.4.1-1: Supported test configurations for NR SA FR1 – E-UTRA Cell reselection to lower priority E-UTRA for 1RX

Configuration	Description of serving cell	Description of target cell
16.1.2.1.3-1	NR 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode	LTE 10 MHz bandwidth, TDD duplex mode
16.1.2.1.3-2	NR 15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode	LTE 10 MHz bandwidth, TDD duplex mode
16.1.2.1.3-3	NR 30 kHz SSB SCS, 20 MHz bandwidth, TDD duplex mode	LTE 10 MHz bandwidth, TDD duplex mode
16.1.2.1.3-4	NR 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode	LTE 10 MHz bandwidth, FDD duplex mode
16.1.2.1.3-5	NR 15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode	LTE 10 MHz bandwidth, FDD duplex mode
16.1.2.1.3-6	NR 30 kHz SSB SCS, 20 MHz bandwidth, TDD duplex mode	LTE 10 MHz bandwidth, FDD duplex mode
16.1.2.1.3-7	NR 15 kHz SSB SCS, 10 MHz bandwidth, HD-FDD duplex mode	LTE 10 MHz bandwidth, TDD duplex mode
16.1.2.1.3-8	NR 15 kHz SSB SCS, 10 MHz bandwidth, HD-FDD duplex mode	LTE 10 MHz bandwidth, FDD duplex mode
Note: The UE is only required to be tested in one of the supported test configurations.		

Configure the test equipment and the DUT according to the parameters in Table 16.1.2.3.4.1-2.

Table 16.1.2.3.4.1-2: Initial conditions for NR SA FR1 – E-UTRA Cell reselection to lower priority E-UTRA for 1RX

Parameter	Value	Comment
Test environment	NC	As specified in TS 38.508-1 [14] clause 4.1.
Test frequencies	As specified in Annex E, table E.14-1 and TS 38.508-1 [14] clause 4.3.1.	

Channel bandwidth	As specified by the test configuration selected from Table 6.1.1.2.4.1-1.		
Propagation conditions	AWGN		As specified in Annex C.2.2.
Connection Diagram	TE Part	A.3.1.8.1	As specified in TS 38.508-1 [14] Annex A.
	DUT Part	A.3.2.2.1	
Exceptions to connection diagram	Without faders.		

1. The general test parameter settings are set up according to Table 16.1.2.3.4.1-3.
2. Message contents are defined in clause 16.1.2.3.4.3.
3. There are two cells in the test on two carriers. Cell 1 is the NR PCell and Cell 2 is the E-UTRA neighbour cell. Cell 1 is configured according to Annex C.1.1 and C.1.2, Cell 2 is configured according to TS 36.521-3 [26] Annex C.1.0 and C.1.1.

Table 16.1.2.3.4.1-3: General test parameters for NR SA FR1 - E-UTRA Cell reselection to lower priority E-UTRA for 1RX

Parameter		Unit	Test configuration	Value	Comment
Initial condition	Active cell		1, 2, 3, 4, 5, 6, 7, 8	Cell1	The UE camps on cell 1 in the initial phase.
	Neighbour cell		1, 2, 3, 4, 5, 6, 7, 8	Cell2	
T1 end condition	Active cell		1, 2, 3, 4, 5, 6, 7, 8	Cell2	The UE shall perform reselection to cell 2 during T1.
	Neighbour cell		1, 2, 3, 4, 5, 6, 7, 8	Cell1	
T2 end condition	Active cell		1, 2, 3, 4, 5, 6, 7, 8	Cell1	The UE shall perform reselection to cell 1 during T2 for iteration of the tests.
	Neighbour cell		1, 2, 3, 4, 5, 6, 7, 8	Cell2	
Access Barring Information		-	1, 2, 3, 4, 5, 6, 7, 8	Not Sent	No additional delays in random access procedure.
DRX cycle length		s	1, 2, 3, 4, 5, 6, 7, 8	1.28	The value shall be used for all cells in the test.
NR PRACH configuration index			1, 2, 3, 4, 5, 6, 7, 8	102	The detailed configuration is specified in TS 38.211 clause 6.3.3.2
E-UTRAN PRACH configuration index			1, 2, 3, 7	534	As specified in table 5.7.1-2 in TS 36.211 [23]
			4, 5, 6, 8		
T1		s	1, 2, 3, 4, 5, 6, 7, 8	15	T1 needs to be defined so that cell re-selection reaction time is taken into account.
T2		s	1, 2, 3, 4, 5, 6, 7, 8	75	T2 needs to be defined so that cell re-selection reaction time is taken into account.

16.1.2.3.4.2 Test procedure

Two cells are deployed in the test, which are one FR1 NR PCell (Cell 1) and an E-UTRA neighbour cell (Cell 2). The test consists of two successive time periods, with time duration of T1 and T2 respectively. Both NR cell 1 and E-UTRAN cell 2 are already identified by the UE prior to the start of the test. E-UTRAN cell 2 is of lower priority than cell 1.

The cell reselection delay to a lower priority E-UTRAN cell is defined as the time from the beginning of time period T1, to the moment when the UE camps on cell 2, and starts to send preambles on the PRACH for sending the RRC CONNECTION REQUEST message to perform a Tracking Area Update procedure on cell 2.

1. Ensure the UE is in state RRC_IDLE with generic procedure parameters connectivity *NR* according to TS 38.508-1 [14] clause 4.5 on Cell 1.

2. Set the parameters according to T2 in Table 16.1.2.3.5-1 and 16.1.2.3.5-2. SS waits at least for 32sec($T_{detect,EUTRAN}$) to ensure the UE can detect E-UTRA neighbour cell (Cell2).

3. Set the parameters according to T1 in Table 16.1.2.3.5-1 and 16.1.2.3.5-2. T1 starts.

4. The SS waits for random access requests information from the UE to perform cell re-selection on Cell 2.

5. If the UE responds on Cell 2 during time duration T1 within 8 seconds from the beginning of time period T1 then count a success for the event "re-select lower priority E-UTRA Cell 2" and continue with step 6. Otherwise, if T1 expires and the UE has not yet re-selected Cell 2, count a failure for the event "re-select lower priority E-UTRA Cell 2", the TE shall switch off and on the UE and skip to step 11.

6 The SS shall send an *RRCConnectionRelease* message to ensure that the UE is in state RRC_IDLE on Cell 2.

7. The SS shall switch the power setting from T1 to T2 as specified in Table 16.1.2.3.5-1 and 16.1.2.3.5-2. T2 starts.

8. The SS waits for random access requests information from the UE to perform cell re-selection on Cell 1.

9. If the UE has re-selected Cell 1 within T3, then count a success for the event "re-select higher priority NR Cell 1" and continue with step 10. Otherwise, if T3 expires and the UE has not yet re-selected Cell 1, count a fail for the event "re-select higher priority NR Cell 1" and the TE shall switch off and, on the UE and skip to step 12. to step 11.

10. The SS shall send an *RRCRelease* message to ensure that the UE is in state RRC_IDLE on Cell 1.

11. Ensure the UE is in state RRC_IDLE with generic procedure parameters connectivity *NR* according to TS 38.508-1 [14] clause 4.5.

12. Repeat step 2-11 until the confidence level according to Tables G.2.3-1 in Annex G clause G.2 is achieved.

16.1.2.3.4.3 Message contents

Message contents are according to TS 38.508-1 [14] clause 7.3 with the following exceptions:

Table 16.1.2.3.4.3-1: Common Exception messages

Default Message Contents	
Common contents of system information blocks exceptions	TBD
Default RRC messages and information elements contents exceptions	

Table 16.1.2.3.4.3-2: TBD

TBD

16.1.2.3.5 Test requirement

Table 16.1.2.3.5-1 defines the primary level settings including test tolerances for NR – E-UTRA cell re-selection test case in AWGN for 1 Rx UE.

Table 16.1.2.3.5-1: NR cell specific test parameters for NR SA FR1 - E-UTRA Cell reselection to lower priority E-UTRA for 1RX

Parameter	Unit	Test configuration	Cell 1	
			T1	T2
TDD configuration		1, 4, 7, 8	N/A	
		2, 5	TDDConf.1.1	
		3, 6	TDDConf.2.1	
PDSCH RMC configuration		1, 4, 7, 8	SR.1.1 FDD	
		2, 5	SR.1.1 TDD	
		3, 6	SR.2.1 TDD	

RMSI CORESET RMC configuration		1, 4, 7, 8	CR.1.1 FDD	
		2, 5	CR.1.1 TDD	
		3, 6	CR.2.1 TDD	
Dedicated CORESET RMC configuration		1, 4, 7, 8	CCR.1.1 FDD	
		2, 5	CCR.1.1 TDD	
		3, 6	CCR.2.1 TDD	
SSB configuration		1, 4, 7, 8	SSB.1 FR1	
		2, 5	SSB.1 FR1	
		3, 6	SSB.1 RedCap FR1	
SMTC configuration		1, 4, 7, 8	SMTC.2	
		2, 5	SMTC.1	
		3, 6	SMTC.1	
OCNG Pattern		1, 2, 3, 4, 5, 6, 7, 8	OP.1 defined in A.3.2.1	
Initial DL BWP configuration		1, 2, 3, 4, 5, 6, 7, 8	DLBWP.0.1	
Initial UL BWP configuration		1, 2, 3, 4, 5, 6, 7, 8	ULBWP.0.1	
RLM-RS		1, 2, 3, 4, 5, 6, 7, 8	SSB	
Qrxlevmin	dBm/SCS	1, 2, 4, 5	-140	
		3, 6	-137	
N_{oc}	dBm/SCS	1, 4, 7, 8	-98	
		2, 5	-98	
		3, 6	-95	
N_{oc}	dBm/15 kHz	1, 2, 3, 4, 5, 6, 7, 8	-98	
SS-RSRP	dBm/SCS	1, 4, 7, 8	-102	-86
		2, 5	-102	-86
		3, 6	-99	-83
$\hat{E}_s / I_{ot}$	dB	1, 4, 7, 8	-4	12
		2, 5		
		3, 6		
$\hat{E}_s / N_{oc}$	dB	1, 4, 7, 8	-4	12
		2, 5		
		3, 6		
Io	dBm/9.36 MHz	1, 4, 7, 8	-68.60	-57.78
	dBm/9.36 MHz	2, 5	-68.60	-57.78
	dBm/18.36 MHz	3, 6	-65.67	-54.85
Treselection	S	1, 2, 3, 4, 5, 6, 7, 8	0	
SnonintrasearchP	dB	1, 2, 3, 4, 5, 6, 7, 8	Not sent	
$Thresh_{x, highP}$	dB	1, 2, 3, 4, 5, 6, 7, 8	48	
$Thresh_{serving, lowP}$	dB	1, 2, 3, 4, 5, 6, 7, 8	44	
$Thresh_{x, lowP}$ (Note 2)	dB	1, 2, 3, 4, 5, 6, 7, 8	50	
Propagation Condition		1, 2, 3, 4, 5, 6, 7, 8	AWGN	

Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.

Note 2: This refers to the value of $Thresh_{x, high}$ which is included in NR system information, and is a threshold for the E-UTRA target cell

Table 16.1.2.3.5-2: E-UTRA Cell specific test parameters for NR SA FR1 - E-UTRA Cell reselection to lower priority E-UTRA for 1RX

Parameter	Unit	Cell 2	
		T1	T2
E-UTRA RF Channel number		1	
$BW_{channel}$	MHz	10	
OCNG Patterns defined in TS 36.133 [15] clause A.3.2		OP.2 TDD for test configuration 1, 2, 3; OP.2 FDD for test configuration 4, 5, 6	
PBCH_RA	dB	0	
PBCH_RB	dB		
PSS_RA	dB		
SSS_RA	dB		

PCFICH_RB	dB		
PHICH_RA	dB		
PHICH_RB	dB		
PDCCH_RA	dB		
PDCCH_RB	dB		
PDSCH_RA	dB		
PDSCH_RB	dB		
OCNG_RA Note 1	dB		
OCNG_RB Note 1	dB		
Qrxlevmin	dBm	-140	
N_{oc}	dBm/15 kHz	-98	
RSRP	dBm/15 KHz	-84	-84
$\hat{E}_s / I_{ot}$	dB	14	14
$\hat{E}_s / N_{oc}$	dB	14	14
$Treselection_{EUTRAN}$	S	0	
SnonintrasearchP	dB	Not sent	
$Thresh_{x, highP}$ (Note 2)	dB	48	
$Thresh_{serving, lowP}$	dB	44	
$Thresh_{x, lowP}$	dB	50	
Propagation Condition		AWGN	

Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.

Note 2: This refers to the value of $Thresh_{x, high}$ which is included in E-UTRA system information, and is a threshold for the NR target cell

The cell reselection delay to a lower priority E-UTRAN cell is defined as the time from the beginning of time period T1, to the moment when the UE camps on cell 2, and starts to send preambles on the PRACH for sending the *RRCSetupRequest* message to perform a Tracking Area Update procedure on cell 2.

The cell re-selection delay to a lower priority cell shall be less than 8 s.

The rate of correct events observed during repeated tests shall be at least 90% with the confidence level of 95%.

16.1.2.4 NR SA FR1 - E-UTRA Cell reselection to lower priority E-UTRA for 2RX

Editor's Note: This test case is incomplete in following aspects:

- Message contents are missing.

16.1.2.4.1 Test purpose

The purpose of this test is to verify the requirement for the NR – E-UTRA inter-RAT cell reselection to lower priority E-UTRA cell, for 2 Rx RedCap UEs. The requirements are specified in TS 38.133 [6] in clause 4.2.2.5.

16.1.2.4.2 Test applicability

This test applies to all types of NR RedCap UE with 2Rx from release 17 and forward.

16.1.2.4.3 Minimum conformance requirements

The minimum conformance requirements are defined in clause 16.1.2.0.1.

The normative reference for this requirement is TS 38.133 [6] clause A.16.1.2.4.

16.1.2.4.4 Test description

16.1.2.4.4.1 Initial conditions

This test shall be tested using any of the test configurations in Table 16.1.2.4.4.1-1.

Table 16.1.2.4.4.1-1: Supported test configurations for NR SA FR1 - E-UTRA Cell reselection to lower priority E-UTRA for 2RX

Configuration	Description of serving cell	Description of target cell
16.1.2.1.4-1	NR 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode	LTE 10 MHz bandwidth, TDD duplex mode
16.1.2.1.4-2	NR 15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode	LTE 10 MHz bandwidth, TDD duplex mode
16.1.2.1.4-3	NR 30 kHz SSB SCS, 20 MHz bandwidth, TDD duplex mode	LTE 10 MHz bandwidth, TDD duplex mode
16.1.2.1.4-4	NR 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode	LTE 10 MHz bandwidth, FDD duplex mode
16.1.2.1.4-5	NR 15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode	LTE 10 MHz bandwidth, FDD duplex mode
16.1.2.1.4-6	NR 30 kHz SSB SCS, 20 MHz bandwidth, TDD duplex mode	LTE 10 MHz bandwidth, FDD duplex mode
16.1.2.1.4-7	NR 15 kHz SSB SCS, 10 MHz bandwidth, HD-FDD duplex mode	LTE 10 MHz bandwidth, TDD duplex mode
16.1.2.1.4-8	NR 15 kHz SSB SCS, 10 MHz bandwidth, HD-FDD duplex mode	LTE 10 MHz bandwidth, FDD duplex mode
Note: The UE is only required to be tested in one of the supported test configurations.		

Configure the test equipment and the DUT according to the parameters in Table 16.1.2.4.4.1-2.

Table 16.1.2.4.4.1-2: Initial conditions for NR SA FR1 - E-UTRA Cell reselection to lower priority E-UTRA for 2RX

Parameter	Value		Comment
Test environment	NC		As specified in TS 38.508-1 [14] clause 4.1.
Test frequencies	As specified in Annex E, table E.14-1 and TS 38.508-1 [14] clause 4.3.1.		
Channel bandwidth	As specified by the test configuration selected from Table 6.1.1.2.4.1-1.		
Propagation conditions	AWGN		As specified in Annex C.2.2.
Connection Diagram	TE Part	A.3.1.6.1	As specified in TS 38.508-1 [14] Annex A.
	DUT Part	A.3.2.3.2	
Exceptions to connection diagram	Without faders.		

1. The general test parameter settings are set up according to Table 16.1.2.4.4.1-3.
2. Message contents are defined in clause 16.1.2.4.4.3.
3. There are two cells in the test on two carriers. Cell 1 is the NR PCell and Cell 2 is the E-UTRA neighbour cell. Cell 1 is configured according to Annex C.1.1 and C.1.2, Cell 2 is configured according to TS 36.521-3 [26] Annex C.1.0 and C.1.1.

Table 16.1.2.4.4.1-3: General test parameters for NR SA FR1 - E-UTRA Cell reselection to lower priority E-UTRA for 2RX

Parameter		Unit	Test configuration	Value	Comment
Initial condition	Active cell		1, 2, 3, 4, 5, 6, 7, 8	Cell1	The UE camps on cell 1 in the initial phase.
	Neighbour cell		1, 2, 3, 4, 5, 6, 7, 8	Cell2	
T1 end condition	Active cell		1, 2, 3, 4, 5, 6, 7, 8	Cell2	The UE shall perform reselection to cell 2 during T1.
	Neighbour cell		1, 2, 3, 4, 5, 6, 7, 8	Cell1	
T2 end condition	Active cell		1, 2, 3, 4, 5, 6, 7, 8	Cell1	The UE shall perform reselection to cell 1 during T2 for iteration of the tests.
	Neighbour cell		1, 2, 3, 4, 5, 6, 7, 8	Cell2	

Access Barring Information	-	1, 2, 3, 4, 5, 6, 7, 8	Not Sent	No additional delays in random access procedure.
DRX cycle length	s	1, 2, 3, 4, 5, 6, 7, 8	1.28	The value shall be used for all cells in the test.
NR PRACH configuration index		1, 2, 3, 4, 5, 6, 7, 8	102	The detailed configuration is specified in TS 38.211 clause 6.3.3.2
E-UTRAN PRACH configuration index		1, 2, 3, 7	534	As specified in table 5.7.1-2 in TS 36.211 [23]
		4, 5, 6, 8		
T1	s	1, 2, 3, 4, 5, 6, 7, 8	15	T1 needs to be defined so that cell re-selection reaction time is taken into account.
T2	s	1, 2, 3, 4, 5, 6, 7, 8	75	T2 needs to be defined so that cell re-selection reaction time is taken into account.

16.1.2.4.4.2 Test procedure

Same test procedure as in 16.1.2.3.4.2.

16.1.2.4.4.3 Message contents

Message contents are according to TS 38.508-1 [14] clause 7.3 with the following exceptions:

Table 16.1.2.4.4.3-1: Common Exception messages

Default Message Contents	
Common contents of system information blocks exceptions	TBD
Default RRC messages and information elements contents exceptions	

Table 16.1.2.4.4.3-2: TBD

TBD

16.1.2.4.5 Test requirement

Table 16.1.2.4.5-1 defines the primary level settings including test tolerances for NR – E-UTRA cell re-selection test case in AWGN for 2 Rx UE.

Table 16.1.2.4.5-1: NR cell specific test parameters for NR SA FR1 - E-UTRA Cell reselection to lower priority E-UTRA for 2RX

Parameter	Unit	Test configuration	Cell 1	
			T1	T2
TDD configuration		1, 4, 7, 8	N/A	
		2, 5	TDDConf.1.1	
		3, 6	TDDConf.2.1	
PDSCH RMC configuration		1, 4, 7, 8	SR.1.1 FDD	
		2, 5	SR.1.1 TDD	
		3, 6	SR.2.1 TDD	
RMSI CORESET RMC configuration		1, 4, 7, 8	CR.1.1 FDD	
		2, 5	CR.1.1 TDD	
		3, 6	CR.2.1 TDD	
Dedicated CORESET RMC configuration		1, 4, 7, 8	CCR.1.1 FDD	
		2, 5	CCR.1.1 TDD	
		3, 6	CCR.2.1 TDD	
SSB configuration		1, 4, 7, 8	SSB.1 FR1	
		2, 5	SSB.1 FR1	
		3, 6	SSB.1 RedCap FR1	
SMTC configuration		1, 4, 7, 8	SMTC.2	

		2, 5	SMTC.1	
		3, 6	SMTC.1	
OCNG Pattern		1, 2, 3, 4, 5, 6, 7, 8	OP.1 defined in A.3.2.1	
Initial DL BWP configuration		1, 2, 3, 4, 5, 6, 7, 8	DLBWP.0.1	
Initial UL BWP configuration		1, 2, 3, 4, 5, 6, 7, 8	ULBWP.0.1	
RLM-RS		1, 2, 3, 4, 5, 6, 7, 8	SSB	
Qrxlevmin	dBm/SCS	1, 2, 4, 5	-140	
		3, 6	-137	
N_{oc}	dBm/SCS	1, 4	-100	
		2, 5	-100	
		3, 6	-97	
N_{oc}	dBm/15 kHz	1, 2, 3, 4, 5, 6, 7, 8	-100	
SS-RSRP	dBm/SCS	1, 4, 7, 8	-102	-86
		2, 5	-102	-86
		3, 6	-99	-83
$\hat{E}_s / I_{ot}$	dB	1, 4, 7, 8	-3.6	13.6
		2, 5		
		3, 6		
$\hat{E}_s / N_{oc}$	dB	1, 4, 7, 8	-3.6	13.6
		2, 5		
		3, 6		
Io	dBm/9.36 MHz	1, 4, 7, 8	-70.84	-56.26
	dBm/9.36 MHz	2, 5	-70.84	-56.26
	dBm/18.36 MHz	3, 6	-65.12	-55.15
Treselection	S	1, 2, 3, 4, 5, 6, 7, 8	0	
SnonintrasearchP	dB	1, 2, 3, 4, 5, 6, 7, 8	Not sent	
$Thresh_{x, highP}$	dB	1, 2, 3, 4, 5, 6, 7, 8	48	
$Thresh_{serving, lowP}$	dB	1, 2, 3, 4, 5, 6, 7, 8	44	
$Thresh_{x, lowP (Note 2)}$	dB	1, 2, 3, 4, 5, 6, 7, 8	50	
Propagation Condition		1, 2, 3, 4, 5, 6, 7, 8	AWGN	

Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.

Note 2: This refers to the value of $Thresh_{x, high}$ which is included in NR system information, and is a threshold for the E-UTRA target cell

Table 16.1.2.4.5-2: E-UTRA cell specific test parameters for NR SA FR1 - E-UTRA Cell reselection to lower priority E-UTRA for 2RX

Parameter	Unit	Cell 2	
		T1	T2
E-UTRA RF Channel number		1	
$BW_{channel}$	MHz	10	
OCNG Patterns defined in TS 36.133 [15] clause A.3.2		OP.2 TDD for test configuration 1, 2, 3; OP.2 FDD for test configuration 4, 5, 6	
PBCH_RA	dB	0	
PBCH_RB	dB		
PSS_RA	dB		
SSS_RA	dB		
PCFICH_RB	dB		
PHICH_RA	dB		
PHICH_RB	dB		
PDCCH_RA	dB		
PDCCH_RB	dB		
PDSCH_RA	dB		
PDSCH_RB	dB		
OCNG_RA[Note 1]	dB		
OCNG_RB[Note 1]	dB		
Qrxlevmin	dBm	-140	

N_{oc}	dBm/15 kHz	-98	
RSRP	dBm/15 KHz	-82.4	-84
$\hat{E}_s / I_{ot}$	dB	15.6	14
$\hat{E}_s / N_{oc}$	dB	15.6	14
$Treselection_{EUTRAN}$	S	0	
SnonintrasearchP	dB	Not sent	
$Thresh_{X, highP}$ (Note 2)	dB	48	
$Thresh_{serving, lowP}$	dB	44	
$Thresh_{X, lowP}$	dB	50	
Propagation Condition		AWGN	
Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols. Note 2: This refers to the value of $Thresh_{X, high}$ which is included in E-UTRA system information, and is a threshold for the NR target cell			

The cell reselection delay to a lower priority E-UTRAN cell is defined as the time from the beginning of time period T1, to the moment when the UE camps on cell 2, and starts to send preambles on the PRACH for sending the *RRCSetupRequest* message to perform a Tracking Area Update procedure on cell 2.

The cell re-selection delay to a lower priority cell shall be less than 8 s.

The rate of correct events observed during repeated tests shall be at least 90% with the confidence level of 95%.

16.1.2.5 NR SA FR1 - E-UTRA Cell reselection to lower priority E-UTRA for UE fulfilling stationary relaxed measurement criterion for 1 Rx UE

Editor's Note: This test case is incomplete in following aspects:

- Message contents are missing.
- Test procedure is TBD
- TT analysis is missing.
- PRACH configuration is TBD

16.1.2.5.1 Test purpose

The purpose of this test is to verify the requirement for the NR – E-UTRA inter-RAT cell reselection for UE fulfilling stationary relaxed measurement criterion for 1 Rx RedCap UEs. The requirements are specified in TS 38.133 [6] in clause 4.2B.2.11.2.

16.1.2.5.2 Test applicability

This test applies to all types of NR RedCap UE with 1Rx from release 17 and forward.

16.1.2.5.3 Minimum conformance requirements

The minimum conformance requirements are defined in clause 16.1.2.0.3.

The normative reference for this requirement is TS 38.133 [6] clause A.16.1.2.5.

16.1.2.5.4 Test description

16.1.2.5.4.1 Initial conditions

This test shall be tested using any of the test configurations in Table 16.1.2.5.4.1-1.

Table 16.1.2.5.4.1-1: Supported test configurations for NR SA FR1 - E-UTRA Cell reselection to lower priority E-UTRA for UE fulfilling stationary relaxed measurement criterion for 1 Rx UE

Configuration	Description of serving cell	Description of target cell
16.1.2.1.5-1	NR 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode	LTE 10 MHz bandwidth, TDD duplex mode
16.1.2.1.5-2	NR 15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode	LTE 10 MHz bandwidth, TDD duplex mode
16.1.2.1.5-3	NR 30 kHz SSB SCS, 20 MHz bandwidth, TDD duplex mode	LTE 10 MHz bandwidth, TDD duplex mode
16.1.2.1.5-4	NR 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode	LTE 10 MHz bandwidth, FDD duplex mode
16.1.2.1.5-5	NR 15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode	LTE 10 MHz bandwidth, FDD duplex mode
16.1.2.1.5-6	NR 30 kHz SSB SCS, 20 MHz bandwidth, TDD duplex mode	LTE 10 MHz bandwidth, FDD duplex mode
16.1.2.1.5-7	NR 15 kHz SSB SCS, 10 MHz bandwidth, HD-FDD duplex mode	LTE 10 MHz bandwidth, TDD duplex mode
16.1.2.1.5-8	NR 15 kHz SSB SCS, 10 MHz bandwidth, HD-FDD duplex mode	LTE 10 MHz bandwidth, FDD duplex mode
Note: The UE is only required to be tested in one of the supported test configurations.		

Configure the test equipment and the DUT according to the parameters in Table 16.1.2.5.4.1-2.

Table 16.1.2.5.4.1-2: Initial conditions for NR SA FR1 - E-UTRA Cell reselection to lower priority E-UTRA for UE fulfilling stationary relaxed measurement criterion for 1 Rx UE

Parameter	Value		Comment
Test environment	NC		As specified in TS 38.508-1 [14] clause 4.1.
Test frequencies	As specified in Annex E, table E.4-1 and TS 38.508-1 [14] clause 4.3.1.		
Channel bandwidth	As specified by the test configuration selected from Table 6.1.1.2.4.1-1.		
Propagation conditions	AWGN		As specified in Annex C.2.2.
Connection Diagram	TE Part	A.3.1.8.1	As specified in TS 38.508-1 [14] Annex A.
	DUT Part	A.3.2.2.1	
Exceptions to connection diagram	Without faders.		

1. The general test parameter settings are set up according to Table 16.1.2.5.4.1-3.
2. Message contents are defined in clause 16.1.2.5.4.3.
3. There are two cells in the test on two carriers. Cell 1 is the NR PCell and Cell 2 is the E-UTRA neighbour cell. Cell 1 is configured according to Annex C.1.1 and C.1.2, Cell 2 is configured according to TS 36.521-3 [26] Annex C.1.0 and C.1.1.

Table 16.1.2.5.4.1-3: General test parameters for NR SA FR1 - E-UTRA Cell reselection to lower priority E-UTRA for UE fulfilling stationary relaxed measurement criterion for 1 Rx UE

Parameter		Unit	Test configuration	Value	Comment
Initial condition	Active cell		1, 2, 3, 4, 5, 6, 7, 8	Cell1	The UE camps on cell 1 in the initial phase, it fulfils stationary criterion, and during T1 period the UE reselects to cell 2
	Neighbour cells		1, 2, 3, 4, 5, 6, 7, 8	Cell2	
T1 end condition	Active cell		1, 2, 3, 4, 5, 6, 7, 8	Cell2	The UE shall perform reselection to cell 2 during T1
	Neighbour cells		1, 2, 3, 4, 5, 6, 7, 8	Cell1	
T2 end condition	Active cell		1, 2, 3, 4, 5, 6, 7, 8	Cell1	The UE shall perform reselection to cell 1 with higher priority during T2 for iteration of the tests.
	Neighbour cells		1, 2, 3, 4, 5, 6, 7, 8	Cell2	

Access Barring Information	-	1, 2, 3, 4, 5, 6, 7, 8	Not Sent	No additional delays in random access procedure.
DRX cycle length	s	1, 2, 3, 4, 5, 6, 7, 8	0.64	The value shall be used for all cells in the test.
NR PRACH configuration index		1, 2, 3, 4, 5, 6, 7, 8	TBD	The detailed configuration is specified in TS 38.211 clause 6.3.3.2
E-UTRAN PRACH configuration index		1, 2, 3, 7, 8	53	As specified in table 5.7.1-2 in TS 36.211 [23]
		4, 5, 6	4	
T1	s	1, 2, 3, 4, 5, 6, 7, 8	24	T1 needs to be defined so that cell re-selection reaction time is taken into account.
T2	s	1, 2, 3, 4, 5, 6, 7, 8	24	T2 needs to be defined so that cell re-selection reaction time is taken into account.

16.1.2.5.4.2 Test procedure

TBD

16.1.2.5.4.3 Message contents

Message contents are according to TS 38.508-1 [14] clause 7.3 with the following exceptions:

Table 16.1.2.5.4.3-1: Common Exception messages

Default Message Contents	
Common contents of system information blocks exceptions	TBD
Default RRC messages and information elements contents exceptions	

Table 16.1.2.5.4.3-2: TBD

TBD

16.1.2.5.5 Test requirement

Table 16.1.2.5.5-1 defines the primary level settings including test tolerances for NR – E-UTRA cell re-selection test case in AWGN for UE fulfilling stationary relaxed measurement criterion for 1 Rx UE.

Table 16.1.2.5.5-1: NR cell specific test parameters for NR SA FR1 - E-UTRA Cell reselection to lower priority E-UTRA for UE fulfilling stationary relaxed measurement criterion for 1 Rx UE

Parameter	Unit	Test configuration	Cell 1	
			T1	T2
TDD configuration		1, 4,7, 8	N/A	
		2, 5	TDDConf.1.1	
		3, 6	TDDConf.2.1	
PDSCH RMC configuration		1, 4, 8	SR.1.1 FDD	
		2, 5	SR.1.1 TDD	
		3, 6	SR.2.1 TDD	
RMSI CORESET RMC configuration		1, 4, 8	CR.1.1 FDD	
		2, 5	CR.1.1 TDD	
		3, 6	CR.2.1 TDD	
Dedicated CORESET RMC configuration		1, 4, 8	CCR.1.1 FDD	
		2, 5	CCR.1.1 TDD	
		3, 6	CCR.2.1 TDD	
SSB configuration		1, 4, 8	SSB.1 FR1	
		2, 5	SSB.1 FR1	
		3, 6	SSB.1 RedCap FR1	
SMTC configuration		1, 4, 8	SMTC.2	
		2, 5	SMTC.1	

		3, 6	SMTC.1	
OCNG Pattern		1, 2, 3, 4, 5, 6, 7, 8	OP.1 defined in A.3.2.1	
Initial DL BWP configuration		1, 2, 3, 4, 5, 6, 7, 8	DLBWP.0.1	
Initial UL BWP configuration		1, 2, 3, 4, 5, 6, 7, 8	ULBWP.0.1	
RLM-RS		1, 2, 3, 4, 5, 6, 7, 8	SSB	
Qrxlevmin	dBm/SCS	1, 2, 4, 5	-140	
		3, 6	-137	
N_{oc}	dBm/SCS	1, 4, 8	-98	
		2, 5	-98	
		3, 6	-95	
N_{oc}	dBm/15 kHz	1, 2, 3, 4, 5, 6, 7, 8	-98	
SS-RSRP	dBm/SCS	1, 4, 8	-102	-86
		2, 5	-102	-86
		3, 6	-99	-83
$\hat{E}_s / I_{ot}$	dB	1, 4, 8	-4	12
		2, 5		
		3, 6		
$\hat{E}_s / N_{oc}$	dB	1, 4, 8	-4	12
		2, 5		
		3, 6		
Io	dBm/9.36 MHz	1, 4, 8	-68.60	-57.78
	dBm/9.36 MHz	2, 5	-68.60	-57.78
	dBm/18.36 MHz	3, 6	-65.67	-54.85
TreselectionP	S	1, 2, 3, 4, 5, 6, 7, 8	0	
Snonintrasearch	dB	1, 2, 3, 4, 5, 6, 7, 8	50	
$Thresh_{x, highP}$	dB	1, 2, 3, 4, 5, 6, 7, 8	48	
$Thresh_{serving, lowP}$	dB	1, 2, 3, 4, 5, 6, 7, 8	44	
$Thresh_{x, lowP (Note 2)}$	dB	1, 2, 3, 4, 5, 6, 7, 8	50	
$S_{SearchDeltaP-Stationary}$	dB	1, 2, 3, 4, 5, 6, 7, 8	3	
$T_{SearchDeltaP-Stationary}$	s	1, 2, 3, 4, 5, 6, 7, 8	5	
Propagation Condition		1, 2, 3, 4, 5, 6, 7, 8	AWGN	

Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.

Note 2: This refers to the value of $Thresh_{x, low}$ which is included in NR system information, and is a threshold for the E-UTRA target cell

Table 16.1.2.5.5-2: E-UTRA cell specific test parameters for NR SA FR1 - E-UTRA Cell reselection to lower priority E-UTRA for UE fulfilling stationary relaxed measurement criterion for 1 Rx UE

Parameter	Unit	Cell 2	
		T1	T2
E-UTRA RF Channel number		1	
$BW_{channel}$	MHz	10	
OCNG Patterns defined in TS 36.133 [15] clause A.3.2		OP.2 TDD for test configuration 1, 2, 3; OP.2 FDD for test configuration 4, 5, 6	
PBCH_RA	dB	0	
PBCH_RB	dB		
PSS_RA	dB		
SSS_RA	dB		
PCFICH_RB	dB		
PHICH_RA	dB		
PHICH_RB	dB		

PDCCH_RA	dB		
PDCCH_RB	dB		
PDSCH_RA	dB		
PDSCH_RB	dB		
OCNG_RA Note 1	dB		
OCNG_RB Note 1	dB		
Qrxlevmin	dBm	-140	
N_{oc}	dBm/15 kHz	-98	
RSRP	dBm/15 KHz	-84	-84
$\hat{E}_s / I_{ot}$	dB	14	14
$\hat{E}_s / N_{oc}$	dB	14	14
$Treselection_{EUTRAN}$	S	0	
Snonintrasearch	dB	Not sent	
$Thresh_{X, high (Note 2)}$	dB	48	
$Thresh_{serving, low}$	dB	44	
$Thresh_{X, low}$	dB	50	
Propagation Condition		AWGN	

Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.

Note 2: This refers to the value of $Thresh_{X, high}$ which is included in E-UTRA system information, and is a threshold for the NR target cell

The cell reselection delay to a lower priority E-UTRAN cell with UE fulfilling stationary relaxed measurement criterion is defined as the time from the beginning of time period T1, to the moment when the UE camps on cell 2, and starts to send preambles on the PRACH for sending the *RRCConnectionRequest* message to perform a Tracking Area Update procedure on cell 2.

The cell re-selection delay to a lower priority cell shall be less than 32 s.

The rate of correct events observed during repeated tests shall be at least 90% with the confidence level of 95%.

16.1.2.6 NR SA FR1 - E-UTRA Cell reselection to lower priority E-UTRA for UE fulfilling stationary relaxed measurement criterion for 2 Rx UE

Editor's Note: This test case is incomplete in following aspects:

- Message contents are missing.
- Test procedure is TBD
- PRACH configuration is TBD

16.1.2.6.1 Test purpose

The purpose of this test is to verify the requirement for the NR – E-UTRA inter-RAT cell reselection for UE fulfilling stationary relaxed measurement criterion for 2 Rx RedCap UEs. The requirements are specified in TS 38.133 [6] in clause 4.2B.2.11.2.

16.1.2.6.2 Test applicability

This test applies to all types of NR RedCap UE with 2Rx from release 17 and forward.

16.1.2.6.3 Minimum conformance requirements

The minimum conformance requirements are defined in clause 16.1.2.0.3.

The normative reference for this requirement is TS 38.133 [6] clause A.16.1.2.6.

16.1.2.6.4 Test description

16.1.2.6.4.1 Initial conditions

This test shall be tested using any of the test configurations in Table 16.1.2.6.4.1-1.

Table 16.1.2.6.4.1-1: Supported test configurations for NR SA FR1 - E-UTRA Cell reselection to lower priority E-UTRA for UE fulfilling stationary relaxed measurement criterion for 2 Rx UE

Configuration	Description of serving cell	Description of target cell
16.1.2.1.6-1	NR 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode	LTE 10 MHz bandwidth, TDD duplex mode
16.1.2.1.6-2	NR 15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode	LTE 10 MHz bandwidth, TDD duplex mode
16.1.2.1.6-3	NR 30 kHz SSB SCS, 20 MHz bandwidth, TDD duplex mode	LTE 10 MHz bandwidth, TDD duplex mode
16.1.2.1.6-4	NR 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode	LTE 10 MHz bandwidth, FDD duplex mode
16.1.2.1.6-5	NR 15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode	LTE 10 MHz bandwidth, FDD duplex mode
16.1.2.1.6-6	NR 30 kHz SSB SCS, 20 MHz bandwidth, TDD duplex mode	LTE 10 MHz bandwidth, FDD duplex mode
16.1.2.1.6-7	NR 15 kHz SSB SCS, 10 MHz bandwidth, HD-FDD duplex mode	LTE 10 MHz bandwidth, TDD duplex mode
16.1.2.1.6-8	NR 15 kHz SSB SCS, 10 MHz bandwidth, HD-FDD duplex mode	LTE 10 MHz bandwidth, FDD duplex mode
Note: The UE is only required to be tested in one of the supported test configurations.		

Configure the test equipment and the DUT according to the parameters in Table 16.1.2.6.4.1-2.

Table 16.1.2.6.4.1-2: Initial conditions for NR SA FR1 - E-UTRA Cell reselection to lower priority E-UTRA for UE fulfilling stationary relaxed measurement criterion for 2 Rx UE

Parameter	Value		Comment
Test environment	NC		As specified in TS 38.508-1 [14] clause 4.1.
Test frequencies	As specified in Annex E, table E.14-1 and TS 38.508-1 [14] clause 4.3.1.		
Channel bandwidth	As specified by the test configuration selected from Table 6.1.1.2.4.1-1.		
Propagation conditions	AWGN		As specified in Annex C.2.2.
Connection Diagram	TE Part	A.3.1.6.1	As specified in TS 38.508-1 [14] Annex A.
	DUT Part	A.3.2.3.2	
Exceptions to connection diagram	Without faders.		

1. The general test parameter settings are set up according to Table 16.1.2.6.4.1-3.
2. Message contents are defined in clause 16.1.2.6.4.3.
3. There are two cells in the test on two carriers. Cell 1 is the NR PCell and Cell 2 is the E-UTRA neighbour cell. Cell 1 is configured according to Annex C.1.1 and C.1.2, Cell 2 is configured according to TS 36.521-3 [26] Annex C.1.0 and C.1.1.

Table 16.1.2.6.4.1-3: General test parameters for NR SA FR1 - E-UTRA Cell reselection to lower priority E-UTRA for UE fulfilling stationary relaxed measurement criterion for 2 Rx UE

Parameter		Unit	Test configuration	Value	Comment
Initial condition	Active cell		1, 2, 3, 4, 5, 6, 7, 8	Cell1	The UE camps on cell 1 in the initial phase, it fulfils stationary criterion, and during T1 period the UE reselects to cell 2
	Neighbour cells		1, 2, 3, 4, 5, 6, 7, 8	Cell2	
T1 end condition	Active cell		1, 2, 3, 4, 5, 6, 7, 8	Cell2	The UE shall perform reselection to cell 2 during T1
	Neighbour cells		1, 2, 3, 4, 5, 6, 7, 8	Cell1	
T2 end condition	Active cell		1, 2, 3, 4, 5, 6, 7, 8	Cell1	The UE shall perform reselection to cell 1 with higher priority during T2 for iteration of the tests.
	Neighbour cells		1, 2, 3, 4, 5, 6, 7, 8	Cell2	
Access Barring Information		-	1, 2, 3, 4, 5, 6, 7, 8	Not Sent	No additional delays in random access procedure.
DRX cycle length		s	1, 2, 3, 4, 5, 6, 7, 8	0.64	The value shall be used for all cells in the test.
NR PRACH configuration index			1, 2, 3, 4, 5, 6, 7, 8	TBD	The detailed configuration is specified in TS 38.211 clause 6.3.3.2
E-UTRAN PRACH configuration index			1, 2, 3, 7	53	As specified in table 5.7.1-2 in TS 36.211 [23]
			4, 5, 6, 8	4	
T1		s	1, 2, 3, 4, 5, 6, 7, 8	24	T1 needs to be defined so that cell re-selection reaction time is taken into account.
T2		s	1, 2, 3, 4, 5, 6, 7, 8	24	T2 needs to be defined so that cell re-selection reaction time is taken into account.

16.1.2.6.4.2 Test procedure

TBD

16.1.2.6.4.3 Message contents

Message contents are according to TS 38.508-1 [14] clause 7.3 with the following exceptions:

Table 16.1.2.6.4.3-1: Common Exception messages

Default Message Contents	
Common contents of system information blocks exceptions	TBD
Default RRC messages and information elements contents exceptions	

Table 16.1.2.6.4.3-2: TBD

TBD

16.1.2.6.5 Test requirement

Table 16.1.2.6.5-1 defines the primary level settings including test tolerances for NR – E-UTRA cell re-selection test case in AWGN for UE fulfilling stationary relaxed measurement criterion for 2 Rx UE.

Table 16.1.2.6.5-1: NR cell specific test parameters for NR SA FR1 - E-UTRA Cell reselection to lower priority E-UTRA for UE fulfilling stationary relaxed measurement criterion for 2 Rx UE

Parameter	Unit	Test configuration	Cell 1

			T1	T2
TDD configuration		1, 4, 7, 8	N/A	
		2, 5	TDDConf.1.1	
		3, 6	TDDConf.2.1	
PDSCH RMC configuration		1, 4, 7, 8	SR.1.1 FDD	
		2, 5	SR.1.1 TDD	
		3, 6	SR.2.1 TDD	
RMSI CORESET RMC configuration		1, 4, 7, 8	CR.1.1 FDD	
		2, 5	CR.1.1 TDD	
		3, 6	CR.2.1 TDD	
Dedicated CORESET RMC configuration		1, 4, 7, 8	CCR.1.1 FDD	
		2, 5	CCR.1.1 TDD	
		3, 6	CCR.2.1 TDD	
SSB configuration		1, 4, 7, 8	SSB.1 FR1	
		2, 5	SSB.1 FR1	
		3, 6	SSB.1 RedCap FR1	
SMTC configuration		1, 4, 7, 8	SMTC.2	
		2, 5	SMTC.1	
		3, 6	SMTC.1	
OCNG Pattern		1, 2, 3, 4, 5, 6, 7, 8	OP.1 defined in A.3.2.1	
Initial DL BWP configuration		1, 2, 3, 4, 5, 6, 7, 8	DLBWP.0.1	
Initial UL BWP configuration		1, 2, 3, 4, 5, 6, 7, 8	ULBWP.0.1	
RLM-RS		1, 2, 3, 4, 5, 6, 7, 8	SSB	
Qrxlevmin	dBm/SCS	1, 2, 4, 5	-140	
		3, 6	-137	
N_{oc}	dBm/SCS	1, 4, 7, 8	-100	
		2, 5	-100	
		3, 6	-97	
N_{oc}	dBm/15 kHz	1, 2, 3, 4, 5, 6, 7, 8	-100	
SS-RSRP	dBm/SCS	1, 4, 7, 8	-103.6	-84.4
		2, 5	-103.6	-84.4
		3, 6	-100.6	-81-4
$\hat{E}_s / I_{ot}$	dB	1, 4, 7, 8	-3.6	13.6
		2, 5		
		3, 6		
$\hat{E}_s / N_{oc}$	dB	1, 4, 7, 8	-3.6	13.6
		2, 5		
		3, 6		
Io	dBm/9.36 MHz	1, 4, 7, 8	-70.84	-56.26
	dBm/9.36 MHz	2, 5	-70.84	-56.26
	dBm/18.36 MHz	3, 6	-65.12	-53.15
TreselectionP	S	1, 2, 3, 4, 5, 6, 7, 8	0	
Snonintrasearch	dB	1, 2, 3, 4, 5, 6, 7, 8	50	
$Thresh_{x, highP}$	dB	1, 2, 3, 4, 5, 6, 7, 8	48	
$Thresh_{serving, lowP}$	dB	1, 2, 3, 4, 5, 6, 7, 8	44	
$Thresh_{x, lowP (Note 2)}$	dB	1, 2, 3, 4, 5, 6, 7, 8	50	
$S_{SearchDeltaP-Stationary}$	dB	1, 2, 3, 4, 5, 6, 7, 8	3	
$T_{SearchDeltaP-Stationary}$	s	1, 2, 3, 4, 5, 6, 7, 8	5	
Propagation Condition		1, 2, 3, 4, 5, 6, 7, 8	AWGN	

Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.

Note 2: This refers to the value of $Thresh_{x, low}$ which is included in NR system information, and is a threshold for the E-UTRA target cell

Table 16.1.2.6.5-2: E-UTRA cell specific test parameters for NR SA FR1 - E-UTRA Cell reselection to lower priority E-UTRA for UE fulfilling stationary relaxed measurement criterion for 2 Rx UE

Parameter	Unit	Cell 2	
		T1	T2

E-UTRA RF Channel number		1	
$BW_{channel}$	MHz	10	
OCNG Patterns defined in TS 36.133 [15] clause A.3.2		OP.2 TDD for test configuration 1, 2, 3; OP.2 FDD for test configuration 4, 5, 6	
PBCH_RA	dB	0	
PBCH_RB	dB		
PSS_RA	dB		
SSS_RA	dB		
PCFICH_RB	dB		
PHICH_RA	dB		
PHICH_RB	dB		
PDCCH_RA	dB		
PDCCH_RB	dB		
PDSCH_RA	dB		
PDSCH_RB	dB		
OCNG_RA[Note 1]	dB		
OCNG_RB[Note 1]	dB		
Qrxlevmin	dBm	-140	
N_{oc}	dBm/15 kHz	-98	
RSRP	dBm/15 KHz	-82.4	-84
$\hat{E}_s / I_{ot}$	dB	15.6	14
$\hat{E}_s / N_{oc}$	dB	15.6	14
$Treselection_{EUTRAN}$	S	0	
Snonintrasearch	dB	Not sent	
$Thresh_{x, high (Note 2)}$	dB	48	
$Thresh_{serving, low}$	dB	44	
$Thresh_{x, low}$	dB	50	
Propagation Condition		AWGN	
Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols. Note 2: This refers to the value of $Thresh_{x, high}$ which is included in E-UTRA system information, and is a threshold for the NR target cell			

The cell reselection delay to a lower priority E-UTRAN cell with UE fulfilling stationary relaxed measurement criterion is defined as the time from the beginning of time period T1, to the moment when the UE camps on cell 2, and starts to send preambles on the PRACH for sending the *RRCConnectionRequest* message to perform a Tracking Area Update procedure on cell 2.

The cell re-selection delay to a lower priority cell shall be less than 32 s.

The rate of correct events observed during repeated tests shall be at least 90% with the confidence level of 95%.

16.2

16.3 RRC_CONNECTED state mobility for RedCap

16.3.1 Handover

16.3.1.0 Minimum conformance requirements

16.3.1.0.1 Minimum conformance requirements for NR – E-UTRAN handover

The requirements in clause 6.3.1.0.1 shall apply when RedCap UE is capable of 2 Rx.

When UE is only required to support 1 Rx antenna, the requirements for category 1bis UE defined in 36.133 [23] clause 5.1.2 shall apply.

The normative reference for this requirement is TS 38.133 [6] clause 6.1D.2.1.

16.3.1.0.2 Minimum conformance requirements for NR FR1 – NR FR1 handover

The purpose of NR handover is to change the NR PCell to another NR cell for RedCap UE. The requirements in this clause are applicable to SA NR.

The requirements in this clause apply for the following handover scenarios:

- Handover to a target cell's initial BWP associated with CD-SSB;
- Handover to a target cell's specific Redcap BWP associated with NCD-SSB besides to the initial BWP associated with CD-SSB (i.e. UE directly sync to the NCD-SSB and perform RACH on that BWP).

The requirements in clause 6.3.1.0.2 shall apply when RedCap UE is capable of 2 Rx.

When UE is only required to support 1 Rx antenna, the requirements defined in clause 6.1.1.2 shall apply except that:

- T_{search} is the time required to search the target cell when the target cell is not already known when the handover command is received by the UE. If the target cell is known, then T_{search} = 0 ms. If the target cell is an unknown intra-frequency cell and the target cell Es/Iot≥-2 dB, then T_{search} = 2*T_{rs} ms. If the target cell is an unknown inter-frequency cell and the target cell Es/Iot≥-2 dB, then T_{search} = 5* T_{rs} ms. Regardless of whether DRX is in use by the UE, T_{search} shall still be based on non-DRX target cell search times.
- T_{rs} is the SMTC periodicity of the target NR cell if the UE has been provided with an SMTC configuration for the target cell in the handover command, otherwise, T_{rs} is the SMTC configured in the *measObjectNR* having the same SSB frequency and subcarrier spacing as NCD-SSB indicated by *nonCellDefiningSSB-r17* if the first active DL BWP included in handover command is configured with *nonCellDefiningSSB-r17*, otherwise, as CD-SSB indicated by *absoluteFrequencySSB* in *frequencyInfoDL* in handover command.
- If the measObjectNRs having the same SSB frequency and subcarrier spacing configured by MN and SN have different SMTC, Trs is the periodicity of one of the SMTC which is up to UE implementation. If the UE is not provided SMTC configuration or measurement object on this frequency, the requirement in this clause is applied with T_{rs}=5ms assuming the SSB transmission periodicity is 5ms. There is no requirement if the SSB transmission periodicity is not 5ms. If the UE has been provided with higher layer in TS 38.331 [2] signalling of *smtc2* prior to the handover command, T_{rs} follows *smtc1* or *smtc2* according to the physical cell ID of the target cell.

For RedCap UE with HD-FDD, the handover requirements are met provided that

- SSB is available at the UE once every SMTC period during Tsearch
- One SSB is available during T_{Δ}
- One SSB is available during $T_{IU.}$

The normative reference for this requirement is TS 38.133 [6] clause 6.1D.1.2.

16.3.1.1 NR SA FR1 Intra-frequency handover from FR1 to FR1 with known target cell for 1 Rx UE

Editor's note: This test cases is incomplete in following aspects:

- TT analysis is still missing

16.3.1.1.1 Test purpose

To verify the requirement for the NR FR1-NR FR1 intra frequency handover requirements for 1 Rx RedCap UE specified in 38.133 [6] clause 6.1D.1.2.

16.3.1.1.2 Test applicability

This test applies to all types of NR RedCap UE with 1 Rx from Release 17 onwards.

16.3.1.1.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 16.3.1.0.2.

The normative reference for this requirement is TS 38.133 [6] clause A.16.3.1.1.

16.3.1.1.4 Test description

16.3.1.1.4.1 Initial conditions

Same as the initial conditions given in sub-clause 6.3.1.1.4.1 with the following exceptions:

- Table 6.3.1.1.4.1-1 is replaced by Table 16.3.1.1.4.1-1.
- Table 6.3.1.1.4.1-2 is replaced by Table 16.3.1.1.4.1-2.
- Table 6.3.1.1.4.1-3 is replaced by Table 16.3.1.1.4.1-3.

Table 16.3.1.1.4.1-1: Supported test configurations

Configuration	Description
16.3.1.1-1	Source cell:NR 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode Target cell: NR 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode
16.3.1.1-2	Source cell:NR 15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode Target cell: NR 15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode
16.3.1.1-3	Source cell:NR 30 kHz SSB SCS, 20 MHz bandwidth, TDD duplex mode Target cell: NR 30 kHz SSB SCS, 20 MHz bandwidth, TDD duplex mode
16.3.1.1-4	Source cell:NR 15 kHz SSB SCS, 10 MHz bandwidth, HD-FDD duplex mode Target cell: NR 15 kHz SSB SCS, 10 MHz bandwidth, HD-FDD duplex mode
Note: The UE is only required to be tested in one of the supported test configurations	

Table 16.3.1.1.4.1-2: Initial conditions

Parameter	Value		Comment
Test environment	NC		As specified in TS 38.508-1 [14] clause 4.1.
Test frequencies	As specified in Annex E, Table E.14-1 and TS 38.508-1 [14] clause 4.3.1.		
Channel bandwidth	As specified by the test configuration selected from Table 16.3.1.1.4.1-1.		
Propagation conditions	AWGN		As specified in Annex C.2.2.
Connection Diagram	TE Part	A.3.1.8.1	As specified in TS 38.508-1 [14] Annex A.
	DUT Part	A.3.2.2.1	
Exceptions to connection diagram	N/A		

Table 16.3.1.1.4.1-3: General test parameters

Parameter		Unit	Value	Comment
Initial conditions	Active cell		Cell 1	
	Neighbouring cell		Cell 2	
Final condition	Active cell		Cell 2	
A3-Offset		dB	0	
Hysteresis		dB	0	
Time To Trigger		s	0	
Filter coefficient			0	L3 filtering is not used
Access Barring Information		-	Not Sent	No additional delays in random access procedure.
Time offset between cells			3 μs	Synchronous cells
T1		s	5	
T2		s	≤5	
T3		s	1	

16.3.1.1.4.2 Test procedure

Same as the test procedure given in sub-clause 6.3.1.1.4.2.

16.3.1.1.4.3 Message contents

Same as the message contents specified in sub-clause 6.3.1.1.4.3.

16.3.1.1.5 Test requirement

Same as the test requirements given in sub-clause 6.3.1.1.5 with following exceptions:

- Table 6.3.1.1.5-1 is replaced by Table 16.3.1.1.5-1.
- $T_{interrupt}$ in test requirements is specified in 38.133 [6] clause 6.1D.2.2.

Table 16.3.1.1.5-1: Cell specific test parameters

Parameter		Unit	Cell 1			Cell 2		
			T1	T2	T3	T1	T2	T3
NR RF Channel Number			1			1		
Duplex mode	Config 1		FDD					
	Config 2,3		TDD					
	Config 4		HD-FDD					
TDD configuration	Config 1,4		Not Applicable					
	Config 2		TDDConf.1.1					
	Config 3		TDDConf.2.1					
$BW_{channel}$	Config 1,2,4	MHz	10: $N_{RB,c}$ = 52					
	Config 3		20: $N_{RB,c}$ = 51					
BWP BW	Config 1,2,4	MHz	10: $N_{RB,c}$ = 52					
	Config 3		20: $N_{RB,c}$ = 51					
DRX Cycle		ms	Not Applicable					
PDSCH Reference measurement channel	Config 1,4		SR.1.1 FDD					
	Config 2		SR.1.1 TDD					
	Config 3		SR.2.1 TDD					
CORESET Reference Channel	Config 1,4		CR.1.1 FDD					
	Config 2		CR.1.1 TDD					
	Config 3		CR.2.1 TDD					
TRS configuration	Config 1,4		TRS.1.1 FDD					
	Config 2		TRS.1.1 TDD					
	Config 3		TRS.1.2 TDD					
OCNG Patterns			OP.1					
SMTC Configuration			SMTC.1					
SSB Configuration	Config 1,2,4		SSB.1 FR1			SSB.1 FR1		
	Config 3		SSB.1 RedCap FR1			SSB.1 RedCap FR1		
	Config 1,2,4	kHz	15 kHz					

PDSCH/PDCCH subcarrier spacing	Config 3		30 kHz					
PUCCH/PUSCH subcarrier spacing	Config 1,2,4	kHz	15 kHz					
	Config 3		30 kHz					
PRACH configuration			PRACH.1 FR1					
Initial DL BWP			DLBWP.0.1					
Dedicated DL BWP			DLBWP.1.1					
Initial UL BWP			ULBWP.0.1					
Dedicated UL BWP			ULBWP.1.1					
EPRE ratio of PSS to SSS		dB	0					
EPRE ratio of PBCH DMRS to SSS								
EPRE ratio of PBCH to PBCH DMRS								
EPRE ratio of PDCCH DMRS to SSS								
EPRE ratio of PDCCH to PDCCH DMRS								
EPRE ratio of PDSCH DMRS to SSS								
EPRE ratio of PDSCH to PDSCH								
EPRE ratio of OCNG DMRS to SSS Note 1								
EPRE ratio of OCNG to OCNG DMRS Note 1								
N_{oc} Note2		dBm/15kHz	-98					
N_{oc} Note2	Config 1,2,4	dBm/SCS	-98					
	Config 3		-95					
$\hat{E}_s/I_{ot}$		dB	8	-4.27	-4.27	-∞	3.36	3.36
$\hat{E}_s/N_{oc}$		dB	8	8	8	-∞	12	12
SSB_RP	Config 1,2,4	dBm/SCS	-90	-90	-90	-∞	-86	-86
	Config 3	dBm/SCS	-87	-87	-87	-∞	-83	-83
Io Note3	Config 1,2,4	dBm/ 9.36MHz	-61.41	-56.40	-56.40	-61.41	-56.40	-56.40
	Config 3	dBm/ 18.36MHz	-58.49	-53.49	-53.49	-58.49	-53.49	-53.49
Propagation condition		-	AWGN			AWGN		
Antenna Configuration			1x1					

Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.

Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for N_{oc} to be fulfilled.

Note 3: Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.

16.3.1.2 NR SA FR1 Intra-frequency handover from FR1 to FR1 with known target cell for 2 Rx UE

16.3.1.2.1 Test purpose

To verify the requirement for the NR FR1-NR FR1 intra frequency handover requirements for 2 Rx RedCap UE as specified in 38.133 [6] clause 6.1D.1.2

16.3.1.2.2 Test applicability

This test applies to all types of NR RedCap UE with 2 Rx from Release 17 onwards.

16.3.1.2.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 16.3.1.0.2.

The normative reference for this requirement is TS 38.133 [6] clause A.16.3.1.2.

16.3.1.2.4 Test description

16.3.1.2.4.1 Initial conditions

Same as the initial conditions given in sub-clause 6.3.1.1.4.1 with the following exceptions:

- Table 6.3.1.1.4.1-1 is replaced by Table 16.3.1.2.4.1-1.
- Table 6.3.1.1.4.1-2 is replaced by Table 16.3.1.2.4.1-2.
- Table 6.3.1.1.4.1-3 is replaced by Table 16.3.1.2.4.1-3

Table 16.3.1.2.4.1-1: Supported test configurations

Configuration	Description
16.3.1.2-1	Source cell:NR 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode Target cell: NR 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode
16.3.1.2-2	Source cell:NR 15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode Target cell: NR 15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode
16.3.1.2-3	Source cell:NR 30 kHz SSB SCS, 20 MHz bandwidth, TDD duplex mode Target cell: NR 30 kHz SSB SCS, 20 MHz bandwidth, TDD duplex mode
16.3.1.2-4	Source cell:NR 15 kHz SSB SCS, 10 MHz bandwidth, HD-FDD duplex mode Target cell: NR 15 kHz SSB SCS, 10 MHz bandwidth, HD-FDD duplex mode
Note: The UE is only required to be tested in one of the supported test configurations	

Table 16.3.1.2.4.1-2: Initial conditions

Parameter	Value		Comment
Test environment	NC		As specified in TS 38.508-1 [14] clause 4.1.
Test frequencies	As specified in Annex E, Table E.14-1 and TS 38.508-1 [14] clause 4.3.1.		
Channel bandwidth	As specified by the test configuration selected from Table 16.3.1.2.4.1-1.		
Propagation conditions	AWGN		As specified in Annex C.2.2.
Connection Diagram	TE Part	A.3.1.8.2	As specified in TS 38.508-1 [14] Annex A.
	DUT Part	A.3.2.3.4	
Exceptions to connection diagram	N/A		

Table 16.3.1.2.4.1-3: General test parameters

Parameter		Unit	Value	Comment
Initial conditions	Active cell		Cell 1	
	Neighbouring cell		Cell 2	
Final condition	Active cell		Cell 2	
A3-Offset		dB	-1	
Hysteresis		dB	0	
TimeToTrigger		s	0	
Filter coefficient			0	L3 filtering is not used
Access Barring Information		-	Not Sent	No additional delays in random access procedure.
Time offset between cells			3 μs	Synchronous cells
T1		s	5	
T2		s	≤5	
T3		s	1	

16.3.1.2.4.2 Test procedure

Same as the test procedure given in sub-clause 6.3.1.1.4.2.

16.3.1.2.4.3 Message contents

Same as the message contents specified in 6.3.1.1.4.3 with following exceptions:

- Table 7.3.1-3 in TS 38.508-1 [14] is used with condition SMTC.1.

16.3.1.2.5 Test requirement

Table 16.3.1.2.5-1 defines the primary level settings including test tolerances for all tests.

Table 16.3.1.2.5-1: Cell specific test parameters

Parameter		Unit	Cell 1			Cell 2		
			T1	T2	T3	T1	T2	T3
NR RF Channel Number			1			1		
Duplex mode	Config 1		FDD					
	Config 2,3		TDD					
	Config 4		HD-FDD					
TDD configuration	Config 1,4		Not Applicable					
	Config 2		TDDConf.1.1					
	Config 3		TDDConf.2.1					
$BW_{channel}$	Config 1,2,4	MHz	10: $N_{RB,c}$ = 52					
	Config 3		20: $N_{RB,c}$ = 51					
BWP BW	Config 1,2,4	MHz	10: $N_{RB,c}$ = 52					
	Config 3		20: $N_{RB,c}$ = 51					
DRX Cycle		ms	Not Applicable					
PDSCH Reference measurement channel	Config 1,4		SR.1.1 FDD					
	Config 2		SR.1.1 TDD					
	Config 3		SR.2.1 TDD					
CORESET Reference Channel	Config 1,4		CR.1.1 FDD					
	Config 2		CR.1.1 TDD					
	Config 3		CR.2.1 TDD					
TRS configuration	Config 1,4		TRS.1.1 FDD					
	Config 2		TRS.1.1 TDD					
	Config 3		TRS.1.2 TDD					
OCNG Patterns			OP.1					
SMTC Configuration			SMTC.1					
SSB Configuration	Config 1,2,4		SSB.1 FR1			SSB.1 FR1		
	Config 3		SSB.1 RedCap FR1			SSB.1 RedCap FR1		
PDSCH/PDCCH subcarrier spacing	Config 1,2,4	kHz	15 kHz					
	Config 3		30 kHz					
PUCCH/PUSCH subcarrier spacing	Config 1,2,4	kHz	15 kHz					
	Config 3		30 kHz					
PRACH configuration			PRACH.1 FR1					
BWP configuration	Initial DL BWP		DLBWP.0.1					
	Dedicated DL BWP		DLBWP.1.1					
	Initial UL BWP		ULBWP.0.1					
	Dedicated UL BWP		ULBWP.1.1					
EPRE ratio of PSS to SSS		dB	0					
EPRE ratio of PBCH DMRS to SSS								
EPRE ratio of PBCH to PBCH DMRS								
EPRE ratio of PDCCH DMRS to SSS								
EPRE ratio of PDCCH to PDCCH DMRS								
EPRE ratio of PDSCH DMRS to SSS								
EPRE ratio of PDSCH to PDSCH								
EPRE ratio of OCNG DMRS to SSS Note 1								
EPRE ratio of OCNG to OCNG DMRS Note 1								
N_{oc} Note2		dBm/ 15kHz	-98					
N_{oc} Note2	Config 1,2,4	dBm/ SCS	-98					
	Config 3		-95					
$\hat{E}_s / I_{ot}$		dB	8	-2.41	-2.41	-∞	1.36	1.36
$\hat{E}_s / N_{oc}$		dB	8	8	8	-∞	10	10

SSB_RP	Config 1,2,4	dBm/ SCS	-90	-90	-90	-∞	-88	-88
	Config 3	dBm/ SCS	-87	-87	-87	-∞	-85	-85
Io[Note3]	Config 1,2,4	dBm/ 9.36MHz	-61.41	-57.67	-57.67	-61.41	-57.67	-57.67
	Config 3	dBm/ 18.36MHz	-58.49	-54.74	-54.74	-58.49	-54.74	-54.74
Propagation condition		-	AWGN			AWGN		
Antenna Configuration			1x2					

Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.

Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for N_{oc} to be fulfilled.

Note 3: Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.

The UE shall start to transmit the PRACH to Cell 2 less than 92 ms from the beginning of time period T3.
The rate of correct handovers observed during repeated tests shall be at least 90%.

The handover delay can be expressed as: RRC procedure delay + $T_{interrupt}$, where:

- RRC procedure delay = 10 ms, is the RRC processing delay specified in TS 38.331 [2] clause 12.
- $T_{interrupt}$ = 62 ms, is the interruption time specified in TS 38.133 [6] clause 6.1D.1.2.

This gives a total of 72 ms.

16.3.1.3 NR SA FR1 Intra-frequency handover from FR1 to FR1 with unknown target cell for 1 Rx UE

Editor's Note: This test case is incomplete in following aspects:

- TT analysis is still missing.

16.3.1.3.1 Test purpose

To verify the requirement for the NR FR1-NR FR1 intra frequency handover requirements for 1Rx RedCap as specified in TS 38.133 [6] clause 6.1D.1.2.

16.3.1.3.2 Test applicability

This test applies to all types of NR RedCap UEs with 1 Rx from Release 17 onwards.

16.3.1.3.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 16.3.1.0.2.

The normative reference for this requirement is TS 38.133 [6] clause A.16.3.1.3.

16.3.1.3.4 Test description

The test scenario comprises of two carriers and one cell on each carrier. No gap patterns are configured in the test case. The test consists of two successive time periods, with time durations of T1, T2 respectively.

Before the test starts,

- UE is connected to Cell 1 with active DL BWP and active UL BWP
- UE is configured with *BWP-specific servingCellMO* under *BWP-DownlinkDedicated* which serves as the reference SSB for the serving cell. The *BWP-specific servingCellMO* corresponds to the NCD-SSB within the active DL BWP.

At the start of time duration T1, the UE does not have any timing information of cell 2. Starting T2, cell 2 becomes detectable and the UE receives an RRC handover command from the network indicating the UE to handover to cell 2 with *firstActiveDownlinkBWP-Id* configured to DL BWP and *firstActiveUplinkBWP-Id* configured to UL BWP. The start of T2 is the instant when the last TTI containing the RRC message implying handover is sent to the UE.

16.3.1.3.4.1 Initial conditions

This test shall be tested using any of the test configurations in Table 16.3.1.3.4.1-1.

Table 16.3.1.3.4.1-1: Supported test configurations

Config	Description
16.3.1.3-1	Source cell:NR 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode Target cell: NR 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode
16.3.1.3-2	Source cell:NR 15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode Target cell: NR 15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode
16.3.1.3-3	Source cell:NR 30 kHz SSB SCS, 20 MHz bandwidth, TDD duplex mode Target cell: NR 30 kHz SSB SCS, 20 MHz bandwidth, TDD duplex mode
16.3.1.3-4	Source cell:NR 15 kHz SSB SCS, 10 MHz bandwidth, HD-FDD duplex mode Target cell: NR 15 kHz SSB SCS, 10 MHz bandwidth, HD-FDD duplex mode
Note: The UE is only required to be tested in one of the supported test configurations	

Configure the test equipment and the DUT according to the parameters in Table 16.3.1.3.4.1-2

Table 16.3.1.3.4.1-2: Initial conditions

Parameter	Value		Comment
Test environment	NC		As specified in TS 38.508-1 [14] clause 4.1.
Test frequencies	As specified in Annex E, Table E.14-1 and TS 38.508-1 [14] clause 4.3.1.		
Channel bandwidth	As specified by the test configuration selected from Table 16.3.1.3.4.1-1		
Propagation conditions	AWGN		As specified in Annex C.2.2.
Connection Diagram	TE Part	A.3.1.8.1	As specified in TS 38.508-1 [14] Annex A.
	DUT Part	A.3.2.2.1	
Exceptions to connection diagram	N/A		

1. Message contents are defined in clause 16.3.1.3.4.3.
2. The power levels and settings for NR Cell 1 are set according to Annex C.1.2 and C.1.3. Cell 2 is NR FR1 target Cell, and its power levels and settings are also set according to Annex C.1.2 and C.1.3.
3. The test parameters are given in Table 16.3.1.3.4.1-3 below.

Table 16.3.1.3.4.1-3: General test parameters

Parameter		Unit	Value	Comment
Initial conditions	Active cell		Cell 1	
	Neighbouring cell		Cell 2	
Final condition	Active cell		Cell 2	
Access Barring Information		-	Not Sent	No additional delays in random access procedure.
Time offset between cells			3 μs	Synchronous cells
T1		s	5	
T2		s	≤5	

16.3.1.3.4.2 Test procedure

1. Ensure the UE is in State RRC_CONNECTED with generic procedure parameters Connectivity *NR*, Connected without release *On* according to TS 38.508-1 [14] clause 4.5. Establish SRB2 and DRB in the RRC Reconfiguration message. Cell 1 is the active cell.
2. Set the parameters according to T1 in Table 16.3.1.3.5-1.

3. Set NR Cell 2 physical cell identity = (current NR cell 2 physical cell identity + 1) mod 14 + 2 for current iteration of the test procedure loop

4. SS shall transmit an *RRCReconfiguration* message implying handover to the RedCap-specific dedicated BWP of Cell 2.

5. At the instant when the last TTI containing the *RRCReconfiguration* message in step 4) is sent to the UE, the SS shall switch the power settings from T1 to T2 as specified in Table 16.3.1.3.5-1. T2 starts.

6. If the UE transmits a PRACH preamble to Cell 2 satisfying the delay requirement specified in clause 16.3.1.3.5 then the number of successful tests is increased by one. Otherwise, the number of failure tests is increased by one.

7. After T2 expires, the SS shall

   - transmit an *RRCReconfiguration* message to cause the UE handover back to Cell 1. if the handover fails, switch off and on the UE

   or

   - switch off and on the UE.

8. Ensure the UE is in State RRC_CONNECTED with generic procedure parameters Connectivity *NR*, Connected without release *On* according to TS 38.508-1 [14] clause 4.5. Cell 1 is the active cell.

9. Repeat step 2-8 until the confidence level according to Tables G.2.3-1 in Annex G clause G.2 is achieved.

16.3.1.3.4.3 Message contents

Message contents are according to TS 38.508-1 [14] clause 7.3 with the following exceptions:

Table 16.3.1.3.4.3-1: *RRCReconfiguration* (Step 1, 4 and 8, test procedure)

Derivation Path: Table H.3.2-2 with condition RBConfig_KeyChange			
Information Element	**Value/remark**	**Comment**	**Condition**
RRCReconfiguration::= SEQUENCE {			
criticalExtensions CHOICE {			
rrcReconfiguration SEQUENCE {			
nonCriticalExtension SEQUENCE {			
masterCellGroup	CellGroupConfig	Table 16.3.1.3.4.3-2	
}			
}			
}			
}			

Table 16.3.1.3.4.3-2: *CellGroupConfig* (Table 16.3.1.3.4.3-1)

Derivation Path: Table H.3.2-3			
Information Element	**Value/remark**	**Comment**	**Condition**
CellGroupConfig ::= SEQUENCE {			
spCellConfig SEQUENCE {			
reconfigurationWithSync SEQUENCE {			
smtc	SMTC specified in 38.508-1 [14] Table 7.3.1-3 with condition SMTC.2 RedCap		
}			
spCellConfigDedicated	ServingCellConfig	Table 16.3.1.3.4.3-3	
}			

Table 16.3.1.3.4.3-3: *ServingCellConfig* (Table 16.3.1.3.4.3-2)

Derivation Path: TS 38.508-1 [14] Table 4.6.3-167 with condition MEAS			
Information Element	**Value/remark**	**Comment**	**Condition**

ServingCellConfig ::= SEQUENCE {			
downlinkBWP-ToAddModList SEQUENCE (SIZE (1..maxNrofBWPs)) OF BWP-Downlink {	1 entry		
BWP-Downlink[1]	BWP-Downlink	entry 1 Table 16.3.1.3.4.3-4	
}			
firstActiveDownlinkBWP-Id	1	Activate the RedCap-specific dedicated DL BWP	
uplinkConfig SEQUENCE {			
uplinkBWP-ToAddModList SEQUENCE (SIZE (1..maxNrofBWPs)) OF BWP-Uplink {	1 entry		
BWP-Uplink[1]	BWP-Uplink	entry 1 Table 16.3.1.3.4.3-5	
}			
firstActiveUplinkBWP-Id	1	Activate the RedCap-specific dedicated UL BWP	
}			
}			
}			

Table 16.3.1.3.4.3-4: *BWP-Downlink* (Table 16.3.1.3.4.3-3)

Derivation Path: TS 38.508-1 [14], Table 4.6.3-9			
Information Element	**Value/remark**	**Comment**	**Condition**
BWP-Downlink ::= SEQUENCE {			
bwp-Id	1		
bwp-Common SEQUENCE {			
genericParameters SEQUENCE {			
locationAndBandwidth	The RIV corresponds to DLBWP.1.1 RedCap corresponding to NCD-SSB PRB index		
}			
}			
bwp-Dedicated SEQUENCE {			
nonCellDefiningSSB-r17 SEQUENCE {			
absoluteFrequencySSB-r17	ARFCN-ValueNR of NCD-SSB		
ssb-Periodicity-r17	ms80		
ssb-TimeOffset-r17	ms5		
}			
}			
}			

Table 16.3.1.3.4.3-5: *BWP-Uplink* (Table 16.3.1.3.4.3-3)

Derivation Path: TS 38.508-1 [14], Table 4.6.3-13			
Information Element	**Value/remark**	**Comment**	**Condition**
BWP-Uplink ::= SEQUENCE {			
bwp-Id	1		
bwp-Common SEQUENCE {	BWP-UplinkCommon		
genericParameters SEQUENCE {			
locationAndBandwidth	The RIV corresponds to ULBWP.1.1 RedCap. The starting PRB index for dedicated UL BWP is the same as the corresponding		

	RedCap-specific dedicated DL BWP		
}			
}			
}			

16.3.1.3.5 Test requirements

Table 16.3.1.3.5-1 defines the primary level settings including test tolerances for all tests.

Table 16.3.1.3.5-1: Cell specific test parameters

Parameter		Unit	Cell 1		Cell 2	
			T1	T2	T1	T2
NR RF Channel Number			1		1	
Duplex mode	Config 1		FDD			
	Config 2,3		TDD			
	Config 4		HD-FDD			
TDD configuration	Config 1,4		Not Applicable			
	Config 2		TDDConf.1.1			
	Config 3		TDDConf. 2.1			
$BW_{channel}$	Config 1,2,4	MHz	10: $N_{RB,c}$ = 52			
	Config 3		20: $N_{RB,c}$ = 51			
BWP BW	Config 1,2,4	MHz	10: $N_{RB,c}$ = 52			
	Config 3		20: $N_{RB,c}$ = 51			
DRX Cycle		ms	Not Applicable			
PDSCH Reference measurement channel	Config 1,4		SR.1.1 FDD			
	Config 2		SR.1.1 TDD			
	Config 3		SR.2.1 TDD			
CORESET Reference Channel	Config 1,4		CR.1.1 FDD			
	Config 2		CR.1.1 TDD			
	Config 3		CR.2.1 TDD			
TRS configuration	Config 1,4		TRS.1.1 FDD			
	Config 2		TRS.1.1 TDD			
	Config 3		TRS.1.2 TDD			
OCNG Patterns			OP.1			
SMTC configuration for CD-SSB			SMTC.1			
SMTC configuration for NCD-SSB			SMTC.2 RedCap			
CD-SSB Configuration	Config 1,2,4		SSB.1 FR1			
	Config 3		SSB.1 RedCap FR1			
NCD-SSB Configuration	Config 1,2,4		SSB.6 RedCap FR1 (Note 1)			
	Config 3		SSB.7 RedCap FR1 (Note 1)			
PDSCH/PDCCH subcarrier spacing	Config 1,2,4	kHz	15			
	Config 3		30			
PUCCH/PUSCH subcarrier spacing	Config 1,2,4	kHz	15			
	Config 3		30			
PRACH configuration			PRACH.1 FR1			
BWP configuration	Initial DL BWP		DLBWP.0.1		DLBWP.0.1	
	Dedicated DL BWP		DLBWP.1.1 RedCap Note 2		DLBWP.1.1 RedCap Note 2	
	Initial UL BWP		ULBWP.0.1		ULBWP.0.1	
	Dedicated UL BWP		ULBWP.1.1 RedCap Note 3		ULBWP.1.1 RedCap Note 3	
EPRE ratio of PSS to SSS		dB	0			
EPRE ratio of PBCH DMRS to SSS						
EPRE ratio of PBCH to PBCH DMRS						
EPRE ratio of PDCCH DMRS to SSS						
EPRE ratio of PDCCH to PDCCH DMRS						
EPRE ratio of PDSCH DMRS to SSS						
EPRE ratio of PDSCH to PDSCH						
EPRE ratio of OCNG DMRS to SSS Note 4						
EPRE ratio of OCNG to OCNG DMRS Note 4						
N_{oc} Note5		dBm/15kHz	-98			

N_{oc} Note5	Config 1,2,4	dBm/SCS	-98			
	Config 3		-95			
$\hat{E}_s / I_{ot}$		dB	8	-0.64	-Infinity	-0.64
$\hat{E}_s / N_{oc}$		dB	8	8	-Infinity	8
SSB_RP	Config 1,2,4	dBm/SCS	-90	-90	-Infinity	-90
	Config 3	dBm/SCS	-87	-87	-Infinity	-87
Io Note6	Config 1,2,4	dBm/9.36MHz	-61.41	-58.71	-61.41	-58.71
	Config 3	dBm/18.36MHz	-58.48	-55.78	-58.48	-55.78
Propagation condition			AWGN		AWGN	
Antenna Configuration			1x1		1x1	

Note 1: NCD-SSB is configured within dedicated RedCap DL BWP and is separated from the CD-SSB by at least 20MHz.
Note 2: The starting PRB index for dedicated DL BWP corresponding to NCD-SSB PRB index;
Note 3: The starting PRB index for dedicated UL BWP is the same as the dedicated DL BWP corresponding to NCD-SSB PRB index;
Note 4: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.
Note 5: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for N_{oc} to be fulfilled.
Note 6: Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.

The handover delay is measured from the beginning of time period T2 to the time that the UE transmit the first PRACH to Cell 2. The handover delay shall be no larger than: RRC procedure delay + $T_{interrupt}$, where:

- RRC procedure delay = 10 ms, is the RRC processing delay specified in TS 38.331 [13] clause 12,
- $T_{interrupt}$ = 282 ms, is the interruption time specified in TS 38.133 [6] clause 6.1D.1.2.

This gives a total of 292 ms.

16.3.1.4 NR SA FR1 Intra-frequency handover from FR1 to FR1 with unknown target cell for 2 Rx UE

16.3.1.4.1 Test purpose

To verify the requirement for the NR FR1-NR FR1 intra frequency handover requirements for 2Rx RedCap UE as specified in TS 38.133 [6] clause 6.1D.1.2.

16.3.1.4.2 Test applicability

This test applies to all types of NR RedCap UE with 2 Rx from Release 17 onwards.

16.3.1.4.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 16.3.1.0.2.

The normative reference for this requirement is TS 38.133 [6] clause A.16.3.1.4.

16.3.1.4.4 Test description

The test scenario comprises of two carriers and one cell on each carrier. No gap patterns are configured in the test case. The test consists of two successive time periods, with time durations of T1, T2 respectively.

Before the test starts,

- UE is connected to Cell 1 with active DL BWP and active UL BWP
- UE is configured with *BWP-specific servingCellMO* under *BWP-DownlinkDedicated* which serves as the reference SSB for the serving cell. The *BWP-specific servingCellMO* corresponds to the NCD-SSB within the active DL BWP.

At the start of time duration T1, the UE does not have any timing information of cell 2. Starting T2, cell 2 becomes detectable and the UE receives an RRC handover command from the network indicating the UE to handover to cell 2 with *firstActiveDownlinkBWP-Id* configured to DL BWP and *firstActiveUplinkBWP-Id* configured to UL BWP. The start of T2 is the instant when the last TTI containing the RRC message implying handover is sent to the UE.

16.3.1.4.4.1 Initial conditions

This test shall be tested using any of the test configurations in Table 16.3.1.4.4.1-1.

Table 16.3.1.4.4.1-1: Supported test configurations

Configuration	Description
16.3.1.4-1	Source cell:NR 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode Target cell: NR 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode
16.3.1.4-2	Source cell:NR 15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode Target cell: NR 15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode
16.3.1.4-3	Source cell:NR 30 kHz SSB SCS, 20 MHz bandwidth, TDD duplex mode Target cell: NR 30 kHz SSB SCS, 20 MHz bandwidth, TDD duplex mode
16.3.1.4-4	Source cell:NR 15 kHz SSB SCS, 10 MHz bandwidth, HD-FDD duplex mode Target cell: NR 15 kHz SSB SCS, 10 MHz bandwidth, HD-FDD duplex mode
Note: The UE is only required to be tested in one of the supported test configurations	

Configure the test equipment and the DUT according to the parameters in Table 16.3.1.4.4.1-2.

Table 16.3.1.4.4.1-2: Initial conditions

Parameter	Value		Comment
Test environment	NC		As specified in TS 38.508-1 [14] clause 4.1.
Test frequencies	As specified in Annex E, Table E.14-1 and TS 38.508-1 [14] clause 4.3.1.		
Channel bandwidth	As specified by the test configuration selected from Table 16.3.1.4.4.1-1.		
Propagation conditions	AWGN		As specified in Annex C.2.2.
Connection Diagram	TE Part	A.3.1.8.2	As specified in TS 38.508-1 [14] Annex A.
	DUT Part	A.3.2.3.4	
Exceptions to connection diagram	N/A		

1. Message contents are defined in clause 16.3.1.4.4.3.
2. The power levels and settings for NR Cell 1 are set according to Annex C.1.2 and C.1.3. Cell 2 is NR FR1 target Cell, and its power levels and settings are also set according to Annex C.1.2 and C.1.3.
3. The test parameters are given in Table 16.3.1.4.4.1-3 below.

Table 16.3.1.4.4.1-3: General test parameters

Parameter		Unit	Value	Comment
Initial conditions	Active cell		Cell 1	
	Neighbouring cell		Cell 2	
Final condition	Active cell		Cell 2	
Access Barring Information		-	Not Sent	No additional delays in random access procedure.
Time offset between cells			3 μs	Synchronous cells
T1		s	5	
T2		s	≤5	

16.3.1.4.4.2 Test procedure

1. Ensure the UE is in State RRC_CONNECTED with generic procedure parameters Connectivity *NR*, Connected without release *On* according to TS 38.508-1 [14] clause 4.5. Establish SRB2 and DRB in the RRC Reconfiguration message. Cell 1 is the active cell.

2. Set the parameters according to T1 in Table 16.3.1.4.5-1.
3. Set NR Cell 2 physical cell identity = (current NR cell 2 physical cell identity + 1) mod 14 + 2 for current iteration of the test procedure loop
4. SS shall transmit an *RRCReconfiguration* message implying handover to the RedCap-specific dedicated BWP of Cell 2.
5. At the instant when the last TTI containing the *RRCReconfiguration* message in step 4) is sent to the UE, the SS shall switch the power settings from T1 to T2 as specified in Table 16.3.1.4.5-1. T2 starts.
6. If the UE transmits a PRACH preamble to Cell 2 satisfying the delay requirement specified in clause 16.3.1.4.5 then the number of successful tests is increased by one. Otherwise, the number of failure tests is increased by one.
7. After T2 expires, the SS shall
   - transmit an *RRCReconfiguration* message to cause the UE handover back to Cell 1. if the handover fails, switch off and on the UE

   or

   - switch off and on the UE.
8. Ensure the UE is in State RRC_CONNECTED with generic procedure parameters Connectivity *NR*, Connected without release *On* according to TS 38.508-1 [14] clause 4.5. Cell 1 is the active cell.
9. Repeat step 2-8 until the confidence level according to Tables G.2.3-1 in Annex G clause G.2 is achieved.

16.3.1.4.4.3 Message contents

Message contents are according to TS 38.508-1 [14] clause 7.3 with the following exceptions:

Table 16.3.1.4.4.3-1: *RRCReconfiguration* (Step 1, 4 and 8, test procedure)

Derivation Path: Table H.3.2-2 with condition RBConfig_KeyChange			
Information Element	**Value/remark**	**Comment**	**Condition**
RRCReconfiguration::= SEQUENCE {			
criticalExtensions CHOICE {			
rrcReconfiguration SEQUENCE {			
nonCriticalExtension SEQUENCE {			
masterCellGroup	CellGroupConfig	Table 16.3.1.4.4.3-2	
}			
}			
}			
}			

Table 16.3.1.4.4.3-2: *CellGroupConfig* (Table 16.3.1.4.4.3-1)

Derivation Path: Table H.3.2-3			
Information Element	**Value/remark**	**Comment**	**Condition**
CellGroupConfig ::= SEQUENCE {			
spCellConfig SEQUENCE {			
reconfigurationWithSync SEQUENCE {			
smtc	SMTC specified in 38.508-1 [14] Table 7.3.1-3 with condition SMTC.2 RedCap		
}			
spCellConfigDedicated	ServingCellConfig	Table 16.3.1.4.4.3-3	
}			

Table 16.3.1.4.4.3-3: *ServingCellConfig* (Table 16.3.1.4.4.3-2)

Derivation Path: TS 38.508-1 [14] Table 4.6.3-167 with condition MEAS			
Information Element	**Value/remark**	**Comment**	**Condition**
ServingCellConfig ::= SEQUENCE {			
downlinkBWP-ToAddModList SEQUENCE (SIZE (1..maxNrofBWPs)) OF BWP-Downlink {	1 entry		
BWP-Downlink[1]	BWP-Downlink	entry 1 Table 16.3.1.4.4.3-4	
}			
firstActiveDownlinkBWP-Id	1	Activate the RedCap-specific dedicated DL BWP	
uplinkConfig SEQUENCE {			
uplinkBWP-ToAddModList SEQUENCE (SIZE (1..maxNrofBWPs)) OF BWP-Uplink {	1 entry		
BWP-Uplink[1]	BWP-Uplink	entry 1 Table 16.3.1.4.4.3-5	
}			
firstActiveUplinkBWP-Id	1	Activate the RedCap-specific dedicated UL BWP	
}			
}			
}			

Table 16.3.1.4.4.3-4: *BWP-Downlink* (Table 16.3.1.4.4.3-3)

Derivation Path: TS 38.508-1 [14], Table 4.6.3-9			
Information Element	**Value/remark**	**Comment**	**Condition**
BWP-Downlink ::= SEQUENCE {			
bwp-Id	1		
bwp-Common SEQUENCE {			
genericParameters SEQUENCE {			
locationAndBandwidth	The RIV corresponds to DLBWP.1.1 RedCap corresponding to NCD-SSB PRB index		
}			
}			
bwp-Dedicated SEQUENCE {			
nonCellDefiningSSB-r17 SEQUENCE {			
absoluteFrequencySSB-r17	ARFCN-ValueNR of NCD-SSB		
ssb-Periodicity-r17	ms80		
ssb-TimeOffset-r17	ms5		
}			
}			
}			

Table 16.3.1.4.4.3-5: *BWP-Uplink* (Table 16.3.1.4.4.3-3)

Derivation Path: TS 38.508-1 [14], Table 4.6.3-13			
Information Element	**Value/remark**	**Comment**	**Condition**
BWP-Uplink ::= SEQUENCE {			
bwp-Id	1		
bwp-Common SEQUENCE {	BWP-UplinkCommon		
genericParameters SEQUENCE {			
locationAndBandwidth	The RIV corresponds to ULBWP.1.1 RedCap.		

	The starting PRB index for dedicated UL BWP is the same as the corresponding RedCap-specific dedicated DL BWP		
}			
}			
}			

16.3.1.4.5 Test requirement

Table 16.3.1.4.5-1 defines the primary level settings including test tolerances for all tests.

Table 16.3.1.4.5-1: Cell specific test parameters Parameter		**Unit**	**Cell 1**		**Cell 2**	
			T1	**T2**	**T1**	**T2**
NR RF Channel Number			1		1	
Duplex mode	Config 1		FDD			
	Config 2,3		TDD			
	Config 4		HD-FDD			
TDD configuration	Config 1,4		Not Applicable			
	Config 2		TDDConf.1.1			
	Config 3		TDDConf. 2.1			
$BW_{channel}$	Config 1,2,4	MHz	10: $N_{RB,c}$ = 52			
	Config 3		20: $N_{RB,c}$ = 51			
BWP BW	Config 1,2,4	MHz	10: $N_{RB,c}$ = 52			
	Config 3		20: $N_{RB,c}$ = 51			
DRX Cycle		ms	Not Applicable			
PDSCH Reference measurement channel	Config 1,4		SR.1.1 FDD			
	Config 2		SR.1.1 TDD			
	Config 3		SR.2.1 TDD			
CORESET Reference Channel	Config 1,4		CR.1.1 FDD			
	Config 2		CR.1.1 TDD			
	Config 3		CR.2.1 TDD			
TRS configuration	Config 1, 4		TRS.1.1 FDD			
	Config 2		TRS.1.1 TDD			
	Config 3		TRS.1.2 TDD			
OCNG Patterns			OP.1			
SMTC configuration for CD-SSB			SMTC.1			
SMTC configuration for NCD-SSB			SMTC.2 RedCap			
CD-SSB Configuration	Config 1,2,4		SSB.1 FR1			
	Config 3		SSB.1 RedCap FR1			
NCD-SSB Configuration	Config 1,2,4		SSB.6 RedCap FR1 Note 1			
	Config 3		SSB.7 RedCap FR1 Note 1			
PDSCH/PDCCH subcarrier spacing	Config 1,2,4	kHz	15			
	Config 3		30			
PUCCH/PUSCH subcarrier spacing	Config 1,2,4	kHz	15			
	Config 3		30			
PRACH configuration			PRACH.1 FR1			
BWP configuration	Initial DL BWP		DLBWP.0.1		DLBWP.0.1	
	Dedicated DL BWP		DLBWP.1.1 RedCap Note 2		DLBWP.1.1 RedCap Note 2	
	Initial UL BWP		ULBWP.0.1		ULBWP.0.1	
	Dedicated UL BWP		ULBWP.1.1 RedCap Note 3		ULBWP.1.1 RedCap Note 3	
EPRE ratio of PSS to SSS		dB	0			
EPRE ratio of PBCH DMRS to SSS						
EPRE ratio of PBCH to PBCH DMRS						
EPRE ratio of PDCCH DMRS to SSS						
EPRE ratio of PDCCH to PDCCH DMRS						
EPRE ratio of PDSCH DMRS to SSS						
EPRE ratio of PDSCH to PDSCH						
EPRE ratio of OCNG DMRS to SSS Note 4						

EPRE ratio of OCNG to OCNG DMRS Note 4						
N_{oc} Note5		dBm/15kHz	-98			
N_{oc} Note5	Config 1,2,4	dBm/SCS	-98			
	Config 3		-95			
$\hat{E}_s/I_{ot}$		dB	8	-0.64	-Infinity	-0.64
$\hat{E}_s/N_{oc}$		dB	8	8	-Infinity	8
SSB_RP	Config 1,2,4	dBm/SCS	-90	-90	-Infinity	-90
	Config 3	dBm/SCS	-87	-87	-Infinity	-87
Io Note6	Config 1,2,4	dBm/9.36MHz	-61.41	-58.71	-61.41	-58.71
	Config 3	dBm/18.36MHz	-58.41	-55.71	-58.41	-55.71
Propagation condition			AWGN		AWGN	

Note 1: NCD-SSB is configured within dedicated RedCap DL BWP and is separated from the CD-SSB by at least 20MHz.
Note 2: The starting PRB index for dedicated DL BWP corresponding to NCD-SSB PRB index;
Note 3: The starting PRB index for dedicated UL BWP is the same as the dedicated DL BWP corresponding to NCD-SSB PRB index.
Note 4: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.
Note 5: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for N_{oc} to be fulfilled.
Note 6: Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.

The handover delay is measured from the beginning of time period T2 to the time that the UE transmit the first PRACH to Cell 2. The handover delay shall be no larger than: RRC procedure delay + $T_{interrupt}$, where:

- RRC procedure delay = 10 ms, is the RRC processing delay specified in TS 38.331 [13] clause 12,
- $T_{interrupt}$ = 202 ms, is the interruption time specified in TS 38.133 [6] clause 6.1D.1.2.

This gives a total of 212 ms.

16.3.1.5 NR SA FR1-FR1 Inter-frequency handover from FR1 to FR1 with unknown target cell for 1 Rx UE

Editor's note: This test cases is incomplete in following aspects:

- TT analysis is still missing

16.3.1.5.1 Test purpose

To verify the requirement for the NR FR1-NR FR1 inter frequency handover requirements for 1 Rx RedCap UE as specified in TS 38.133 [6] clause 6.1D.1.2.

16.3.1.5.2 Test applicability

This test applies to all types of NR RedCap UE with 1 Rx from Release 17 onwards.

16.3.1.5.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 16.3.1.0.2.

The normative reference for this requirement is TS 38.133 [6] clause A.16.3.1.5.

16.3.1.5.4 Test description

The test scenario comprises of two carriers and one cell on each carrier. No gap patterns are configured in the test case. The test consists of two successive time periods, with time durations of T1, T2 respectively. At the start of time duration T1, the UE does not have any timing information of cell 2. Starting T2, cell 2 becomes detectable and the UE receives

an RRC handover command from the network, then UE handover from cell 1's CD-SSB to cell 2's specific Redcap BWP associated with NCD-SSB. The start of T2 is the instant when the last TTI containing the RRC message implying handover is sent to the UE.

16.3.1.5.4.1 Initial conditions

This test shall be tested using any of the test configurations in Table 16.3.1.5.4.1-1.

Table 16.3.1.5.4.1-1: Supported test configurations

Configuration	Description
16.3.1.5-1	Source cell:NR 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode Target cell: NR 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode
16.3.1.5-2	Source cell:NR 15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode Target cell: NR 15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode
16.3.1.5-3	Source cell:NR 30 kHz SSB SCS, 20 MHz bandwidth, TDD duplex mode Target cell: NR 30 kHz SSB SCS, 20 MHz bandwidth, TDD duplex mode
16.3.1.5-4	Source cell:NR 15 kHz SSB SCS, 10 MHz bandwidth, HD-FDD duplex mode Target cell: NR 15 kHz SSB SCS, 10 MHz bandwidth, HD-FDD duplex mode
Note: The UE is only required to be tested in one of the supported test configurations	

Configure the test equipment and the DUT according to the parameters in Table 16.3.1.5.4.1-2.

Table 16.3.1.5.4.1-2: Initial conditions

Parameter	Value		Comment
Test environment	NC		As specified in TS 38.508-1 [14] clause 4.1.
Test frequencies	As specified in Annex E, Table E.14-1 and TS 38.508-1 [14] clause 4.3.1.		
Channel bandwidth	As specified by the test configuration selected from Table 16.3.1.5.4.1-1.		
Propagation conditions	AWGN		As specified in Annex C.2.2.
Connection Diagram	TE Part	A.3.1.8.1	As specified in TS 38.508-1 [14] Annex A.
	DUT Part	A.3.2.2.1	
Exceptions to connection diagram	N/A		

1. Message contents are defined in clause 16.3.1.5.4.3.
2. The power levels and settings for NR Cell 1 are set according to Annex C.1.2 and C.1.3. Cell 2 is NR FR1 target Cell, and its power levels and settings are also set according to Annex C.1.2 and C.1.3.
3. The test parameters are given in Tables 16.3.1.5.4.1-3 and 16.3.1.5.5-1 below.

Table 16.3.1.5.4.1-3: General test parameters

Parameter		Unit	Value	Comment
Initial conditions	Active cell		Cell 1	
	Neighbouring cell		Cell 2	
Final condition	Active cell		Cell 2	
Access Barring Information		-	Not Sent	No additional delays in random access procedure.
T1		s	5	
T2		s	≤5	

16.3.1.5.4.2 Test procedure

1. Ensure the UE is in State RRC_CONNECTED with generic procedure parameters Connectivity *NR*, Connected without release *On* according to TS 38.508-1 [14] clause 4.5. Establish SRB2 and DRB in the RRC Reconfiguration message. Cell 1 is the active cell.
2. Set the parameters according to T1 in Table 16.3.1.5.5-1.

3. Set NR Cell 2 physical cell identity = (current NR cell 2 physical cell identity + 1) mod 14 + 2 for current iteration of the test procedure loop

4. SS shall transmit an *RRCReconfiguration* message implying handover to the RedCap-specific dedicated BWP of Cell 2.

5. At the instant when the last TTI containing the *RRCReconfiguration* message in step 4) is sent to the UE, the SS shall switch the power settings from T1 to T2 as specified in Table 16.3.1.5.5-1. T2 starts.

6. If the UE transmits a PRACH preamble to Cell 2 satisfying the delay requirement specified in clause 16.3.1.5.5 then the number of successful tests is increased by one. Otherwise, the number of failure tests is increased by one.

7. After T2 expires, the SS shall

   - transmit an *RRCReconfiguration* message to cause the UE handover back to Cell 1. if the handover fails, switch off and on the UE

   or

   - switch off and on the UE.

8. Ensure the UE is in State RRC_CONNECTED with generic procedure parameters Connectivity *NR*, Connected without release *On* according to TS 38.508-1 [14] clause 4.5. Cell 1 is the active cell.

9. Repeat step 2-8 until the confidence level according to Tables G.2.3-1 in Annex G clause G.2 is achieved.

16.3.1.5.4.3 Message contents

Message contents are according to TS 38.508-1 [14] clause 7.3 with the following exceptions:

Table 16.3.1.5.4.3-1: *RRCReconfiguration* (Step 4, test procedure)

Derivation Path: Table H.3.2-2 with condition RBConfig_KeyChange			
Information Element	**Value/remark**	**Comment**	**Condition**
RRCReconfiguration::= SEQUENCE {			
criticalExtensions CHOICE {			
rrcReconfiguration SEQUENCE {			
nonCriticalExtension SEQUENCE {			
masterCellGroup	CellGroupConfig	Table 16.3.1.5.4.3-2	
}			
}			
}			
}			

Table 16.3.1.5.4.3-2: *CellGroupConfig* (Table 16.3.1.5.4.3-1)

Derivation Path: Table H.3.2-3			
Information Element	**Value/remark**	**Comment**	**Condition**
CellGroupConfig ::= SEQUENCE {			
spCellConfig SEQUENCE {			
reconfigurationWithSync SEQUENCE {			
smtc	SMTC specified in 38.508-1 [14] Table 7.3.1-3 with condition SMTC.2 RedCap		
}			
spCellConfigDedicated	ServingCellConfig	Table 16.3.1.5.4.3-3	
}			

Table 16.3.1.5.4.3-3: *ServingCellConfig* (Table 16.3.1.5.4.3-2)

Derivation Path: TS 38.508-1 [14] Table 4.6.3-167 with condition MEAS			
Information Element	**Value/remark**	**Comment**	**Condition**

ServingCellConfig ::= SEQUENCE {			
downlinkBWP-ToAddModList SEQUENCE (SIZE (1..maxNrofBWPs)) OF BWP-Downlink {	1 entry		
BWP-Downlink[1]	BWP-Downlink	entry 1 Table 16.3.1.5.4.3-4	
}			
firstActiveDownlinkBWP-Id	1	Activate the RedCap-specific dedicated DL BWP	
uplinkConfig SEQUENCE {			
uplinkBWP-ToAddModList SEQUENCE (SIZE (1..maxNrofBWPs)) OF BWP-Uplink {	1 entry		
BWP-Uplink[1]	BWP-Uplink	entry 1 Table 16.3.1.5.4.3-5	
}			
firstActiveUplinkBWP-Id	1	Activate the RedCap-specific dedicated UL BWP	
}			
}			
}			

Table 16.3.1.5.4.3-4: *BWP-Downlink* (Table 16.3.1.5.4.3-3)

Derivation Path: TS 38.508-1 [14], Table 4.6.3-9			
Information Element	**Value/remark**	**Comment**	**Condition**
BWP-Downlink ::= SEQUENCE {			
bwp-Id	1		
bwp-Common SEQUENCE {			
genericParameters SEQUENCE {			
locationAndBandwidth	The RIV corresponds to DLBWP.1.1 RedCap corresponding to NCD-SSB PRB index		
}			
}			
bwp-Dedicated SEQUENCE {			
nonCellDefiningSSB-r17 SEQUENCE {			
absoluteFrequencySSB-r17	ARFCN-ValueNR of NCD-SSB		
ssb-Periodicity-r17	ms80		
ssb-TimeOffset-r17	ms5		
}			
}			
}			

Table 16.3.1.5.4.3-5: *BWP-Uplink* (Table 16.3.1.5.4.3-3)

Derivation Path: TS 38.508-1 [14], Table 4.6.3-13			
Information Element	**Value/remark**	**Comment**	**Condition**
BWP-Uplink ::= SEQUENCE {			
bwp-Id	1		
bwp-Common SEQUENCE {	BWP-UplinkCommon		
genericParameters SEQUENCE {			
locationAndBandwidth	The RIV corresponds to ULBWP.1.1 RedCap The starting PRB index for dedicated UL BWP is the same as the corresponding RedCap-		

	specific dedicated DL BWP		
}			
}			
}			

16.3.1.5.5 Test requirement

Table 16.3.1.5.5-1 defines the primary level settings including test tolerances for all tests.

Table 16.3.1.5.5-1: Cell specific test parameters Parameter		**Unit**	**Cell 1**		**Cell 2**	
			T1	**T2**	**T1**	**T2**
NR RF Channel Number			1		2	
Duplex mode	Config 1		FDD			
	Config 2,3		TDD			
	Config 4		HD-FDD			
TDD configuration	Config 1,4		Not Applicable			
	Config 2		TDDConf.1.1			
	Config 3		TDDConf.2.1			
$BW_{channel}$	Config 1,2,4	MHz	10: $N_{RB,c}$ = 52			
	Config 3		20: $N_{RB,c}$ = 51			
BWP BW	Config 1,2,4	MHz	10: $N_{RB,c}$ = 52			
	Config 3		20: $N_{RB,c}$ = 51			
TRS configuration	Config 1,4		TRS.1.1 FDD			
	Config 2		TRS.1.1 TDD			
	Config 3		TRS.1.2 TDD			
DRX Cycle		ms	Not Applicable			
PDSCH Reference measurement channel	Config 1,4		SR.1.1 FDD			
	Config 2		SR.1.1 TDD			
	Config 3		SR.2.1 TDD			
CORESET Reference Channel	Config 1,4		CR.1.1 FDD			
	Config 2		CR.1.1 TDD			
	Config 3		CR. 2.1 TDD			
OCNG Patterns			OP.1			
SMTC configuration for CD-SSB			SMTC.1			
SMTC configuration for NCD-SSB			SMTC.2 RedCap			
CD-SSB Configuration	Config 1,2,4		SSB.1 FR1			
	Config 3		SSB.1 RedCap FR1			
NCD-SSB Configuration	Config 1,2,4		SSB.6 RedCap FR1 Note 4			
	Config 3		SSB.7 RedCap FR1 Note 4			
PDSCH/PDCCH subcarrier spacing	Config 1,2,4	kHz	15			
	Config 3		30			
PUCCH/PUSCH subcarrier spacing	Config 1,2,4	kHz	15			
	Config 3		30			
PRACH configuration			PRACH.1 FR1			
Initial DL BWP			DLBWP.0.1			
Dedicated DL BWP			DLBWP.1.1 RedCap Note 5		DLBWP.1.1 RedCap Note 6	
Initial UL BWP			ULBWP.0.1			
Dedicated UL BWP			DLBWP.1.1 RedCap Note 7		ULBWP.1.1 RedCap Note 8	
EPRE ratio of PSS to SSS		dB	0			
EPRE ratio of PBCH DMRS to SSS						
EPRE ratio of PBCH to PBCH DMRS						
EPRE ratio of PDCCH DMRS to SSS						
EPRE ratio of PDCCH to PDCCH DMRS						
EPRE ratio of PDSCH DMRS to SSS						
EPRE ratio of PDSCH to PDSCH						
EPRE ratio of OCNG DMRS to SSS Note 1						
EPRE ratio of OCNG to OCNG DMRS Note 1						
N_{oc} Note2		dBm/ 15kHz	-98		-98	
N_{oc} Note2	Config 1,2,4	dBm/SCS	-98		-98	
	Config 3		-95		-95	

$\hat{E}_s/I_{ot}$		dB	4	4	-Infinity	5
$\hat{E}_s/N_{oc}$		dB	4	4	-Infinity	5
SSB_RP	Config 1,2,4	dBm/SCS	-94	-94	-Infinity	-93
	Config 3	dBm/SCS	-91	-91	-Infinity	-90
Io[Note3]	Config 1,2,4	dBm/ 9.36MHz	-64.59	-64.59	-70.05	-63.85
	Config 3	dBm/ 18.36MHz	-61.67	-61.67	-67.13	-60.93
Propagation condition		-	AWGN		AWGN	
Antenna Configuration			1x1			

Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.
Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for N_{oc} to be fulfilled.
Note 3: Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.
Note 4: NCD-SSB is configured within dedicated RedCap DL BWP.
Note 5: The starting PRB index for dedicated DL BWP corresponding to CD-SSB PRB index;
Note 6: The starting PRB index for dedicated DL BWP corresponding to NCD-SSB PRB index;
Note 7: The starting PRB index for dedicated UL BWP is the same as the dedicated DL BWP corresponding to CD-SSB PRB index;
Note 8: The starting PRB index for dedicated UL BWP is the same as the dedicated DL BWP corresponding to NCD-SSB PRB index;

The handover delay is measured from the beginning of time period T2 to the time that the UE transmit the first PRACH to Cell 2. The handover delay shall be no larger than: RRC procedure delay + $T_{interrupt}$, where:

- RRC procedure delay = 10 ms, is the RRC processing delay specified in TS 38.331 [13] clause 12,
- $T_{interrupt}$ = 522 ms, is the interruption time specified in TS 38.133 [6] clause 6.1D.1.2.

This gives a total of 532 ms.

16.3.1.6 NR SA FR1-FR1 Inter-frequency handover from FR1 to FR1 with unknown target cell for 2 Rx UE

16.3.1.6.1 Test purpose

To verify the requirement for the NR FR1-NR FR1 inter frequency handover requirements for 2 Rx RedCap UE as specified in TS 38.133 [6] clause 6.1D.1.2.

16.3.1.6.2 Test applicability

This test applies to all types of NR RedCap UE with 2 Rx from Release 17 onwards.

16.3.1.6.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 16.3.1.0.2.

The normative reference for this requirement is TS 38.133 [6] clause A.16.3.1.6.

16.3.1.6.4 Test description

The test scenario comprises of two carriers and one cell on each carrier. No gap patterns are configured in the test case. The test consists of two successive time periods, with time durations of T1, T2 respectively. At the start of time duration T1, the UE does not have any timing information of cell 2. Starting T2, cell 2 becomes detectable and the UE receives an RRC handover command from the network, then UE handover from cell 1's CD-SSB to cell 2's specific Redcap BWP associated with NCD-SSB. The start of T2 is the instant when the last TTI containing the RRC message implying handover is sent to the UE.

16.3.1.6.4.1 Initial conditions

This test shall be tested using any of the test configurations in Table 16.3.1.6.4.1-1.

Table 16.3.1.6.4.1-1: Supported test configurations

Configuration	Description
16.3.1.6-1	Source cell:NR 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode Target cell: NR 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode
16.3.1.6-2	Source cell:NR 15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode Target cell: NR 15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode
16.3.1.6-3	Source cell:NR 30 kHz SSB SCS, 20 MHz bandwidth, TDD duplex mode Target cell: NR 30 kHz SSB SCS, 20 MHz bandwidth, TDD duplex mode
16.3.1.6-4	Source cell:NR 15 kHz SSB SCS, 10 MHz bandwidth, HD-FDD duplex mode Target cell: NR 15 kHz SSB SCS, 10 MHz bandwidth, HD-FDD duplex mode
Note: The UE is only required to be tested in one of the supported test configurations	

Configure the test equipment and the DUT according to the parameters in Table 16.3.1.6.4.1-2.

Table 16.3.1.6.4.1-2: Initial conditions

Parameter	Value		Comment
Test environment	NC		As specified in TS 38.508-1 [14] clause 4.1.
Test frequencies	As specified in Annex E, Table E.14-1 and TS 38.508-1 [14] clause 4.3.1.		
Channel bandwidth	As specified by the test configuration selected from Table 16.3.1.6.4.1-1.		
Propagation conditions	AWGN		As specified in Annex C.2.2.
Connection Diagram	TE Part	A.3.1.8.2	As specified in TS 38.508-1 [14] Annex A.
	DUT Part	A.3.2.3.4	
Exceptions to connection diagram	N/A		

1. Message contents are defined in clause 16.3.1.6.4.3.
2. The power levels and settings for NR Cell 1 are set according to Annex C.1.2 and C.1.3. Cell 2 is NR FR1 target Cell, and its power levels and settings are also set according to Annex C.1.2 and C.1.3.
3. The test parameters are given in Tables 16.3.1.6.4.1-3 and 16.3.1.6.5-1 below.

Table 16.3.1.6.4.1-3: General test parameters

Parameter		Unit	Value	Comment
Initial conditions	Active cell		Cell 1	
	Neighbouring cell		Cell 2	
Final condition	Active cell		Cell 2	
Access Barring Information		-	Not Sent	No additional delays in random access procedure.
T1		s	5	
T2		s	≤5	

16.3.1.6.4.2 Test procedure

1. Ensure the UE is in State RRC_CONNECTED with generic procedure parameters Connectivity *NR*, Connected without release *On* according to TS 38.508-1 [14] clause 4.5. Establish SRB2 and DRB in the RRC Reconfiguration message. Cell 1 is the active cell.
2. Set the parameters according to T1 in Table 16.3.1.6.5-1.
3. Set NR Cell 2 physical cell identity = (current NR cell 2 physical cell identity + 1) mod 14 + 2 for current iteration of the test procedure loop

4. SS shall transmit an *RRCReconfiguration* message implying handover to the RedCap-specific dedicated BWP of Cell 2.

5. At the instant when the last TTI containing the *RRCReconfiguration* message in step 4) is sent to the UE, the SS shall switch the power settings from T1 to T2 as specified in Table 16.3.1.6.5-1. T2 starts.

6. If the UE transmits a PRACH preamble to Cell 2 satisfying the delay requirement specified in clause 16.3.1.6.5 then the number of successful tests is increased by one. Otherwise, the number of failure tests is increased by one.

7. After T2 expires, the SS shall

   - transmit an *RRCReconfiguration* message to cause the UE handover back to Cell 1. if the handover fails, switch off and on the UE

   or

   - switch off and on the UE.

8. Ensure the UE is in State RRC_CONNECTED with generic procedure parameters Connectivity *NR*, Connected without release *On* according to TS 38.508-1 [14] clause 4.5. Cell 1 is the active cell.

9. Repeat step 2-8 until the confidence level according to Tables G.2.3-1 in Annex G clause G.2 is achieved.

16.3.1.6.4.3 Message contents

Message contents are according to TS 38.508-1 [14] clause 7.3 with the following exceptions:

Table 16.3.1.6.4.3-1: *RRCReconfiguration* (Step 4, test procedure)

Derivation Path: Table H.3.2-2 with condition RBConfig_KeyChange			
Information Element	**Value/remark**	**Comment**	**Condition**
RRCReconfiguration::= SEQUENCE {			
criticalExtensions CHOICE {			
rrcReconfiguration SEQUENCE {			
nonCriticalExtension SEQUENCE {			
masterCellGroup	CellGroupConfig	Table 16.3.1.6.4.3-2	
}			
}			
}			
}			

Table 16.3.1.6.4.3-2: *CellGroupConfig* (Table 16.3.1.6.4.3-1)

Derivation Path: Table H.3.2-3			
Information Element	**Value/remark**	**Comment**	**Condition**
CellGroupConfig ::= SEQUENCE {			
spCellConfig SEQUENCE {			
reconfigurationWithSync SEQUENCE {			
smtc	SMTC specified in 38.508-1 [14] Table 7.3.1-3 with condition SMTC.2 RedCap		
}			
spCellConfigDedicated	ServingCellConfig	Table 16.3.1.6.4.3-3	
}			

Table 16.3.1.6.4.3-3: *ServingCellConfig* (Table 16.3.1.6.4.3-2)

Derivation Path: TS 38.508-1 [14] Table 4.6.3-167 with condition MEAS			
Information Element	**Value/remark**	**Comment**	**Condition**
ServingCellConfig ::= SEQUENCE {			
downlinkBWP-ToAddModList SEQUENCE (SIZE (1..maxNrofBWPs)) OF BWP-Downlink {	1 entry		

BWP-Downlink[1]	BWP-Downlink	entry 1 Table 16.3.1.6.4.3-4	
}			
firstActiveDownlinkBWP-Id	1	Activate the RedCap-specific dedicated DL BWP	
uplinkConfig SEQUENCE {			
uplinkBWP-ToAddModList SEQUENCE (SIZE (1..maxNrofBWPs)) OF BWP-Uplink {	1 entry		
BWP-Uplink[1]	BWP-Uplink	entry 1 Table 16.3.1.6.4.3-5	
}			
firstActiveUplinkBWP-Id	1	Activate the RedCap-specific dedicated UL BWP	
}			
}			
}			

Table 16.3.1.6.4.3-4: *BWP-Downlink* (Table 16.3.1.6.4.3-3)

Derivation Path: TS 38.508-1 [14], Table 4.6.3-9			
Information Element	**Value/remark**	**Comment**	**Condition**
BWP-Downlink ::= SEQUENCE {			
bwp-Id	1		
bwp-Common SEQUENCE {			
genericParameters SEQUENCE {			
locationAndBandwidth	The RIV corresponds to DLBWP.1.1 RedCap corresponding to NCD-SSB PRB index		
}			
}			
bwp-Dedicated SEQUENCE {			
nonCellDefiningSSB-r17 SEQUENCE {			
absoluteFrequencySSB-r17	ARFCN-ValueNR of NCD-SSB		
ssb-Periodicity-r17	ms80		
ssb-TimeOffset-r17	ms5		
}			
}			
}			

Table 16.3.1.6.4.3-5: *BWP-Uplink* (Table 16.3.1.6.4.3-3)

Derivation Path: TS 38.508-1 [14], Table 4.6.3-13			
Information Element	**Value/remark**	**Comment**	**Condition**
BWP-Uplink ::= SEQUENCE {			
bwp-Id	1		
bwp-Common SEQUENCE {	BWP-UplinkCommon		
genericParameters SEQUENCE {			
locationAndBandwidth	The RIV corresponds to ULBWP.1.1 RedCap. The starting PRB index for dedicated UL BWP is the same as the corresponding RedCap-specific dedicated DL BWP		
}			
}			

}			

16.3.1.6.5 Test requirement

Table 16.3.1.6.5-1 defines the primary level settings including test tolerances for all tests.

Table 16.3.1.6.5-1: Cell specific test parametersParameter		**Unit**	**Cell 1**		**Cell 2**	
			T1	**T2**	**T1**	**T2**
NR RF Channel Number			1		2	
Duplex mode	Config 1		FDD			
	Config 2,3		TDD			
	Config 4		HD-FDD			
TDD configuration	Config 1,4		Not Applicable			
	Config 2		TDDConf.1.1			
	Config 3		TDDConf.2.1			
$BW_{channel}$	Config 1,2,4	MHz	10: $N_{RB,c}$ = 52			
	Config 3		20: $N_{RB,c}$ = 51			
BWP BW	Config 1,2,4	MHz	10: $N_{RB,c}$ = 52			
	Config 3		20: $N_{RB,c}$ = 51			
TRS configuration	Config 1,4		TRS.1.1 FDD			
	Config 2		TRS.1.1 TDD			
	Config 3		TRS.1.2 TDD			
DRX Cycle		ms	Not Applicable			
PDSCH Reference measurement channel	Config 1,4		SR.1.1 FDD			
	Config 2		SR.1.1 TDD			
	Config 3		SR.2.1 TDD			
CORESET Reference Channel	Config 1,4		CR.1.1 FDD			
	Config 2		CR.1.1 TDD			
	Config 3		CR. 2.1 TDD			
OCNG Patterns			OP.1			
SMTC configuration for CD-SSB			SMTC.1			
SMTC configuration for NCD-SSB			SMTC.2 RedCap			
CD-SSB Configuration	Config 1,2,4		SSB.1 FR1			
	Config 3		SSB.1 RedCap FR1			
NCD-SSB Configuration	Config 1,2,4		SSB.6 RedCap FR1 Note 4			
	Config 3		SSB.7 RedCap FR1 Note 4			
PDSCH/PDCCH subcarrier spacing	Config 1,2,4	kHz	15			
	Config 3		30			
PUCCH/PUSCH subcarrier spacing	Config 1,2,4	kHz	15			
	Config 3		30			
PRACH configuration			PRACH.1 FR1			
Initial DL BWP			DLBWP.0.1			
Dedicated DL BWP			DLBWP.1.1 RedCap Note 5		DLBWP.1.1 RedCap Note 6	
Initial UL BWP			ULBWP.0.1			
Dedicated UL BWP			DLBWP.1.1 RedCap Note 7		ULBWP.1.1 RedCap Note 8	
EPRE ratio of PSS to SSS		dB	0			
EPRE ratio of PBCH DMRS to SSS						
EPRE ratio of PBCH to PBCH DMRS						
EPRE ratio of PDCCH DMRS to SSS						
EPRE ratio of PDCCH to PDCCH DMRS						
EPRE ratio of PDSCH DMRS to SSS						
EPRE ratio of PDSCH to PDSCH						
EPRE ratio of OCNG DMRS to SSS Note 1						
EPRE ratio of OCNG to OCNG DMRS Note 1						
N_{oc} Note2		dBm/ 15kHz	-98		-98	
N_{oc} Note2	Config 1,2,4	dBm/SCS	-98		-98	
	Config 3		-95		-95	
$\hat{E}_s / I_{ot}$		dB	4	4	-Infinity	5
$\hat{E}_s / N_{oc}$		dB	4	4	-Infinity	5
SSB_RP	Config 1,2,4	dBm/SCS	-94	-94	-Infinity	-93
	Config 3	dBm/SCS	-91	-91	-Infinity	-90

Io[Note3]	Config 1,2,4	dBm/ 9.36MHz	-64.59	-64.59	-70.05	-63.85
	Config 3	dBm/ 18.36MHz	-61.67	-61.67	-67.13	-60.93
Propagation condition		-	AWGN		AWGN	
Antenna Configuration			1x2			

Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.
Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for N_{oc} to be fulfilled.
Note 3: Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.
Note 4: NCD-SSB is configured within dedicated RedCap DL BWP.
Note 5: The starting PRB index for dedicated DL BWP corresponding to CD-SSB PRB index;
Note 6: The starting PRB index for dedicated DL BWP corresponding to NCD-SSB PRB index;
Note 7: The starting PRB index for dedicated UL BWP is the same as the dedicated DL BWP corresponding to CD-SSB PRB index;
Note 8: The starting PRB index for dedicated UL BWP is the same as the dedicated DL BWP corresponding to NCD-SSB PRB index;

The handover delay is measured from the beginning of time period T2 to the time that the UE transmit the first PRACH to Cell 2. The handover delay shall be no larger than: RRC procedure delay + $T_{interrupt}$, where:

- RRC procedure delay = 10 ms, is the RRC processing delay specified in TS 38.331 [13] clause 12,
- $T_{interrupt}$ = 362 ms, is the interruption time specified in TS 38.133 [6] clause 6.1D.1.2.

This gives a total of 372 ms.

16.3.1.7 NR SA FR1 - E-UTRA handover for 1Rx UE

Editor's note: This test cases is incomplete in following aspects:

- TT analysis is still missing

16.3.1.7.1 Test purpose

To verify that the UE can make correct inter-RAT E-UTRAN handover when operating in standalone (SA) operation with PCell in FR1. This test shall also verify the NR to E-UTRAN handover requirements as specified in 38.133 [6] clause 6.1D.2.1.

16.3.1.7.2 Test applicability

This test applies to all types of NR RedCap UE with 1 Rx from Release 17 onwards.

16.3.1.7.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 16.3.1.0.1.

The normative reference for this requirement is TS 38.133 [6] clause A.16.3.1.7.

16.3.1.7.4 Test description

16.3.1.7.4.1 Initial conditions

Same as the initial conditions given in sub-clause 6.3.1.4.4.1 with the following exceptions:

- Table 6.3.1.4.4.1-1 is replaced by Table 16.3.1.7.4.1-1.
- Table 6.3.1.4.4.1-2 is replaced by Table 16.3.1.7.4.1-2.
- Table 6.3.1.4.4.1-3 is replaced by Table 16.3.1.7.4.1-3

Table 16.3.1.7.4.1-1: Supported test configurations

Configuration	Description
16.3.1.7-1	NR 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode, LTE FDD
16.3.1.7-2	NR 15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode, LTE FDD
16.3.1.7-3	NR 30 kHz SSB SCS, 20 MHz bandwidth, TDD duplex mode, LTE FDD
16.3.1.7-4	NR 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode, LTE TDD
16.3.1.7-5	NR 15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode, LTE TDD
16.3.1.7-6	NR 30 kHz SSB SCS, 20 MHz bandwidth, TDD duplex mode, LTE TDD
16.3.1.7-7	NR 15 kHz SSB SCS, 10 MHz bandwidth, HD-FDD mode, LTE FDD
16.3.1.7-8	NR 15 kHz SSB SCS, 10 MHz bandwidth, HD-FDD mode, LTE TDD
Note: The UE is only required to be tested in one of the supported test configurations	

Table 16.3.1.7.4.1-2: Initial conditions

Parameter	Value		Comment
Test environment	NC		As specified in TS 38.508-1 [14] clause 4.1.
Test frequencies	As specified in Annex E, Table E.4-1 and TS 38.508-1 [14] clause 4.3.1.		
Channel bandwidth	As specified by the test configuration selected from Table 16.3.1.7.4.1-1.		
Propagation conditions	AWGN		As specified in Annex C.2.2.
Connection Diagram	TE Part	A.3.1.8.1	As specified in TS 38.508-1 [14] Annex A.
	DUT Part	A.3.2.2.1	
Exceptions to connection diagram	N/A		

Table 16.3.1.7.4.1-3: General test parameters

Parameter		Unit	Value	Comment
NR RF Channel Number			1	1 NR carrier frequency is used in the test
LTE RF Channel Number			2	1 E-UTRAN carrier frequency is used in the test
Initial conditions	Active cell		Cell 1	NR cell
	Neighbouring cell		Cell 2	E-UTRAN cell
Final condition	Active cell		Cell 2	
NR measurement quantity			SS-RSRP	
E-UTRAN measurement quantity			RSRP	
b2-Threshold1		dBm	As specified in Table 16.3.1.7.5-1	Absolute NR SS-RSRP threshold for event B2
b2-Threshold2EUTRAN		dBm	-98	Absolute E-UTRAN RSRP threshold for event B2
Hysteresis		dB	0	
TimeToTrigger		s	0	
Filter coefficient			0	L3 filtering is not used
DRX			OFF	Non-DRX test
Access Barring Information		-	Not sent	No additional delays in random access procedure
Time offset between cells			3 ms	Asynchronous cells
Gap pattern configuration Id			0	As specified in 38.133 [6] Table 9.1.2-1 started before T2 starts
T1		s	5	
T2		s	≤5	
T3		s	1	

16.3.1.7.4.2 Test procedure

Same as the test procedure given in sub-clause 6.3.1.4.4.2.

16.3.1.7.4.3 Message contents

Same as the message contents specified in 6.3.1.4.4.3 with the following exceptions:

- Table 7.3.1-3 in TS 38.508-1 [14] is used with condition SMTC.1 RedCap.

16.3.1.7.5 Test requirement

Same as the test requirements given in sub-clause 6.3.1.4.5 with following exceptions:

- Table 6.3.1.4.4.1-3 is replaced by Table 16.3.1.7.4.1-3.
- Table 6.3.1.4.5-1 is replaced by Table 16.3.1.7.5-1.
- Table 6.3.1.4.5-2 is replaced by Table 16.3.1.7.5-2.
- $T_{interrupt}$ in test requirements is specified in 38.133 [6] clause 6.1D.2.1.

Table 16.3.1.7.5-1: Cell specific test parameters (Cell 1)

Parameter		Unit	Configuration	Cell 1		
				T1	T2	T3
RF channel number			1,2,3,4,5,6,7,8	1		
Duplex mode			1,4	FDD		
			2,3,5,6	TDD		
			7,8	HD-FDD		
TDD Configuration			2,5	TDDConf.1.1		
			3,6	TDDConf.1.2		
$BW_{channel}$		MHz	1,4,7,8	10: $N_{RB,c}$ = 52 (FDD)		
			2,5	10: $N_{RB,c}$ = 52 (TDD)		
			3,6	20: $N_{RB,c}$ = 51 (TDD)		
PDSCH reference measurement channel			1,4,7,8	SR.1.1 FDD		
			2,5	SR.1.1 TDD		
			3,6	SR.2.1 TDD		
CORSET reference channel			1,4,7,8	CR.1.1 FDD		
			2,5	CR.1.1 TDD		
			3,6	CR.2.1 TDD		
TRS configuration			1,4,7,8	TRS.1.1 FDD		
			2,5	TRS.1.1 TDD		
			3,6	TRS.1.2 TDD		
OCNG pattern[Note1]			1,2,3,4,5,6,7,8	OP.1		
BWP	Initial DL BWP		1,2,3,4,5,6,7,8	DLBWP.0.1		
	Dedicated DL BWP			DLBWP.1.1		
	Initial UL BWP			ULBWP.0.1		
	Dedicated UL BWP			ULBWP.1.1		
SMTC configuration			1,2,3,4,5,6,7,8	SMTC.1 RedCap		
SSB configuration			1,2,4,5,7,8	SSB.1 FR1		
			3,6	SSB.1 RedCap FR1		
b2-Threshold1		dBm	1,2,4,5,7,8	-96		
			3,6	-93		
EPRE ratio of PSS to SSS		dB	1,2,3,4,5,6,7,8	0		
EPRE ratio of PBCH_DMRS to SSS						
EPRE ratio of PBCH to PBCH_DMRS						
EPRE ratio of PDCCH_DMRS to SSS						
EPRE ratio of PDCCH to PDCCH_DMRS						
EPRE ratio of PDSCH_DMRS to SSS						
EPRE ratio of PDSCH to PDSCH_DMRS						
EPRE ratio of OCNG DMRS to SSS						
EPRE ratio of OCNG to OCNG DMRS						
N_{oc}[Note2]		dBm/15 KHz	1,2,3,4,5,6,7,8	-100	-104	-100
N_{oc}[Note2]		dBm/SCS	1,2,4,5,7,8	-100	-104	-100
			3,6	-97	-101	-97

$\hat{E}_s/N_{oc}$	dB	1,2,3,4,5,6,7,8	12	0	-4
$\hat{E}_s/I_{ot}$[Note3]	dB	1,2,3,4,5,6,7,8	12	0	-4
SS-RSRP[Note3]	dBm/SCS	1,2,4,5,7,8	-88	-104	-104
		3,6	-85	-101	-101
Io[Note3]	dBm/9.36 MHz	1,2,4,5,7,8	-59.78	-73.04	-70.59
	dBm/18.36 MHz	3,6	-56.86	-70.11	-67.67
Propagation condition		1,2,3,4,5,6,7,8	AWGN		

Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.
Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for N_{oc} to be fulfilled.
Note 3: $\hat{E}_s/I_{ot}$, SS-RSRP, and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.

Table 16.3.1.7.5-2: Cell specific test parameters (Cell 2)

Parameter	Unit	Configuration	Cell 2		
			T1	T2	T3
RF channel number		1,2,3,4,5,6,7,8	2		
Duplex mode		1,2,3,7	FDD		
		4,5,6,8	TDD		
TDD special subframe configuration[Note1]		4,5,6,8	6		
TDD uplink-downlink configuration[Note1]		4,5,6,8	1		
$BW_{channel}$	MHz	1,2,3,4,5,6,7,8	5 MHz: $N_{RB,c}$ = 25 10 MHz: $N_{RB,c}$ = 50 20 MHz: $N_{RB,c}$ = 100		
PRACH Configuration[Note2]		1,2,3,7	4		
		4,5,6,8	53		
PDSCH parameters: DL Reference Measurement Channel[Note3]		1,2,3,7	5 MHz: R.7 FDD 10 MHz: R.3 FDD 20 MHz: R.6 FDD		
		4,5,6,8	5 MHz: R.4 TDD 10 MHz: R.0 TDD 20 MHz: R.3 TDD		
PCFICH/PDCCH/PHICH parameters: DL Reference Measurement Channel[Note3]		1,2,3,7	5 MHz: R.11 FDD 10 MHz: R.6 FDD 20 MHz: R.10 FDD		
		4,5,6,8	5 MHz: R.11 TDD 10 MHz: R.6 TDD 20 MHz: R.10 TDD		
OCNG Patterns[Note3]		1,2,3,7	5 MHz: OP.20 FDD 10 MHz: OP.10 FDD 20 MHz: OP.17 FDD		
		4,5,6,8	5 MHz: OP.9 TDD 10 MHz: OP.1 TDD 20 MHz: OP.7 TDD		
PBCH_RA	dB	1,2,3,4,5,6,7,8	0		
PBCH_RB					
PSS_RA					
SSS_RA					
PCFICH_RB					
PHICH_RA					
PHICH_RB					
PDCCH_RA					
PDCCH_RB					
PDSCH_RA					
PDSCH_RB					
OCNG_RA[Note4]					
OCNG_RB[Note4]					
N_{oc}[Note5]	dBm/15kHz	1,2,3,4,5,6,7,8	-98		

$\hat{E}_s/N_{oc}$	dB	1,2,3,4,5,6,7,8	-Infinity	8	78
$\hat{E}_s/I_{ot}$ Note6	dB	1,2,3,4,5,6,7,8	-Infinity	78	78
RSRP Note6	dBm/15kHz	1,2,3,4,5,6,7,8	-Infinity	-90	-90
SCH_RP Note6	dBm/15kHz	1,2,3,4,5,6,7,8	-Infinity	-90	-90
Io Note6	dBm/9MHz	1,2,3,4,5,6,7,8	-67.21 +10log($N_{RB,c}$/100)	-58.57 +10log($N_{RB,c}$/100)	-58.57 +10log($N_{RB,c}$/100)
Propagation Condition		1,2,3,4,5,6,7,8	AWGN		

Note 1: Special subframe and uplink-downlink configurations are specified in table 4.2-1 in TS 36.211 [24].
Note 2: PRACH configurations are specified in table 5.7.1-2 and table 5.7.1-3 in TS 36.211 [24].
Note 3: DL RMCs and OCNG patterns are specified in clauses A 3.1 and A 3.2 of TS 36.133 [23] respectively.
Note 4: OCNG shall be used such that all cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.
Note 5: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for N_{oc} to be fulfilled.
Note 6: $\hat{E}_s/I_{ot}$, RSRP, SCH_RP and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.
Note 7: Propagation condition and correlation matrix are defined in clause B.2 in TS 36.101 [27].

16.3.1.8 NR SA FR1 - E-UTRA handover for 2Rx UE

16.3.1.8.1 Test purpose

To verify that the UE can make correct inter-RAT E-UTRAN handover when operating in standalone (SA) operation with PCell in FR1. This test shall also verify the NR to E-UTRAN handover requirements as specified in 38.133 [6] clause 6.1D.2.1.

16.3.1.8.2 Test applicability

This test applies to all types of NR RedCap UE with 2 Rx from Release 17 onwards.

16.3.1.8.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 16.3.1.0.1.

The normative reference for this requirement is TS 38.133 [6] clause A.16.3.1.8.

16.3.1.8.4 Test description

16.3.1.8.4.1 Initial conditions

Same as the initial conditions given in sub-clause 6.3.1.4.4.1 with the following exceptions:

- Table 6.3.1.4.4.1-1 is replaced by Table 16.3.1.8.4.1-1.
- Table 6.3.1.4.4.1-2 is replaced by Table 16.3.1.8.4.1-2.
- Table 6.3.1.4.4.1-3 is replaced by Table 16.3.1.8.4.1-3

Table 16.3.1.8.4.1-1: Supported test configurations

Configuration	Description
16.3.1.8-1	NR 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode, LTE FDD
16.3.1.8-2	NR 15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode, LTE FDD
16.3.1.8-3	NR 30 kHz SSB SCS, 20 MHz bandwidth, TDD duplex mode, LTE FDD
16.3.1.8-4	NR 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode, LTE TDD
16.3.1.8-5	NR 15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode, LTE TDD
16.3.1.8-6	NR 30 kHz SSB SCS, 20 MHz bandwidth, TDD duplex mode, LTE TDD
16.3.1.8-7	NR 15 kHz SSB SCS, 10 MHz bandwidth, HD-FDD mode, LTE FDD
16.3.1.8-8	NR 15 kHz SSB SCS, 10 MHz bandwidth, HD-FDD mode, LTE TDD
Note: The UE is only required to be tested in one of the supported test configurations	

Table 16.3.1.8.4.1-2: Initial conditions

Parameter	Value		Comment
Test environment	NC		As specified in TS 38.508-1 [14] clause 4.1.
Test frequencies	As specified in Annex E, Table E.4-1 and TS 38.508-1 [14] clause 4.3.1.		
Channel bandwidth	As specified by the test configuration selected from Table 16.3.1.8.4.1-1.		
Propagation conditions	AWGN		As specified in Annex C.2.2.
Connection Diagram	TE Part	A.3.1.6.1	As specified in TS 38.508-1 [14] Annex A.
	DUT Part	A.3.2.3.2	
Exceptions to connection diagram	N/A		

Table 16.3.1.8.4.1-3: General test parameters

Parameter		Unit	Value	Comment
NR RF Channel Number			1	1 NR carrier frequency is used in the test
LTE RF Channel Number			2	1 E-UTRAN carrier frequency is used in the test
Initial conditions	Active cell		Cell 1	NR cell
	Neighbouring cell		Cell 2	E-UTRAN cell
Final condition	Active cell		Cell 2	
NR measurement quantity			SS-RSRP	
E-UTRAN measurement quantity			RSRP	
b2-Threshold1		dBm	As specified in Table 16.3.1.7.5-2	Absolute NR SS-RSRP threshold for event B2
b2-Threshold2EUTRAN		dBm	-98	Absolute E-UTRAN RSRP threshold for event B2
Hysteresis		dB	0	
TimeToTrigger		s	0	
Filter coefficient			0	L3 filtering is not used
DRX			OFF	Non-DRX test
Access Barring Information		-	Not sent	No additional delays in random access procedure
Time offset between cells			3 ms	Asynchronous cells
Gap pattern configuration Id			0	As specified in 38.133 [6] Table 9.1.2-1 started before T2 starts
T1		s	5	
T2		s	≤5	
T3		s	1	

16.3.1.8.4.2 Test procedure

Same as the test procedure given in sub-clause 6.3.1.4.4.2.

16.3.1.8.4.3 Message contents

Same as the message contents specified in 6.3.1.4.4.3 with the following exceptions:

- Table 7.3.1-3 in TS 38.508-1 [14] is used with condition SMTC.1 RedCap.

16.3.1.8.5 Test requirement

Same as the test requirements given in sub-clause 6.3.1.4.5 with following exceptions:

- Table 6.3.1.4.4.1-3 is replaced by Table 16.3.1.8.4.1-3.
- Table 6.3.1.4.5-1 is replaced by Table 16.3.1.8.5-1.
- Table 6.3.1.4.5-2 is replaced by Table 16.3.1.8.5-2.
- $T_{interrupt}$ in test requirements is specified in 38.133 [6] clause 6.1D.2.1.

Table 16.3.1.8.5-1: Cell specific test parameters (Cell 1)

Parameter		Unit	Configuration	Cell 1		
				T1	T2	T3
RF channel number			1,2,3,4,5,6,7,8	1		
Duplex mode			1,4	FDD		
			2,3,5,6	TDD		
			7,8	HD-FDD		
TDD Configuration			2,5	TDDConf.1.1		
			3,6	TDDConf.1.2		
$BW_{channel}$		MHz	1,4,7,8	10: $N_{RB,c}$ = 52 (FDD)		
			2,5	10: $N_{RB,c}$ = 52 (TDD)		
			3,6	20: $N_{RB,c}$ = 51 (TDD)		
PDSCH reference measurement channel			1,4,7,8	SR.1.1 FDD		
			2,5	SR.1.1 TDD		
			3,6	SR.2.1 TDD		
CORSET reference channel			1,4,7,8	CR.1.1 FDD		
			2,5	CR.1.1 TDD		
			3,6	CR.2.1 TDD		
TRS configuration			1,4,7,8	TRS.1.1 FDD		
			2,5	TRS.1.1 TDD		
			3,6	TRS.1.2 TDD		
OCNG pattern[Note1]			1,2,3,4,5,6,7,8	OP.1		
BWP	Initial DL BWP		1,2,3,4,5,6,7,8	DLBWP.0.1		
	Dedicated DL BWP			DLBWP.1.1		
	Initial UL BWP			ULBWP.0.1		
	Dedicated UL BWP			ULBWP.1.1		
SMTC configuration			1,2,3,4,5,6,7,8	SMTC.1 RedCap		
SSB configuration			1,2,4,5,7,8	SSB.1 FR1		
			3,6	SSB.1 RedCap FR1		
b2-Threshold1		dBm	1,2,4,5,7,8	-96		
			3,6	-93		
EPRE ratio of PSS to SSS		dB	1,2,3,4,5,6,7,8	0		
EPRE ratio of PBCH_DMRS to SSS						
EPRE ratio of PBCH to PBCH_DMRS						
EPRE ratio of PDCCH_DMRS to SSS						
EPRE ratio of PDCCH to PDCCH_DMRS						
EPRE ratio of PDSCH_DMRS to SSS						
EPRE ratio of PDSCH to PDSCH_DMRS						
EPRE ratio of OCNG DMRS to SSS						
EPRE ratio of OCNG to OCNG DMRS						
N_{oc}[Note2]		dBm/15 KHz	1,2,3,4,5,6,7,8	-100	-104	-100
N_{oc}[Note2]		dBm/SCS	1,2,4,5,7,8	-100	-104	-100
			3,6	-97	-101	-97
$\hat{E}_s/N_{oc}$		dB	1,2,3,4,5,6,7,8	13.55	-1.55	-5.55
$\hat{E}_s/I_{ot}$[Note3]		dB	1,2,3,4,5,6,7,8	13.55	-1.55	-5.55
SS-RSRP[Note3]		dBm/SCS	1,2,4,5,7,8	-86.45	-105.55	-105.55
			3,6	-83.44	-102.54	-102.54
Io[Note3]		dBm/9.36 MHz	1,2,4,5,7,8	-58.31	-73.04	-70.98
		dBm/18.36 MHz	3,6	-55.38	-70.82	-68.05
Propagation condition			1,2,3,4,5,6,7,8	AWGN		
Antenna Configuration and Correlation Matrix			1,2,3,4,5,6,7.8	1x2 Low		

Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.

Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for N_{oc} to be fulfilled.

Note 3: $\hat{E}_s/I_{ot}$, SS-RSRP, and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.

Table 16.3.1.8.5-2: Cell specific test parameters (Cell 2)

Parameter	Unit	Configuration	Cell 2		
			T1	T2	T3
RF channel number		1,2,3,4,5,6,7,8	2		
Duplex mode		1,2,3,7	FDD		
		4,5,6,8	TDD		
TDD special subframe configuration[Note1]		4,5,6,8	6		
TDD uplink-downlink configuration[Note1]		4,5,6,8	1		
$BW_{channel}$	MHz	1,2,3,4,5,6,7,8	5 MHz: $N_{RB,c}$ = 25 10 MHz: $N_{RB,c}$ = 50 20 MHz: $N_{RB,c}$ = 100		
PRACH Configuration[Note2]		1,2,3,7	4		
		4,5,6,8	53		
PDSCH parameters: DL Reference Measurement Channel[Note3]		1,2,3,7	5 MHz: R.7 FDD 10 MHz: R.3 FDD 20 MHz: R.6 FDD		
		4,5,6,8	5 MHz: R.4 TDD 10 MHz: R.0 TDD 20 MHz: R.3 TDD		
PCFICH/PDCCH/PHICH parameters: DL Reference Measurement Channel[Note3]		1,2,3,7	5 MHz: R.11 FDD 10 MHz: R.6 FDD 20 MHz: R.10 FDD		
		4,5,6,8	5 MHz: R.11 TDD 10 MHz: R.6 TDD 20 MHz: R.10 TDD		
OCNG Patterns[Note3]		1,2,3,7	5 MHz: OP.20 FDD 10 MHz: OP.10 FDD 20 MHz: OP.17 FDD		
		4,5,6,8	5 MHz: OP.9 TDD 10 MHz: OP.1 TDD 20 MHz: OP.7 TDD		
PBCH_RA	dB	1,2,3,4,5,6,7,8	0		
PBCH_RB					
PSS_RA					
SSS_RA					
PCFICH_RB					
PHICH_RA					
PHICH_RB					
PDCCH_RA					
PDCCH_RB					
PDSCH_RA					
PDSCH_RB					
OCNG_RA[Note4]					
OCNG_RB[Note4]					
N_{oc}[Note5]	dBm/15kHz	1,2,3,4,5,6,7,8	-98		
$\hat{E}_s/N_{oc}$	dB	1,2,3,4,5,6,7,8	-Infinity	9.55	9.55
$\hat{E}_s/I_{ot}$[Note6]	dB	1,2,3,4,5,6,7,8	-Infinity	9.55	9.55
RSRP[Note6]	dBm/15kHz	1,2,3,4,5,6,7,8	-Infinity	-88.45	-88.45
SCH_RP[Note6]	dBm/15kHz	1,2,3,4,5,6,7,8	-Infinity	-88.45	-88.45
Io[Note6]	dBm/9MHz	1,2,3,4,5,6,7,8	-67.21 +10log($N_{RB,c}$/100)	-57.20 +10log($N_{RB,c}$/100)	-57.20 +10log($N_{RB,c}$/100)
Propagation Condition		1,2,3,4,5,6,7,8	AWGN		
Antenna Configuration and Correlation Matrix [Note7]		1,2,3,4,5,6,7,8	1x2 Low		

Note 1: Special subframe and uplink-downlink configurations are specified in table 4.2-1 in TS 36.211 [24].
Note 2: PRACH configurations are specified in table 5.7.1-2 and table 5.7.1-3 in TS 36.211 [24].
Note 3: DL RMCs and OCNG patterns are specified in clauses A 3.1 and A 3.2 of TS 36.133 [23] respectively.
Note 4: OCNG shall be used such that all cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.
Note 5: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for N_{oc} to be fulfilled.

Note 6:	$\hat{E}_s/I_{ot}$, RSRP, SCH_RP and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.
Note 7:	Propagation condition and correlation matrix are defined in clause B.2 in TS 36.101 [27].

16.3.1.9 NR SA FR1 - E-UTRA handover with unknown target cell for 1 Rx UE

Editor's note: This test cases is incomplete in following aspects:

- TT analysis is still missing

16.3.1.9.1 Test purpose

To verify that the UE can make correct inter-RAT E-UTRAN handover when operating in standalone (SA) operation with PCell in FR1. This test shall also verify the NR to E-UTRAN handover requirements for the case when the target E-UTRAN cell is unknown as specified in 38.133 [6] clause 6.1D.2.1.

16.3.1.9.2 Test applicability

This test applies to all types of NR RedCap UE with 1 Rx from Release 17 onwards.

16.3.1.9.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 16.3.1.0.1.

The normative reference for this requirement is TS 38.133 [6] clause A.16.3.1.9.

16.3.1.9.4 Test description

16.3.1.9.4.1 Initial conditions

Same as the initial conditions given in sub-clause 6.3.1.5.4.1 with the following exceptions:

- Table 6.3.1.5.4.1-1 is replaced by Table 16.3.1.9.4.1-1.
- Table 6.3.1.5.4.1-2 is replaced by Table 16.3.1.9.4.1-2.
- Table 6.3.1.5.4.1-3 is replaced by Table 16.3.1.9.4.1-3

Table 16.3.1.9.4.1-1: Supported test configurations

Configuration	Description
16.3.1.9-1	NR 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode, LTE FDD
16.3.1.9-2	NR 15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode, LTE FDD
16.3.1.9-3	NR 30 kHz SSB SCS, 20 MHz bandwidth, TDD duplex mode, LTE FDD
16.3.1.9-4	NR 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode, LTE TDD
16.3.1.9-5	NR 15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode, LTE TDD
16.3.1.9-6	NR 30 kHz SSB SCS, 20 MHz bandwidth, TDD duplex mode, LTE TDD
16.3.1.9-7	NR 15 kHz SSB SCS, 10 MHz bandwidth, HD-FDD mode, LTE FDD
16.3.1.9-8	NR 15 kHz SSB SCS, 10 MHz bandwidth, HD-FDD mode, LTE TDD
Note: The UE is only required to be tested in one of the supported test configurations	

Table 16.3.1.9.4.1-2: Initial conditions

Parameter	Value		Comment
Test environment	NC		As specified in TS 38.508-1 [14] clause 4.1.
Test frequencies	As specified in Annex E, Table E.4-1 and TS 38.508-1 [14] clause 4.3.1.		
Channel bandwidth	As specified by the test configuration selected from Table 16.3.1.9.4.1-1.		
Propagation conditions	AWGN		As specified in Annex C.2.2.
Connection Diagram	TE Part	A.3.1.8.1	As specified in TS 38.508-1 [14] Annex A.
	DUT Part	A.3.2.2.1	

Exceptions to connection diagram	N/A	

Table 16.3.1.9.4.1-3: General test parameters

Parameter		Unit	Value	Comment
NR RF Channel Number			1	1 NR carrier frequency is used in the test
LTE RF Channel Number			2	1 E-UTRAN carrier frequency is used in the test
Initial conditions	Active cell		Cell 1	NR cell
	Neighbouring cell		Cell 2	E-UTRAN cell
Final condition	Active cell		Cell 2	
NR measurement quantity			SS-RSRP	
DRX			OFF	Non-DRX test
Access Barring Information		-	Not sent	No additional delays in random access procedure
Time offset between cells			3 ms	Asynchronous cells
T1		s	≤5	
T2		s	1	

16.3.1.9.4.2 Test procedure

Same as the test procedure given in sub-clause 6.3.1.5.4.2.

16.3.1.9.4.3 Message contents

Same as the message contents specified in 6.3.1.5.4.3.

16.3.1.9.5 Test requirement

Same as the test requirements given in sub-clause 6.3.1.5.5 with following exceptions:

- Table 6.3.1.5.4.1-3 is replaced by Table 16.3.1.9.4.1-3.
- Table 6.3.1.5.5-1 is replaced by Table 16.3.1.9.5-1.
- Table 6.3.1.5.5-2 is replaced by Table 16.3.1.9.5-2.
- $T_{interrupt}$ in test requirements is specified in 38.133 [6] clause 6.1D.2.1.

Table 16.3.1.9.5-1: Cell specific test parameters (Cell 1)

Parameter	Unit	Configuration	Cell 1	
			T1	T2
RF channel number		1,2,3,4,5,6,7,8	1	
Duplex mode		1,4	FDD	
		2,3,5,6	TDD	
		7,8	HD-FDD	
TDD Configuration		2,5	TDDConf.1.1	
		3,6	TDDConf.1.2	
$BW_{channel}$	MHz	1,4,7,8	10: $N_{RB,c}$ = 52 (FDD)	
		2,5	10: $N_{RB,c}$ = 52 (TDD)	
		3,6	20: $N_{RB,c}$ = 51 (TDD)	
PDSCH reference measurement channel		1,4,7,8	SR.1.1 FDD	
		2,5	SR.1.1 TDD	
		3,6	SR.2.1 TDD	
CORSET reference channel		1,4,7,8	CR.1.1 FDD	
		2,5	CR.1.1 TDD	
		3,6	CR.2.1 TDD	
TRS configuration		1,4,7,8	TRS.1.1 FDD	

			2,5	TRS.1.1 TDD	
			3,6	TRS.1.2 TDD	
OCNG pattern[Note1]			1,2,3,4,5,6,7,8	OP.1	
BWP	Initial DL BWP		1,2,3,4,5,6,7,8	DLBWP.0.1	
	Dedicated DL BWP			DLBWP.1.1	
	Initial UL BWP			ULBWP.0.1	
	Dedicated UL BWP			ULBWP.1.1	
SMTC configuration			1,2,3,4,5,6,7,8	SMTC.1 RedCap	
SSB configuration			1,2,4,5,7,8	SSB.1 FR1	
			3,6	SSB.1 RedCap FR1	
EPRE ratio of PSS to SSS		dB	1,2,3,4,5,6,7,8	0	
EPRE ratio of PBCH_DMRS to SSS					
EPRE ratio of PBCH to PBCH_DMRS					
EPRE ratio of PDCCH_DMRS to SSS					
EPRE ratio of PDCCH to PDCCH_DMRS					
EPRE ratio of PDSCH_DMRS to SSS					
EPRE ratio of PDSCH to PDSCH_DMRS					
EPRE ratio of OCNG DMRS to SSS					
EPRE ratio of OCNG to OCNG DMRS					
N_{oc}[Note2]		dBm/15 KHz	1,2,3,4,5,6,7,8	-98	
N_{oc}[Note2]		dBm/SCS	1,2,4,5,7,8	-98	
			3,6	-95	
$\hat{E}_s/N_{oc}$		dB	1,2,3,4,5,6,7,8	0	0
$\hat{E}_s/I_{ot}$[Note3]		dB	1,2,3,4,5,6,7,8	0	0
SS-RSRP[Note3]		dBm/SCS	1,2,4,5,7,8	-98	-98
			3,6	-95	-95
Io[Note3]		dBm/9.36 MHz	1,2,4,5,7,8	-67.04	-67.04
		dBm/38.16 MHz	3,6	-64.12	-64.12
Propagation condition			1,2,3,4,5,6,7,8	AWGN	

Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.

Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for N_{oc} to be fulfilled.

Note 3: $\hat{E}_s/I_{ot}$, SS-RSRP, and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.

Table 16.3.1.9.5-2: Cell specific test parameters (Cell 2)

Parameter	Unit	Configuration	Cell 2	
			T1	T2
RF channel number		1,2,3,4,5,6,7,8	2	
Duplex mode		1,2,3,7	FDD	
		4,5,6,8	TDD	
TDD special subframe configuration[Note1]		4,5,6,8	6	
TDD uplink-downlink configuration[Note1]		4,5,6,8	1	
$BW_{channel}$	MHz	1,2,3,4,5,6,7,8	5 MHz: $N_{RB,c}$ = 25 10 MHz: $N_{RB,c}$ = 50 20 MHz: $N_{RB,c}$ = 100	
PRACH Configuration[Note2]		1,2,3,7	4	
		4,5,6,8	53	
PDSCH parameters: DL Reference Measurement Channel[Note3]		1,2,3,7	5 MHz: R.7 FDD 10 MHz: R.3 FDD 20 MHz: R.6 FDD	
		4,5,6,8	5 MHz: R.4 TDD 10 MHz: R.0 TDD 20 MHz: R.3 TDD	
PCFICH/PDCCH/PHICH parameters: DL Reference Measurement Channel[Note3]		1,2,3,7	5 MHz: R.11 FDD 10 MHz: R.6 FDD 20 MHz: R.10 FDD	

		4,5,6,8	5 MHz: R.11 TDD 10 MHz: R.6 TDD 20 MHz: R.10 TDD	
OCNG Patterns[Note3]		1,2,3,7	5 MHz: OP.20 FDD 10 MHz: OP.10 FDD 20 MHz: OP.17 FDD	
		4,5,6,8	5 MHz: OP.9 TDD 10 MHz: OP.1 TDD 20 MHz: OP.7 TDD	
PBCH_RA	dB	1,2,3,4,5,6,7,8	0	
PBCH_RB				
PSS_RA				
SSS_RA				
PCFICH_RB				
PHICH_RA				
PHICH_RB				
PDCCH_RA				
PDCCH_RB				
PDSCH_RA				
PDSCH_RB				
OCNG_RA[Note4]				
OCNG_RB[Note4]				
N_{oc}[Note5]	dBm/15kHz	1,2,3,4,5,6,7,8	-98	
$\hat{E}_s/N_{oc}$	dB	1,2,3,4,5,6,7,8	-Infinity	7
$\hat{E}_s/I_{ot}$[Note6]	dB	1,2,3,4,5,6,7,8	-Infinity	7
RSRP[Note6]	dBm/15kHz	1,2,3,4,5,6,7,8	-Infinity	-91
SCH_RP[Note6]	dBm/15kHz	1,2,3,4,5,6,7,8	-Infinity	-91
Io[Note6]	dBm/9MHz	1,2,3,4,5,6,7,8	-70.22	-62.43
Propagation Condition		1,2,3,4,5,6,7,8	AWGN	

Note 1: Special subframe and uplink-downlink configurations are specified in table 4.2-1 in TS 36.211 [24].
Note 2: PRACH configurations are specified in table 5.7.1-2 and table 5.7.1-3 in TS 36.211 [24].
Note 3: DL RMCs and OCNG patterns are specified in clauses A 3.1 and A 3.2 of TS 36.133 [23] respectively.
Note 4: OCNG shall be used such that all cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.
Note 5: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for N_{oc} to be fulfilled.
Note 6: $\hat{E}_s/I_{ot}$, RSRP, SCH_RP and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.
Note 7: Propagation condition and correlation matrix are defined in clause B.2 in TS 36.101 [27].

16.3.1.10 NR SA FR1 - E-UTRA handover with unknown target cell for 2 Rx UE

16.3.1.10.1 Test purpose

To verify that the UE can make correct inter-RAT E-UTRAN handover when operating in standalone (SA) operation with PCell in FR1. This test shall also verify the NR to E-UTRAN handover requirements for the case when the target E-UTRAN cell is unknown as specified in 38.133 [6] clause 6.1D.2.1.

16.3.1.10.2 Test applicability

This test applies to all types of NR RedCap UE with 2 Rx from Release 17 onwards.

16.3.1.10.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 16.3.1.0.1.

The normative reference for this requirement is TS 38.133 [6] clause A.16.3.1.10.

16.3.1.10.4 Test description

16.3.1.10.4.1 Initial conditions

Same as the initial conditions given in sub-clause 6.3.1.5.4.1 with the following exceptions:

- Table 6.3.1.5.4.1-1 is replaced by Table 16.3.1.10.4.1-1.
- Table 6.3.1.5.4.1-2 is replaced by Table 16.3.1.10.4.1-2.
- Table 6.3.1.5.4.1-3 is replaced by Table 16.3.1.10.4.1-3

Table 16.3.1.10.4.1-1: Supported test configurations

Configuration	Description
16.3.1.10-1	NR 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode, LTE FDD
16.3.1.10-2	NR 15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode, LTE FDD
16.3.1.10-3	NR 30 kHz SSB SCS, 20 MHz bandwidth, TDD duplex mode, LTE FDD
16.3.1.10-4	NR 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode, LTE TDD
16.3.1.10-5	NR 15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode, LTE TDD
16.3.1.10-6	NR 30 kHz SSB SCS, 20 MHz bandwidth, TDD duplex mode, LTE TDD
16.3.1.10-7	NR 15 kHz SSB SCS, 10 MHz bandwidth, HD-FDD mode, LTE FDD
16.3.1.10-8	NR 15 kHz SSB SCS, 10 MHz bandwidth, HD-FDD mode, LTE TDD
Note: The UE is only required to be tested in one of the supported test configurations	

Table 16.3.1.10.4.1-2: Initial conditions

Parameter	Value		Comment
Test environment	NC		As specified in TS 38.508-1 [14] clause 4.1.
Test frequencies	As specified in Annex E, Table E.4-1 and TS 38.508-1 [14] clause 4.3.1.		
Channel bandwidth	As specified by the test configuration selected from Table 16.3.1.10.4.1-1.		
Propagation conditions	AWGN		As specified in Annex C.2.2.
Connection Diagram	TE Part	A.3.1.6.1	As specified in TS 38.508-1 [14] Annex A.
	DUT Part	A.3.2.3.2	
Exceptions to connection diagram	N/A		

Table 16.3.1.10.4.1-3: General test parameters

Parameter		Unit	Value	Comment
NR RF Channel Number			1	1 NR carrier frequency is used in the test
LTE RF Channel Number			2	1 E-UTRAN carrier frequency is used in the test
Initial conditions	Active cell		Cell 1	NR cell
	Neighbouring cell		Cell 2	E-UTRAN cell
Final condition	Active cell		Cell 2	
NR measurement quantity			SS-RSRP	
DRX			OFF	Non-DRX test
Access Barring Information		-	Not sent	No additional delays in random access procedure
Time offset between cells			3 ms	Asynchronous cells
T1		s	≤5	
T2		s	1	

16.3.1.10.4.2 Test procedure

Same as the test procedure given in sub-clause 6.3.1.5.4.2.

16.3.1.10.4.3 Message contents

Same as the message contents specified in 6.3.1.5.4.3.

16.3.1.10.5 Test requirement

Same as the test requirements given in sub-clause 6.3.1.5.5 with following exceptions:

- Table 6.3.1.5.4.1-3 is replaced by Table 16.3.1.10.4.1-3.
- Table 6.3.1.5.5-1 is replaced by Table 16.3.1.10.5-1.
- Table 6.3.1.5.5-2 is replaced by Table 16.3.1.10.5-2.
- $T_{interrupt}$ in test requirements is specified in 38.133 [6] clause 6.1D.2.1.

Table 16.3.1.10.5-1: Cell specific test parameters (Cell 1)

Parameter		Unit	Configuration	Cell 1	
				T1	T2
RF channel number			1,2,3,4,5,6,7,8	1	
Duplex mode			1,4	FDD	
			2,3,5,6	TDD	
			7,8	HD-FDD	
TDD Configuration			2,5	TDDConf.1.1	
			3,6	TDDConf.1.2	
$BW_{channel}$		MHz	1,4,7,8	10: $N_{RB,c}$ = 52 (FDD)	
			2,5	10: $N_{RB,c}$ = 52 (TDD)	
			3,6	20: $N_{RB,c}$ = 51 (TDD)	
PDSCH reference measurement channel			1,4,7,8	SR.1.1 FDD	
			2,5	SR.1.1 TDD	
			3,6	SR.2.1 TDD	
CORSET reference channel			1,4,7,8	CR.1.1 FDD	
			2,5	CR.1.1 TDD	
			3,6	CR.2.1 TDD	
TRS configuration			1,4,7,8	TRS.1.1 FDD	
			2,5	TRS.1.1 TDD	
			3,6	TRS.1.2 TDD	
OCNG pattern[Note1]			1,2,3,4,5,6,7,8	OP.1	
BWP	Initial DL BWP		1,2,3,4,5,6,7,8	DLBWP.0.1	
	Dedicated DL BWP			DLBWP.1.1	
	Initial UL BWP			ULBWP.0.1	
	Dedicated UL BWP			ULBWP.1.1	
SMTC configuration			1,2,3,4,5,6,7,8	SMTC.1 RedCap	
SSB configuration			1,2,4,5,7,8	SSB.1 FR1	
			3, 6	SSB.1 RedCap FR1	
EPRE ratio of PSS to SSS		dB	1,2,3,4,5,6,7,8	0	
EPRE ratio of PBCH-DMRS to SSS					
EPRE ratio of PBCH to PBCH-DMRS					
EPRE ratio of PDCCH-DMRS to SSS					
EPRE ratio of PDCCH to PDCCH-DMRS					
EPRE ratio of PDSCH_DMRS to SSS					
EPRE ratio of PDSCH to PDSCH-DMRS					
EPRE ratio of OCNG DMRS to SSS					
EPRE ratio of OCNG to OCNG DMRS					
N_{oc}[Note2]		dBm/15 KHz	1,2,3,4,5,6,7,8	-98	
N_{oc}[Note2]		dBm/SCS	1,2,4,5,7,8	-98	
			3,6	-95	
$\hat{E}_s/N_{oc}$		dB	1,2,3,4,5,6,7,8	0	0
$\hat{E}_s/I_{ot}$[Note3]		dB	1,2,3,4,5,6,7,8	0	0
SS-RSRP[Note3]		dBm/SCS	1,2,4,5,7,8	-98	-98
			3,6	-95	-95
Io[Note3]		dBm/9.36 MHz	1,2,4,5,7,8	-67.04	-67.04

	dBm/18.36 MHz	3,6	-64.12	-64.12
Propagation condition		1,2,3,4,5,6,7,8	AWGN	
Antenna Configuration and Correlation Matrix		1,2,3,4,5,6,7,8	1x2 Low	
Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols. Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for N_{oc} to be fulfilled. Note 3: $\hat{E}_s/I_{ot}$, SS-RSRP, and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.				

Table 16.3.1.10.5-2: Cell specific test parameters (Cell 2)

Parameter	Unit	Configuration	Cell 2	
			T1	T2
RF channel number		1,2,3,4,5,6,7,8	2	
Duplex mode		1,2,3,7	FDD	
		4,5,6,8	TDD	
TDD special subframe configuration[Note1]		4,5,6,8	6	
TDD uplink-downlink configuration[Note1]		4,5,6,8	1	
$BW_{channel}$	MHz	1,2,3,4,5,6,7,8	5 MHz: $N_{RB,c}$ = 25 10 MHz: $N_{RB,c}$ = 50 20 MHz: $N_{RB,c}$ = 100	
PRACH Configuration[Note2]		1,2,3,7	4	
		4,5,6,8	53	
PDSCH parameters: DL Reference Measurement Channel[Note3]		1,2,3,7	5 MHz: R.7 FDD 10 MHz: R.3 FDD 20 MHz: R.6 FDD	
		4,5,6,8	5 MHz: R.4 TDD 10 MHz: R.0 TDD 20 MHz: R.3 TDD	
PCFICH/PDCCH/PHICH parameters: DL Reference Measurement Channel[Note3]		1,2,3,7	5 MHz: R.11 FDD 10 MHz: R.6 FDD 20 MHz: R.10 FDD	
		4,5,6,8	5 MHz: R.11 TDD 10 MHz: R.6 TDD 20 MHz: R.10 TDD	
OCNG Patterns[Note3]		1,2,3,7	5 MHz: OP.20 FDD 10 MHz: OP.10 FDD 20 MHz: OP.17 FDD	
		4,5,6,8	5 MHz: OP.9 TDD 10 MHz: OP.1 TDD 20 MHz: OP.7 TDD	
PBCH_RA	dB	1,2,3,4,5,6,7,8	0	
PBCH_RB				
PSS_RA				
SSS_RA				
PCFICH_RB				
PHICH_RA				
PHICH_RB				
PDCCH_RA				
PDCCH_RB				
PDSCH_RA				
PDSCH_RB				
OCNG_RA[Note4]				
OCNG_RB[Note4]				
N_{oc}[Note5]	dBm/15kHz	1,2,3,4,5,6,7,8	-98	
$\hat{E}_s/N_{oc}$	dB	1,2,3,4,5,6,7,8	-Infinity	7
$\hat{E}_s/I_{ot}$[Note6]	dB	1,2,3,4,5,6,7,8	-Infinity	7
RSRP[Note6]	dBm/15kHz	1,2,3,4,5,6,7,8	-Infinity	-91
SCH_RP[Note6]	dBm/15kHz	1,2,3,4,5,6,7,8	-Infinity	-91
Io[Note6]	dBm/9MHz	1,2,3,4,5,6,7,8	-70.22	-62.43
Propagation Condition		1,2,3,4,5,6,7,8	AWGN	

Antenna Configuration and Correlation Matrix Note7		1,2,3,4,5,6,7,8	1x2 Low

Note 1: Special subframe and uplink-downlink configurations are specified in table 4.2-1 in TS 36.211 [24].
Note 2: PRACH configurations are specified in table 5.7.1-2 and table 5.7.1-3 in TS 36.211 [24].
Note 3: DL RMCs and OCNG patterns are specified in clauses A 3.1 and A 3.2 of TS 36.133 [23] respectively.
Note 4: OCNG shall be used such that all cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.
Note 5: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for N_{oc} to be fulfilled.
Note 6: $\hat{E}_s/I_{ot}$, RSRP, SCH_RP and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.
Note 7: Propagation condition and correlation matrix are defined in clause B.2 in TS 36.101 [27].

16.3.2 RRC connection mobility control for RedCap

16.3.2.1 RRC re-establishment for RedCap

16.3.2.1.0 Minimum conformance requirements

16.3.2.1.0.1 Minimum conformance requirements for FR1 RRC re-establishment

The requirements in clause 6.3.2.1.0.1 shall apply when RedCap UE is capable of 2 Rx.

When UE is only required to support 1 Rx antenna, the requirements defined in clause 6.3.2.1.0.1 shall apply except that:

- $T_{identify_intra_NR}$ as specified in Table 16.3.2.1.0.1-1.
- $T_{identify_inter_NR,\ i}$ as specified in Table 16.3.2.1.0.1-2.

Table 16.3.2.1.0.1-1: Time to identify target NR cell for RRC connection re-establishment to NR intra-frequency cell

Serving cell SSB $\hat{E}s/Iot$ (dB)	FR of target NR cell	$T_{identify_intra_NR}$ [ms]	
		Known NR cell	Unknown NR cell
≥ -8	FR1	MAX (200 ms, 6 x T_{SMTC})	MAX (800 ms, [11] x T_{SMTC})
< -8	FR1	N/A	800 Note1

Note 1: The UE is not required to successfully identify a cell on any NR frequency layer when T_{SMTC} > 20 ms and serving cell SSB $\hat{E}s/Iot$ < -8 dB.

Table 16.3.2.1.0.1-2: Time to identify target NR cell for RRC connection re-establishment to NR inter-frequency cell

Serving cell SSB $\hat{E}s/Iot$ (dB)	FR of target NR cell	$T_{identify_inter_NR,\ i}$ [ms]	
		Known NR cell	Unknown NR cell
≥ -8	FR1	MAX (200 ms, 7 x $T_{SMTC,\ i}$)	MAX (800 ms, [14] x $T_{SMTC,\ i}$)
< -8	FR1	N/A	800 Note1

Note 1: The UE is not required to successfully identify a cell on any NR frequency layer when $T_{SMTC,i}$ > 20 ms and serving cell SSB $\hat{E}s/Iot$ < -8 dB.

The normative reference for this requirement is TS 38.133 [6] clauses 6.2.1B.

16.3.2.1.1 NR SA FR1 Intra-frequency RRC Re-establishment in FR1 for 1 Rx UE

Editor's Note: This test case is incomplete in following aspects:

- TT analysis is still missing.

16.3.2.1.1.1 Test purpose

To verify that the NR intra-frequency RRC re-establishment delay in FR1 with known target cell is within the specified limits. This test will verify the requirements in 38.133 [6] clause 6.2.1B.

16.3.2.1.1.2 Test applicability

This test applies to all types of NR RedCap UE with 1Rx from Release 17 onwards.

16.3.2.1.1.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 6.3.2.1.0.1.

The normative reference for this requirement is TS 38.133 [6] clause A.16.3.2.1.1.

16.3.2.1.1.4 Test description

16.3.2.1.1.4.1 Initial conditions

Same as the initial conditions given in sub-clause 6.3.2.1.1.4.1 with following exceptions:

- Table 6.3.2.1.1.4.1-1 is replaced by Table 16.3.2.1.1.4.1-1.
- Table 6.3.2.1.1.4.1-2 is replaced by Table 16.3.2.1.1.4.1-2.
- Table 6.3.2.1.1.4.1-3 is replaced by Table 16.3.2.1.1.4.1-3

Table 16.3.2.1.1.4.1-1: Supported test configurations

Configuration	Description
16.3.2.1.1-1	15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode
16.3.2.1.1-2	15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode
16.3.2.1.1-3	30 kHz SSB SCS, 20 MHz bandwidth, TDD duplex mode
16.3.2.1.1-4	15 kHz SSB SCS, 10 MHz bandwidth, HD-FDD duplex mode
Note: The UE is only required to be tested in one of the supported test configurations.	

Table 16.3.2.1.1.4.1-2: Initial conditions

Parameter	Value		Comment
Test environment	NC		As specified in TS 38.508-1 [14] clause 4.1.
Test frequencies	As specified in Annex E, Table E.4-1 and TS 38.508-1 [14] clause 4.3.1.		
Channel bandwidth	As specified by the test configuration selected from Table 16.3.2.1.1.4.1-1.		
Propagation conditions	AWGN		As specified in Annex C.2.2.
Connection Diagram	TE Part	A.3.1.8.1	As specified in TS 38.508-1 [14] Annex A.
	DUT Part	A.3.2.2.1	
Exceptions to connection diagram			

Table 16.3.2.1.1.4.1-3: General test parameters for NR intra-frequency RRC Re-establishment test case in FR1

Parameter		Unit	Test configuration	Value	Comment
Initial condition	Active cell		1,2,3,4	Cell1	
	Neighbour cells		1,2,3,4	Cell2	
Final condition	Active cell		1,2,3,4	Cell2	
RF Channel Number			1,2,3,4	1	

Time offset between cells		1,4	3 ms	Asynchronous cells
		2,3	3 µs	Synchronous cells
N310	-	1,2,3,4	1	Maximum consecutive out-of-sync indications from lower layers
N311	-	1,2,3,4	1	Minimum consecutive in-sync indications from lower layers
T310	ms	1,2,3,4	0	Radio link failure timer;
T311	ms	1,2,3,4	3000	RRC re-establishment timer
Access Barring Information	-	1,2,3,4	Not Sent	No additional delays in random access procedure.
SSB configuration		1,2,4	SSB.1 FR1	
		3	SSB.1 RedCap FR1	
SMTC configuration		1,4	SMTC.2	
		2,3	SMTC.1	
DRX cycle length	s	1,2,3,4	OFF	
PRACH configuration		1,2,3,4	PRACH.1 FR1	Table A.7.1-1
T1	s	1,2,3,4	5	
T2	ms	1,2,3,4	440	Time for the UE to detect RLF (Summation of $T_{Evaluate_out_SSB}$ defined in clause 8.1B in TS 38.133 [6], T310 and the period for UE turns off transmitter defined in clause 8.1B.5 in TS 38.133[6])
T3	s	1,2,3,4	2	

16.3.2.1.1.4.2 Test procedure

Same as the test procedure given in sub-clause 6.3.2.1.1.4.2.

16.3.2.1.1.4.3 Message contents

Same as the message contents given in 6.3.2.1.1.4.3 with the following exceptions:

- Table 7.3.1-3 in 38.508-1 [14] is used with condition SMTC.2 for Test Configuration 16.3.2.1.1-4.

16.3.2.1.1.5 Test requirement

Same as the test requirements given in sub-clause 6.3.2.1.1.5 with following exceptions:

- Table 6.3.2.1.1.5-1 is replaced by Table 16.3.2.1.1.5-1.

Table 16.3.2.1.1.5-1: Cell specific test parameters

Parameter	Unit	Test config	Cell 1			Cell 2		
			T1	T2	T3	T1	T2	T3
TDD configuration		1,4	N/A			N/A		
		2	TDDConf.1.1			TDDConf.1.1		
		3	TDDConf.2.1			TDDConf.2.1		
PDSCH RMC configuration		1,4	SR.1.1 FDD			SR.1.1 FDD		
		2	SR.1.1 TDD			SR.1.1 TDD		
		3	SR.2.1 TDD			SR.2.1 TDD		
RMSI CORESET RMC configuration		1,4	CR.1.1 FDD			CR.1.1 FDD		
		2	CR.1.1 TDD			CR.1.1 TDD		
		3	CR.2.1 TDD			CR.2.1 TDD		
Dedicated CORESET RMC configuration		1,4	CCR.1.1 FDD			CCR.1.1 FDD		
		2	CCR.1.1 TDD			CCR.1.1 TDD		
		3	CCR.2.1 TDD			CCR.2.1 TDD		
OCNG Pattern		1,2,3,4	OP.1			OP.1		
TRS configuration		1,4	TRS.1.1 FDD			TRS.1.1 FDD		
		2	TRS.1.1 TDD			TRS.1.1 TDD		
		3	TRS.1.2 TDD			TRS.1.2 TDD		

Initial DL BWP configuration		1,2,3,4	DLBWP.0.1			DLBWP.0.1		
Initial UL BWP configuration		1,2,3,4	ULBWP.0.1			ULBWP.0.1		
Active DL BWP configuration		1,2,3,4	DLBWP.1.1 RedCap	N/A	N/A	N/A	N/A	DLBWP.1.1 RedCap
Active UL BWP configuration		1,2,3,4	ULBWP.1.1 RedCap	N/A	N/A	N/A	N/A	ULBWP.1.1 RedCap
RLM-RS		1,2,3,4	SSB			SSB		
$\hat{E}_s/I_{ot}$	dB	1,2,3,4	1.54	-infinity	-infinity	-3.79	4	4
N_{oc} Note2	dBm/SCS	1,2,4	-98					
		3	-95					
N_{oc} Note2	dBm/15 kHz	1,2,3,4	-98					
$\hat{E}_s/N_{oc}$	dB	1,2,3,4	7	-infinity	-infinity	4	4	4
SS-RSRP Note3	dBm/SCS	1,2,4	-91	-infinity	-infinity	-94	-94	-94
		3	-88	-infinity	-infinity	-91	-91	-91
Io	dBm/9.36 MHz	1,2,4	-60.74	-64.59	-64.59	-60.74	-64.59	-64.59
	dBm/18.36 MHz	3	-57.81	-61.66	-61.66	-57.81	-61.66	-61.66
Propagation Condition		1,2,3,4	AWGN					

Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.

Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for N_{oc} to be fulfilled.

Note 3: SS-RSRP levels have been derived from other parameters for information purposes. They are not settable parameters themselves.

16.3.2.1.2 NR SA FR1 Intra-frequency RRC Re-establishment in FR1 for 2 Rx UE

16.3.2.1.2.1 Test purpose

To verify that the NR intra-frequency RRC re-establishment delay in FR1 with known target cell is within the specified limits. This test will verify the requirements in 38.133 [6] clause 6.2.1B.

16.3.2.1.2.2 Test applicability

This test applies to all types of NR RedCap UE with 2Rx from Release 17 onwards.

16.3.2.1.2.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 6.3.2.1.0.1.

The normative reference for this requirement is TS 38.133 [6] clause A.16.3.2.1.2.

16.3.2.1.2.4 Test description

16.3.2.1.2.4.1 Initial conditions

Same as the initial conditions given in sub-clause 6.3.2.1.1.4.1 with following exceptions:

- Table 6.3.2.1.1.4.1-1 is replaced by Table 16.3.2.1.2.4.1-1.
- Table 6.3.2.1.1.4.1-2 is replaced by Table 16.3.2.1.2.4.1-2.
- Table 6.3.2.1.1.4.1-3 is replaced by Table 16.3.2.1.2.4.1-3

Table 16.3.2.1.2.4.1-1: Supported test configurations

Configuration	Description
16.3.2.1.2-1	15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode
16.3.2.1.2-2	15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode
16.3.2.1.2-3	30 kHz SSB SCS, 20 MHz bandwidth, TDD duplex mode
16.3.2.1.2-4	15 kHz SSB SCS, 10 MHz bandwidth, HD-FDD duplex mode
Note: The UE is only required to be tested in one of the supported test configurations.	

Table 16.3.2.1.2.4.1-2: Initial conditions

Parameter	Value		Comment
Test environment	NC		As specified in TS 38.508-1 [14] clause 4.1.
Test frequencies	As specified in Annex E, Table E.4-1 and TS 38.508-1 [14] clause 4.3.1.		
Channel bandwidth	As specified by the test configuration selected from Table 6.3.2.1.1.4.1-1.		
Propagation conditions	AWGN		As specified in Annex C.2.2.
Connection Diagram	TE Part	A.3.1.8.2	As specified in TS 38.508-1 [14] Annex A.
	DUT Part	A.3.2.3.4	
Exceptions to connection diagram	- Without LTE link		

Table 16.3.2.1.2.4.1-3: General test parameters for NR intra-frequency RRC Re-establishment test case in FR1

Parameter		Unit	Test configuration	Value	Comment
Initial condition	Active cell		1,2,3,4	Cell1	
	Neighbour cells		1,2,3,4	Cell2	
Final condition	Active cell		1,2,3,4	Cell2	
RF Channel Number			1,2,3,4	1	
Time offset between cells			1,4	3 ms	Asynchronous cells
			2,3	3 μs	Synchronous cells
N310		-	1,2,3,4	1	Maximum consecutive out-of-sync indications from lower layers
N311		-	1,2,3,4	1	Minimum consecutive in-sync indications from lower layers
T310		ms	1,2,3,4	0	Radio link failure timer;
T311		ms	1,2,3,4	3000	RRC re-establishment timer
Access Barring Information		-	1,2,3,4	Not Sent	No additional delays in random access procedure.
SSB configuration			1,2,4	SSB.1 FR1	
			3	SSB.1 RedCap FR1	
SMTC configuration			1,4	SMTC.2	
			2,3	SMTC.1	
DRX cycle length		s	1,2,3,4	OFF	
PRACH configuration			1,2,3,4	PRACH.1 FR1	Table A.7.1-1
T1		s	1,2,3,4	5	
T2		ms	1,2,3,4	240	Time for the UE to detect RLF (Summation of $T_{Evaluate_out_SSB}$ defined in clause 8.1B in TS 38.133 [6], T310 and the period for UE turns off transmitter defined in clause 8.1B.5 in TS 38.133[6])
T3		s	1,2,3,4	2	

16.3.2.1.2.4.2 Test procedure

Same as the test procedure given in sub-clause 6.3.2.1.1.4.2.

16.3.2.1.2.4.3 Message contents

Same as the message contents given in 6.3.2.1.1.4.3 with the following exceptions:

- Table 7.3.1-3 in 38.508-1 [14] is used with condition SMTC.2 for Test Configuration 16.3.2.1.2-4.

16.3.2.1.2.5 Test requirement

Same as the test requirements given in sub-clause 6.3.2.1.1.5 with following exceptions:

- Table 6.3.2.1.1.5-1 is replaced by Table 16.3.2.1.2.5-1.

Table 16.3.2.1.2.5-1: Cell specific test parameters

Parameter	Unit	Test config	Cell 1			Cell 2		
			T1	T2	T3	T1	T2	T3
TDD configuration		1,4	N/A			N/A		
		2	TDDConf.1.1			TDDConf.1.1		
		3	TDDConf.2.1			TDDConf.2.1		
PDSCH RMC configuration		1,4	SR.1.1 FDD			SR.1.1 FDD		
		2	SR.1.1 TDD			SR.1.1 TDD		
		3	SR.2.1 TDD			SR.2.1 TDD		
RMSI CORESET RMC configuration		1,4	CR.1.1 FDD			CR.1.1 FDD		
		2	CR.1.1 TDD			CR.1.1 TDD		
		3	CR.2.1 TDD			CR.2.1 TDD		
Dedicated CORESET RMC configuration		1,4	CCR.1.1 FDD			CCR.1.1 FDD		
		2	CCR.1.1 TDD			CCR.1.1 TDD		
		3	CCR.2.1 TDD			CCR.2.1 TDD		
OCNG Pattern		1,2,3,4	OP.1			OP.1		
TRS configuration		1,4	TRS.1.1 FDD			TRS.1.1 FDD		
		2	TRS.1.1 TDD			TRS.1.1 TDD		
		3	TRS.1.2 TDD			TRS.1.2 TDD		
Initial DL BWP configuration		1,2,3,4	DLBWP.0.1			DLBWP.0.1		
Initial UL BWP configuration		1,2,3,4	ULBWP.0.1			ULBWP.0.1		
Active DL BWP configuration		1,2,3,4	DLBWP.1.1 RedCap	N/A	N/A	N/A	N/A	DLBWP.1.1 RedCap
Active UL BWP configuration		1,2,3,4	ULBWP.1.1 RedCap	N/A	N/A	N/A	N/A	ULBWP.1.1 RedCap
RLM-RS		1,2,3,4	SSB			SSB		
$\hat{E}_s/I_{ot}$	dB	1,2,3,4	1.54	-infinity	-infinity	-3.79	4	4
N_{oc} Note2	dBm/SCS	1,2,4	-98					
		3	-95					
N_{oc} Note2	dBm/15 kHz	1,2,3,4	-98					
$\hat{E}_s/N_{oc}$	dB	1,2,3,4	7	-infinity	-infinity	4	4	4
SS-RSRP Note3	dBm/SCS	1,2,4	-91	-infinity	-infinity	-94	-94	-94
		3	-88	-infinity	-infinity	-91	-91	-91
Io	dBm/9.36 MHz	1,2,4	-60.74	-64.59	-64.59	-60.74	-64.59	-64.59
	dBm/18.36 MHz	3	-57.81	-61.66	-61.66	-57.81	-61.66	-61.66
Propagation Condition		1,2,3,4	AWGN					

Note 1:	OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.
Note 2:	Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for N_{oc} to be fulfilled.
Note 3:	SS-RSRP levels have been derived from other parameters for information purposes. They are not settable parameters themselves.

16.3.2.1.3 NR SA FR1-FR1 Inter-frequency RRC Re-establishment in FR1 for 1 Rx UE

Editor's Note : This test case is incomplete in following aspects :

- TT analysis is still missing.

16.3.2.1.3.1 Test purpose

To verify that the NR inter-frequency RRC re-establishment delay in FR1 without known target cell is within the specified limits. This test will verify the requirements in 38.133 [6] clause 6.2.1B.

16.3.2.1.3.2 Test applicability

This test applies to all types of NR RedCap UE with 1Rx from Release 17 onwards.

16.3.2.1.3.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 6.3.2.1.0.1.

The normative reference for this requirement is TS 38.133 [6] clause A.16.3.2.1.3.

16.3.2.1.3.4 Test description

16.3.2.1.3.4.1 Initial conditions

Same as the initial conditions given in sub-clause 6.3.2.1.2.4.1 with following exceptions:

- Table 6.3.2.1.2.4.1-1 is replaced by Table 16.3.2.1.3.4.1-1.
- Table 6.3.2.1.2.4.1-2 is replaced by Table 16.3.2.1.3.4.1-2.
- Table 6.3.2.1.1.4.1-3 is replaced by Table 16.3.2.1.3.4.1-3

Table 16.3.2.1.3.4.1-1: Supported test configurations

Configuration	Description of serving cell	Description of target cell
16.3.2.1.3-1	15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode	15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode
16.3.2.1.3-2	15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode	15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode
16.3.2.1.3-3	30 kHz SSB SCS, 20 MHz bandwidth, TDD duplex mode	30 kHz SSB SCS, 20 MHz bandwidth, TDD duplex mode
16.3.2.1.3-4	15 kHz SSB SCS, 10 MHz bandwidth, HD-FDD duplex mode	15 kHz SSB SCS, 10 MHz bandwidth, HD-FDD duplex mode
Note: The UE is only required to be tested in one of the supported test configurations.		

Table 16.3.2.1.3.4.1-2: Initial conditions

Parameter	Value	Comment
Test environment	NC	As specified in TS 38.508-1 [14] clause 4.1.
Test frequencies	As specified in Annex E, Table E.4-1 and TS 38.508-1 [14] clause 4.3.1.	
Channel bandwidth	As specified by the test configuration selected from Table 16.3.2.1.3.4.1-1.	
Propagation conditions	AWGN	As specified in Annex C.2.2.

Connection Diagram	TE Part	A.3.1.8.1	As specified in TS 38.508-1 [14] Annex A.
	DUT Part	A.3.2.2.1	
Exceptions to connection diagram			

Table 16.3.2.1.3.4.1-3: General test parameters for NR intra-frequency RRC Re-establishment test case in FR1

Parameter		Unit	Test configuration	Value	Comment
Initial condition	Active cell		1,2,3,4	Cell1	
	Neighbour cells		1,2,3,4	Cell2	
Final condition	Active cell		1,2,3,4	Cell2	
RF Channel Number			1,2,3,4	1,2	
Time offset between cells			1,4	3 ms	Asynchronous cells
			2,3	3 μs	Synchronous cells
N310		-	1,2,3,4	1	Maximum consecutive out-of-sync indications from lower layers
N311		-	1,2,3,4	1	Minimum consecutive in-sync indications from lower layers
T310		ms	1,2,3,4	0	Radio link failure timer;
T311		ms	1,2,3,4	5000	RRC re-establishment timer
Access Barring Information		-	1,2,3,4	Not Sent	No additional delays in random access procedure.
SSB configuration			1,2,4	SSB.1 FR1	
			3	SSB.1 RedCap FR1	
SMTC configuration			1,4	SMTC.2	
			2,3	SMTC.1	
DRX cycle length		s	1,2,3,4	OFF	
PRACH configuration			1,2,3,4	PRACH.1 FR1	Table A.7.1-1
T1		s	1,2,3,4	5	
T2		ms	1,2,3,4	440	Time for the UE to detect RLF (Summation of $T_{Evaluate_out_SSB}$ defined in clause 8.1B in TS 38.133 [6], T310 and the period for UE turns off transmitter defined in clause 8.1B.5 in TS 38.133[6])
T3		s	1,2,3,4	5	

16.3.2.1.3.4.2 Test procedure

Same as the test procedure given in sub-clause 6.3.2.1.2.4.2.

16.3.2.1.3.4.3 Message contents

Same as the message contents given in 6.3.2.1.2.4.3 with the following exceptions:

- Table 7.3.1-3 in 38.508-1 [14] is used with condition SMTC.2 for Test Configuration 16.3.2.1.3-4.

16.3.2.1.3.5 Test requirement

Same as the test requirements given in sub-clause 6.3.2.1.2.5 with following exceptions:

- Table 6.3.2.1.2.5-1 is replaced by Table 16.3.2.1.3.5-1.

Table 16.3.2.1.3.5-1: Cell specific test parameters

Parameter	Unit	Test config	Cell 1			Cell 2		
			T1	T2	T3	T1	T2	T3
RF Channel Number		1,2,3,4	1			2		
TDD configuration		1,4	N/A			N/A		
		2	TDDConf.1.1			TDDConf.1.1		
		3	TDDConf.2.1			TDDConf.2.1		
PDSCH RMC configuration		1,4	SR.1.1 FDD			SR.1.1 FDD		
		2	SR.1.1 TDD			SR.1.1 TDD		
		3	SR.2.1 TDD			SR.2.1 TDD		
RMSI CORESET RMC configuration		1,4	CR.1.1 FDD			CR.1.1 FDD		
		2	CR.1.1 TDD			CR.1.1 TDD		
		3	CR.2.1 TDD			CR.2.1 TDD		
Dedicated CORESET RMC configuration		1,4	CCR.1.1 FDD			CCR.1.1 FDD		
		2	CCR.1.1 TDD			CCR.1.1 TDD		
		3	CCR.2.1 TDD			CCR.2.1 TDD		
OCNG Pattern		1,2,3,4	OP.1			OP.1		
TRS configuration		1,4	TRS.1.1 FDD			TRS.1.1 FDD		
		2	TRS.1.1 TDD			TRS.1.1 TDD		
		3	TRS.1.2 TDD			TRS.1.2 TDD		
Initial DL BWP configuration		1,2,3,4	DLBWP.0.1			DLBWP.0.1		
Initial UL BWP configuration		1,2,3,4	ULBWP.0.1			ULBWP.0.1		
Active DL BWP configuration		1,2,3,4	DLBWP.1.1 RedCap	N/A	N/A	N/A	N/A	DLBWP.1.1 RedCap
Active UL BWP configuration		1,2,3,4	ULBWP.1.1 RedCap	N/A	N/A	N/A	N/A	ULBWP.1.1 RedCap
RLM-RS		1,2,3,4	SSB			SSB		
$\hat{E}_s/I_{ot}$	dB	1,2,3,4	4	-infinity	-infinity	-infinity	-infinity	7
N_{oc} Note2	dBm/SCS	1,2,4	-98					
		3	-95					
N_{oc} Note2	dBm/15 kHz	1,2,3,4	-98					
$\hat{E}_s/N_{oc}$	dB	1,2,3,4	4	-infinity	-infinity	-infinity	-infinity	7
SS-RSRP Note3	dBm/SCS	1,2,4	-94	-infinity	-infinity	-infinity	-infinity	-91
		3	-91	-infinity	-infinity	-infinity	-infinity	-88
Io	dBm/9.36 MHz	1,2,4	-64.59	-70.05	-70.05	-70.05	-70.05	-62.26
	dBm/18.36 MHz	3	-61.66	-67.12	-67.12	-67.12	-67.12	-59.33
Propagation Condition		1,2,3,4	AWGN					

Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.
Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for N_{oc} to be fulfilled.
Note 3: SS-RSRP levels have been derived from other parameters for information purposes. They are not settable parameters themselves.

16.3.2.1.4 NR SA FR1 Intra-frequency RRC Re-establishment in FR1 for 2 Rx UE

16.3.2.1.4.1 Test purpose

To verify that the NR inter-frequency RRC re-establishment delay in FR1 without known target cell is within the specified limits. This test will verify the requirements in 38.133 [6] clause 6.2.1B.

16.3.2.1.4.2 Test applicability

This test applies to all types of NR RedCap UE with 2Rx from Release 17 onwards.

16.3.2.1.4.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 6.3.2.1.0.1.

The normative reference for this requirement is TS 38.133 [6] clause A.16.3.2.1.4.

16.3.2.1.4.4 Test description

16.3.2.1.4.4.1 Initial conditions

Same as the initial conditions given in sub-clause 6.3.2.1.2.4.1 with following exceptions:

- Table 6.3.2.1.2.4.1-1 is replaced by Table 16.3.2.1.4.4.1-1.
- Table 6.3.2.1.2.4.1-2 is replaced by Table 16.3.2.1.4.4.1-2.
- Table 6.3.2.1.2.4.1-3 is replaced by Table 16.3.2.1.4.4.1-3

Table 16.3.2.1.4.4.1-1: Supported test configurations

Configuration	Description of serving cell	Description of target cell
16.3.2.1.4-1	15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode	15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode
16.3.2.1.4-2	15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode	15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode
16.3.2.1.4-3	30 kHz SSB SCS, 20 MHz bandwidth, TDD duplex mode	30 kHz SSB SCS, 20 MHz bandwidth, TDD duplex mode
16.3.2.1.4-4	15 kHz SSB SCS, 10 MHz bandwidth, HD-FDD duplex mode	15 kHz SSB SCS, 10 MHz bandwidth, HD-FDD duplex mode
Note: The UE is only required to be tested in one of the supported test configurations.		

Table 16.3.2.1.4.4.1-2: Initial conditions

Parameter	Value		Comment
Test environment	NC		As specified in TS 38.508-1 [14] clause 4.1.
Test frequencies	As specified in Annex E, Table E.4-1 and TS 38.508-1 [14] clause 4.3.1.		
Channel bandwidth	As specified by the test configuration selected from Table 6.3.2.1.2.4.1-1.		
Propagation conditions	AWGN		As specified in Annex C.2.2.
Connection Diagram	TE Part	A.3.1.8.2	As specified in TS 38.508-1 [14] Annex A.
	DUT Part	A.3.2.3.4	
Exceptions to connection diagram	- Without LTE link		

Table 16.3.2.1.4.4.1-3: General test parameters for NR intra-frequency RRC Re-establishment test case in FR1

Parameter		Unit	Test configuration	Value	Comment
Initial condition	Active cell		1,2,3,4	Cell1	
	Neighbour cells		1,2,3,4	Cell2	
Final condition	Active cell		1,2,3,4	Cell2	
RF Channel Number			1,2,3,4	1,2	
Time offset between cells			1,4	3 ms	Asynchronous cells
			2,3	3 μs	Synchronous cells
N310		-	1,2,3,4	1	Maximum consecutive out-of-sync indications from lower layers

N311	-	1,2,3,4	1	Minimum consecutive in-sync indications from lower layers
T310	ms	1,2,3,4	0	Radio link failure timer;
T311	ms	1,2,3,4	5000	RRC re-establishment timer
Access Barring Information	-	1,2,3,4	Not Sent	No additional delays in random access procedure.
SSB configuration		1,2,4	SSB.1 FR1	
		3	SSB.1 RedCap FR1	
SMTC configuration		1,4	SMTC.2	
		2,3	SMTC.1	
DRX cycle length	s	1,2,3,4	OFF	
PRACH configuration		1,2,3,4	PRACH.1 FR1	Table A.7.1-1
T1	s	1,2,3,4	5	
T2	ms	1,2,3,4	240	Time for the UE to detect RLF (Summation of $T_{Evaluate_out_SSB}$ defined in clause 8.1B in TS 38.133 [6], T310 and the period for UE turns off transmitter defined in clause 8.1B.5 in TS 38.133[6])
T3	s	1,2,3,4	5	

16.3.2.1.4.4.2 Test procedure

Same as the test procedure given in sub-clause 6.3.2.1.2.4.2.

16.3.2.1.4.4.3 Message contents

Same as the message contents given in 6.3.2.1.2.4.3 with the following exceptions:

- Table 7.3.1-3 in 38.508-1 [14] is used with condition SMTC.2 for Test Configuration 16.3.2.1.4-4.

16.3.2.1.4.5 Test requirement

Same as the test requirements given in sub-clause 6.3.2.1.2.5 with following exceptions:

- Table 6.3.2.1.2.5-1 is replaced by Table 16.3.2.1.4.5-1.

Table 16.3.2.1.4.5-1: Cell specific test parameters

Parameter	Unit	Test config	Cell 1			Cell 2		
			T1	T2	T3	T1	T2	T3
RF Channel Number		1,2,3,4	1			2		
TDD configuration		1,4	N/A			N/A		
		2	TDDConf.1.1			TDDConf.1.1		
		3	TDDConf.2.1			TDDConf.2.1		
PDSCH RMC configuration		1,4	SR.1.1 FDD			SR.1.1 FDD		
		2	SR.1.1 TDD			SR.1.1 TDD		
		3	SR.2.1 TDD			SR.2.1 TDD		
RMSI CORESET RMC configuration		1,4	CR.1.1 FDD			CR.1.1 FDD		
		2	CR.1.1 TDD			CR.1.1 TDD		
		3	CR.2.1 TDD			CR.2.1 TDD		
Dedicated CORESET RMC configuration		1,4	CCR.1.1 FDD			CCR.1.1 FDD		
		2	CCR.1.1 TDD			CCR.1.1 TDD		
		3	CCR.2.1 TDD			CCR.2.1 TDD		
OCNG Pattern		1,2,3,4	OP.1			OP.1		
TRS configuration		1,4	TRS.1.1 FDD			TRS.1.1 FDD		
		2	TRS.1.1 TDD			TRS.1.1 TDD		
		3	TRS.1.2 TDD			TRS.1.2 TDD		
Initial DL BWP configuration		1,2,3,4	DLBWP.0.1			DLBWP.0.1		
Initial UL BWP configuration		1,2,3,4	ULBWP.0.1			ULBWP.0.1		

Active DL BWP configuration		1,2,3,4	DLBWP.1.1 RedCap	N/A	N/A	N/A	N/A	DLBWP.1.1 RedCap
Active UL BWP configuration		1,2,3,4	ULBWP.1.1 RedCap	N/A	N/A	N/A	N/A	ULBWP.1.1 RedCap
RLM-RS		1,2,3,4	SSB			SSB		
$\hat{E}_s/I_{ot}$	dB	1,2,3,4	4	-infinity	-infinity	-infinity	-infinity	7
N_{oc} Note2	dBm/SCS	1,2,4	-98					
		3	-95					
N_{oc} Note2	dBm/15 kHz	1,2,3,4	-98					
$\hat{E}_s/N_{oc}$	dB	1,2,3,4	4	-infinity	-infinity	-infinity	-infinity	7
SS-RSRP Note3	dBm/SCS	1,2,4	-94	-infinity	-infinity	-infinity	-infinity	-91
		3	-91	-infinity	-infinity	-infinity	-infinity	-88
Io	dBm/9.36 MHz	1,2,4	-64.59	-70.05	-70.05	-70.05	-70.05	-62.26
	dBm/18.36 MHz	3	-61.66	-67.12	-67.12	-67.12	-67.12	-59.33
Propagation Condition		1,2,3,4	AWGN					

Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.
Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for N_{oc} to be fulfilled.
Note 3: SS-RSRP levels have been derived from other parameters for information purposes. They are not settable parameters themselves.

16.3.2.1.5 NR SA FR1-FR1 Inter-frequency RRC Re-establishment in FR1 for 1 Rx UE

Editor's Note : This test case is incomplete in following aspects :

- TT analysis is still missing.

16.3.2.1.5.1 Test purpose

To verify that the NR intra-frequency RRC re-establishment delay in FR1 without serving cell timing is within the specified limits. This test will verify the requirements in 38.133 [6] clause 6.2.1B.

16.3.2.1.5.2 Test applicability

This test applies to all types of NR RedCap UE with 1Rx from Release 17 onwards.

16.3.2.1.5.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 6.3.2.1.0.1.

The normative reference for this requirement is TS 38.133 [6] clause A.16.3.2.1.5.

16.3.2.1.5.4 Test description

16.3.2.1.5.4.1 Initial conditions

Same as the initial conditions given in sub-clause 6.3.2.1.3.4.1 with following exceptions:

- Table 6.3.2.1.3.4.1-1 is replaced by Table 16.3.2.1.5.4.1-1.
- Table 6.3.2.1.3.4.1-2 is replaced by Table 16.3.2.1.5.4.1-2.

- Table 6.3.2.1.1.4.1-3 is replaced by Table 16.3.2.1.5.4.1-3

Table 16.3.2.1.5.4.1-1: Supported test configurations

Configuration	Description
16.3.2.1.5-1	15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode
16.3.2.1.5-2	15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode
16.3.2.1.5-3	30 kHz SSB SCS, 20 MHz bandwidth, TDD duplex mode
16.3.2.1.5-4	15 kHz SSB SCS, 10 MHz bandwidth, HD-FDD duplex mode
Note: The UE is only required to be tested in one of the supported test configurations.	

Table 16.3.2.1.5.4.1-2: Initial conditions

Parameter	Value		Comment
Test environment	NC		As specified in TS 38.508-1 [14] clause 4.1.
Test frequencies	As specified in Annex E, Table E.4-1 and TS 38.508-1 [14] clause 4.3.1.		
Channel bandwidth	As specified by the test configuration selected from Table 16.3.2.1.5.4.1-1.		
Propagation conditions	AWGN		As specified in Annex C.2.2.
Connection Diagram	TE Part	A.3.1.8.1	As specified in TS 38.508-1 [14] Annex A.
	DUT Part	A.3.2.2.1	
Exceptions to connection diagram			

Table 16.3.2.1.5.4.1-3: General test parameters for NR intra-frequency RRC Re-establishment test case in FR1

Parameter		Unit	Test configuration	Value	Comment
Initial condition	Active cell		1,2,3,4	Cell1	
	Neighbour cells		1,2,3,4	Cell2	
Final condition	Active cell		1,2,3,4	Cell2	
RF Channel Number			1,2,3,4	1	
Time offset between cells			1,4	3 ms	Asynchronous cells
			2,3	3 μs	Synchronous cells
N310		-	1,2,3,4	1	Maximum consecutive out-of-sync indications from lower layers
N311		-	1,2,3,4	1	Minimum consecutive in-sync indications from lower layers
T310		ms	1,2,3,4	6000	Radio link failure timer;
T311		ms	1,2,3,4	3000	RRC re-establishment timer
Access Barring Information		-	1,2,3,4	Not Sent	No additional delays in random access procedure.
SSB configuration			1,2,4	SSB.1 FR1	
			3	SSB.1 RedCap FR1	
SMTC configuration			1,4	SMTC.2	
			2,3	SMTC.1	
DRX cycle length		s	1,2,3,4	OFF	
PRACH configuration			1,2,3,4	PRACH.1 FR1	Table A.7.1-1
T1		s	1,2,3,4	5	
T2		s	1,2,3,4	6.24	Time for the UE to detect RLF (Summation of $T_{Evaluate_out_SSB}$ defined in clause 8.1B in TS 38.133 [6], T310 and the period for UE turns off transmitter defined in clause 8.1B.5 in TS 38.133[6])
T3		s	1,2,3,4	3	

16.3.2.1.5.4.2 Test procedure

Same as the test procedure given in sub-clause 6.3.2.1.3.4.2.

16.3.2.1.5.4.3 Message contents

Same as the message contents given in 6.3.2.1.3.4.3 with the following exceptions:

- Table 7.3.1-3 in 38.508-1 [14] is used with condition SMTC.2 for Test Configuration 16.3.2.1.5-4.

16.3.2.1.5.5 Test requirement

Same as the test requirements given in sub-clause 6.3.2.1.3.5 with following exceptions:

- Table 6.3.2.1.3.5-1 is replaced by Table 16.3.2.1.5.5-1.

Table 16.3.2.1.5.5-1: Cell specific test parameters

Parameter	Unit	Test config	Cell 1			Cell 2		
			T1	T2	T3	T1	T2	T3
TDD configuration		1,4	N/A			N/A		
		2	TDDConf.1.1			TDDConf.1.1		
		3	TDDConf.2.1			TDDConf.2.1		
PDSCH RMC configuration		1,4	SR.1.1 FDD			SR.1.1 FDD		
		2	SR.1.1 TDD			SR.1.1 TDD		
		3	SR.2.1 TDD			SR.2.1 TDD		
RMSI CORESET RMC configuration		1,4	CR.1.1 FDD			CR.1.1 FDD		
		2	CR.1.1 TDD			CR.1.1 TDD		
		3	CR.2.1 TDD			CR.2.1 TDD		
Dedicated CORESET RMC configuration		1,4	CCR.1.1 FDD			CCR.1.1 FDD		
		2	CCR.1.1 TDD			CCR.1.1 TDD		
		3	CCR.2.1 TDD			CCR.2.1 TDD		
OCNG Pattern		1,2,3,4	OP.1			OP.1		
TRS configuration		1,4	TRS.1.1 FDD			TRS.1.1 FDD		
		2	TRS.1.1 TDD			TRS.1.1 TDD		
		3	TRS.1.2 TDD			TRS.1.2 TDD		
Initial DL BWP configuration		1,2,3,4	DLBWP.0.1			DLBWP.0.1		
Initial UL BWP configuration		1,2,3,4	ULBWP.0.1			ULBWP.0.1		
RLM-RS		1,2,3,4	SSB			SSB		
$\hat{E}_s/I_{ot}$	dB	1,2,3,4	4	-infinity	-infinity	-infinity	-infinity	4
N_{oc} Note2	dBm/SCS	1,2,4	-98					
		3	-95					
N_{oc} Note2	dBm/15 kHz	1,2,3,4	-98					
$\hat{E}_s/N_{oc}$	dB	1,2,3,4	4	-infinity	-infinity	-infinity	-infinity	4
SS-RSRP Note3	dBm/SCS	1,2,4	-94	-infinity	-infinity	-infinity	-infinity	-94
		3	-91	-infinity	-infinity	-infinity	-infinity	-91
Io	dBm/9.36 MHz	1,2,4	-64.59	-70.05	-70.05	-70.05	-70.05	-64.59
	dBm/18.36 MHz	3	-61.68	-67.12	-67.12	-67.12	-67.12	-61.68
Propagation Condition		1,2,3,4	AWGN					

Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.
Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for N_{oc} to be fulfilled.
Note 3: SS-RSRP levels have been derived from other parameters for information purposes. They are not settable parameters themselves.

16.3.2.1.6 NR SA FR1 Intra-frequency RRC Re-establishment in FR1 for 2 Rx UE

16.3.2.1.6.1 Test purpose

To verify that the NR intra-frequency RRC re-establishment delay in FR1 without serving cell timing is within the specified limits. This test will verify the requirements in 38.133 [6] clause 6.2.1B.

16.3.2.1.6.2 Test applicability

This test applies to all types of NR RedCap UE with 2Rx from Release 17 onwards.

16.3.2.1.6.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 6.3.2.1.0.1.

The normative reference for this requirement is TS 38.133 [6] clause A.16.3.2.1.6.

16.3.2.1.6.4 Test description

16.3.2.1.6.4.1 Initial conditions

Same as the initial conditions given in sub-clause 6.3.2.1.3.4.1 with following exceptions:

- Table 6.3.2.1.3.4.1-1 is replaced by Table 16.3.2.1.6.4.1-1.
- Table 6.3.2.1.3.4.1-2 is replaced by Table 16.3.2.1.6.4.1-2.
- Table 6.3.2.1.3.4.1-3 is replaced by Table 16.3.2.1.6.4.1-3

Table 16.3.2.1.6.4.1-1: Supported test configurations

Configuration	Description
16.3.2.1.6-1	15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode
16.3.2.1.6-2	15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode
16.3.2.1.6-3	30 kHz SSB SCS, 20 MHz bandwidth, TDD duplex mode
16.3.2.1.6-4	15 kHz SSB SCS, 10 MHz bandwidth, HD-FDD duplex mode
Note: The UE is only required to be tested in one of the supported test configurations.	

Table 16.3.2.1.6.4.1-2: Initial conditions

Parameter	Value		Comment
Test environment	NC		As specified in TS 38.508-1 [14] clause 4.1.
Test frequencies	As specified in Annex E, Table E.4-1 and TS 38.508-1 [14] clause 4.3.1.		
Channel bandwidth	As specified by the test configuration selected from Table 6.3.2.1.3.4.1-1.		
Propagation conditions	AWGN		As specified in Annex C.2.2.
Connection Diagram	TE Part	A.3.1.8.2	As specified in TS 38.508-1 [14] Annex A.
	DUT Part	A.3.2.3.4	
Exceptions to connection diagram	- Without LTE link		

Table 16.3.2.1.6.4.1-3: General test parameters for NR intra-frequency RRC Re-establishment test case in FR1

Parameter		Unit	Test configuration	Value	Comment
Initial condition	Active cell		1,2,3,4	Cell1	
	Neighbour cells		1,2,3,4	Cell2	

Final condition	Active cell		1,2,3,4	Cell2	
RF Channel Number			1,2,3,4	1	
Time offset between cells			1,4	3 ms	Asynchronous cells
			2,3	3 μs	Synchronous cells
N310		-	1,2,3,4	1	Maximum consecutive out-of-sync indications from lower layers
N311		-	1,2,3,4	1	Minimum consecutive in-sync indications from lower layers
T310		ms	1,2,3,4	6000	Radio link failure timer;
T311		ms	1,2,3,4	3000	RRC re-establishment timer
Access Barring Information		-	1,2,3,4	Not Sent	No additional delays in random access procedure.
SSB configuration			1,2,4	SSB.1 FR1	
			3	SSB.1 RedCap FR1	
SMTC configuration			1,4	SMTC.2	
			2,3	SMTC.1	
DRX cycle length		s	1,2,3,4	OFF	
PRACH configuration			1,2,3,4	PRACH.1 FR1	Table A.7.1-1
T1		s	1,2,3,4	5	
T2		s	1,2,3,4	6.24	Time for the UE to detect RLF (Summation of $T_{Evaluate_out_SSB}$ defined in clause 8.1B in TS 38.133 [6], T310 and the period for UE turns off transmitter defined in clause 8.1B.5 in TS 38.133[6])
T3		s	1,2,3,4	3	

16.3.2.1.6.4.2 Test procedure

Same as the test procedure given in sub-clause 6.3.2.1.3.4.2.

16.3.2.1.6.4.3 Message contents

Same as the message contents given in 6.3.2.1.3.4.3 with the following exceptions:

- Table 7.3.1-3 in 38.508-1 [14] is used with condition SMTC.2 for Test Configuration 16.3.2.1.6-4.

16.3.2.1.6.5 Test requirement

Same as the test requirements given in sub-clause 6.3.2.1.3.5 with following exceptions:

- Table 6.3.2.1.3.5-1 is replaced by Table 16.3.2.1.6.5-1.

Table 16.3.2.1.6.5-1: Cell specific test parameters

Parameter	Unit	Test config	Cell 1			Cell 2		
			T1	T2	T3	T1	T2	T3
TDD configuration		1,4	N/A			N/A		
		2	TDDConf.1.1			TDDConf.1.1		
		3	TDDConf.2.1			TDDConf.2.1		
PDSCH RMC configuration		1,4	SR.1.1 FDD			SR.1.1 FDD		
		2	SR.1.1 TDD			SR.1.1 TDD		
		3	SR.2.1 TDD			SR.2.1 TDD		
RMSI CORESET RMC configuration		1,4	CR.1.1 FDD			CR.1.1 FDD		
		2	CR.1.1 TDD			CR.1.1 TDD		
		3	CR.2.1 TDD			CR.2.1 TDD		
Dedicated CORESET RMC configuration		1,4	CCR.1.1 FDD			CCR.1.1 FDD		
		2	CCR.1.1 TDD			CCR.1.1 TDD		
		3	CCR.2.1 TDD			CCR.2.1 TDD		
OCNG Pattern		1,2,3,4	OP.1			OP.1		

TRS configuration		1,4	TRS.1.1 FDD			TRS.1.1 FDD		
		2	TRS.1.1 TDD			TRS.1.1 TDD		
		3	TRS.1.2 TDD			TRS.1.2 TDD		
Initial DL BWP configuration		1,2,3,4	DLBWP.0.1			DLBWP.0.1		
Initial UL BWP configuration		1,2,3,4	ULBWP.0.1			ULBWP.0.1		
RLM-RS		1,2,3,4	SSB			SSB		
$\hat{E}_s/I_{ot}$	dB	1,2,3,4	4	-infinity	-infinity	-infinity	-infinity	4
N_{oc} Note2	dBm/SCS	1,2,4	-98					
		3	-95					
N_{oc} Note2	dBm/15 kHz	1,2,3,4	-98					
$\hat{E}_s/N_{oc}$	dB	1,2,3,4	4	-infinity	-infinity	-infinity	-infinity	4
SS-RSRP Note3	dBm/SCS	1,2,4	-94	-infinity	-infinity	-infinity	-infinity	-94
		3	-91	-infinity	-infinity	-infinity	-infinity	-91
Io	dBm/9.36 MHz	1,2,4	-64.59	-70.05	-70.05	-70.05	-70.05	-64.59
	dBm/18.36 MHz	3	-61.66	-67.12	-67.12	-67.12	-67.12	-61.66
Propagation Condition		1,2,3,4	AWGN					

Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.
Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for N_{oc} to be fulfilled.
Note 3: SS-RSRP levels have been derived from other parameters for information purposes. They are not settable parameters themselves.

16.3.2.2 Random access for RedCap

16.3.2.2.0 Minimum conformance requirements

16.3.2.2.0.1 Minimum conformance requirements for Contention based random access

The 4-step and 2-step random access requirements described in clause 6.3.2.2.0.1 are applicable for TDD and FDD RedCap UEs.

The 4-step and 2-step RA requirements for contention based random access defined in clause 6.3.2.2.0.1 apply to HD-FDD UE with the following conditions:

- The RedCap UE operating in HD-FDD mode is not expected to perform PRACH transmission on a PRACH resource of a cell if UE has not received at least one SSB associated with that PRACH resource during the last T_p period in the cell, where T_p=160 ms.

- The RedCap UE operating in HD-FDD mode shall meet the PRACH requirements when performing PRACH transmission on a PRACH resource of a cell provided that the UE has received at least one SSB associated with that PRACH resource during the last T_p period before the PRACH transmission, where T_p=160 ms.

The normative reference for this requirement is TS 38.133 [6] clauses 6.2.2B.

16.3.2.2.0.2 Minimum conformance requirements for Non-Contention based random access

The 4-step and 2-step non-contention based random access requirements described in clause 6.3.2.2.0.1 are applicable for TDD and FDD RedCap UEs.

The normative reference for this requirement is TS 38.133 [6] clauses 6.2.1B.

16.3.2.2.1 NR SA FR1 4-step RA type contention based random access test in FR1 for NR standalone for 1 Rx UE

Editor's Note : This test case is incomplete in following aspects :

- TT analysis is still missing.
- Test requirements are still in brackets.

16.3.2.2.1.1 Test purpose

To verify that the behaviour of the random access procedure is according to the requirements and that the PRACH power settings and timing are within specified limits. This test will verify the requirements in 38.133 [6] clause 6.2.2B.2 and Clause 7.1A.2 in an AWGN model.

16.3.2.2.1.2 Test applicability

This test applies to all types of NR RedCap UE with 1Rx from Release 17 onwards.

16.3.2.2.1.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 6.3.2.2.0.1.

The normative reference for this requirement is TS 38.133 [6] clause A.16.3.2.2.1.

16.3.2.2.1.4 Test description

16.3.2.2.1.4.1 Initial conditions

Same as the initial conditions given in sub-clause 6.3.2.2.1.4.1 with following exceptions:

- Table 6.3.2.2.1.4.1-1 is replaced by Table 16.3.2.2.1.4.1-1.
- Table 6.3.2.2.1.4.1-2 is replaced by Table 16.3.2.2.1.4.1-2.

Table 16.3.2.2.1.4.1-1: Supported test configurations

Configuration	Description
16.3.2.2.1-1	15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode
16.3.2.2.1-2	15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode
16.3.2.2.1-3	30 kHz SSB SCS, 20 MHz bandwidth, TDD duplex mode
16.3.2.2.1-4	15 kHz SSB SCS, 10 MHz bandwidth, HD-FDD duplex mode
Note: The UE is only required to be tested in one of the supported test configurations.	

Table 16.3.2.2.1.4.1-2: Initial conditions

Parameter	Value		Comment
Test environment	NC		As specified in TS 38.508-1 [14] clause 4.1.
Test frequencies	As specified in Annex E, Table E.4-1 and TS 38.508-1 [14] clause 4.3.1.		
Channel bandwidth	As specified by the test configuration selected from Table 16.3.2.2.1.4.1-1.		
Propagation conditions	AWGN		As specified in Annex C.2.2.
Connection Diagram	TE Part	A.3.1.8.1	As specified in TS 38.508-1 [14] Annex A.
	DUT Part	A.3.2.2.1	
Exceptions to connection diagram			

16.3.2.2.1.4.2 Test procedure

Same as the test procedure given in sub-clause 6.3.2.2.1.4.2 with following exceptions:

- Step 4 (Test 1) is replaced by following steps:

4. Test 1: Correct behaviour when transmitting Random Access Preamble

4.1. The UE shall send a preamble to the System Simulator. The System Simulator shall check that the Random Access Preamble belongs to one of the Random Access Preambles associated with the SSB with index 0, which has SS-RSRP above the configured rsrp-ThresholdSSB+[1dB].

16.3.2.2.1.4.3 Message contents

Same as the message contents given in 6.3.2.2.1.4.3.

16.3.2.2.1.5 Test requirement

Same as the test requirements given in sub-clause 6.3.2.2.1.5 with following exceptions:

- Table 6.3.2.2.1.5-1 is replaced by Table 16.3.2.2.1.5-1.

Table 16.3.2.2.1.5-1: General test parameters

Parameter			Unit	Test-1	Comments
SSB Configuration		Config 1,2,4		SSB.1 FR1	As defined in A.3 and A.3A, except for number of SSBs per SS-burst and SS/PBCH block index as below
		Config 3		SSB.1 RedCap FR1	
Number of SSBs per SS-burst				2	Different from the definition in A.3 and A.3A
SS/PBCH block index				0,1	Different from the definition in A.3 and A.3A
Duplex Mode for Cell 1		Config 1		FDD	
		Config 2,3		TDD	
		Config 4		HD-FDD	
TDD Configuration		Config 2		TDDConf.1.1	
		Config 3		TDDConf.2.1	
CSI-RS for tracking		Config 1,4		TRS.1.1 FDD	
		Config 2		TRS.1.1 TDD	
		Config 3		TRS.1.2 TDD	
OCNG Pattern Note 1				OP.1	As defined in A.2.1
PDSCH parameters Note 4		Config 1,4		SR.1.1 FDD	As defined in A.1.1
		Config 2		SR.1.1 TDD	
		Config 3		SR.2.1 TDD	
RMSI CORESET Reference Channel		Config 1,4		CR.1.1 FDD	
		Config 2		CR.1.1 TDD	
		Config 3		CR.2.1 TDD	
Dedicated CORESET Reference Channel		Config 1,4		CCR.1.1 FDD	
		Config 2		CCR.1.1 TDD	
		Config 3		CCR.2.1 TDD	
NR RF Channel Number				1	
EPRE ratio of PSS to SSS			dB	0	
EPRE ratio of PBCH_DMRS to SSS					
EPRE ratio of PBCH to PBCH_DMRS					
EPRE ratio of PDCCH_DMRS to SSS					
EPRE ratio of PDCCH to PDCCH_DMRS					
EPRE ratio of PDSCH_DMRS to SSS					
EPRE ratio of PDSCH to PDSCH_DMRS					
SSB with index 0	$\hat{E}_s / I_{ot}$		dB	3	Power of SSB with index 0 is set to be above configured *rsrp-ThresholdSSB*+[1dB]
	N_{oc}	Config 1,2,4	dBm/15kHz	-98	
		Config 3		-101	
	$\hat{E}_s / N_{oc}$		dB	3	
	SS-RSRP Note 3		dBm/ SCS	-95	

SSB with index 1	$\hat{E}_s / I_{ot}$		dB	-17	Power of SSB with index 1 is set to be below configured *rsrp-ThresholdSSB*+[1dB]
	N_{oc}	Config 1,2,4	dBm/15kHz	-98	
		Config 3		-101	
	$\hat{E}_s / N_{oc}$		dB	-17	
	SS-RSRP Note 3		dBm/ SCS	-115	
Io Note 2		Config 1,2,4	dBm	-65.3/9.36MHz	For symbols without SSB index 1
		Config 3		-65.38/18.36 MHz	
ss-PBCH-BlockPower			dBm/ SCS	-5	As defined in clause 6.3.2 in TS 38.331 [13].
Configured UE transmitted power ($P_{CMAX,\ f,c}$)			dBm	23	As defined in clause 6.2.4 in TS 38.101-1 [2].
PRACH Configuration				PRACH.1 FR1	As defined in A.7.1
Propagation Condition			-	AWGN	

Note 1: OCNG shall be used such that the cell is fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols. The OCNG pattern is chosen during the test according to the presence of a DL reference measurement channel.
Note 2: SS-RSRP, Es/Iot and Io levels have been derived from other parameters for information purpose. They are not settable parameters.
Note 3: The DL PDSCH reference measurement channel is used in the test only when a downlink transmission dedicated to the UE under test is required.

16.3.2.2.2 NR SA FR1 4-step RA type contention based random access test in FR1 for NR standalone for 2 Rx UE

16.3.2.2.2.1 Test purpose

To verify that the behaviour of the random access procedure is according to the requirements and that the PRACH power settings and timing are within specified limits. This test will also verify the requirements in 38.133 [6] Clause 6.2.2B.2 and Clause 7.1A.2 in an AWGN model

16.3.2.2.2.2 Test applicability

This test applies to all types of NR RedCap UE with 2Rx from Release 17 onwards.

16.3.2.2.2.3 Minimum conformance requirement

The minimum conformance requirements are specified in clause 16.3.2.2.0.1.

The normative reference for this requirement is TS 38.133 [6] clauses A.16.3.2.2.2.

16.3.2.2.2.4 Test description

16.3.2.2.2.4.1 Initial conditions

Same as the initial conditions given in 6.3.2.2.1.4.1 with following exceptions:

- Table 6.3.2.2.1.4.1-1 is replaced by Table 16.3.2.2.2.4.1-1.
- Table 6.3.2.2.1.4.1-2 is replaced by Table 16.3.2.2.2.4.1-2.

Table 16.3.2.2.2.4.1-1: Supported test configurations

Config	Description
16.3.2.2.2-1	NR 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode
16.3.2.2.2-2	NR 15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode

16.3.2.2.2-3	NR 30 kHz SSB SCS, 20 MHz bandwidth, TDD duplex mode
16.3.2.2.2-4	NR 15 kHz SSB SCS, 10 MHz bandwidth, HD-FDD duplex mode
Note: The UE is only required to be tested in one of the supported test configurations depending on UE capability	

Table 16.3.2.2.2.4.1-2: Initial conditions for Contention based random access test in FR1 for NR standalone

Parameter	Value		Comment
Test environment	NC		As specified in TS 38.508-1 [14] clause 4.1.
Test frequencies	As specified in Annex E, Table E.4-1 and TS 38.508-1 [14] clause 4.3.1.		
Channel bandwidth	As specified by the test configuration selected from Table 16.3.2.2.2.4.1-1.		
Propagation conditions	AWGN		As specified in Annex C.2.2.
Connection Diagram	TE Part	A.3.1.7.1	As specified in TS 38.508-1 [14] Annex A.
	DUT Part	A.3.2.3.4	
Exceptions to connection diagram	N/A		

16.3.2.2.2.4.2 Test procedure

Same as the test procedure given in clause 6.3.2.2.1.4.2.

16.3.2.2.2.4.3 Message contents

Same as the message contents given in clause 6.3.2.2.1.4.3.

16.3.2.2.2.5 Test requirement

Same as the test requirements given in clause 6.3.2.2.1.4.2 with following exceptions:

- Table 6.3.2.2.1.5-1 is replaced by Table 16.3.2.2.2.5-1.

Table 16.3.2.2.2.5-1: General test parameters

Parameter		Unit	Test-1	Comments
SSB Configuration	Config 1,2,4		SSB.1 FR1	As defined in A.3 and A.3A, except for number of SSBs per SS-burst and SS/PBCH block index as below
	Config 3		SSB.1 RedCap FR1	
Number of SSBs per SS-burst			2	Different from the definition in A.3.10 and A.3.10B
SS/PBCH block index			0,1	Different from the definition in A.3.10 and A.3.10B
Duplex Mode for Cell 1	Config 1,4		FDD	
	Config 2,3		TDD	
TDD Configuration	Config 2		TDDConf.1.1	
	Config 3		TDDConf.2.1	
CSI-RS for tracking	Config 1,4		TRS.1.1 FDD	
	Config 2		TRS.1.1 TDD	
	Config 3		TRS.1.2 TDD	
OCNG Pattern Note 1			OP.1	As defined in A.2.1.
PDSCH parameters Note 4	Config 1,4		SR.1.1 FDD	As defined in A.1.1.
	Config 2		SR.1.1 TDD	
	Config 3		SR.2.1 TDD	
RMSI CORESET Reference Channel	Config 1,4		CR.1.1 FDD	
	Config 2		CR.1.1 TDD	
	Config 3		CR.2.1 TDD	

Dedicated CORESET Reference Channel		Config 1,4		CCR.1.1 FDD	
		Config 2		CCR.1.1 TDD	
		Config 3		CCR.2.1 TDD	
NR RF Channel Number				1	
EPRE ratio of PSS to SSS			dB	0	
EPRE ratio of PBCH_DMRS to SSS					
EPRE ratio of PBCH to PBCH_DMRS					
EPRE ratio of PDCCH_DMRS to SSS					
EPRE ratio of PDCCH to PDCCH_DMRS					
EPRE ratio of PDSCH_DMRS to SSS					
EPRE ratio of PDSCH to PDSCH_DMRS					
SSB with index 0	$\hat{E}_s/I_{ot}$		dB	3	Power of SSB with index 0 is set to be above configured *rsrp-ThresholdSSB*
	N_{oc}	Config 1,2,4	dBm/15kHz	-98	
		Config 3		-101	
	$\hat{E}_s/N_{oc}$		dB	3	
	SS-RSRP Note 3		dBm/ SCS	-95	
SSB with index 1	$\hat{E}_s/I_{ot}$		dB	-17	Power of SSB with index 1 is set to be below configured *rsrp-ThresholdSSB*
	N_{oc}	Config 1,2,4	dBm/15kHz	-98	
		Config 3		-101	
	$\hat{E}_s/N_{oc}$		dB	-17	
	SS-RSRP Note 3		dBm/ SCS	-115	
Io Note 2		Config 1,2,4	dBm	-65.3/9.36MHz	For symbols without SSB index 1
		Config 3		-65.38/18.36 MHz	
ss-PBCH-BlockPower			dBm/ SCS	-5	As defined in clause 6.3.2 in TS 38.331 [13].
Configured UE transmitted power ($P_{CMAX,\ f,c}$)			dBm	23	As defined in clause 6.2.4 in TS 38.101-1 [2].
PRACH Configuration				PRACH.1 FR1	As defined in A.7.1.
Propagation Condition			-	AWGN	

Note 1: OCNG shall be used such that the cell is fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols. The OCNG pattern is chosen during the test according to the presence of a DL reference measurement channel.
Note 2: SS-RSRP, Es/Iot and Io levels have been derived from other parameters for information purpose. They are not settable parameters.
Note 3: The DL PDSCH reference measurement channel is used in the test only when a downlink transmission dedicated to the UE under test is required.

16.3.2.2.3 NR SA FR1 4-step RA type non-contention based random access test in FR1 for NR standalone for 1 Rx UE

Editor's Note : This test case is incomplete in following aspects :

- TT analysis is still missing.
- Test requirements are still in brackets.

16.3.2.2.3.1 Test purpose

To verify that the behaviour of the random access procedure is according to the requirements and that the PRACH power settings and timing are within specified limits. This test will verify the requirements in 38.133 [6] clause 6.2.2B.2 and Clause 7.1A.2 in an AWGN model.

16.3.2.2.3.2 Test applicability

This test applies to all types of NR RedCap UE with 1Rx from Release 17 onwards.

16.3.2.2.3.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 6.3.2.2.0.2.

The normative reference for this requirement is TS 38.133 [6] clause A.16.3.2.2.3.

16.3.2.2.3.4 Test description

16.3.2.2.3.4.1 Initial conditions

Same as the initial conditions given in sub-clause 6.3.2.2.2.4.1 with following exceptions:

- Table 6.3.2.2.2.4.1-1 is replaced by Table 16.3.2.2.3.4.1-1.
- Table 6.3.2.2.2.4.1-2 is replaced by Table 16.3.2.2.3.4.1-2.

Table 16.3.2.2.3.4.1-1: Supported test configurations

Configuration	Description
16.3.2.2.3-1	15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode
16.3.2.2.3-2	15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode
16.3.2.2.3-3	30 kHz SSB SCS, 20 MHz bandwidth, TDD duplex mode
16.3.2.2.3-4	15 kHz SSB SCS, 10 MHz bandwidth, HD-FDD duplex mode
Note: The UE is only required to be tested in one of the supported test configurations.	

Table 16.3.2.2.3.4.1-2: Initial conditions

Parameter	Value		Comment
Test environment	NC		As specified in TS 38.508-1 [14] clause 4.1.
Test frequencies	As specified in Annex E, Table E.4-1 and TS 38.508-1 [14] clause 4.3.1.		
Channel bandwidth	As specified by the test configuration selected from Table 16.3.2.2.3.4.1-1.		
Propagation conditions	AWGN		As specified in Annex C.2.2.
Connection Diagram	TE Part	A.3.1.8.1	As specified in TS 38.508-1 [14] Annex A.
	DUT Part	A.3.2.2.1	
Exceptions to connection diagram			

16.3.2.2.3.4.2 Test procedure

Same as the test procedure given in sub-clause 6.3.2.2.2.4.2

16.3.2.2.3.4.3 Message contents

Same as the message contents given in 6.3.2.2.2.4.3.

16.3.2.2.3.5 Test requirement

Same as the test requirements given in sub-clause 6.3.2.2.2.5 with following exceptions:

- Table 6.3.2.2.2.5-1 is replaced by Table 16.3.2.2.3.5-1.

Table 16.3.2.2.3.5-1: General test parameters

Parameter		Unit	Test-1	Test-2	Comments
SSB Configuration	Config 1,2,4		SSB.1 FR1	SSB.1 FR1	

		Config 3		SSB.1 RedCap FR1	SSB.1 RedCap FR1	As defined in A.3, except for number of SSBs per SS-burst and SS/PBCH block index as below
Number of SSBs per SS-burst				2	2	Different from the definition in A.3.10B
SS/PBCH block index				0,1	0,1	Different from the definition in A.3.10B
CSI-RS Configuration		Config 1,2,4		N/A	CSI-RS.1.1 FDD	As defined in A.1.4
		Config 3			CSI-RS.2.1 TDD	
Duplex Mode for Cell 1		Config 1		FDD	FDD	
		Config 2,3		TDD	TDD	
		Config 4		HD-FDD	HD-FDD	
TDD Configuration		Config 2		TDDConf.1.1	TDDConf.1.1	
		Config 3		TDDConf.2.1	TDDConf.2.1	
CSI-RS for tracking		Config 1,4		TRS.1.1 FDD	TRS.1.1 FDD	
		Config 2		TRS.1.1 TDD	TRS.1.1 TDD	
		Config 3		TRS.1.2 TDD	TRS.1.2 TDD	
OCNG Pattern Note 1				OP.1	OP.1	As defined in A.2.1.
PDSCH parameters Note 4		Config 1,4		SR.1.1 FDD	SR.1.1 FDD	As defined in A.3.1.1
		Config 2		SR.1.1 TDD	SR.1.1 TDD	
		Config 3		CR.2.1 TDD	CR.2.1 TDD	
RMSI CORESET Reference Channel		Config 1,4		CR.1.1 TDD	CR.1.1 TDD	
		Config 2		CR.1.1 TDD	CR.1.1 TDD	
		Config 3		CR.2.1 TDD	CR.2.1 TDD	
Dedicated CORESET Reference Channel		Config 1,4		CCR.1.1 TDD	CCR.1.1 TDD	
		Config 2		CCR.1.1 TDD	CCR.1.1 TDD	
		Config 3		CCR.2.1 TDD	CCR.2.1 TDD	
NR RF Channel Number				1	1	
EPRE ratio of PSS to SSS			dB	0	0	
EPRE ratio of PBCH_DMRS to SSS						
EPRE ratio of PBCH to PBCH_DMRS						
EPRE ratio of PDCCH_DMRS to SSS						
EPRE ratio of PDCCH to PDCCH_DMRS						
EPRE ratio of PDSCH_DMRS to SSS						
EPRE ratio of PDSCH to PDSCH_DMRS						
SSB with index 0	$\hat{E}_s / I_{ot}$		dB	3	3	Power of SSB with index 0 is set to be above configured *rsrp-ThresholdSSB*+[1dB]
	N_{oc}	Config 1,2,4	dBm/15kHz	-98	-98	
		Config 3		-101	-101	
	$\hat{E}_s / N_{oc}$		dB	3	3	
	SS-RSRP Note 3		dBm/ SCS	-95	-95	
SSB with index 1	$\hat{E}_s / I_{ot}$		dB	-17	-17	Power of SSB with index 1 is set to be below configured *rsrp-ThresholdSSB*+[1dB]
	N_{oc}	Config 1,2,4	dBm/15kHz	-98	-98	
		Config 3		-101	-101	
	$\hat{E}_s / N_{oc}$		dB	-17	-17	
	SS-RSRP Note 3		dBm/ SCS	-115	-115	
Io Note 2		Config 1,2,4	dBm	-65.3/9.36MHz	-65.3/9.36MHz	For symbols without SSB index 1

	Config 3		-65.38/18.36 MHz	-65.38/18.36 MHz	
ss-PBCH-BlockPower		dBm/ SCS	-5	-5	As defined in clause 6.3.2 in TS 38.331 [13].
Configured UE transmitted power ($P_{CMAX,\ f,c}$)		dBm	23	23	As defined in clause 6.2.4 in TS 38.101-1 [2].
PRACH Configuration			PRACH.2 FR1	PRACH.3 FR1	As defined in A.3.8B.2.
Propagation Condition		-	AWGN	AWGN	
Note 1: OCNG shall be used such that the cell is fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols. The OCNG pattern is chosen during the test according to the presence of a DL reference measurement channel. Note 2: SS-RSRP, Es/Iot and Io levels have been derived from other parameters for information purpose. They are not settable parameters. Note 3: The DL PDSCH reference measurement channel is used in the test only when a downlink transmission dedicated to the UE under test is required.					

16.3.2.2.4 NR SA FR1 4-step RA type non-contention based random access test in FR1 for NR standalone for 1 Rx UE

16.3.2.2.4.1 Test purpose

To verify that the behaviour of the random access procedure is according to the requirements and that the PRACH power settings and timing are within specified limits. This test will also verify the requirements in 38.133 [6] Clause 6.2.2B.2 and Clause 7.1A.2 in an AWGN model

16.3.2.2.4.2 Test applicability

This test applies to all types of NR RedCap UE with 2Rx from Release 17 onwards.

16.3.2.2.4.3 Minimum conformance requirement

The minimum conformance requirements are specified in clause 16.3.2.2.0.2.

The normative reference for this requirement is TS 38.133 [6] clauses A.16.3.2.2.4.

16.3.2.2.4.4 Test description

16.3.2.2.4.4.1 Initial conditions

Same as the initial conditions given in 6.3.2.2.2.4.1 with following exceptions:

- Table 6.3.2.2.2.4.1-1 is replaced by Table 16.3.2.2.4.4.1-1.
- Table 6.3.2.2.2.4.1-2 is replaced by Table 16.3.2.2.4.4.1-2.

Table 16.3.2.2.4.4.1-1: Supported test configurations

Config	Description
16.3.2.2.4-1	NR 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode
16.3.2.2.4-2	NR 15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode
16.3.2.2.4-3	NR 30 kHz SSB SCS, 20 MHz bandwidth, TDD duplex mode
16.3.2.2.4-4	NR 15 kHz SSB SCS, 10 MHz bandwidth, HD-FDD duplex mode
Note: The UE is only required to be tested in one of the supported test configurations depending on UE capability	

Table 16.3.2.2.4.4.1-2: Initial conditions for non-contention based random access test in FR1 for NR standalone

Parameter	Value	Comment

Test environment	NC		As specified in TS 38.508-1 [14] clause 4.1.
Test frequencies	As specified in Annex E, Table E.4-1 and TS 38.508-1 [14] clause 4.3.1.		
Channel bandwidth	As specified by the test configuration selected from Table 16.3.2.2.4.4.1-1.		
Propagation conditions	AWGN		As specified in Annex C.2.2.
Connection Diagram	TE Part	A.3.1.7.1	As specified in TS 38.508-1 [14] Annex A.
	DUT Part	A.3.2.3.4	
Exceptions to connection diagram	N/A		

16.3.2.2.4.4.2 Test procedure

Same as the test procedure given in clause 6.3.2.2.2.4.2.

16.3.2.2.4.4.3 Message contents

Same as the message contents given in clause 6.3.2.2.2.4.3.

16.3.2.2.4.5 Test requirement

Same as the test requirements given in clause 6.3.2.2.2.4.2 with following exceptions:

- Table 6.3.2.2.2.5-1 is replaced by Table 16.3.2.2.4.5-1.

Table 16.3.2.2.4.5-1: General test parameters

Parameter		Unit	Test-1	Test-2	Comments
SSB Configuration	Config 1,2,4		SSB.1 FR1	SSB.1 FR1	As defined in A.3, except for number of SSBs per SS-burst and SS/PBCH block index as below
	Config 3		SSB.1 RedCap FR1	SSB.1 RedCap FR1	
Number of SSBs per SS-burst			2	2	Different from the definition in A.3.10B
SS/PBCH block index			0,1	0,1	Different from the definition in A.3.10B
CSI-RS Configuration	Config 1,2,4		N/A	CSI-RS.1.1 FDD	As defined in A.1.4
	Config 3			CSI-RS.2.1 TDD	
Duplex Mode for Cell 1	Config 1		FDD	FDD	
	Config 2,3		TDD	TDD	
	Config 4		HD-FDD	HD-FDD	
TDD Configuration	Config 2		TDDConf.1.1	TDDConf.1.1	
	Config 3		TDDConf.2.1	TDDConf.2.1	
CSI-RS for tracking	Config 1,4		TRS.1.1 FDD	TRS.1.1 FDD	
	Config 2		TRS.1.1 TDD	TRS.1.1 TDD	
	Config 3		TRS.1.2 TDD	TRS.1.2 TDD	
OCNG Pattern Note 1			OP.1	OP.1	As defined in A.2.1.
PDSCH parameters Note 4	Config 1,4		SR.1.1 FDD	SR.1.1 FDD	As defined in A.3.1.1
	Config 2		SR.1.1 TDD	SR.1.1 TDD	
	Config 3		CR.2.1 TDD	CR.2.1 TDD	
RMSI CORESET Reference Channel	Config 1,4		CR.1.1 TDD	CR.1.1 TDD	
	Config 2		CR.1.1 TDD	CR.1.1 TDD	
	Config 3		CR.2.1 TDD	CR.2.1 TDD	
Dedicated CORESET Reference Channel	Config 1,4		CCR.1.1 TDD	CCR.1.1 TDD	
	Config 2		CCR.1.1 TDD	CCR.1.1 TDD	
	Config 3		CCR.2.1 TDD	CCR.2.1 TDD	
NR RF Channel Number			1	1	

EPRE ratio of PSS to SSS			dB	0	0	
EPRE ratio of PBCH_DMRS to SSS						
EPRE ratio of PBCH to PBCH_DMRS						
EPRE ratio of PDCCH_DMRS to SSS						
EPRE ratio of PDCCH to PDCCH_DMRS						
EPRE ratio of PDSCH_DMRS to SSS						
EPRE ratio of PDSCH to PDSCH_DMRS						
SSB with index 0	$\hat{E}_s / I_{ot}$		dB	3	3	Power of SSB with index 0 is set to be above configured *rsrp-ThresholdSSB*
	N_{oc}	Config 1,2,4	dBm/15kHz	-98	-98	
		Config 3		-101	-101	
	$\hat{E}_s / N_{oc}$		dB	3	3	
	SS-RSRP Note 3		dBm/ SCS	-95	-95	
SSB with index 1	$\hat{E}_s / I_{ot}$		dB	-17	-17	Power of SSB with index 1 is set to be below configured *rsrp-ThresholdSSB*
	N_{oc}	Config 1,2,4	dBm/15kHz	-98	-98	
		Config 3		-101	-101	
	$\hat{E}_s / N_{oc}$		dB	-17	-17	
	SS-RSRP Note 3		dBm/ SCS	-115	-115	
Io Note 2		Config 1,2,4	dBm	-65.3/9.36MHz	-65.3/9.36MHz	For symbols without SSB index 1
		Config 3		-65.38/18.36 MHz	-65.38/18.36 MHz	
ss-PBCH-BlockPower			dBm/ SCS	-5	-5	As defined in clause 6.3.2 in TS 38.331 [13].
Configured UE transmitted power ($P_{CMAX,\ f,c}$)			dBm	23	23	As defined in clause 6.2.4 in TS 38.101-1 [2].
PRACH Configuration				PRACH.2 FR1	PRACH.3 FR1	As defined in A.3.8B.2.
Propagation Condition			-	AWGN	AWGN	

Note 1: OCNG shall be used such that the cell is fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols. The OCNG pattern is chosen during the test according to the presence of a DL reference measurement channel.
Note 2: SS-RSRP, Es/Iot and Io levels have been derived from other parameters for information purpose. They are not settable parameters.
Note 3: The DL PDSCH reference measurement channel is used in the test only when a downlink transmission dedicated to the UE under test is required.

16.3.2.2.5 NR SA FR1 2-step RA type contention based random access test in FR1 for NR standalone for 1 Rx UE

Editor's Note : This test case is incomplete in following aspects :

- TT analysis is still missing.

16.3.2.2.5.1 Test purpose

To verify that the behaviour of the 2-step RA type random access procedure is according to the requirements and that the PRACH power settings and timing are within specified limits. This test will verify the requirements in 38.133 [6] clause 6.2.2B.2 and Clause 7.1A.2 in an AWGN model.

16.3.2.2.5.2 Test applicability

This test applies to all types of NR RedCap UE with 1Rx and supporting 2-step RACH from Release 17 onwards.

16.3.2.2.5.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 6.3.2.2.0.1.

The normative reference for this requirement is TS 38.133 [6] clause A.16.3.2.2.5.

16.3.2.2.5.4 Test description

16.3.2.2.5.4.1 Initial conditions

Same as the initial conditions given in sub-clause 6.3.2.2.3.4.1 with following exceptions:

- Table 6.3.2.2.3.4.1-1 is replaced by Table 16.3.2.2.5.4.1-1.
- Table 6.3.2.2.3.4.1-2 is replaced by Table 16.3.2.2.5.4.1-2.

Table 16.3.2.2.5.4.1-1: Supported test configurations

Configuration	Description
16.3.2.2.5-1	15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode
16.3.2.2.5-2	15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode
16.3.2.2.5-3	30 kHz SSB SCS, 20 MHz bandwidth, TDD duplex mode
16.3.2.2.5-4	15 kHz SSB SCS, 10 MHz bandwidth, HD-FDD duplex mode
Note: The UE is only required to be tested in one of the supported test configurations.	

Table 16.3.2.2.5.4.1-2: Initial conditions

Parameter	Value		Comment
Test environment	NC		As specified in TS 38.508-1 [14] clause 4.1.
Test frequencies	As specified in Annex E, Table E.4-1 and TS 38.508-1 [14] clause 4.3.1.		
Channel bandwidth	As specified by the test configuration selected from Table 16.3.2.2.5.4.1-1.		
Propagation conditions	AWGN		As specified in Annex C.2.2.
Connection Diagram	TE Part	A.3.1.8.1	As specified in TS 38.508-1 [14] Annex A.
	DUT Part	A.3.2.2.1	
Exceptions to connection diagram			

16.3.2.2.5.4.2 Test procedure

Same as the test procedure given in sub-clause 6.3.2.2.3.4.2.

16.3.2.2.5.4.3 Message contents

Same as the message contents given in 6.3.2.2.3.4.3.

16.3.2.2.5.5 Test requirement

Same as the test requirements given in sub-clause 6.3.2.2.3.5 with following exceptions:

- Table 6.3.2.2.3.5-1 is replaced by Table 16.3.2.2.5.5-1.

Table 16.3.2.2.5.5-1: General test parameters

Parameter		Unit	Test-1	Comments
SSB Configuration	Config 1,2,4		SSB.1 FR1	As defined in A.3, except for number of SSBs per SS-burst and SS/PBCH block index as below
	Config 3		SSB.1 RedCap FR1	

Number of SSBs per SS-burst			2	Different from the definition in A.3
SS/PBCH block index			0,1	Different from the definition in A.3
Duplex Mode for Cell 1	Config 1		FDD	
	Config 2,3		TDD	
	Config 4		HD-FDD	
TDD Configuration	Config 2		TDDConf.1.1	
	Config 3		TDDConf.2.1	
CSI-RS for tracking	Config 1,4		TRS.1.1 FDD	
	Config 2		TRS.1.1 TDD	
	Config 3		TRS.1.2 TDD	
OCNG Pattern Note 1			OP.1	As defined in A.2.1
PDSCH parameters Note 4	Config 1,4		SR.1.1 FDD	As defined in A.1.1
	Config 2		SR.1.1 TDD	
	Config 3		SR.2.1 TDD	
NR RF Channel Number			1	
EPRE ratio of PSS to SSS		dB	0	
EPRE ratio of PBCH_DMRS to SSS				
EPRE ratio of PBCH to PBCH_DMRS				
EPRE ratio of PDCCH_DMRS to SSS				
EPRE ratio of PDCCH to PDCCH_DMRS				
EPRE ratio of PDSCH_DMRS to SSS				
EPRE ratio of PDSCH to PDSCH_DMRS				
SSB with index 0	$\hat{E}_s / I_{ot}$	dB	3	Power of SSB with index 0 is set to be above configured *msgA-RSRP-ThresholdSSB*
	N_{oc} Config 1,2,4	dBm/15kHz	-98	
	N_{oc} Config 3		-101	
	$\hat{E}_s / N_{oc}$	dB	3	
	SS-RSRP Note 3	dBm/ SCS	-95	
SSB with index 1	$\hat{E}_s / I_{ot}$	dB	-17	Power of SSB with index 1 is set to be below configured *msgA-RSRP-ThresholdSSB*
	N_{oc} Config 1,2,4	dBm/15kHz	-98	
	N_{oc} Config 3		-101	
	$\hat{E}_s / N_{oc}$	dB	-17	
	SS-RSRP Note 3	dBm/ SCS	-115	
Io Note 2	Config 1,2,4	dBm	-65.3/9.36MHz	For symbols without SSB index 1
	Config 3		-65.38/18.36 MHz	
ss-PBCH-BlockPower		dBm/ SCS	-5	As defined in clause 6.3.2 in TS 38.331 [13].
Configured UE transmitted power ($P_{CMAX,\ f,c}$)		dBm	23	As defined in clause 6.2.4 in TS 38.101-1 [2].
MsgA Configuration			MsgA.1 FR1	As defined in A.7A.1
msgA-RSRP-ThresholdSSB		dBm	RSRP_51	The actual value of the threshold is -105dBm, as defined in TS 38.331 [13].
Propagation Condition		-	AWGN	

Note 1: OCNG shall be used such that the cell is fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols. The OCNG pattern is chosen during the test according to the presence of a DL reference measurement channel.

Note 2: SS-RSRP, Es/Iot and Io levels have been derived from other parameters for information purpose. They are not settable parameters.

Note 3: The DL PDSCH reference measurement channel is used in the test only when a downlink transmission dedicated to the UE under test is required.

16.3.2.2.6 NR SA FR1 2-step RA type contention based random access test in FR1 for NR standalone for 2 Rx UE

16.3.2.2.6.1 Test purpose

To verify that the behaviour of the 2-step RA type random access procedure is according to the requirements and that the PRACH power settings and timing are within specified limits. This test will also verify the requirements in 38.133 [6] Clause 6.2.2B.2 and Clause 7.1A.2 in an AWGN model

16.3.2.2.6.2 Test applicability

This test applies to all types of NR RedCap UE with 2Rx and supporting 2-step RACH from Release 17 onwards.

16.3.2.2.6.3 Minimum conformance requirement

The minimum conformance requirements are specified in clause 16.3.2.2.0.1.

The normative reference for this requirement is TS 38.133 [6] clauses A.16.3.2.2.6.

16.3.2.2.6.4 Test description

16.3.2.2.6.4.1 Initial conditions

Same as the initial conditions given in 6.3.2.2.1.4.1 with following exceptions:

- Table 6.3.2.2.1.4.1-1 is replaced by Table 16.3.2.2.6.4.1-1.
- Table 6.3.2.2.1.4.1-2 is replaced by Table 16.3.2.2.6.4.1-2.

Table 16.3.2.2.6.4.1-1: Supported test configurations

Config	Description
16.3.2.2.6-1	NR 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode
16.3.2.2.6-2	NR 15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode
16.3.2.2.6-3	NR 30 kHz SSB SCS, 20 MHz bandwidth, TDD duplex mode
16.3.2.2.6-4	NR 15 kHz SSB SCS, 10 MHz bandwidth, HD-FDD duplex mode
Note: The UE is only required to be tested in one of the supported test configurations depending on UE capability	

Table 16.3.2.2.6.4.1-2: Initial conditions for Contention based random access test in FR1 for NR standalone

Parameter	Value		Comment
Test environment	NC		As specified in TS 38.508-1 [14] clause 4.1.
Test frequencies	As specified in Annex E, Table E.4-1 and TS 38.508-1 [14] clause 4.3.1.		
Channel bandwidth	As specified by the test configuration selected from Table 16.3.2.2.6.4.1-1.		
Propagation conditions	AWGN		As specified in Annex C.2.2.
Connection Diagram	TE Part	A.3.1.7.1	As specified in TS 38.508-1 [14] Annex A.
	DUT Part	A.3.2.3.4	
Exceptions to connection diagram	N/A		

16.3.2.2.6.4.2 Test procedure

Same as the test procedure given in clause 6.3.2.2.1.4.2.

16.3.2.2.6.4.3 Message contents

Same as the message contents given in clause 6.3.2.2.1.4.3.

16.3.2.2.6.5 Test requirement

Same as the test requirements given in clause 6.3.2.2.1.4.2 with following exceptions:

- Table 6.3.2.2.1.5-1 is replaced by Table 16.3.2.2.6.5-1.

Table 16.3.2.2.6.5-1: General test parameters

Parameter			Unit	Test-1	Comments
SSB Configuration		Config 1,2,4		SSB.1 FR1	As defined in A.3, except for number of SSBs per SS-burst and SS/PBCH block index as below
		Config 3		SSB.1 RedCap FR1	
Number of SSBs per SS-burst				2	Different from the definition in A.3
SS/PBCH block index				0,1	Different from the definition in A.3
Duplex Mode for Cell 1		Config 1		FDD	
		Config 2,3		TDD	
		Config 4		HD-FDD	
TDD Configuration		Config 2		TDDConf.1.1	
		Config 3		TDDConf.2.1	
CSI-RS for tracking		Config 1,4		TRS.1.1 FDD	
		Config 2		TRS.1.1 TDD	
		Config 3		TRS.1.2 TDD	
OCNG Pattern Note 1				OP.1	As defined in A.2.1
PDSCH parameters Note 4		Config 1,4		SR.1.1 FDD	As defined in A.1.1
		Config 2		SR.1.1 TDD	
		Config 3		SR.2.1 TDD	
NR RF Channel Number				1	
EPRE ratio of PSS to SSS			dB	0	
EPRE ratio of PBCH_DMRS to SSS					
EPRE ratio of PBCH to PBCH_DMRS					
EPRE ratio of PDCCH_DMRS to SSS					
EPRE ratio of PDCCH to PDCCH_DMRS					
EPRE ratio of PDSCH_DMRS to SSS					
EPRE ratio of PDSCH to PDSCH_DMRS					
SSB with index 0	$\hat{E}_s / I_{ot}$		dB	3	Power of SSB with index 0 is set to be above configured *msgA-RSRP-ThresholdSSB*
	N_{oc}	Config 1,2,4	dBm/15kHz	-98	
		Config 3		-101	
	$\hat{E}_s / N_{oc}$		dB	3	
	SS-RSRP Note 3		dBm/ SCS	-95	
SSB with index 1	$\hat{E}_s / I_{ot}$		dB	-17	Power of SSB with index 1 is set to be below configured *msgA-RSRP-ThresholdSSB*
	N_{oc}	Config 1,2,4	dBm/15kHz	-98	
		Config 3		-101	
	$\hat{E}_s / N_{oc}$		dB	-17	
	SS-RSRP Note 3		dBm/ SCS	-115	
Io Note 2		Config 1,2,4	dBm	-65.3/9.36MHz	For symbols without SSB index 1
		Config 3		-65.38/18.36 MHz	
ss-PBCH-BlockPower			dBm/ SCS	-5	As defined in clause 6.3.2 in TS 38.331 [13].

Configured UE transmitted power ($P_{CMAX,\ f,c}$)	dBm	23	As defined in clause 6.2.4 in TS 38.101-1 [2].
MsgA Configuration		MsgA.1 FR1	As defined in A.7A.1
msgA-RSRP-ThresholdSSB	dBm	RSRP_51	The actual value of the threshold is -105dBm, as defined in TS 38.331 [13].
Propagation Condition	-	AWGN	
Note 1: OCNG shall be used such that the cell is fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols. The OCNG pattern is chosen during the test according to the presence of a DL reference measurement channel. Note 2: SS-RSRP, Es/Iot and Io levels have been derived from other parameters for information purpose. They are not settable parameters. Note 3: The DL PDSCH reference measurement channel is used in the test only when a downlink transmission dedicated to the UE under test is required.			

16.3.2.2.7 NR SA FR1 2-step RA type non-contention based test in FR1 for NR standalone for 1 RX UE

Editor's Note : This test case is incomplete in following aspects :

- TT analysis is still missing.

16.3.2.2.7.1 Test purpose

To verify that the behaviour of the random access procedure is according to the requirements and that the PRACH power settings and timing are within specified limits. This test will verify the requirements in 38.133 [6] clause 6.2.2B.2 and Clause 7.1A.2 in an AWGN model.

16.3.2.2.7.2 Test applicability

This test applies to all types of NR RedCap UE with 1Rx and 2-step RACH from Release 17 onwards.

16.3.2.2.7.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 6.3.2.2.0.2.

The normative reference for this requirement is TS 38.133 [6] clause A.16.3.2.2.7.

16.3.2.2.7.4 Test description

16.3.2.2.7.4.1 Initial conditions

Same as the initial conditions given in sub-clause 6.3.2.2.4.4.1 with following exceptions:

- Table 6.3.2.2.4.4.1-1 is replaced by Table 16.3.2.2.7.4.1-1.
- Table 6.3.2.2.4.4.1-2 is replaced by Table 16.3.2.2.7.4.1-2.

Table 16.3.2.2.7.4.1-1: Supported test configurations

Configuration	Description
16.3.2.2.7-1	30 kHz SSB SCS, 20 MHz bandwidth, TDD duplex mode
16.3.2.2.7-2	15 kHz SSB SCS, 10 MHz bandwidth, HD-FDD duplex mode
Note: The UE is only required to be tested in one of the supported test configurations.	

Table 16.3.2.2.7.4.1-2: Initial conditions

Parameter	Value	Comment
Test environment	NC	As specified in TS 38.508-1 [14] clause 4.1.

Test frequencies	As specified in Annex E, Table E.4-1 and TS 38.508-1 [14] clause 4.3.1.		
Channel bandwidth	As specified by the test configuration selected from Table 16.3.2.2.7.4.1-1.		
Propagation conditions	AWGN		As specified in Annex C.2.2.
Connection Diagram	TE Part	A.3.1.8.1	As specified in TS 38.508-1 [14] Annex A.
	DUT Part	A.3.2.2.1	
Exceptions to connection diagram			

16.3.2.2.7.4.2 Test procedure

Same as the test procedure given in sub-clause 6.3.2.2.4.4.2.

16.3.2.2.7.4.3 Message contents

Same as the message contents given in 6.3.2.2.4.4.3.

16.3.2.2.7.5 Test requirement

Same as the test requirements given in sub-clause 6.3.2.2.4.5 with following exceptions:

- Table 6.3.2.2.4.5-1 is replaced by Table 16.3.2.2.7.5-1.

Table 16.3.2.2.7.5-1: General test parameters

Parameter			Unit	Test-1	Comments
SSB Configuration		Config 1		SSB.1 RedCap FR1	As defined in A.3, except for number of SSBs per SS-burst and SS/PBCH block index as below
		Config 2		SSB.1 FR1	
Number of SSBs per SS-burst				2	Different from the definition in A.3
SS/PBCH block index				0,1	Different from the definition in A.3
Duplex Mode for Cell 1		Config 1		TDD	
		Config 2		HD-FDD	
TDD Configuration		Config 1		TDDConf.2.1	
CSI-RS for tracking		Config 1,4		TRS.1.1 FDD	
		Config 2		TRS.1.1 TDD	
		Config 3		TRS.1.2 TDD	
OCNG Pattern Note 1				OP.1	As defined in A.2.1
PDSCH parameters Note 4		Config 1		SR.2.1 TDD	As defined in A.1.1
		Config 2		SR.1.1 FDD	
NR RF Channel Number				1	
EPRE ratio of PSS to SSS			dB	0	
EPRE ratio of PBCH_DMRS to SSS					
EPRE ratio of PBCH to PBCH_DMRS					
EPRE ratio of PDCCH_DMRS to SSS					
EPRE ratio of PDCCH to PDCCH_DMRS					
EPRE ratio of PDSCH_DMRS to SSS					
EPRE ratio of PDSCH to PDSCH_DMRS					
SSB with index 0	$\hat{E}_s / I_{ot}$		dB	3	Power of SSB with index 0 is set to be above configured *msgA-RSRP-ThresholdSSB*
	N_{oc}	Config 1	dBm/15kHz	-101	
		Config 2		-98	
	$\hat{E}_s / N_{oc}$		dB	3	
	SS-RSRP Note 3		dBm/ SCS	-95	

SSB with index 1	$\hat{E}_s / I_{ot}$		dB	-17	Power of SSB with index 1 is set to be below configured *msgA-RSRP-ThresholdSSB*
	N_{oc}	Config 1	dBm/15kHz	-101	
		Config 2		-98	
	$\hat{E}_s / N_{oc}$		dB	-17	
	SS-RSRP Note 3		dBm/ SCS	-115	
Io Note 2		Config 1	dBm	-65.3/9.36MHz	For symbols without SSB index 1
		Config 2		-65.38/18.36 MHz	
ss-PBCH-BlockPower			dBm/ SCS	-5	As defined in clause 6.3.2 in TS 38.331 [13].
Configured UE transmitted power ($P_{\text{CMAX, f,c}}$)			dBm	23	As defined in clause 6.2.4 in TS 38.101-1 [2].
MsgA Configuration				MsgA.2 FR1	As defined in A.7A.1
msgA-RSRP-ThresholdSSB			dBm	RSRP_51	The actual value of the threshold is -105dBm, as defined in TS 38.331 [13].
Propagation Condition			-	AWGN	

Note 1: OCNG shall be used such that the cell is fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols. The OCNG pattern is chosen during the test according to the presence of a DL reference measurement channel.
Note 2: SS-RSRP, Es/Iot and Io levels have been derived from other parameters for information purpose. They are not settable parameters.
Note 3: The DL PDSCH reference measurement channel is used in the test only when a downlink transmission dedicated to the UE under test is required.

16.3.2.2.8 NR SA FR1 2-step RA type non-contention based test in FR1 for NR standalone for 2 RX UE

16.3.2.2.8.1 Test purpose

To verify that the behaviour of the random access procedure is according to the requirements and that the PRACH power settings and timing are within specified limits. This test will verify the requirements in 38.133 [6] Clause 6.2.2B.2 and Clause 7.1A.2 in an AWGN model.

16.3.2.2.8.2 Test applicability

This test applies to all types of NR RedCap UE with 2Rx and 2-step RACH from Release 17 onwards.

16.3.2.2.8.3 Minimum conformance requirement

The minimum conformance requirements are specified in clause 16.3.2.2.0.1.

The normative reference for this requirement is TS 38.133 [6] clauses A.16.3.2.2.8.

16.3.2.2.8.4 Test description

16.3.2.2.8.4.1 Initial conditions

Same as the initial conditions given in 6.3.2.2.4.4.1 with following exceptions:

- Table 6.3.2.2.4.4.1-1 is replaced by Table 16.3.2.2.8.4.1-1.
- Table 6.3.2.2.4.4.1-2 is replaced by Table 16.3.2.2.8.4.1-2.

Table 16.3.2.2.8.4.1-1: Supported test configurations

Config	Description
16.3.2.2.8-1	NR 30 kHz SSB SCS, 20 MHz bandwidth, TDD duplex mode
16.3.2.2.8-2	NR 15 kHz SSB SCS, 10 MHz bandwidth, HD-FDD duplex mode
Note: The UE is only required to be tested in one of the supported test configurations depending on UE capability	

Table 16.3.2.2.8.4.1-2: Initial conditions for Contention based random access test in FR1 for NR standalone

Parameter	Value		Comment
Test environment	NC		As specified in TS 38.508-1 [14] clause 4.1.
Test frequencies	As specified in Annex E, Table E.4-1 and TS 38.508-1 [14] clause 4.3.1.		
Channel bandwidth	As specified by the test configuration selected from Table 16.3.2.2.8.4.1-1.		
Propagation conditions	AWGN		As specified in Annex C.2.2.
Connection Diagram	TE Part	A.3.1.7.1	As specified in TS 38.508-1 [14] Annex A.
	DUT Part	A.3.2.3.4	
Exceptions to connection diagram	N/A		

16.3.2.2.8.4.2 Test procedure

Same as the test procedure given in clause 6.3.2.2.4.4.2.

16.3.2.2.8.4.3 Message contents

Same as the message contents given in clause 6.3.2.2.4.4.3.

16.3.2.2.8.5 Test requirement

Same as the test requirements given in clause 6.3.2.2.4.4.2 with following exceptions:

- Table 6.3.2.2.4.5-1 is replaced by Table 16.3.2.2.8.5-1.

Table 16.3.2.2.8.5-1: General test parameters

Parameter		Unit	Test-1	Comments
SSB Configuration	Config 1		SSB.1 RedCap FR1	As defined in A.3, except for number of SSBs per SS-burst and SS/PBCH block index as below
	Config 2		SSB.1 FR1	
Number of SSBs per SS-burst			2	Different from the definition in A.3
SS/PBCH block index			0,1	Different from the definition in A.3
Duplex Mode for Cell 1	Config 1		TDD	
	Config 2		HD-FDD	
TDD Configuration	Config 2		TDDConf.2.1	
OCNG Pattern Note 1			OP.1	As defined in A.2.1
PDSCH parameters Note 4	Config 1		SR.2.1 TDD	As defined in A.1.1
	Config 2		SR.1.1 FDD	
NR RF Channel Number			1	
EPRE ratio of PSS to SSS		dB	0	
EPRE ratio of PBCH_DMRS to SSS				
EPRE ratio of PBCH to PBCH_DMRS				
EPRE ratio of PDCCH_DMRS to SSS				
EPRE ratio of PDCCH to PDCCH_DMRS				
EPRE ratio of PDSCH_DMRS to SSS				
EPRE ratio of PDSCH to PDSCH_DMRS				

SSB with index 0	$\hat{E}_s/I_{ot}$		dB	3	Power of SSB with index 0 is set to be above configured *msgA-RSRP-ThresholdSSB*
	N_{oc}	Config 1	dBm/15kHz	-101	
		Config 2		-98	
	$\hat{E}_s/N_{oc}$		dB	3	
	SS-RSRP Note 3		dBm/ SCS	-95	
SSB with index 1	$\hat{E}_s/I_{ot}$		dB	-17	Power of SSB with index 1 is set to be below configured *msgA-RSRP-ThresholdSSB*
	N_{oc}	Config 1	dBm/15kHz	-101	
		Config 2		-98	
	$\hat{E}_s/N_{oc}$		dB	-17	
	SS-RSRP Note 3		dBm/ SCS	-115	
Io Note 2		Config 1	dBm	-65.3/9.36MHz	For symbols without SSB index 1
		Config 2		-65.38/18.36 MHz	
ss-PBCH-BlockPower			dBm/ SCS	-5	As defined in clause 6.3.2 in TS 38.331 [13].
Configured UE transmitted power ($P_{\text{CMAX, f,c}}$)			dBm	23	As defined in clause 6.2.4 in TS 38.101-1 [2].
MsgA Configuration				MsgA.2 FR1	As defined in A.7A.1
msgA-RSRP-ThresholdSSB				RSRP_51	The actual value of the threshold is -105dBm, as defined in TS 38.331 [13].
Propagation Condition			-	AWGN	

Note 1: OCNG shall be used such that the cell is fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols. The OCNG pattern is chosen during the test according to the presence of a DL reference measurement channel.
Note 2: SS-RSRP, Es/Iot and Io levels have been derived from other parameters for information purpose. They are not settable parameters.
Note 3: The DL PDSCH reference measurement channel is used in the test only when a downlink transmission dedicated to the UE under test is required.

16.3.2.3 RRC connection release with redirection for RedCap

16.3.2.3.0 Minimum conformance requirements

16.3.2.3.0.1 Minimum conformance requirements for FR1 RRC connection release with redirection

The requirements in clause 6.3.2.3.0.1 shall apply when RedCap UE is capable of 2 Rx.

When UE is only required to support 1 Rx antenna, the requirements defined in clause 6.3.2.3.0.1 shall apply except that:

- $T_{identify\text{-}NR}$ as specified in Table 16.3.2.3.0.1-1.

Table 16.3.2.3.0.1-1: Time to identify target NR cell for RRC connection release with redirection to NR

FR of target NR cell	$T_{identify\text{-}NR}$
FR1	MAX (680 ms, [12] x T_{rs})
Note: If the UE has been provided with higher layer signalling of *smtc2* specified in TS 38.331 [2] prior to the redirection command, T_{rs} follows *smtc1* or *smtc2* according to the physical cell ID of the target cell.	

The HD-FDD UE shall meet the RRC connection release with redirection requirements provided that SSB is available at the UE once every SMTC period during T_{search}.

The normative reference for this requirement is TS 38.133 [6] clauses 6.2.3A.2.1.

16.3.2.3.0.2 Minimum conformance requirements for FR1 – E-UTRAN RRC connection release with redirection

The requirements in clause 6.3.2.3.0.2 shall apply.

The normative reference for this requirement is TS 38.133 [6] clauses 6.2.3A.2.2.

16.3.2.3.1 NR SA FR1-FR1 Redirection from NR in FR1 to NR in FR1 for 1 Rx UE

Editor's Note: This test case is incomplete in following aspects:

- TT analysis is still missing.
- Some test parameters are still TBD.

16.3.2.3.1.1 Test purpose

To verify RRC connection release with redirection from NR to NR requirements specified in 38.133 [6] clause 6.2.3A.2.1.

16.3.2.3.1.2 Test applicability

This test applies to all types of NR RedCap UE with 1Rx from Release 17 onwards.

16.3.2.3.1.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 16.3.2.3.0.1.

The normative reference for this requirement is TS 38.133 [6] clause A.16.3.2.3.1.

16.3.2.3.1.4 Test description

16.3.2.3.1.4.1 Initial conditions

Same as the initial conditions given in sub-clause 6.3.2.3.1.4.1 with following exceptions:

- Table 6.3.2.3.1.4.1-1 is replaced by Table 16.3.2.3.1.4.1-1.
- Table 6.3.2.3.1.4.1-2 is replaced by Table 16.3.2.3.1.4.1-2.
- Table 6.3.2.3.1.4.1-3 is replaced by Table 16.3.2.3.1.4.1-3.

Table 16.3.2.3.1.4.1-1: Supported test configurations

Configuration	Description
16.3.2.3.1-1	Source cell: NR 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode Target cell: NR 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode
16.3.2.3.1-2	Source cell: NR 15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode Target cell: NR 15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode
16.3.2.3.1-3	Source cell: NR 30 kHz SSB SCS, 20 MHz bandwidth, TDD duplex mode Target cell: NR 30 kHz SSB SCS, 20 MHz bandwidth, TDD duplex mode
16.3.2.3.1-4	Source cell: NR 15 kHz SSB SCS, 10 MHz bandwidth, HD-FDD duplex mode Target cell: NR 15 kHz SSB SCS, 10 MHz bandwidth, HD-FDD duplex mode
Note: The UE is only required to be tested in one of the supported test configurations	

Table 16.3.2.3.1.4.1-2: Initial conditions

Parameter	Value		Comment
Test environment	NC		As specified in TS 38.508-1 [14] clause 4.1.
Test frequencies	As specified in Annex E, Table E.4-1 and TS 38.508-1 [14] clause 4.3.1.		
Channel bandwidth	As specified by the test configuration selected from Table 16.3.2.3.1.4.1-1.		
Propagation conditions	AWGN		As specified in Annex C.2.2.
Connection Diagram	TE Part	A.3.1.8.1	As specified in TS 38.508-1 [14] Annex A.
	DUT Part	A.3.2.2.1	
Exceptions to connection diagram			

Table 16.3.2.3.1.4.1-3: General test parameters

Parameter		Unit	Value	Comment
Initial conditions	Active cell		Cell 1	
	Neighbouring cell		Cell 2	
Final condition	Active cell		Cell 2	
Filter coefficient			0	L3 filtering is not used
Access Barring Information		-	Not Sent	No additional delays in random access procedure.
Time offset between cells			3 µs	Synchronous cells
T1		s	5	
T2		s	2.3	

16.3.2.3.1.4.2 Test procedure

Same as the test procedure given in sub-clause 6.3.2.3.1.4.2.

16.3.2.3.1.4.3 Message contents

Same as the message contents given in 6.3.2.3.1.4.3 with following exceptions.

- Table 6.3.2.3.1.4.3-1 is replaced by Table 16.3.2.3.1.4.3-1.

Table 16.3.2.3.1.4.3-1: RRCRelease (Test procedure, Step 3)

Derivation Path: TS 38.508-1 [14], Table 4.6.1-16			
Information Element	**Value/remark**	**Comment**	**Condition**
RRCRelease ::= SEQUENCE {			
criticalExtensions CHOICE {			
rrcRelease SEQUENCE {			
redirectedCarrierInfo CHOICE {			
nr SEQUENCE {			
carrierFreq	ARFCN-ValueNR of Cell 2		
ssbSubcarrierSpacing	kHz15		Config 1,2,4
	kHz30		Config 3
smtc SEQUENCE {			
duration	sf1		SMTC.1
	sf5		SMTC.2
}			
}			
}			
}			
}			
}			

16.3.2.3.1.5 Test requirement

Same as the test requirements given in sub-clause 6.3.2.3.1.5 with following exceptions:

- Table 6.3.2.3.1.5-1 is replaced by Table 16.3.2.3.1.5-1.

Table 16.3.2.3.1.5-1: Cell specific test parameters

Parameter		Unit	Cell 1		Cell 2	
			T1	T2	T1	T2
NR RF Channel Number			1		2	
Duplex mode	Config 1		FDD			
	Config 2, 3		TDD			
	Config 4		HD-FDD			
SSB Configuration	Config 1,2,4		SSB.1 FR1			
	Config 3		SSB.1 RedCap FR1			
CSI-RS for tracking	Config 1,4		TRS.1.1 FDD			
	Config 2		TRS.1.1 TDD			
	Config 3		TRS.1.2 TDD			
TDD configuration	Config 1,4		Not Applicable			
	Config 2		TDDConf.1.1			
	Config 3		TDDConf.2.1			
$BW_{channel}$	Config 1,2,4	MHz	10: $N_{RB,c}$ = 52			
	Config 3		20: $N_{RB,c}$ = 51			
BWP BW	Config 1,2,4	MHz	10: $N_{RB,c}$ = 52			
	Config 3		20: $N_{RB,c}$ = 51			
DRX Cycle		ms	Not Applicable			
PDSCH Reference measurement channel	Config 1		SR.1.1 FDD			
	Config 2		SR.1.1 TDD			
	Config 3		SR.2.1 TDD			
	Config 4		TBD			
CORESET Reference Channel	Config 1		TBD			
	Config 2		TBD			
	Config 3		TBD			
	Config 4		TBD			
OCNG Patterns			OG.1			
SMTC configuration	Config 1,2,4		SMTC.1 FR1			
	Config 3		SMTC.2 FR1			
PDSCH/PDCCH subcarrier spacing	Config 1,2,4	kHz	15 kHz			
	Config 3		30 kHz			
PUCCH/PUSCH subcarrier spacing	Config 1,2,4	kHz	15 kHz			
	Config 3		30 kHz			
PRACH configuration			PRACH.1 FR1			
BWP configuration	Initial DL BWP		DLBWP.0.1			
	Dedicated DL BWP		DLBWP.1.1 RedCap			
	Initial UL BWP		ULBWP.0.1			
	Dedicated UL BWP		ULBWP.1.1 RedCap			
EPRE ratio of PSS to SSS		dB	0			
EPRE ratio of PBCH DMRS to SSS						
EPRE ratio of PBCH to PBCH DMRS						
EPRE ratio of PDCCH DMRS to SSS						
EPRE ratio of PDCCH to PDCCH DMRS						
EPRE ratio of PDSCH DMRS to SSS						
EPRE ratio of PDSCH to PDSCH						
EPRE ratio of OCNG DMRS to SSS(Note 1)						
EPRE ratio of OCNG to OCNG DMRS (Note 1)						
N_{oc} Note2		dBm/15kHz	-98			
N_{oc} Note2	Config 1,2,4	dBm/SCS	-98			
	Config 3		-95			
$\hat{E}_s/I_{ot}$		dB	4	4	-infinity	4
$\hat{E}_s/N_{oc}$		dB	4	4	-infinity	4
Io Note3	Config 1,2,4	dBm/ 9.36MHz	-64.59	-64.59	-70.05	-64.59
	Config 3	dBm/ 18.36MHz	-61.66	-61.66	-67.12	-61.66

Propagation condition	-	AWGN
Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols. Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for N_{oc} to be fulfilled. Note 3: Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.		

16.3.2.3.2 NR SA FR1-FR1 Redirection from NR in FR1 to NR in FR1 for 2 Rx UE

16.3.2.3.2.1 Test purpose

To verify RRC connection release with redirection from NR to NR requirements specified in 38.133 [6] clause 6.2.3A.2.1.

16.3.2.3.2.2 Test applicability

This test applies to all types of NR RedCap UE with 2Rx from Release 17 onwards.

16.3.2.3.2.3 Minimum conformance requirement

The minimum conformance requirements are specified in clause 16.3.2.3.0.1.

The normative reference for this requirement is TS 38.133 [6] clauses A.16.3.2.3.2.

16.3.2.3.2.4 Test description

16.3.2.3.2.4.1 Initial conditions

Same as the initial conditions given in 6.3.2.3.1.4.1 with following exceptions:

- Table 6.3.2.3.1.4.1-1 is replaced by Table 16.3.2.3.2.4.1-1.
- Table 6.3.2.3.1.4.1-2 is replaced by Table 16.3.2.3.2.4.1-2.
- Table 6.3.2.3.1.4.1-3 is replaced by Table 16.3.2.3.1.4.1-3.

Table 16.3.2.3.2.4.1-1: Supported test configurations

Configuration	Description
16.3.2.3.2-1	Source cell: NR 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode Target cell: NR 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode
16.3.2.3.2-2	Source cell: NR 15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode Target cell: NR 15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode
16.3.2.3.2-3	Source cell: NR 30 kHz SSB SCS, 20 MHz bandwidth, TDD duplex mode Target cell: NR 30 kHz SSB SCS, 20 MHz bandwidth, TDD duplex mode
16.3.2.3.2-4	Source cell: NR 15 kHz SSB SCS, 10 MHz bandwidth, HD-FDD duplex mode Target cell: NR 15 kHz SSB SCS, 10 MHz bandwidth, HD-FDD duplex mode
Note: The UE is only required to be tested in one of the supported test configurations	

Table 16.3.2.3.2.4.1-2: Initial conditions

Parameter	Value		Comment
Test environment	NC		As specified in TS 38.508-1 [14] clause 4.1.
Test frequencies	As specified in Annex E, Table E.4-1 and TS 38.508-1 [14] clause 4.3.1.		
Channel bandwidth	As specified by the test configuration selected from Table 16.3.2.3.2.4.1-1.		
Propagation conditions	AWGN		As specified in Annex C.2.2.
Connection Diagram	TE Part	A.3.1.8.2	As specified in TS 38.508-1 [14] Annex A.
	DUT Part	A.3.2.3.4	

Exceptions to connection diagram	N/A	

Table 16.3.2.3.2.4.1-3: General test parameters

Parameter		Unit	Value	Comment
Initial conditions	Active cell		Cell 1	
	Neighbouring cell		Cell 2	
Final condition	Active cell		Cell 2	
Filter coefficient			0	L3 filtering is not used
Access Barring Information		-	Not Sent	No additional delays in random access procedure.
Time offset between cells			3 μs	Synchronous cells
T1		s	5	
T2		s	2.3	

16.3.2.3.2.4.2 Test procedure

Same as the test procedure given in clause 6.3.2.3.1.4.2.

16.3.2.3.2.4.3 Message contents

Same as the message contents given in 6.3.2.3.1.4.3 with following exceptions.

- Table 6.3.2.3.1.4.2-1 is replaced by Table 16.3.2.3.2.4.3-1.

Table 16.3.2.3.2.4.3-1: RRCRelease (Test procedure, Step 3)

Derivation Path: TS 38.508-1 [14], Table 4.6.1-16			
Information Element	**Value/remark**	**Comment**	**Condition**
RRCRelease ::= SEQUENCE {			
criticalExtensions CHOICE {			
rrcRelease SEQUENCE {			
redirectedCarrierInfo CHOICE {			
nr SEQUENCE {			
carrierFreq	ARFCN-ValueNR of Cell 2		
ssbSubcarrierSpacing	kHz15		Config 1,2,4
	kHz30		Config 3
smtc SEQUENCE {			
duration	sf1		SMTC.1
	sf5		SMTC.2
}			
}			
}			
}			
}			
}			

16.3.2.3.2.5 Test requirement

Same as the test requirements given in clause 6.3.2.3.1.5 with following exceptions:

- Table 6.3.2.3.1.5-1 is replaced by Table 16.3.2.3.2.5-1.

Table 16.3.2.3.2.5-1: Cell specific test parameter

Parameter		Unit	Cell 1		Cell 2	
			T1	T2	T1	T2
NR RF Channel Number			1		2	
Duplex mode	Config 1		FDD			

	Config 2, 3		TDD			
	Config 4		HD-FDD			
SSB Configuration	Config 1,2,4		SSB.1 FR1			
	Config 3		SSB.1 RedCap FR1			
CSI-RS for tracking	Config 1,4		TRS.1.1 FDD			
	Config 2		TRS.1.1 TDD			
	Config 3		TRS.1.2 TDD			
TDD configuration	Config 1,4		Not Applicable			
	Config 2		TDDConf.1.1			
	Config 3		TDDConf.2.1			
$BW_{channel}$	Config 1,2,4	MHz	10: $N_{RB,c}$ = 52			
	Config 3		20: $N_{RB,c}$ = 51			
BWP BW	Config 1,2,4	MHz	10: $N_{RB,c}$ = 52			
	Config 3		20: $N_{RB,c}$ = 51			
DRX Cycle		ms	Not Applicable			
PDSCH Reference measurement channel	Config 1,4		SR.1.1 FDD			
	Config 2		SR.1.1 TDD			
	Config 3		SR.2.1 TDD			
CORESET Reference Channel	Config 1,4		CR.1.1 FDD			
	Config 2		CR.1.1 TDD			
	Config 3		CR.2.1 TDD			
OCNG Patterns			OP.1			
SMTC configuration	Config 1,2,4		SMTC.1 FR1			
	Config 3		SMTC.2 FR1			
PDSCH/PDCCH subcarrier spacing	Config 1,2,4	kHz	15 kHz			
	Config 3		30 kHz			
PUCCH/PUSCH subcarrier spacing	Config 1,2,4	kHz	15 kHz			
	Config 3		30 kHz			
PRACH configuration			PRACH.1 FR1			
BWP configuration	Initial DL BWP		DLBWP.0.1			
	Dedicated DL BWP		DLBWP.1.1 RedCap			
	Initial UL BWP		ULBWP.0.1			
	Dedicated UL BWP		ULBWP.1.1 RedCap			
EPRE ratio of PSS to SSS		dB	0			
EPRE ratio of PBCH DMRS to SSS						
EPRE ratio of PBCH to PBCH DMRS						
EPRE ratio of PDCCH DMRS to SSS						
EPRE ratio of PDCCH to PDCCH DMRS						
EPRE ratio of PDSCH DMRS to SSS						
EPRE ratio of PDSCH to PDSCH						
EPRE ratio of OCNG DMRS to SSS(Note 1)						
EPRE ratio of OCNG to OCNG DMRS (Note 1)						
N_{oc} Note2		dBm/15kHz	-98			
N_{oc} Note2	Config 1,2,4	dBm/SCS	-98			
	Config 3		-95			
$\hat{E}_s/I_{ot}$		dB	4	4	-infinity	4
$\hat{E}_s/N_{oc}$		dB	4	4	-infinity	4
Io Note3	Config 1,2,4	dBm/ 9.36MHz	-64.59	-64.59	-70.05	-64.59
	Config 3	dBm/ 18.36MHz	-61.66	-61.66	-67.12	-61.66
Propagation condition		-	AWGN			

Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.

Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for N_{oc} to be fulfilled.

Note 3: Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.

16.3.2.3.3 NR SA FR1-FR1 Redirection from NR in FR1 to E-UTRAN for 1 Rx UE

Editor's Note : This test case is incomplete in following aspects:

- TT analysis is still missing.

16.3.2.3.3.1 Test purpose

To verify RRC connection release with redirection from NR to E-UTRAN requirements specified in 38.133 [4] clause 6.2.3A.2.2.

16.3.2.3.3.2 Test applicability

This test applies to all types of NR RedCap UE with 1Rx from Release 17 onwards.

16.3.2.3.3.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 16.3.2.3.0.2.

The normative reference for this requirement is TS 38.133 [6] clause A.16.3.2.3.3.

16.3.2.3.3.4 Test description

16.3.2.3.3.4.1 Initial conditions

Same as the initial conditions given in sub-clause 6.3.2.3.2.4.1 with following exceptions:

- Table 6.3.2.3.2.4.1-1 is replaced by Table 16.3.2.3.3.4.1-1.
- Table 6.3.2.3.2.4.1-2 is replaced by Table 16.3.2.3.3.4.1-2.
- Table 6.3.2.3.2.4.1-3 is replaced by Table 16.3.2.3.3.4.1-3.

Table 16.3.2.3.3.4.1-1: Supported test configurations

Configuration	Description
16.3.2.3.3-1	NR 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode, LTE FDD
16.3.2.3.3-2	NR 15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode, LTE FDD
16.3.2.3.3-3	NR 30 kHz SSB SCS, 20 MHz bandwidth, TDD duplex mode, LTE FDD
16.3.2.3.3-4	NR 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode, LTE TDD
16.3.2.3.3-5	NR 15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode, LTE TDD
16.3.2.3.3-6	NR 30 kHz SSB SCS, 20 MHz bandwidth, TDD duplex mode, LTE TDD
16.3.2.3.3-7	NR 15 kHz SSB SCS, 10 MHz bandwidth, HD-FDD duplex mode, LTE FDD
16.3.2.3.3-8	NR 15 kHz SSB SCS, 10 MHz bandwidth, HD-FDD duplex mode, LTE TDD
Note: The UE is only required to be tested in one of the supported test configurations	

Table 16.3.2.3.3.4.1-2: Initial conditions

Parameter	Value		Comment
Test environment	NC		As specified in TS 38.508-1 [14] clause 4.1.
Test frequencies	As specified in Annex E, Table E.4-1 and TS 38.508-1 [14] clause 4.3.1.		
Channel bandwidth	As specified by the test configuration selected from Table 16.3.2.3.3.4.1-1.		
Propagation conditions	AWGN		As specified in Annex C.2.2.
Connection Diagram	TE Part	A.3.1.8.1	As specified in TS 38.508-1 [14] Annex A.
	DUT Part	A.3.2.2.1	
Exceptions to connection diagram			

Table 16.3.2.3.3.4.1-3: General test parameters

Parameter		Unit	Value	Comment
Initial conditions	Active cell		Cell 1	
	Neighbouring cell		Cell 2	
Final condition	Active cell		Cell 2	
Filter coefficient			0	L3 filtering is not used
Access Barring Information		-	Not Sent	No additional delays in random access procedure.
Time offset between cells			3 μs	Synchronous cells
T1		s	5	
T2		s	2.3	

16.3.2.3.3.4.2 Test procedure

Same as the test procedure given in sub-clause 6.3.2.3.2.4.2.

16.3.2.3.3.4.3 Message contents

Same as the message contents given in 6.3.2.3.2.4.3.

16.3.2.3.3.5 Test requirement

Same as the test requirements given in sub-clause 6.3.2.3.2.5 with following exceptions:

- Table 6.3.2.3.2.5-1 is replaced by Table 16.3.2.3.3.5-1.
- Table 6.3.2.3.2.5-2 is replaced by Table 16.3.2.3.3.5-2.

Table 16.3.2.3.3.5-1: Cell specific test parameters for NR Cell (Cell 1)

Parameter		Unit	Cell 1	
			T1	T2
RF Channel Number			1	
Duplex mode	Config 1,4		FDD	
	Config 2,3,5,6		TDD	
	Config 7,8		HD-FDD	
SSB Configuration	Config 1,2,4,5,7,8		SSB.1 FR1	
	Config 3,6		SSB.1 RedCap FR1	
CSI-RS for tracking	Config 1,4,7,8		TRS.1.1 FDD	
	Config 2,5		TRS.1.1 TDD	
	Config 3,6		TRS.1.2 TDD	
TDD configuration	Config 1,4,7,8		Not Applicable	
	Config 2,5		TDDConf.1.1	
	Config 3,6		TDDConf.2.1	
$BW_{channel}$	Config 1,2,4,5,7,8	MHz	10: $N_{RB,c}$ = 52	
	Config 3,6		20: $N_{RB,c}$ = 51	
BWP BW	Config 1,2,4,5,7,8	MHz	10: $N_{RB,c}$ = 52	
	Config 3,6		20: $N_{RB,c}$ = 51	
DRX Cycle		ms	Not Applicable	
PDSCH Reference measurement channel	Config 1,4,7,8		SR.1.1 FDD	
	Config 2,5		SR.1.1 TDD	
	Config 3,6		SR.2.1 TDD	
CORESET Reference Channel	Config 1,4,7,8		CR.1.1 FDD	
	Config 2,5		CR.1.1 TDD	
	Config 3,6		CR.2.1 TDD	
OCNG Patterns			OP.1	
SMTC configuration	Config 1,2,4,5,7,8		SMTC.1 FR1	
	Config 3,6		SMTC.2 FR1	
PDSCH/PDCCH subcarrier spacing	Config 1,2,4,5,7,8	kHz	15 kHz	
	Config 3,6		30 kHz	
PUCCH/PUSCH subcarrier spacing	Config 1,2,4,5,7,8	kHz	15 kHz	
	Config 3,6		30 kHz	
PRACH configuration			PRACH.1 FR1	

BWP configuration	Initial DL BWP		DLBWP.0.1	
	Dedicated DL BWP		DLBWP.1.1 RedCap	
	Initial UL BWP		ULBWP.0.1	
	Dedicated UL BWP		ULBWP.1.1 RedCap	
EPRE ratio of PSS to SSS		dB	0	
EPRE ratio of PBCH DMRS to SSS				
EPRE ratio of PBCH to PBCH DMRS				
EPRE ratio of PDCCH DMRS to SSS				
EPRE ratio of PDCCH to PDCCH DMRS				
EPRE ratio of PDSCH DMRS to SSS				
EPRE ratio of PDSCH to PDSCH				
EPRE ratio of OCNG DMRS to SSS Note 1				
EPRE ratio of OCNG to OCNG DMRS Note 1				
N_{oc} Note2		dBm/15kHz	-98	
N_{oc} Note2	Config 1,2,4,5,7,8	dBm/SCS	-98	
	Config 3,6		-95	
$\hat{E}_s/I_{ot}$		dB	4	4
$\hat{E}_s/N_{oc}$		dB	4	4
Io Note3	Config 1,2,4,5,7,8	dBm/ 9.36MHz	-64.59	-64.59
	Config 3,6	dBm/ 18.36MHz	-61.66	-61.66
Propagation condition		-	AWGN	

Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.

Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for N_{oc} to be fulfilled.

Note 3: Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.

Table 16.3.2.3.3.5-2: Cell specific test parameters for E-UTRAN Cell (Cell 2)

Parameter	Unit	Configuration	Cell 2	
			T1	T2
RF channel number		1,2,3,4,5,6,7,8	2	
Duplex mode		1,2,3,7	FDD	
		4,5,6,8	TDD	
TDD special subframe configuration Note1		4,5,6,8	6	
TDD uplink-downlink configuration Note1		4,5,6,8	1	
$BW_{channel}$	MHz	1,2,3,4,5,6,7,8	5 MHz: $N_{RB,c}$ = 25 10 MHz: $N_{RB,c}$ = 50 20 MHz: $N_{RB,c}$ = 100	
PRACH Configuration Note2		1,2,3,7	4	
		4,5,6,8	53	
PDSCH parameters: DL Reference Measurement Channel Note3		1,2,3,7	5 MHz: R.7 FDD 10 MHz: R.3 FDD 20 MHz: R.6 FDD	
		4,5,6,8	5 MHz: R.4 TDD 10 MHz: R.0 TDD 20 MHz: R.3 TDD	
PCFICH/PDCCH/PHICH parameters: DL Reference Measurement Channel Note3		1,2,3,7	5 MHz: R.11 FDD 10 MHz: R.6 FDD 20 MHz: R.10 FDD	
		4,5,6,8	5 MHz: R.11 TDD 10 MHz: R.6 TDD 20 MHz: R.10 TDD	
OCNG Patterns Note3		1,2,3,7	5 MHz: OP.20 FDD 10 MHz: OP.10 FDD 20 MHz: OP.17 FDD	
		4,5,6,8	5 MHz: OP.9 TDD	

			10 MHz: OP.1 TDD 20 MHz: OP.7 TDD	
PBCH_RA	dB	1,2,3,4,5,6,7,8	0	
PBCH_RB				
PSS_RA				
SSS_RA				
PCFICH_RB				
PHICH_RA				
PHICH_RB				
PDCCH_RA				
PDCCH_RB				
PDSCH_RA				
PDSCH_RB				
OCNG_RA Note4				
OCNG_RB Note4				
N_{oc} Note5	dBm/15kHz	1,2,3,4,5,6,7,8	-98	
$\hat{E}_s/N_{oc}$	dB	1,2,3,4,5,6,7,8	-Infinity	4
$\hat{E}_s/I_{ot}$ Note6	dB	1,2,3,4,5,6,7,8	-Infinity	4
RSRP Note6	dBm/15kHz	1,2,3,4,5,6,7,8	-Infinity	-94
SCH_RP Note6	dBm/15kHz	1,2,3,4,5,6,7,8	-Infinity	-94
Io Note6	dBm/9MHz	1,2,3,4,5,6,7,8	-70.22	-64.76
Propagation Condition		1,2,3,4,5,6,7,8	AWGN	

Note 1: Special subframe and uplink-downlink configurations are specified in table 4.2-1 in TS 36.211 [24].
Note 2: PRACH configurations are specified in table 5.7.1-2 and table 5.7.1-3 in TS 36.211 [24].
Note 3: DL RMCs and OCNG patterns are specified in clauses A 3.1 and A 3.2 of TS 36.133 [23] respectively.
Note 4: OCNG shall be used such that all cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.
Note 5: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for N_{oc} to be fulfilled.
Note 6: $\hat{E}_s/I_{ot}$, RSRP, SCH_RP and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.
Note 7: Propagation condition and correlation matrix are defined in clause B.2 in TS 36.101 [27].

16.3.2.3.4 NR SA FR1-FR1 Redirection from NR in FR1 to E-UTRAN for 2 Rx UE

16.3.2.3.4.1 Test purpose

To verify RRC connection release with redirection from NR to E-UTRAN requirements specified in 38.133 [4] clause 6.2.3A.2.2.

16.3.2.3.4.2 Test applicability

This test applies to all types of NR RedCap UE with 2Rx from Release 17 onwards.

16.3.2.3.4.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 16.3.2.3.0.2.

The normative reference for this requirement is TS 38.133 [6] clause A.16.3.2.3.4.

16.3.2.3.4.4 Test description

16.3.2.3.4.4.1 Initial conditions

Same as the initial conditions given in sub-clause 6.3.2.3.2.4.1 with following exceptions:

- Table 6.3.2.3.2.4.1-1 is replaced by Table 16.3.2.3.4.4.1-1.
- Table 6.3.2.3.2.4.1-2 is replaced by Table 16.3.2.3.4.4.1-2.
- Table 6.3.2.3.2.4.1-3 is replaced by Table 16.3.2.3.4.4.1-3.

Table 16.3.2.3.4.4.1-1: Supported test configurations

Configuration	Description
16.3.2.3.4-1	NR 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode, LTE FDD
16.3.2.3.4-2	NR 15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode, LTE FDD
16.3.2.3.4-3	NR 30 kHz SSB SCS, 20 MHz bandwidth, TDD duplex mode, LTE FDD
16.3.2.3.4-4	NR 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode, LTE TDD
16.3.2.3.4-5	NR 15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode, LTE TDD
16.3.2.3.4-6	NR 30 kHz SSB SCS, 20 MHz bandwidth, TDD duplex mode, LTE TDD
16.3.2.3.4-7	NR 15 kHz SSB SCS, 10 MHz bandwidth, HD-FDD duplex mode, LTE FDD
16.3.2.3.4-8	NR 15 kHz SSB SCS, 10 MHz bandwidth, HD-FDD duplex mode, LTE TDD
Note: The UE is only required to be tested in one of the supported test configurations	

Table 16.3.2.3.4.4.1-2: Initial conditions

Parameter	Value		Comment
Test environment	NC		As specified in TS 38.508-1 [14] clause 4.1.
Test frequencies	As specified in Annex E, Table E.4-1 and TS 38.508-1 [14] clause 4.3.1.		
Channel bandwidth	As specified by the test configuration selected from Table 16.3.2.3.4.4.1-1.		
Propagation conditions	AWGN		As specified in Annex C.2.2.
Connection Diagram	TE Part	A.3.1.6.1	As specified in TS 38.508-1 [14] Annex A.
	DUT Part	A.3.2.3.2	
Exceptions to connection diagram			

Table 16.3.2.3.4.4.1-3: General test parameters

Parameter		Unit	Value	Comment
Initial conditions	Active cell		Cell 1	
	Neighbouring cell		Cell 2	
Final condition	Active cell		Cell 2	
Filter coefficient			0	L3 filtering is not used
Access Barring Information		-	Not Sent	No additional delays in random access procedure.
Time offset between cells			3 μs	Synchronous cells
T1		s	5	
T2		s	2.3	

16.3.2.3.4.4.2 Test procedure

Same as the test procedure given in sub-clause 6.3.2.3.2.4.2.

16.3.2.3.4.4.3 Message contents

Same as the message contents given in 6.3.2.3.2.4.3.

16.3.2.3.4.5 Test requirement

Same as the test requirements given in sub-clause 6.3.2.3.2.5 with following exceptions:

- Table 6.3.2.3.2.5-1 is replaced by Table 16.3.2.3.4.5-1.
- Table 6.3.2.3.2.5-2 is replaced by Table 16.3.2.3.4.5-2.

Table 16.3.2.3.4.5-1: Cell specific test parameters for NR Cell (Cell 1)

Parameter		Unit	Cell 1	
			T1	T2
RF Channel Number			1	
Duplex mode	Config 1,4		FDD	

	Config 2,3,5,6		TDD	
	Config 7,8		HD-FDD	
SSB Configuration	Config 1,2,4,5,7,8		SSB.1 FR1	
	Config 3,6		SSB.1 RedCap FR1	
CSI-RS for tracking	Config 1,4,7,8		TRS.1.1 FDD	
	Config 2,5		TRS.1.1 TDD	
	Config 3,6		TRS.1.2 TDD	
TDD configuration	Config 1,4,7,8		Not Applicable	
	Config 2,5		TDDConf.1.1	
	Config 3,6		TDDConf.2.1	
$BW_{channel}$	Config 1,2,4,5,7,8	MHz	10: $N_{RB,c}$ = 52	
	Config 3,6		20: $N_{RB,c}$ = 51	
BWP BW	Config 1,2,4,5,7,8	MHz	10: $N_{RB,c}$ = 52	
	Config 3,6		20: $N_{RB,c}$ = 51	
DRX Cycle		ms	Not Applicable	
PDSCH Reference measurement channel	Config 1,4,7,8		SR.1.1 FDD	
	Config 2,5		SR.1.1 TDD	
	Config 3,6		SR.2.1 TDD	
CORESET Reference Channel	Config 1,4,7,8		CR.1.1 FDD	
	Config 2,5		CR.1.1 TDD	
	Config 3,6		CR.2.1 TDD	
OCNG Patterns			OP.1	
SMTC configuration	Config 1,2,4,5,7,8		SMTC.1 FR1	
	Config 3,6		SMTC.2 FR1	
PDSCH/PDCCH subcarrier spacing	Config 1,2,4,5,7,8	kHz	15 kHz	
	Config 3,6		30 kHz	
PUCCH/PUSCH subcarrier spacing	Config 1,2,4,5,7,8	kHz	15 kHz	
	Config 3,6		30 kHz	
PRACH configuration			PRACH.1 FR1	
BWP configuration	Initial DL BWP		DLBWP.0.1	
	Dedicated DL BWP		DLBWP.1.1 RedCap	
	Initial UL BWP		ULBWP.0.1	
	Dedicated UL BWP		ULBWP.1.1 RedCap	
EPRE ratio of PSS to SSS		dB	0	
EPRE ratio of PBCH DMRS to SSS				
EPRE ratio of PBCH to PBCH DMRS				
EPRE ratio of PDCCH DMRS to SSS				
EPRE ratio of PDCCH to PDCCH DMRS				
EPRE ratio of PDSCH DMRS to SSS				
EPRE ratio of PDSCH to PDSCH				
EPRE ratio of OCNG DMRS to SSS Note 1				
EPRE ratio of OCNG to OCNG DMRS Note 1				
N_{oc} Note2		dBm/15kHz	-98	
N_{oc} Note2	Config 1,2,4,5,7,8	dBm/SCS	-98	
	Config 3,6		-95	
$\hat{E}_s / I_{ot}$		dB	4	4
$\hat{E}_s / N_{oc}$		dB	4	4
Io Note3	Config 1,2,4,5,7,8	dBm/ 9.36MHz	-64.59	-64.59
	Config 3,6	dBm/ 18.36MHz	-61.66	-61.66
Propagation condition		-	AWGN	

Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.

Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for N_{oc} to be fulfilled.

Note 3: Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.

Table 16.3.2.3.4.5-2: Cell specific test parameters for E-UTRAN Cell (Cell 2)

Parameter	Unit	Configuration	Cell 2	
			T1	T2
RF channel number		1,2,3,4,5,6,7,8	2	
Duplex mode		1,2,3,7	FDD	
		4,5,6,8	TDD	
TDD special subframe configuration[Note1]		4,5,6,8	6	
TDD uplink-downlink configuration[Note1]		4,5,6,8	1	
$BW_{channel}$	MHz	1,2,3,4,5,6,7,8	5 MHz: $N_{RB,c}$ = 25 10 MHz: $N_{RB,c}$ = 50 20 MHz: $N_{RB,c}$ = 100	
PRACH Configuration[Note2]		1,2,3,7	4	
		4,5,6,8	53	
PDSCH parameters: DL Reference Measurement Channel[Note3]		1,2,3,7	5 MHz: R.7 FDD 10 MHz: R.3 FDD 20 MHz: R.6 FDD	
		4,5,6,8	5 MHz: R.4 TDD 10 MHz: R.0 TDD 20 MHz: R.3 TDD	
PCFICH/PDCCH/PHICH parameters: DL Reference Measurement Channel[Note3]		1,2,3,7	5 MHz: R.11 FDD 10 MHz: R.6 FDD 20 MHz: R.10 FDD	
		4,5,6,8	5 MHz: R.11 TDD 10 MHz: R.6 TDD 20 MHz: R.10 TDD	
OCNG Patterns[Note3]		1,2,3,7	5 MHz: OP.20 FDD 10 MHz: OP.10 FDD 20 MHz: OP.17 FDD	
		4,5,6,8	5 MHz: OP.9 TDD 10 MHz: OP.1 TDD 20 MHz: OP.7 TDD	
PBCH_RA	dB	1,2,3,4,5,6,7,8	0	
PBCH_RB				
PSS_RA				
SSS_RA				
PCFICH_RB				
PHICH_RA				
PHICH_RB				
PDCCH_RA				
PDCCH_RB				
PDSCH_RA				
PDSCH_RB				
OCNG_RA[Note4]				
OCNG_RB[Note4]				
N_{oc}[Note5]	dBm/15kHz	1,2,3,4,5,6,7,8	-98	
$\hat{E}_s/N_{oc}$	dB	1,2,3,4,5,6,7,8	-Infinity	4
$\hat{E}_s/I_{ot}$[Note6]	dB	1,2,3,4,5,6,7,8	-Infinity	4
RSRP[Note6]	dBm/15kHz	1,2,3,4,5,6,7,8	-Infinity	-94
SCH_RP[Note6]	dBm/15kHz	1,2,3,4,5,6,7,8	-Infinity	-94
Io[Note6]	dBm/9MHz	1,2,3,4,5,6,7,8	-70.22	-64.76
Propagation Condition		1,2,3,4,5,6,7,8	AWGN	

Note 1: Special subframe and uplink-downlink configurations are specified in table 4.2-1 in TS 36.211 [24].
Note 2: PRACH configurations are specified in table 5.7.1-2 and table 5.7.1-3 in TS 36.211 [24].
Note 3: DL RMCs and OCNG patterns are specified in clauses A 3.1 and A 3.2 of TS 36.133 [23] respectively.
Note 4: OCNG shall be used such that all cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.
Note 5: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for N_{oc} to be fulfilled.
Note 6: $\hat{E}_s/I_{ot}$, RSRP, SCH_RP and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.
Note 7: Propagation condition and correlation matrix are defined in clause B.2 in TS 36.101 [27].

16.4 Timing for RedCap

16.4.1 UE transmit timing for RedCap

16.4.1.0 Minimum conformance requirements

16.4.1.0.1 Minimum conformance requirements for UE transmit timing accuracy

The UE initial transmission timing error shall be less than or equal to $\pm T_e$ where the timing error limit value T_e is specified in Table 16.4.1.0.1-1. This requirement applies:

- when it is the first transmission in a DRX cycle for PUCCH, PUSCH and SRS, or it is the PRACH transmission, or it is the msgA transmission.

The UE shall meet the T_e requirement for an initial transmission provided that at least one SSB (CD-SSB or NCD-SSB) is available at the UE during the last 160 ms on the condition that:

the SSB is within the UE's active BWP, or

the SSB is not within the UE's active BWP, and the measurement gap is configured

The reference point for the UE initial transmit timing control requirement shall be the downlink timing of the reference cell minus $(N_{\mathrm{TA}} + N_{\mathrm{TA\ offset}}) \times T_{\mathrm{c}}$. The downlink timing is defined as the time when the first ~~detected~~ path (in time) of the corresponding downlink frame used by the UE to determine downlink timing is received from the reference cell at UE antenna. N_{TA} for PRACH is defined as 0.

$(N_{\mathrm{TA}} + N_{\mathrm{TA\ offset}}) \times T_{\mathrm{c}}$ (in T_c units) for other channels is the difference between UE transmission timing and the downlink timing immediately after when the last timing advance in 38.133 [6] clause 7.3A was applied. N_{TA} for other channels is not changed until next timing advance is received. The value of $N_{\mathrm{TA\ offset}}$ depends on the duplex mode of the cell in which the uplink transmission takes place and the frequency range (FR). $N_{\mathrm{TA\ offset}}$ is defined in Table 16.4.1.0.1-2.

Table 16.4.1.0.1-1: T_e Timing Error Limit

Frequency Range	SCS of SSB signals (kHz)	SCS of uplink signals (kHz)	T_e
1	15	15	12*64*T_c
		30	10*64*T_c
		60	10*64*T_c
	30	15	8*64*T_c
		30	8*64*T_c
		60	7*64*T_c
Note 1: T_c is the basic timing unit defined in TS 38.211 [6]			

Table 16.4.1.0.1-2: The Value of $N_{\mathrm{TA\ offset}}$

Frequency range and band of cell used for uplink transmission	$N_{\mathrm{TA\ offset}}$ (Unit: T_C)
FR1 FDD or TDD band with neither E-UTRA–NR nor NB-IoT–NR coexistence case	25600 (Note 1)
FR1 FDD band with E-UTRA–NR and/or NB-IoT–NR coexistence case	0 (Note 1)
FR1 TDD band with E-UTRA–NR and/or NB-IoT–NR coexistence case	39936 (Note 1)
FR2	13792

Note 1:	The UE identifies $N_{\text{TA offset}}$ based on the information n-TimingAdvanceOffset as specified in TS 38.331 [2]. If UE is not provided with the information n-TimingAdvanceOffset, the default value of $N_{\text{TA offset}}$ is set as 25600 for FR1 band.
Note 2:	Void

When it is not the first transmission in a DRX cycle or there is no DRX cycle, and when it is the transmission for PUCCH, PUSCH and SRS transmission, the UE shall be capable of changing the transmission timing according to the received downlink frame of the reference cell except when the timing advance in 38.133 [6] clause 7.3A is applied.

When the transmission timing error between the UE and the reference timing exceeds $\pm T_e$ then the UE is required to adjust its timing to within $\pm T_e$. The reference timing shall be $(N_{\text{TA}} + N_{\text{TA offset}}) \times T_c$ before the downlink timing of the reference cell. All adjustments made to the UE uplink timing shall follow these rules:

1) The maximum amount of the magnitude of the timing change in one adjustment shall be T_q.

2) The minimum aggregate adjustment rate shall be T_p per second.

3) The maximum aggregate adjustment rate shall be T_q per 200 ms.

   where the maximum autonomous time adjustment step T_q and the aggregate adjustment rate T_p are specified in Table 16.4.1.0.1-3.

Table 16.4.1.0.1-3: T_q Maximum Autonomous Time Adjustment Step and T_p Minimum Aggregate Adjustment rate

Frequency Range	SCS of uplink signals (kHz)	T_q	T_p
1	15	$5.5*64*T_c$	$5.5*64*T_c$
	30	$5.5*64*T_c$	$5.5*64*T_c$
	60	$5.5*64*T_c$	$5.5*64*T_c$
NOTE: T_c is the basic timing unit defined in TS 38.211 [6]			

The normative reference for this requirement is TS.38.133 [6] clause 7.1A.

16.4.1.1 NR SA FR1 NR UE Transmit Timing Test for FR1 for 1Rx RedCap UE

16.4.1.1.1 Test purpose

The purpose of this test is to verify that the UE can follow frame timing change of the connected gNodeb and that the UE initial transmit timing accuracy, maximum amount of timing change in one adjustment, minimum and maximum adjustment rate are within the specified limits. This test will verify the requirements in 38.133 [6] clause 7.1A.2.

16.4.1.1.2 Test applicability

This test applies to all types of NR RedCap UE with 1Rx from Release 17 onwards.

16.4.1.1.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 16.4.1.0.1.

The normative reference for this requirement is TS.38.133 [6] clause A.16.4.1.1

16.4.1.1.4 Test Description

16.4.1.1.4.1 Initial Conditions

Same as the initial conditions given in clause 6.4.1.1.4.1 with following exceptions:

- Table 6.4.1.1.4.1-1 is replaced by Table 16.4.1.1.4.1-1.

- Table 6.4.1.1.4.1-2 is replaced by Table 16.4.1.1.4.1-2

Table 16.4.1.1.4.1-1: Supported test configurations for FR1 PCell

Configuration	Description
16.4.1.1-1	NR FDD, SSB SCS 15 kHz, data SCS 15 kHz, BW 10 MHz
16.4.1.1-2	NR TDD, SSB SCS 15 kHz, data SCS 15 kHz, BW 10 MHz
16.4.1.1-3	NR TDD, SSB SCS 30 kHz, data SCS 30 kHz, BW 20 MHz
16.4.1.1-4	NR HD-FDD, SSB SCS 15 kHz, data SCS 15 kHz, BW 10 MHz
Note: The UE is only required to be tested in one of the supported test configurations	

Table 16.4.1.1.4.1-2: Initial conditions for NR SA FR1 transmit timing accuracy

Parameter	Value		Comment
Test environment	NC		As specified in TS 38.508-1 [14] clause 4.1.
Test frequencies	As specified in Annex E, Table E.4-1 and TS 38.508-1 [14] clause 4.3.1.		
Channel bandwidth	As specified by the test configuration selected from Table 16.3.2.3.1.4.1-1.		
Propagation conditions	AWGN		As specified in Annex C.2.2.
Connection Diagram	TE Part	A.3.1.8.1	As specified in TS 38.508-1 [14] Annex A.
	DUT Part	A.3.2.2.1	
Exceptions to connection diagram			

16.4.1.1.4.2 Test procedure

Same as the test procedure given in clause 6.4.1.1.4.2.

16.4.1.1.4.3 Message contents

Same as the message contents given in clause 6.4.1.1.4.3.

16.4.1.1.5 Test Requirements

Same as the test Requirements given in clause 6.4.1.1.5 with following exceptions:

- Table 6.4.1.1.5-1 is replaced by Table 16.4.1.1.5-1.

Table 16.4.1.1.5-1: Cell Specific Test Parameters for UL Transmit Timing test

Parameter	Unit	Config	Test1	Test2
SSB ARFCN		1,2,3	Freq1	Freq1
TDD configuration		1,4	Not Applicable	
		2	TDDConf.1.1	
		3	TDDConf.2.1	
$BW_{channel}$	MHz	1,2,4	10: $N_{RB,c}$ = 52	
		3	20: $N_{RB,c}$ = 51	
Initial BWP Configuration		1,2,3,4	DLBWP.0.1 ULBWP.0.1	
Dedicated BWP Configuration		1,2,3,4	DLBWP.1.1 ULBWP.1.1	
DRX Cycle	ms	1,2,3,4	N/A	DRX.8[Note5]
PDSCH Reference measurement channel		1,4	SR.1.1 FDD	
		2	SR.1.1 TDD	
		3	SR.2.1 TDD	
RMSI CORESET Reference Channel		1,4	CR.1.1 FDD	
		2	CR.1.1 TDD	
		3	CR.2.1 TDD	
Dedicated CORESET Reference Channel		1,4	CCR.1.1 FDD	
		2	CCR.1.1 TDD	

		3	CCR.2.1 TDD	
OCNG Patterns		1,2,3,4	OP.1	
SSB configuration		1,2,4	SSB.1 FR1	
		3	SSB.1 RedCap FR1	
SMTC Configuration		1,2,4	SMTC.1	
		3	SMTC.2	
TRS configuration		1,4	TRS.1.1 FDD	
		2	TRS.1.1 TDD	
		3	TRS.1.2 TDD	
EPRE ratio of PSS to SSS	dB	1,2,3,4	0	0
EPRE ratio of PBCH DMRS to SSS				
EPRE ratio of PBCH to PBCH DMRS				
EPRE ratio of PDCCH DMRS to SSS				
EPRE ratio of PDCCH to PDCCH DMRS				
EPRE ratio of PDSCH DMRS to SSS				
EPRE ratio of PDSCH to PDSCH				
EPRE ratio of OCNG DMRS to SSS Note 1				
EPRE ratio of OCNG to OCNG DMRS Note 1				
N_{oc} Note2	dBm/15 kHz	1,2,3,4	-98	-98
N_{oc} Note2	dBm/SCS	1,2,4	-98	-98
		3	-95	-95
$\hat{E}_s / I_{ot}$		1,2,3,4	3.3	3.3
$\hat{E}_s / N_{oc}$		1,2,3,4	3.3 Note 7	3.3 Note 7
SS-RSRP Note3	dBm/SCS	1,2,4	-94.7	-94.7
		3	-91.7	-91.7
Io Note3	dBm/9.36MHz	1,2,4	-65.08	-65.08
	dBm/18.36MHz	3	-62.16	-62.16
Propagation condition		1,2,3,4	AWGN	
SRS Config		1,2,4	SRSConf.1 Note6	SRSConf.3 Note6
		3	SRSConf.1 Note6	SRSConf.2 Note6

Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.
Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for N_{oc} to be fulfilled.
Note 3: SS-RSRP and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.
Note 4: SS-RSRP minimum requirements are specified assuming independent interference and noise at each receiver antenna port.
Note 5: DRX related parameters are given in Table A.5-1
Note 6: SRS configs are given in Table 6.4.1.1.5-2
Note 7: With the test tolerance given in Annex F.

16.4.1.2 NR SA FR1 NR UE Transmit Timing Test for FR1 for 2Rx RedCap UE

16.4.1.2.1 Test purpose

The purpose of this test is to verify that the UE can follow frame timing change of the connected gNodeb and that the UE initial transmit timing accuracy, maximum amount of timing change in one adjustment, minimum and maximum adjustment rate are within the specified limits. This test will verify the requirements in 38.133 [6] clause 7.1A.2.

16.4.1.2.2 Test applicability

This test applies to all types of NR RedCap UE with 2Rx from Release 17 onwards.

16.4.1.2.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 16.4.1.0.1.

The normative reference for this requirement is TS.38.133 [6] clause A.16.4.1.2

16.4.1.2.4 Test Description

16.4.1.2.4.1 Initial Conditions

Same as the initial conditions given in clause 6.4.1.1.4.1 with following exceptions:

- Table 6.4.1.1.4.1-1 is replaced by Table 16.4.1.2.4.1-1.
- Table 6.4.1.1.4.1-2 is replaced by Table 16.4.1.2.4.1-2

Table 16.4.1.2.4.1-1: Supported test configurations for FR1 PCell

Configuration	Description
16.4.1.2-1	NR FDD, SSB SCS 15 kHz, data SCS 15 kHz, BW 10 MHz
16.4.1.2-2	NR TDD, SSB SCS 15 kHz, data SCS 15 kHz, BW 10 MHz
16.4.1.2-3	NR TDD, SSB SCS 30 kHz, data SCS 30 kHz, BW 20 MHz
16.4.1.2-4	NR HD-FDD, SSB SCS 15 kHz, data SCS 15 kHz, BW 10 MHz
Note: The UE is only required to be tested in one of the supported test configurations	

Table 16.4.1.2.4.1-2: Initial conditions for NR SA FR1 transmit timing accuracy

Parameter	Value		Comment
Test environment	NC		As specified in TS 38.508-1 [14] clause 4.1.
Test frequencies	As specified in Annex E, Table E.4-1 and TS 38.508-1 [14] clause 4.3.1.		
Channel bandwidth	As specified by the test configuration selected from Table 16.3.2.3.1.4.1-1.		
Propagation conditions	AWGN		As specified in Annex C.2.2.
Connection Diagram	TE Part	A.3.1.7.1	As specified in TS 38.508-1 [14] Annex A.
	DUT Part	A.3.2.3.4	
Exceptions to connection diagram	Without LTE link		

16.4.1.2.4.2 Test procedure

Same as the test procedure given in clause 6.4.1.1.4.2.

16.4.1.2.4.3 Message contents

Same as the message contents given in clause 6.4.1.1.4.3.

16.4.1.2.5 Test Requirements

Same as the test Requirements given in clause 6.4.1.1.5 with following exceptions:

- Table 6.4.1.1.5-1 is replaced by Table 16.4.1.2.5-1.

Table 16.4.1.2.5-1: Cell Specific Test Parameters for UL Transmit Timing test

Parameter	Unit	Config	Test1	Test2
SSB ARFCN		1,2,3	Freq1	Freq1
TDD configuration		1,4	Not Applicable	
		2	TDDConf.1.1	
		3	TDDConf.2.1	
$BW_{channel}$	MHz	1,2,4	10: $N_{RB,c}$ = 52	

		3	20: $N_{RB,c}$ = 51	
Initial BWP Configuration		1,2,3,4	DLBWP.0.1 ULBWP.0.1	
Dedicated BWP Configuration		1,2,3,4	DLBWP.1.1 ULBWP.1.1	
DRX Cycle	ms	1,2,3,4	N/A	DRX.8 Note5
PDSCH Reference measurement channel		1,4	SR.1.1 FDD	
		2	SR.1.1 TDD	
		3	SR.2.1 TDD	
RMSI CORESET Reference Channel		1,4	CR.1.1 FDD	
		2	CR.1.1 TDD	
		3	CR.2.1 TDD	
Dedicated CORESET Reference Channel		1,4	CCR.1.1 FDD	
		2	CCR.1.1 TDD	
		3	CCR.2.1 TDD	
OCNG Patterns		1,2,3,4	OP.1	
SSB configuration		1,2,4	SSB.1 FR1	
		3	SSB.1 RedCap FR1	
SMTC Configuration		1,2,4	SMTC.1	
		3	SMTC.2	
TRS configuration		1,4	TRS.1.1 FDD	
		2	TRS.1.1 TDD	
		3	TRS.1.2 TDD	
EPRE ratio of PSS to SSS	dB	1,2,3,4	0	0
EPRE ratio of PBCH DMRS to SSS				
EPRE ratio of PBCH to PBCH DMRS				
EPRE ratio of PDCCH DMRS to SSS				
EPRE ratio of PDCCH to PDCCH DMRS				
EPRE ratio of PDSCH DMRS to SSS				
EPRE ratio of PDSCH to PDSCH				
EPRE ratio of OCNG DMRS to SSS Note 1				
EPRE ratio of OCNG to OCNG DMRS Note 1				
N_{oc} Note2	dBm/15 kHz	1,2,3,4	-98	-98
N_{oc} Note2	dBm/SCS	1,2,4	-98	-98
		3	-95	-95
$\hat{E}_s / I_{ot}$		1,2,3,4	3.3	3.3
$\hat{E}_s / N_{oc}$		1,2,3,4	3.3 Note 7	3.3 Note 7
SS-RSRP Note3	dBm/SCS	1,2,4	-94.7	-94.7
		3	-91.7	-91.7
Io Note3	dBm/9.36MHz	1,2,4	-65.08	-65.08
	dBm/18.36MHz	3	-62.16	-62.16
Propagation condition		1,2,3,4	AWGN	
SRS Config		1,2,4	SRSConf.1 Note6	SRSConf.3 Note6
		3	SRSConf.1 Note6	SRSConf.2 Note6

Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.

Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for N_{oc} to be fulfilled.

Note 3: SS-RSRP and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.

Note 4: SS-RSRP minimum requirements are specified assuming independent interference and noise at each receiver antenna port.

Note 5: DRX related parameters are given in Table A.5-1

Note 6: SRS configs are given in Table 6.4.1.1.5-2

Note 7: With the test tolerance given in Annex F.

16.4.2

16.4.3 Timing advance for RedCap

16.4.3.0 Minimum conformance requirement

The timing advance is initiated from gNB to UE configured with only PCell, with MAC message that implies the adjustment of the timing advance, as defined in TS 38.321 [12] clause 5.2.

UE shall adjust the timing of its uplink transmission at time slot n+k+1 for a timing advance command received in time slot n, and the value of k is defined in TS 38.213 [8] clause 4.2. The same requirement applies also when the UE is not able to transmit a configured uplink transmission due to the channel assessment procedure.

The UE shall adjust the timing of its transmissions with a relative accuracy better than or equal to the UE Timing Advance adjustment accuracy requirement in Table 16.4.3.0-1, to the signalled timing advance value compared to the timing of preceding uplink transmission. The timing advance command step is defined in TS 38.213 [8].

Table 16.4.3.0-1: UE Timing Advance adjustment accuracy

UL Sub Carrier Spacing(kHz)	15	30
UE Timing Advance adjustment accuracy	±256 T_c	±256 T_c

16.4.3.1 NR SA FR1 SA FR1 timing advance adjustment accuracy for 1 Rx UE

16.4.3.1.1 Test purpose

To verify UE timing advance adjustment delay and accuracy requirement defined in TS 38.133 [6] clause 7.3A.

16.4.3.1.2 Test applicability

This test applies to all types of NR RedCap UE with 1 Rx from Release 17 onwards.

16.4.3.1.3 Minimum conformance requirement

The minimum conformance requirements are specified in clause 16.4.3.0.

The normative reference for this requirement is TS 38.133 [6] clause A.16.4.3.1.

16.4.3.1.4 Test description

16.4.3.1.4.1 Initial conditions

Same as the initial conditions given in sub-clause 6.4.3.1.4.1 with following exceptions:

- Table 6.4.3.1.4.1-1 is replaced by Table 16.4.3.1.4.1-1.
- Table 6.4.3.1.4.1-2 is replaced by Table 16.4.3.1.4.1-2.
- Table 6.4.3.1.4.1-3 is replaced by Table 16.4.3.1.4.1-3.

Table 16.4.3.1.4.1-1: Supported test configurations

Config	Description
16.4.3.1-1	NR 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode
16.4.3.1-2	NR 15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode
16.4.3.1-3	NR 30 kHz SSB SCS, 20 MHz bandwidth, TDD duplex mode
16.4.3.1-4	NR 15 kHz SSB SCS, 10 MHz bandwidth, HD-FDD duplex mode
Note: The UE is only required to be tested in one of the supported test configurations	

Table 16.4.3.1.4.1-2: Initial conditions

Parameter	Value		Comment
Test environment	NC		As specified in TS 38.508-1 [14] clause 4.1.
Test frequencies	As specified in Annex E, Table E.14-1 and TS 38.508-1 [14] clause 4.3.1.		
Channel bandwidth	As specified by the test configuration selected from Table 16.4.3.1.4.1-1.		
Propagation conditions	AWGN		As specified in Annex C.2.2.
Connection Diagram	TE Part	A.3.1.8.1	As specified in TS 38.508-1 [14] Annex A.
	DUT Part	A.3.2.2.1	
Exceptions to connection diagram	Without LTE link		

Table 16.4.3.1.4.1-3: General test parameters

Parameter	Unit	Value	Comment
RF channel number		1	
Initial DL BWP		DLBWP.0.1	As specified in Table A.8.1-1
Dedicated DL BWP		DLBWP.1.1	As specified in Table A.8.1-2
Initial UL BWP		ULBWP.0.1	As specified in Table A.8.2-1
Dedicated UL BWP		ULBWP.1.1	As specified in Table A.8.2-2
Timing Advance Command (T_A) value during T1		31	$N_{TA_new} = N_{TA_old}$ for the purpose of establishing a reference value from which the timing advance adjustment accuracy can be measured during T2
Timing Advance Command (T_A) value during T2		39	For SCS = 15kHz : $N_{TA_new} = N_{TA_old} + 8192*T_c$ For SCS = 30kHz : $N_{TA_new} = N_{TA_old} + 4096*T_c$ (based on equation in TS 38.213 [8] clause 4.2)
T1	s	5	
T2	s	5	

16.4.3.1.4.2 Test Procedure

Same as the test procedure given in sub-clause 6.4.3.1.4.2.

16.4.3.1.4.3 Message Contents

Same as the message contents specified in sub-clause 6.4.3.1.4.3.

16.4.3.1.5 Test Requirement

Same as the test requirements given in sub-clause 6.4.3.1.5 with following exceptions:

- Table 6.4.3.1.5-1 is replaced by Table 16.4.3.1.5-1.
- Table 6.4.3.1.5-2 is replaced by Table 16.4.3.1.5-2.
- Table 6.4.3.1.5-3 is replaced by Table 16.4.3.1.5-3.

Table 16.4.3.1.5-1: Cell specific test parameters

Parameter		Unit	Test1	
			T1	T2
Duplex mode	Config 1		FDD	
	Config 2,3		TDD	
	Config 4		HD-FDD	
TDD configuration	Config 1,4		Not Applicable	
	Config 2		TDDConf.1.1	

	Config 3		TDDConf.2.1
$BW_{channel}$	Config 1,4	MHz	10: $N_{RB,c}$ = 52
	Config 2		10: $N_{RB,c}$ = 52
	Config 3		20: $N_{RB,c}$ = 51
BWP BW	Config 1,4	MHz	10: $N_{RB,c}$ = 52
	Config 2		10: $N_{RB,c}$ = 52
	Config 3		20: $N_{RB,c}$ = 51
DRX Cycle		ms	Not Applicable
PDSCH Reference measurement channel	Config 1,4		SR.1.1 FDD
	Config 2		SR.1.1 TDD
	Config 3		SR.2.1 TDD
RMSI CORESET Reference Channel	Config 1,4		CR.1.1 FDD
	Config 2		CR.1.1 TDD
	Config 3		CR.2.1 TDD
Dedicated CORESET Reference Channel	Config 1,4		CCR.1.1 FDD
	Config 2		CCR.1.1 TDD
	Config 3		CCR.2.1 TDD
TRS Configuration	Config 1,4		TRS.1.1 FDD
	Config 2		TRS.1.1 TDD
	Config 3		TRS.1.2 TDD
OCNG Patterns			OP.1
SMTC configuration	Config 1,2,4		SMTC.1 FR1
	Config 3		SMTC.2 FR1
SSB configuration	Config 1,2,4		SSB.1 FR1
	Config 3		SSB.1 RedCap FR1
PDSCH/PDCCH subcarrier spacing	Config 1,2,4	kHz	15 kHz
	Config 3		30 kHz
PUCCH/PUSCH subcarrier spacing	Config 1,2,4	kHz	15 kHz
	Config 3		30 kHz
EPRE ratio of PSS to SSS		dB	0
EPRE ratio of PBCH DMRS to SSS			
EPRE ratio of PBCH to PBCH DMRS			
EPRE ratio of PDCCH DMRS to SSS			
EPRE ratio of PDCCH to PDCCH DMRS			
EPRE ratio of PDSCH DMRS to SSS			
EPRE ratio of PDSCH to PDSCH			
EPRE ratio of OCNG DMRS to SSS Note 1			
EPRE ratio of OCNG to OCNG DMRS Note 1			
N_{oc} Note2		dBm/15kHz	-98
N_{oc} Note2	Config 1,2,4	dBm/SCS	-98
	Config 3		-95
$\hat{E}_s / I_{ot}$		dB	3
$\hat{E}_s / N_{oc}$		dB	3
Io Note3	Config 1,2,4	dBm/9.36MHz	-67.57
	Config 3	dBm/18.36MHz	-65.76
Propagation condition			AWGN

Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.

Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for N_{oc} to be fulfilled.

Note 3: Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.

Table 16.4.3.1.5-2: Sounding Reference Symbol Configuration

Field		Value	Comment
c-SRS	Config 1,2,4	12	Frequency hopping is disabled
	Config 3	24	
b-SRS		0	

b-hop		0	
freqDomainPosition		0	Frequency domain position of SRS
freqDomainShift		0	
groupOrSequenceHopping		neither	No group or sequence hopping
SRS-PeriodicityAndOffset	Config 1,2,4	sl5=2	Once every 5 slots
	Config 3	sl5=4	
pathlossReferenceRS		ssb-Index=0	SSB #0 is used for SRS path loss estimation
usage		Codebook	Codebook based UL transmission
startPosition		0	resourceMapping setting. SRS on last symbol of slot, and 1symbols for SRS without repetition.
nrofSymbols		n1	
repetitionFactor		n1	
combOffset-n2		0	transmissionComb setting
cyclicShift-n2		0	
nrofSRS-Ports		port1	Number of antenna ports used for SRS transmission
Note: For further information see clause 6.3.2 in TS 38.331.			

Table 16.4.3.1.5-3: UE Timing Advance adjustment accuracy

Sub Carrier Spacing, SCS kHz	15	30
UE Timing Advance adjustment accuracy	±344 T_c	±344 T_c

16.4.3.2 NR SA FR1 SA FR1 timing advance adjustment accuracy for 2 Rx UE

16.4.3.2.1 Test purpose

To verify UE timing advance adjustment delay and accuracy requirement defined in TS 38.133 [6] clause 7.3A.

16.4.3.2.2 Test applicability

This test applies to all types of NR RedCap UE with 2 Rx from Release 17 onwards.

16.4.3.2.3 Minimum conformance requirement

The minimum conformance requirements are specified in clause 16.4.3.0.

The normative reference for this requirement is TS 38.133 [6] clause A.16.4.3.2.

16.4.3.2.4 Test description

16.4.3.2.4.1 Initial conditions

Same as the initial conditions given in sub-clause 6.4.3.1.4.1 with following exceptions:

- Table 6.4.3.1.4.1-1 is replaced by Table 16.4.3.2.4.1-1.
- Table 6.4.3.1.4.1-2 is replaced by Table 16.4.3.2.4.1-2.
- Table 6.4.3.1.4.1-3 is replaced by Table 16.4.3.2.4.1-3.

Table 16.4.3.2.4.1-1: Supported test configurations

Config	Description
16.4.3.2-1	NR 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode
16.4.3.2-2	NR 15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode
16.4.3.2-3	NR 30 kHz SSB SCS, 20 MHz bandwidth, TDD duplex mode
16.4.3.2-4	NR 15 kHz SSB SCS, 10 MHz bandwidth, HD-FDD duplex mode
Note: The UE is only required to be tested in one of the supported test configurations	

Table 16.4.3.2.4.1-2: Initial conditions

Parameter	Value		Comment
Test environment	NC		As specified in TS 38.508-1 [14] clause 4.1.
Test frequencies	As specified in Annex E, Table E.14-1 and TS 38.508-1 [14] clause 4.3.1.		
Channel bandwidth	As specified by the test configuration selected from Table 16.4.3.2.4.1-1.		
Propagation conditions	AWGN		As specified in Annex C.2.2.
Connection Diagram	TE Part	A.3.1.8.2	As specified in TS 38.508-1 [14] Annex A.
	DUT Part	A.3.2.3.1	
Exceptions to connection diagram	Without LTE link		

Table 16.4.3.2.4.1-3: General test parameters

Parameter	Unit	Value	Comment
RF channel number		1	
Initial DL BWP		DLBWP.0.1	As specified in Table A.8.1-1
Dedicated DL BWP		DLBWP.1.1	As specified in Table A.8.1-2
Initial UL BWP		ULBWP.0.1	As specified in Table A.8.2-1
Dedicated UL BWP		ULBWP.1.1	As specified in Table A.8.2-2
Timing Advance Command (T_A) value during T1		31	$N_{TA_new} = N_{TA_old}$ for the purpose of establishing a reference value from which the timing advance adjustment accuracy can be measured during T2
Timing Advance Command (T_A) value during T2		39	For SCS = 15kHz : $N_{TA_new} = N_{TA_old}$ + $8192*T_c$ For SCS = 30kHz : $N_{TA_new} = N_{TA_old}$ + $4096*T_c$ (based on equation in TS38.213 section 4.2)
T1	s	5	
T2	s	5	

16.4.3.2.4.2 Test Procedure

Same as the test procedure given in sub-clause 6.4.3.1.4.2.

16.4.3.2.4.3 Message Contents

Same as the message contents specified in sub-clause 6.4.3.1.4.3.

16.4.3.2.5 Test Requirement

Same as the test requirements given in sub-clause 6.4.3.1.5 with following exceptions:

- Table 6.4.3.1.5-1 is replaced by Table 16.4.3.2.5-1.
- Table 6.4.3.1.5-2 is replaced by Table 16.4.3.2.5-2.
- Table 6.4.3.1.5-3 is replaced by Table 16.4.3.2.5-3.

Table 16.4.3.2.5-1: Cell specific test parameters

Parameter		Unit	Test1	
			T1	T2
Duplex mode	Config 1		FDD	
	Config 2,3		TDD	
	Config 4		HD-FDD	
TDD configuration	Config 1,4		Not Applicable	
	Config 2		TDDConf.1.1	
	Config 3		TDDConf.2.1	
$BW_{channel}$	Config 1,4	MHz	10: $N_{RB,c}$ = 52	

	Config 2		10: $N_{RB,c}$ = 52
	Config 3		20: $N_{RB,c}$ = 51
BWP BW	Config 1,4	MHz	10: $N_{RB,c}$ = 52
	Config 2		10: $N_{RB,c}$ = 52
	Config 3		20: $N_{RB,c}$ = 51
DRX Cycle		ms	Not Applicable
PDSCH Reference measurement channel	Config 1,4		SR.1.1 FDD
	Config 2		SR.1.1 TDD
	Config 3		SR.2.1 TDD
RMSI CORESET Reference Channel	Config 1,4		CR.1.1 FDD
	Config 2		CR.1.1 TDD
	Config 3		CR.2.1 TDD
Dedicated CORESET Reference Channel	Config 1,4		CCR.1.1 FDD
	Config 2		CCR.1.1 TDD
	Config 3		CCR.2.1 TDD
TRS Configuration	Config 1,4		TRS.1.1 FDD
	Config 2		TRS.1.1 TDD
	Config 3		TRS.1.2 TDD
OCNG Patterns			OP.1
SMTC configuration	Config 1,2,4		SMTC.1 FR1
	Config 3		SMTC.2 FR1
SSB configuration	Config 1,2,4		SSB.1 FR1
	Config 3		SSB.1 RedCap FR1
PDSCH/PDCCH subcarrier spacing	Config 1,2,4	kHz	15 kHz
	Config 3		30 kHz
PUCCH/PUSCH subcarrier spacing	Config 1,2,4	kHz	15 kHz
	Config 3		30 kHz
EPRE ratio of PSS to SSS		dB	0
EPRE ratio of PBCH DMRS to SSS			
EPRE ratio of PBCH to PBCH DMRS			
EPRE ratio of PDCCH DMRS to SSS			
EPRE ratio of PDCCH to PDCCH DMRS			
EPRE ratio of PDSCH DMRS to SSS			
EPRE ratio of PDSCH to PDSCH			
EPRE ratio of OCNG DMRS to SSS Note 1			
EPRE ratio of OCNG to OCNG DMRS Note 1			
N_{oc} Note2		dBm/15kHz	-98
N_{oc} Note2	Config 1,2,4	dBm/SCS	-98
	Config 3		-95
$\hat{E}_s / I_{ot}$		dB	3
$\hat{E}_s / N_{oc}$		dB	3
Io Note3	Config 1,2,4	dBm/9.36MHz	-67.57
	Config 3	dBm/18.36MHz	-65.76
Propagation condition			AWGN

Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.

Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for N_{oc} to be fulfilled.

Note 3: Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.

Table 16.4.3.2.5-2: Sounding Reference Symbol Configuration

Field		Value	Comment
c-SRS	Config 1,2,4	12	Frequency hopping is disabled
	Config 3	24	
b-SRS		0	
b-hop		0	
freqDomainPosition		0	Frequency domain position of SRS
freqDomainShift		0	

groupOrSequenceHopping		neither	No group or sequence hopping
SRS-PeriodicityAndOffset	Config 1,2,4	sl5=2	Once every 5 slots
	Config 3	sl5=4	
pathlossReferenceRS		ssb-Index=0	SSB #0 is used for SRS path loss estimation
usage		Codebook	Codebook based UL transmission
startPosition		0	resourceMapping setting. SRS on last symbol of slot, and 1symbols for SRS without repetition.
nrofSymbols		n1	
repetitionFactor		n1	
combOffset-n2		0	transmissionComb setting
cyclicShift-n2		0	
nrofSRS-Ports		port1	Number of antenna ports used for SRS transmission
Note: For further information see clause 6.3.2 in TS 38.331.			

Table 16.4.3.2.5-3: UE Timing Advance adjustment accuracy

Sub Carrier Spacing, SCS kHz	15	30
UE Timing Advance adjustment accuracy	±344 T_c	±344 T_c

16.5 Signalling characteristics for RedCap

16.5.1 Radio link monitoring for RedCap

16.5.1.0 Minimum requirements

16.5.1.0.1 General

The UE shall monitor the downlink radio link quality based on the reference signal configured as RLM-RS resource(s) in order to detect the downlink radio link quality of the PCell as specified in TS 38.213 [3]. The configured RLM-RS resources can be all SSBs, or all CSI-RSs, or a mix of SSBs and CSI-RSs. UE is not required to perform RLM outside the active DL BWP. The SSB and SMTC in this section applies for both CD-SSB and NCD-SSB if it is not additional specified.

On each RLM-RS resource, the UE shall estimate the downlink radio link quality and compare it to the thresholds Q_{out} and Q_{in} for the purpose of monitoring downlink radio link quality of the cell.

The threshold Q_{out} is defined as the level at which the downlink radio link cannot be reliably received and shall correspond to the out-of-sync block error rate ($BLER_{out}$) as defined in Table 16.5.1.0.1-1. For SSB based radio link monitoring, $Q_{out_SSB,RedCap}$ is derived based on the hypothetical PDCCH transmission parameters listed in Table 16.5.1.0.1-2. For CSI-RS based radio link monitoring, $Q_{out_CSI\text{-}RS,RedCap}$ is derived based on the hypothetical PDCCH transmission parameters listed in Table 16.5.1.0.1-4.

The threshold Q_{in} is defined as the level at which the downlink radio link quality can be significantly more reliably received than at Q_{out} and shall correspond to the in-sync block error rate ($BLER_{in}$) as defined in Table 16.5.1.0.1-1. For SSB based radio link monitoring, $Q_{in_SSB,RedCap}$ is derived based on the hypothetical PDCCH transmission parameters listed in Table 16.5.1.0.1-3. For CSI-RS based radio link monitoring, $Q_{in_CSI\text{-}RS,RedCap}$ is derived based on the hypothetical PDCCH transmission parameters listed in Table 16.5.1.0.1-5.

The out-of-sync block error rate ($BLER_{out}$) and in-sync block error rate ($BLER_{in}$) are determined from the network configuration via parameter *rlmInSyncOutOfSyncThreshold* signalled by higher layers. When UE is not configured with *RLM-IS-OOS-thresholdConfig* from the network, UE determines out-of-sync and in-sync block error rates from Configuration #0 in Table 16.5.1.0.1-1 as default. All requirements here are applicable for BLER Configuration #0 in Table 16.5.1.0.1-1.

Table 16.5.1.0.1-1: Out-of-sync and in-sync block error rates

Configuration	$BLER_{out}$	$BLER_{in}$

0	10%	2%

UE shall be able to monitor up to N_{RLM} RLM-RS resources of the same or different types in each corresponding carrier frequency range, depending on a maximum number L_{max} of SSBs per half frame according to TS 38.213 [3], where N_{RLM} is specified in Table 16.5.1.0.1-6 according TS 38.213 [3], and meet the requirements as specified in 38.133 [6] clause 8.1B. UE is not required to meet the requirements in 38.133 [6] clause 8.1B if RLM-RS is not configured and no TCI state for PDCCH is activated.

Table 16.5.1.0.1-2: PDCCH transmission parameters for out-of-sync evaluation for RedCap UE

Attribute	Value for BLER Configuration #0
DCI format	1-0
Number of control OFDM symbols	2
Aggregation level (CCE)	16; for RedCap UE with 1Rx branch. 8; for RedCap UE with 2Rx branches.
Ratio of hypothetical PDCCH RE energy to average SSS RE energy	4dB
Ratio of hypothetical PDCCH DMRS energy to average SSS RE energy	4dB
Bandwidth (PRBs)	48; for RedCap UE with 1Rx branch. 24; for RedCap UE with 2Rx branches.
Sub-carrier spacing (kHz)	SCS of the active DL BWP
DMRS precoder granularity	REG bundle size
REG bundle size	6
CP length	Normal
Mapping from REG to CCE	Distributed
Note: SCS = 60KHz is not applicable for FR1.	

Table 16.5.1.0.1-3: PDCCH transmission parameters for in-sync evaluation for RedCap UE

Attribute	Value for BLER Configuration #0
DCI payload size	1-0
Number of control OFDM symbols	2
Aggregation level (CCE)	8; for RedCap UE with 1Rx branch. 4; for RedCap UE with 2Rx branches.
Ratio of hypothetical PDCCH RE energy to average SSS RE energy	0dB
Ratio of hypothetical PDCCH DMRS energy to average SSS RE energy	0dB
Bandwidth (PRBs)	48; for RedCap UE with 1Rx branch. 24; for RedCap UE with 2Rx branches.
Sub-carrier spacing (kHz)	SCS of the active DL BWP
DMRS precoder granularity	REG bundle size
REG bundle size	6
CP length	Normal
Mapping from REG to CCE	Distributed
Note: SCS = 60KHz is not applicable for FR1.	

Table 16.5.1.0.1-4: PDCCH transmission parameters for out-of-sync evaluation for RedCap UE

Attribute	Value for BLER Configuration #0
DCI format	1-0
Number of control OFDM symbols	2
Aggregation level (CCE)	16; for RedCap UE with 1Rx branch. 8; for RedCap UE with 2Rx branches.

Ratio of hypothetical PDCCH RE energy to average CSI-RS RE energy	4dB
Ratio of hypothetical PDCCH DMRS energy to average CSI-RS RE energy	4dB
Bandwidth (PRBs)	48
Sub-carrier spacing (kHz)	SCS of the active DL BWP
DMRS precoder granularity	REG bundle size
REG bundle size	6
CP length	Normal
Mapping from REG to CCE	Distributed
Note: SCS = 60KHz is not applicable for FR1.	

Table 16.5.1.0.1-5: PDCCH transmission parameters for in-sync evaluation for RedCap UE

Attribute	Value for BLER Configuration #0
DCI payload size	1-0
Number of control OFDM symbols	2
Aggregation level (CCE)	8; for RedCap UE with 1Rx branch. 4; for RedCap UE with 2Rx branches.
Ratio of hypothetical PDCCH RE energy to average CSI-RS RE energy	0dB
Ratio of hypothetical PDCCH DMRS energy to average CSI-RS RE energy	0dB
Bandwidth (PRBs)	48
Sub-carrier spacing (kHz)	SCS of the active DL BWP
DMRS precoder granularity	REG bundle size
REG bundle size	6
CP length	Normal
Mapping from REG to CCE	Distributed
Note: SCS = 60KHz is not applicable for FR1.	

Table 16.5.1.0.1-6: Maximum number of RLM-RS resources X_{RLM-RS}

Carrier frequency range of PCell	L_{max}	Maximum number of RLM-RS resources, N_{RLM}
FR1, ≤ 3 GHz[Note]	4	2
FR1, > 3 GHz[Note]	8	4
FR2	64	8
NOTE: For unpaired spectrum operation with Case C - 30 kHz SCS, 3GHz is replaced by 1.88GHz, as specified in clause 4.1 in TS 38.213 [3].		

When the UE transitions between RLM CD-SSB resource and RLM NCD-SSB resource during one evaluation period, the UE is allowed to restart the ongoing evaluation using the second SSB type after BWP switching. Subsequent to this duration, the UE shall use an evaluation period corresponding to the second SSB type for each RLM-RS resource.

The requirements in 38.133 [6] clause 8.1.4 shall also apply except the scenarios described above.

The requirements in 38.133 [6] clause 8.1.5 shall apply.

When the downlink radio link quality on all the configured RLM-RS resources is worse than Q_{out}, Layer 1 of the UE shall send an out-of-sync indication for the cell to the higher layers. A Layer 3 filter shall be applied to the out-of-sync indications as specified in TS 38.331 [13].

When the downlink radio link quality on at least one of the configured RLM-RS resources is better than $Q_{in,RedCap}$, layer 1 of the UE shall send an in-sync indication for the cell to the higher layers. A layer 3 filter shall be applied to the in-sync indications as specified in TS 38.331 [2].

The out-of-sync and in-sync evaluations for the configured RLM-RS resources shall be performed as specified in clause 5 in TS 38.213 [8]. Two successive indications from layer 1 shall be separated by at least $T_{Indication_interval,RedCap}$.

When DRX is not used for RedCap UEs, $T_{Indication_interval,RedCap}$ is max(10ms, $T_{RLM\text{-}RS,M}$), where $T_{RLM,M}$ is the shortest periodicity of all configured RLM-RS resources for the monitored cell, which corresponds to T_{SSB} specified in clause 38.133 [6] 8.1B.2 if the RLM-RS resource is SSB, or $T_{CSI\text{-}RS}$ specified in 38.133 [6] clause 8.1B.3 if the RLM-RS resource is CSI-RS.

In case DRX is used for RedCap UEs, $T_{Indication_interval,RedCap}$ is max(10ms, 1.5 × DRX_cycle_length, 1.5 × $T_{RLM\text{-}RS,M}$)) if DRX cycle_length is less than or equal to 320ms, and $T_{Indication_interval}$ is DRX_cycle_length if DRX cycle_length is greater than 320ms. Upon start of T310 timer as specified in TS 38.331 [2], the UE shall monitor the configured RLM-RS resources for recovery using the evaluation period and layer 1 indication interval corresponding to the no DRX mode until the expiry or stop of T310 timer.

When DRX is not used for HD-FDD RedCap UEs, $T_{Indication_interval,RedCap}$ is max(10ms, $T_{RLM\text{-}RS,M}$), where $T_{RLM,M}$ is the shortest periodicity of all configured RLM-RS resources for the monitored cell, which corresponds to T_{SSB} specified in 38.133 [6] clause 8.1B.2 if the RLM-RS resource is SSB, or $T_{CSI\text{-}RS}$ specified in 38.133 [6] clause 8.1B.3 if the RLM-RS resource is CSI-RS, under the following condition

- For each RLM-RS configuration, at least one RLM-RS sample must fall with DL occasion within an indication period.

In case DRX is used for HD-FDD RedCap UEs, $T_{Indication_interval,RedCap}$ is max(10ms, 1.5 × DRX_cycle_length, 1.5 × $T_{RLM\text{-}RS,M}$)) if DRX cycle_length is less than or equal to 320ms, and $T_{Indication_interval}$ is DRX_cycle_length if DRX cycle_length is greater than 320ms, under the following condition

- For each RLM-RS configuration, at least one RLM-RS sample must fall with DL occasion within an indication period.

The requirements in 38.133 [6] clause 8.1.7 shall apply

The normative reference for this requirement is TS 38.133 [6] clauses 8.1B.1, 8.1B.2, 8.1B.3, 8.1B.4, 8.1B.5, 8.1B.6 and 8.1B.7.

16.5.1.0.2 Minimum conformance requirements for SSB-based RLM

The requirements in this clause apply for each SSB based RLM-RS resource configured for PCell, provided that the SSB configured for RLM is actually transmitted within UE active DL BWP during the entire evaluation period specified in this clause.

UE shall be able to evaluate whether the downlink radio link quality on the configured RLM-RS resource estimated over the last $T_{Evaluate_out_SSB,RedCap}$ [ms] period becomes worse than the threshold $Q_{out_SSB,RedCap}$ within $T_{Evaluate_out_SSB,RedCap}$ [ms] evaluation period.

UE shall be able to evaluate whether the downlink radio link quality on the configured RLM-RS resource estimated over the last $T_{Evaluate_in_SSB,RedCap}$ [ms] period becomes better than the threshold $Q_{in_SSB,RedCap}$ within $T_{Evaluate_in_SSB,RedCap}$ [ms] evaluation period.

$T_{Evaluate_out_SSB,RedCap}$ and $T_{Evaluate_in_SSB,RedCap}$ are defined in Table 16.5.1.0.2-1 and Table 16.5.1.0.2-2 for FR1 for UE with 2Rx RedCap and 1Rx RedCap, respectively.

Table 16.5.1.0.2-1: Evaluation period $T_{Evaluate_out_SSB,RedCap}$ and $T_{Evaluate_in_SSB,RedCap}$ for FR1 for 2Rx RedCap UE

Configuration	$T_{Evaluate_out_SSB,RedCap}$ (ms)	$T_{Evaluate_in_SSB,RedCap}$ (ms)
no DRX	Max(200, Ceil(10 × P) × T_{SSB})	Max(100, Ceil(5 × P) × T_{SSB})
DRX cycle≤320ms	Max(200, Ceil(15 × P) × Max(T_{DRX},T_{SSB}))	Max(100, Ceil(7.5 × P) × Max(T_{DRX},T_{SSB}))
DRX cycle>320ms	Ceil(10 × P) × T_{DRX}	Ceil(5 × P) × T_{DRX}
NOTE: T_{SSB} is the periodicity of the SSB configured for RLM. T_{DRX} is the DRX cycle length.		

Table 16.5.1.0.2-2: Evaluation period $T_{Evaluate_out_SSB,RedCap}$ and $T_{Evaluate_in_SSB,RedCap}$ for FR1 for 1Rx RedCap UE

Configuration	$T_{Evaluate_out_SSB,RedCap}$ (ms)	$T_{Evaluate_in_SSB,RedCap}$ (ms)
no DRX	Max(400, Ceil(20 × P) × T_{SSB})	Max(100, Ceil(5 × P) × T_{SSB})
DRX cycle≤320ms	Max(400, Ceil(30 × P) × Max(T_{DRX},T_{SSB}))	Max(100, Ceil(7.5 × P) × Max(T_{DRX},T_{SSB}))
DRX cycle>320ms	Ceil(20 × P) × T_{DRX}	Ceil(5 × P) × T_{DRX}
NOTE: T_{SSB} is the periodicity of the SSB configured for RLM. T_{DRX} is the DRX cycle length.		

For FR1,

- $P = \frac{1}{1-\frac{T_{SSB}}{MGRP}}$, when in the monitored cell there are measurement gaps configured for intra-frequency, inter-frequency or inter-RAT measurements, and these measurement gaps are overlapping with some but not all occasions of the SSB; and
- P = 1 when in the monitored cell there are no measurement gaps overlapping with any occasion of the SSB.

If the high layer in TS 38.331 [13] signalling of *smtc2* is present, $T_{SMTCperiod}$ follows *smtc2*; otherwise $T_{SMTCperiod}$ follows *smtc1*.

Longer evaluation period would be expected if the combination of RLM-RS resource, SMTC occasion and measurement gap configurations does not meet previous conditions.

Longer evaluation period would be expected during the period $T_{identify_CGI}$ when the UE is requested to decode an NR CGI.

Longer evaluation period would be expected during the period $T_{identify_CGI,E-UTRAN}$ when the UE is requested to decode an LTE CGI.

For FR1, when the SSB for RLM is in the same OFDM symbol as CSI-RS for RLM, BFD, CBD or L1-RSRP measurement,

- If SSB and CSI-RS have same SCS, UE shall be able to measure the SSB for RLM without any restriction;
- If SSB and CSI-RS have different SCS,
  - If UE supports *simultaneousRxDataSSB-DiffNumerology*, UE shall be able to measure the SSB for RLM without any restriction;
  - If UE does not support *simultaneousRxDataSSB-DiffNumerology*, UE is required to measure one of but not both SSB for RLM and CSI-RS. Longer measurement period for SSB based RLM is expected, and no requirements are defined.

The normative reference for this requirement is TS 38.133 [6] clauses 8.1B.2.

16.5.1.0.3 Minimum conformance requirements for CSI-RS based RLM

The requirements in this clause apply for each CSI-RS based RLM-RS resource configured for PCell, provided that the CSI-RS configured for RLM is actually transmitted within UE active DL BWP during the entire evaluation period specified in this clause. UE is not expected to perform radio link monitoring measurements on the CSI-RS configured as RLM-RS if the CSI-RS is not in the active TCI state of any CORESET configured in the UE active BWP.

UE shall be able to evaluate whether the downlink radio link quality on the configured RLM-RS resource estimated over the last $T_{Evaluate_out_CSI-RS,RedCap}$ ms period becomes worse than the threshold $Q_{out_CSI-RS,RedCap}$ within $T_{Evaluate_out_CSI-RS,RedCap}$ ms evaluation period.

UE shall be able to evaluate whether the downlink radio link quality on the configured RLM-RS resource estimated over the last $T_{Evaluate_in_CSI-RS,RedCap}$ ms period becomes better than the threshold $Q_{in_CSI-RS,RedCap}$ within $T_{Evaluate_in_CSI-RS,RedCap}$ ms evaluation period.

$T_{Evaluate_out_CSI-RS,RedCap}$ and $T_{Evaluate_in_CSI-RS,RedCap}$ are defined in Table 16.5.1.0.3-1 and Table 16.5.1.0.3-2 for FR1 for RedCap 2Rx RedCap and 1Rx RedCap, respectively.

Table 16.5.1.0.3-1: Evaluation period $T_{Evaluate_out_CSI-RS,RedCap}$ and $T_{Evaluate_in_CSI-RS,RedCap}$ for FR1 for 2Rx RedCap UE

Configuration	$T_{Evaluate_out_CSI-RS,RedCap}$ (ms)	$T_{Evaluate_in_CSI-RS,RedCap}$ (ms)
no DRX	Max(200, Ceil($M_{out,RedCap}$×P)×T_{CSI-RS})	Max(100, Ceil($M_{in,RedCap}$×P) × T_{CSI-RS})
DRX ≤ 320ms	Max(200, Ceil(1.5×$M_{out,RedCap}$ ×P)× Max(T_{DRX}, T_{CSI-RS}))	Max(100, Ceil(1.5×$M_{in,RedCap}$×P)× Max(T_{DRX}, T_{CSI-RS}))
DRX > 320ms	Ceil($M_{out,RedCap}$ ×P) × T_{DRX}	Ceil($M_{in,RedCap}$ ×P) × T_{DRX}
NOTE: T_{CSI-RS} is the periodicity of the CSI-RS resource configured for RLM. The requirements in this table apply for T_{CSI-RS} equal to 5 ms, 10ms, 20 ms or 40 ms. T_{DRX} is the DRX cycle length.		

Table 16.5.1.0.3-2: Evaluation period $T_{Evaluate_out_CSI-RS,RedCap}$ and $T_{Evaluate_in_CSI-RS,RedCap}$ for FR1 for 1Rx RedCap UE

Configuration	$T_{Evaluate_out_CSI-RS,RedCap}$ (ms)	$T_{Evaluate_in_CSI-RS,RedCap}$ (ms)
no DRX	Max(400, Ceil($M_{out,RedCap}$×P)×T_{CSI-RS})	Max(100, Ceil($M_{in,RedCap}$×P) × T_{CSI-RS})
DRX ≤ 320ms	Max(400, Ceil(1.5×$M_{out,RedCap}$ ×P)× Max(T_{DRX}, T_{CSI-RS}))	Max(100, Ceil(1.5×$M_{in,RedCap}$×P)× Max(T_{DRX}, T_{CSI-RS}))
DRX > 320ms	Ceil($M_{out,RedCap}$ ×P) × T_{DRX}	Ceil($M_{in,RedCap}$ ×P) × T_{DRX}
NOTE: T_{CSI-RS} is the periodicity of the CSI-RS resource configured for RLM. The requirements in this table apply for T_{CSI-RS} equal to 5 ms, 10ms, 20 ms or 40 ms. T_{DRX} is the DRX cycle length.		

For FR1,

- $P = \frac{1}{1-\frac{T_{CSI-RS}}{MGRP}}$, when in the monitored cell there are measurement gaps configured for intra-frequency, inter-frequency or inter-RAT measurements, and these measurement gaps are overlapping with some but not all occasions of the CSI-RS; and

- P=1 when in the monitored cell there are no measurement gaps overlapping with any occasion of the CSI-RS.

Longer evaluation period would be expected if the combination of RLM-RS resource, SMTC occasion and measurement gap configurations does not meet previous conditions.

Longer evaluation period would be expected during the period $T_{identify_CGI}$ when the UE is requested to decode an NR CGI.

Longer evaluation period would be expected during the period $T_{identify_CGI,E-UTRAN}$ when the UE is requested to decode an LTE CGI.

For FR1, when the CSI-RS for RLM is in the same OFDM symbol as SSB for RLM, BFD, CBD or L1-RSRP measurement, UE is not required to receive CSI-RS for RLM in the PRBs that overlap with an SSB.

For FR1, when the SSB for RLM, BFD, CBD, or L1-RSRP measurement is within the active BWP and has same SCS than CSI-RS for RLM, the UE shall be able to perform CSI-RS measurement without restrictions.

For FR1, when the SSB for RLM, BFD, CBD or L1-RSRP measurement is within the active BWP and has different SCS than CSI-RS for RLM, the UE shall be able to perform CSI-RS measurement with restrictions according to its capabilities:

- If the UE supports *simultaneousRxDataSSB-DiffNumerology* the UE shall be able to perform CSI-RS for RLM measurement without restrictions.

- If the UE does not support *simultaneousRxDataSSB-DiffNumerology*, UE is required to measure one of but not both CSI-RS for RLM and SSB. Longer measurement period for CSI-RS based RLM is expected, and no requirements are defined.

For FR1, when the CSI-RS for RLM is in the same OFDM symbol as another CSI-RS for RLM, BFD, CBD or L1-RSRP measurement, UE shall be able to measure the CSI-RS for RLM without any restriction.

The normative reference for this requirement is TS 38.133 [6] clauses 8.1B.3.

16.5.1.1 NR SA FR1 Radio Link Monitoring Out-of-sync Test for FR1 PCell configured with SSB-based RLM RS in non-DRX mode for 1 Rx UE

Editor's Notes: This test case is incomplete in following aspects:

- TT analysis is missing.

16.5.1.1.1 Test purpose

To verify that the 1Rx RedCap UE properly detects the out of sync and in sync for the purpose of monitoring downlink radio link quality of the PCell for 1Rx RedCap UE. This test will partly verify the FR1 radio link monitoring requirements in 38.133 [6] clause 8.1B.2.

16.5.1.1.2 Test applicability

This test applies to all types of NR RedCap UE with 1 RX from Release 17 onwards.

16.5.1.1.3 Minimum conformance requirement

The minimum conformance requirements are specified in clause 16.5.1.0.1 and 16.5.1.0.2.

The normative reference for this requirement is TS 38.133 [6] clause A.16.5.1.1.

16.5.1.1.4 Test description

Same as the test description given in clause 6.5.1.1.4.

16.5.1.1.4.1 Initial conditions

Same as the initial conditions given in clause 6.5.1.1.4.1 with following exceptions:

- Table 6.5.1.1.4.1-1 is replaced by Table 16.5.1.1.4.1-1.
- Table 6.5.1.1.4.1-2 is replaced by Table 16.5.1.1.4.1-2.
- Table 6.5.1.1.4.1-4 is replaced by Table 16.5.1.1.4.1-3.

Table 16.5.1.1.4.1-1: Supported test configurations

Configuration	Description
16.5.1.1-1	SSB SCS 15 kHz, data SCS 15 kHz, BW 10 MHz, FDD
16.5.1.1-2	SSB SCS 15 kHz, data SCS 15 kHz, BW 10 MHz, TDD
16.5.1.1-3	SSB SCS 30 kHz, data SCS 30 kHz, BW 20 MHz, TDD
16.5.1.1-4	SSB SCS 15 kHz, data SCS 15 kHz, BW 10 MHz, HD-FDD
Note: The UE is only required to pass in one of the supported test configurations in FR1	

Table 16.5.1.1.4.1-2: Initial conditions

Parameter	Value		Comment
Test environment	NC		As specified in TS 38.508-1 [14] clause 4.1.
Test frequencies	As specified in Annex E.1.2, Table E.4-1 and TS 38.508-1 [14] clause 4.3.1.		
Channel bandwidth	As specified by the test configuration selected from Table 16.5.1.1.4.1-1		
Propagation conditions	AWGN		As specified in Annex C.2.2.
Connection Diagram	TE Part	A.3.1.8.1	As specified in TS 38.508-1 [14] Annex A.
	DUT Part	A.3.2.2.1	
Exceptions to connection diagram			

Table 16.5.1.1.4.1-3: General test parameters

Parameter		Unit	Value
			Test 1
Active PCell			Cell 1
RF Channel Number			1
Duplex mode	Config 1		FDD
	Config 2, 3		TDD
	Config 4		HD-FDD
$BW_{channel}$	Config 1,2,4	MHz	10: $N_{RB,c}$ = 52
	Config 3		20: $N_{RB,c}$ = 51
DL initial BWP configuration	Config 1,2,3,4		DLBWP.0.1
DL dedicated BWP configuration	Config 1,2,3,4		DLBWP.1.1
UL initial BWP configuration	Config 1,2,3,4		ULBWP.0.1
UL dedicated BWP configuration	Config 1,2,3,4		ULBWP.1.1
TDD Configuration	Config 1,4		Not Applicable
	Config 2		TDDConf.1.1
	Config 3		TDDConf.2.1
RMSI CORESET Reference Channel	Config 1,4		CR.1.1 FDD
	Config 2		CR.1.1 TDD
	Config 3		CR.2.1 TDD
Dedicated CORESET Reference Channel	Config 1,4		CCR.1.3 FDD
	Config 2		CCR.1.3 TDD
	Config 3		CCR.2.2 TDD
SSB Configuration	Config 1,2,4		SSB.1 FR1
	Config 3		SSB.1 RedCap FR1
SMTC Configuration	Config 1,2,3,4		SMTC.1
PDSCH/PDCCH subcarrier spacing	Config 1,2,4		15 kHz
	Config 3		30 kHz
PRACH Configuration	Config 1,2,3,4		PRACH.1 FR1
SSB index assigned as RLM RS			0
OCNG parameters			OP.1
CP length			Normal
Correlation Matrix and Antenna Configuration			2x1 low
Out of sync transmission parameters	DCI format		1-0
	Number of Control OFDM symbols		2
	Aggregation level	CCE	16
	Ratio of hypothetical PDCCH RE energy to average SSS RE energy	dB	4
	Ratio of hypothetical PDCCH DMRS energy to average SSS RE energy	dB	4
	DMRS precoder granularity		REG bundle size
	REG bundle size		6
DRX			*OFF*
Gap pattern ID			*gp0*
Layer 3 filtering			*Enabled*
T310 timer		ms	*0*
T311 timer		ms	1000
N310			1
N311			1
CSI-RS configuration for CSI reporting	Config 1,4		CSI-RS.1.1 FDD
	Config 2		CSI-RS.1.1 TDD
	Config 3		CSI-RS.2.1 TDD
CSI-RS for tracking	Config 1,4		TRS.1.1 FDD
	Config 2		TRS.1.1 TDD

	Config 3		TRS.1.2 TDD
T1		s	0.2
T2		s	0.96
T3		s	1
D1		s	0.84
Note 1: All configurations are assigned to the UE prior to the start of time period T1. Note 2: UE-specific PDCCH is not transmitted after T1 starts.			

16.5.1.1.4.2 Test Procedure

Same as the test procedure given in clause 6.5.1.1.4.2.

16.5.1.1.4.3 Message Contents

Same as the message contents given in clause 6.5.1.1.4.3.

16.5.1.1.5 Test Requirement

Same as the test requirements given in clause 6.5.1.1.5 with following exceptions:

- Table 6.5.1.1.5-1 is replaced by Table 16.5.1.1.5-1.

Table 16.5.1.1.5-1: Cell specific test parameters (Cell 1)

Parameter		Unit	Test 1		
			T1	T2	T3
EPRE ratio of PDCCH DMRS to SSS		dB	4		
EPRE ratio of PDCCH to PDCCH DMRS		dB	0		
EPRE ratio of PBCH DMRS to SSS		dB	0		
EPRE ratio of PBCH to PBCH DMRS		dB			
EPRE ratio of PSS to SSS		dB			
EPRE ratio of PDSCH DMRS to SSS		dB			
EPRE ratio of PDSCH to PDSCH DMRS		dB			
EPRE ratio of OCNG DMRS to SSS		dB			
EPRE ratio of OCNG to OCNG DMRS		dB			
SNR on RLM-RS	Config 1,2,4	dB	1	-7	-15
	Config 3		1	-7	-15
N_{oc}	Config 1,2,4	dBm/15 kHz	-98		
	Config 3		-98		
N_{oc}	Config 1,2,4	dBm/SCS	-98		
	Config 3		-95		
Propagation condition			TDL-C 300ns 100Hz		
Note 1: OCNG shall be used such that the resources in Cell 1 are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols. Note 2: The signal contains PDCCH for UEs other than the device under test as part of OCNG. Note 3: SNR levels correspond to the signal to noise ratio over the SSS REs. Note 4: The SNR in time periods T1, T2 and T3 is denoted as SNR1, SNR2 and SNR3 respectively in Figure 6.5.1.1.4-1.					

16.5.1.2 NR SA FR1 Radio Link Monitoring Out-of-sync Test for FR1 PCell configured with SSB-based RLM RS in non-DRX mode for 2 Rx UE

16.5.1.2.1 Test purpose

The purpose of this test is to verify that the UE properly detects the out of sync and in sync for the purpose of monitoring downlink radio link quality of the PCell for 2Rx RedCap UE. This test will partly verify the FR1 radio link monitoring requirements in 38.133 [6] clause 8.1B.2.

16.5.1.2.2 Test applicability

This test applies to all types of NR RedCap UE with 2 RX from Release 17 onwards.

16.5.1.2.3 Minimum conformance requirement

The minimum conformance requirements are specified in clause 16.5.1.0.1 and 16.5.1.0.2.

The normative reference for this requirement is TS 38.133 [6] clause A.16.5.1.2.

16.5.1.2.4 Test description

Same as the test description given in clause 6.5.1.1.4.

16.5.1.2.4.1 Initial conditions

Same as the initial conditions given in clause 6.5.1.1.4.1 with following exceptions:

- Table 6.5.1.1.4.1-1 is replaced by Table 16.5.1.2.4.1-1.
- Table 6.5.1.1.4.1-2 is replaced by Table 16.5.1.2.4.1-2.
- Table 6.5.1.1.4.1-4 is replaced by Table 16.5.1.2.4.1-3.

Table 16.5.1.2.4.1-1: Supported test configurations

Configuration	Description
16.5.1.2-1	SSB SCS 15 kHz, data SCS 15 kHz, BW 10 MHz, FDD
16.5.1.2-2	SSB SCS 15 kHz, data SCS 15 kHz, BW 10 MHz, TDD
16.5.1.2-3	SSB SCS 30 kHz, data SCS 30 kHz, BW 20 MHz, TDD
16.5.1.2-4	SSB SCS 15 kHz, data SCS 15 kHz, BW 10 MHz, HD-FDD
Note: The UE is only required to pass in one of the supported test configurations in FR1	

Table 16.5.1.2.4.1-2: Initial conditions

Parameter	Value		Comment
Test environment	NC		As specified in TS 38.508-1 [14] clause 4.1.
Test frequencies	As specified in Annex E.1.2, Table E.4-1 and TS 38.508-1 [14] clause 4.3.1.		
Channel bandwidth	As specified by the test configuration selected from Table 16.5.1.2.4.1-1		
Propagation conditions	AWGN		As specified in Annex C.2.2.
Connection Diagram	TE Part	A.3.1.7.1	As specified in TS 38.508-1 [14] Annex A.
	DUT Part	A.3.2.3.4	
Exceptions to connection diagram			

Table 16.5.1.2.4.1-3: General test parameters

Parameter		Unit	Value
			Test 1
Active PCell			Cell 1
RF Channel Number			1
Duplex mode	Config 1		FDD
	Config 2, 3		TDD
	Config 4		HD-FDD
$BW_{channel}$	Config 1,2,4	MHz	10: $N_{RB,c}$ = 52
	Config 3		20: $N_{RB,c}$ = 51
DL initial BWP configuration	Config 1,2,3,4		DLBWP.0.1
DL dedicated BWP configuration	Config 1,2,3,4		DLBWP.1.1
UL initial BWP configuration	Config 1,2,3,4		ULBWP.0.1
UL dedicated BWP configuration	Config 1,2,3,4		ULBWP.1.1

TDD Configuration	Config 1,4		Not Applicable
	Config 2		TDDConf.1.1
	Config 3		TDDConf.2.1
RMSI CORESET Reference Channel	Config 1,4		CR.1.1 FDD
	Config 2		CR.1.1 TDD
	Config 3		CR.2.1 TDD
Dedicated CORESET Reference Channel	Config 1,4		CCR.1.3 FDD
	Config 2		CCR.1.3 TDD
	Config 3		CCR.2.2 TDD
SSB Configuration	Config 1,2,4		SSB.1 FR1
	Config 3		SSB.1 RedCap FR1
SMTC Configuration	Config 1,2,3,4		SMTC.1
PDSCH/PDCCH subcarrier spacing	Config 1,2,4		15 kHz
	Config 3		30 kHz
PRACH Configuration	Config 1,2,3,4		PRACH.1 FR1
SSB index assigned as RLM RS			0
OCNG parameters			OP.1
CP length			Normal
Correlation Matrix and Antenna Configuration			2x2 low
Out of sync transmission parameters	DCI format		1-0
	Number of Control OFDM symbols		2
	Aggregation level	CCE	16
	Ratio of hypothetical PDCCH RE energy to average SSS RE energy	dB	4
	Ratio of hypothetical PDCCH DMRS energy to average SSS RE energy	dB	4
	DMRS precoder granularity		REG bundle size
	REG bundle size		6
DRX			*OFF*
Gap pattern ID			*gp0*
Layer 3 filtering			*Enabled*
T310 timer		ms	*0*
T311 timer		ms	1000
N310			1
N311			1
CSI-RS configuration for CSI reporting	Config 1,4		CSI-RS.1.1 FDD
	Config 2		CSI-RS.1.1 TDD
	Config 3		CSI-RS.2.1 TDD
CSI-RS for tracking	Config 1,4		TRS.1.1 FDD
	Config 2		TRS.1.1 TDD
	Config 3		TRS.1.2 TDD
T1		s	0.2
T2		s	0.48
T3		s	0.48
D1		s	0.44
Note 1: All configurations are assigned to the UE prior to the start of time period T1. Note 2: UE-specific PDCCH is not transmitted after T1 starts.			

16.5.1.2.4.2 Test Procedure

Same as the test procedure given in clause 6.5.1.1.4.2.

16.5.1.2.4.3 Message Contents

Same as the message contents given in clause 6.5.1.1.4.3.

16.5.1.2.5 Test Requirement

Same as the test requirements given in clause 6.5.1.1.5 with following exceptions:

- Table 6.5.1.1.5-1 is replaced by Table 16.5.1.2.5-1.

Table 16.5.1.2.5-1: Cell specific test parameters (Cell 1)

Parameter		Unit	Test 1		
			T1	T2	T3
EPRE ratio of PDCCH DMRS to SSS		dB	4		
EPRE ratio of PDCCH to PDCCH DMRS		dB	0		
EPRE ratio of PBCH DMRS to SSS		dB	0		
EPRE ratio of PBCH to PBCH DMRS		dB			
EPRE ratio of PSS to SSS		dB			
EPRE ratio of PDSCH DMRS to SSS		dB			
EPRE ratio of PDSCH to PDSCH DMRS		dB			
EPRE ratio of OCNG DMRS to SSS		dB			
EPRE ratio of OCNG to OCNG DMRS		dB			
SNR on RLM-RS	Config 1,2,4	dB	1.8 Note 5	-6.2 Note 5	-15.8 Note 5
	Config 3		1.8 Note 5	-6.2 Note 5	-15.8 Note 5
N_{oc}	Config 1,2,4	dBm/15 kHz	-98		
	Config 3		-98		
N_{oc}	Config 1,2,4	dBm/SCS	-98		
	Config 3		-95		
Propagation condition			TDL-C 300ns 100Hz		

Note 1: OCNG shall be used such that the resources in Cell 1 are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.
Note 2: The signal contains PDCCH for UEs other than the device under test as part of OCNG.
Note 3: SNR levels correspond to the signal to noise ratio over the SSS REs.
Note 4: The SNR in time periods T1, T2 and T3 is denoted as SNR1, SNR2 and SNR3 respectively in Figure 6.5.1.1.4-1.
Note 5: Including the test tolerance given in Annex F.

16.5.1.3 NR SA FR1 Radio Link Monitoring In-sync Test for FR1 PCell configured with SSB-based RLM RS in non-DRX mode for 1 Rx UE

Editor's Notes: This test case is incomplete in following aspects:

- TT analysis is missing.

16.5.1.3.1 Test purpose

To verify that the UE properly detects the out of sync and in sync for the purpose of monitoring downlink radio link quality of the PCell. This test will partly verify the FR1 radio link monitoring requirements in 38.133 [6] clause 8.1B.

16.5.1.3.2 Test applicability

This test applies to all types of NR RedCap UE with 1 RX from Release 17 onwards.

16.5.1.3.3 Minimum conformance requirement

The minimum conformance requirements are specified in clause 16.5.1.0.1 and 16.5.1.0.2.

The normative reference for this requirement is TS 38.133 [6] clause A.16.5.1.3.

16.5.1.3.4 Test description

Same as the test description given in clause 6.5.1.2.4.

16.5.1.3.4.1 Initial conditions

Same as the initial conditions given in clause 6.5.1.2.4.1 with following exceptions:

- Table 6.5.1.2.4.1-1 is replaced by Table 16.5.1.3.4.1-1.
- Table 6.5.1.2.4.1-2 is replaced by Table 16.5.1.3.4.1-2.
- Table 6.5.1.2.4.1-4 is replaced by Table 16.5.1.3.4.1-3.

Table 16.5.1.3.4.1-1: Supported test configurations

Configuration	Description
16.5.1.3-1	SSB SCS 15 kHz, data SCS 15 kHz, BW 10 MHz, FDD
16.5.1.3-2	SSB SCS 15 kHz, data SCS 15 kHz, BW 10 MHz, TDD
16.5.1.3-3	SSB SCS 30 kHz, data SCS 30 kHz, BW 20 MHz, TDD
16.5.1.3-4	SSB SCS 15 kHz, data SCS 15 kHz, BW 10 MHz, HD-FDD
Note: The UE is only required to pass in one of the supported test configurations in FR1	

Table 16.5.1.3.4.1-2: Initial conditions

Parameter	Value		Comment
Test environment	NC		As specified in TS 38.508-1 [14] clause 4.1.
Test frequencies	As specified in Annex E.1.2, Table E.4-1 and TS 38.508-1 [14] clause 4.3.1.		
Channel bandwidth	As specified by the test configuration selected from Table 16.5.1.3.4.1-1		
Propagation conditions	AWGN		As specified in Annex C.2.2.
Connection Diagram	TE Part	A.3.1.8.1	As specified in TS 38.508-1 [14] Annex A.
	DUT Part	A.3.2.2.1	
Exceptions to connection diagram			

Table 16.5.1.3.4.1-3: General test parameters

Parameter		Unit	Value
			Test 1
Active PCell			Cell 1
RF Channel Number			1
Duplex mode	Config 1		FDD
	Config 2,3		TDD
	Config 4		HD-FDD
$BW_{channel}$	Config 1,2,4	MHz	10: $N_{RB,c}$ = 52
	Config 3		20: NRB,c = 51
DL initial BWP configuration	Config 1,2,3,4		DLBWP.0.1
DL dedicated BWP configuration	Config 1,2,3,4		DLBWP.1.1
UL initial BWP configuration	Config 1,2,3,4		ULBWP.0.1
UL dedicated BWP configuration	Config 1,2,3,4		ULBWP.1.1
TDD Configuration	Config 1,4		Not Applicable
	Config 2		TDDConf.1.1
	Config 3		TDDConf.2.1
RMSI CORESET Reference Channel	Config 1,4		CR.1.1 FDD
	Config 2		CR.1.1 TDD
	Config 3		CR.2.1 TDD
Dedicated CORESET Reference Channel	Config 1,4		CCR.1.1 FDD
	Config 2		CCR.1.1 TDD
	Config 3		CCR.2.1 TDD
SSB Configuration	Config 1,2,4		SSB.1 FR1
	Config 3		SSB.1 RedCap FR1

SMTC Configuration	Config 1,2,3,4		SMTC.1
PDSCH/PDCCH subcarrier spacing	Config 1,2,4		15 kHz
	Config 3		30 kHz
PRACH Configuration	Config 1,2,3,4		PRACH.1 FR1
SSB index assigned as RLM RS			0
OCNG parameters			OP.1
CP length			Normal
Correlation Matrix and Antenna Configuration			2x1 Low
In sync transmission parameters	DCI format		1-0
	Number of Control OFDM symbols		2
	Aggregation level	CCE	8
	Ratio of hypothetical PDCCH RE energy to average SSS RE energy	dB	0
	Ratio of hypothetical PDCCH DMRS energy to average SSS RE energy	dB	0
	DMRS precoder granularity		REG bundle size
	REG bundle size		6
Out of sync transmission parameters	DCI format		1-0
	Number of Control OFDM symbols		2
	Aggregation level	CCE	16
	Ratio of hypothetical PDCCH RE energy to average SSS RE energy	dB	4
	Ratio of hypothetical PDCCH DMRS energy to average SSS RE energy	dB	4
	DMRS precoder granularity		REG bundle size
	REG bundle size		6
DRX			*OFF*
Gap pattern ID			N.A.
Layer 3 filtering			*Enabled*
T310 timer		ms	1000
T311 timer		ms	1000
N310			1
N311			1
CSI-RS configuration for CSI reporting	Config 1,4		CSI-RS.1.1 FDD
	Config 2		CSI-RS.1.1 TDD
	Config 3		CSI-RS.2.1 TDD
CSI-RS for tracking	Config 1,4		TRS.1.1 FDD
	Config 2		TRS.1.1 TDD
	Config 3		TRS.1.2 TDD
T1		s	0.2
T2		s	0.2
T3		s	0.24
T4		s	0.2
T5		s	0.88
D1		s	0.84
Note 1: All configurations are assigned to the UE prior to the start of time period T1. Note 2: UE-specific PDCCH is not transmitted after T1 starts.			

16.5.1.3.4.2 Test Procedure

Same as the test procedure given in clause 6.5.1.2.4.2.

16.5.1.3.4.3 Message Contents

Same as the message contents given in clause 6.5.1.2.4.3.

16.5.1.3.5 Test Requirement

Same as the test requirements given in clause 6.5.1.2.5 with following exceptions:

- Table 6.5.1.2.5-1 is replaced by Table 16.5.1.3.5-1.

Table 16.5.1.3.5-1: Cell specific test parameters (Cell 1)

Parameter		Unit	Test 1				
			T1	T2	T3	T4	T5
EPRE ratio of PDCCH DMRS to SSS		dB	0				
EPRE ratio of PDCCH to PDCCH DMRS		dB	0				
EPRE ratio of PBCH DMRS to SSS		dB	0				
EPRE ratio of PBCH to PBCH DMRS		dB					
EPRE ratio of PSS to SSS		dB					
EPRE ratio of PDSCH DMRS to SSS		dB					
EPRE ratio of PDSCH to PDSCH DMRS		dB					
EPRE ratio of OCNG DMRS to SSS		dB					
EPRE ratio of OCNG to OCNG DMRS		dB					
SNR on RLM-RS	Config 1,2,4	dB	1	-7	-15	-4.5	1
	Config 3		1	-7	-15	-4.5	1
N_{oc}	Config 1,2,4	dBm/15 kHz	-98				
	Config 3		-98				
N_{oc}	Config 1,2,4	dBm/SCS	-98				
	Config 3		-95				
Propagation condition			TDL-C 300ns 100Hz				

Note 1: OCNG shall be used such that the resources in Cell 1 are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.
Note 2: The signal contains PDCCH for UEs other than the device under test as part of OCNG.
Note 3: SNR levels correspond to the signal to noise ratio over the SSS REs.
Note 4: The SNR in time periods T1, T2, T3, T4 and T5 is denoted as SNR1, SNR2, SNR3, SNR4 and SNR5 respectively in Figure 6.5.1.2.1-1.

16.5.1.4 NR SA FR1 Radio Link Monitoring In-sync Test for FR1 PCell configured with SSB-based RLM RS in non-DRX mode for 2 Rx UE

16.5.1.4.1 Test purpose

To verify that the UE properly detects the out of sync and in sync for the purpose of monitoring downlink radio link quality of the PCell. This test will partly verify the FR1 radio link monitoring requirements in 38.133 [6] clause 8.1B.

16.5.1.4.2 Test applicability

This test applies to all types of NR RedCap UE with 2 RX from Release 17 onwards.

16.5.1.4.3 Minimum conformance requirement

The minimum conformance requirements are specified in clause 16.5.1.0.1 and 16.5.1.0.2.

The normative reference for this requirement is TS 38.133 [6] clause A.16.5.1.4.

16.5.1.4.4 Test description

Same as the test description given in clause 6.5.1.2.4.

16.5.1.4.4.1 Initial conditions

Same as the initial conditions given in clause 6.5.1.2.4.1 with following exceptions:

- Table 6.5.1.2.4.1-1 is replaced by Table 16.5.1.4.4.1-1.
- Table 6.5.1.2.4.1-2 is replaced by Table 16.5.1.4.4.1-2.
- Table 6.5.1.2.4.1-4 is replaced by Table 16.5.1.4.4.1-3.

Table 16.5.1.4.4.1-1: Supported test configurations

Configuration	Description
16.5.1.4-1	SSB SCS 15 kHz, data SCS 15 kHz, BW 10 MHz, FDD
16.5.1.4-2	SSB SCS 15 kHz, data SCS 15 kHz, BW 10 MHz, TDD
16.5.1.4-3	SSB SCS 30 kHz, data SCS 30 kHz, BW 20 MHz, TDD
16.5.1.4-4	SSB SCS 15 kHz, data SCS 15 kHz, BW 10 MHz, HD-FDD
Note: The UE is only required to pass in one of the supported test configurations in FR1	

Table 16.5.1.4.4.1-2: Initial conditions

Parameter	Value		Comment
Test environment	NC		As specified in TS 38.508-1 [14] clause 4.1.
Test frequencies	As specified in Annex E.1.2, Table E.4-1 and TS 38.508-1 [14] clause 4.3.1.		
Channel bandwidth	As specified by the test configuration selected from Table 16.5.1.4.4.1-1		
Propagation conditions	AWGN		As specified in Annex C.2.2.
Connection Diagram	TE Part	A.3.1.7.1	As specified in TS 38.508-1 [14] Annex A.
	DUT Part	A.3.2.3.4	
Exceptions to connection diagram			

Table 16.5.1.4.4.1-3: General test parameters

Parameter		Unit	Value
			Test 1
Active PCell			Cell 1
RF Channel Number			1
Duplex mode	Config 1		FDD
	Config 2,3		TDD
	Config 4		HD-FDD
$BW_{channel}$	Config 1,2,4	MHz	10: $N_{RB,c}$ = 52
	Config 3		20: NRB,c = 51
DL initial BWP configuration	Config 1,2,3,4		DLBWP.0.1
DL dedicated BWP configuration	Config 1,2,3,4		DLBWP.1.1
UL initial BWP configuration	Config 1,2,3,4		ULBWP.0.1
UL dedicated BWP configuration	Config 1,2,3,4		ULBWP.1.1
TDD Configuration	Config 1,4		Not Applicable
	Config 2		TDDConf.1.1
	Config 3		TDDConf.2.1
RMSI CORESET Reference Channel	Config 1,4		CR.1.1 FDD
	Config 2		CR.1.1 TDD
	Config 3		CR.2.1 TDD
Dedicated CORESET Reference Channel	Config 1,4		CCR.1.1 FDD
	Config 2		CCR.1.1 TDD
	Config 3		CCR.2.1 TDD
SSB Configuration	Config 1,2,4		SSB.1 FR1
	Config 3		SSB.1 RedCap FR1
SMTC Configuration	Config 1,2,3,4		SMTC.1
PDSCH/PDCCH subcarrier spacing	Config 1,2,4		15 kHz
	Config 3		30 kHz
PRACH Configuration	Config 1,2,3,4		PRACH.1 FR1
SSB index assigned as RLM RS			0

OCNG parameters			OP.1
CP length			Normal
Correlation Matrix and Antenna Configuration			2x2 Low
In sync transmission parameters	DCI format		1-0
	Number of Control OFDM symbols		2
	Aggregation level	CCE	8
	Ratio of hypothetical PDCCH RE energy to average SSS RE energy	dB	0
	Ratio of hypothetical PDCCH DMRS energy to average SSS RE energy	dB	0
	DMRS precoder granularity		REG bundle size
	REG bundle size		6
Out of sync transmission parameters	DCI format		1-0
	Number of Control OFDM symbols		2
	Aggregation level	CCE	16
	Ratio of hypothetical PDCCH RE energy to average SSS RE energy	dB	4
	Ratio of hypothetical PDCCH DMRS energy to average SSS RE energy	dB	4
	DMRS precoder granularity		REG bundle size
	REG bundle size		6
DRX			*OFF*
Gap pattern ID			N.A.
Layer 3 filtering			*Enabled*
T310 timer		ms	1000
T311 timer		ms	1000
N310			1
N311			1
CSI-RS configuration for CSI reporting	Config 1,4		CSI-RS.1.1 FDD
	Config 2		CSI-RS.1.1 TDD
	Config 3		CSI-RS.2.1 TDD
CSI-RS for tracking	Config 1,4		TRS.1.1 FDD
	Config 2		TRS.1.1 TDD
	Config 3		TRS.1.2 TDD
T1		s	0.2
T2		s	0.2
T3		s	0.24
T4		s	0.2
T5		s	0.88
D1		s	0.84
Note 1: All configurations are assigned to the UE prior to the start of time period T1. Note 2: UE-specific PDCCH is not transmitted after T1 starts.			

16.5.1.4.4.2 Test Procedure

Same as the test procedure given in clause 6.5.1.2.4.2.

16.5.1.4.4.3 Message Contents

Same as the message contents given in clause 6.5.1.2.4.3.

16.5.1.4.5 Test Requirement

Same as the test requirements given in clause 6.5.1.2.5 with following exceptions:

- Table 6.5.1.2.5-1 is replaced by Table 16.5.1.4.5-1.

Table 16.5.1.4.5-1: Cell specific test parameters (Cell 1)

Parameter		Unit	Test 1				
			T1	T2	T3	T4	T5
EPRE ratio of PDCCH DMRS to SSS		dB	0				
EPRE ratio of PDCCH to PDCCH DMRS		dB	0				
EPRE ratio of PBCH DMRS to SSS		dB	0				
EPRE ratio of PBCH to PBCH DMRS		dB					
EPRE ratio of PSS to SSS		dB					
EPRE ratio of PDSCH DMRS to SSS		dB					
EPRE ratio of PDSCH to PDSCH DMRS		dB					
EPRE ratio of OCNG DMRS to SSS		dB					
EPRE ratio of OCNG to OCNG DMRS		dB					
SNR on RLM-RS	Config 1,2,4	dB	1.8 Note 6	-6.2 Note 6	-15.8 Note 6	-5.3 Note 6	1.8 Note 6
	Config 3		1.8 Note 6	-6.2 Note 6	-15.8 Note 6	-5.3 Note 6	1.8 Note 6
N_{oc}	Config 1,2,4	dBm/15 kHz	-98				
	Config 3		-98				
N_{oc}	Config 1,2,4	dBm/SCS	-98				
	Config 3		-95				
Propagation condition			TDL-C 300ns 100Hz				

Note 1: OCNG shall be used such that the resources in Cell 1 are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.
Note 2: The signal contains PDCCH for UEs other than the device under test as part of OCNG.
Note 3: SNR levels correspond to the signal to noise ratio over the SSS REs.
Note 4: The SNR in time periods T1, T2, T3, T4 and T5 is denoted as SNR1, SNR2, SNR3, SNR4 and SNR5 respectively in Figure 6.5.1.2.1-1.
Note 5: The SNR values are specified for testing a UE which supports 2RX on at least one band.
Note 6: Including the test tolerance given in Annex F.

16.5.1.7 NR SA FR1 Radio Link Monitoring In-sync Test for FR1 PCell configured with SSB-based RLM RS in DRX mode for 1 Rx UE

Editor's Notes: This test case is incomplete in following aspects:

- TT analysis is missing.

16.5.1.7.1 Test purpose

To verify that the UE properly detects the out of sync and in sync for the purpose of monitoring downlink radio link quality of the PCell when DRX is used. This test will partly verify the FR1 radio link monitoring requirements in 38.133 [6] clause 8.1B.

16.5.1.7.2 Test applicability

This test applies to all types of NR RedCap UE with 1 RX from Release 17 onwards.

16.5.1.7.3 Minimum conformance requirement

The minimum conformance requirements are specified in clause 16.5.1.0.1 and 16.5.1.0.2.

The normative reference for this requirement is TS 38.133 [6] clause A.16.5.1.7.

16.5.1.7.4 Test description

Same as the test description given in clause 6.5.1.4.4.

16.5.1.7.4.1 Initial conditions

Same as the initial conditions given in clause 6.5.1.4.4.1 with following exceptions:

- Table 6.5.1.4.4.1-1 is replaced by Table 16.5.1.7.4.1-1.
- Table 6.5.1.4.4.1-2 is replaced by Table 16.5.1.7.4.1-2.
- Table 6.5.1.4.4.1-4 is replaced by Table 16.5.1.7.4.1-3.

Table 16.5.1.7.4.1-1: Supported test configurations

Configuration	Description
16.5.1.7-1	SSB SCS 15 kHz, data SCS 15 kHz, BW 10 MHz, FDD
16.5.1.7-2	SSB SCS 15 kHz, data SCS 15 kHz, BW 10 MHz, TDD
16.5.1.7-3	SSB SCS 30 kHz, data SCS 30 kHz, BW 20 MHz, TDD
16.5.1.7-4	SSB SCS 15 kHz, data SCS 15 kHz, BW 10 MHz, HD-FDD
Note: The UE is only required to pass in one of the supported test configurations in FR1	

Table 16.5.1.7.4.1-2: Initial conditions

Parameter	Value		Comment
Test environment	NC		As specified in TS 38.508-1 [14] clause 4.1.
Test frequencies	As specified in Annex E.1.2, Table E.4-1 and TS 38.508-1 [14] clause 4.3.1.		
Channel bandwidth	As specified by the test configuration selected from Table 16.5.1.7.4.1-1		
Propagation conditions	AWGN		As specified in Annex C.2.2.
Connection Diagram	TE Part	A.3.1.8.1	As specified in TS 38.508-1 [14] Annex A.
	DUT Part	A.3.2.2.1	
Exceptions to connection diagram			

Table 16.5.1.7.4.1-3: General test parameters

Parameter		Unit	Value
			Test 1
Active PCell			Cell 1
RF Channel Number			1
Duplex mode	Config 1		FDD
	Config 2,3		TDD
	Config 4		HD-FDD
$BW_{channel}$	Config 1,2,4	MHz	10: $N_{RB,c}$ = 52
	Config 3		20: NRB,c = 51
DL initial BWP configuration	Config 1,2,3,4		DLBWP.0.1
DL dedicated BWP configuration	Config 1,2,3,4		DLBWP.1.1
UL initial BWP configuration	Config 1,2,3,4		ULBWP.0.1
UL dedicated BWP configuration	Config 1,2,3,4		ULBWP.1.1
TDD Configuration	Config 1,4		Not Applicable
	Config 2		TDDConf.1.1
	Config 3		TDDConf.2.1
RMSI CORESET Reference Channel	Config 1,4		CR.1.1 FDD
	Config 2		CR.1.1 TDD
	Config 3		CR.2.1 TDD
Dedicated CORESET Reference Channel	Config 1,4		CCR.1.1 FDD
	Config 2		CCR.1.1 TDD
	Config 3		CCR.2.1 TDD
SSB Configuration	Config 1,2,4		SSB.1 FR1
	Config 3		SSB.1 RedCap FR1

SMTC Configuration	Config 1,2,3,4		SMTC.1
PDSCH/PDCCH subcarrier spacing	Config 1,2,4		15 kHz
	Config 3		30 kHz
PRACH Configuration	Config 1,2,3,4		PRACH.1 FR1
SSB index assigned as RLM RS			0
OCNG parameters			OP.1
CP length			Normal
Correlation Matrix and Antenna Configuration			2x1 Low
In sync transmission parameters	DCI format		1-0
	Number of Control OFDM symbols		2
	Aggregation level	CCE	8
	Ratio of hypothetical PDCCH RE energy to average SSS RE energy	dB	0
	Ratio of hypothetical PDCCH DMRS energy to average SSS RE energy	dB	0
	DMRS precoder granularity		REG bundle size
	REG bundle size		6
Out of sync transmission parameters	DCI format		1-0
	Number of Control OFDM symbols		2
	Aggregation level	CCE	16
	Ratio of hypothetical PDCCH RE energy to average SSS RE energy	dB	4
	Ratio of hypothetical PDCCH DMRS energy to average SSS RE energy	dB	4
	DMRS precoder granularity		REG bundle size
	REG bundle size		6
DRX			DRX.3
Gap pattern ID			N.A.
Layer 3 filtering			*Enabled*
T310 timer		ms	1000
T311 timer		ms	1000
N310			1
N311			1
CSI-RS configuration for CSI reporting	Config 1,4		CSI-RS.1.1 FDD
	Config 2		CSI-RS.1.1 TDD
	Config 3		CSI-RS.2.1 TDD
CSI-RS for tracking	Config 1,4		TRS.1.1 FDD
	Config 2		TRS.1.1 TDD
	Config 3		TRS.1.2 TDD
T1		s	0.2
T2		s	0.2
T3		s	0.64
T4		s	0.2
T5		s	0.88
D1		s	0.84
Note 1: All configurations are assigned to the UE prior to the start of time period T1. Note 2: UE-specific PDCCH is not transmitted after T1 starts.			

16.5.1.7.4.2 Test Procedure

Same as the test procedure given in clause 6.5.1.4.4.2.

16.5.1.7.4.3 Message Contents

Same as the message contents given in clause 6.5.1.4.4.3.

16.5.1.7.5 Test Requirement

Same as the test requirements given in clause 6.5.1.4.5 with following exceptions:

- Table 6.5.1.4.5-1 is replaced by Table 16.5.1.7.5-1.

Table 16.5.1.7.5-1: Cell specific test parameters (Cell 1)

Parameter		Unit	Test 1				
			T1	T2	T3	T4	T5
EPRE ratio of PDCCH DMRS to SSS		dB	0				
EPRE ratio of PDCCH to PDCCH DMRS		dB	0				
EPRE ratio of PBCH DMRS to SSS		dB	0				
EPRE ratio of PBCH to PBCH DMRS		dB					
EPRE ratio of PSS to SSS		dB					
EPRE ratio of PDSCH DMRS to SSS		dB					
EPRE ratio of PDSCH to PDSCH DMRS		dB					
EPRE ratio of OCNG DMRS to SSS		dB					
EPRE ratio of OCNG to OCNG DMRS		dB					
SNR on RLM-RS	Config 1,2,4	dB	1	-7	-15	-4.5	1
	Config 3		1	-7	-15	-4.5	1
N_{oc}	Config 1,2,4	dBm/15 kHz	-98				
	Config 3		-98				
N_{oc}	Config 1,2,4	dBm/SCS	-98				
	Config 3		-95				
Propagation condition			TDL-C 300ns 100Hz				

Note 1: OCNG shall be used such that the resources in Cell 1 are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.
Note 2: The signal contains PDCCH for UEs other than the device under test as part of OCNG.
Note 3: SNR levels correspond to the signal to noise ratio over the SSS REs.
Note 4: The SNR in time periods T1, T2, T3, T4 and T5 is denoted as SNR1, SNR2, SNR3, SNR4 and SNR5 respectively in Figure 6.5.1.4.1-1.

16.5.1.8 NR SA FR1 Radio Link Monitoring In-sync Test for FR1 PCell configured with SSB-based RLM RS in DRX mode for 2 Rx UE

16.5.1.8.1 Test purpose

To verify that the UE properly detects the out of sync and in sync for the purpose of monitoring downlink radio link quality of the PCell when DRX is used. This test will partly verify the FR1 radio link monitoring requirements in 38.133 [6] clause 8.1B.

16.5.1.8.2 Test applicability

This test applies to all types of NR RedCap UE with 2 RX from Release 17 onwards.

16.5.1.8.3 Minimum conformance requirement

The minimum conformance requirements are specified in clause 16.5.1.0.1 and 16.5.1.0.2.

The normative reference for this requirement is TS 38.133 [6] clause A.16.5.1.8.

16.5.1.8.4 Test description

Same as the test description given in clause 6.5.1.4.4.

16.5.1.8.4.1 Initial conditions

Same as the initial conditions given in clause 6.5.1.4.4.1 with following exceptions:

- Table 6.5.1.4.4.1-1 is replaced by Table 16.5.1.8.4.1-1.
- Table 6.5.1.4.4.1-2 is replaced by Table 16.5.1.8.4.1-2.
- Table 6.5.1.4.4.1-4 is replaced by Table 16.5.1.8.4.1-3.

Table 16.5.1.8.4.1-1: Supported test configurations

Configuration	Description
16.5.1.8-1	SSB SCS 15 kHz, data SCS 15 kHz, BW 10 MHz, FDD
16.5.1.8-2	SSB SCS 15 kHz, data SCS 15 kHz, BW 10 MHz, TDD
16.5.1.8-3	SSB SCS 30 kHz, data SCS 30 kHz, BW 20 MHz, TDD
16.5.1.8-4	SSB SCS 15 kHz, data SCS 15 kHz, BW 10 MHz, HD-FDD
Note: The UE is only required to pass in one of the supported test configurations in FR1	

Table 16.5.1.8.4.1-2: Initial conditions

Parameter	Value		Comment
Test environment	NC		As specified in TS 38.508-1 [14] clause 4.1.
Test frequencies	As specified in Annex E.1.2, Table E.4-1 and TS 38.508-1 [14] clause 4.3.1.		
Channel bandwidth	As specified by the test configuration selected from Table 16.5.1.8.4.1-1		
Propagation conditions	AWGN		As specified in Annex C.2.2.
Connection Diagram	TE Part	A.3.1.7.1	As specified in TS 38.508-1 [14] Annex A.
	DUT Part	A.3.2.3.4	
Exceptions to connection diagram			

Table 16.5.1.8.4.1-3: General test parameters

Parameter		Unit	Value
			Test 1
Active PCell			Cell 1
RF Channel Number			1
Duplex mode	Config 1		FDD
	Config 2,3		TDD
	Config 4		HD-FDD
$BW_{channel}$	Config 1,2,4	MHz	10: $N_{RB,c}$ = 52
	Config 3		20: $N_{RB,c}$ = 51
DL initial BWP configuration	Config 1,2,3,4		DLBWP.0.1
DL dedicated BWP configuration	Config 1,2,3,4		DLBWP.1.1
UL initial BWP configuration	Config 1,2,3,4		ULBWP.0.1
UL dedicated BWP configuration	Config 1,2,3,4		ULBWP.1.1
TDD Configuration	Config 1,4		Not Applicable
	Config 2		TDDConf.1.1
	Config 3		TDDConf.2.1
RMSI CORESET Reference Channel	Config 1,4		CR.1.1 FDD
	Config 2		CR.1.1 TDD
	Config 3		CR.2.1 TDD
Dedicated CORESET Reference Channel	Config 1,4		CCR.1.1 FDD
	Config 2		CCR.1.1 TDD
	Config 3		CCR.2.1 TDD
SSB Configuration	Config 1,2,4		SSB.1 FR1
	Config 3		SSB.1 RedCap FR1

SMTC Configuration	Config 1,2,3,4		SMTC.1
PDSCH/PDCCH subcarrier spacing	Config 1,2,4		15 kHz
	Config 3		30 kHz
PRACH Configuration	Config 1,2,3,4		PRACH.1 FR1
SSB index assigned as RLM RS			0
OCNG parameters			OP.1
CP length			Normal
Correlation Matrix and Antenna Configuration			2x2 Low
In sync transmission parameters	DCI format		1-0
	Number of Control OFDM symbols		2
	Aggregation level	CCE	8
	Ratio of hypothetical PDCCH RE energy to average SSS RE energy	dB	0
	Ratio of hypothetical PDCCH DMRS energy to average SSS RE energy	dB	0
	DMRS precoder granularity		REG bundle size
	REG bundle size		6
Out of sync transmission parameters	DCI format		1-0
	Number of Control OFDM symbols		2
	Aggregation level	CCE	16
	Ratio of hypothetical PDCCH RE energy to average SSS RE energy	dB	4
	Ratio of hypothetical PDCCH DMRS energy to average SSS RE energy	dB	4
	DMRS precoder granularity		REG bundle size
	REG bundle size		6
DRX			DRX.3
Gap pattern ID			N.A.
Layer 3 filtering			*Enabled*
T310 timer		ms	1000
T311 timer		ms	1000
N310			1
N311			1
CSI-RS configuration for CSI reporting	Config 1,4		CSI-RS.1.1 FDD
	Config 2		CSI-RS.1.1 TDD
	Config 3		CSI-RS.2.1 TDD
CSI-RS for tracking	Config 1,4		TRS.1.1 FDD
	Config 2		TRS.1.1 TDD
	Config 3		TRS.1.2 TDD
T1		s	0.2
T2		s	0.2
T3		s	0.64
T4		s	0.2
T5		s	0.88
D1		s	0.84
Note 1: All configurations are assigned to the UE prior to the start of time period T1. Note 2: UE-specific PDCCH is not transmitted after T1 starts.			

16.5.1.8.4.2 Test Procedure

Same as the test procedure given in clause 6.5.1.4.4.2.

16.5.1.8.4.3 Message Contents

Same as the message contents given in clause 6.5.1.4.4.3.

16.5.1.8.5 Test Requirement

Same as the test requirements given in clause 6.5.1.4.5 with following exceptions:

- Table 6.5.1.4.5-1 is replaced by Table 16.5.1.8.5-1.

Table 16.5.1.8.5-1: Cell specific test parameters (Cell 1)

Parameter		Unit	Test 1				
			T1	T2	T3	T4	T5
EPRE ratio of PDCCH DMRS to SSS		dB	0				
EPRE ratio of PDCCH to PDCCH DMRS		dB	0				
EPRE ratio of PBCH DMRS to SSS		dB	0				
EPRE ratio of PBCH to PBCH DMRS		dB					
EPRE ratio of PSS to SSS		dB					
EPRE ratio of PDSCH DMRS to SSS		dB					
EPRE ratio of PDSCH to PDSCH DMRS		dB					
EPRE ratio of OCNG DMRS to SSS		dB					
EPRE ratio of OCNG to OCNG DMRS		dB					
SNR on RLM-RS	Config 1,2,4	dB	1.8 Note 6	-6.2 Note 6	-15.8 Note 6	-5.3 Note 6	1.8 Note 6
	Config 3		1.8 Note 6	-6.2 Note 6	-15.8 Note 6	-5.3 Note 6	1.8 Note 6
N_{oc}	Config 1,2,4	dBm/15 kHz	-98				
	Config 3		-98				
N_{oc}	Config 1,2,4	dBm/SCS	-98				
	Config 3		-95				
Propagation condition			TDL-C 300ns 100Hz				

Note 1: OCNG shall be used such that the resources in Cell 1 are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.
Note 2: The signal contains PDCCH for UEs other than the device under test as part of OCNG.
Note 3: SNR levels correspond to the signal to noise ratio over the SSS REs.
Note 4: The SNR in time periods T1, T2, T3, T4 and T5 is denoted as SNR1, SNR2, SNR3, SNR4 and SNR5 respectively in Figure 6.5.1.4.1-1.
Note 5: The SNR values are specified for testing a UE which supports 2RX on at least one band.
Note 6: Including the test tolerance given in Annex F.

16.5.1.9 NR SA FR1 Radio Link Monitoring Out-of-sync Test for FR1 PCell configured with CSI-RS-based RLM in non-DRX mode for 1 Rx UE

Editor's note: This test cases is incomplete in following aspects:

- TT analysis is still missing

16.5.1.9.1 Test purpose

To verify that the UE properly detects the out of sync for the purpose of monitoring downlink CSI-RS based radio link quality of the PCell when no DRX is used for 1 Rx RedCap UE. This test will partly verify the FR1 PCell CSI-RS Out-of-sync radio link monitoring requirements in 38.133 [6] clause 8.1B.3.

16.5.1.9.2 Test applicability

This test applies to all types of NR RedCap UE with 1 Rx from Release 17 onwards supporting CSI-RS based RLM.

16.5.1.9.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 16.5.1.0.1 and 16.5.1.0.3.

The normative reference for this requirement is TS 38.133 [6] clause A.16.5.1.9.

16.5.1.9.4 Test description

Same as the test description given in clause 6.5.1.5.4.

16.5.1.9.4.1 Initial conditions

Same as the initial conditions given in clause 6.5.1.5.4.1 with following exceptions:

- Table 6.5.1.5.4.1-1 is replaced by Table 16.5.1.9.4.1-1.
- Table 6.5.1.5.4.1-2 is replaced by Table 16.5.1.9.4.1-2.
- Table 6.5.1.5.4.1-3 is replaced by Table 16.5.1.9.4.1-3.

Table 16.5.1.9.4.1-1: Supported test configurations

Configuration	Description
16.5.1.9-1	15 kHz SSB SCS, 15 kHz data SCS, 10 MHz bandwidth, FDD duplex mode
16.5.1.9-2	15 kHz SSB SCS, 15 kHz data SCS, 10 MHz bandwidth, TDD duplex mode
16.5.1.9-3	30 kHz SSB SCS, 30 kHz data SCS, 20 MHz bandwidth, TDD duplex mode
16.5.1.9-4	15 kHz SSB SCS, 15 kHz data SCS, 10 MHz bandwidth, HD-FDD duplex mode
Note: The UE is only required to pass in one of the supported test configurations in FR1	

Table 16.5.1.9.4.1-2: Initial conditions

Parameter	Value		Comment
Test environment	NC		As specified in TS 38.508-1 [14] clause 4.1.
Test frequencies	As specified in Annex E, Table E.14-1 and TS 38.508-1 [14] clause 4.3.1.		
Channel bandwidth	As specified by the test configuration selected from Table 16.5.1.9.4.1-1.		
Propagation conditions	AWGN		As specified in Annex C.2.2
Connection Diagram	TE Part	A.3.1.8.1	As specified in TS 38.508-1 [14] Annex A.
	DUT Part	A.3.2.2.1	
Exceptions to connection diagram			

Table 16.5.1.9.4.1-3: General test parameters

Parameter		Unit	Value
			Test 1
Active PCell			Cell 1
RF Channel Number			1
Duplex mode	Config 1		FDD
	Config 2,3		TDD
	Config 4		HD-FDD
TDD Configuration	Config 1,4		Not Applicable
	Config 2		TDDConf.1.1
	Config 3		TDDConf.2.1
DL initial BWP configuration			DLBWP.0.1
DL dedicated BWP configuration			DLBWP.1.1
UL initial BWP configuration			ULBWP.0.1
UL dedicated BWP configuration			ULBWP.1.1
RMSI CORESET Reference Channel	Config 1,4		CR.1.1 FDD
	Config 2		CR.1.1 TDD
	Config 3		CR.2.1 TDD
Dedicated CORESET Reference Channel	Config 1,4		CCR.1.3 FDD
	Config 2		CCR.1.3 TDD
	Config 3		CCR.2.2 TDD

SSB Configuration	Config 1,2,4		SSB.1 FR1
	Config 3		SSB.1 RedCap FR1
SMTC Configuration			SMTC.1
PDSCH/PDCCH subcarrier spacing	Config 1,2,4		15 kHz
	Config 3		30 kHz
TRS configuration	Config 1,4		TRS.1.1 FDD
	Config 2		TRS.1.1 TDD
	Config 3		TRS.1.2 TDD
CSI-RS for RLM	Config 1,4		Resource #4 in TRS.1.1 FDD
	Config 2		Resource #4 in TRS.1.1 TDD
	Config 3		Resource #4 in TRS.1.2 TDD
TCI configuration for PDCCH/PDSCH			TCI.State.2
OCNG parameters			OP.1
CP length			Normal
Correlation Matrix and Antenna Configuration			2x1 Low
Out of sync transmission parameters	DCI format		1-0
	Number of Control OFDM symbols		2
	Aggregation level	CCE	16
	Ratio of hypothetical PDCCH RE energy to average CSI-RS RE energy	dB	4
	Ratio of hypothetical PDCCH DMRS energy to average CSI-RS RE energy	dB	4
	DMRS precoder granularity		REG bundle size
	REG bundle size		6
DRX			OFF
Gap pattern ID			gp0
Layer 3 filtering			Enabled
T310 timer		ms	0
T311 timer		ms	1000
N310			1
N311			1
CSI-RS configuration	Config 1,4		CSI-RS.1.1 FDD
	Config 2		CSI-RS.1.1 TDD
	Config 3		CSI-RS.2.1 TDD
T1		s	0.2
T2		s	0.8
T3		s	0.88
D1		s	0.84
Note 1: UE-specific PDCCH is not transmitted after T1 starts.			

16.5.1.9.4.2 Test procedure

Same as the test procedure given in clause 6.5.1.5.4.2.

16.5.1.9.4.3 Message contents

Same as the message contents given in clause 6.5.1.5.4.3.

16.5.1.9.5 Test requirement

Same as the test requirements given in clause 6.5.1.5.5 with following exceptions:

- Table 6.5.1.5.5-1 is replaced by Table 16.5.1.9.5-1.

Table 16.5.1.9.5-1: Cell specific test parameters

Parameter	Unit	Test 1		
		T1	T2	T3
EPRE ratio of PDCCH DMRS to SSS	dB	4		
EPRE ratio of PDCCH to PDCCH DMRS	dB			
EPRE ratio of PBCH DMRS to SSS	dB	0		
EPRE ratio of PBCH to PBCH DMRS	dB			

EPRE ratio of PBCH to PBCH DMRS	dB			
EPRE ratio of PDSCH DMRS to SSS	dB			
EPRE ratio of PDSCH to PDSCH DMRS	dB			
EPRE ratio of OCNG DMRS to SSS	dB			
EPRE ratio of OCNG to OCNG DMRS	dB			
SNR on RLM-RS	dB	1	-7	-15
N_{oc}	dBm/15KHz	-98		
Propagation condition		TDL-C 300ns 100Hz		

Note 1: OCNG shall be used such that the resources in Cell 1 are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.
Note 2: The uplink resources for CSI reporting are assigned to the UE prior to the start of time period T1.
Note 3: NZP CSI-RS resource set configuration for CSI reporting are assigned to the UE prior to the start of time period T1.
Note 4: Measurement gap configuration is assigned to the UE prior to the start of time period T1.
Note 5: The timers and layer 3 filtering related parameters are configured prior to the start of time period T1.
Note 6: The signal contains PDCCH for UEs other than the device under test as part of OCNG.
Note 7: SNR levels correspond to the signal to noise ratio over the SSS REs.
Note 8: The SNR in time periods T1, T2 and T3 is denoted as SNR1, SNR2 and SNR3 respectively in figure 6.5.1.5.4-1.

16.5.1.10 NR SA FR1 Radio Link Monitoring Out-of-sync Test for FR1 PCell configured with CSI-RS-based RLM in non-DRX mode for 2 Rx UE

16.5.1.10.1 Test purpose

To verify that the UE properly detects the out of sync for the purpose of monitoring downlink CSI-RS based radio link quality of the PCell when no DRX is used for 2 Rx RedCap UE. This test will partly verify the FR1 PCell CSI-RS Out-of-sync radio link monitoring requirements in 38.133 [6] clause 8.1B.3.

16.5.1.10.2 Test applicability

This test applies to all types of NR RedCap UE with 2 Rx from Release 17 onwards supporting CSI-RS based RLM.

16.5.1.10.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 16.5.1.0.1 and 16.5.1.0.3.

The normative reference for this requirement is TS 38.133 [6] clause A.16.5.1.10.

16.5.1.10.4 Test description

Same as the test description given in clause 6.5.1.5.4.

16.5.1.10.4.1 Initial conditions

Same as the initial conditions given in clause 6.5.1.5.4.1 with following exceptions:

- Table 6.5.1.5.4.1-1 is replaced by Table 16.5.1.10.4.1-1.
- Table 6.5.1.5.4.1-2 is replaced by Table 16.5.1.10.4.1-2.
- Table 6.5.1.5.4.1-3 is replaced by Table 16.5.1.10.4.1-3.

Table 16.5.1.10.4.1-1: Supported test configurations

Configuration	Description
16.5.1.10-1	15 kHz SSB SCS, 15 kHz data SCS, 10 MHz bandwidth, FDD duplex mode
16.5.1.10-2	15 kHz SSB SCS, 15 kHz data SCS, 10 MHz bandwidth, TDD duplex mode
16.5.1.10-3	30 kHz SSB SCS, 30 kHz data SCS, 20 MHz bandwidth, TDD duplex mode
16.5.1.10-4	15 kHz SSB SCS, 15 kHz data SCS, 10 MHz bandwidth, HD-FDD duplex mode
Note: The UE is only required to pass in one of the supported test configurations in FR1	

Table 16.5.1.10.4.1-2: Initial conditions

Parameter	Value		Comment
Test environment	NC		As specified in TS 38.508-1 [14] clause 4.1.
Test frequencies	As specified in Annex E, Table E.14-1 and TS 38.508-1 [14] clause 4.3.1.		
Channel bandwidth	As specified by the test configuration selected from Table 16.5.1.10.4.1-1.		
Propagation conditions	AWGN		As specified in Annex C.2.2
Connection Diagram	TE Part	A.3.1.8.2	As specified in TS 38.508-1 [14] Annex A.
	DUT Part	A.3.2.3.4	
Exceptions to connection diagram			

Table 16.5.1.10.4.1-3: General test parameters

Parameter		Unit	Value
			Test 1
Active PCell			Cell 1
RF Channel Number			1
Duplex mode	Config 1		FDD
	Config 2,3		TDD
	Config 4		HD-FDD
TDD Configuration	Config 1,4		Not Applicable
	Config 2		TDDConf.1.1
	Config 3		TDDConf.2.1
DL initial BWP configuration			DLBWP.0.1
DL dedicated BWP configuration			DLBWP.1.1
UL initial BWP configuration			ULBWP.0.1
UL dedicated BWP configuration			ULBWP.1.1
RMSI CORESET Reference Channel	Config 1,4		CR.1.1 FDD
	Config 2		CR.1.1 TDD
	Config 3		CR.2.1 TDD
Dedicated CORESET Reference Channel	Config 1,4		CCR.1.3 FDD
	Config 2		CCR.1.3 TDD
	Config 3		CCR.2.2 TDD
SSB Configuration	Config 1,2,4		SSB.1 FR1
	Config 3		SSB.1 RedCap FR1
SMTC Configuration			SMTC.1
PDSCH/PDCCH subcarrier spacing	Config 1,2,4		15 kHz
	Config 3		30 kHz
TRS configuration	Config 1,4		TRS.1.1 FDD
	Config 2		TRS.1.1 TDD
	Config 3		TRS.1.2 TDD
CSI-RS for RLM	Config 1,4		Resource #4 in TRS.1.1 FDD
	Config 2		Resource #4 in TRS.1.1 TDD
	Config 3		Resource #4 in TRS.1.2 TDD
TCI configuration for PDCCH/PDSCH			TCI.State.2
OCNG parameters			OP.1
CP length			Normal
Correlation Matrix and Antenna Configuration			2x2 Low
Out of sync transmission parameters	DCI format		1-0
	Number of Control OFDM symbols		2
	Aggregation level	CCE	8
	Ratio of hypothetical PDCCH RE energy to average CSI-RS RE energy	dB	4
	Ratio of hypothetical PDCCH DMRS energy to average CSI-RS RE energy	dB	4
	DMRS precoder granularity		REG bundle size
	REG bundle size		6
DRX			OFF
Gap pattern ID			gp0

Layer 3 filtering			Enabled
T310 timer		ms	0
T311 timer		ms	1000
N310			1
N311			1
CSI-RS configuration	Config 1,4		CSI-RS.1.1 FDD
	Config 2		CSI-RS.1.1 TDD
	Config 3		CSI-RS.2.1 TDD
T1		s	0.2
T2		s	0.48
T3		s	0.48
D1		s	0.44
Note 1: UE-specific PDCCH is not transmitted after T1 starts.			

16.5.1.10.4.2 Test procedure

Same as the test procedure given in clause 6.5.1.5.4.2.

16.5.1.10.4.3 Message contents

Same as the message contents given in clause 6.5.1.5.4.3.

16.5.1.10.5 Test requirement

Same as the test requirements given in clause 6.5.1.5.5 with following exceptions:

- Table 6.5.1.5.5-1 is replaced by Table 16.5.1.10.5-1.

Table 16.5.1.10.5-1: Cell specific test parameters

Parameter	Unit	Test 1		
		T1	T2	T3
EPRE ratio of PDCCH DMRS to SSS	dB	4		
EPRE ratio of PDCCH to PDCCH DMRS	dB			
EPRE ratio of PBCH DMRS to SSS	dB	0		
EPRE ratio of PBCH to PBCH DMRS	dB			
EPRE ratio of PBCH to PBCH DMRS	dB			
EPRE ratio of PDSCH DMRS to SSS	dB			
EPRE ratio of PDSCH to PDSCH DMRS	dB			
EPRE ratio of OCNG DMRS to SSS	dB			
EPRE ratio of OCNG to OCNG DMRS	dB			
SNR on RLM-RS	dB	1.8	-6.2	-15.8
N_{OC}	dBm/15KHz	-98		
Propagation condition		TDL-C 300ns 100Hz		

Note 1: OCNG shall be used such that the resources in Cell 1 are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.
Note 2: The uplink resources for CSI reporting are assigned to the UE prior to the start of time period T1.
Note 3: NZP CSI-RS resource set configuration for CSI reporting are assigned to the UE prior to the start of time period T1.
Note 4: Measurement gap configuration is assigned to the UE prior to the start of time period T1.
Note 5: The timers and layer 3 filtering related parameters are configured prior to the start of time period T1.
Note 6: The signal contains PDCCH for UEs other than the device under test as part of OCNG.
Note 7: SNR levels correspond to the signal to noise ratio over the SSS REs.
Note 8: The SNR in time periods T1, T2 and T3 is denoted as SNR1, SNR2 and SNR3 respectively in figure 6.5.1.5.4-1.
Note 9: The SNR values are specified for testing a UE which supports 2RX on at least one band.

16.5.1.11 NR SA FR1 Radio Link Monitoring In-sync Test for FR1 PCell configured with CSI-RS-based RLM in non-DRX mode for 1 Rx UE

Editor's note: This test cases is incomplete in following aspects:

- TT analysis is still missing

16.5.1.11.1 Test purpose

To verify that the UE properly detects the in sync for the purpose of monitoring downlink CSI-RS based radio link quality of the PCell when no DRX is used. This test will partly verify the FR1 PCell CSI-RS In-sync radio link monitoring requirements in 38.133 [6] clause 8.1B.3.

16.5.1.11.2 Test applicability

This test applies to all types of NR RedCap UE with 1 Rx from Release 17 onwards supporting CSI-RS based RLM.

16.5.1.11.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 16.5.1.0.1 and 16.5.1.0.3.

The normative reference for this requirement is TS 38.133 [6] clause A.16.5.1.11.

16.5.1.11.4 Test description

Same as the test description given in clause 6.5.1.6.4.

16.5.1.11.4.1 Initial conditions

Same as the initial conditions given in clause 6.5.1.6.4.1 with following exceptions:

- Table 6.5.1.6.4.1-1 is replaced by Table 16.5.1.11.4.1-1.
- Table 6.5.1.6.4.1-2 is replaced by Table 16.5.1.11.4.1-2.
- Table 6.5.1.6.4.1-3 is replaced by Table 16.5.1.11.4.1-3.

Table 16.5.1.11.4.1-1: Supported test configurations

Configuration	Description
16.5.1.11-1	15 kHz SSB SCS, 15 kHz data SCS, 10 MHz bandwidth, FDD duplex mode
16.5.1.11-2	15 kHz SSB SCS, 15 kHz data SCS, 10 MHz bandwidth, TDD duplex mode
16.5.1.11-3	30 kHz SSB SCS, 30 kHz data SCS, 20 MHz bandwidth, TDD duplex mode
16.5.1.11-4	15 kHz SSB SCS, 15 kHz data SCS, 10 MHz bandwidth, HD-FDD duplex mode
Note: The UE is only required to pass in one of the supported test configurations in FR1	

Table 16.5.1.11.4.1-2: Initial conditions

Parameter	Value		Comment
Test environment	NC		As specified in TS 38.508-1 [14] clause 4.1.
Test frequencies	As specified in Annex E, Table E.14-1 and TS 38.508-1 [14] clause 4.3.1.		
Channel bandwidth	As specified by the test configuration selected from Table 16.5.1.11.4.1-1.		
Propagation conditions	AWGN		As specified in Annex C.2.2
Connection Diagram	TE Part	A.3.1.8.1	As specified in TS 38.508-1 [14] Annex A.
	DUT Part	A.3.2.2.1	
Exceptions to connection diagram			

Table 16.5.1.11.4.1-3: General test parameters

Parameter	Unit	Value
		Test 1
Active PCell		Cell 1

RF Channel Number			1
Duplex mode	Config 1		FDD
	Config 2,3		TDD
	Config 4		HD-FDD
TDD Configuration	Config 1,4		Not Applicable
	Config 2		TDDConf.1.1
	Config 3		TDDConf.2.1
DL initial BWP configuration			DLBWP.0.1
DL dedicated BWP configuration			DLBWP.1.1
UL initial BWP configuration			ULBWP.0.1
UL dedicated BWP configuration			ULBWP.1.1
RMSI CORESET Reference Channel	Config 1,4		CR.1.1 FDD
	Config 2		CR.1.1 TDD
	Config 3		CR.2.1 TDD
Dedicated CORESET Reference Channel	Config 1,4		CCR.1.1 FDD
	Config 2		CCR.1.1 TDD
	Config 3		CCR.2.1 TDD
SSB Configuration	Config 1,2,4		SSB.1 FR1
	Config 3		SSB.1 RedCap FR1
SMTC Configuration			SMTC.1
PDSCH/PDCCH subcarrier spacing	Config 1,2,4		15 kHz
	Config 3		30 kHz
TRS configuration	Config 1,4		TRS.1.1 FDD
	Config 2		TRS.1.1 TDD
	Config 3		TRS.1.2 TDD
CSI-RS for RLM	Config 1,4		Resource #4 in TRS.1.1 FDD
	Config 2		Resource #4 in TRS.1.1 TDD
	Config 3		Resource #4 in TRS.1.2 TDD
TCI configuration for PDCCH/PDSCH			TCI.State.2
OCNG parameters			OP.1
CP length			Normal
Correlation Matrix and Antenna Configuration			2x1 Low
Out of sync transmission parameters	DCI format		1-0
	Number of Control OFDM symbols		2
	Aggregation level	CCE	16
	Ratio of hypothetical PDCCH RE energy to average CSI-RS RE energy	dB	4
	Ratio of hypothetical PDCCH DMRS energy to average CSI-RS RE energy	dB	4
	DMRS precoder granularity		REG bundle size
	REG bundle size		6
In sync transmission parameters	DCI format		1-0
	Number of Control OFDM symbols		2
	Aggregation level	CCE	8
	Ratio of hypothetical PDCCH RE energy to average CSI-RS RE energy	dB	0
	Ratio of hypothetical PDCCH DMRS energy to average CSI-RS RE energy	dB	0
	DMRS precoder granularity		REG bundle size
	REG bundle size		6
DRX			OFF
Gap pattern ID			N.A
Layer 3 filtering			Enabled
T310 timer		ms	2000
T311 timer		ms	1000
N310			1
N311			1
CSI-RS configuration	Config 1,4		CSI-RS.1.1 FDD
	Config 2		CSI-RS.1.1 TDD
	Config 3		CSI-RS.2.1 TDD
T1		s	0.2
T2		s	0.2
T3		s	0.88
T4		s	0.2

T5	s	0.88
T6	s	0.24
Note 1: UE-specific PDCCH is not transmitted after T1 starts.		

16.5.1.11.4.2 Test procedure

Same as the test procedure given in clause 6.5.1.6.4.2.

16.5.1.11.4.3 Message contents

Same as the message contents given in clause 6.5.1.6.4.3.

16.5.1.11.5 Test requirement

Same as the test requirements given in clause 6.5.1.6.5 with following exceptions:

- Table 6.5.1.6.5-1 is replaced by Table 16.5.1.11.5-1.

Table 16.5.1.11.5-1: Cell specific test parameters

Parameter	Unit	Test 1				
		T1	T2	T3	T4	T5
EPRE ratio of PDCCH DMRS to SSS	dB	4				
EPRE ratio of PDCCH to PDCCH DMRS	dB					
EPRE ratio of PBCH DMRS to SSS	dB	0				
EPRE ratio of PBCH to PBCH DMRS	dB					
EPRE ratio of PSS to SSS	dB					
EPRE ratio of PDSCH DMRS to SSS	dB					
EPRE ratio of PDSCH to PDSCH DMRS	dB					
EPRE ratio of OCNG DMRS to SSS	dB					
EPRE ratio of OCNG to OCNG DMRS	dB					
SNR on RLM-RS	dB	1	-7	-15	-4.5	1
N_{oc}	dBm/15kHz	-98				
Propagation condition		TDL-C 300ns 100Hz				

Note 1: OCNG shall be used such that the resources in Cell 1 are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.
Note 2: The uplink resources for CSI reporting are assigned to the UE prior to the start of time period T1.
Note 3: NZP CSI-RS resource set configuration for CSI reporting are assigned to the UE prior to the start of time period T1.
Note 4: Measurement gap configuration is assigned to the UE prior to the start of time period T1.
Note 5: The timers and layer 3 filtering related parameters are configured prior to the start of time period T1.
Note 6: The signal contains PDCCH for UEs other than the device under test as part of OCNG.
Note 7: SNR levels correspond to the signal to noise ratio over the SSS REs.
Note 8: The SNR in time periods T1, T2, T3, T4 and T5 is denoted as SNR1, SNR2, SNR3, SNR4 and SNR5 respectively in figure 6.5.1.6.4-1.

16.5.1.12 NR SA FR1 Radio Link Monitoring In-sync Test for FR1 PCell configured with CSI-RS-based RLM in non-DRX mode for 2 Rx UE

16.5.1.12.1 Test purpose

To verify that the UE properly detects the in sync for the purpose of monitoring downlink CSI-RS based radio link quality of the PCell when no DRX is used. This test will partly verify the FR1 PCell CSI-RS In-sync radio link monitoring requirements in 38.133 [6] clause 8.1B.3.

16.5.1.12.2 Test applicability

This test applies to all types of NR RedCap UE with 2 Rx from Release 17 onwards supporting CSI-RS based RLM.

16.5.1.12.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 16.5.1.0.1 and 16.5.1.0.3.

The normative reference for this requirement is TS 38.133 [6] clause A.16.5.1.12.

16.5.1.12.4 Test description

Same as the test description given in clause 6.5.1.6.4.

16.5.1.12.4.1 Initial conditions

Same as the initial conditions given in clause 6.5.1.6.4.1 with following exceptions:

- Table 6.5.1.6.4.1-1 is replaced by Table 16.5.1.12.4.1-1.
- Table 6.5.1.6.4.1-2 is replaced by Table 16.5.1.12.4.1-2.
- Table 6.5.1.6.4.1-3 is replaced by Table 16.5.1.12.4.1-3.

Table 16.5.1.12.4.1-1: Supported test configurations

Configuration	Description
16.5.1.12-1	15 kHz SSB SCS, 15 kHz data SCS, 10 MHz bandwidth, FDD duplex mode
16.5.1.12-2	15 kHz SSB SCS, 15 kHz data SCS, 10 MHz bandwidth, TDD duplex mode
16.5.1.12-3	30 kHz SSB SCS, 30 kHz data SCS, 20 MHz bandwidth, TDD duplex mode
16.5.1.12-4	15 kHz SSB SCS, 15 kHz data SCS, 10 MHz bandwidth, HD-FDD duplex mode
Note: The UE is only required to pass in one of the supported test configurations in FR1	

Table 16.5.1.12.4.1-2: Initial conditions

Parameter	Value		Comment
Test environment	NC		As specified in TS 38.508-1 [14] clause 4.1.
Test frequencies	As specified in Annex E, Table E.14-1 and TS 38.508-1 [14] clause 4.3.1.		
Channel bandwidth	As specified by the test configuration selected from Table 16.5.1.12.4.1-1.		
Propagation conditions	AWGN		As specified in Annex C.2.2
Connection Diagram	TE Part	A.3.1.8.2	As specified in TS 38.508-1 [14] Annex A.
	DUT Part	A.3.2.3.4	
Exceptions to connection diagram			

Table 16.5.1.12.4.1-3: General test parameters

Parameter		Unit	Value
			Test 1
Active PCell			Cell 1
RF Channel Number			1
Duplex mode	Config 1		FDD
	Config 2,3		TDD
	Config 4		HD-FDD
TDD Configuration	Config 1,4		Not Applicable
	Config 2		TDDConf.1.1
	Config 3		TDDConf.2.1
DL initial BWP configuration			DLBWP.0.1
DL dedicated BWP configuration			DLBWP.1.1
UL initial BWP configuration			ULBWP.0.1
UL dedicated BWP configuration			ULBWP.1.1
RMSI CORESET Reference Channel	Config 1,4		CR.1.1 FDD
	Config 2		CR.1.1 TDD
	Config 3		CR.2.1 TDD

Dedicated CORESET Reference Channel	Config 1,4		CCR.1.1 FDD
	Config 2		CCR.1.1 TDD
	Config 3		CCR.2.1 TDD
SSB Configuration	Config 1,2,4		SSB.1 FR1
	Config 3		SSB.1 RedCap FR1
SMTC Configuration			SMTC.1
PDSCH/PDCCH subcarrier spacing	Config 1,2,4		15 kHz
	Config 3		30 kHz
TRS configuration	Config 1,4		TRS.1.1 FDD
	Config 2		TRS.1.1 TDD
	Config 3		TRS.1.2 TDD
CSI-RS for RLM	Config 1,4		Resource #4 in TRS.1.1 FDD
	Config 2		Resource #4 in TRS.1.1 TDD
	Config 3		Resource #4 in TRS.1.2 TDD
TCI configuration for PDCCH/PDSCH			TCI.State.2
OCNG parameters			OP.1
CP length			Normal
Correlation Matrix and Antenna Configuration			2x2 Low
Out of sync transmission parameters	DCI format		1-0
	Number of Control OFDM symbols		2
	Aggregation level	CCE	8
	Ratio of hypothetical PDCCH RE energy to average CSI-RS RE energy	dB	4
	Ratio of hypothetical PDCCH DMRS energy to average CSI-RS RE energy	dB	4
	DMRS precoder granularity		REG bundle size
	REG bundle size		6
In sync transmission parameters	DCI format		1-0
	Number of Control OFDM symbols		2
	Aggregation level	CCE	4
	Ratio of hypothetical PDCCH RE energy to average CSI-RS RE energy	dB	0
	Ratio of hypothetical PDCCH DMRS energy to average CSI-RS RE energy	dB	0
	DMRS precoder granularity		REG bundle size
	REG bundle size		6
DRX			OFF
Gap pattern ID			N.A
Layer 3 filtering			Enabled
T310 timer		ms	1000
T311 timer		ms	1000
N310			1
N311			1
CSI-RS configuration	Config 1,4		CSI-RS.1.1 FDD
	Config 2		CSI-RS.1.1 TDD
	Config 3		CSI-RS.2.1 TDD
T1		s	0.2
T2		s	0.2
T3		s	0.44
T4		s	0.2
T5		s	0.88
T6		s	0.24
Note 1: UE-specific PDCCH is not transmitted after T1 starts.			

16.5.1.12.4.2 Test procedure

Same as the test procedure given in clause 6.5.1.6.4.2.

16.5.1.12.4.3 Message contents

Same as the message contents given in clause 6.5.1.6.4.3.

16.5.1.12.5 Test requirement

Same as the test requirements given in clause 6.5.1.6.5 with following exceptions:

- Table 6.5.1.6.5-1 is replaced by Table 16.5.1.12.5-1.

Table 16.5.1.12.5-1: Cell specific test parameters

Parameter	Unit	Test 1				
		T1	T2	T3	T4	T5
EPRE ratio of PDCCH DMRS to SSS	dB	4				
EPRE ratio of PDCCH to PDCCH DMRS	dB					
EPRE ratio of PBCH DMRS to SSS	dB	0				
EPRE ratio of PBCH to PBCH DMRS	dB					
EPRE ratio of PSS to SSS	dB					
EPRE ratio of PDSCH DMRS to SSS	dB					
EPRE ratio of PDSCH to PDSCH DMRS	dB					
EPRE ratio of OCNG DMRS to SSS	dB					
EPRE ratio of OCNG to OCNG DMRS	dB					
SNR on RLM-RS	dB	1.8	-6.2	-15.8	-5.3	1.8
N_{oc}	dBm/15kHz	-98				
Propagation condition		TDL-C 300ns 100Hz				

Note 1: OCNG shall be used such that the resources in Cell 1 are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.
Note 2: The uplink resources for CSI reporting are assigned to the UE prior to the start of time period T1.
Note 3: NZP CSI-RS resource set configuration for CSI reporting are assigned to the UE prior to the start of time period T1.
Note 4: Measurement gap configuration is assigned to the UE prior to the start of time period T1.
Note 5: The timers and layer 3 filtering related parameters are configured prior to the start of time period T1.
Note 6: The signal contains PDCCH for UEs other than the device under test as part of OCNG.
Note 7: SNR levels correspond to the signal to noise ratio over the SSS REs.
Note 8: The SNR in time periods T1, T2, T3, T4 and T5 is denoted as SNR1, SNR2, SNR3, SNR4 and SNR5 respectively in figure 6.5.1.6.4-1.
Note 9: The SNR values are specified for testing a UE which supports 2RX on at least one band.

16.5.1.13 NR SA FR1 Radio Link Monitoring Out-of-sync Test for FR1 PCell configured with CSI-RS-based RLM in non-DRX mode for 1 Rx UE

Editor's note: This test cases is incomplete in following aspects:

- TT analysis is still missing

16.5.1.13.1 Test purpose

To verify that the UE properly detects the out of sync for the purpose of monitoring downlink CSI-RS based radio link quality of the PCell when DRX is used for 1 Rx RedCap UE. This test will partly verify the FR1 PCell CSI-RS Out-of-sync radio link monitoring requirements in 38.133 [6] clause 8.1B.3.

16.5.1.13.2 Test applicability

This test applies to all types of NR RedCap UE with 1 Rx from Release 17 onwards supporting CSI-RS based RLM and long DRX cycle.

16.5.1.13.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 16.5.1.0.1 and 16.5.1.0.3.

The normative reference for this requirement is TS 38.133 [6] clause A.16.5.1.13.

16.5.1.13.4 Test description

Same as the test description given in clause 6.5.1.7.4.

16.5.1.13.4.1 Initial conditions

Same as the initial conditions given in clause 6.5.1.7.4.1 with following exceptions:

- Table 6.5.1.7.4.1-1 is replaced by Table 16.5.1.13.4.1-1.
- Table 6.5.1.7.4.1-2 is replaced by Table 16.5.1.13.4.1-2.
- Table 6.5.1.7.4.1-3 is replaced by Table 16.5.1.13.4.1-3.

Table 16.5.1.13.4.1-1: Supported test configurations

Configuration	Description
16.5.1.13-1	15 kHz SSB SCS, 15 kHz data SCS, 10 MHz bandwidth, FDD duplex mode
16.5.1.13-2	15 kHz SSB SCS, 15 kHz data SCS, 10 MHz bandwidth, TDD duplex mode
16.5.1.13-3	30 kHz SSB SCS, 30 kHz data SCS, 20 MHz bandwidth, TDD duplex mode
16.5.1.13-4	15 kHz SSB SCS, 15 kHz data SCS, 10 MHz bandwidth, HD-FDD duplex mode
Note: The UE is only required to pass in one of the supported test configurations in FR1	

Table 16.5.1.13.4.1-2: Initial conditions

Parameter	Value		Comment
Test environment	NC		As specified in TS 38.508-1 [14] clause 4.1.
Test frequencies	As specified in Annex E, Table E.14-1 and TS 38.508-1 [14] clause 4.3.1.		
Channel bandwidth	As specified by the test configuration selected from Table 16.5.1.13.4.1-1.		
Propagation conditions	AWGN		As specified in Annex C.2.2
Connection Diagram	TE Part	A.3.1.8.1	As specified in TS 38.508-1 [14] Annex A.
	DUT Part	A.3.2.2.1	
Exceptions to connection diagram			

Table 16.5.1.13.4.1-3: General test parameters

Parameter		Unit	Value
			Test 1
Active PCell			Cell 1
RF Channel Number			1
Duplex mode	Config 1		FDD
	Config 2,3		TDD
	Config 4		HD-FDD
TDD Configuration	Config 1,4		Not Applicable
	Config 2		TDDConf.1.1
	Config 3		TDDConf.2.1
DL initial BWP configuration			DLBWP.0.1
DL dedicated BWP configuration			DLBWP.1.1
UL initial BWP configuration			ULBWP.0.1
UL dedicated BWP configuration			ULBWP.1.1
RMSI CORESET Reference Channel	Config 1,4		CR.1.1 FDD
	Config 2		CR.1.1 TDD
	Config 3		CR.2.1 TDD
Dedicated CORESET Reference Channel	Config 1,4		CCR.1.3 FDD
	Config 2		CCR.1.3 TDD
	Config 3		CCR.2.2 TDD
SSB Configuration	Config 1,2,4		SSB.1 FR1
	Config 3		SSB.1 RedCap FR1
SMTC Configuration			SMTC.1
PDSCH/PDCCH subcarrier spacing	Config 1,2,4		15 kHz
	Config 3		30 kHz
TRS configuration	Config 1,4		TRS.1.1 FDD

	Config 2		TRS.1.1 TDD
	Config 3		TRS.1.2 TDD
CSI-RS for RLM	Config 1,4		Resource #4 in TRS.1.1 FDD
	Config 2		Resource #4 in TRS.1.1 TDD
	Config 3		Resource #4 in TRS.1.2 TDD
TCI configuration for PDCCH/PDSCH			TCI.State.2
OCNG parameters			OP.1
CP length			Normal
Correlation Matrix and Antenna Configuration			2x1 Low
Out of sync transmission parameters	DCI format		1-0
	Number of Control OFDM symbols		2
	Aggregation level	CCE	16
	Ratio of hypothetical PDCCH RE energy to average CSI-RS RE energy	dB	4
	Ratio of hypothetical PDCCH DMRS energy to average CSI-RS RE energy	dB	4
	DMRS precoder granularity		REG bundle size
	REG bundle size		6
DRX			DRX.3
Gap pattern ID			N.A
Layer 3 filtering			Enabled
T310 timer		ms	0
T311 timer		ms	1000
N310			1
N311			1
CSI-RS configuration	Config 1,4		CSI-RS.1.1 FDD
	Config 2		CSI-RS.1.1 TDD
	Config 3		CSI-RS.2.1 TDD
T1		s	0.2
T2		s	2.24
T3		s	2.28
D1		s	2.24
Note 1: UE-specific PDCCH is not transmitted after T1 starts.			

16.5.1.13.4.2 Test procedure

Same as the test procedure given in clause 6.5.1.7.4.2.

16.5.1.13.4.3 Message contents

Same as the message contents given in clause 6.5.1.7.4.3.

16.5.1.13.5 Test requirement

Same as the test requirements given in clause 6.5.1.7.5 with following exceptions:

- Table 6.5.1.7.5-1 is replaced by Table 16.5.1.13.5-1.

Table 16.5.1.13.5-1: Cell specific test parameters

Parameter	Unit	Test 1		
		T1	T2	T3
EPRE ratio of PDCCH DMRS to SSS	dB	4		
EPRE ratio of PDCCH to PDCCH DMRS	dB			
EPRE ratio of PBCH DMRS to SSS	dB	0		
EPRE ratio of PBCH to PBCH DMRS	dB			
EPRE ratio of PBCH to PBCH DMRS	dB			
EPRE ratio of PDSCH DMRS to SSS	dB			
EPRE ratio of PDSCH to PDSCH DMRS	dB			
EPRE ratio of OCNG DMRS to SSS	dB			
EPRE ratio of OCNG to OCNG DMRS	dB			
SNR on RLM-RS	dB	1	-7	-15
N_{oc}	dBm/15KHz	-98		

Propagation condition		TDL-C 300ns 100Hz

Note 1: OCNG shall be used such that the resources in Cell 1 are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.
Note 2: The uplink resources for CSI reporting are assigned to the UE prior to the start of time period T1.
Note 3: NZP CSI-RS resource set configuration for CSI reporting are assigned to the UE prior to the start of time period T1.
Note 4: Measurement gap configuration is assigned to the UE prior to the start of time period T1.
Note 5: The timers and layer 3 filtering related parameters are configured prior to the start of time period T1.
Note 6: The signal contains PDCCH for UEs other than the device under test as part of OCNG.
Note 7: SNR levels correspond to the signal to noise ratio over the SSS REs.
Note 8: The SNR in time periods T1, T2 and T3 is denoted as SNR1, SNR2 and SNR3 respectively in figure 6.5.1.7.4-1.

16.5.1.14 NR SA FR1 Radio Link Monitoring Out-of-sync Test for FR1 PCell configured with CSI-RS-based RLM in DRX mode for 2 Rx UE

16.5.1.14.1 Test purpose

To verify that the UE properly detects the out of sync for the purpose of monitoring downlink CSI-RS based radio link quality of the PCell when DRX is used for 2 Rx RedCap UE. This test will partly verify the FR1 PCell CSI-RS Out-of-sync radio link monitoring requirements in 38.133 [6] clause 8.1B.3.

16.5.1.14.2 Test applicability

This test applies to all types of NR RedCap UE with 2 Rx from Release 17 onwards supporting CSI-RS based RLM and long DRX cycle.

16.5.1.14.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 16.5.1.0.1 and 16.5.1.0.3.

The normative reference for this requirement is TS 38.133 [6] clause A.16.5.1.14.

16.5.1.14.4 Test description

Same as the test description given in clause 6.5.1.7.4.

16.5.1.14.4.1 Initial conditions

Same as the initial conditions given in clause 6.5.1.7.4.1 with following exceptions:

- Table 6.5.1.7.4.1-1 is replaced by Table 16.5.1.14.4.1-1.
- Table 6.5.1.7.4.1-2 is replaced by Table 16.5.1.14.4.1-2.
- Table 6.5.1.7.4.1-3 is replaced by Table 16.5.1.14.4.1-3.

Table 16.5.1.14.4.1-1: Supported test configurations

Configuration	Description
16.5.1.14-1	15 kHz SSB SCS, 15 kHz data SCS, 10 MHz bandwidth, FDD duplex mode
16.5.1.14-2	15 kHz SSB SCS, 15 kHz data SCS, 10 MHz bandwidth, TDD duplex mode
16.5.1.14-3	30 kHz SSB SCS, 30 kHz data SCS, 20 MHz bandwidth, TDD duplex mode
16.5.1.14-4	15 kHz SSB SCS, 15 kHz data SCS, 10 MHz bandwidth, HD-FDD duplex mode
Note: The UE is only required to pass in one of the supported test configurations in FR1	

Table 16.5.1.14.4.1-2: Initial conditions

Parameter	Value	Comment
Test environment	NC	As specified in TS 38.508-1 [14] clause 4.1.
Test frequencies	As specified in Annex E, Table E.14-1 and TS 38.508-1 [14] clause 4.3.1.	

Channel bandwidth	As specified by the test configuration selected from Table 16.5.1.14.4.1-1.		
Propagation conditions	AWGN		As specified in Annex C.2.2
Connection Diagram	TE Part	A.3.1.8.2	As specified in TS 38.508-1 [14] Annex A.
	DUT Part	A.3.2.3.4	
Exceptions to connection diagram			

Table 16.5.1.14.4.1-3: General test parameters

Parameter			Unit	Value
				Test 1
Active PCell				Cell 1
RF Channel Number				1
Duplex mode		Config 1		FDD
		Config 2,3		TDD
		Config 4		HD-FDD
TDD Configuration		Config 1,4		Not Applicable
		Config 2		TDDConf.1.1
		Config 3		TDDConf.2.1
DL initial BWP configuration				DLBWP.0.1
DL dedicated BWP configuration				DLBWP.1.1
UL initial BWP configuration				ULBWP.0.1
UL dedicated BWP configuration				ULBWP.1.1
RMSI CORESET Reference Channel		Config 1,4		CR.1.1 FDD
		Config 2		CR.1.1 TDD
		Config 3		CR.2.1 TDD
Dedicated CORESET Reference Channel		Config 1,4		CCR.1.3 FDD
		Config 2		CCR.1.3 TDD
		Config 3		CCR.2.2 TDD
SSB Configuration		Config 1,2,4		SSB.1 FR1
		Config 3		SSB.1 RedCap FR1
SMTC Configuration				SMTC.1
PDSCH/PDCCH subcarrier spacing		Config 1,2,4		15 kHz
		Config 3		30 kHz
TRS configuration		Config 1,4		TRS.1.1 FDD
		Config 2		TRS.1.1 TDD
		Config 3		TRS.1.2 TDD
CSI-RS for RLM		Config 1,4		Resource #4 in TRS.1.1 FDD
		Config 2		Resource #4 in TRS.1.1 TDD
		Config 3		Resource #4 in TRS.1.2 TDD
TCI configuration for PDCCH/PDSCH				TCI.State.2
OCNG parameters				OP.1
CP length				Normal
Correlation Matrix and Antenna Configuration				2x2 Low
Out of sync transmission parameters	DCI format			1-0
	Number of Control OFDM symbols			2
	Aggregation level		CCE	8
	Ratio of hypothetical PDCCH RE energy to average CSI-RS RE energy		dB	4
	Ratio of hypothetical PDCCH DMRS energy to average CSI-RS RE energy		dB	4
	DMRS precoder granularity			REG bundle size
	REG bundle size			6
DRX				DRX.3
Gap pattern ID				N.A.
Layer 3 filtering				Enabled
T310 timer			ms	0
T311 timer			ms	1000
N310				1
N311				1

CSI-RS configuration	Config 1,4		CSI-RS.1.1 FDD
	Config 2		CSI-RS.1.1 TDD
	Config 3		CSI-RS.2.1 TDD
T1		s	0.2
T2		s	1.28
T3		s	1.28
D1		s	1.24
Note 1: UE-specific PDCCH is not transmitted after T1 starts.			

16.5.1.14.4.2 Test procedure

Same as the test procedure given in clause 6.5.1.7.4.2.

16.5.1.14.4.3 Message contents

Same as the message contents given in clause 6.5.1.7.4.3.

16.5.1.14.5 Test requirement

Same as the test requirements given in clause 6.5.1.7.5 with following exceptions:

- Table 6.5.1.7.5-1 is replaced by Table 16.5.1.14.5-1.

Table 16.5.1.14.5-1: Cell specific test parameters

Parameter	Unit	Test 1		
		T1	T2	T3
EPRE ratio of PDCCH DMRS to SSS	dB	4		
EPRE ratio of PDCCH to PDCCH DMRS	dB			
EPRE ratio of PBCH DMRS to SSS	dB	0		
EPRE ratio of PBCH to PBCH DMRS	dB			
EPRE ratio of PBCH to PBCH DMRS	dB			
EPRE ratio of PDSCH DMRS to SSS	dB			
EPRE ratio of PDSCH to PDSCH DMRS	dB			
EPRE ratio of OCNG DMRS to SSS	dB			
EPRE ratio of OCNG to OCNG DMRS	dB			
SNR on RLM-RS Config 1,2,3,4	dB	1.8	-6.2	-15.8
N_{oc}	dBm/15KHz	-98		
Propagation condition		TDL-C 300ns 100Hz		

Note 1: OCNG shall be used such that the resources in Cell 1 are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.
Note 2: The uplink resources for CSI reporting are assigned to the UE prior to the start of time period T1.
Note 3: NZP CSI-RS resource set configuration for CSI reporting are assigned to the UE prior to the start of time period T1.
Note 4: Measurement gap configuration is assigned to the UE prior to the start of time period T1.
Note 5: The timers and layer 3 filtering related parameters are configured prior to the start of time period T1.
Note 6: The signal contains PDCCH for UEs other than the device under test as part of OCNG.
Note 7: SNR levels correspond to the signal to noise ratio over the SSS REs.
Note 8: The SNR in time periods T1, T2 and T3 is denoted as SNR1, SNR2 and SNR3 respectively in figure 6.5.1.7.4-1.
Note 9: The SNR values are specified for testing a UE which supports 2RX on at least one band.

16.5.1.15 NR SA FR1 Radio Link Monitoring In-sync Test for FR1 PCell configured with CSI-RS-based RLM in DRX mode for 1 Rx UE

Editor's note: This test cases is incomplete in following aspects:

- TT analysis is still missing

16.5.1.15.1 Test purpose

To verify that the UE properly detects the in sync for the purpose of monitoring downlink CSI-RS based radio link quality of the PCell when DRX is used. This test will partly verify the FR1 PCell CSI-RS In-sync radio link monitoring requirements in 38.133 [6] clause 8.1B.3.

16.5.1.15.2 Test applicability

This test applies to all types of NR RedCap UE with 1 Rx from Release 17 onwards supporting CSI-RS based RLM and long DRX cycle.

16.5.1.15.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 16.5.1.0.1 and 16.5.1.0.3.

The normative reference for this requirement is TS 38.133 [6] clause A.16.5.1.15.

16.5.1.15.4 Test description

Same as the test description given in clause 6.5.1.8.4.

16.5.1.15.4.1 Initial conditions

Same as the initial conditions given in clause 6.5.1.8.4.1 with following exceptions:

- Table 6.5.1.8.4.1-1 is replaced by Table 16.5.1.15.4.1-1.
- Table 6.5.1.8.4.1-2 is replaced by Table 16.5.1.15.4.1-2.
- Table 6.5.1.8.4.1-3 is replaced by Table 16.5.1.15.4.1-3.

Table 16.5.1.15.4.1-1: Supported test configurations

Configuration	Description
16.5.1.15-1	15 kHz SSB SCS, 15 kHz data SCS, 10 MHz bandwidth, FDD duplex mode
16.5.1.15-2	15 kHz SSB SCS, 15 kHz data SCS, 10 MHz bandwidth, TDD duplex mode
16.5.1.15-3	30 kHz SSB SCS, 30 kHz data SCS, 20 MHz bandwidth, TDD duplex mode
16.5.1.15-4	15 kHz SSB SCS, 15 kHz data SCS, 10 MHz bandwidth, HD-FDD duplex mode
Note: The UE is only required to pass in one of the supported test configurations in FR1	

Table 16.5.1.15.4.1-2: Initial conditions

Parameter	Value		Comment
Test environment	NC		As specified in TS 38.508-1 [14] clause 4.1.
Test frequencies	As specified in Annex E, Table E.14-1 and TS 38.508-1 [14] clause 4.3.1.		
Channel bandwidth	As specified by the test configuration selected from Table 16.5.1.15.4.1-1.		
Propagation conditions	AWGN		As specified in Annex C.2.2
Connection Diagram	TE Part	A.3.1.8.1	As specified in TS 38.508-1 [14] Annex A.
	DUT Part	A.3.2.2.1	
Exceptions to connection diagram			

Table 16.5.1.15.4.1-3: General test parameters

Parameter		Unit	Value
			Test 1
Active PCell			Cell 1
RF Channel Number			1
Duplex mode	Config 1		FDD

		Config 2,3		TDD
		Config 4		HD-FDD
TDD Configuration		Config 1,4		Not Applicable
		Config 2		TDDConf.1.1
		Config 3		TDDConf.2.1
DL initial BWP configuration				DLBWP.0.1
DL dedicated BWP configuration				DLBWP.1.1
UL initial BWP configuration				ULBWP.0.1
UL dedicated BWP configuration				ULBWP.1.1
RMSI CORESET Reference Channel		Config 1,4		CR.1.1 FDD
		Config 2		CR.1.1 TDD
		Config 3		CR.2.1 TDD
Dedicated CORESET Reference Channel		Config 1,4		CCR.1.1 FDD
		Config 2		CCR.1.1 TDD
		Config 3		CCR.2.1 TDD
SSB Configuration		Config 1,2,4		SSB.1 FR1
		Config 3		SSB.1 RedCap FR1
SMTC Configuration				SMTC.1
PDSCH/PDCCH subcarrier spacing		Config 1,2,4		15 kHz
		Config 3		30 kHz
TRS configuration		Config 1,4		TRS.1.1 FDD
		Config 2		TRS.1.1 TDD
		Config 3		TRS.1.2 TDD
CSI-RS for RLM		Config 1,4		Resource #4 in TRS.1.1 FDD
		Config 2		Resource #4 in TRS.1.1 TDD
		Config 3		Resource #4 in TRS.1.2 TDD
TCI configuration for PDCCH/PDSCH				TCI.State.2
OCNG parameters				OP.1
CP length				Normal
Correlation Matrix and Antenna Configuration				2x1 Low
Out of sync transmission parameters	DCI format			1-0
	Number of Control OFDM symbols			2
	Aggregation level		CCE	16
	Ratio of hypothetical PDCCH RE energy to average CSI-RS RE energy		dB	4
	Ratio of hypothetical PDCCH DMRS energy to average CSI-RS RE energy		dB	4
	DMRS precoder granularity			REG bundle size
	REG bundle size			6
In sync transmission parameters	DCI format			1-0
	Number of Control OFDM symbols			2
	Aggregation level		CCE	8
	Ratio of hypothetical PDCCH RE energy to average CSI-RS RE energy		dB	0
	Ratio of hypothetical PDCCH DMRS energy to average CSI-RS RE energy		dB	0
	DMRS precoder granularity			REG bundle size
	REG bundle size			6
DRX				DRX.3
Gap pattern ID				gp0
Layer 3 filtering				Enabled
T310 timer			ms	4000
T311 timer			ms	1000
N310				1
N311				1
CSI-RS configuration		Config 1,4		CSI-RS.1.1 FDD
		Config 2		CSI-RS.1.1 TDD
		Config 3		CSI-RS.2.1 TDD
T1			s	0.2
T2			s	0.2
T3			s	2.28
T4			s	0.2
T5			s	1.2
T6			s	1
Note 1: UE-specific PDCCH is not transmitted after T1 starts.				

16.5.1.15.4.2 Test procedure

Same as the test procedure given in clause 6.5.1.8.4.2.

16.5.1.15.4.3 Message contents

Same as the message contents given in clause 6.5.1.8.4.3.

16.5.1.15.5 Test requirement

Same as the test requirements given in clause 6.5.1.8.5 with following exceptions:

- Table 6.5.1.8.5-1 is replaced by Table 16.5.1.15.5-1.

Table 16.5.1.15.5-1: Cell specific test parameters

Parameter	Unit	Test 1				
		T1	T2	T3	T4	T5
EPRE ratio of PDCCH DMRS to SSS	dB	4				
EPRE ratio of PDCCH to PDCCH DMRS	dB					
EPRE ratio of PBCH DMRS to SSS	dB	0				
EPRE ratio of PBCH to PBCH DMRS	dB					
EPRE ratio of PSS to SSS	dB					
EPRE ratio of PDSCH DMRS to SSS	dB					
EPRE ratio of PDSCH to PDSCH DMRS	dB					
EPRE ratio of OCNG DMRS to SSS	dB					
EPRE ratio of OCNG to OCNG DMRS	dB					
SNR on RLM-RS	dB	1	-7	-15	-4.5	1
N_{oc}	dBm/15kHz	-98				
Propagation condition		TDL-C 300ns 100Hz				

Note 1: OCNG shall be used such that the resources in Cell 1 are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.
Note 2: The uplink resources for CSI reporting are assigned to the UE prior to the start of time period T1.
Note 3: NZP CSI-RS resource set configuration for CSI reporting are assigned to the UE prior to the start of time period T1.
Note 4: Measurement gap configuration is assigned to the UE prior to the start of time period T1.
Note 5: The timers and layer 3 filtering related parameters are configured prior to the start of time period T1.
Note 6: The signal contains PDCCH for UEs other than the device under test as part of OCNG.
Note 7: SNR levels correspond to the signal to noise ratio over the SSS REs.
Note 8: The SNR in time periods T1, T2, T3, T4 and T5 is denoted as SNR1, SNR2, SNR3, SNR4 and SNR5 respectively in figure 6.5.1.8.4-1.

16.5.1.16 NR SA FR1 Radio Link Monitoring In-sync Test for FR1 PCell configured with CSI-RS-based RLM in DRX mode for 2 Rx UE

16.5.1.16.1 Test purpose

To verify that the UE properly detects the in sync for the purpose of monitoring downlink CSI-RS based radio link quality of the PCell when DRX is used. This test will partly verify the FR1 PCell CSI-RS In-sync radio link monitoring requirements in 38.133 [6] clause 8.1B.3.

16.5.1.16.2 Test applicability

This test applies to all types of NR RedCap UE with 2 Rx from Release 17 onwards supporting CSI-RS based RLM and long DRX cycle.

16.5.1.16.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 16.5.1.0.1 and 16.5.1.0.3.

The normative reference for this requirement is TS 38.133 [6] clause A.16.5.1.16.

16.5.1.16.4 Test description

Same as the test description given in clause 6.5.1.8.4.

16.5.1.16.4.1 Initial conditions

Same as the initial conditions given in clause 6.5.1.8.4.1 with following exceptions:

- Table 6.5.1.8.4.1-1 is replaced by Table 16.5.1.16.4.1-1.
- Table 6.5.1.8.4.1-2 is replaced by Table 16.5.1.16.4.1-2.
- Table 6.5.1.8.4.1-3 is replaced by Table 16.5.1.16.4.1-3.

Table 16.5.1.16.4.1-1: Supported test configurations

Configuration	Description
16.5.1.16-1	15 kHz SSB SCS, 15 kHz data SCS, 10 MHz bandwidth, FDD duplex mode
16.5.1.16-2	15 kHz SSB SCS, 15 kHz data SCS, 10 MHz bandwidth, TDD duplex mode
16.5.1.16-3	30 kHz SSB SCS, 30 kHz data SCS, 20 MHz bandwidth, TDD duplex mode
16.5.1.16-4	15 kHz SSB SCS, 15 kHz data SCS, 10 MHz bandwidth, HD-FDD duplex mode
Note: The UE is only required to pass in one of the supported test configurations in FR1	

Table 16.5.1.16.4.1-2: Initial conditions

Parameter	Value		Comment
Test environment	NC		As specified in TS 38.508-1 [14] clause 4.1.
Test frequencies	As specified in Annex E, Table E.14-1 and TS 38.508-1 [14] clause 4.3.1.		
Channel bandwidth	As specified by the test configuration selected from Table 16.5.1.16.4.1-1.		
Propagation conditions	AWGN		As specified in Annex C.2.2
Connection Diagram	TE Part	A.3.1.8.2	As specified in TS 38.508-1 [14] Annex A.
	DUT Part	A.3.2.3.4	
Exceptions to connection diagram			

Table 16.5.1.16.4.1-3: General test parameters

Parameter		Unit	Value
			Test 1
Active PCell			Cell 1
RF Channel Number			1
Duplex mode	Config 1		FDD
	Config 2,3		TDD
	Config 4		HD-FDD
TDD Configuration	Config 1,4		Not Applicable
	Config 2		TDDConf.1.1
	Config 3		TDDConf.2.1
DL initial BWP configuration			DLBWP.0.1
DL dedicated BWP configuration			DLBWP.1.1
UL initial BWP configuration			ULBWP.0.1
UL dedicated BWP configuration			ULBWP.1.1
RMSI CORESET Reference Channel	Config 1,4		CR.1.1 FDD
	Config 2		CR.1.1 TDD
	Config 3		CR.2.1 TDD
Dedicated CORESET Reference Channel	Config 1,4		CCR.1.1 FDD
	Config 2		CCR.1.1 TDD
	Config 3		CCR.2.1 TDD

SSB Configuration	Config 1,2,4		SSB.1 FR1
	Config 3		SSB.1 RedCap FR1
SMTC Configuration			SMTC.1
PDSCH/PDCCH subcarrier spacing	Config 1,2,4		15 kHz
	Config 3		30 kHz
TRS configuration	Config 1,4		TRS.1.1 FDD
	Config 2		TRS.1.1 TDD
	Config 3		TRS.1.2 TDD
CSI-RS for RLM	Config 1,4		Resource #4 in TRS.1.1 FDD
	Config 2		Resource #4 in TRS.1.1 TDD
	Config 3		Resource #4 in TRS.1.2 TDD
TCI configuration for PDCCH/PDSCH			TCI.State.2
OCNG parameters			OP.1
CP length			Normal
Correlation Matrix and Antenna Configuration			2x2 Low
Out of sync transmission parameters	DCI format		1-0
	Number of Control OFDM symbols		2
	Aggregation level	CCE	8
	Ratio of hypothetical PDCCH RE energy to average CSI-RS RE energy	dB	4
	Ratio of hypothetical PDCCH DMRS energy to average CSI-RS RE energy	dB	4
	DMRS precoder granularity		REG bundle size
	REG bundle size		6
In sync transmission parameters	DCI format		1-0
	Number of Control OFDM symbols		2
	Aggregation level	CCE	4
	Ratio of hypothetical PDCCH RE energy to average CSI-RS RE energy	dB	0
	Ratio of hypothetical PDCCH DMRS energy to average CSI-RS RE energy	dB	0
	DMRS precoder granularity		REG bundle size
	REG bundle size		6
DRX			DRX.3
Gap pattern ID			gp0
Layer 3 filtering			Enabled
T310 timer		ms	3000
T311 timer		ms	1000
N310			1
N311			1
CSI-RS configuration	Config 1,4		CSI-RS.1.1 FDD
	Config 2		CSI-RS.1.1 TDD
	Config 3		CSI-RS.2.1 TDD
T1		s	0.2
T2		s	0.2
T3		s	1.24
T4		s	0.2
T5		s	1.88
T6		s	1
Note 1: UE-specific PDCCH is not transmitted after T1 starts.			

16.5.1.16.4.2 Test procedure

Same as the test procedure given in clause 6.5.1.8.4.2.

16.5.1.16.4.3 Message contents

Same as the message contents given in clause 6.5.1.8.4.3.

16.5.1.16.5 Test requirement

Same as the test requirements given in clause 6.5.1.8.5 with following exceptions:

- Table 6.5.1.8.5-1 is replaced by Table 16.5.1.16.5-1.

Table 16.5.1.16.5-1: Cell specific test parameters

Parameter	Unit	Test 1				
		T1	T2	T3	T4	T5
EPRE ratio of PDCCH DMRS to SSS	dB	4				
EPRE ratio of PDCCH to PDCCH DMRS	dB					
EPRE ratio of PBCH DMRS to SSS	dB	0				
EPRE ratio of PBCH to PBCH DMRS	dB					
EPRE ratio of PSS to SSS	dB					
EPRE ratio of PDSCH DMRS to SSS	dB					
EPRE ratio of PDSCH to PDSCH DMRS	dB					
EPRE ratio of OCNG DMRS to SSS	dB					
EPRE ratio of OCNG to OCNG DMRS	dB					
SNR on RLM-RS	dB	1.8	-6.2	-15.8	-5.3	1.8
N_{oc}	dBm/15kHz	-98				
Propagation condition		TDL-C 300ns 100Hz				

Note 1: OCNG shall be used such that the resources in Cell 1 are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.
Note 2: The uplink resources for CSI reporting are assigned to the UE prior to the start of time period T1.
Note 3: NZP CSI-RS resource set configuration for CSI reporting are assigned to the UE prior to the start of time period T1.
Note 4: Measurement gap configuration is assigned to the UE prior to the start of time period T1.
Note 5: The timers and layer 3 filtering related parameters are configured prior to the start of time period T1.
Note 6: The signal contains PDCCH for UEs other than the device under test as part of OCNG.
Note 7: SNR levels correspond to the signal to noise ratio over the SSS REs.
Note 8: The SNR in time periods T1, T2, T3, T4 and T5 is denoted as SNR1, SNR2, SNR3, SNR4 and SNR5 respectively in figure 6.5.1.8.4-1.
Note 9: The SNR values are specified for testing a UE which supports 2RX on at least one band.

16.5.2 Beam Failure Detection and Link recovery procedures for RedCap

16.5.2.0 Minimum requirements

16.5.2.0.1 General

The Redcap UE shall assess the downlink radio link quality of a serving cell based on the reference signal in the set $\bar{q}_0$ as specified in TS 38.213 [3] in order to detect beam failure on PCell in SA. The SSB and SMTC in this section applies for both CD-SSB and NCD-SSB if it is not additional specified.

The RS resource configurations in the set $\bar{q}_0$ on PCell can be periodic CSI-RS resources and/or SSBs. UE is not required to perform beam failure detection outside the active DL BWP. UE is not required to meet the requirements in 38.133 [6] clause 8.5B.2 and 8.5B.3 if UE does not have set $\bar{q}_0$.

On each RS resource configuration in the set $\bar{q}_0$, the UE shall estimate the radio link quality and compare it to the threshold $Q_{out_LR_Redcap}$ for the purpose of accessing downlink radio link quality of the serving cell beams.

The threshold $Q_{out_LR_Redcap}$ is defined as the level at which the downlink radio level link of a given resource configuration on set $\bar{q}_0$ cannot be reliably received and shall correspond to the $BLER_{out}$ = 10% block error rate of a hypothetical PDCCH transmission. For SSB based beam failure detection, $Q_{out_LR_SSB}$ is derived based on the hypothetical PDCCH transmission parameters listed in Table 16.5.2.0.1-1. For CSI-RS based beam failure detection, $Q_{out_LR_CSI\text{-}RS}$ is derived based on the hypothetical PDCCH transmission parameters listed in Table 16.5.2.0.1-2.

Table 16.5.2.0.1-1: PDCCH transmission parameters for beam failure instance

Attribute	Value for BLER
DCI format	1-0

Number of control OFDM symbols	2
Aggregation level (CCE)	16 for 1 Rx UE; 8 for 2 Rx UE
Ratio of hypothetical PDCCH RE energy to average SSS RE energy	0dB
Ratio of hypothetical PDCCH DMRS energy to average SSS RE energy	0dB
Bandwidth (PRBs)	48 for 1 Rx UE; 24 for 2 Rx UE
Sub-carrier spacing (kHz)	Same as the SCS of RMSI CORESET
DMRS precoder granularity	REG bundle size
REG bundle size	6
CP length	Normal
Mapping from REG to CCE	Distributed
Note 1： Note: SCS=60kHz is not applicable for FR1	

Table 16.5.2.0.1-2: PDCCH transmission parameters for beam failure instance

Attribute	Value for BLER
DCI format	1-0
Number of control OFDM symbols	2
Aggregation level (CCE)	16 for 1 Rx UE; 8 for 2 Rx UE
Ratio of hypothetical PDCCH RE energy to average CSI-RS RE energy	0dB
Ratio of hypothetical PDCCH DMRS energy to average CSI-RS RE energy	0dB
Bandwidth (PRBs)	48 for 1 Rx UE; 24 for 2 Rx UE
Sub-carrier spacing (kHz)	SCS of the active DL BWP
DMRS precoder granularity	REG bundle size
REG bundle size	6
CP length	Normal
Mapping from REG to CCE	Distributed
Note 1： Note: SCS=60kHz is not applicable for FR1	

Upon request the UE shall deliver configuration indexes from the set $\bar{q}_1$ as specified in TS 38.213 [3] to higher layers, and the corresponding L1-RSRP measurement provided that the measured L1-RSRP is equal to or better than the threshold $Q_{in_LR_RedCap}$, which is indicated by higher layer parameter *rsrp-ThresholdSSB*. The UE applies the $Q_{in_LR_RedCap}$ threshold to the L1-RSRP measurement obtained from an SSB. The UE applies the $Q_{in_LR_RedCap}$ threshold to the L1-RSRP measurement obtained for a CSI-RS resource after scaling a respective CSI-RS reception power with a value provided by higher layer parameter *powerControlOffsetSS*. The RS resource configurations in the set $\bar{q}_1$ can be periodic CSI-RS resources or SSBs or both SSB and CSI-RS resources. UE is not required to perform candidate beam detection outside the active DL BWP.

When the radio link quality on all the RS resources in set $\bar{q}_0$ is worse than $Q_{out_LR_Redcap}$, layer 1 of the UE shall send a beam failure instance indication to the higher layers

The beam failure instance evaluation for the RS resources in set $\bar{q}_0$ shall be performed as specified in TS 38.213 [3] clause 6. Two successive indications from layer 1 shall be separated by at least $T_{Indication_interval_BFD_Redcap}$.

When DRX is not used, $T_{Indication_interval_BFD_Redcap}$ is max(2ms, $T_{SSB\text{-}RS,M}$)) or max(2ms, $T_{CSI\text{-}RS,M}$), where $T_{SSB\text{-}RS,M}$ and $T_{CSI\text{-}RS,M}$ is the shortest periodicity of all RS resources in set $\bar{q}_0$ for the accessed cell, corresponding to either the shortest periodicity of the SSB in the set $\bar{q}_0$ or CSI-RS resource in the set $\bar{q}_0$.

When DRX is used, for SSB based link quality measurement,

- $T_{Indication_interval_BFD_Redcap}$ = Max(1.5 × DRX_cycle_length, 1.5 × $T_{SSB\text{-}RS,M}$), if DRX_cycle_length ≤ 320ms,

- $T_{Indication_interval_BFD_Redcap}$ = DRX_cycle_length, if DRX_cycle_length > 320ms.

When DRX is used, for CSI-RS based link quality measurement,

- $T_{Indication_interval_BFD_Redcap}$ = Max(1.5 × DRX_cycle_length, 1.5 × $T_{CSI\text{-}RS,M}$), if DRX_cycle_length ≤ 320ms,
- $T_{Indication_interval_BFD_Redcap}$ = DRX_cycle_length, if DRX_cycle_length > 320ms.

For HD-FDD UE, the above conditions and requirements $T_{Indication_interval_BFD_Redcap}$ apply given that for each BFD-RS configuration, at least one BFD-RS sample must fall with DL occasion within an indication period.

There are no scheduling restrictions due to beam failure detection performed on SSB and CSI-RS configured for BFD with the same SCS as PDSCH or PDCCH in FR1.

For UEs which support *simultaneousRxDataSSB-DiffNumerology* [14] there are no restrictions on scheduling availability due to beam failure detection when SSB is configured as BFD. For UEs which do not support *simultaneousRxDataSSB-DiffNumerology* [14] the following restrictions apply due to beam failure detection when SSB is configured as BFD.

- The UE is not expected to transmit PUCCH, PUSCH or SRS or receive PDCCH, PDSCH or CSI-RS for tracking or CSI-RS for CQI on SSB symbols to be measured for beam failure detection.

There are no scheduling restrictions due to L1-RSRP measurement performed on SSB and CSI-RS configured as link recovery detection resource with the same SCS as PDSCH or PDCCH in FR1.

For UEs which support *simultaneousRxDataSSB-DiffNumerology* [14] there are no restrictions on scheduling availability due to L1-RSRP measurement based on SSB as link recovery detection resource. For UEs which do not support *simultaneousRxDataSSB-DiffNumerology* [14] the following restrictions apply due to L1-RSRP measurement based on SSB configured as link recovery detection resource.

- The UE is not expected to transmit PUCCH, PUSCH or SRS or receive PDCCH, PDSCH, TRS, CSI-RS for tracking or CSI-RS for CQI on SSB symbols to be measured for L1-RSRP.

When the UE transitions between BFD CD-SSB resource and BFD NCD-SSB resource during one evaluation period, the UE is allowed to restart the ongoing evaluation using the second SSB type after BWP switching. Subsequent to this duration, the UE shall use an evaluation period corresponding to the second SSB type for each BFD-RS resource.

The requirements in 38.133 [6] clause 8.5.10 shall also apply except the scenarios described above.

The normative reference for this requirement is TS 38.133 [6] clauses 8.5B.1, 8.5B.2, 8.5B.3, 8.5B.4, 8.5B.6, 8.5B.8 and 8.5B.9.

16.5.2.0.2 Minimum conformance requirements for SSB-based BFD and CBD

The requirements in this clause apply for each SSB resource in the set $\bar{q}_0$ configured for a serving cell, provided that the SSB configured for beam failure detection is actually transmitted within the UE active DL BWP during the entire evaluation period specified in Table 16.5.2.0.2-1.

The requirements in this clause apply for each SSB resource in the set $\bar{q}_1$ configured for a serving cell, provided that the SSBs configured for candidate beam detection are actually transmitted within UE active DL BWP during the entire evaluation period specified in Table 16.5.2.0.2-2.

UE shall be able to evaluate whether the downlink radio link quality on the configured SSB resource in set $\bar{q}_0$ estimated over the last $T_{Evaluate_BFD_SSB_Redcap}$ ms period becomes worse than the threshold $Q_{out_LR_SSB}$ within $T_{Evaluate_BFD_SSB_Redcap}$ ms period.

The value of $T_{Evaluate_BFD_SSB_Redcap}$ is defined in Table 16.5.2.0.2-1 for FR1.

For FR1,

- $P = \frac{1}{1-\frac{T_{SSB}}{MGRP}}$, when in the monitored cell there are measurement gaps configured for intra-frequency, inter-frequency or inter-RAT measurements, which are overlapping with some but not all occasions of the SSB.

- P=1 when in the monitored cell there are no measurement gaps overlapping with any occasion of the SSB.

where,

If the high layer in TS 38.331 [2] signalling of *smtc2* is configured, $T_{SMTCperiod}$ corresponds to the value of higher layer parameter *smtc2*; Otherwise $T_{SMTCperiod}$ corresponds to the value of higher layer parameter *smtc1*.

Longer evaluation period would be expected if the combination of BFD-RS resource, SMTC occasion and measurement gap configurations does not meet pervious conditions.

For an FR1 serving cell, longer evaluation period would be expected during the period $T_{identify_CGI}$ when the UE is requested to decode an NR CGI.

For an FR1 serving cell, longer BFD evaluation period would be expected during the period $T_{identify_CGI,E\text{-}UTRAN}$ when the UE is requested to decode an LTE CGI.

Table 16.5.2.0.2-1: Evaluation period $T_{Evaluate_BFD_SSB_Redcap}$ for FR1

Configuration	$T_{Evaluate_BFD_SSB_Redcap}$ (ms) for Redcap UE with 2 Rx	$T_{Evaluate_BFD_SSB_Redcap}$ (ms) for 1 Rx Redcap
no DRX	Max(50, Ceil(5 × P) × T_{SSB})	[Max(50, Ceil(10 × P) × T_{SSB})]
DRX cycle ≤ 320ms	Max(50, Ceil(7.5 × P) × Max(T_{DRX},T_{SSB}))	[Max(50, Ceil(15 × P) × Max(T_{DRX},T_{SSB}))]
DRX cycle > 320ms	Ceil(5 × P) × T_{DRX}	[Ceil(10 × P) × T_{DRX}]
Note: T_{SSB} is the periodicity of SSB in the set $\bar{q}_0$. T_{DRX} is the DRX cycle length.		

The UE is required to be capable of measuring SSB for BFD without measurement gaps. The UE is required to perform the SSB measurements with measurement restrictions as described in the following scenarios.

For FR1, when the SSB for BFD measurement is in the same OFDM symbol as CSI-RS for RLM, BFD, CBD or L1-RSRP measurement,

- If SSB and CSI-RS have same SCS, UE shall be able to measure the SSB for BFD measurement without any restriction;
- If SSB and CSI-RS have different SCS,
  - If UE supports *simultaneousRxDataSSB-DiffNumerology*, UE shall be able to measure the SSB for BFD measurement without any restriction;
  - If UE does not support *simultaneousRxDataSSB-DiffNumerology*, UE is required to measure one of but not both SSB for BFD measurement and CSI-RS. Longer measurement period for SSB based BFD measurement is expected, and no requirements are defined.

The UE shall monitor the configured SSB resources using the evaluation period in Table 16.5.2.0.2-2 corresponding to the non-DRX mode, if the configured DRX cycle ≤ 320ms.

The value of $T_{Evaluate_CBD_SSB_Redcap}$ is defined in Table 16.5.2.0.2-2 for FR1.

where,

For FR1,

- $P = \frac{1}{1-\frac{T_{SSB}}{MGRP}}$, when in the monitored cell there are measurement gaps configured for intra-frequency, inter-frequency or inter-RAT measurements, which are overlapping with some but not all occasions of the SSB,
- P = 1 when in the monitored cell there are no measurement gaps overlapping with any occasion of the SSB.

where,

If the high layer in TS 38.331 [2] signalling of *smtc2* is present, $T_{SMTCperiod}$ follows *smtc2*; Otherwise $T_{SMTCperiod}$ follows *smtc1*.

Longer evaluation period would be expected if the combination of the CBD-RS resource, SMTC occasion and measurement gap configurations does not meet pervious conditions.

For an FR1 serving cell, longer evaluation period would be expected during the period $T_{identify_CGI}$ when the UE is requested to decode an NR CGI.

For an FR1 serving cell, longer CBD evaluation period would be expected during the period $T_{identify_CGI,E-UTRAN}$ when the UE is requested to decode an LTE CGI.

The values of P_{CBD} used in Table 16.5.2.0.2-2 are defined as

For each SSB resource in the set $\overline{q}_1$ configured for PCell

- $P_{CBD} = 1$.

Table 16.5.2.0.2-2: Evaluation period $T_{Evaluate_CBD_SSB_Redcap}$ for FR1

Configuration	$T_{Evaluate_CBD_SSB_Redcap}$ (ms)
non-DRX, DRX cycle ≤ 320ms	$Max(25, Ceil(3 \times P \times P_{CBD}) \times T_{SSB})$
DRX cycle > 320ms	$Ceil(3 \times P \times P_{CBD}) \times T_{DRX}$
Note: T_{SSB} is the periodicity of SSB in the set $\overline{q}_1$. T_{DRX} is the DRX cycle length.	

The normative reference for this requirement is TS 38.133 [6] clauses 8.5B.2 and 8.5B.5.

16.5.2.0.3 Minimum conformance requirements for CSI-RS based RLM

The requirements in this clause apply for each CSI-RS resource in the set $\overline{q}_0$ of resource configurations for a serving cell, provided that the CSI-RS resource(s) in set $\overline{q}_0$ for beam failure detection are actually transmitted within the UE active DL BWP during the entire evaluation period specified in Table 16.5.2.0.3-1.

The requirements in this clause apply for each CSI-RS resource in the set $\overline{q}_1$ configured for a serving cell, provided that the CSI-RS resources configured for candidate beam detection are actually transmitted within UE active DL BWP during the entire evaluation period specified in Table 16.5.2.0.3-2.

UE shall be able to evaluate whether the downlink radio link quality on the CSI-RS resource in set $\overline{q}_0$ estimated over the last $T_{Evaluate_BFD_CSI-RS_Redcap}$ ms period becomes worse than the threshold $Q_{out_LR_CSI-RS}$ within $T_{Evaluate_BFD_CSI-RS_Redcap}$ ms period.

The value of $T_{Evaluate_BFD_CSI-RS_Redcap}$ is defined in Table 16.5.2.0.3-1 for FR1.

For FR1,

- $P = \frac{1}{1-\frac{T_{CSI-RS}}{MGRP}}$, when in the monitored cell there are measurement gaps configured for intra-frequency, inter-frequency or inter-RAT measurements, which are overlapping with some but not all occasions of the CSI-RS.
- P = 1 when in the monitored cell there are no measurement gaps overlapping with any occasion of the CSI-RS.

where,

If the high layer in TS 38.331 [2] signalling of *smtc2* is configured, $T_{SMTCperiod}$ corresponds to the value of higher layer parameter *smtc2*; Otherwise $T_{SMTCperiod}$ corresponds to the value of higher layer parameter *smtc1*.

Note: The overlap between CSI-RS for BFD and SMTC means that CSI-RS for BFD is within the SMTC window duration.

Longer evaluation period would be expected if the combination of the BFD-RS resource, SMTC occasion and measurement gap configurations does not meet pervious conditions.

For an FR1 serving cell, longer evaluation period would be expected during the period $T_{identify_CGI}$ when the UE is requested to decode an NR CGI.

For an FR1 serving cell, longer BFD evaluation period would be expected during the period $T_{identify_CGI,E\text{-}UTRAN}$ when the UE is requested to decode an LTE CGI.

The values of M_{BFD} used in Table 16.5.2.0.3-1 are defined as

- M_{BFD} = 10, if the CSI-RS resource(s) in set $\overline{q}_0$ used for BFD is transmitted with Density = 3 and over the bandwidth $\geqslant$ 24 PRBs.

The values of P_{BFD} used in Table 16.5.2.0.3-1 are defined as

For each CSI-RS resource in the set $\overline{q}_0$ configured for PCell

- P_{BFD} = 1.

Table 16.5.2.0.3-1: Evaluation period $T_{Evaluate_BFD_CSI\text{-}RS_Redcap}$ for FR1

Configuration	$T_{Evaluate_BFD_CSI\text{-}RS_Redcap}$ (ms) for Redcap UE with 2 Rx	$T_{Evaluate_BFD_CSI\text{-}RS_Redcap}$ (ms) for 1 Rx Redcap
no DRX	$\text{Max}(50, \text{Ceil}(M_{BFD} \times P \times P_{BFD}) \times T_{CSI\text{-}RS})$	$\text{Max}(50, \text{Ceil}(2 \times M_{BFD} \times P \times P_{BFD}) \times T_{CSI\text{-}RS})$
DRX cycle ≤ 320ms	$\text{Max}(50, \text{Ceil}(1.5 \times M_{BFD} \times P \times P_{BFD}) \times \text{Max}(T_{DRX}, T_{CSI\text{-}RS}))$	$\text{Max}(50, \text{Ceil}(2 \times 1.5 \times M_{BFD} \times P \times P_{BFD}) \times \text{Max}(T_{DRX}, T_{CSI\text{-}RS}))$
DRX cycle > 320ms	$\text{Ceil}(M_{BFD} \times P \times P_{BFD}) \times T_{DRX}$	$\text{Ceil}(2 \times M_{BFD} \times P \times P_{BFD}) \times T_{DRX}$
Note: $T_{CSI\text{-}RS}$ is the periodicity of CSI-RS resource in the set $\overline{q}_0$. T_{DRX} is the DRX cycle length.		

The UE is required to be capable of measuring CSI-RS for BFD without measurement gaps. The UE is required to perform the CSI-RS measurements with measurement restrictions as described in the following scenarios.

For FR1, when the CSI-RS for BFD measurement is in the same OFDM symbol as SSB for RLM, BFD, CBD or L1-RSRP measurement, UE is not required to receive CSI-RS for BFD measurement in the PRBs that overlap with an SSB.

For FR1, when the SSB for RLM, BFD, CBD or L1-RSRP measurement is within the active BWP and has same SCS than CSI-RS for BFD measurement, the UE shall be able to perform CSI-RS measurement without restrictions.

For FR1, when the SSB for RLM, BFD, CBD or L1-RSRP measurement is within the active BWP and has different SCS than CSI-RS for BFD measurement, the UE shall be able to perform CSI-RS measurement with restrictions according to its capabilities:

- If the UE supports *simultaneousRxDataSSB-DiffNumerology* the UE shall be able to perform CSI-RS measurement without restrictions.

- If the UE does not support *simultaneousRxDataSSB-DiffNumerology*, UE is required to measure one of but not both CSI-RS for BFD measurement and SSB. Longer measurement period for CSI-RS based BFD measurement is expected, and no requirements are defined.

For FR1, when the CSI-RS for BFD measurement is in the same OFDM symbol as another CSI-RS for RLM, BFD, CBD or L1-RSRP measurement, UE shall be able to measure the CSI-RS for BFD measurement without any restriction.

Upon request the UE shall be able to evaluate whether the L1-RSRP measured on the configured CSI-RS resource in set $\overline{q}_1$ estimated over the last $T_{Evaluate_CBD_CSI\text{-}RS_Redcap}$ [ms] period becomes better than the threshold $Q_{in_LR_RedCap}$ within $T_{Evaluate_CBD_CSI\text{-}RS_Redcap}$ [ms] period provided CSI-RS Ês/Iot is according to 38.133 [6] Annex Table B.2.4.2 for a corresponding band.

The UE shall monitor the configured CSI-RS resources using the evaluation period in Table 16.5.2.0.3-2 corresponding to the non-DRX mode, if the configured DRX cycle ≤ 320ms.

The value of $T_{Evaluate_CBD_CSI\text{-}RS_Redcap}$ is defined in Table 16.5.2.0.3-2 for FR1.

For FR1,

- $P = \frac{1}{1-\frac{T_{CSI-RS}}{MGRP}}$, when in the monitored cell there are measurement gaps configured for intra-frequency, inter-frequency or inter-RAT measurements, which are overlapping with some but not all occasions of the CSI-RS; and
- P = 1 when in the monitored cell there are no measurement gaps overlapping with any occasion of the CSI-RS.

where,

If the high layer in TS 38.331 [2] signalling of *smtc2* is present, $T_{SMTCperiod}$ follows *smtc2*; Otherwise $T_{SMTCperiod}$ follows *smtc1*.

Note: The overlap between CSI-RS for CBD and SMTC means that CSI-RS for CBD is within the SMTC window duration.

Longer evaluation period would be expected if the combination of the CBD-RS resource, SMTC occasion and measurement gap configurations does not meet pervious conditions.

Longer evaluation period would be expected if the CSI-RS is on the same OFDM symbols with RLM, BFD, BM-RS, or other CBD-RS, according to the measurement restrictions defined in clause 8.5.6.3.

For an FR1 serving cell, longer evaluation period would be expected during the period $T_{identify_CGI}$ when the UE is requested to decode an NR CGI.

For an FR1 serving cell, longer CBD evaluation period would be expected during the period $T_{identify_CGI,E-UTRAN}$ when the UE is requested to decode an LTE CGI.

The values of M_{CBD} used in Table 16.5.2.0.3-2 are defined as

- M_{CBD} = 3, if the CSI-RS resource configured in the set $\bar{q}_1$ is transmitted with Density = 3 and over the bandwidth $\geqslant$ 24 PRBs.

The values of P_{CBD} used in Table 16.5.2.0.3-2 are defined as

For each CSI-RS resource in the set $\bar{q}_1$ configured for PCell

- P_{CBD} = 1.

Table 16.5.2.0.3-2: Evaluation period $T_{Evaluate_CBD_CSI-RS_Redcap}$ for FR1

Configuration	$T_{EvaluateC_CBD_CSI-RS_Redcap}$ (ms)
non-DRX, DRX cycle ≤ 320ms	$Max(25, Ceil(M_{CBD} \times P \times P_{CBD}) \times T_{CSI-RS})$
DRX cycle > 320ms	$Ceil(M_{CBD} \times P \times P_{CBD}) \times T_{DRX}$
Note: T_{CSI-RS} is the periodicity of CSI-RS resource in the set $\bar{q}_1$. T_{DRX} is the DRX cycle length.	

The normative reference for this requirement is TS 38.133 [6] clauses 8.5B.3 and 8.5B.6.

16.5.2.1 NR SA FR1 Beam Failure Detection and Link Recovery Test for FR1 PCell configured with SSB-based BFD and LR in non-DRX mode for 1 Rx UE

Editor's Notes: This test case is incomplete in following aspects:

- TT analysis is missing.

16.5.2.1.1 Test purpose

The purpose of this test is to verify that the UE properly detects SSB-based beam failure in the set q_0 configured for a serving cell and that the UE performs correct SSB-based link recovery based on beam candidate set q_1. The purpose is to test the downlink monitoring for beam failure detection within the UEs active DL BWP, during the evaluation period,

and link recovery, when no DRX is used. This test will partly verify the SSB based beam failure detection and link recovery for an FR1 serving cell requirements in 38.133 [6] clause 8.5B.

16.5.2.1.2 Test applicability

This test applies to all types of NR RedCap UE with 1 Rx from release 17 onwards and supporting link recovery.

16.5.2.1.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 16.5.2.0.1 and 16.5.2.0.2.

The normative reference for this requirement is TS 38.133 [6] clause A.16.5.2.1.

16.5.2.1.4 Test description

Same as the test description given in clause 6.5.5.1.4.

16.5.2.1.4.1 Initial conditions

Same as the initial conditions 6.5.5.1.4.1 with following exceptions:

- Table 6.5.5.1.4.1-1 is replaced by Table 16.5.2.1.4.1-1.
- Table 6.5.5.1.4.1-2 is replaced by Table 16.5.2.1.4.1-2.
- Table 6.5.5.1.4.1-3 is replaced by Table 16.5.2.1.4.1-3.

Table 16.5.2.1.4.1-1: Supported test configurations

Configuration	Description
16.5.2.1-1	15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode
16.5.2.1-2	15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode
16.5.2.1-3	30 kHz SSB SCS, 20 MHz bandwidth, TDD duplex mode
16.5.2.1-4	15 kHz SSB SCS, 10 MHz bandwidth, HD-FDD duplex mode,
Note: The UE is only required to pass in one of the supported test configurations in FR1	

Table 16.5.2.1.4.1-2: Initial conditions

Parameter	Value		Comment
Test environment	NC		As specified in TS 38.508-1 [14] clause 4.1.
Test frequencies	As specified in Annex E, table E.4-1 and TS 38.508-1 [14] clause 4.3.1 and 4.4.2.		
Channel bandwidth	As specified by the test configuration selected from Table 16.5.2.1.4.1-1.		
Propagation conditions	AWGN		As specified in Annex C.2.2.
Connection Diagram	TE Part	A.3.1.8.1	As specified in TS 38.508-1 [14] Annex A.
	DUT Part	A.3.2.2.1	
Exceptions to connection diagram			

Table 16.5.2.1.4.1-3: General test parameters

Parameter		Unit	Value	Comment
			Test 1	
Active PCell			Cell 1	
RF Channel Number			1	
Duplex mode	Config 1		FDD	
	Config 2,3		TDD	
	Config 4		HD-FDD	

BWchannel		Config 1,2,4	MHz	10: $N_{RB,c}$ = 52	
		Config 3		20: $N_{RB,c}$ = 51	
DL initial BWP configuration		Config 1,2,3,4		DLBWP.0.1	
DL dedicated BWP configuration		Config 1,2,3,4		DLBWP.1.1	
UL initial BWP configuration		Config 1,2,3,4		ULBWP.0.1	
UL dedicated BWP configuration		Config 1,2,3,4		ULBWP.1.1	
TDD Configuration		Config 1,4		Not Applicable	
		Config 2		TDDConf.1.1	
		Config 3		TDDConf.2.1	
CORESET Reference Channel		Config 1,4		CR.1.1 FDD	
		Config 2		CR.1.1 TDD	
		Config 3		CR.2.1 TDD	
SSB Configuration		Config 1,4		SSB.3 FR1	
		Config 2		SSB.3 FR1	
		Config 3		SSB.2 RedCap FR1	
SMTC Configuration		Config 1,2,4		SMTC.1 RedCap	
		Config 3		SMTC.1 RedCap	
PDSCH/PDCCH subcarrier spacing		Config 1,2		15 KHz	
		Config 3		30 KHz	
PRACH Configuration		Config 1,2,3,4		PRACH.1 FR1	
SSB Index assigned as BFD RS (q_0)				0	
SSB Index assigned as CBD RS (q_1)				1	
OCNG parameters				OP.1	
CP length				Normal	
Correlation Matrix and Antenna Configuration				2x1 Low	
Beam failure detection transmission parameters	DCI format			1-0	
	Number of Control OFDM symbols			2	
	Aggregation level		CCE	16	
	Ratio of hypothetical PDCCH RE energy to average CSI-RS RE energy		dB	0	
	Ratio of hypothetical PDCCH DMRS energy to average CSI-RS RE energy		dB	0	
	DMRS precoder granularity			REG bundle size	
	REG bundle size			6	
DRX				OFF	
Gap pattern ID				gp0	
gapOffset				0	
rlmInSyncOutOfSyncThreshold				absent	When the field is absent, the UE applies the value 0. (Table 8.1.1-1).
rsrp-ThresholdSSB		Config 1,2,4	dBm/ SCS	-98	Threshold used for $Q_{in_LR_SSB}$
		Config 3		-95	
beamFailureInstanceMaxCount				n1	see clause 5.17 of TS 38.321 [7]
beamFailureDetectionTimer				pbfd4	see clause 5.17 of TS 38.321 [7]
CSI-RS configuration for CSI reporting		Config 1,4		CSI-RS.1.1 FDD	
		Config 2		CSI-RS.1.1 TDD	
		Config 3		CSI-RS.2.1 TDD	
CSI-RS for tracking		Config 1,4		TRS.1.1 FDD	
		Config 2		TRS.1.1 TDD	
		Config 3		TRS.1.2 TDD	
SSB Index assigned as RLM RS				0,1	
T310 Timer		ms		1000	
N310				2	

T1	s	0.2	During this time the UE shall be fully synchronized to cell 1
T2	s	0.37	
T3	s	0.24	
T4	s	0	
T5	s	0.17	
D1	s	0.13	
Note 1: All configurations are assigned to the UE prior to the start of time period T1. Note 2: UE-specific PDCCH is not transmitted after T1 starts.			

16.5.2.1.4.2 Test procedure

Same as the test procedure given in clause 6.5.5.1.4.2.

16.5.2.1.4.3 Message contents

Same as the message contents given in clause 6.5.5.1.4.3 with following exceptions:

- Table 7.3.1-3 in TS 38.508-1 [14] is used with condition SMTC.1 RedCap.

16.5.2.1.5 Test requirement

Same as the test requirements given in clause 6.5.5.1.5 with following exceptions:

- Table 6.5.5.1.5-1 is replaced by Table 16.5.2.1.5-1.

Table 16.5.2.1.5-1: NR Cell specific test parameters (Cell 1)

Parameter		Unit	Test 1				
			T1	T2	T3	T4	T5
EPRE ratio of PDCCH DMRS to SSS		dB	0				
EPRE ratio of PDCCH to PDCCH DMRS		dB					
EPRE ratio of PBCH DMRS to SSS		dB					
EPRE ratio of PBCH to PBCH DMRS		dB					
EPRE ratio of PSS to SSS		dB					
EPRE ratio of PDSCH DMRS to SSS		dB					
EPRE ratio of PDSCH to PDSCH DMRS		dB					
EPRE ratio of OCNG DMRS to SSS		dB					
EPRE ratio of OCNG to OCNG DMRS		dB					
SNR_SSB of set q_0	Config 1,2,4	dB	5	-3	-12	-12	-12
	Config 3		5	-3	-12	-12	-12
SNR_SSB of set q_1	Config 1,2,4	dB	-10	-10	10	10	10
	Config 3		-10	-10	10	10	10
SSB_RP of set q_1	Config 1,2,4	dBm/SCS	-108	-108	-88	-88	-88
	Config 3		-105	-105	-85	-85	-85
N_{oc}	Config 1,2,3,4	dBm/15 KHz	-98				
Propagation condition			TDL-C 300ns 100Hz				
Note 1: OCNG shall be used such that the resources in Cell 1 are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols. Note 2: The uplink resources for CSI reporting are assigned to the UE prior to the start of time period T1. Note 3: NZP CSI-RS resource set configuration for CSI reporting are assigned to the UE prior to the start of time period T1. Note 4: Measurement gap configuration is assigned to the UE prior to the start of time period T1. Note 5: The timers and layer 3 filtering related parameters are configured prior to the start of time period T1. Note 6: The signal contains PDCCH for UEs other than the device under test as part of OCNG. Note 7: SNR levels correspond to the signal to noise ratio over the SSS REs. Note 8: The SNR in time periods T1, T2, T3, T4 and T5 is denoted as SNR1, SNR2 and SNR3 respectively in figure 6.5.5.1.4-1.								

16.5.2.2 NR SA FR1 Beam Failure Detection and Link Recovery Test for FR1 PCell configured with SSB-based BFD and LR in non-DRX mode for 2 Rx UE

16.5.2.2.1 Test purpose

The purpose of this test is to verify that the UE properly detects SSB-based beam failure in the set q_0 configured for a serving cell and that the UE performs correct SSB-based link recovery based on beam candidate set q_1. The purpose is to test the downlink monitoring for beam failure detection within the UEs active DL BWP, during the evaluation period, and link recovery, when no DRX is used. This test will partly verify the SSB based beam failure detection and link recovery for an FR1 serving cell requirements in 38.133 [6] clause 8.5B.

16.5.2.2.2 Test applicability

This test applies to all types of NR RedCap UE with 2 Rx from release 17 onwards and supporting link recovery.

16.5.2.2.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 16.5.2.0.1 and 16.5.2.0.2.

The normative reference for this requirement is TS 38.133 [6] clause A.16.5.2.2.

16.5.2.2.4 Test description

Same as the test description given in clause 6.5.5.1.4.

16.5.2.2.4.1 Initial conditions

Same as the initial conditions 6.5.5.1.4.1 with following exceptions:

- Table 6.5.5.1.4.1-1 is replaced by Table 16.5.2.2.4.1-1.
- Table 6.5.5.1.4.1-2 is replaced by Table 16.5.2.2.4.1-2.
- Table 6.5.5.1.4.1-3 is replaced by Table 16.5.2.2.4.1-3.

Table 16.5.2.2.4.1-1: Supported test configurations

Configuration	Description
16.5.2.2-1	15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode
16.5.2.2-2	15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode
16.5.2.2-3	30 kHz SSB SCS, 20 MHz bandwidth, TDD duplex mode
16.5.2.2-4	15 kHz SSB SCS, 10 MHz bandwidth, HD-FDD duplex mode,
Note: The UE is only required to pass in one of the supported test configurations in FR1	

Table 16.5.2.2.4.1-2: Initial conditions

Parameter	Value		Comment
Test environment	NC		As specified in TS 38.508-1 [14] clause 4.1.
Test frequencies	As specified in Annex E, table E.4-1 and TS 38.508-1 [14] clause 4.3.1 and 4.4.2.		
Channel bandwidth	As specified by the test configuration selected from Table 16.5.2.2.4.1-1.		
Propagation conditions	AWGN		As specified in Annex C.2.2.
Connection Diagram	TE Part	A.3.1.7.1	As specified in TS 38.508-1 [14] Annex A.
	DUT Part	A.3.2.3.4	
Exceptions to connection diagram	- Without LTE link		

Table 16.5.2.2.4.1-3: General test parameters

Parameter		Unit	Value	Comment
			Test 1	
Active PCell			Cell 1	
RF Channel Number			1	
Duplex mode	Config 1		FDD	
	Config 2,3		TDD	
	Config 4		HD-FDD	
BWchannel	Config 1,2,4	MHz	10: $N_{RB,c}$ = 52	
	Config 3		20: $N_{RB,c}$ = 51	
DL initial BWP configuration	Config 1,2,3,4		DLBWP.0.1	
DL dedicated BWP configuration	Config 1,2,3,4		DLBWP.1.1	
UL initial BWP configuration	Config 1,2,3,4		ULBWP.0.1	
UL dedicated BWP configuration	Config 1,2,3,4		ULBWP.1.1	
TDD Configuration	Config 1,4		Not Applicable	
	Config 2		TDDConf.1.1	
	Config 3		TDDConf.2.1	
CORESET Reference Channel	Config 1,4		CR.1.1 FDD	
	Config 2		CR.1.1 TDD	
	Config 3		CR.2.1 TDD	
SSB Configuration	Config 1,4		SSB.3 FR1	
	Config 2		SSB.3 FR1	
	Config 3		SSB.2 RedCap FR1	
SMTC Configuration	Config 1,2,4		SMTC.1 RedCap	
	Config 3		SMTC.1 RedCap	
PDSCH/PDCCH subcarrier spacing	Config 1,2		15 KHz	
	Config 3		30 KHz	
PRACH Configuration	Config 1,2,3,4		PRACH.1 FR1	
SSB Index assigned as BFD RS (q_0)			0	
SSB Index assigned as CBD RS (q_1)			1	
OCNG parameters			OP.1	
CP length			Normal	
Correlation Matrix and Antenna Configuration			2x2 Low	
Beam failure detection transmission parameters	DCI format		1-0	
	Number of Control OFDM symbols		2	
	Aggregation level	CCE	8	
	Ratio of hypothetical PDCCH RE energy to average CSI-RS RE energy	dB	0	
	Ratio of hypothetical PDCCH DMRS energy to average CSI-RS RE energy	dB	0	
	DMRS precoder granularity		REG bundle size	
	REG bundle size		6	
DRX			OFF	
Gap pattern ID			gp0	
gapOffset			0	
rlmInSyncOutOfSyncThreshold			absent	When the field is absent, the UE applies the value 0. (Table 8.1.1-1).
rsrp-ThresholdSSB	Config 1,2,4	dBm/ SCS	-98	Threshold used for $Q_{in_LR_SSB}$
	Config 3		-95	
beamFailureInstanceMaxCount			n1	see clause 5.17 of TS 38.321 [7]
beamFailureDetectionTimer			pbfd4	see clause 5.17 of TS 38.321 [7]
CSI-RS configuration for CSI reporting	Config 1,4		CSI-RS.1.1 FDD	
	Config 2		CSI-RS.1.1 TDD	

	Config 3		CSI-RS.2.1 TDD	
CSI-RS for tracking	Config 1,4		TRS.1.1 FDD	
	Config 2		TRS.1.1 TDD	
	Config 3		TRS.1.2 TDD	
SSB Index assigned as RLM RS			0,1	
T310 Timer	ms		1000	
N310			2	
T1		s	0.2	During this time the UE shall be fully synchronized to cell 1
T2		s	0.37	
T3		s	0.24	
T4		s	0	
T5		s	0.17	
D1		s	0.13	
Note 1: All configurations are assigned to the UE prior to the start of time period T1. Note 2: UE-specific PDCCH is not transmitted after T1 starts.				

16.5.2.2.4.2 Test procedure

Same as the test procedure given in clause 6.5.5.1.4.2.

16.5.2.2.4.3 Message contents

Same as the message contents given in clause 6.5.5.1.4.3 with following exceptions:

- Table 7.3.1-3 in TS 38.508-1 [14] is used with condition SMTC.1 RedCap.

16.5.2.2.5 Test requirement

Same as the test requirements given in clause 6.5.5.1.5 with following exceptions:

- Table 6.5.5.1.5-1 is replaced by Table 16.5.2.2.5-1.

Table 16.5.2.2.5-1: NR Cell specific test parameters (Cell 1)

Parameter		Unit	Test 1				
			T1	T2	T3	T4	T5
EPRE ratio of PDCCH DMRS to SSS		dB	0				
EPRE ratio of PDCCH to PDCCH DMRS		dB					
EPRE ratio of PBCH DMRS to SSS		dB					
EPRE ratio of PBCH to PBCH DMRS		dB					
EPRE ratio of PSS to SSS		dB					
EPRE ratio of PDSCH DMRS to SSS		dB					
EPRE ratio of PDSCH to PDSCH DMRS		dB					
EPRE ratio of OCNG DMRS to SSS		dB					
EPRE ratio of OCNG to OCNG DMRS		dB					
SNR_SSB of set q_0	Config 1,2,4	dB	5.8	-2.2	-12.8	-12.8	-12.8
	Config 3		5.8	-2.2	-12.8	-12.8	-12.8
SNR_SSB of set q_1	Config 1,2,4	dB	-10.2	-10.2	10.2	10.2	10.2
	Config 3		-10.2	-10.2	10.2	10.2	10.2
SSB_RP of set q_1	Config 1,2,4	dBm/ SCS	-108.2	-108.2	-88.2	-88.2	-88.2
	Config 3		-105.2	-105.2	-85.2	-85.2	-85.2
N_{oc}	Config 1,2,3,4	dBm/15 KHz	-98				
Propagation condition			TDL-C 300ns 100Hz				

Note 1:	OCNG shall be used such that the resources in Cell 1 are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.
Note 2:	The uplink resources for CSI reporting are assigned to the UE prior to the start of time period T1.
Note 3:	NZP CSI-RS resource set configuration for CSI reporting are assigned to the UE prior to the start of time period T1.
Note 4:	Measurement gap configuration is assigned to the UE prior to the start of time period T1.
Note 5:	The timers and layer 3 filtering related parameters are configured prior to the start of time period T1.
Note 6:	The signal contains PDCCH for UEs other than the device under test as part of OCNG.
Note 7:	SNR levels correspond to the signal to noise ratio over the SSS REs.
Note 8:	The SNR in time periods T1, T2, T3, T4 and T5 is denoted as SNR1, SNR2 and SNR3 respectively in figure 6.5.5.1.4-1.
Note 9:	The SNR values are specified for testing a UE which supports 2RX on at least one band.

16.5.2.5 NR SA FR1 Beam Failure Detection and Link Recovery Test for FR1 PCell configured with CSI-RS-based BFD and LR in non-DRX mode for 1 Rx UE

Editor's note: This test cases is incomplete in following aspects:

- TT analysis is still missing

16.5.2.5.1 Test purpose

To verify that the UE properly detects CSI-RS-based beam failure in the set q_0 configured for a serving cell and that the UE performs correct CSI-RS-based link recovery based on beam candidate set q_1. The purpose is to test the downlink monitoring for beam failure detection within the UEs active DL BWP, during the evaluation period, and link recovery, when no DRX is used. This test will partly verify the CSI-RS based beam failure detection and link recovery for an FR1 serving cell requirements in 38.133 [6] clause 8.5B.3.

16.5.2.5.2 Test applicability

This test applies to all types of NR RedCap UE with 1 Rx from Release 17 onwards supporting CSI-RS based RLM and link recovery.

16.5.2.5.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 16.5.2.0.1 and 16.5.2.0.3.

The normative reference for this requirement is TS 38.133 [6] clause A.16.5.2.5.

16.5.2.5.4 Test description

Same as the test description given in clause 6.5.5.3.4.

16.5.2.5.4.1 Initial conditions

Same as the initial conditions given in clause 6.5.5.3.4.1 with following exceptions:

- Table 6.5.5.3.4.1-1 is replaced by Table 16.5.2.5.4.1-1.
- Table 6.5.5.3.4.1-2 is replaced by Table 16.5.2.5.4.1-2.
- Table 6.5.5.3.4.1-3 is replaced by Table 16.5.2.5.4.1-3.

Table 16.5.2.5.4.1-1: Supported test configurations

Configuration	Description
16.5.2.5-1	15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode
16.5.2.5-2	15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode
16.5.2.5-3	30 kHz SSB SCS, 20 MHz bandwidth, TDD duplex mode
16.5.2.5-4	15 kHz SSB SCS, 10 MHz bandwidth, HD-FDD duplex mode
Note: The UE is only required to pass in one of the supported test configurations in FR1	

Table 16.5.2.5.4.1-2: Initial conditions

Parameter	Value		Comment
Test environment	NC		As specified in TS 38.508-1 [14] clause 4.1.
Test frequencies	As specified in Annex E, Table E.14-1 and TS 38.508-1 [14] clause 4.3.1.		
Channel bandwidth	As specified by the test configuration selected from Table 16.5.2.5.4.1-1.		
Propagation conditions	AWGN		As specified in Annex C.2.2
Connection Diagram	TE Part	A.3.1.8.1	As specified in TS 38.508-1 [14] Annex A.
	DUT Part	A.3.2.2.1	
Exceptions to connection diagram			

Table 16.5.2.5.4.1-3: General test parameters

Parameter			Unit	Value	Comment
				Test 1	
Active PCell				Cell 1	
RF Channel Number				1	
Duplex mode		Config 1		FDD	
		Config 2,3		TDD	
		Config 4		HD-FDD	
TDD Configuration		Config 1,4		Not Applicable	
		Config 2		TDDConf.1.1	
		Config 3		TDDConf.2.1	
RMSI CORESET Reference Channel		Config 1,4		CR.1.1 FDD	
		Config 2		CR.1.1 TDD	
		Config 3		CR.2.1 TDD	
Dedicated CORESET Reference Channel		Config 1,4		CCR.1.1 FDD	
		Config 2		CCR.1.1 TDD	
		Config 3		CCR.2.1 TDD	
SSB Configuration		Config 1,2,4		SSB.3 FR1	
		Config 3		SSB.2 RedCap FR1	
SMTC Configuration				SMTC.1	
PDSCH/PDCCH subcarrier spacing		Config 1,2,4		15 KHz	
		Config 3		30 KHz	
PRACH Configuration				PRACH.4 FR1	
csi-RS-Index assigned as beam failure detection RS in set q_0				0	
OCNG parameters				OP.1	
CP length				Normal	
Correlation Matrix and Antenna Configuration				2x1 Low	
Beam failure detection transmission parameters	DCI format			1-0	
	Number of Control OFDM symbols			2	
	Aggregation level		CCE	16	
	Ratio of hypothetical PDCCH RE energy to average CSI-RS RE energy		dB	0	
	Ratio of hypothetical PDCCH DMRS energy to average CSI-RS RE energy		dB	0	
	DMRS precoder granularity			REG bundle size	
	REG bundle size			6	
DRX				OFF	
Gap pattern ID				N.A.	
csi-RS-Index assigned as candidate beam detection RS in set q_1				1	
rlmInSyncOutOfSyncThreshold				absent	When the field is absent, the UE applies the value 0.
rsrp-ThresholdSSB		Config 1,2,4	dBm/SCS	-98	Threshold used for $Q_{in_LR_SSB}$

	Config 3	dBm/SCS	-95	Threshold used for $Q_{in_LR_SSB}$
powerControlOffsetSS			db0	Used for deriving rsrp-ThresholdCSI-RS
beamFailureInstanceMaxCount			n1	see TS 38.321 [12], section 5.17
beamFailureDetectionTimer			pbfd4	see TS 38.321 [12], section 5.17
CSI-RS configuration for q_0 and q_1	Config 1,4		CSI-RS.1.2 FDD	
	Config 2		CSI-RS.1.2 TDD	
	Config 3		CSI-RS.2.2 TDD	
CSI-RS configuration for CSI reporting	Config 1,4		CSI-RS.1.1 FDD	
	Config 2		CSI-RS.1.1 TDD	
	Config 3		CSI-RS.2.1 TDD	
TRS configuration	Config 1,4		TRS.1.1 FDD	
	Config 2		TRS.1.1 TDD	
	Config 3		TRS.1.2 TDD	
CSI-RS-Index assigned as RLM RS	Config 1,4		CSI-RS.1.2 FDD	
	Config 2		CSI-RS.1.2 TDD	
	Config 3		CSI-RS.2.2 TDD	
T310 Timer		ms	1000	
N310			2	
T1		s	0.2	During this time the UE shall be fully synchronized to cell 1
T2		s	0.18	
T3		s	0.27	
T4		s	0	
T5		s	0.08	
D1		s	0.04	
Note 1: UE-specific PDCCH is not transmitted after T1 starts.				

16.5.2.5.4.2 Test procedure

Same as the test procedure given in clause 6.5.5.3.4.2.

16.5.2.5.4.3 Message contents

Same as the message contents given in clause 6.5.5.3.4.3.

16.5.2.5.5 Test requirement

Same as the test requirements given in clause 6.5.5.3.5 with following exceptions:

- Table 6.5.5.3.5-1 is replaced by Table 16.5.2.5.5-1.

Table 16.5.2.5.5-1: Cell specific test parameters

Parameter		Unit	Test 1				
			T1	T2	T3	T4	T5
EPRE ratio of PDCCH DMRS to SSS		dB	0				
EPRE ratio of PDCCH to PDCCH DMRS		dB					
EPRE ratio of PBCH DMRS to SSS		dB					
EPRE ratio of PBCH to PBCH DMRS		dB					
EPRE ratio of PSS to SSS		dB					
EPRE ratio of PDSCH DMRS to SSS		dB					
EPRE ratio of PDSCH to PDSCH DMRS		dB					
EPRE ratio of OCNG DMRS to SSS		dB					
EPRE ratio of OCNG to OCNG DMRS		dB					
SNR_CSI-RS of set q_0		dB	5	-3	-12	-12	-12
SNR_CSI-RS of set q_1		dB	-10	-10	10	10	10
CSI-RS_RP of set q_1	Config 1,2,4	dBm/ SCS	-108	-108	-88	-88	-88
	Config 3		-105	-105	-85	-85	-85

N_{oc}	dBm/ 15 KHz	-98
Propagation condition		TDL-C 300ns 100Hz
Note 1: OCNG shall be used such that the resources in Cell 1 are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.		
Note 2: The uplink resources for CSI reporting are assigned to the UE prior to the start of time period T1.		
Note 3: NZP CSI-RS resource set configuration for CSI reporting are assigned to the UE prior to the start of time period T1.		
Note 4: The timers and layer 3 filtering related parameters are configured prior to the start of time period T1.		
Note 5: The signal contains PDCCH for UEs other than the device under test as part of OCNG.		
Note 6: SNR levels correspond to the signal to noise ratio over the REs carrying CSI-RS.		
Note 7: The SNR in time periods T1, T2, T3, T4 and T5 is denoted as SNR1, SNR2 and SNR3 respectively in figure 6.5.5.3.4-1.		

16.5.2.6 NR SA FR1 Beam Failure Detection and Link Recovery Test for FR1 PCell configured with CSI-RS-based BFD and LR in non-DRX mode for 2 Rx UE

16.5.2.6.1 Test purpose

To verify that the UE properly detects CSI-RS-based beam failure in the set q_0 configured for a serving cell and that the UE performs correct CSI-RS-based link recovery based on beam candidate set q_1. The purpose is to test the downlink monitoring for beam failure detection within the UEs active DL BWP, during the evaluation period, and link recovery, when no DRX is used. This test will partly verify the CSI-RS based beam failure detection and link recovery for an FR1 serving cell requirements in 38.133 [6] clause 8.5B.3.

16.5.2.6.2 Test applicability

This test applies to all types of NR RedCap UE with 2 Rx from Release 17 onwards supporting CSI-RS based RLM and link recovery.

16.5.2.6.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 16.5.2.0.1 and 16.5.2.0.3.

The normative reference for this requirement is TS 38.133 [6] clause A.16.5.2.6.

16.5.2.6.4 Test description

Same as the test description given in clause 6.5.5.3.4.

16.5.2.6.4.1 Initial conditions

Same as the initial conditions given in clause 6.5.5.3.4.1 with following exceptions:

- Table 6.5.5.3.4.1-1 is replaced by Table 16.5.2.6.4.1-1.
- Table 6.5.5.3.4.1-2 is replaced by Table 16.5.2.6.4.1-2.
- Table 6.5.5.3.4.1-3 is replaced by Table 16.5.2.6.4.1-3.

Table 16.5.2.6.4.1-1: Supported test configurations

Configuration	Description
16.5.2.6-1	15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode
16.5.2.6-2	15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode
16.5.2.6-3	30 kHz SSB SCS, 20 MHz bandwidth, TDD duplex mode
16.5.2.6-4	15 kHz SSB SCS, 10 MHz bandwidth, HD-FDD duplex mode
Note: The UE is only required to pass in one of the supported test configurations in FR1	

Table 16.5.2.6.4.1-2: Initial conditions

Parameter	Value		Comment
Test environment	NC		As specified in TS 38.508-1 [14] clause 4.1.
Test frequencies	As specified in Annex E, Table E.14-1 and TS 38.508-1 [14] clause 4.3.1.		
Channel bandwidth	As specified by the test configuration selected from Table 16.5.2.6.4.1-1.		
Propagation conditions	AWGN		As specified in Annex C.2.2
Connection Diagram	TE Part	A.3.1.8.2 with n=1	As specified in TS 38.508-1 [14] Annex A.
	DUT Part	A.3.2.3.4	
Exceptions to connection diagram			

Table 16.5.2.6.4.1-3: General test parameters

Parameter			Unit	Value	Comment
				Test 1	
Active PCell				Cell 1	
RF Channel Number				1	
Duplex mode		Config 1		FDD	
		Config 2,3		TDD	
		Config 4		HD-FDD	
TDD Configuration		Config 1,4		Not Applicable	
		Config 2		TDDConf.1.1	
		Config 3		TDDConf.2.1	
RMSI CORESET Reference Channel		Config 1,4		CR.1.1 FDD	
		Config 2		CR.1.1 TDD	
		Config 3		CR.2.1 TDD	
Dedicated CORESET Reference Channel		Config 1,4		CCR.1.1 FDD	
		Config 2		CCR.1.1 TDD	
		Config 3		CCR.2.1 TDD	
SSB Configuration		Config 1,2,4		SSB.3 FR1	
		Config 3		SSB.2 RedCap FR1	
SMTC Configuration				SMTC.1	
PDSCH/PDCCH subcarrier spacing		Config 1,2,4		15 KHz	
		Config 3		30 KHz	
PRACH Configuration				PRACH.4 FR1	
csi-RS-Index assigned as beam failure detection RS in set q_0				0	
OCNG parameters				OP.1	
CP length				Normal	
Correlation Matrix and Antenna Configuration				2x2 Low	
Beam failure detection transmission parameters	DCI format			1-0	
	Number of Control OFDM symbols			2	
	Aggregation level		CCE	8	
	Ratio of hypothetical PDCCH RE energy to average CSI-RS RE energy		dB	0	
	Ratio of hypothetical PDCCH DMRS energy to average CSI-RS RE energy		dB	0	
	DMRS precoder granularity			REG bundle size	
	REG bundle size			6	
DRX				OFF	
Gap pattern ID				N.A.	
csi-RS-Index assigned as candidate beam detection RS in set q_1				1	
rlmInSyncOutOfSyncThreshold				absent	When the field is absent, the UE applies the value 0.
rsrp-ThresholdSSB		Config 1,2,4	dBm/SCS	-98	Threshold used for $Q_{in_LR_SSB}$

	Config 3	dBm/SCS	-95	Threshold used for $Q_{in_LR_SSB}$
powerControlOffsetSS			db0	Used for deriving rsrp-ThresholdCSI-RS
beamFailureInstanceMaxCount			n1	see TS 38.321 [12], section 5.17
beamFailureDetectionTimer			pbfd4	see TS 38.321 [12], section 5.17
CSI-RS configuration for q_0 and q_1	Config 1,4		CSI-RS.1.2 FDD	
	Config 2		CSI-RS.1.2 TDD	
	Config 3		CSI-RS.2.2 TDD	
CSI-RS configuration for CSI reporting	Config 1,4		CSI-RS.1.1 FDD	
	Config 2		CSI-RS.1.1 TDD	
	Config 3		CSI-RS.2.1 TDD	
TRS configuration	Config 1,4		TRS.1.1 FDD	
	Config 2		TRS.1.1 TDD	
	Config 3		TRS.1.2 TDD	
CSI-RS-Index assigned as RLM RS	Config 1,4		CSI-RS.1.2 FDD	
	Config 2		CSI-RS.1.2 TDD	
	Config 3		CSI-RS.2.2 TDD	
T310 Timer		ms	1000	
N310			2	
T1		s	0.2	During this time the UE shall be fully synchronized to cell 1
T2		s	0.18	
T3		s	0.14	
T4		s	0	
T5		s	0.08	
D1		s	0.04	
Note 1: UE-specific PDCCH is not transmitted after T1 starts.				

16.5.2.6.4.2 Test procedure

Same as the test procedure given in clause 6.5.5.3.4.2.

16.5.2.6.4.3 Message contents

Same as the message contents given in clause 6.5.5.3.4.3.

16.5.2.6.5 Test requirement

Same as the test requirements given in clause 6.5.5.3.5 with following exceptions:

- Table 6.5.5.3.5-1 is replaced by Table 16.5.2.6.5-1.

Table 16.5.2.6.5-1: Cell specific test parameters

Parameter	Unit	Test 1				
		T1	T2	T3	T4	T5
EPRE ratio of PDCCH DMRS to SSS	dB	0				
EPRE ratio of PDCCH to PDCCH DMRS	dB					
EPRE ratio of PBCH DMRS to SSS	dB					
EPRE ratio of PBCH to PBCH DMRS	dB					
EPRE ratio of PSS to SSS	dB					
EPRE ratio of PDSCH DMRS to SSS	dB					
EPRE ratio of PDSCH to PDSCH DMRS	dB					
EPRE ratio of OCNG DMRS to SSS	dB					

EPRE ratio of OCNG to OCNG DMRS		dB					
SNR_CSI-RS of set q_0		dB	5.8	-2.2	-12.8	-12.8	-12.8
SNR_CSI-RS of set q_1		dB	-10.2	-10.2	10.2	10.2	10.2
CSI-RS_RP of set q_1	Config 1,2,4	dBm/ SCS	-108.2	-108.2	-87.8	-87.8	-87.8
	Config 3		-105.2	-105.2	-84.8	-84.8	-84.8
N_{oc}		dBm/ 15 KHz	-98				
Propagation condition			TDL-C 300ns 100Hz				

Note 1: OCNG shall be used such that the resources in Cell 1 are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.
Note 2: The uplink resources for CSI reporting are assigned to the UE prior to the start of time period T1.
Note 3: NZP CSI-RS resource set configuration for CSI reporting are assigned to the UE prior to the start of time period T1.
Note 4: The timers and layer 3 filtering related parameters are configured prior to the start of time period T1.
Note 5: The signal contains PDCCH for UEs other than the device under test as part of OCNG.
Note 6: SNR levels correspond to the signal to noise ratio over the REs carrying CSI-RS.
Note 7: The SNR in time periods T1, T2, T3, T4 and T5 is denoted as SNR1, SNR2 and SNR3 respectively in figure 6.5.5.3.4-1.
Note 8: The SNR values are specified for testing a UE which supports 2RX on at least one band.

16.5.2.7 NR SA FR1 Beam Failure Detection and Link Recovery Test for FR1 PCell configured with CSI-RS-based BFD and LR in DRX mode for 1 Rx UE

Editor's note: This test cases is incomplete in following aspects:

- TT analysis is still missing

16.5.2.7.1 Test purpose

To verify that the UE properly detects CSI-RS-based beam failure in the set q_0 configured for a serving cell and that the UE performs correct CSI-RS-based link recovery based on beam candidate set q_1. The purpose is to test the downlink monitoring for beam failure detection within the UEs active DL BWP, during the evaluation period, and link recovery, when DRX is used. This test will partly verify the CSI-RS based beam failure detection and link recovery for an FR1 serving cell requirements in 38.133 [6] clause 8.5B.3.

16.5.2.7.2 Test applicability

This test applies to all types of NR RedCap UE with 1 Rx from Release 17 onwards supporting CSI-RS based RLM, long DRX cycle and link recovery.

16.5.2.7.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 16.5.2.0.1 and 16.5.2.0.3.

The normative reference for this requirement is TS 38.133 [6] clause A.16.5.2.7.

16.5.2.7.4 Test description

Same as the test description given in clause 6.5.5.4.4.

16.5.2.7.4.1 Initial conditions

Same as the initial conditions given in clause 6.5.5.4.4.1 with following exceptions:

- Table 6.5.5.4.4.1-1 is replaced by Table 16.5.2.7.4.1-1.
- Table 6.5.5.4.4.1-2 is replaced by Table 16.5.2.7.4.1-2.
- Table 6.5.5.4.4.1-3 is replaced by Table 16.5.2.7.4.1-3.

Table 16.5.2.7.4.1-1: Supported test configurations

Configuration	Description
16.5.2.7-1	15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode
16.5.2.7-2	15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode
16.5.2.7-3	30 kHz SSB SCS, 20 MHz bandwidth, TDD duplex mode
16.5.2.7-4	15 kHz SSB SCS, 10 MHz bandwidth, HD-FDD duplex mode
Note: The UE is only required to pass in one of the supported test configurations in FR1	

Table 16.5.2.7.4.1-2: Initial conditions

Parameter	Value		Comment
Test environment	NC		As specified in TS 38.508-1 [14] clause 4.1.
Test frequencies	As specified in Annex E, Table E.14-1 and TS 38.508-1 [14] clause 4.3.1.		
Channel bandwidth	As specified by the test configuration selected from Table 16.5.2.7.4.1-1.		
Propagation conditions	AWGN		As specified in Annex C.2.2
Connection Diagram	TE Part	A.3.1.8.1	As specified in TS 38.508-1 [14] Annex A.
	DUT Part	A.3.2.2.1	
Exceptions to connection diagram			

Table 16.5.2.7.4.1-3: General test parameters

Parameter		Unit	Value	Comment
			Test 1	
Active PCell			Cell 1	
RF Channel Number			1	
Duplex mode	Config 1		FDD	
	Config 2,3		TDD	
	Config 4		HD-FDD	
TDD Configuration	Config 1,4		Not Applicable	
	Config 2		TDDConf.1.1	
	Config 3		TDDConf.2.1	
RMSI CORESET Reference Channel	Config 1,4		CR.1.1 FDD	
	Config 2		CR.1.1 TDD	
	Config 3		CR.2.1 TDD	
Dedicated CORESET Reference Channel	Config 1,4		CCR.1.1 FDD	
	Config 2		CCR.1.1 TDD	
	Config 3		CCR.2.1 TDD	
SSB Configuration	Config 1,2,4		SSB.3 FR1	
	Config 3		SSB.2 RedCap FR1	
SMTC Configuration			SMTC.1	
PDSCH/PDCCH subcarrier spacing	Config 1,2,4		15 KHz	
	Config 3		30 KHz	
PRACH Configuration			PRACH.4 FR1	
csi-RS-Index assigned as beam failure detection RS in set q_0			0	
OCNG parameters			OP.1	
CP length			Normal	
Correlation Matrix and Antenna Configuration			2x1 Low	
Beam failure detection transmission parameters	DCI format		1-0	
	Number of Control OFDM symbols		2	
	Aggregation level	CCE	16	
	Ratio of hypothetical PDCCH RE energy to average CSI-RS RE energy	dB	0	
	Ratio of hypothetical PDCCH DMRS energy to average CSI-RS RE energy	dB	0	

	DMRS precoder granularity		REG bundle size	
	REG bundle size		6	
DRX			DRX.7	
Gap pattern ID			N.A.	
csi-RS-Index assigned as candidate beam detection RS in set q_1			1	
rlmInSyncOutOfSyncThreshold			absent	When the field is absent, the UE applies the value 0.
rsrp-ThresholdSSB	Config 1,2,4	dBm/SCS	-98	Threshold used for $Q_{in_LR_SSB}$
	Config 3	dBm/SCS	-95	Threshold used for $Q_{in_LR_SSB}$
powerControlOffsetSS			db0	Used for deriving rsrp-ThresholdCSI-RS
beamFailureInstanceMaxCount			n1	see TS 38.321 [12], section 5.17
beamFailureDetectionTimer			pbfd4	see TS 38.321 [12], section 5.17
CSI-RS configuration for q_0 and q_1	Config 1,4		CSI-RS.1.2 FDD	
	Config 2		CSI-RS.1.2 TDD	
	Config 3		CSI-RS.2.2 TDD	
CSI-RS configuration for CSI reporting	Config 1,4		CSI-RS.1.1 FDD	
	Config 2		CSI-RS.1.1 TDD	
	Config 3		CSI-RS.2.1 TDD	
TRS configuration	Config 1,4		TRS.1.1 FDD	
	Config 2		TRS.1.1 TDD	
	Config 3		TRS.1.2 TDD	
CSI-RS-Index assigned as RLM RS	Config 1,4		CSI-RS.1.2 FDD	
	Config 2		CSI-RS.1.2 TDD	
	Config 3		CSI-RS.2.2 TDD	
T310 Timer		ms	1000	
N310			2	
T1		s	1	During this time the UE shall be fully synchronized to cell 1
T2		s	8.37	
T3		s	12.24	
T4		s	0	
T5		s	1.97	
D1		s	1.93	
Note 1: UE-specific PDCCH is not transmitted after T1 starts.				

16.5.2.7.4.2 Test procedure

Same as the test procedure given in clause 6.5.5.4.4.2.

16.5.2.7.4.3 Message contents

Same as the message contents given in clause 6.5.5.4.4.3.

16.5.2.7.5 Test requirement

Same as the test requirements given in clause 6.5.5.4.5 with following exceptions:

- Table 6.5.5.4.5-1 is replaced by Table 16.5.2.7.5-1.

Table 16.5.2.7.5-1: Cell specific test parameters

Parameter	Unit	Test 1				
		T1	T2	T3	T4	T5
EPRE ratio of PDCCH DMRS to SSS	dB	0				
EPRE ratio of PDCCH to PDCCH DMRS	dB					

EPRE ratio of PBCH DMRS to SSS		dB					
EPRE ratio of PBCH to PBCH DMRS		dB					
EPRE ratio of PSS to SSS		dB					
EPRE ratio of PDSCH DMRS to SSS		dB					
EPRE ratio of PDSCH to PDSCH DMRS		dB					
EPRE ratio of OCNG DMRS to SSS		dB					
EPRE ratio of OCNG to OCNG DMRS		dB					
SNR_CSI-RS of set q_0		dB	5	-3	-12	-12	-12
SNR_CSI-RS of set q_1		dB	-10	-10	10	10	10
CSI-RS_RP of set q_1	Config 1,2,4	dBm/ SCS	-108	-108	-88	-88	-88
	Config 3		-105	-105	-85	-85	-85
N_{oc}		dBm/ 15 KHz	-98				
Propagation condition			TDL-C 300ns 100Hz				

Note 1: OCNG shall be used such that the resources in Cell 1 are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.
Note 2: The uplink resources for CSI reporting are assigned to the UE prior to the start of time period T1.
Note 3: NZP CSI-RS resource set configuration for CSI reporting are assigned to the UE prior to the start of time period T1.
Note 4: The timers and layer 3 filtering related parameters are configured prior to the start of time period T1.
Note 5: The signal contains PDCCH for UEs other than the device under test as part of OCNG.
Note 6: SNR levels correspond to the signal to noise ratio over the REs carrying CSI-RS.
Note 7: The SNR in time periods T1, T2, T3, T4 and T5 is denoted as SNR1, SNR2 and SNR3 respectively in figure 6.5.5.4.4-1.

16.5.2.8 NR SA FR1 Beam Failure Detection and Link Recovery Test for FR1 PCell configured with CSI-RS-based BFD and LR in DRX mode for 2 Rx UE

16.5.2.8.1 Test purpose

To verify that the UE properly detects CSI-RS-based beam failure in the set q_0 configured for a serving cell and that the UE performs correct CSI-RS-based link recovery based on beam candidate set q_1. The purpose is to test the downlink monitoring for beam failure detection within the UEs active DL BWP, during the evaluation period, and link recovery, when DRX is used. This test will partly verify the CSI-RS based beam failure detection and link recovery for an FR1 serving cell requirements in 38.133 [6] clause 8.5B.3.

16.5.2.8.2 Test applicability

This test applies to all types of NR RedCap UE with 2 Rx from Release 17 onwards supporting CSI-RS based RLM, long DRX cycle and link recovery.

16.5.2.8.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 16.5.2.0.1 and 16.5.2.0.3.

The normative reference for this requirement is TS 38.133 [6] clause A.16.5.2.8.

16.5.2.8.4 Test description

Same as the test description given in clause 6.5.5.4.4.

16.5.2.8.4.1 Initial conditions

Same as the initial conditions given in clause 6.5.5.4.4.1 with following exceptions:

- Table 6.5.5.4.4.1-1 is replaced by Table 16.5.2.8.4.1-1.
- Table 6.5.5.4.4.1-2 is replaced by Table 16.5.2.8.4.1-2.
- Table 6.5.5.4.4.1-3 is replaced by Table 16.5.2.8.4.1-3.

Table 16.5.2.8.4.1-1: Supported test configurations

Configuration	Description
16.5.2.8-1	15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode
16.5.2.8-2	15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode
16.5.2.8-3	30 kHz SSB SCS, 20 MHz bandwidth, TDD duplex mode
16.5.2.8-4	15 kHz SSB SCS, 10 MHz bandwidth, HD-FDD duplex mode
Note: The UE is only required to pass in one of the supported test configurations in FR1	

Table 16.5.2.8.4.1-2: Initial conditions

Parameter	Value		Comment
Test environment	NC		As specified in TS 38.508-1 [14] clause 4.1.
Test frequencies	As specified in Annex E, Table E.14-1 and TS 38.508-1 [14] clause 4.3.1.		
Channel bandwidth	As specified by the test configuration selected from Table 16.5.2.8.4.1-1.		
Propagation conditions	AWGN		As specified in Annex C.2.2
Connection Diagram	TE Part	A.3.1.8.2	As specified in TS 38.508-1 [14] Annex A.
	DUT Part	A.3.2.3.4	
Exceptions to connection diagram			

Table 16.5.2.8.4.1-3: General test parameters

Parameter		Unit	Value	Comment
			Test 1	
Active PCell			Cell 1	
RF Channel Number			1	
Duplex mode	Config 1		FDD	
	Config 2,3		TDD	
	Config 4		HD-FDD	
TDD Configuration	Config 1,4		Not Applicable	
	Config 2		TDDConf.1.1	
	Config 3		TDDConf.2.1	
RMSI CORESET Reference Channel	Config 1,4		CR.1.1 FDD	
	Config 2		CR.1.1 TDD	
	Config 3		CR.2.1 TDD	
Dedicated CORESET Reference Channel	Config 1,4		CCR.1.1 FDD	
	Config 2		CCR.1.1 TDD	
	Config 3		CCR.2.1 TDD	
SSB Configuration	Config 1,2,4		SSB.3 FR1	
	Config 3		SSB.2 RedCap FR1	
SMTC Configuration			SMTC.1	
PDSCH/PDCCH subcarrier spacing	Config 1,2,4		15 KHz	
	Config 3		30 KHz	
PRACH Configuration			PRACH.4 FR1	
csi-RS-Index assigned as beam failure detection RS in set q_0			0	
OCNG parameters			OP.1	
CP length			Normal	
Correlation Matrix and Antenna Configuration			2x2 Low	
	DCI format		1-0	

Beam failure detection transmission parameters	Number of Control OFDM symbols			2	
	Aggregation level		CCE	8	
	Ratio of hypothetical PDCCH RE energy to average CSI-RS RE energy		dB	0	
	Ratio of hypothetical PDCCH DMRS energy to average CSI-RS RE energy		dB	0	
	DMRS precoder granularity			REG bundle size	
	REG bundle size			6	
DRX				DRX.7	
Gap pattern ID				N.A.	
csi-RS-Index assigned as candidate beam detection RS in set q_1				1	
rlmInSyncOutOfSyncThreshold				absent	When the field is absent, the UE applies the value 0.
rsrp-ThresholdSSB		Config 1,2,4	dBm/SCS	-98	Threshold used for $Q_{in_LR_SSB}$
		Config 3	dBm/SCS	-95	Threshold used for $Q_{in_LR_SSB}$
powerControlOffsetSS				db0	Used for deriving rsrp-ThresholdCSI-RS
beamFailureInstanceMaxCount				n1	see TS 38.321 [12], section 5.17
beamFailureDetectionTimer				pbfd4	see TS 38.321 [12], section 5.17
CSI-RS configuration for q_0 and q_1		Config 1,4		CSI-RS.1.2 FDD	
		Config 2		CSI-RS.1.2 TDD	
		Config 3		CSI-RS.2.2 TDD	
CSI-RS configuration for CSI reporting		Config 1,4		CSI-RS.1.1 FDD	
		Config 2		CSI-RS.1.1 TDD	
		Config 3		CSI-RS.2.1 TDD	
TRS configuration		Config 1,4		TRS.1.1 FDD	
		Config 2		TRS.1.1 TDD	
		Config 3		TRS.1.2 TDD	
CSI-RS-Index assigned as RLM RS		Config 1,4		CSI-RS.1.2 FDD	
		Config 2		CSI-RS.1.2 TDD	
		Config 3		CSI-RS.2.2 TDD	
T310 Timer			ms	1000	
N310				2	
T1			s	1	During this time the UE shall be fully synchronized to cell 1
T2			s	8.37	
T3			s	6.44	
T4			s	0	
T5			s	1.97	
D1			s	1.93	
Note 1: UE-specific PDCCH is not transmitted after T1 starts.					

16.5.2.8.4.2 Test procedure

Same as the test procedure given in clause 6.5.5.4.4.2.

16.5.2.8.4.3 Message contents

Same as the message contents given in clause 6.5.5.4.4.3.

16.5.2.8.5 Test requirement

Same as the test requirements given in clause 6.5.5.4.5 with following exceptions:

- Table 6.5.5.4.5-1 is replaced by Table 16.5.2.8.5-1.

Table 16.5.2.8.5-1: Cell specific test parameters

Parameter		Unit	Test 1				
			T1	T2	T3	T4	T5
EPRE ratio of PDCCH DMRS to SSS		dB	0				
EPRE ratio of PDCCH to PDCCH DMRS		dB					
EPRE ratio of PBCH DMRS to SSS		dB					
EPRE ratio of PBCH to PBCH DMRS		dB					
EPRE ratio of PSS to SSS		dB					
EPRE ratio of PDSCH DMRS to SSS		dB					
EPRE ratio of PDSCH to PDSCH DMRS		dB					
EPRE ratio of OCNG DMRS to SSS		dB					
EPRE ratio of OCNG to OCNG DMRS		dB					
SNR_CSI-RS of set q_0		dB	5.8	-2.2	-12.8	-12.8	-12.8
SNR_CSI-RS of set q_1		dB	-10.2	-10.2	10.2	10.2	10.2
CSI-RS_RP of set q_1	Config 1,2,4	dBm/ SCS	-108.2	-108.2	-87.8	-87.8	-87.8
	Config 3		-105.2	-105.2	-84.8	-84.8	-84.8
N_{oc}		dBm/ 15 KHz	-98				
Propagation condition			TDL-C 300ns 100Hz				

Note 1: OCNG shall be used such that the resources in Cell 1 are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.
Note 2: The uplink resources for CSI reporting are assigned to the UE prior to the start of time period T1.
Note 3: NZP CSI-RS resource set configuration for CSI reporting are assigned to the UE prior to the start of time period T1.
Note 4: The timers and layer 3 filtering related parameters are configured prior to the start of time period T1.
Note 5: The signal contains PDCCH for UEs other than the device under test as part of OCNG.
Note 6: SNR levels correspond to the signal to noise ratio over the REs carrying CSI-RS.
Note 7: The SNR in time periods T1, T2, T3, T4 and T5 is denoted as SNR1, SNR2 and SNR3 respectively in figure 6.5.5.4.4-1.
Note 8: The SNR values are specified for testing a UE which supports 2RX on at least one band.

16.5.3

16.5.4 UE specific CBW change for RedCap

16.5.4.0 Minimum conformance requirements

16.5.4.0.1 Minimum conformance requirements for UE specific CBW change

The requirements in this clause apply for a RedCap UE receives reconfiguration of *offsetToCarrier* or *carrierBandwidth* to change channel bandwidth.

After the UE receives RRC reconfiguration involving *offsetToCarrier* or *carrierBandwidth* change on the old CBW, UE shall be able to receive PDSCH/PDCCH on the DL BWP with BWP ID firstActiveDownlinkBWP-Id or transmit PUSCH on the UL BWP with BWP ID firstActiveUplinkBWP-Id of the new CBW right after a time duration of $\frac{T_{RRCprocessingDelay}+T_{CBWchangeDelayRRC}}{NR\ Slot\ length}$ slots which begins from the beginning of DL slot n, where

- DL slot n is the last slot overlapping with the PDSCH containing the RRC command, and
- $T_{RRCprocessingDelay}$ is the length of the RRC procedure delay in millisecond as defined in TS 36.331 [29] clause 11.2 is the corresponding RRC message is embedded in E-UTRA RRC message, otherwise it is the length of the RRC procedure delay in millisecond as defined in TS 38.331 [13] clause 12, and
- $T_{CBWchangeDelayRRC} = 6\ ms$ is the time used by the UE to perform CBW change.

The UE is not required to transmit UL signals or receive DL signals during the above defined time duration $\frac{T_{RRCprocessingDelay}+T_{CBWchangeDelayRRC}}{NR\ Slot\ length}$ on the cell where UE-specific CBW change occurs. When $T_{HARQ} >$

$T_{RRCprocessing\,Delay}$ a longer switching delay is allowed. Where T_{HARQ} is the time between DL data transmission and acknowledgement as specified in TS 38.213 [8].

The normative reference for this requirement is TS 38.133 [6] clause 8.13A.1 and 8.13A.2.

16.5.4.1 NR SA FR1 UE specific CBW change on PCell in non-DRX for 1 Rx UE

16.5.4.1.1 Test purpose

To verify the UE specific CBW change delay requirement defined in 38.133 [6] clause 8.13A.

16.5.4.1.2 Test applicability

This test applies to all types of NR RedCap UEs with 1 Rx from Release 17 onwards.

16.5.4.1.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 16.5.4.0.1.

The normative reference for this requirement is TS 38.133 [6] clause A.16.5.4.1.

16.5.4.1.4 Test description

Same as the test description given in clause 6.5.8.1.

16.5.4.1.4.1 Initial conditions

Same as the initial conditions given in clause 6.5.8.1 with following exceptions:

- Table 6.5.8.1.4.1-1 is replaced by Table 16.5.4.1.4.1-1.
- Table 6.5.8.1.4.1-2 is replaced by Table 16.5.4.1.4.1-2.
- Table 6.5.8.1.4.1-3 is replaced by Table 16.5.4.1.4.1-3.

Table 16.5.4.1.4.1-1: Supported test configurations

Configuration	Description
16.5.4.1-1	15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode
16.5.4.1-2	15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode
16.5.4.1-3	30 kHz SSB SCS, 20 MHz bandwidth, TDD duplex mode
16.5.4.1-4	15 kHz SSB SCS, 10 MHz bandwidth, HD-FDD duplex mode,
Note: The UE is only required to pass in one of the supported test configurations in FR1	

Table 16.5.4.1.4.1-2: Initial conditions

Parameter	Value		Comment
Test environment	NC		As specified in TS 38.508-1 [14] clause 4.1.
Test frequencies	As specified in Annex E, table E.14-1 and TS 38.508-1 [14] clause 4.3.1 and 4.4.2.		
Channel bandwidth	As specified by the test configuration selected from Table 16.5.4.1.4.1-1.		
Propagation conditions	AWGN		As specified in Annex C.2.2.
Connection Diagram	TE Part	A.3.1.8.1	As specified in TS 38.508-1 [14] Annex A.
	DUT Part	A.3.2.2.1	
Exceptions to connection diagram	- Without LTE link		

Table 16.5.4.1.4.1-3: General test parameters

Parameter	Unit	Value	Comment
NR RF Channel Number		1	One NR radio channel is used for this test
Active Cell		Cell 1	Cell on RF channel number 1.
CP length		Normal	
DRX		OFF	
T1	s	0.2	

16.5.4.1.4.2 Test procedure

Same as the test procedure given in clause 6.5.8.1.4.2.

16.5.4.1.4.3 Message contents

Same as the message contents given in clause 6.5.8.1.4.2.

16.5.4.1.5 Test requirement

Same as the test requirements given in clause 6.5.8.1.5 with followings exceptions:

- Table 6.5.8.1.5-1 is replaced by Table 16.5.4.1.5-1.

Table 16.5.4.1.5-1: NR Cell specific test parameters

Parameter			Unit	Cell 1
Frequency Range				FR1
Duplex mode		Config 1		FDD
		Config 2,3		TDD
		Config 4		HD-FDD
TDD configuration		Config 1,4		Not Applicable
		Config 2		TDDConf.1.1
		Config 3		TDDConf.2.1
$BW_{channel}$		Config 1,2,4		10 MHz: $N_{RB,c}$ = 52
		Config 3		20 MHz: $N_{RB,c}$ = 51
Active DL BWP ID				0
Initial DL BWP Configuration (BWP-1)				DLBWP.0.2
Initial UL BWP Configuration (BWP-1)				ULBWP.0.2
Initial Condition	Active DL CBW Configuration (CBW-1)			DLCBW.1.1
	Active UL CBW Configuration (CBW-1)			ULCBW.1.1
Final Condition	Active DL CBW Configuration (CBW-2)			DLCBW.1.2
	Active UL CBW Configuration (CBW-2)			ULCBW.1.2
PDSCH Reference measurement channel		Config 1,4		SR.1.1 FDD
		Config 2		SR.1.1 TDD
		Config 3		SR.2.1 TDD
RMSI CORESET parameters		Config 1,4		CR.1.1 FDD
		Config 2		CR.1.1 TDD
		Config 3		CR.2.1 TDD
Dedicated CORESET parameters		Config 1,4		CCR.1.1 FDD
		Config 2		CCR.1.1 TDD
		Config 3		CCR.2.1 TDD
OCNG Patterns				OP.1
SSB Configuration		Config 1,2,4		SSB.1 FR1
		Config 3		SSB.1 RedCap FR1
SMTC Configuration				SMTC.1 RedCap FR1
TRS Configuration		Config 1,4		TRS.1.1 FDD
		Config 2		TRS.1.1 TDD
		Config 3		TRS.1.2 TDD
Antenna Configuration				1x1
Propagation Condition				AWGN
EPRE ratio of PSS to SSS			dB	0
EPRE ratio of PBCH DMRS to SSS				
EPRE ratio of PBCH to PBCH DMRS				

EPRE ratio of PDCCH DMRS to SSS			
EPRE ratio of PDCCH to PDCCH DMRS			
EPRE ratio of PDSCH DMRS to SSS			
EPRE ratio of PDSCH to PDSCH			
EPRE ratio of OCNG DMRS to SSS(Note 1)			
EPRE ratio of OCNG to OCNG DMRS(Note 1)			
N_{oc} Note 2	Config 1,2,4	dBm/SCS	-104
	Config 3		-101
SS-RSRP Note 3	Config 1,2,4	dBm/SCS	-87
	Config 3		-84
$\hat{E}_s/I_{ot}$		dB	17
$\hat{E}_s/N_{oc}$		dB	17
Io Note3	Config 1,2,4	dBm/9.36MHz	-58.96
	Config 3	dBm/18.36MHz	-56.04
Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.			
Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for N_{oc} to be fulfilled.			
Note 3: SS-RSRP and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.			
Note 4: For unpaired spectrum, a DL BWP is linked with an UL BWP. DLBWP.0.1 is linked with ULBWP.0.1; DLBWP.1.1 is linked with ULBWP.1.1; as defined in clause 12 of TS 38.213 [3].			

16.5.4.2 NR SA FR1 UE specific CBW change on PCell in non-DRX for 2 Rx UE

16.5.4.2.1 Test purpose

To verify the UE specific CBW change delay requirement defined in 38.133 [6] clause 8.13A.

16.5.4.2.2 Test applicability

This test applies to all types of NR RedCap UEs with 2 Rx from Release 17 onwards.

16.5.4.2.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 16.5.4.0.1.

The normative reference for this requirement is TS 38.133 [6] clause A.16.5.4.2.

16.5.4.2.4 Test description

Same as the test description given in clause 6.5.8.1.

16.5.4.2.4.1 Initial conditions

Same as the initial conditions given in clause 6.5.8.1 with following exceptions:

- Table 6.5.8.1.4.1-1 is replaced by Table 16.5.4.2.4.1-1.
- Table 6.5.8.1.4.1-2 is replaced by Table 16.5.4.2.4.1-2.
- Table 6.5.8.1.4.1-3 is replaced by Table 16.5.4.2.4.1-3.

Table 16.5.4.2.4.1-1: Supported test configurations

Configuration	Description
16.5.4.2-1	15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode
16.5.4.2-2	15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode
16.5.4.2-3	30 kHz SSB SCS, 20 MHz bandwidth, TDD duplex mode
16.5.4.2-4	15 kHz SSB SCS, 10 MHz bandwidth, HD-FDD duplex mode,
Note: The UE is only required to pass in one of the supported test configurations in FR1	

Table 16.5.4.2.4.1-2: Initial conditions

Parameter	Value		Comment
Test environment	NC		As specified in TS 38.508-1 [14] clause 4.1.
Test frequencies	As specified in Annex E, table E.14-1 and TS 38.508-1 [14] clause 4.3.1 and 4.4.2.		
Channel bandwidth	As specified by the test configuration selected from Table 16.5.4.2.4.1-1.		
Propagation conditions	AWGN		As specified in Annex C.2.2.
Connection Diagram	TE Part	A.3.1.7.1	As specified in TS 38.508-1 [14] Annex A.
	DUT Part	A.3.2.3.4	
Exceptions to connection diagram	- Without LTE link		

Table 16.5.4.2.4.1-3: General test parameters

Parameter	Unit	Value	Comment
NR RF Channel Number		1	One NR radio channel is used for this test
Active Cell		Cell 1	Cell on RF channel number 1.
CP length		Normal	
DRX		OFF	
T1	s	0.2	

16.5.4.2.4.2 Test procedure

Same as the test procedure given in clause 6.5.8.1.4.2.

16.5.4.2.4.3 Message contents

Same as the message contents given in clause 6.5.8.1.4.2.

16.5.4.2.5 Test requirement

Same as the test requirements given in clause 6.5.8.1.5 with followings exceptions:

- Table 6.5.8.1.5-1 is replaced by Table 16.5.4.2.5-1.

Table 16.5.4.2.5-1: NR Cell specific test parameters

Parameter			Unit	Cell 1
Frequency Range				FR1
Duplex mode		Config 1		FDD
		Config 2,3		TDD
		Config 4		HD-FDD
TDD configuration		Config 1,4		Not Applicable
		Config 2		TDDConf.1.1
		Config 3		TDDConf.2.1
$BW_{channel}$		Config 1,2,4		10 MHz: $N_{RB,c}$ = 52
		Config 3		20 MHz: $N_{RB,c}$ = 51
Active DL BWP ID				0
Initial DL BWP Configuration (BWP-1)				DLBWP.0.2
Initial UL BWP Configuration (BWP-1)				ULBWP.0.2
Initial Condition	Active DL CBW Configuration (CBW-1)			DLCBW.1.1
	Active UL CBW Configuration (CBW-1)			ULCBW.1.1
Final Condition	Active DL CBW Configuration (CBW-2)			DLCBW.1.2
	Active UL CBW Configuration (CBW-2)			ULCBW.1.2
PDSCH Reference measurement channel		Config 1,4		SR.1.1 FDD
		Config 2		SR.1.1 TDD
		Config 3		SR.2.1 TDD

RMSI CORESET parameters	Config 1,4		CR.1.1 FDD
	Config 2		CR.1.1 TDD
	Config 3		CR.2.1 TDD
Dedicated CORESET parameters	Config 1,4		CCR.1.1 FDD
	Config 2		CCR.1.1 TDD
	Config 3		CCR.2.1 TDD
OCNG Patterns			OP.1
SSB Configuration	Config 1,2,4		SSB.1 FR1
	Config 3		SSB.1 RedCap FR1
SMTC Configuration			SMTC.1 RedCap FR1
TRS Configuration	Config 1,4		TRS.1.1 FDD
	Config 2		TRS.1.1 TDD
	Config 3		TRS.1.2 TDD
Antenna Configuration			1x2 low
Propagation Condition			AWGN
EPRE ratio of PSS to SSS		dB	0
EPRE ratio of PBCH DMRS to SSS			
EPRE ratio of PBCH to PBCH DMRS			
EPRE ratio of PDCCH DMRS to SSS			
EPRE ratio of PDCCH to PDCCH DMRS			
EPRE ratio of PDSCH DMRS to SSS			
EPRE ratio of PDSCH to PDSCH			
EPRE ratio of OCNG DMRS to SSS(Note 1)			
EPRE ratio of OCNG to OCNG DMRS(Note 1)			
N_{oc} Note 2	Config 1,2,4	dBm/SCS	-104
	Config 3		-101
SS-RSRP Note 3	Config 1,2,4	dBm/SCS	-87
	Config 3		-84
$\hat{E}_s/I_{ot}$		dB	17
$\hat{E}_s/N_{oc}$		dB	17
Io Note3	Config 1,2,4	dBm/9.36MHz	-58.96
	Config 3	dBm/18.36MHz	-56.04

Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.
Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for N_{oc} to be fulfilled.
Note 3: SS-RSRP and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.
Note 4: For unpaired spectrum, a DL BWP is linked with an UL BWP. DLBWP.0.1 is linked with ULBWP.0.1; DLBWP.1.1 is linked with ULBWP.1.1; as defined in clause 12 of TS 38.213 [3].

16.6 Measurement procedures for RedCap

16.6.1 Intra-frequency measurements for RedCap

16.6.1.0 Minimum conformance requirements

16.6.1.0.1 General

A measurement is defined as a SSB based intra-frequency measurement provided the centre frequency of the reference SSB of the serving cell and the centre frequency of the SSB of the neighbour cell are the same, and the subcarrier spacing of the two SSBs are also the same. The reference SSB is the SSB defined in BWP-specific *servingCellMO* under *BWP-DownlinkDedicated* of active DL BWP. If the field is absent, the reference SSB is the SSB defined in *servingCellMO* under *ServingCellConfig*.

The UE shall be able to identify new intra-frequency cells and perform SS-RSRP, SS-RSRQ, and SS-SINR measurements of identified intra-frequency cells if carrier frequency information is provided by PCell, even if no explicit neighbour list with physical layer cell identities is provided.

The UE can perform intra-frequency SSB based measurements without measurement gaps if

- the SSB is completely contained in the active BWP of the UE, or

- the active downlink BWP is initial BWP [3].

For intra-frequency SSB based measurements without measurement gaps, UE may cause scheduling restriction as specified in 38.133 [6] clause 9.2B.5.3.

SSB based measurements are configured along with one or two measurement timing configuration(s) (SMTC(s)) which provides periodicity, duration and offset information on a window of up to 5ms where the measurements are to be performed. For intra-frequency connected mode measurements, up to two measurement window periodicities may be configured. A single measurement window offset and measurement duration are configured per intra-frequency measurement object.

When measurement gaps are needed, the UE is not expected to detect SSB which start earlier than the gap starting time + switching time, nor detect SSB which end later than the gap end – switching time. Switching time is 0.5ms for frequency range FR1.

The requirements in this clause apply, provided:

- The cell being identified or measured is detectable.

An intra-frequency cell shall be considered detectable when for each relevant SSB:

- For 2Rx RedCap:
  - SS-RSRP related side conditions given in 38.133 [6] clauses 10.1.2 and 10.1.3 for FR1 and FR2, respectively, for a corresponding Band,
  - SS-RSRQ related side conditions given in 38.133 [6] clauses 10.1.7 and 10.1.8 for FR1 and FR2, respectively, for a corresponding Band,
  - SS-SINR related side conditions given in 38.133 [6] clauses 10.1.12 and 10.1.13 for FR1 and FR2, respectively, for a corresponding Band,
  - SSB_RP and SSB Ês/Iot according to Annex B.2.2 for a corresponding Band.
- For 1Rx RedCap:
  - SS-RSRP related side conditions given in clauses [x.y.z] and [x.y.z] for FR1 and FR2, respectively, for a corresponding Band,
  - SS-RSRQ related side conditions given in clauses [x.y.z] and [x.y.z] for FR1 and FR2, respectively, for a corresponding Band,
  - SS-SINR related side conditions given in clauses [x.y.z] and [x.y.z] for FR1 and FR2, respectively, for a corresponding Band,
  - SSB_RP and SSB Ês/Iot according to Annex [x.y.z] for a corresponding Band.

For 2Rx RedCap: The requirements in 38.133 [6] clause 9.2.4.3 shall apply.

For 1Rx RedCap: Reported RSRP, RSRQ, and RS-SINR measurements contained in event triggered measurement reports shall meet the requirements in 38.133 [6] clauses 10.1.2.1 (RSRP for FR1), 10.1.7.1 (RSRQ for FR1), 10.1.12.1 (RS-SINR for FR1).

The UE shall not send any event triggered measurement reports as long as no reporting criteria are fulfilled.

The measurement reporting delay is defined as the time between an event that will trigger a measurement report and the point when the UE starts to transmit the measurement report over the air interface. This requirement assumes that the measurement report is not delayed by other RRC signalling on the DCCH. This measurement reporting delay excludes a delay uncertainty resulted when inserting the measurement report to the TTI of the uplink DCCH. The delay uncertainty is: 2 x TTI_{DCCH}. This measurement reporting delay excludes a delay which caused by no UL resources being available for UE to send the measurement report on.

The event triggered measurement reporting delay, measured without L3 filtering shall be less than $T_{identify\ intra\ with\ index_RedCap}$ or $T_{identify\ intra\ without\ index_RedCap}$ defined in clause 16.6.1.0.2 or clause 16.6.1.0.3. When L3 filtering is used an additional delay can be expected.

A cell is detectable only if at least one SSBs measured from the Cell being configured remains detectable during the time period $T_{identify_intra_without_index_RedCap}$ or $T_{identify_intra_with_index_RedCap}$ as defined in clause 16.6.1.0.2 or clause 16.6.1.0.3. If a cell which has been detectable at least for the time period $T_{identify\ intra\ without\ index_RedCap}$ or $T_{identify\ intra\ with\ index_RedCap}$ defined in clause 16.6.1.0.2 or clause 16.6.1.0.3 becomes undetectable for a period ≤ 5 seconds and then the cell becomes detectable again with the same spatial reception parameter and triggers an event, the event triggered measurement reporting delay shall be less than $T_{SSB_measurement_period_intra_RedCap}$ provided the timing to that cell has not changed more than $\pm 3200/2^{\mu} T_c$ while the measurement gap has not been available and L3 filtering has not been used, where μ is the SCS configuration as defined in clause 4.2 of TS 38.211 [3]. When L3 filtering is used, an additional delay can be expected.

The normative reference for this requirement is TS 38.133 [6] clauses 9.2B.1 and 9.2B.4.3.

16.6.1.0.2 Minimum conformance requirements for event-triggered measurement without gap

The UE shall be able to identify a new detectable intra-frequency cell within $T_{identify_intra_without_index_RedCap}$ if the UE is not indicated to report SSB based RRM measurement result with the associated SSB index(*reportQuantityRsIndexes* or *maxNrofRSIndexesToReport* is not configured), or the UE is indicated that the neighbour cell is synchronous with the serving cell (*deriveSSB-IndexFromCell* is enabled). Otherwise UE shall be able to identify a new detectable intra frequency cell within $T_{identify_intra_with_index_RedCap}$. The UE shall be able to identify a new detectable intra frequency SS block of an already detected cell within $T_{identify_intra_without_index_RedCap}$. It is assumed that *deriveSSB-IndexFromCell* is always enabled for FR1 TDD.

$$T_{identify_intra_without_index_RedCap} = (T_{PSS/SSS_sync_intra_RedCap} + T_{SSB_measurement_period_intra_RedCap})\ ms$$

$$T_{identify_intra_with_index_RedCap} = (T_{PSS/SSS_sync_intra_RedCap} + T_{SSB_measurement_period_intra_RedCap} + T_{SSB_time_index_intra_RedCap})\ ms$$

Where:

$T_{PSS/SSS_sync_intra_RedCap}$: it is the time period used in PSS/SSS detection given in Table 16.6.1.0.2-1 for 2RX RedCap and Table 16.6.1.0.2-2 for 1Rx RedCap.

$T_{SSB_time_index_intra_RedCap}$: it is the time period used to acquire the index of the SSB being measured given in Table 16.6.1.0.2-3 for 2RX RedCap and Table 16.6.1.0.2-4 for 1RX RedCap.

$T_{SSB_measurement_period_intra_RedCap}$: equal to a measurement period of SSB based measurement given in Table 16.6.1.0.2-5 for 2RX RedCap and Table 16.6.1.0.2-6 for 1RX RedCap.

$CSSF_{intra_RedCap}$: it is a carrier specific scaling factor and is determined according to $CSSF_{outside_gap_RedCap,i}$ in 38.133 [6] clause 9.1A.5.1 for measurement conducted outside measurement gaps, i.e. when intra-frequency SMTC is fully non overlapping or partially overlapping with measurement gaps.

When intra-frequency SMTC is fully non overlapping with measurement gaps, Kp=1.

Table 16.6.1.0.2-1: Time period for PSS/SSS detection, (Frequency range FR1) for 2Rx RedCap UE

DRX cycle	$T_{PSS/SSS_sync_intra_RedCap}$
No DRX	max(600ms, ceil(5 x K_p) x SMTC period)[Note 1] x $CSSF_{intra_RedCap}$
DRX cycle≤ 320ms	max(600ms, ceil(5 x K_p) x max(SMTC period,DRX cycle)) x $CSSF_{intra_RedCap}$
DRX cycle>320ms	ceil(5 x K_p) x DRX cycle x $CSSF_{intra_RedCap}$
NOTE 1: If different SMTC periodicities are configured for different cells, the SMTC period in the requirement is the one used by the cell being identified	

Table 16.6.1.0.2-2: Time period for PSS/SSS detection, (Frequency range FR1) for 1Rx RedCap UE

DRX cycle	$T_{PSS/SSS_sync_intra_RedCap}$
No DRX	max(600ms, ceil(7 x K_p) x SMTC period)[Note 1] x $CSSF_{intra_RedCap}$
DRX cycle≤ 320ms	max(600ms, ceil(7 x K_p) x max(SMTC period,DRX cycle)) x $CSSF_{intra_RedCap}$
DRX cycle>320ms	ceil(7 x K_p) x DRX cycle x $CSSF_{intra_RedCap}$
NOTE 1: If different SMTC periodicities are configured for different cells, the SMTC period in the requirement is the one used by the cell being identified	

Table 16.6.1.0.2-3: Time period for time index detection (FR1) for 2Rx RedCap UE

DRX cycle	$T_{SSB_time_index_intra_RedCap}$
No DRX	max(120ms, ceil(3 x K_p) x SMTC period)[Note 1] x $CSSF_{intra_RedCap}$
DRX cycle≤ 320ms	max(120ms, ceil (3 x K_p) x max(SMTC period,DRX cycle)) x $CSSF_{intra_RedCap}$
DRX cycle>320ms	Ceil(3 x K_p) x DRX cycle x $CSSF_{intra_RedCap}$
NOTE 1: If different SMTC periodicities are configured for different cells, the SMTC period in the requirement is the one used by the cell being identified	

Table 16.6.1.0.2-4: Time period for time index detection (FR1) for 1Rx RedCap UE

DRX cycle	$T_{SSB_time_index_intra_RedCap}$
No DRX	max(160ms, ceil([6] x K_p) x SMTC period)[Note 1] x $CSSF_{intra_RedCap}$
DRX cycle≤ 320ms	max(160ms, ceil ([6] x K_p) x max(SMTC period,DRX cycle)) x $CSSF_{intra_RedCap}$
DRX cycle>320ms	Ceil([6] x K_p) x DRX cycle x $CSSF_{intra_RedCap}$
NOTE 1: If different SMTC periodicities are configured for different cells, the SMTC period in the requirement is the one used by the cell being identified	

Table 16.6.1.0.2-5: Measurement period for intra-frequency measurements without gaps (FR1) for 2Rx RedCap UE

DRX cycle	$T_{SSB_measurement_period_intra_RedCap}$
No DRX	max(200ms, ceil(5 x K_p) x SMTC period)[Note 1] x $CSSF_{intra_RedCap}$
DRX cycle≤ 320ms	max(200ms, ceil(1.5x 5 x K_p) x max(SMTC period,DRX cycle)) x $CSSF_{intra_RedCap}$
DRX cycle>320ms	ceil(5 x K_p) x DRX cycle x $CSSF_{intra_RedCap}$
NOTE 1: If different SMTC periodicities are configured for different cells, the SMTC period in the requirement is the one used by the cell being identified	

Table 16.6.1.0.2-6: Measurement period for intra-frequency measurements without gaps (FR1) for 1Rx RedCap UE

DRX cycle	$T_{SSB_measurement_period_intra_RedCap}$
No DRX	max([200]ms, ceil([5] x K_p) x SMTC period)[Note 1] x $CSSF_{intra_RedCap}$
DRX cycle≤ 320ms	max([200]ms, ceil(1.5x [5] x K_p) x max(SMTC period,DRX cycle)) x $CSSF_{intra_RedCap}$
DRX cycle>320ms	ceil([5] x K_p) x DRX cycle x $CSSF_{intra_RedCap}$
NOTE 1: If different SMTC periodicities are configured for different cells, the SMTC period in the requirement is the one used by the cell being identified	

When the UE performs intra-frequency measurements in a TDD band, the following restrictions apply due to SS-RSRP or SS-SINR measurement

- The UE is not expected to transmit PUCCH/PUSCH/SRS on SSB symbols to be measured, and on 1 data symbol before each consecutive SSB symbols to be measured and 1 data symbol after each consecutive SSB symbols to be measured within SMTC window duration. If the high layer in TS 38.331 [2] signalling of *smtc2* is configured, the SMTC periodicity follows *smtc2*; Otherwise SMTC periodicity follows *smtc1*.

When the UE performs intra-frequency measurements in a TDD band, the following restrictions apply due to SS-RSRQ measurement

- The UE is not expected to transmit PUCCH/PUSCH/SRS on SSB symbols to be measured, RSSI measurement symbols, and on 1 data symbol before each consecutive SSB to be measured/RSSI symbols and 1 data symbol after each consecutive SSB to be measured/RSSI symbols within SMTC window duration. If the high layer signalling of *smtc2* is configured in TS 38.331 [2], the SMTC periodicity follows *smtc2*; Otherwise the SMTC periodicity follows *smtc1*.

When the UE performs intra-frequency measurements in a HD-FDD band, the following restrictions apply due to SS-RSRP or SS-SINR measurement

- The UE is not expected to transmit PUCCH/PUSCH/SRS on SSB symbols to be measured, and on 1 data symbol before each consecutive SSB symbols to be measured and 1 data symbol after each consecutive SSB symbols to

be measured within SMTC window duration. If the high layer in TS 38.331 [2] signalling of *smtc2* is configured, the SMTC periodicity follows *smtc2*; Otherwise SMTC periodicity follows *smtc1*.

When the UE performs intra-frequency measurements in a HD-FDD band, the following restrictions apply due to SS-RSRQ measurement

- The UE is not expected to transmit PUCCH/PUSCH/SRS on SSB symbols to be measured, RSSI measurement symbols, and on 1 data symbol before each consecutive SSB to be measured/RSSI symbols and 1 data symbol after each consecutive SSB to be measured/RSSI symbols within SMTC window duration. If the high layer signalling of *smtc2* is configured in TS 38.331 [2], the SMTC periodicity follows *smtc2*; Otherwise the SMTC periodicity follows *smtc1*.

The normative reference for this requirement is TS 38.133 [6] clauses 9.2B.5.

16.6.1.0.3 Minimum conformance requirements for event-triggered measurement with gap

The UE shall be able to identify a new detectable intra frequency cell within $T_{identify_intra_without_index_RedCap}$ if UE is not indicated to report SSB based RRM measurement result with the associated SSB index (*reportQuantityRsIndexes* or *maxNrofRSIndexesToReport* is not configured), or the UE has been indicated that the neighbour cell is synchronous with the serving cell (*deriveSSB-IndexFromCell* is enabled). Otherwise UE shall be able to identify a new detectable intra frequency cell within $T_{identify_intra_with_index_RedCap.}$ The UE shall be able to identify a new detectable intra frequency SS block of an already detected cell within $T_{identify_intra_without_index_RedCap.}$ It is assumed that *deriveSSB-IndexFromCell* is always enabled for FR1 TDD.

$$T_{identify_intra_without_index_RedCap} = T_{PSS/SSS_sync_intra_RedCap} + T_{SSB_measurement_period_intra_RedCap} \text{ ms}$$

$$T_{identify_intra_with_index_RedCap} = T_{PSS/SSS_sync_intra_RedCap} + T_{SSB_measurement_period_intra_RedCap} + T_{SSB_time_index_intra_RedCap} \text{ ms}$$

Where:

$T_{PSS/SSS_sync_intra_RedCap}$: it is the time period used in PSS/SSS detection given in Table 16.6.1.0.3-1 for 2RX RedCap or Table 16.6.1.0.3-2 for 1RX RedCap.

$T_{SSB_time_index_intra_RedCap}$: it is the time period used to acquire the index of the SSB being measured given in Table 16.6.1.0.3-3 for 2RX RedCap or Table 16.6.1.0.3-4 for 1RX RedCap.

$T_{SSB_measurement_period_intra_RedCap}$: equal to a measurement period of SSB based measurement given in Table 16.6.1.0.3-5 for 2RX RedCap or Table 16.6.1.0.3-6 for 1RX RedCap.

$CSSF_{intra_RedCap}$: it is a carrier specific scaling factor and is determined according to $CSSF_{within_gap_RedCap,i}$ in 38.133 [6] clause 9.1A.5.2 for measurement conducted within measurement gaps.

Table 16.6.1.0.3-1: Time period for PSS/SSS detection (FR1) for 2Rx RedCap UE

DRX cycle	$T_{PSS/SSS_sync_intra_RedCap}$
No DRX	max(600ms, 5 x max(MGRP, SMTC period)) x $CSSF_{intra_RedCap}$
DRX cycle≤ 320ms	max(600ms, 5 x max(MGRP, SMTC period,DRX cycle)) x $CSSF_{intra_RedCap}$
DRX cycle>320ms	5 x max(MGRP, DRX cycle) x $CSSF_{intra_RedCap}$

Table 16.6.1.0.3-2: Time period for PSS/SSS detection (FR1) for 1Rx RedCap UE

DRX cycle	$T_{PSS/SSS_sync_intra_RedCap}$
No DRX	max(600 ms, 7 x max(MGRP, SMTC period)) x $CSSF_{intra_RedCap}$
DRX cycle≤ 320ms	max(600 ms, 7 x max(MGRP, SMTC period,DRX cycle)) x $CSSF_{intra_RedCap}$
DRX cycle>320ms	7 x max(MGRP, DRX cycle) x $CSSF_{intra_RedCap}$

Table 16.6.1.0.3-3: Time period for time index detection (Frequency range FR1) for 2Rx RedCap UE

DRX cycle	$T_{SSB_time_index_intra_RedCap}$
No DRX	max(120ms, 3 x max(MGRP, SMTC period)) x $CSSF_{intra_RedCap}$
DRX cycle≤ 320ms	max(120ms, 3 x max(MGRP, SMTC period,DRX cycle) x $CSSF_{intra_RedCap}$)
DRX cycle>320ms	3 x max(MGRP, DRX cycle) x $CSSF_{intra_RedCap}$

Table 16.6.1.0.3-4: Time period for time index detection (Frequency range FR1) for 1Rx RedCap UE

DRX cycle	$T_{SSB_time_index_intra_RedCap}$
No DRX	max(160ms, [6] x max(MGRP, SMTC period)) x $CSSF_{intra_RedCap}$
DRX cycle≤ 320ms	max(160ms, [6] x max(MGRP, SMTC period,DRX cycle) x $CSSF_{intra_RedCap}$)
DRX cycle>320ms	[6] x max(MGRP, DRX cycle) x $CSSF_{intra_RedCap}$

Table 16.6.1.0.3-5: Measurement period for intra-frequency measurements with gaps (FR1) for 2Rx RedCap UE

DRX cycle	$T_{SSB_measurement_period_intra_RedCap}$
No DRX	max(200ms, 5 x max(MGRP, SMTC period)) x $CSSF_{intra_RedCap}$
DRX cycle≤ 320ms	max(200ms, ceil(1.5x 5) x max(MGRP, SMTC period,DRX cycle)) x $CSSF_{intra_RedCap}$
DRX cycle>320ms	5 x max(MGRP, DRX cycle) x $CSSF_{intra_RedCap}$

Table 16.6.1.0.3-6: Measurement period for intra-frequency measurements with gaps (FR1) for 1Rx RedCap UE

DRX cycle	$T_{SSB_measurement_period_intra_RedCap}$
No DRX	max([200] ms, [5] x max(MGRP, SMTC period)) x $CSSF_{intra_RedCap}$
DRX cycle≤ 320ms	max([200] ms, ceil(1.5x [5]) x max(MGRP, SMTC period,DRX cycle)) x $CSSF_{intra_RedCap}$
DRX cycle>320ms	[5] x max(MGRP, DRX cycle) x $CSSF_{intra_RedCap}$

The normative reference for this requirement is TS 38.133 [6] clauses 9.2B.6.

16.6.1.1 NR SA FR1 Event triggered reporting tests without gap under non-DRX for 1 Rx UE

Editor's note: This test case is incomplete in following aspects:

- TT analysis is still missing.

16.6.1.1.1 Test purpose

To verify that the UE makes correct reporting of an event. This test will partly verify the intra-frequency cell search requirements in 38.133 [6] clauses 9.2B.5.1 and 9.2B.5.2.

16.6.1.1.2 Test applicability

This test applies to all types of NR RedCap UE with 1 Rx from Release 17 onwards.

16.6.1.1.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 16.6.1.0.1 and 16.6.1.0.3.

The normative reference for this requirement is TS 38.133 [6] clause A.16.6.1.1.

16.6.1.1.4 Test description

Two cells are deployed in the test, which are FR1 PCell (NR Cell 1) and a FR1 neighbour cell (NR Cell 2) on the same frequency as the PCell. The general and cell specific test parameters for PCell and neighbour cell are given in Table 16.6.1.1.4.1-3 and Table 16.6.1.1.5-1, respectively. In the measurement configuration a measurement object is configured for the frequency of the PCell, and it indicates to the UE that event-triggered reporting with Event A3 is used.

16.6.1.1.4.1 Initial conditions

This test shall be tested using any of the test configurations in Table 16.6.1.1.4.1-1.

Table 16.6.1.1.4.1-1: Supported test configurations

Configuration	Description
16.6.1.1-1	15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode
16.6.1.1-2	15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode
16.6.1.1-3	30 kHz SSB SCS, 20 MHz bandwidth, TDD duplex mode
16.6.1.1-4	15 kHz SSB SCS, 10 MHz bandwidth, HD-FDD duplex mode
Note: The UE is only required to be tested in one of the supported test configurations.	

Configure the test requirement and the DUT according to the parameters in Table 16.6.1.1.4.1-2.

Table 16.6.1.1.4.1-2: Initial conditions

Parameter	Value		Comment
Test environment	NC		As specified in TS 38.508-1 [14] clause 4.1.
Test frequencies	As specified in Annex E, Table E.14-1 and TS 38.508-1 [14] clause 4.3.1.		
Channel bandwidth	As specified by the test configuration selected from Table 16.6.1.1.4.1-1.		
Propagation conditions	AWGN		As specified in Annex C.2.2
Connection Diagram	TE Part	A.3.1.8.1	As specified in TS 38.508-1 [14] Annex A.
	DUT Part	A.3.2.2.1	
Exceptions to connection diagram			

1. The test parameters for PCell and neighbour cell are given in Table 16.6.1.1.4.1-3 below.

2. Message contents are defined in clause 16.6.1.1.4.3.

3. There is one carrier and two cells specified in the test. NR Cell 1 is the cell used for connection setup with the power level set according to Annex C.1.1 and C.1.2 for this test.

Table 16.6.1.1.4.1-3: General test parameters

Parameter		Unit	Value	Comment
Active cell			Cell 1	
Neighbour cell			Cell 2	Cell to be identified.
RF Channel Number			1: Cell 1 and Cell 2	
CD-SSB configuration	Config 1,2,4		SSB.1 FR1	
	Config 3		SSB.1 RedCap FR1	
NCD-SSB configuration	Config 1,2,4		SSB.6 RedCap FR1 Note 1	
	Config 3		SSB.7 RedCap FR1 Note 1	
SMTC configuration for NCD-SSB	Config 1,4		SMTC.4 RedCap	
	Config 2,3		SMTC.2 RedCap	
A3-Offset		dB	-4.5	
CP length			Normal	
Hysteresis		dB	0	
Time To Trigger		s	0	
Filter coefficient			0	L3 filtering is not used
DRX			N/A	OFF
Time offset between serving and neighbour cells	Config 1,4	ms	3	Asynchronous cells.The timing of Cell 2 is 3 ms later than the timing of Cell 1.
	Config 2,3	µs	3	Synchronous cells
T1		s	5	
T2		s	5	
Note 1: NCD-SSB is configured within dedicated RedCap DL BWP.				

16.6.1.1.4.2 Test procedure

The test consists of two successive time periods with time duration of T1 and T2 respectively. During time duration T1, the UE shall not have any timing information of NR Cell 2.

1. Ensure the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity *NR*, Connected without release *On* and Test Mode *On* according to TS 38.508-1 [14] clause 4.5.

2. Set the parameters according to T1 in Table 16.6.1.1.5-1.

3. Set NR Cell 2 physical cell identity = (current NR cell 2 physical cell identity + 1) mod 1008 for current iteration of the test procedure loop

4. SS shall transmit an *RRCReconfiguration* message to configure RedCap-specific dedicated BWP and Event A3 triggered reporting.

5. The UE shall transmit an *RRCReconfigurationComplete* message. T1 starts upon the SS receives the *RRCReconfigurationComplete* message.

6. When T1 expires, the SS shall switch the power setting from T1 to T2 as specified in Table 16.6.1.1.5-1. T2 starts.

7. The SS increases the number of successful tests by one if the UE transmits a *MeasurementReport* message triggered by event A3 satisfying the overall delay requirement specified in clause 16.6.1.1.5, otherwise the SS increases the number of failure tests by one.

8. After the SS receive the *MeasurementReport* message in step 7) or when T2 expires, the SS shall:

   - transmit *RRCRelease* message to release the RRC connection which includes the release of the established radio bearers as well as all radio resources

   or

   - switch the UE off.

9. Depending on the choice in step 8, the SS shall,

   - transmit in NR Cell 1 a *Paging* message including matched ng-5G-S-TMSI for the UE if an *RRCRelease* has been sent in step 8. If the paging fails, switches off and on the UE,

   or

   - switch on the UE if the UE is switched off in step 8.

10. Ensure the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity *NR*, Connected without release *On* and Test Mode *On* according to TS 38.508-1 [14] clause 4.5.

11. Repeat step 2-10 until the confidence level according to Tables G.2.3-1 in Annex G clause G.2 is achieved.

16.6.1.1.4.3 Message contents

Message contents are according to TS 38.508-1 [14] clause 7.3 with the following exceptions:

Table 16.6.1.1.4.3-1: Common Exception messages

Default Message Contents	
Common contents of system information blocks exceptions	
Default RRC messages and information elements contents exceptions	Table H.3.1-1 Table H.3.1-2 Table H.3.1-4 with A3-offset = -4.5dB Table H.3.1-5 Table H.3.1-7 with Condition INTRA-FREQ Table H.3.1-8 with Condition SSB RLM

Table 16.6.1.1.4.3-2: *MeasObjectNR* (step 4, test procedure)

Derivation Path: Table H.3.1-3 with condition INTRA-FREQ MO			
Information Element	**Value/remark**	**Comment**	**Condition**
MeasObjectNR ::= SEQUENCE {			

ssbFrequency	ARFCN-ValueNR of NCD-SSB		
smtc1	SSB-MTC specified in 38.508-1 [14] Table 7.3.1-3 with condition SMTC.2 RedCap	SMTC.2 RedCap	Config 1,4
	SSB-MTC specified in 38.508-1 [14] Table 7.3.1-3 with condition SMTC.4 RedCap	SMTC.4 RedCap	Config 2,3
}			

Table 16.6.1.1.4.3-2: *ServingCellConfig* (step 4, test procedure)

Derivation Path: TS 38.508-1 [14] Table 4.6.3-167 with condition MEAS			
Information Element	**Value/remark**	**Comment**	**Condition**
ServingCellConfig ::= SEQUENCE {			
tdd-UL-DL-ConfigurationDedicated	Not present		
downlinkBWP-ToAddModList SEQUENCE (SIZE (1..maxNrofBWPs)) OF BWP-Downlink {	1 entry		
BWP-Downlink[1]	BWP-Downlink	entry 1 Table 16.6.1.1.4.3-3	
}			
firstActiveDownlinkBWP-Id	1	Activate the RedCap-specific dedicated DL BWP	
uplinkConfig SEQUENCE {			
initialUplinkBWP	Not present		
uplinkBWP-ToAddModList SEQUENCE (SIZE (1..maxNrofBWPs)) OF BWP-Uplink {	1 entry		
BWP-Uplink[1]	BWP-Uplink	entry 1 Table 16.6.1.1.4.3-4	
}			
firstActiveUplinkBWP-Id	1	Activate the RedCap-specific dedicated UL BWP	
pusch-ServingCellConfig	Not present		
}			
}			
servingCellMO	Not present		
}			

Table 16.6.1.1.4.3-3: *BWP-Downlink* (Table 16.6.1.1.4.3-2)

Derivation Path: TS 38.508-1 [14], Table 4.6.3-9			
Information Element	**Value/remark**	**Comment**	**Condition**
BWP-Downlink ::= SEQUENCE {			
bwp-Id	1		
bwp-Common SEQUENCE {			
genericParameters SEQUENCE {			
locationAndBandwidth	The RIV corresponds to DLBWP.1.3 RedCap		
}			
}			
bwp-Dedicated SEQUENCE {			
nonCellDefiningSSB-r17 SEQUENCE {			
absoluteFrequencySSB-r17	ARFCN-ValueNR of NCD-SSB		
ssb-Periodicity-r17	ms80		
ssb-TimeOffset-r17	ms5		
}			

servingCellMO-r17	1	MeasObjectId associated to NCD-SSB	
}			
}			

Table 16.6.1.1.4.3-4: *BWP-Uplink* (Table 16.6.1.1.4.3-2)

Derivation Path: TS 38.508-1 [14], Table 4.6.3-13			
Information Element	**Value/remark**	**Comment**	**Condition**
BWP-Uplink ::= SEQUENCE {			
bwp-Id	1		
bwp-Common SEQUENCE {	BWP-UplinkCommon		
genericParameters SEQUENCE {			
locationAndBandwidth	The RIV corresponds to ULBWP.1.3 RedCap		
}			
}			
}			

16.6.1.1.5 Test requirement

Table 16.6.1.1.4.1-3 and Table 16.6.1.1.5-1 define the primary level settings including test tolerances.

Table 16.6.1.1.5-1: NR Cell specific test parameters for SA intra-frequency event triggered reporting tests without gap under non-DRX

Parameter		Unit	Cell 1		Cell 2	
			T1	T2	T1	T2
TDD configuration	Config 1,4		N/A		N/A	
	Config 2		TDDConf.1.1		TDDConf.1.1	
	Config 3		TDDConf.2.1		TDDConf.2.1	
PDSCH RMC configuration	Config 1,4		SR.1.1 FDD		N/A	
	Config 2		SR.1.1 TDD			
	Config 3		SR.2.1 TDD			
RMSI CORESET RMC configuration	Config 1,4		CR.1.1 FDD		N/A	
	Config 2		CR.1.1 TDD			
	Config 3		CR.2.1 TDD			
Dedicated CORESET RMC configuration	Config 1,4		CCR.1.1 FDD		N/A	
	Config 2		CCR.1.1 TDD			
	Config 3		CCR.2.1 TDD			
OCNG Patterns			OP.1		OP.1	
TRS Configuration	Config 1,4		TRS.1.1 FDD		N/A	
	Config 2		TRS.1.1 TDD			
	Config 3		TRS.1.2 TDD			
Initial DL BWP configuration			DLBWP.0.1		DLBWP.0.1	
Initial UL BWP configuration			ULBWP.0.1		ULBWP.0.1	
Active DL BWP configuration			DLBWP.1.3 RedCap		DLBWP.1.3 RedCap	
Active UL BWP configuration			ULBWP.1.3 RedCap		ULBWP.1.3 RedCap	
RLM-RS			SSB		SSB	
N_{oc} Note 2	Config 1,2,4	dBm/SCS	-98			
	Config 3		-95			
N_{oc} Note 2		dBm/15 KHz	-98			
$\hat{E}_s/I_{ot}$		dB	4	-1.46	-Infinity	-1.46
$\hat{E}_s/N_{oc}$		dB	4	4	-Infinity	4
SS-RSRP Note 3	Config 1,2,4	dBm/SCS	-94	-94	-Infinity	-94
	Config 3		-91	-91	-Infinity	-91
Io	Config 1,2,4	dBm/9.36 MHz	-64.60	-62.25	-64.60	-62.25
	Config 3	dBm/18.36 MHz	-61.68	-59.34	-61.68	-59.34
Propagation Condition			AWGN			
Antenna Configuration			1x1			

Note 1: The resources for uplink transmission are assigned to the UE prior to the start of time period T2.
Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for N_{oc} to be fulfilled.
Note 3: SS-RSRP levels have been derived from other parameters for information purposes. They are not settable parameters themselves.

The overall delay is measured from the beginning of time period T2 to the time that the SS receives the first *MeasurementReport* message triggered by event A3. It is allowed to be up to $2xTTI_{DCCH}$ higher than the measurement reporting delay specified in 38.133[6] clause 9.2B.4 due to the TTI insertion uncertainty of the measurement report in DCCH.

Then the overall delay shall be no larger than: $T_{identify_intra_without_index} + 2xTTI_{DCCH}$, where

- $T_{identify_intra_without_index}$ = 1000 ms, is the time for intra-frequency cell identification specified in 38.133 [6] clause 9.2B.5.1,
- TTI_{DCCH} = 1 ms.

Which gives a total of 1002 ms.

The UE is not required to read the neighbour cell SSB index in this test.

For the test to pass, the total number of successful tests shall be more than 90% of the cases with a confidence level of 95%.

16.6.1.2 NR SA FR1 Event triggered reporting tests without gap under non-DRX for 2 Rx UE

16.6.1.2.1 Test purpose

To verify that the UE makes correct reporting of an event. This test will partly verify the intra-frequency cell search requirements in 38.133 [6] clauses 9.2B.5.1 and 9.2B.5.2.

16.6.1.2.2 Test applicability

This test applies to all types of NR RedCap UE with 2 Rx from Release 17 onwards.

16.6.1.2.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 16.6.1.0.1 and 16.6.1.0.3.

The normative reference for this requirement is TS 38.133 [6] clause A.16.6.1.2.

16.6.1.2.4 Test description

Two cells are deployed in the test, which are FR1 PCell (NR Cell 1) and a FR1 neighbour cell (NR Cell 2) on the same frequency as the PCell. The general and cell specific test parameters for PCell and neighbour cell are given in Table 16.6.1.2.4.1-3 and Table 16.6.1.2.5-1, respectively. In the measurement configuration a measurement object is configured for the frequency of the PCell, and it indicates to the UE that event-triggered reporting with Event A3 is used.

16.6.1.2.4.1 Initial conditions

This test shall be tested using any of the test configurations in Table 16.6.1.2.4.1-1.

Table 16.6.1.2.4.1-1: Supported test configurations

Configuration	Description
16.6.1.2-1	15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode
16.6.1.2-2	15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode
16.6.1.2-3	30 kHz SSB SCS, 20 MHz bandwidth, TDD duplex mode
16.6.1.2-4	15 kHz SSB SCS, 10 MHz bandwidth, HD-FDD duplex mode

Note: The UE is only required to be tested in one of the supported test configurations.

Configure the test requirement and the DUT according to the parameters in Table 16.6.1.2.4.1-2.

Table 16.6.1.2.4.1-2: Initial conditions

Parameter	Value		Comment
Test environment	NC		As specified in TS 38.508-1 [14] clause 4.1.
Test frequencies	As specified in Annex E, Table E.14-1 and TS 38.508-1 [14] clause 4.3.1.		
Channel bandwidth	As specified by the test configuration selected from Table 16.6.1.2.4.1-1.		
Propagation conditions	AWGN		As specified in Annex C.2.2
Connection Diagram	TE Part	A.3.1.8.2	As specified in TS 38.508-1 [14] Annex A.
	DUT Part	A.3.2.3.4	
Exceptions to connection diagram			

1. The test parameters for PCell and neighbour cell are given in Table 16.6.1.2.4.1-3 below.

2. Message contents are defined in clause 16.6.1.2.4.3.

3. There is one carrier and two cells specified in the test. NR Cell 1 is the cell used for connection setup with the power level set according to Annex C.1.1 and C.1.2 for this test.

Table 16.6.1.2.4.1-3: General test parameters

Parameter		Unit	Value	Comment
Active cell			Cell 1	
Neighbour cell			Cell 2	Cell to be identified.
RF Channel Number			1: Cell 1 and Cell 2	
CD-SSB configuration	Config 1,2,4		SSB.1 FR1	
	Config 3		SSB.1 RedCap FR1	
NCD-SSB configuration	Config 1,2,4		SSB.6 RedCap FR1 Note 1	
	Config 3		SSB.7 RedCap FR1 Note 1	
SMTC configuration for NCD-SSB	Config 1,4		SMTC.4 RedCap	
	Config 2,3		SMTC.2 RedCap	
A3-Offset		dB	-4.5	
CP length			Normal	
Hysteresis		dB	0	
Time To Trigger		s	0	
Filter coefficient			0	L3 filtering is not used
DRX			N/A	OFF
Time offset between serving and neighbour cells	Config 1,4	ms	3	Asynchronous cells.The timing of Cell 2 is 3 ms later than the timing of Cell 1.
	Config 2,3	µs	3	Synchronous cells
T1		s	5	
T2		s	5	
Note 1: NCD-SSB is configured within dedicated RedCap DL BWP.				

16.6.1.2.4.2 Test procedure

The test consists of two successive time periods with time duration of T1 and T2 respectively. During time duration T1, the UE shall not have any timing information of NR Cell 2.

1. Ensure the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity *NR*, Connected without release *On* and Test Mode *On* according to TS 38.508-1 [14] clause 4.5.

2. Set the parameters according to T1 in Table 16.6.1.2.5-1.

3. Set NR Cell 2 physical cell identity = (current NR cell 2 physical cell identity + 1) mod 1008 for current iteration of the test procedure loop

4. SS shall transmit an *RRCReconfiguration* message to configure RedCap-specific dedicated BWP and Event A3 triggered reporting.

5. The UE shall transmit an *RRCReconfigurationComplete* message. T1 starts upon the SS receives the *RRCReconfigurationComplete* message.

6. When T1 expires, the SS shall switch the power setting from T1 to T2 as specified in Table 16.6.1.2.5-1. T2 starts.

7. The SS increases the number of successful tests by one if the UE transmits a *MeasurementReport* message triggered by event A3 satisfying the overall delay requirement specified in clause 16.6.1.2.5, otherwise the SS increases the number of failure tests by one.

8. After the SS receive the *MeasurementReport* message in step 7) or when T2 expires, the SS shall:

   - transmit *RRCRelease* message to release the RRC connection which includes the release of the established radio bearers as well as all radio resources

   or

   - switch the UE off.

9. Depending on the choice in step 8, the SS shall,

   - transmit in NR Cell 1 a *Paging* message including matched ng-5G-S-TMSI for the UE if an *RRCRelease* has been sent in step 8. If the paging fails, switches off and on the UE,

   or

   - switch on the UE if the UE is switched off in step 8.

10. Ensure the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity *NR*, Connected without release *On* and Test Mode *On* according to TS 38.508-1 [14] clause 4.5.

11. Repeat step 2-10 until the confidence level according to Tables G.2.3-1 in Annex G clause G.2 is achieved.

16.6.1.2.4.3 Message contents

Message contents are according to TS 38.508-1 [14] clause 7.3 with the following exceptions:

Table 16.6.1.2.4.3-1: Common Exception messages

Default Message Contents	
Common contents of system information blocks exceptions	
Default RRC messages and information elements contents exceptions	Table H.3.1-1 Table H.3.1-2 Table H.3.1-4 with A3-offset = -4.5dB Table H.3.1-5 Table H.3.1-7 with Condition INTRA-FREQ Table H.3.1-8 with Condition SSB RLM

Table 16.6.1.2.4.3-2: *MeasObjectNR* (step 4, test procedure)

Derivation Path: Table H.3.1-3 with condition INTRA-FREQ MO			
Information Element	**Value/remark**	**Comment**	**Condition**
MeasObjectNR ::= SEQUENCE {			
ssbFrequency	ARFCN-ValueNR of NCD-SSB		
smtc1	SSB-MTC specified in 38.508-1 [14] Table 7.3.1-3 with condition SMTC.2 RedCap	SMTC.2 RedCap	Config 2,3
	SSB-MTC specified in 38.508-1 [14] Table	SMTC.4 RedCap	Config 1,4

	7.3.1-3 with condition SMTC.4 RedCap		
}			

Table 16.6.1.2.4.3-3: *ServingCellConfig* (step 4, test procedure)

Derivation Path: TS 38.508-1 [14] Table 4.6.3-167 with condition MEAS			
Information Element	**Value/remark**	**Comment**	**Condition**
ServingCellConfig ::= SEQUENCE {			
downlinkBWP-ToAddModList SEQUENCE (SIZE (1..maxNrofBWPs)) OF BWP-Downlink {	1 entry		
BWP-Downlink[1]	BWP-Downlink	entry 1 Table 16.6.1.2.4.3-4	
}			
firstActiveDownlinkBWP-Id	1	Activate the RedCap-specific dedicated DL BWP	
uplinkConfig SEQUENCE {			
initialUplinkBWP	Not present		
uplinkBWP-ToAddModList SEQUENCE (SIZE (1..maxNrofBWPs)) OF BWP-Uplink {	1 entry		
BWP-Uplink[1]	BWP-Uplink	entry 1 Table 16.6.1.2.4.3-5	
}			
firstActiveUplinkBWP-Id	1	Activate the RedCap-specific dedicated UL BWP	
pusch-ServingCellConfig	Not present		
}			
}			
servingCellMO	Not present		
}			

Table 16.6.1.2.4.3-4: *BWP-Downlink* (Table 16.6.1.2.4.3-3)

Derivation Path: TS 38.508-1 [14], Table 4.6.3-9			
Information Element	**Value/remark**	**Comment**	**Condition**
BWP-Downlink ::= SEQUENCE {			
bwp-Id	1		
bwp-Common SEQUENCE {			
genericParameters SEQUENCE {			
locationAndBandwidth	The RIV corresponds to DLBWP.1.3 RedCap		
}			
}			
bwp-Dedicated SEQUENCE {			
nonCellDefiningSSB-r17 SEQUENCE {			
absoluteFrequencySSB-r17	ARFCN-ValueNR of NCD-SSB		
ssb-Periodicity-r17	ms80		
ssb-TimeOffset-r17	ms5		
}			
servingCellMO-r17	1	MeasObjectId associated with NCD-SSB	
}			
}			

Table 16.6.1.2.4.3-5: *BWP-Uplink* (Table 16.6.1.2.4.3-3)

Derivation Path: TS 38.508-1 [14], Table 4.6.3-13			
Information Element	**Value/remark**	**Comment**	**Condition**
BWP-Uplink ::= SEQUENCE {			

bwp-Id	1		
bwp-Common SEQUENCE {	BWP-UplinkCommon		
genericParameters SEQUENCE {			
locationAndBandwidth	The RIV corresponds to ULBWP.1.3 RedCap		
}			
}			
}			

16.6.1.2.5 Test requirement

Table 16.6.1.2.4.1-3 and Table 16.6.1.2.5-1 define the primary level settings including test tolerances.

Table 16.6.1.2.5-1: NR Cell specific test parameters for SA intra-frequency event triggered reporting tests without gap under non-DRX

Parameter		Unit	Cell 1		Cell 2	
			T1	T2	T1	T2
TDD configuration	Config 1,4		N/A		N/A	
	Config 2		TDDConf.1.1		TDDConf.1.1	
	Config 3		TDDConf.2.1		TDDConf.2.1	
PDSCH RMC configuration	Config 1,4		SR.1.1 FDD		N/A	
	Config 2		SR.1.1 TDD			
	Config 3		SR.2.1 TDD			
RMSI CORESET RMC configuration	Config 1,4		CR.1.1 FDD		N/A	
	Config 2		CR.1.1 TDD			
	Config 3		CR.2.1 TDD			
Dedicated CORESET RMC configuration	Config 1,4		CCR.1.1 FDD		N/A	
	Config 2		CCR.1.1 TDD			
	Config 3		CCR.2.1 TDD			
OCNG Patterns			OP.1		OP.1	
TRS Configuration	Config 1,4		TRS.1.1 FDD		N/A	
	Config 2		TRS.1.1 TDD			
	Config 3		TRS.1.2 TDD			
Initial DL BWP configuration			DLBWP.0.1		DLBWP.0.1	
Initial UL BWP configuration			ULBWP.0.1		ULBWP.0.1	
Active DL BWP configuration			DLBWP.1.3 RedCap		DLBWP.1.3 RedCap	
Active UL BWP configuration			ULBWP.1.3 RedCap		ULBWP.1.3 RedCap	
RLM-RS			SSB		SSB	
N_{oc} Note 2	Config 1,2,4	dBm/SCS	-98			
	Config 3		-95			
N_{oc} Note 2		dBm/15 KHz	-98			
$\hat{E}_s/I_{ot}$		dB	4	-1.46	-Infinity	-1.46
$\hat{E}_s/N_{oc}$		dB	4	4	-Infinity	4
SS-RSRP Note 3	Config 1,2,4	dBm/SCS	-94	-94	-Infinity	-94
	Config 3		-91	-91	-Infinity	-91
Io	Config 1,2,4	dBm/9.36 MHz	-64.60	-62.25	-64.60	-62.25
	Config 3	dBm/18.36 MHz	-61.68	-59.34	-61.68	-59.34
Propagation Condition			AWGN			

Note 1: The resources for uplink transmission are assigned to the UE prior to the start of time period T2.
Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for N_{oc} to be fulfilled.
Note 3: SS-RSRP levels have been derived from other parameters for information purposes. They are not settable parameters themselves.

The overall delay is measured from the beginning of time period T2 to the time that the SS receives the first *MeasurementReport* message triggered by event A3. It is allowed to be up to $2xTTI_{DCCH}$ higher than the measurement reporting delay specified in 38.133[6] clause 9.2B.4 due to the TTI insertion uncertainty of the measurement report in DCCH.

Then the overall delay shall be shall be no larger than: $T_{identify_intra_without_index} + 2xTTI_{DCCH}$, where

- $T_{identify_intra_without_index}$ = 1000 ms, is the time for intra-frequency cell identification specified in 38.133 [6] clause 9.2B.5.1,

- TTI_{DCCH} = 1 ms.

Which gives a total of 1002 ms.

The UE is not required to read the neighbour cell SSB index in this test.

For the test to pass, the total number of successful tests shall be more than 90% of the cases with a confidence level of 95%.

16.6.1.3 NR SA FR1 Event triggered reporting tests without gap under DRX for 1 Rx UE

Editor's Notes: This test case is incomplete in following aspects:

- TT analysis is missing.

16.6.1.3.1 Test purpose

To verify that the UE makes correct reporting of an event. This test will partly verify the intra-frequency cell identification and measurement period requirements in 38.133 [6] clauses 9.2B.5.1 and 9.2B.5.2.

16.6.1.3.2 Test applicability

This test applies to all types of NR RedCap UE with 1Rx from release 17 onwards and supporting long DRX cycle.

16.6.1.3.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 16.6.1.0.1 and 16.6.1.0.2.

The normative reference for this requirement is TS 38.133 [6] clause A.16.6.1.3.

16.6.1.3.4 Test description

16.6.1.3.4.1 Initial conditions

Same as the initial conditions given in clause 6.6.1.2.4.1 with following exceptions:

- Table 6.6.1.2.4.1-1 is replaced by Table 16.6.1.3.4.1-1.

- Table 6.6.1.2.4.1-2 is replaced by Table 16.6.1.3.4.1-2.

- Table 6.6.1.2.4.1-3 is replaced by Table 16.6.1.3.4.1-3.

Table 16.6.1.3.4.1-1: Supported test configurations

Configuration	Description
16.6.1.3-1	15 kHz SSB SCS, 10MHz bandwidth, FDD duplex mode
16.6.1.3-2	15 kHz SSB SCS, 10MHz bandwidth, TDD duplex mode
16.6.1.3-3	30 kHz SSB SCS, 20MHz bandwidth, TDD duplex mode
16.6.1.3-4	15 kHz SSB SCS, 10 MHz bandwidth, HD-FDD duplex mode
Note: The UE is only required to be tested in one of the supported test configurations.	

Table 16.6.1.3.4.1-2: Initial conditions

Parameter	Value	Comment
Test environment	NC	As specified in TS 38.508-1 [14] clause 4.1.
Test frequencies	As specified in Annex E, table E.4-1 and TS 38.508-1 [14] clause 4.3.1.	
Channel bandwidth	As specified by the test configuration selected from Table 16.6.1.3.4.1-1.	

Propagation conditions	AWGN		As specified in Annex C.2.2.
Connection Diagram	TE Part	A.3.1.8.1	As specified in TS 38.508-1 [14] Annex A.
	DUT Part	A.3.2.2.1	
Exceptions to connection diagram			

Table 16.6.1.3.4.1-3: General test parameters for SA intra-frequency event triggered reporting tests without gap for FR1 under DRX

Parameter	Unit	Test configuration	Value		Comment
			Test 1	Test 2	
Active cell		1,2,3,4	Cell 1		
Neighbour cell		1,2,3,4	Cell 2		Cell to be identified.
RF Channel Number		1,2,3,4	1: Cell 1 and Cell 2		
SSB configuration		1,2,4	SSB.1 FR1		
		3	SSB.1 RedCap FR1		
SMTC configuration		1,2,3,4	SMTC.1 RedCap FR1		
A3-Offset	dB	1,2,3,4	-4.5		
CP length		1,2,3,4	Normal		
Hysteresis	dB	1,2,3,4	0		
Time To Trigger	s	1,2,3,4	0		
Filter coefficient		1,2,3,4	0		L3 filtering is not used
DRX	ms	1,2,3,4	DRX.1	DRX.7	
Time offset between serving and neighbour cells		1,4	3 ms		Asynchronous cells. The timing of Cell 2 is 3ms later than the timing of Cell 1
		2,3	3 us		Synchronous cells
T1	s	1,2,3,4	5		
T2	s	1,2,3,4	5	10	

16.6.1.3.4.2 Test procedure

Same as the test procedure given in 6.6.1.2.4.2 with following exceptions:

- Step 6 in 6.6.1.2.4.2 is replaced by following step.

6. UE shall transmit a *MeasurementReport* message triggered by Event A3. If the overall delays measured from the beginning of time period T2 is less than 922 ms for Test 1 or less than 7682 ms for Test 2 then the number of successful tests is increased by one. If the UE fails to report the event within the overall delays measured requirement then the number of failure tests is increased by one.

16.6.1.3.4.3 Message contents

Same as the message contents given in 6.6.1.2.4.3 with following exceptions:

- Table 7.3.1-3 in 38.508-1 [14] is used with condition SMTC.1 RedCap FR1.

16.6.1.3.5 Test requirement

Same as the test requirement given in 6.6.1.2.5 with following exceptions:

- Table 6.6.1.2.5-1 is replaced by Table 16.6.1.3.5-1.

- The overall delay measured is expressed as:

Overall delays measured = $T_{PSS/SSS_sync_intra_RedCap}$ + $T_{SSB_measurement_period_intra_RedCap}$ + TTI insertion uncertainty

- $T_{PSS/SSS_sync_intra_RedCap}$ = 600 ms for Test 1, and $T_{PSS/SSS_sync_intra_RedCap}$ = 4480 ms for Test 2;

- $T_{SSB_measurement_period_intra_RedCap}$= 320 ms for Test 1, and $T_{PSS/SSS_sync_intra_RedCap}$ = 3200 ms for Test 2
- TTI insertion uncertainty = 2 ms

As a result, the overall delay measured for Test 1 and Test 2 shall be less than a total of 922 ms and 7682ms respectively.

Table 16.6.1.3.5-1: NR Cell specific test parameters

Parameter	Unit	Test config	Cell 1		Cell 2	
			T1	T2	T1	T2
TDD configuration		1,4	N/A		N/A	
		2	TDDConf.1.1		TDDConf.1.1	
		3	TDDConf.2.1		TDDConf.2.1	
PDSCH RMC configuration		1,4	SR.1.1 FDD		N/A	
		2	SR.1.1 TDD			
		3	SR.2.1 TDD			
RMSI CORESET RMC configuration		1,4	CR.1.1 FDD		N/A	
		2	CR.1.1 TDD			
		3	CR.2.1 TDD			
Dedicated CORESET RMC configuration		1,2	CCR.1.1 FDD		N/A	
		2	CCR.1.1 TDD			
		3	CCR.2.1 TDD			
OCNG Patterns		1,2,3,4	OP.1		OP.1	
TRS Configuration		1,4	TRS.1.1 FDD		N/A	
		2	TRS.1.1 TDD			
		3	TRS.1.2 TDD			
Initial BWP configuration		1,2,3,4	DLBWP.0.1 ULBWP.0.1		DLBWP.0.1 ULBWP.0.1	
Active DL BWP configuration		1,2,3,4	DLBWP.1.1		DLBWP.1.1	
Active UL BWP configuration		1,2,3,4	ULBWP.1.1		ULBWP.1.1	
RLM-RS		1,2,3,4	SSB		SSB	
N_{oc} Note 2	dBm/SCS	1,2,4	-98			
		3	-95			
N_{oc} Note 2	dBm/15 KHz	1,2,3,4	-98			
$\hat{E}_s/I_{ot}$	dB	1,2,3,4	4	-1.46	-Infinity	-1.46
$\hat{E}_s/N_{oc}$	dB	1,2,3,4	4	4	-Infinity	4
SS-RSRP Note 3	dBm/SCS	1,2,4	-94	-94	-Infinity	-94
		3	-91	-91	-Infinity	-91
Io	dBm/ 9.36 MHz	1,2,4	-64.60	-62.25	Specified in Cell 1 columns	
	dBm/ 18.36 MHz	3	-61.68	-59.34		
Propagation Condition		1,2,3,4	AWGN			

Note 1: The resources for uplink transmission are assigned to the UE prior to the start of time period T2.
Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for N_{oc} to be fulfilled.
Note 3: SS-RSRP levels have been derived from other parameters for information purposes. They are not settable parameters themselves.

16.6.1.4 NR SA FR1 Event triggered reporting tests without gap under DRX for 2 Rx UE

16.6.1.4.1 Test purpose

To verify that the UE makes correct reporting of an event. This test will partly verify the intra-frequency cell identification and measurement period requirements in 38.133 [6] clauses 9.2B.5.1 and 9.2B.5.2.

16.6.1.4.2 Test applicability

This test applies to all types of NR RedCap UE with 2Rx from release 17 onwards and supporting long DRX cycle.

16.6.1.4.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 16.6.1.0.1 and 16.6.1.0.2.

The normative reference for this requirement is TS 38.133 [6] clause A.16.6.1.4.

16.6.1.4.4 Test description

16.6.1.4.4.1 Initial conditions

Same as the initial conditions given in clause 6.6.1.2.4.1 with following exceptions:

- Table 6.6.1.2.4.1-1 is replaced by Table 16.6.1.4.4.1-1.
- Table 6.6.1.2.4.1-2 is replaced by Table 16.6.1.4.4.1-2.
- Table 6.6.1.2.4.1-3 is replaced by Table 16.6.1.4.4.1-3.

Table 16.6.1.4.4.1-1: Supported test configurations

Configuration	Description
16.6.1.4-1	15 kHz SSB SCS, 10MHz bandwidth, FDD duplex mode
16.6.1.4-2	15 kHz SSB SCS, 10MHz bandwidth, TDD duplex mode
16.6.1.4-3	30 kHz SSB SCS, 20MHz bandwidth, TDD duplex mode
16.6.1.4-4	15 kHz SSB SCS, 10 MHz bandwidth, HD-FDD duplex mode
Note: The UE is only required to be tested in one of the supported test configurations.	

Table 16.6.1.4.4.1-2: Initial conditions

Parameter	Value		Comment
Test environment	NC		As specified in TS 38.508-1 [14] clause 4.1.
Test frequencies	As specified in Annex E, table E.4-1 and TS 38.508-1 [14] clause 4.3.1.		
Channel bandwidth	As specified by the test configuration selected from Table 16.6.1.4.4.1-1.		
Propagation conditions	AWGN		As specified in Annex C.2.2.
Connection Diagram	TE Part	A.3.1.8.2	As specified in TS 38.508-1 [14] Annex A.
	DUT Part	A.3.2.3.4	
Exceptions to connection diagram	- Without LTE link		

Table 16.6.1.4.4.1-3: General test parameters for SA intra-frequency event triggered reporting tests without gap for FR1 under DRX

Parameter	Unit	Test configuration	Value		Comment
			Test 1	Test 2	
Active cell		1,2,3,4	Cell 1		
Neighbour cell		1,2,3,4	Cell 2		Cell to be identified.
RF Channel Number		1,2,3,4	1: Cell 1 and Cell 2		
SSB configuration		1,2,4	SSB.1 FR1		
		3	SSB.1 RedCap FR1		
SMTC configuration		1,2,3,4	SMTC.1 RedCap FR1		
A3-Offset	dB	1,2,3,4	-4.5		
CP length		1,2,3,4	Normal		
Hysteresis	dB	1,2,3,4	0		
Time To Trigger	s	1,2,3,4	0		

Filter coefficient		1,2,3,4	0		L3 filtering is not used
DRX	ms	1,2,3,4	DRX.1	DRX.7	
Time offset between serving and neighbour cells		1,4	3 ms		Asynchronous cells. The timing of Cell 2 is 3ms later than the timing of Cell 1
		2,3	3 us		Synchronous cells
T1	s	1,2,3,4	5		
T2	s	1,2,3,4	5	10	

16.6.1.4.4.2 Test procedure

Same as the test procedure given in 6.6.1.2.4.2.

16.6.1.4.4.3 Message contents

Same as the message contents given in 6.6.1.2.4.3 with following exceptions:

- Table 7.3.1-3 in 38.508-1 [14] is used with condition SMTC.1 RedCap FR1.

16.6.1.4.5 Test requirement

Same as the test requirement given in 6.6.1.2.5 with following exceptions:

- Table 6.6.1.2.5-1 is replaced by Table 16.6.1.4.5-1.
- The overall delay measured is expressed as:

Overall delays measured = $T_{PSS/SSS_sync_intra_RedCap}$ + $T_{SSB_measurement_period_intra_RedCap}$ + TTI insertion uncertainty

- $T_{PSS/SSS_sync_intra_RedCap}$ = 600 ms for Test 1, and $T_{PSS/SSS_sync_intra_RedCap}$ = 3200 ms for Test 2;
- $T_{SSB_measurement_period_intra_RedCap}$= 320 ms for Test 1, and $T_{PSS/SSS_sync_intra_RedCap}$ = 3200 ms for Test 2
- TTI insertion uncertainty = 2 ms

As a result, the overall delay measured for Test 1 and Test 2 shall be less than a total of 922 ms and 6402 ms respectively.

Table 16.6.1.4.5-1: NR Cell specific test parameters

Parameter	Unit	Test config	Cell 1		Cell 2	
			T1	T2	T1	T2
TDD configuration		1,4	N/A		N/A	
		2	TDDConf.1.1		TDDConf.1.1	
		3	TDDConf.2.1		TDDConf.2.1	
PDSCH RMC configuration		1,4	SR.1.1 FDD		N/A	
		2	SR.1.1 TDD			
		3	SR.2.1 TDD			
RMSI CORESET RMC configuration		1,4	CR.1.1 FDD		N/A	
		2	CR.1.1 TDD			
		3	CR.2.1 TDD			
Dedicated CORESET RMC configuration		1,2	CCR.1.1 FDD		N/A	
		2	CCR.1.1 TDD			
		3	CCR.2.1 TDD			
OCNG Patterns		1,2,3,4	OP.1		OP.1	
TRS Configuration		1,4	TRS.1.1 FDD		N/A	
		2	TRS.1.1 TDD			
		3	TRS.1.2 TDD			
Initial BWP configuration		1,2,3,4	DLBWP.0.1 ULBWP.0.1		DLBWP.0.1 ULBWP.0.1	
Active DL BWP configuration		1,2,3,4	DLBWP.1.1		DLBWP.1.1	
Active UL BWP configuration		1,2,3,4	ULBWP.1.1		ULBWP.1.1	
RLM-RS		1,2,3,4	SSB		SSB	

N_{oc} Note 2	dBm/SCS	1,2,4	-98			
		3	-95			
N_{oc} Note 2	dBm/15 KHz	1,2,3,4	-98			
$\hat{E}_s/I_{ot}$	dB	1,2,3,4	4	-1.46	-Infinity	-1.46
$\hat{E}_s/N_{oc}$	dB	1,2,3,4	4	4	-Infinity	4
SS-RSRP Note 3	dBm/SCS	1,2,4	-94	-94	-Infinity	-94
		3	-91	-91	-Infinity	-91
Io	dBm/ 9.36 MHz	1,2,4	-64.60	-62.25	Specified in Cell 1 columns	
	dBm/ 18.36 MHz	3	-61.68	-59.34		
Propagation Condition		1,2,3,4	AWGN			
Note 1: The resources for uplink transmission are assigned to the UE prior to the start of time period T2. Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for N_{oc} to be fulfilled. Note 3: SS-RSRP levels have been derived from other parameters for information purposes. They are not settable parameters themselves.						

16.6.1.5 NR SA FR1 Event triggered reporting tests with per-UE gaps under non-DRX for 1 Rx UE

Editor's note: This test cases is incomplete in following aspects:

- TT analysis is still missing

16.6.1.5.1 Test purpose

To verify that the UE makes correct reporting of an event. This test will partly verify the intra-frequency cell search requirements in 38.133 [6] clause 9.2B.6.1 and 9.2B.6.2.

16.6.1.5.2 Test applicability

This test applies to all types of NR RedCap UE with 1 Rx from Release 17 onwards supporting CSI-RS based RLM and BWP operation without bandwidth restriction.

16.6.1.5.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 16.6.1.0.1 and 16.6.1.0.3.

The normative reference for this requirement is TS 38.133 [6] clause A.16.6.1.5.

16.6.1.5.4 Test description

16.6.1.5.4.1 Initial conditions

Same as the initial conditions given in clause 6.6.1.3.4.1 with following exceptions:

- Table 6.6.1.3.4.1-1 is replaced by Table 16.6.1.5.4.1-1.
- Table 6.6.1.3.4.1-2 is replaced by Table 16.6.1.5.4.1-2.
- Table 6.6.1.3.4.1-3 is replaced by Table 16.6.1.5.4.1-3.

Table 16.6.1.5.4.1-1: Supported test configurations

Configuration	Description
16.6.1.5-1	15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode
16.6.1.5-2	15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode

16.6.1.5-3	30 kHz SSB SCS, 20 MHz bandwidth, TDD duplex mode
16.6.1.5-4	15 kHz SSB SCS, 10 MHz bandwidth, HD-FDD duplex mode
Note: The UE is only required to pass in one of the supported test configurations in FR1	

Table 16.6.1.5.4.1-2: Initial conditions

Parameter	Value		Comment
Test environment	NC		As specified in TS 38.508-1 [14] clause 4.1.
Test frequencies	As specified in Annex E, Table E.14-1 and TS 38.508-1 [14] clause 4.3.1.		
Channel bandwidth	As specified by the test configuration selected from Table 16.6.1.5.4.1-1.		
Propagation conditions	AWGN		As specified in Annex C.2.2
Connection Diagram	TE Part	A.3.1.8.1	As specified in TS 38.508-1 [14] Annex A.
	DUT Part	A.3.2.2.1	
Exceptions to connection diagram			

Table 16.6.1.5.4.1-3: General test parameters

Parameter	Unit	Test config.	Value	Comment
Active cell		1,2,3,4	Cell 1	
Neighbour cell		1,2,3,4	Cell 2	Cell to be identified.
RF Channel Number		1,2,3,4	1: Cell 1 and Cell 2	
Measurement gap type		1,2,3,4	Per-UE gaps	
Measurement gap repetition periodicity	ms	1,2,3,4	40	
Measurement gap length	ms	1,2,3,4	6	
Measurement gap offset	ms	1,2,3,4	39	
SSB configuration		1,2,4	SSB.1 FR1	
		3	SSB.1 RedCap FR1	
SMTC configuration		1,4	SMTC.2	
		2,3	SMTC.1	
CSI-RS parameters		1,4	CSI-RS.1.2 FDD resource #0	
		2	CSI-RS.1.2 TDD resource #0	
		3	CSI-RS.2.2 TDD resource #0	
A3-Offset	dB	1,2,3,4	-4.5	
CP length		1,2,3,4	Normal	
Hysteresis	dB	1,2,3,4	0	
Time To Trigger	s	1,2,3,4	0	
Filter coefficient		1,2,3,4	0	L3 filtering is not used
DRX	ms	1,2,3,4	N/A	OFF
Time offset between serving and neighbour cells		1,4	3 ms	Asynchronous cells. The timing of Cell 2 is 3ms later than the timing of Cell 1.
		2,3	3 μs	Synchronous cells
T1	s	1, 2, 3	5	
T2	s	1, 2, 3	5	

16.6.1.5.4.2 Test procedure

Same as the test procedure given in clause 6.6.1.3.4.2.

16.6.1.5.4.3 Message contents

Same as the message contents given in clause 6.6.1.3.4.3 with the following exception:

- For test configuration 16.6.1.5-1 and 16.6.1.5-4,

- Table H.3.1-3 is used with condition INTRA-FREQ MO.
- Table 7.3.1-3 specified in 38.508-1 [14] is used with condition SMTC.2.

- For test configuration 16.6.1.5-2 and 16.6.1.5-3,
  - Table H.3.1-3 is used with condition INTRA-FREQ MO and Synchronous cells.
  - Table 7.3.1-3 specified in 38.508-1 [14] is used with condition SMTC.1.

16.6.1.5.5 Test requirement

Same as the test requirements given in clause 6.6.1.3.5 with following exceptions:

- Table 6.6.1.3.5-1 is replaced by Table 16.6.1.5.5-1.

Table 16.6.1.5.5-1: Cell specific test parameters

Parameter	Unit	Test config.	Cell 1		Cell 2	
			T1	T2	T1	T2
TDD configuration		1,4	N/A		N/A	
		2	TDDConf.1.1		TDDConf.1.1	
		3	TDDConf.2.1		TDDConf.2.1	
PDSCH RMC configuration		1,4	SR.1.1 FDD		N/A	
		2	SR.1.1 TDD			
		3	SR.2.1 TDD			
RMSI CORESET RMC configuration		1,4	CR.1.1 FDD		N/A	
		2	CR.1.1 TDD			
		3	CR.2.1 TDD			
Dedicated CORESET RMC configuration		1,4	CCR.1.2 FDD		N/A	
		2	CCR.1.2 TDD			
		3	CCR.2.1 TDD			
OCNG Patterns		1,2,3,4	OP.1		OP.1	
TRS Configuration		1,4	TRS.1.1 FDD		N/A	
		2	TRS.1.1 TDD			
		3	TRS.1.2 TDD			
Initial BWP configuration		1,2,3,4	DLBWP.0.1 ULBWP.0.1		DLBWP.0.1 ULBWP.0.1	
Active DL BWP configuration		1,2,3,4	DLBWP.1.2		DLBWP.1.1	
Active UL BWP configuration		1,2,3,4	ULBWP.1.2		ULBWP.1.1	
RLM-RS		1,2,3,4	CSI-RS		SSB	
N_{oc} Note 2	dBm/SCS	1,2,4	-98			
		3	-95			
N_{oc} Note 2	dBm/15 KHz	1,2,3,4	-98			
$\hat{E}_s/I_{ot}$	dB	1,2,3,4	4	-1.46	-Infinity	-1.46
$\hat{E}_s/N_{oc}$	dB	1,2,3,4	4	4	-Infinity	4
SS-RSRP Note 3	dBm/SCS	1,2,4	-94	-94	-Infinity	-94
		3	-91	-91	-Infinity	-91
Io	dBm/9.36 MHz	1,2,4	-64.60	-62.25	-64.60	-62.25
	dBm/18.36 MHz	3	-61.68	-59.34	-61.68	-59.34
Propagation Condition		1,2,3,4	AWGN			

Note 1: The resources for uplink transmission are assigned to the UE prior to the start of time period T2.
Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for N_{oc} to be fulfilled.
Note 3: SS-RSRP levels have been derived from other parameters for information purposes. They are not settable parameters themselves.

16.6.1.6 NR SA FR1 Event triggered reporting tests with per-UE gaps under non-DRX for 2 Rx UE

16.6.1.6.1 Test purpose

To verify that the UE makes correct reporting of an event. This test will partly verify the intra-frequency cell search requirements in 38.133 [6] clause 9.2B.6.1 and 9.2B.6.2.

16.6.1.6.2 Test applicability

This test applies to all types of NR RedCap UE with 2 Rx from Release 17 onwards supporting CSI-RS based RLM and BWP operation without bandwidth restriction.

16.6.1.6.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 16.6.1.0.1 and 16.6.1.0.3.

The normative reference for this requirement is TS 38.133 [6] clause A.16.6.1.6.

16.6.1.6.4 Test description

16.6.1.6.4.1 Initial conditions

Same as the initial conditions given in clause 6.6.1.3.4.1 with following exceptions:

- Table 6.6.1.3.4.1-1 is replaced by Table 16.6.1.6.4.1-1.
- Table 6.6.1.3.4.1-2 is replaced by Table 16.6.1.6.4.1-2.
- Table 6.6.1.3.4.1-3 is replaced by Table 16.6.1.6.4.1-3.

Table 16.6.1.6.4.1-1: Supported test configurations

Configuration	Description
16.6.1.6-1	15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode
16.6.1.6-2	15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode
16.6.1.6-3	30 kHz SSB SCS, 20 MHz bandwidth, TDD duplex mode
16.6.1.6-4	15 kHz SSB SCS, 10 MHz bandwidth, HD-FDD duplex mode
Note: The UE is only required to pass in one of the supported test configurations in FR1	

Table 16.6.1.6.4.1-2: Initial conditions

Parameter	Value		Comment
Test environment	NC		As specified in TS 38.508-1 [14] clause 4.1.
Test frequencies	As specified in Annex E, Table E.14-1 and TS 38.508-1 [14] clause 4.3.1.		
Channel bandwidth	As specified by the test configuration selected from Table 16.6.1.6.4.1-1.		
Propagation conditions	AWGN		As specified in Annex C.2.2
Connection Diagram	TE Part	A.3.1.8.2	As specified in TS 38.508-1 [14] Annex A.
	DUT Part	A.3.2.3.2	
Exceptions to connection diagram			

Table 16.6.1.6.4.1-3: General test parameters

Parameter	Unit	Test config	Value	Comment
Active cell		1,2,3,4	Cell 1	
Neighbour cell		1,2,3,4	Cell 2	Cell to be identified.

RF Channel Number		1,2,3,4	1: Cell 1 and Cell 2	
Measurement gap type		1,2,3,4	Per-UE gaps	
Measurement gap repetition periodicity	ms	1,2,3,4	40	
Measurement gap length	ms	1,2,3,4	6	
Measurement gap offset	ms	1,2,3,4	39	
SSB configuration		1,2,4	SSB.1 FR1	
		3	SSB.1 RedCap FR1	
SMTC configuration		1,4	SMTC.2	
		2,3	SMTC.1	
CSI-RS parameters		1,4	CSI-RS.1.2 FDD resource #0	
		2	CSI-RS.1.2 TDD resource #0	
		3	CSI-RS.2.2 TDD resource #0	
A3-Offset	dB	1,2,3,4	-4.5	
CP length		1,2,3,4	Normal	
Hysteresis	dB	1,2,3,4	0	
Time To Trigger	s	1,2,3,4	0	
Filter coefficient		1,2,3,4	0	L3 filtering is not used
DRX	ms	1,2,3,4	N/A	OFF
Time offset between serving and neighbour cells		1,4	3 ms	Asynchronous cells. The timing of Cell 2 is 3ms later than the timing of Cell 1.
		2,3	3 μs	Synchronous cells
T1	s	1, 2, 3	5	
T2	s	1, 2, 3	5	

16.6.1.6.4.2 Test procedure

Same as the test procedure given in clause 6.6.1.3.4.2.

16.6.1.6.4.3 Message contents

Same as the message contents given in clause 6.6.1.3.4.3 with the following exception:

- For test configuration 16.6.1.6-1 and 16.6.1.6-4,
  - Table H.3.1-3 is used with condition INTRA-FREQ MO.
  - Table 7.3.1-3 specified in 38.508-1 [14] is used with condition SMTC.2.
- For test configuration 16.6.1.6-2 and 16.6.1.6-3,
  - Table H.3.1-3 is used with condition INTRA-FREQ MO and Synchronous cells.
  - Table 7.3.1-3 specified in 38.508-1 [14] is used with condition SMTC.1.

16.6.1.6.5 Test requirement

Same as the test requirements given in clause 6.6.1.3.5 with following exceptions:

- Table 6.6.1.3.5-1 is replaced by Table 16.6.1.6.5-1.

Table 16.6.1.6.5-1: Cell specific test parameters

Parameter	Unit	Test config.	Cell 1		Cell 2	
			T1	T2	T1	T2
TDD configuration		1,4	N/A		N/A	
		2	TDDConf.1.1		TDDConf.1.1	
		3	TDDConf.2.1		TDDConf.2.1	
PDSCH RMC configuration		1,4	SR.1.1 FDD		N/A	
		2	SR.1.1 TDD			
		3	SR.2.1 TDD			
		1,4	CR.1.1 FDD		N/A	

RMSI CORESET RMC configuration		2	CR.1.1 TDD			
		3	CR.2.1 TDD			
Dedicated CORESET RMC configuration		1,4	CCR.1.2 FDD		N/A	
		2	CCR.1.2 TDD			
		3	CCR.2.1 TDD			
OCNG Patterns		1,2,3,4	OP.1		OP.1	
TRS Configuration		1,4	TRS.1.1 FDD		N/A	
		2	TRS.1.1 TDD			
		3	TRS.1.2 TDD			
Initial BWP configuration		1,2,3,4	DLBWP.0.1 ULBWP.0.1		DLBWP.0.1 ULBWP.0.1	
Active DL BWP configuration		1,2,3,4	DLBWP.1.2		DLBWP.1.1	
Active UL BWP configuration		1,2,3,4	ULBWP.1.2		ULBWP.1.1	
RLM-RS		1,2,3,4	CSI-RS		SSB	
N_{oc} Note 2	dBm/SCS	1,2,4	-98			
		3	-95			
N_{oc} Note 2	dBm/15 KHz	1,2,3,4	-98			
$\hat{E}_s/I_{ot}$	dB	1,2,3,4	4	-1.46	-Infinity	-1.46
$\hat{E}_s/N_{oc}$	dB	1,2,3,4	4	4	-Infinity	4
SS-RSRP Note 3	dBm/SCS	1,2,4	-94	-94	-Infinity	-94
		3	-91	-91	-Infinity	-91
Io	dBm/9.36 MHz	1,2,4	-64.60	-62.25	-64.60	-62.25
	dBm/18.36 MHz	3	-61.68	-59.34	-61.68	-59.34
Propagation Condition		1,2,3,4	AWGN			

Note 1: The resources for uplink transmission are assigned to the UE prior to the start of time period T2.
Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for N_{oc} to be fulfilled.
Note 3: SS-RSRP levels have been derived from other parameters for information purposes. They are not settable parameters themselves.

16.6.1.7 NR SA FR1 Event triggered reporting tests with per-UE gaps under DRX for 1 Rx UE

Editor's Notes: This test case is incomplete in following aspects:

- TT analysis is missing.

16.6.1.7.1 Test purpose

To verify that the UE makes correct reporting of an event. This test will partly verify the intra-frequency cell identification and measurement period requirements in 38.133 [6] clauses 9.2B.6.1 and 9.2B.6.2.

16.6.1.7.2 Test applicability

This test applies to all types of NR RedCap UE with 1Rx from release 17 onwards and supporting CSI-RS-based RLM, BWP operation without bandwidth restriction and long DRX cycle.

16.6.1.7.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 16.6.1.0.1 and 16.6.1.0.3.

The normative reference for this requirement is TS 38.133 [6] clause A.16.6.1.7.

16.6.1.7.4 Test description

16.6.1.7.4.1 Initial conditions

Same as the initial conditions given in clause 6.6.1.4.4.1 with following exceptions:

- Table 6.6.1.4.4.1-1 is replaced by Table 16.6.1.7.4.1-1.
- Table 6.6.1.4.4.1-2 is replaced by Table 16.6.1.7.4.1-2.
- Table 6.6.1.4.4.1-3 is replaced by Table 16.6.1.7.4.1-3.

Table 16.6.1.7.4.1-1: Supported test configurations

Configuration	Description
16.6.1.7-1	15 kHz SSB SCS, 10MHz bandwidth, FDD duplex mode
16.6.1.7-2	15 kHz SSB SCS, 10MHz bandwidth, TDD duplex mode
16.6.1.7-3	30 kHz SSB SCS, 20MHz bandwidth, TDD duplex mode
16.6.1.7-4	15 kHz SSB SCS, 10 MHz bandwidth, HD-FDD duplex mode
Note: The UE is only required to be tested in one of the supported test configurations.	

Table 16.6.1.7.4.1-2: Initial conditions

Parameter	Value		Comment
Test environment	NC		As specified in TS 38.508-1 [14] clause 4.1.
Test frequencies	As specified in Annex E, table E.4-1 and TS 38.508-1 [14] clause 4.3.1.		
Channel bandwidth	As specified by the test configuration selected from Table 16.6.1.7.4.1-1.		
Propagation conditions	AWGN		As specified in Annex C.2.2.
Connection Diagram	TE Part	A.3.1.8.1	As specified in TS 38.508-1 [14] Annex A.
	DUT Part	A.3.2.2.1	
Exceptions to connection diagram			

Table 16.6.1.7.4.1-3: General test parameters

Parameter	Unit	Test configuration	Value		Comment
			Test 1	Test 2	
Active cell		1,2,3,4	Cell 1		
Neighbour cell		1,2,3,4	Cell 2		Cell to be identified.
RF Channel Number		1,2,3,4	1: Cell 1 and Cell 2		
Measurement gap type		1,2,3,4,	Per-UE gaps		
Measurement gap repetition periodicity	ms	1,2,3,4	40		
Measurement gap length	ms	1,2,3,4	6		
Measurement gap offset	ms	1,2,3,4	39		
SSB configuration		1,2,4	SSB.1 FR1		
		3	SSB.1 RedCap FR1		
SMTC configuration		1,2,3,4	SMTC.1 RedCap FR1		
A3-Offset	dB	1,2,3,4	-4.5		
CP length		1,2,3,4	Normal		
Hysteresis	dB	1,2,3,4	0		
Time To Trigger	s	1,2,3,4	0		
Filter coefficient		1,2,3,4	0		L3 filtering is not used
DRX	ms	1,2,3,4	DRX.1	DRX.7	
Time offset between serving and neighbour cells		1,4	3 ms		Asynchronous cells. The timing of Cell 2 is 3ms later than the timing of Cell 1
		2,3	3 us		Synchronous cells
T1	s	1,2,3,4	5		

T2	s	1,2,3,4	5	10	

16.6.1.7.4.2 Test procedure

Same as the test procedure given in 6.6.1.4.4.2 with following exceptions:

- Step 6 in 6.6.1.4.4.2 is replaced by following step.

6. UE shall transmit a *MeasurementReport* message triggered by Event A3. If the overall delays measured from the beginning of time period T2 is less than 922 ms for Test 1 or less than 7682 ms for Test 2 then the number of successful tests is increased by one. If the UE fails to report the event within the overall delays measured requirement then the number of failure tests is increased by one.

16.6.1.7.4.3 Message contents

Same as the message contents given in 6.6.1.4.4.3 with following exceptions:

- Table 7.3.1-3 in 38.508-1 [14] is used with condition SMTC.1 RedCap FR1.

16.6.1.7.5 Test requirement

Same as the test requirement given in 6.6.1.4.5 with following exceptions:

- Table 6.6.1.4.5-1 is replaced by Table 16.6.1.7.5-1.
- The overall delay measured is expressed as:

Overall delays measured = $T_{PSS/SSS_sync_intra_RedCap}$ + $T_{SSB_measurement_period_intra_RedCap}$ + TTI insertion uncertainty

- $T_{PSS/SSS_sync_intra_RedCap}$ = 600 ms for Test 1, and $T_{PSS/SSS_sync_intra_RedCap}$ = 4480 ms for Test 2;
- $T_{SSB_measurement_period_intra_RedCap}$= 320 ms for Test 1, and $T_{PSS/SSS_sync_intra_RedCap}$ = 3200 ms for Test 2
- TTI insertion uncertainty = 2 ms

As a result, the overall delay measured for Test 1 and Test 2 shall be less than a total of 922 ms and 7682ms respectively.

Table 16.6.1.7.5-1: NR Cell specific test parameters

Parameter	Unit	Test config	Cell 1		Cell 2	
			T1	T2	T1	T2
TDD configuration		1,4	N/A		N/A	
		2	TDDConf.1.1		TDDConf.1.1	
		3	TDDConf.2.1		TDDConf.2.1	
PDSCH RMC configuration		1,4	SR.1.1 FDD		N/A	
		2	SR.1.1 TDD			
		3	SR.2.1 TDD			
RMSI CORESET RMC configuration		1,4	CR.1.1 FDD		N/A	
		2	CR.1.1 TDD			
		3	CR.2.1 TDD			
Dedicated CORESET RMC configuration		1,2	CCR.1.1 FDD		N/A	
		2	CCR.1.1 TDD			
		3	CCR.2.1 TDD			
OCNG Patterns		1,2,3,4	OP.1		OP.1	
TRS Configuration		1,4	TRS.1.1 FDD		N/A	
		2	TRS.1.1 TDD			
		3	TRS.1.2 TDD			
Initial BWP configuration		1,2,3,4	DLBWP.0.1 ULBWP.0.1		DLBWP.0.1 ULBWP.0.1	
Active DL BWP configuration		1,2,3,4	DLBWP.1.1		DLBWP.1.1	
Active UL BWP configuration		1,2,3,4	ULBWP.1.1		ULBWP.1.1	
RLM-RS		1,2,3,4	CSI-RS		SSB	

N_{oc} Note 2	dBm/SCS	1,2,4	-98			
		3	-95			
N_{oc} Note 2	dBm/15 KHz	1,2,3,4	-98			
$\hat{E}_s/I_{ot}$	dB	1,2,3,4	4	-1.46	-Infinity	-1.46
$\hat{E}_s/N_{oc}$	dB	1,2,3,4	4	4	-Infinity	4
SS-RSRP Note 3	dBm/SCS	1,2,4	-94	-94	-Infinity	-94
		3	-91	-91	-Infinity	-91
Io	dBm/ 9.36 MHz	1,2,4	-64.60	-62.25	Specified in Cell 1 columns	
	dBm/ 18.36 MHz	3	-61.68	-59.34		
Propagation Condition		1,2,3,4	AWGN			
Note 1: The resources for uplink transmission are assigned to the UE prior to the start of time period T2. Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for N_{oc} to be fulfilled. Note 3: SS-RSRP levels have been derived from other parameters for information purposes. They are not settable parameters themselves.						

16.6.1.8 NR SA FR1 Event triggered reporting tests with gap under DRX for 2 Rx UE

16.6.1.8.1 Test purpose

To verify that the UE makes correct reporting of an event. This test will partly verify the intra-frequency cell identification and measurement period requirements in 38.133 [6] clauses 9.2B.6.1 and 9.2B.6.2.

16.6.1.8.2 Test applicability

This test applies to all types of NR RedCap UE with 2Rx from release 17 onwards and supporting CSI-RS-based RLM, BWP operation without bandwidth restriction and long DRX cycle.

16.6.1.8.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 16.6.1.0.1 and 16.6.1.0.3.

The normative reference for this requirement is TS 38.133 [6] clause A.16.6.1.8.

16.6.1.8.4 Test description

16.6.1.8.4.1 Initial conditions

Same as the initial conditions given in clause 6.6.1.4.4.1 with following exceptions:

- Table 6.6.1.4.4.1-1 is replaced by Table 16.6.1.8.4.1-1.
- Table 6.6.1.4.4.1-2 is replaced by Table 16.6.1.8.4.1-2.
- Table 6.6.1.4.4.1-3 is replaced by Table 16.6.1.8.4.1-3.

Table 16.6.1.8.4.1-1: Supported test configurations

Configuration	Description
16.6.1.8-1	15 kHz SSB SCS, 10MHz bandwidth, FDD duplex mode
16.6.1.8-2	15 kHz SSB SCS, 10MHz bandwidth, TDD duplex mode
16.6.1.8-3	30 kHz SSB SCS, 20MHz bandwidth, TDD duplex mode
16.6.1.8-4	15 kHz SSB SCS, 10 MHz bandwidth, HD-FDD duplex mode
Note: The UE is only required to be tested in one of the supported test configurations.	

Table 16.6.1.8.4.1-2: Initial conditions

Parameter	Value		Comment
Test environment	NC		As specified in TS 38.508-1 [14] clause 4.1.
Test frequencies	As specified in Annex E, table E.4-1 and TS 38.508-1 [14] clause 4.3.1.		
Channel bandwidth	As specified by the test configuration selected from Table 16.6.1.8.4.1-1.		
Propagation conditions	AWGN		As specified in Annex C.2.2.
Connection Diagram	TE Part	A.3.1.8.2	As specified in TS 38.508-1 [14] Annex A.
	DUT Part	A.3.2.3.4	
Exceptions to connection diagram	- Without LTE link		

Table 16.6.1.8.4.1-3: General test parameters

Parameter	Unit	Test configuration	Value		Comment
			Test 1	Test 2	
Active cell		1,2,3,4	Cell 1		
Neighbour cell		1,2,3,4	Cell 2		Cell to be identified.
RF Channel Number		1,2,3,4	1: Cell 1 and Cell 2		
Measurement gap type		1,2,3,4,	Per-UE gaps		
Measurement gap repetition periodicity	ms	1,2,3,4	40		
Measurement gap length	ms	1,2,3,4	6		
Measurement gap offset	ms	1,2,3,4	39		
SSB configuration		1,2,4	SSB.1 FR1		
		3	SSB.1 RedCap FR1		
SMTC configuration		1,2,3,4	SMTC.1 RedCap FR1		
A3-Offset	dB	1,2,3,4	-4.5		
CP length		1,2,3,4	Normal		
Hysteresis	dB	1,2,3,4	0		
Time To Trigger	s	1,2,3,4	0		
Filter coefficient		1,2,3,4	0		L3 filtering is not used
DRX	ms	1,2,3,4	DRX.1	DRX.7	
Time offset between serving and neighbour cells		1,4	3 ms		Asynchronous cells. The timing of Cell 2 is 3ms later than the timing of Cell 1
		2,3	3 us		Synchronous cells
T1	s	1,2,3,4	5		
T2	s	1,2,3,4	5	10	

16.6.1.8.4.2 Test procedure

Same as the test procedure given in 6.6.1.4.4.2.

16.6.1.8.4.3 Message contents

Same as the message contents given in 6.6.1.4.4.3 with following exceptions:

- Table 7.3.1-3 in 38.508-1 [14] is used with condition SMTC.1 RedCap FR1.

16.6.1.8.5 Test requirement

Same as the test requirement given in 6.6.1.4.5 with following exceptions:

- Table 6.6.1.4.5-1 is replaced by Table 16.6.1.8.5-1.
- The overall delay measured is expressed as:

Overall delays measured = $T_{PSS/SSS_sync_intra_RedCap}$ + $T_{SSB_measurement_period_intra_RedCap}$ + TTI insertion uncertainty

- $T_{PSS/SSS_sync_intra_RedCap}$ = 600 ms for Test 1, and $T_{PSS/SSS_sync_intra_RedCap}$ = 3200 ms for Test 2;
- $T_{SSB_measurement_period_intra_RedCap}$= 320 ms for Test 1, and $T_{PSS/SSS_sync_intra_RedCap}$ = 3200 ms for Test 2
- TTI insertion uncertainty = 2 ms

As a result, the overall delay measured for Test 1 and Test 2 shall be less than a total of 922 ms and 6402 ms respectively.

Table 16.6.1.8.5-1: NR Cell specific test parameters

Parameter	Unit	Test config	Cell 1		Cell 2	
			T1	T2	T1	T2
TDD configuration		1,4	N/A		N/A	
		2	TDDConf.1.1		TDDConf.1.1	
		3	TDDConf.2.1		TDDConf.2.1	
PDSCH RMC configuration		1,4	SR.1.1 FDD		N/A	
		2	SR.1.1 TDD			
		3	SR.2.1 TDD			
RMSI CORESET RMC configuration		1,4	CR.1.1 FDD		N/A	
		2	CR.1.1 TDD			
		3	CR.2.1 TDD			
Dedicated CORESET RMC configuration		1,2	CCR.1.1 FDD		N/A	
		2	CCR.1.1 TDD			
		3	CCR.2.1 TDD			
OCNG Patterns		1,2,3,4	OP.1		OP.1	
TRS Configuration		1,4	TRS.1.1 FDD		N/A	
		2	TRS.1.1 TDD			
		3	TRS.1.2 TDD			
Initial BWP configuration		1,2,3,4	DLBWP.0.1 ULBWP.0.1		DLBWP.0.1 ULBWP.0.1	
Active DL BWP configuration		1,2,3,4	DLBWP.1.2		DLBWP.1.1	
Active UL BWP configuration		1,2,3,4	ULBWP.1.2		ULBWP.1.1	
RLM-RS		1,2,3,4	CSI-RS		SSB	
N_{oc} Note 2	dBm/SCS	1,2,4	-98			
		3	-95			
N_{oc} Note 2	dBm/15 KHz	1,2,3,4	-98			
$\hat{E}_s/I_{ot}$	dB	1,2,3,4	4	-1.46	-Infinity	-1.46
$\hat{E}_s/N_{oc}$	dB	1,2,3,4	4	4	-Infinity	4
SS-RSRP Note 3	dBm/SCS	1,2,4	-94	-94	-Infinity	-94
		3	-91	-91	-Infinity	-91
Io	dBm/ 9.36 MHz	1,2,4	-64.60	-62.25	Specified in Cell 1 columns	
	dBm/ 18.36 MHz	3	-61.68	-59.34		
Propagation Condition		1,2,3,4	AWGN			

Note 1: The resources for uplink transmission are assigned to the UE prior to the start of time period T2.
Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for N_{oc} to be fulfilled.
Note 3: SS-RSRP levels have been derived from other parameters for information purposes. They are not settable parameters themselves.

16.6.1.9 NR SA FR1 Event triggered reporting tests without gap under non-DRX with SSB index reading for 1 Rx UE

Editor's note: This test case is incomplete in following aspects:

- TT analysis is still missing.

16.6.1.9.1 Test purpose

To verify that the UE makes correct reporting of an event. This test will partly verify the intra-frequency cell search requirements in 38.133 [6] clauses 9.2B.5.1 and 9.2B.5.2.

16.6.1.9.2 Test applicability

This test applies to all types of NR RedCap UE with 1 Rx from Release 17 onwards.

16.6.1.9.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 16.6.1.0.1 and 16.6.1.0.3.

The normative reference for this requirement is TS 38.133 [6] clause A.16.6.1.9.

16.6.1.9.4 Test description

Two cells are deployed in the test, which are FR1 PCell (NR Cell 1) and a FR1 neighbour cell (NR Cell 2) on the same frequency as the PCell. The general and cell specific test parameters for FDD PCell and neighbour cell are given in Table 16.6.1.9.4.1-3 and Table 16.6.1.9.5-1, respectively. In the measurement configuration a measurement object is configured for the frequency of the PCell, and it indicates to the UE that event-triggered reporting with Event A3 is used.

16.6.1.9.4.1 Initial conditions

This test shall be tested using any of the test configurations in Table 16.6.1.9.4.1-1.

Table 16.6.1.9.4.1-1: Supported test configurations

Configuration	Description
16.6.1.9-1	15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode
16.6.1.9-2	15 kHz SSB SCS, 10 MHz bandwidth, HD-FDD duplex mode
Note: The UE is only required to be tested in one of the supported test configurations.	

Configure the test requirement and the DUT according to the parameters in Table 16.6.1.9.4.1-2.

Table 16.6.1.9.4.1-2: Initial conditions

Parameter	Value		Comment
Test environment	NC		As specified in TS 38.508-1 [14] clause 4.1.
Test frequencies	As specified in Annex E, Table E.14-1 and TS 38.508-1 [14] clause 4.3.1.		
Channel bandwidth	As specified by the test configuration selected from Table 16.6.1.9.4.1-1.		
Propagation conditions	AWGN		As specified in Annex C.2.2
Connection Diagram	TE Part	A.3.1.8.1	As specified in TS 38.508-1 [14] Annex A.
	DUT Part	A.3.2.2.1	
Exceptions to connection diagram			

1. The test parameters for PCell and neighbour cell are given in Table 16.6.1.9.4.1-3 below.

2. Message contents are defined in clause 16.6.1.9.4.3.

3. There is one carrier and two cells specified in the test. NR Cell 1 is the cell used for connection setup with the power level set according to Annex C.1.1 and C.1.2 for this test.

Table 16.6.1.9.4.1-3: General test parameters

Parameter	Unit	Value	Comment

Active cell		Cell 1	
Neighbour cell		Cell 2	Cell to be identified.
RF Channel Number		1: Cell 1 and Cell 2	
CD-SSB configuration		SSB.1 FR1	
NCD-SSB configuration		SSB.6 RedCap FR1 Note 1	
SMTC configuration for CD-SSB		SMTC.2	
SMTC configuration for NCD-SSB		SMTC.4 RedCap	
A3-Offset	dB	-4.5	
CP length		Normal	
Hysteresis	dB	0	
Time To Trigger	s	0	
Filter coefficient		0	L3 filtering is not used
DRX		N/A	OFF
Time offset between serving and neighbour cells	ms	3	Asynchronous cells. The timing of Cell 2 is 3 ms later than the timing of Cell 1.
T1	s	5	
T2	s	5	
Note 1: NCD-SSB is configured within dedicated RedCap DL BWP.			

16.6.1.9.4.2 Test procedure

The test consists of two successive time periods with time duration of T1 and T2 respectively. During time duration T1, the UE shall not have any timing information of NR Cell 2.

1. Ensure the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity *NR*, Connected without release *On* and Test Mode *On* according to TS 38.508-1 [14] clause 4.5.

2. Set the parameters according to T1 in Table 16.6.1.9.5-1.

3. Set NR Cell 2 physical cell identity = (current NR cell 2 physical cell identity + 1) mod 1008 for current iteration of the test procedure loop

4. SS shall transmit an *RRCReconfiguration* message to configure RedCap-specific dedicated BWP and Event A3 triggered reporting.

5. The UE shall transmit an *RRCReconfigurationComplete* message. T1 starts upon the SS receives the *RRCReconfigurationComplete* message.

6. When T1 expires, the SS shall switch the power setting from T1 to T2 as specified in Table 16.6.1.9.5-1. T2 starts.

7. The SS increases the number of successful tests by one if the UE transmits a *MeasurementReport* message triggered by event A3 satisfying the overall delay requirement specified in clause 16.6.1.9.5, otherwise the SS increases the number of failure tests by one.

8. After the SS receive the *MeasurementReport* message in step 7) or when T2 expires, the SS shall:

   - transmit *RRCRelease* message to release the RRC connection which includes the release of the established radio bearers as well as all radio resources

   or

   - switch the UE off.

9. Depending on the choice in step 8, the SS shall,

   - transmit in NR Cell 1 a *Paging* message including matched ng-5G-S-TMSI for the UE if an *RRCRelease* has been sent in step 8. If the paging fails, switches off and on the UE,

   or

   - switch on the UE if the UE is switched off in step 8.

10. Ensure the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity *NR*, Connected without release *On* and Test Mode *On* according to TS 38.508-1 [14] clause 4.5.

11. Repeat step 2-10 until the confidence level according to Tables G.2.3-1 in Annex G clause G.2 is achieved.

16.6.1.9.4.3 Message contents

Message contents are according to TS 38.508-1 [14] clause 7.3 with the following exceptions:

Table 16.6.1.9.4.3-1: Common Exception messages

Default Message Contents	
Common contents of system information blocks exceptions	
Default RRC messages and information elements contents exceptions	Table H.3.1-1 Table H.3.1-2 Table H.3.1-4 with condition SSB Index and A3-offset = -4.5dB Table H.3.1-5 Table H.3.1-7 with Condition INTRA-FREQ and SSB Index Table H.3.1-8 with Condition SSB RLM

Table 16.6.1.9.4.3-2: *MeasObjectNR* (step 4, test procedure)

Derivation Path: Table H.3.1-3 with condition INTRA-FREQ MO			
Information Element	**Value/remark**	**Comment**	**Condition**
MeasObjectNR ::= SEQUENCE {			
ssbFrequency	ARFCN-ValueNR of NCD-SSB		
smtc1	SSB-MTC specified in 38.508-1 [14] Table 7.3.1-3 with condition SMTC.4 RedCap	SMTC.4 RedCap	
}			

Table 16.6.1.9.4.3-3: *ServingCellConfig* (step 4, test procedure)

Derivation Path: TS 38.508-1 [14] Table 4.6.3-167 with condition MEAS			
Information Element	**Value/remark**	**Comment**	**Condition**
ServingCellConfig ::= SEQUENCE {			
tdd-UL-DL-ConfigurationDedicated	Not present		
downlinkBWP-ToAddModList SEQUENCE (SIZE (1..maxNrofBWPs)) OF BWP-Downlink {	1 entry		
BWP-Downlink[1]	BWP-Downlink	entry 1 Table 16.6.1.9.4.3-3	
}			
firstActiveDownlinkBWP-Id	1	Activate the RedCap-specific dedicated DL BWP	
uplinkConfig SEQUENCE {			
initialUplinkBWP	Not present		
uplinkBWP-ToAddModList SEQUENCE (SIZE (1..maxNrofBWPs)) OF BWP-Uplink {	1 entry		
BWP-Uplink[1]	BWP-Uplink	entry 1 Table 16.6.1.9.4.3-4	
}			
firstActiveUplinkBWP-Id	1	Activate the RedCap-specific dedicated UL BWP	
pusch-ServingCellConfig	Not present		
}			
}			
servingCellMO	Not present		
}			

Table 16.6.1.9.4.3-4: *BWP-Downlink* (Table 16.6.1.9.4.3-2)

Derivation Path: TS 38.508-1 [14], Table 4.6.3-9			
Information Element	**Value/remark**	**Comment**	**Condition**
BWP-Downlink ::= SEQUENCE {			
bwp-Id	1		
bwp-Common SEQUENCE {			
genericParameters SEQUENCE {			
locationAndBandwidth	The RIV corresponds to DLBWP.1.3 RedCap		
}			
}			
bwp-Dedicated SEQUENCE {			
nonCellDefiningSSB-r17 SEQUENCE {			
absoluteFrequencySSB-r17	ARFCN-ValueNR of NCD-SSB		
ssb-Periodicity-r17	ms80		
ssb-TimeOffset-r17	ms5		
}			
servingCellMO-r17	1	MeasObjectID associated with NCD-SSB	
}			
}			

Table 16.6.1.9.4.3-5: *BWP-Uplink* (Table 16.6.1.9.4.3-2)

Derivation Path: TS 38.508-1 [14], Table 4.6.3-13			
Information Element	**Value/remark**	**Comment**	**Condition**
BWP-Uplink ::= SEQUENCE {			
bwp-Id	1		
bwp-Common SEQUENCE {	BWP-UplinkCommon		
genericParameters SEQUENCE {			
locationAndBandwidth	The RIV corresponds to ULBWP.1.3 RedCap		
}			
}			
}			

16.6.1.9.5 Test requirement

Table 16.6.1.9.4.1-3 and Table 16.6.1.9.5-1 define the primary level settings including test tolerances.

Table 16.6.1.9.5-1: NR Cell specific test parameters for SA intra-frequency event triggered reporting tests without gap under non-DRX

Parameter	Unit	Cell 1		Cell 2	
		T1	T2	T1	T2
TDD configuration		N/A		N/A	
PDSCH RMC configuration		SR.1.1 FDD		N/A	
RMSI CORESET RMC configuration		CR.1.1 FDD		N/A	
Dedicated CORESET RMC configuration		CCR.1.1 FDD		N/A	
OCNG Patterns		OP.1		OP.1	
TRS Configuration		TRS.1.1 FDD		N/A	
Initial DL BWP configuration		DLBWP.0.1		DLBWP.0.1	
Initial UL BWP configuration		ULBWP.0.1		ULBWP.0.1	
Active DL BWP configuration		DLBWP.1.3 RedCap Note 4		DLBWP.1.3 RedCap Note 4	
Active UL BWP configuration		ULBWP.1.3 RedCap Note 5		ULBWP.1.3 RedCap Note 5	
RLM-RS		SSB		SSB	
N_{oc} Note 2	dBm/SCS	-98			
N_{oc} Note 2	dBm/15 KHz	-98			

$\hat{E}_s/I_{ot}$	dB	4	-1.46	-Infinity	-1.46
$\hat{E}_s/N_{oc}$	dB	4	4	-Infinity	4
SS-RSRP Note 3	dBm/SCS	-94	-94	-Infinity	-94
Io	dBm/9.36 MHz	-64.60	-62.25	-64.60	-62.25
Propagation Condition		AWGN			
Antenna Configuration		1x1			

Note 1: The resources for uplink transmission are assigned to the UE prior to the start of time period T2.
Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for N_{oc} to be fulfilled.
Note 3: SS-RSRP levels have been derived from other parameters for information purposes. They are not settable parameters themselves.
Note 4: The starting PRB index for dedicated DL BWP1 corresponding to CD-SSB PRB index; the starting PRB index for dedicated DL BWP2 corresponding to NCD-SSB PRB index.
Note 5: The starting PRB index for dedicated UL BWP1 is the same as the starting PRB index for dedicated DL BWP1; the starting PRB index for dedicated UL BWP2 is the same as the starting PRB index for dedicated DL BWP2.

The overall delay is measured from the beginning of time period T2 to the time that the SS receives the first *MeasurementReport* message triggered by event A3. It is allowed to be up to $2xTTI_{DCCH}$ higher than the measurement reporting delay specified in 38.133[6] clause 9.2B.4 due to the TTI insertion uncertainty of the measurement report in DCCH.

Then the overall delay shall be shall be no larger than: $T_{identify_intra_with_index} + 2xTTI_{DCCH}$, where

- $T_{identify_intra_with_index}$ = 1480 ms, is the time for intra-frequency cell identification specified in 38.133 [6] clause 9.2B.5.1,

- TTI_{DCCH} = 1 ms.

Which gives a total of 1482 ms.

The UE is required to read the neighbour cell SSB index and report the acquired SSB index in this test.

For the test to pass, the total number of successful tests shall be more than 90% of the cases with a confidence level of 95%.

16.6.1.10 NR SA FR1 Event triggered reporting tests without gap under non-DRX with SSB index reading for 2 Rx UE

16.6.1.10.1 Test purpose

To verify that the UE makes correct reporting of an event. This test will partly verify the intra-frequency cell search requirements in 38.133 [6] clauses 9.2B.5.1 and 9.2B.5.2.

16.6.1.10.2 Test applicability

This test applies to all types of NR RedCap UE with 2 Rx from Release 17 onwards.

16.6.1.10.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 16.6.1.0.1 and 16.6.1.0.3.

The normative reference for this requirement is TS 38.133 [6] clause A.16.6.1.10.

16.6.1.10.4 Test description

Two cells are deployed in the test, which are FR1 PCell (NR Cell 1) and a FR1 neighbour cell (NR Cell 2) on the same frequency as the PCell. The general and cell specific test parameters for FDD PCell and neighbour cell are given in Table 16.6.1.10.4.1-3 and Table 16.6.1.10.5-1, respectively. In the measurement configuration a measurement object is configured for the frequency of the PCell, and it indicates to the UE that event-triggered reporting with Event A3 is used.

16.6.1.10.4.1 Initial conditions

This test shall be tested using any of the test configurations in Table 16.6.1.10.4.1-1.

Table 16.6.1.10.4.1-1: Supported test configurations

Configuration	Description
16.6.1.10-1	15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode
16.6.1.10-2	15 kHz SSB SCS, 10 MHz bandwidth, HD-FDD duplex mode
Note: The UE is only required to be tested in one of the supported test configurations.	

Configure the test requirement and the DUT according to the parameters in Table 16.6.1.10.4.1-2.

Table 16.6.1.10.4.1-2: Initial conditions

Parameter	Value		Comment
Test environment	NC		As specified in TS 38.508-1 [14] clause 4.1.
Test frequencies	As specified in Annex E, Table E.14-1 and TS 38.508-1 [14] clause 4.3.1.		
Channel bandwidth	As specified by the test configuration selected from Table 16.6.1.10.4.1-1.		
Propagation conditions	AWGN		As specified in Annex C.2.2
Connection Diagram	TE Part	A.3.1.8.2	As specified in TS 38.508-1 [14] Annex A.
	DUT Part	A.3.2.3.4	
Exceptions to connection diagram			

1. The test parameters for PCell and neighbour cell are given in Table 16.6.1.10.4.1-3 below.
2. Message contents are defined in clause 16.6.1.10.4.3.
3. There is one carrier and two cells specified in the test. NR Cell 1 is the cell used for connection setup with the power level set according to Annex C.1.1 and C.1.2 for this test.

Table 16.6.1.10.4.1-3: General test parameters

Parameter	Unit	Value	Comment
Active cell		Cell 1	
Neighbour cell		Cell 2	Cell to be identified.
RF Channel Number		1: Cell 1 and Cell 2	
CD-SSB configuration		SSB.1 FR1	
NCD-SSB configuration		SSB.6 RedCap FR1 Note 1	
SMTC configuration for CD-SSB		SMTC.2 RedCap	
SMTC configuration for NCD-SSB		SMTC.4 RedCap	
A3-Offset	dB	-4.5	
CP length		Normal	
Hysteresis	dB	0	
Time To Trigger	s	0	
Filter coefficient		0	L3 filtering is not used
DRX		N/A	OFF
Time offset between serving and neighbour cells	ms	3	Asynchronous cells. The timing of Cell 2 is 3 ms later than the timing of Cell 1.
T1	s	5	
T2	s	5	
Note 1: NCD-SSB is configured within dedicated RedCap DL BWP.			

16.6.1.10.4.2 Test procedure

The test consists of two successive time periods with time duration of T1 and T2 respectively. During time duration T1, the UE shall not have any timing information of NR Cell 2.

1. Ensure the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity *NR*, Connected without release *On* and Test Mode *On* according to TS 38.508-1 [14] clause 4.5.

2. Set the parameters according to T1 in Table 16.6.1.10.5-1.

3. Set NR Cell 2 physical cell identity = (current NR cell 2 physical cell identity + 1) mod 1008 for current iteration of the test procedure loop

4. SS shall transmit an *RRCReconfiguration* message to configure RedCap-specific dedicated BWP and Event A3 triggered reporting.

5. The UE shall transmit an *RRCReconfigurationComplete* message. T1 starts upon the SS receives the *RRCReconfigurationComplete* message.

6. When T1 expires, the SS shall switch the power setting from T1 to T2 as specified in Table 16.6.1.10.5-1. T2 starts.

7. The SS increases the number of successful tests by one if the UE transmits a *MeasurementReport* message triggered by event A3 satisfying the overall delay requirement specified in clause 16.6.1.10.5, otherwise the SS increases the number of failure tests by one.

8. After the SS receive the *MeasurementReport* message in step 7) or when T2 expires, the SS shall:

   - transmit *RRCRelease* message to release the RRC connection which includes the release of the established radio bearers as well as all radio resources

   or

   - switch the UE off.

9. Depending on the choice in step 8, the SS shall,

   - transmit in NR Cell 1 a *Paging* message including matched ng-5G-S-TMSI for the UE if an *RRCRelease* has been sent in step 8. If the paging fails, switches off and on the UE,

   or

   - switch on the UE if the UE is switched off in step 8.

10. Ensure the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity *NR*, Connected without release *On* and Test Mode *On* according to TS 38.508-1 [14] clause 4.5.

11. Repeat step 2-10 until the confidence level according to Tables G.2.3-1 in Annex G clause G.2 is achieved.

16.6.1.10.4.3 Message contents

Message contents are according to TS 38.508-1 [14] clause 7.3 with the following exceptions:

Table 16.6.1.10.4.3-1: Common Exception messages

Default Message Contents	
Common contents of system information blocks exceptions	
Default RRC messages and information elements contents exceptions	Table H.3.1-1 Table H.3.1-2 Table H.3.1-4 with condition SSB Index and A3-offset = -4.5dB Table H.3.1-5 Table H.3.1-7 with Condition INTRA-FREQ and SSB Index Table H.3.1-8 with Condition SSB RLM

Table 16.6.1.10.4.3-2: *MeasObjectNR* (step 4, test procedure)

Derivation Path: Table H.3.1-3 with condition INTRA-FREQ MO			
Information Element	**Value/remark**	**Comment**	**Condition**
MeasObjectNR ::= SEQUENCE {			

ssbFrequency	ARFCN-ValueNR of NCD-SSB		
smtc1	SSB-MTC specified in 38.508-1 [14] Table 7.3.1-3 with condition SMTC.4 RedCap	SMTC.4 RedCap	
}			

Table 16.6.1.10.4.3-3: *ServingCellConfig* (step 4, test procedure)

Derivation Path: TS 38.508-1 [14] Table 4.6.3-167 with condition MEAS			
Information Element	**Value/remark**	**Comment**	**Condition**
ServingCellConfig ::= SEQUENCE {			
tdd-UL-DL-ConfigurationDedicated	Not present		
downlinkBWP-ToAddModList SEQUENCE (SIZE (1..maxNrofBWPs)) OF BWP-Downlink {	1 entry		
BWP-Downlink[1]	BWP-Downlink	entry 1 Table 16.6.1.10.4.3-3	
}			
firstActiveDownlinkBWP-Id	1	Activate the RedCap-specific dedicated DL BWP	
uplinkConfig SEQUENCE {			
initialUplinkBWP	Not present		
uplinkBWP-ToAddModList SEQUENCE (SIZE (1..maxNrofBWPs)) OF BWP-Uplink {	1 entry		
BWP-Uplink[1]	BWP-Uplink	entry 1 Table 16.6.1.10.4.3-4	
}			
firstActiveUplinkBWP-Id	1	Activate the RedCap-specific dedicated UL BWP	
pusch-ServingCellConfig	Not present		
}			
}			
servingCellMO	Not present		
}			

Table 16.6.1.10.4.3-4: *BWP-Downlink* (Table 16.6.1.10.4.3-2)

Derivation Path: TS 38.508-1 [14], Table 4.6.3-9			
Information Element	**Value/remark**	**Comment**	**Condition**
BWP-Downlink ::= SEQUENCE {			
bwp-Id	1		
bwp-Common SEQUENCE {			
genericParameters SEQUENCE {			
locationAndBandwidth	The RIV corresponds to DLBWP.1.3 RedCap		
}			
}			
bwp-Dedicated SEQUENCE {			
nonCellDefiningSSB-r17 SEQUENCE {			
absoluteFrequencySSB-r17	ARFCN-ValueNR of NCD-SSB		
ssb-Periodicity-r17	ms80		
ssb-TimeOffset-r17	ms5		
}			
servingCellMO-r17	1	MeasObjectId associated with NCD-SSB	
}			
}			

Table 16.6.1.10.4.3-5: *BWP-Uplink* (Table 16.6.1.10.4.3-2)

Derivation Path: TS 38.508-1 [14], Table 4.6.3-13			
Information Element	**Value/remark**	**Comment**	**Condition**
BWP-Uplink ::= SEQUENCE {			
bwp-Id	1		
bwp-Common SEQUENCE {	BWP-UplinkCommon		
genericParameters SEQUENCE {			
locationAndBandwidth	The RIV corresponds to ULBWP.1.3 RedCap		
}			
}			
}			

16.6.1.10.5 Test requirement

Table 16.6.1.10.4.1-3 and Table 16.6.1.10.5-1 define the primary level settings including test tolerances.

Table 16.6.1.10.5-1: NR Cell specific test parameters for SA intra-frequency event triggered reporting tests without gap under non-DRX

Parameter	Unit	Cell 1		Cell 2	
		T1	T2	T1	T2
TDD configuration		N/A		N/A	
PDSCH RMC configuration		SR.1.1 FDD		N/A	
RMSI CORESET RMC configuration		CR.1.1 FDD		N/A	
Dedicated CORESET RMC configuration		CCR.1.1 FDD		N/A	
OCNG Patterns		OP.1		OP.1	
TRS Configuration		TRS.1.1 FDD		N/A	
Initial DL BWP configuration		DLBWP.0.1		DLBWP.0.1	
Initial UL BWP configuration		ULBWP.0.1		ULBWP.0.1	
Active DL BWP configuration		DLBWP.1.3 RedCap Note 4		DLBWP.1.3 RedCap Note 4	
Active UL BWP configuration		ULBWP.1.3 RedCap Note 5		ULBWP.1.3 RedCap Note 5	
RLM-RS		SSB		SSB	
N_{oc} Note 2	dBm/SCS	-98			
N_{oc} Note 2	dBm/15 KHz	-98			
$\hat{E}_s/I_{ot}$	dB	4	-1.46	-Infinity	-1.46
$\hat{E}_s/N_{oc}$	dB	4	4	-Infinity	4
SS-RSRP Note 3	dBm/SCS	-94	-94	-Infinity	-94
Io	dBm/9.36 MHz	-64.60	-62.25	-64.60	-62.25
Propagation Condition		AWGN			

Note 1: The resources for uplink transmission are assigned to the UE prior to the start of time period T2.
Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for N_{oc} to be fulfilled.
Note 3: SS-RSRP levels have been derived from other parameters for information purposes. They are not settable parameters themselves.
Note 4: The starting PRB index for dedicated DL BWP1 corresponding to CD-SSB PRB index; the starting PRB index for dedicated DL BWP2 corresponding to NCD-SSB PRB index;
Note 5: The starting PRB index for dedicated UL BWP1 is the same as the starting PRB index for dedicated DL BWP1; the starting PRB index for dedicated UL BWP2 is the same as the starting PRB index for dedicated DL BWP2.

The overall delay is measured from the beginning of time period T2 to the time that the SS receives the first *MeasurementReport* message triggered by event A3. It is allowed to be up to $2xTTI_{DCCH}$ higher than the measurement reporting delay specified in 38.133[6] clause 9.2B.4 due to the TTI insertion uncertainty of the measurement report in DCCH.

Then the overall delay shall be shall be no larger than: $T_{identify_intra_with_index} + 2xTTI_{DCCH}$, where

- $T_{identify_intra_with_index}$ = 1240 ms, is the time for intra-frequency cell identification specified in 38.133 [6] clause 9.2B.5.1,

- TTI_{DCCH} = 1 ms.

Which gives a total of 1242 ms.

The UE is required to read the neighbour cell SSB index and report the acquired SSB index in this test.

For the test to pass, the total number of successful tests shall be more than 90% of the cases with a confidence level of 95%.

16.6.1.11 NR SA FR1 Event triggered reporting tests with per-UE gaps under non-DRX with SSB index reading for 1 Rx UE

Editor's Notes: This test case is incomplete in following aspects:

- TT analysis is missing.

16.6.1.11.1 Test purpose

To verify that the UE makes correct reporting of an event. This test will partly verify the intra-frequency cell identification and measurement period requirements in 38.133 [6] clauses 9.2B.6.1 and 9.2B.6.2.

16.6.1.11.2 Test applicability

This test applies to all types of NR RedCap UE with 1Rx from release 17 onwards and supporting CSI-RS-based RLM and BWP operation without bandwidth restriction.

16.6.1.11.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 16.6.1.0.1 and 16.6.1.0.3.

The normative reference for this requirement is TS 38.133 [6] clause A.16.6.1.11.

16.6.1.11.4 Test description

16.6.1.11.4.1 Initial conditions

Same as the initial conditions given in clause 6.6.1.6.4.1 with following exceptions:

- Table 6.6.1.6.4.1-1 is replaced by Table 16.6.1.11.4.1-1.

- Table 6.6.1.6.4.1-2 is replaced by Table 16.6.1.11.4.1-2.

- Table 6.6.1.6.4.1-3 is replaced by Table 16.6.1.11.4.1-3.

Table 16.6.1.11.4.1-1: Supported test configurations

Configuration	Description
16.6.1.11-1	15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode
16.6.1.11-2	15 kHz SSB SCS, 10 MHz bandwidth, HD-FDD duplex mode
Note: The UE is only required to be tested in one of the supported test configurations.	

Table 16.6.1.11.4.1-2: Initial conditions

Parameter	Value	Comment
Test environment	NC	As specified in TS 38.508-1 [14] clause 4.1.
Test frequencies	As specified in Annex E, table E.4-1 and TS 38.508-1 [14] clause 4.3.1.	
Channel bandwidth	As specified by the test configuration selected from Table 16.6.1.11.4.1-1.	

Propagation conditions	AWGN		As specified in Annex C.2.2.
Connection Diagram	TE Part	A.3.1.8.1	As specified in TS 38.508-1 [14] Annex A.
	DUT Part	A.3.2.2.1	
Exceptions to connection diagram			

Table 16.6.1.11.4.1-3: General test parameters

Parameter	Unit	Test config	Value	Comment
Active cell		1,2	Cell 1	
Neighbour cell		1,2	Cell 2	Cell to be identified.
RF Channel Number		1,2	1: Cell 1 and Cell 2	
Measurement gap type		1,2	Per-UE gaps	
Measurement gap repetition periodicity	ms	1,2	40	
Measurement gap length	ms	1,2	6	
Measurement gap offset	ms	1,2	39	
SSB configuration		1,2	SSB.1 FR1	
SMTC configuration		1,2	SMTC.1 RedCap FR1	
A3-Offset	dB	1,2	-4.5	
CP length		1,2	Normal	
Hysteresis	dB	1,2	0	
Time To Trigger	s	1,2	0	
Filter coefficient		1,2	0	L3 filtering is not used
DRX		1,2	N/A	OFF
Time offset between serving and neighbour cells		1,2	3 ms	Asynchronous cells. The timing of Cell 2 is 3ms later than the timing of Cell 1
T1	s	1,2	5	
T2	s	1,2	5	

16.6.1.11.4.2 Test procedure

Same as the test procedure given in 6.6.1.6.4.2 with following exceptions:

- Step 6 in 6.6.1.6.4.2 is replaced by following step.

6. UE shall transmit a MeasurementReport message triggered by Event A3. If the overall delays measured from the beginning of time period T2 is less than 1042 ms then the number of successful tests is increased by one. If the UE fails to report the event within the overall delays measured requirement then the number of failure tests is increased by one.

16.6.1.11.4.3 Message contents

Same as the message contents given in 6.6.1.6.4.3 with following exceptions:

- Table 7.3.1-3 in 38.508-1 [14] is used with condition SMTC.1 RedCap FR1.

16.6.1.11.5 Test requirement

Same as the test requirement given in 6.6.1.6.5 with following exceptions:

- Table 6.6.1.6.5-1 is replaced by Table 16.6.1.11.5-1.

- The overall delay measured is expressed as:

Overall delays measured = $T_{PSS/SSS_sync_intra_RedCap}$ + $T_{SSB_measurement_period_intra_RedCap}$ + $T_{SSB_time_index_intra_RedCap}$ + TTI insertion uncertainty

- $T_{PSS/SSS_sync_intra_RedCap}$ = 600 ms

- $T_{SSB_measurement_period_intra_RedCap}$= 200 ms
- $T_{SSB_time_index_intra_RedCap}$ = 240 ms
- TTI insertion uncertainty = 2 ms

As a result, the overall delay measured shall be less than a total of 1042 ms.

Table 16.6.1.11.5-1: NR Cell specific test parameters

Parameter	Unit	Test config	Cell 1		Cell 2	
			T1	T2	T1	T2
TDD configuration		1,2	N/A		N/A	
PDSCH RMC configuration		1,2	SR.1.1 FDD		N/A	
RMSI CORESET RMC configuration		1,2	CR.1.1 FDD		N/A	
Dedicated CORESET RMC configuration		1,2	CCR.1.2 FDD		N/A	
OCNG Patterns		1,2	OP.1		OP.1	
TRS Configuration		1,2	TRS.1.1 FDD		N/A	
Initial BWP configuration		1,2	DLBWP.0.1 ULBWP.0.1		DLBWP.0.1 ULBWP.0.1	
Active DL BWP configuration		1,2	DLBWP.1.1		DLBWP.1.1	
Active UL BWP configuration		1,2	ULBWP.1.1		ULBWP.1.1	
RLM-RS		1,2	CSI-RS		SSB	
N_{oc} Note 2	dBm/SCS	1,2	-98			
N_{oc} Note 2	dBm/15 KHz	1,2	-98			
$\hat{E}_s/I_{ot}$	dB	1,2	4	-1.46	-Infinity	-1.46
$\hat{E}_s/N_{oc}$	dB	1,2	4	4	-Infinity	4
SS-RSRP Note 3	dBm/SCS	1,2	-94	-94	-Infinity	-94
Io	dBm/ 9.36 MHz	1,2	-64.60	-62.25	Specified in Cell 1 columns	
Propagation Condition		1,2	AWGN			

Note 1: The resources for uplink transmission are assigned to the UE prior to the start of time period T2.
Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for N_{oc} to be fulfilled.
Note 3: SS-RSRP levels have been derived from other parameters for information purposes. They are not settable parameters themselves.

16.6.1.12 NR SA FR1 Event triggered reporting tests with per-UE gaps under non-DRX with SSB index reading for 2Rx UE

16.6.1.12.1 Test purpose

To verify that the UE makes correct reporting of an event. This test will partly verify the intra-frequency cell identification and measurement period requirements in 38.133 [6] clauses 9.2B.6.1 and 9.2B.6.2.

16.6.1.12.2 Test applicability

This test applies to all types of NR RedCap UE with 2Rx from release 17 onwards and supporting CSI-RS-based RLM and BWP operation without bandwidth restriction.

16.6.1.12.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 16.6.1.0.1 and 16.6.1.0.3.

The normative reference for this requirement is TS 38.133 [6] clause A.16.6.1.12.

16.6.1.12.4 Test description

16.6.1.12.4.1 Initial conditions

Same as the initial conditions given in clause 6.6.1.6.4.1 with following exceptions:

- Table 6.6.1.6.4.1-1 is replaced by Table 16.6.1.12.4.1-1.
- Table 6.6.1.6.4.1-2 is replaced by Table 16.6.1.12.4.1-2.
- Table 6.6.1.6.4.1-3 is replaced by Table 16.6.1.12.4.1-3.

Table 16.6.1.12.4.1-1: Supported test configurations

Configuration	Description
16.6.1.12-1	15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode
16.6.1.12-2	15 kHz SSB SCS, 10 MHz bandwidth, HD-FDD duplex mode
Note: The UE is only required to be tested in one of the supported test configurations.	

Table 16.6.1.12.4.1-2: Initial conditions

Parameter	Value		Comment
Test environment	NC		As specified in TS 38.508-1 [14] clause 4.1.
Test frequencies	As specified in Annex E, table E.4-1 and TS 38.508-1 [14] clause 4.3.1.		
Channel bandwidth	As specified by the test configuration selected from Table 16.6.1.12.4.1-1.		
Propagation conditions	AWGN		As specified in Annex C.2.2.
Connection Diagram	TE Part	A.3.1.8.2	As specified in TS 38.508-1 [14] Annex A.
	DUT Part	A.3.2.3.4	
Exceptions to connection diagram	- Without LTE link		

Table 16.6.1.12.4.1-3: General test parameters

Parameter	Unit	Test config	Value	Comment
Active cell		1,2	Cell 1	
Neighbour cell		1,2	Cell 2	Cell to be identified.
RF Channel Number		1,2	1: Cell 1 and Cell 2	
Measurement gap type		1,2	Per-UE gaps	
Measurement gap repetition periodicity	ms	1,2	40	
Measurement gap length	ms	1,2	6	
Measurement gap offset	ms	1,2	39	
SSB configuration		1,2	SSB.1 FR1	
SMTC configuration		1,2	SMTC.1 RedCap FR1	
A3-Offset	dB	1,2	-4.5	
CP length		1,2	Normal	
Hysteresis	dB	1,2	0	
Time To Trigger	s	1,2	0	
Filter coefficient		1,2	0	L3 filtering is not used
DRX		1,2	N/A	OFF
Time offset between serving and neighbour cells		1,2	3 ms	Asynchronous cells. The timing of Cell 2 is 3ms later than the timing of Cell 1
T1	s	1,2	5	
T2	s	1,2	5	

16.6.1.12.4.2 Test procedure

Same as the test procedure given in 6.6.1.6.4.2.

16.6.1.12.4.3 Message contents

Same as the message contents given in 6.6.1.6.4.3 with following exceptions:

- Table 7.3.1-3 in 38.508-1 [14] is used with condition SMTC.1 RedCap FR1.

Table 16.6.1.12.4.3-1: *ServingCellConfig*

Derivation Path: TS 38.508-1 [14], Table 4.6.3-167			
Information Element	**Value/remark**	**Comment**	**Condition**
ServingCellConfig ::= SEQUENCE {			
downlinkBWP-ToAddModList SEQUENCE (SIZE (1..maxNrofBWPs)) OF SEQUENCE {			
BWP-Downlink[1]	BWP-Downlink with condition BWP-Id1	DLBWP.1.3 RedCap configuration	
}			
firstActiveDownlinkBWP-Id	1	Active DL BWP-ID (BWP2)	BWP-Id1
defaultDownlinkBWP-Id	0	Initial BWP (BWP1)	
uplinkConfig SEQUENCE {			
uplinkBWP-ToAddModList SEQUENCE (SIZE (1..maxNrofBWPs)) OF SEQUENCE {			
BWP-Uplink[1]	BWP-Uplink with condition BWP-Id1	ULBWP.1.3 RedCap configuration	
}			
firstActiveUplinkBWP-Id	1	Active UL BWP-ID (BWP2)	BWP-Id1
}			
}			

16.6.1.12.5 Test requirement

Same as the test requirement given in 6.6.1.6.5 with following exceptions:

- Table 6.6.1.6.5-1 is replaced by Table 16.6.1.12.5-1.
- The overall delay measured is expressed as:

Overall delays measured = $T_{PSS/SSS_sync_intra_RedCap}$ + $T_{SSB_measurement_period_intra_RedCap}$ + $T_{SSB_time_index_intra_RedCap}$ + TTI insertion uncertainty

- $T_{PSS/SSS_sync_intra_RedCap}$ = 600 ms
- $T_{SSB_measurement_period_intra_RedCap}$ = 200 ms
- $T_{SSB_time_index_intra_RedCap}$ = 120 ms
- TTI insertion uncertainty = 2 ms

As a result, the overall delay measured shall be less than a total of 922 ms.

Table 16.6.1.12.5-1: NR Cell specific test parameters

Parameter	Unit	Test config	Cell 1		Cell 2	
			T1	T2	T1	T2
TDD configuration		1,2	N/A		N/A	
PDSCH RMC configuration		1,2	SR.1.1 FDD		N/A	

RMSI CORESET RMC configuration		1,2	CR.1.1 FDD		N/A	
Dedicated CORESET RMC configuration		1,2	CCR.1.2 FDD		N/A	
OCNG Patterns		1,2	OP.1		OP.1	
TRS Configuration		1,2	TRS.1.1 FDD		N/A	
Initial BWP configuration		1,2	DLBWP.0.1 ULBWP.0.1		DLBWP.0.1 ULBWP.0.1	
Active DL BWP configuration		1,2	DLBWP.1.3 RedCap		DLBWP.1.1	
Active UL BWP configuration		1,2	ULBWP.1.3 RedCap		ULBWP.1.1	
RLM-RS		1,2	CSI-RS		SSB	
N_{oc} Note 2	dBm/SCS	1,2	-98			
N_{oc} Note 2	dBm/15 KHz	1,2	-98			
$\hat{E}_s / I_{ot}$	dB	1,2	4	-1.46	-Infinity	-1.46
$\hat{E}_s / N_{oc}$	dB	1,2	4	4	-Infinity	4
SS-RSRP Note 3	dBm/SCS	1,2	-94	-94	-Infinity	-94
Io	dBm/ 9.36 MHz	1,2	-64.60	-62.25	Specified in Cell 1 columns	
Propagation Condition		1,2	AWGN			

Note 1: The resources for uplink transmission are assigned to the UE prior to the start of time period T2.
Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for N_{oc} to be fulfilled.
Note 3: SS-RSRP levels have been derived from other parameters for information purposes. They are not settable parameters themselves.

16.6.2 Inter-frequency measurements for RedCap

16.6.2.0 Minimum conformance requirements

TBD

16.6.2.1 NR SA FR1-FR1 Event triggered reporting tests for FR1 without SSB time index detection when DRX is used for 1 Rx UE

16.6.2.2 NR SA FR1-FR1 Event triggered reporting tests for FR1 without SSB time index detection when DRX is used for 2 Rx UE

16.6.2.3 NR SA FR1-FR1 Event triggered reporting tests for FR1 without SSB time index detection when DRX is used for 1 Rx UE

16.6.2.4 NR SA FR1-FR1 Event triggered reporting tests for FR1 without SSB time index detection when DRX is used for 2 Rx UE

16.6.2.5 NR SA FR1-FR1 Event triggered reporting tests for FR1 with SSB time index detection when DRX is not used for 1 Rx UE

16.6.2.6 NR SA FR1-FR1 Event triggered reporting tests for FR1 with SSB time index detection when DRX is not used for 2 Rx UE

16.6.2.7 NR SA FR1-FR1 Event triggered reporting tests for FR1 with SSB time index detection when DRX is used for 1 Rx UE

16.6.2.8 NR SA FR1-FR1 Event triggered reporting tests for FR1 with SSB time index detection when DRX is used for 2 Rx UE

16.6.2.9 NR SA FR1-FR1 Event triggered reporting tests with additional mandatory gap pattern for 1 Rx UE

16.6.2.10 NR SA FR1-FR1 Event triggered reporting tests with additional mandatory gap pattern for 2 Rx UE

16.6.2.11 NR SA FR1-FR1 Event triggered reporting tests for FR1 when DRX is used for 1 Rx UE

16.6.2.12 NR SA FR1-FR1 Event triggered reporting tests for FR1 when DRX is used for 2 Rx UE

16.6.3 Inter-RAT measurements for RedCap

16.6.3.0 Minimum conformance requirements

TBD

16.6.3.1 NR - E-UTRA event-triggered reporting in non-DRX in FR1 for 1 Rx UE

16.6.3.2 NR - E-UTRA event-triggered reporting in non-DRX in FR1 for 2 Rx UE

16.6.3.3 NR - E-UTRA event-triggered reporting in DRX in FR1 for 1 Rx UE

16.6.3.4 NR - E-UTRA event-triggered reporting in DRX in FR1 for 2 Rx UE

16.6.4 L1-RSRP measurement for beam reporting for RedCap

16.6.4.0 Minimum conformance requirements

16.6.4.0.1 General

When configured by the network, the UE shall be able to perform L1-RSRP measurements of configured CSI-RS, SSB or CSI-RS and SSB resources for L1-RSRP. The measurements shall be performed for PCell, on the resources configured for L1-RSRP measurements within the active BWP.

The UE shall be able to measure all CSI-RS resources and/or SSB resources of the *nzp-CSI-RS-ResourceSet* and/or *csi-SSB-ResourceSet* within the CSI-Resource*Config* settings configured for L1-RSRP for the active BWP, provided that the number of resources does not exceed the UE capability indicated by *beamManagementSSB-CSI-RS*.

The UE shall report the measurement quantity (*reportQuantity*) and send periodic, semi-persistent or aperiodic reports, according to the *reportConfigType* according to the CSI reporting configuration(s) (*CSI-ReportConfig*) for the active BWP.

The UE shall send L1-RSRP reports only for report configurations configured for the active BWP.

The UE shall report the L1-RSRP value as a 7-bit value in the range [-140, -44] dBm with 1dB step size according to clause TBD for FR1, for 1 Rx RedCap, and 10.1.19 for FR1 and 10.1.20 for FR2 for 2 Rx RedCap, if *nrofReportedRS* is configured to one. If *nrofReportedRS* is configured to be larger than one, or if *groupBasedBeamReporting* is enabled, the UE shall use differential L1-RSRP based reporting as defined in clause TBD for FR1, for 1 Rx RedCap, and 10.1.19 for FR1 and 10.1.20 for FR2 for 2 Rx RedCap. The differential L1-RSRP is quantized to a 4-bit value with 2dB step size. The mapping between the reported L1-RSRP value and the measured quantity is described in TBD for 1 Rx RedCap, and 10.1.6 for 2 Rx RedCap.

For 1 Rx RedCap, reported L1-RSRP measurements contained in periodic L1-RSRP measurement reports shall meet the requirements in clause TBD for FR1.

For 2 Rx RedCap, reported L1-RSRP measurements contained in periodic L1-RSRP measurement reports shall meet the requirements in clauses 10.1.19 for FR1 and 10.1.20 for FR2, respectively.

The UE shall only send periodic L1-RSRP measurement reports for an active BWP.

The UE shall transmit the periodic L1-RSRP reporting on PUCCH over the air interface according to the periodicity defined in clause 5.2.1.4 in TS 38.214 [26].

For 1 Rx RedCap, reported L1-RSRP measurements contained in aperiodic triggered, aperiodic triggered periodic and aperiodic triggered semi-persistent L1-RSRP reports shall meet the requirements in clause TBD.

For 2 Rx Redcap, reported L1-RSRP measurements contained in aperiodic triggered, aperiodic triggered periodic and aperiodic triggered semi-persistent L1-RSRP reports shall meet the requirements in clauses 10.1.19 for FR1 and 10.1.20 for FR2, respectively.

The UE shall only send aperiodic L1-RSRP measurement reports, if a DCI trigger has been received.

After the UE receives CSI request in DCI, the UE shall transmit the aperiodic L1-RSRP reporting on PUSCH over the air interface at the time specified according to clause 6.1.2.1 in TS 38.214 [26].

For FD-FDD and TDD RedCap UEs, there are no scheduling restrictions due to L1-RSRP measurement performed on SSB and CSI-RS configured as RS for L1-RSRP measurement with the same SCS as PDSCH/PDCCH in FR1.

For HD-FDD RedCap UE, scheduling restrictions apply for transmission on PUCCH/PUSCH/SRS during the CBD evaluation period, as CBD evaluation is prioritized over UL transmission. The CBD evaluation period equals the measurement period of $T_{L1\text{-}RSRP_Measurement_Period_SSB_RedCap}$ in case L1-RSRP measurement is performed on SSB as defined in clause 16.6.4.0.2, or $T_{L1\text{-}RSRP_Measurement_Period_CSI\text{-}RS_RedCap}$ in case L1-RSRP measurement is performed on CSI-RS and/or SSB as defined in clause 16.6.4.0.3.

For UEs which support *simultaneousRxDataSSB-DiffNumerology* [14] there are no restrictions on scheduling availability due to L1-RSRP measurement based on SSB as RS for L1-RSRP measurement. For UEs which do not support *simultaneousRxDataSSB-DiffNumerology* [14] the following restrictions apply due to L1-RSRP measurement based on SSB configured for L1-RSRP measurement.

- For FD-FDD and TDD RedCap UEs, the UE is not expected to transmit PUCCH/PUSCH/SRS or receive PDCCH/PDSCH/CSI-RS for tracking/CSI-RS for CQI on symbols corresponding to the SSB indexes configured for L1-RSRP measurement.

- For HD-FDD RedCap UE, scheduling restrictions apply for transmission on PUCCH/PUSCH/SRS during the CBD evaluation period, as CBD evaluation is prioritized over UL transmission. The CBD evaluation period equals the measurement period of $T_{L1\text{-}RSRP_Measurement_Period_SSB_RedCap}$ in case L1-RSRP measurement is performed on SSB as defined in clause 16.6.4.0.2, or $T_{L1\text{-}RSRP_Measurement_Period_CSI\text{-}RS_RedCap}$ in case L1-RSRP measurement is performed on CSI-RS and/or SSB as defined in clause 16.6.4.0.3.

The normative reference for this requirement is TS 38.133 [6] clause 9.5B.1, 9.5B.3 and 9.5B.6.

16.6.4.0.2 Minimum conformance requirements for SSB based L1-RSRP measurement for beam reporting

The requirements in this clause apply, provided:

- The SSB resources configured for L1-RSRP measurements are measurable.

An SSB resource configured for L1-RSRP shall be considered measurable when for each relevant SSB the following conditions are met:

For 1 Rx RedCap:

- L1-RSRP related side conditions given in 38.133 [6] clauses TBD for FR1, respectively, for a corresponding band,

- SSB_RP and SSB Ês/Iot according to 38.133 [6] Annex TBD for a corresponding band.

For 2 Rx RedCap:

- L1-RSRP related side conditions given in 38.133 [6] clauses 10.1.19.1 and 10.1.20.1 for FR1 and FR2, respectively, for a corresponding band,

- SSB_RP and SSB Ês/Iot according to 38.133 [6] Annex B.2.4.1 for a corresponding band.

The UE shall be capable of performing L1-RSRP measurements based on the configured SSB resource for L1-RSRP computation, and the UE physical layer shall be capable of reporting L1-RSRP measured over the measurement period of $T_{L1\text{-}RSRP_Measurement_Period_SSB_RedCap}$.

The value of $T_{L1\text{-}RSRP_Measurement_Period_SSB}$ is defined in Table 16.6.4.0.2-1 for FR1 for 2 Rx RedCap, and Table 16.6.4.0.2-2 for FR1 for 1 Rx RedCap, where

- M=1 if higher layer parameter *timeRestrictionForChannelMeasurement* is configured, and M=3 otherwise.

For FR1,

- $P=\frac{1}{1-\frac{T_{SSB}}{MRGP}}$, when in the monitored cell there are measurement gaps configured for intra-frequency, inter-frequency or inter-RAT measurements, which are overlapping with some but not all occasions of the SSB; and

- P=1 when in the monitored cell there are no measurement gaps overlapping with any occasion of the SSB.

Where:

- T_{SSB} = ssb-periodicityServingCell

Longer evaluation period would be expected if the combination of SSB, SMTC occasion and measurement gap configurations does not meet pervious conditions.

For an FR1 serving cell, longer evaluation period would be expected during the period $T_{identify_CGI}$ when the UE is requested to decode an NR CGI.

For an FR1 serving cell, longer L1 RSRP measurement period would be expected during the period $T_{identify_CGI,E-UTRAN}$ when the UE is requested to decode an LTE CGI.

Table 16.6.4.0.2-1: Measurement period $T_{L1\text{-}RSRP_Measurement_Period_SSB_RedCap}$ (FR1) for 2 Rx RedCap

Configuration	$T_{L1\text{-}RSRP_Measurement_Period_SSB_RedCap}$ (ms)
non-DRX	$\max(T_{Report}, \text{ceil}(M*P)*T_{SSB})$
DRX cycle ≤ 320ms	$\max(T_{Report}, \text{ceil}(1.5*M*P)*\max(T_{DRX},T_{SSB}))$
DRX cycle > 320ms	$\text{ceil}(M*P)*T_{DRX}$
Note: T_{SSB} = ssb-periodicityServingCell is the periodicity of the SSB-Index configured for L1-RSRP measurement. T_{DRX} is the DRX cycle length. T_{Report} is configured periodicity for reporting.	

Table 16.6.4.0.2-2: Measurement period $T_{L1\text{-}RSRP_Measurement_Period_SSB_RedCap}$ (FR1) for 1 Rx RedCap

Configuration	$T_{L1\text{-}RSRP_Measurement_Period_SSB_RedCap}$ (ms)
non-DRX	$\max(T_{Report}, \text{ceil}(M*P)*T_{SSB})$
DRX cycle ≤ 320ms	$\max(T_{Report}, \text{ceil}(1.5*M*P)*\max(T_{DRX},T_{SSB}))$
DRX cycle > 320ms	$\text{ceil}(M*P)*T_{DRX}$
Note: T_{SSB} = ssb-periodicityServingCell is the periodicity of the SSB-Index configured for L1-RSRP measurement. T_{DRX} is the DRX cycle length. T_{Report} is configured periodicity for reporting.	

For FR1, when the SSB for L1-RSRP measurement is in the same OFDM symbol as CSI-RS for RLM, BFD, CBD or L1-RSRP measurement,

- If SSB and CSI-RS have same SCS, UE shall be able to measure the SSB for L1-RSRP measurement without any restriction;
- If SSB and CSI-RS have different SCS,
  - If UE supports simultaneousRxDataSSB-DiffNumerology, UE shall be able to measure the SSB for L1-RSRP measurement without any restriction;
  - If UE does not support simultaneousRxDataSSB-DiffNumerology, UE is required to measure one of but not both SSB for L1-RSRP measurement and CSI-RS. Longer measurement period for SSB based L1-RSRP measurement is expected, and no requirements are defined.

The normative reference for this requirement is TS 38.133 [6] clauses 9.5B.2, 9.5B.4.1 and 9.5B.5.1.

16.6.4.0.3 Minimum conformance requirements for CSI-RS based L1-RSRP measurement for beam reporting

The requirements in this clause apply, provided:

- The CSI-RS resources configured for L1-RSRP measurements are measurable.

A CSI-RS resource configured for L1-RSRP shall be considered measurable when for each relevant CSI-RS the following conditions are met:

For 1 Rx RedCap:

- L1-RSRP related side conditions given in 38.133 [6] clauses TBD for FR1, respectively, for a corresponding band,
- CSI-RS_RP and CSI-RS Ês/Iot according to 38.133 [6] Annex TBD for a corresponding band.

For 2 Rx RedCap:

- L1-RSRP related side conditions given in 38.133 [6] clauses 10.1.19.2 and 10.1.20.2 for FR1 and FR2, respectively, for a corresponding band,
- CSI-RS_RP and CSI-RS Ês/Iot according to 38.133 [6] Annex B.2.4.2 for a corresponding band.

Requirements are defined for periodic, semi-persistent and aperiodic resources.

The UE shall be capable of performing L1-RSRP measurements based on the configured CSI-RS resource for L1-RSRP computation, and the UE physical layer shall be capable of reporting L1-RSRP measured over the measurement period of $T_{L1\text{-}RSRP_Measurement_Period_CSI\text{-}RS_RedCap}$.

The value of $T_{L1\text{-}RSRP_Measurement_Period_CSI\text{-}RS_RedCap}$ is defined in Table 16.6.4.0.3-1 for FR1 for 2 Rx RedCap, and in Table 16.6.4.0.3-2 for 1 Rx RedCap, where

- For periodic CSI-RS resources, M=1 if higher layer parameter *timeRestrictionForChannelMeasurement* is configured, and M=3 otherwise
- For aperiodic CSI-RS resources M=1
- For periodic CSI-RS resources in a resource set configured with higher layer parameter *repetition* set to OFF, N=1. The requirements apply if *qcl-InfoPeriodicCSI-RS* is configured for all the resources in the resource set and for each resource one RS has QCL-TypeD with
  - SSB for L1-RSRP measurement, or
  - another CSI-RS in resource set configured with repetition ON.
- For periodic CSI-RS resources in a resource set configured with higher layer parameter *repetition* set to ON, N=ceil(*maxNumberRxBeam* / $N_{res_per_set}$), where $N_{res_per_set}$ is number of resources in the resource set. The requirements apply provided *qcl-InfoPeriodicCSI-RS* is configured with QCL-TypeD for all resources in the resource set.
- For aperiodic CSI-RS resources in a resource set configured with higher layer parameter *repetition* set to OFF, N=1. The requirements apply provided *qcl-info* is configured for all resources in the resource set and for each resource one RS has QCL-TypeD with
  - SSB for L1-RSRP measurement, or
  - another CSI-RS in resource set configured with repetition ON.
- For aperiodic CSI-RS resources in a resource set configured with higher layer parameter *repetition* set to ON, N=1. UE is not required to meet the accuracy requirements in 38.133 [6] clause 10.1.19.2 and 10.1.20.2 if number of resources in the resource set is smaller than *maxNumberRxBeam*. The requirements apply provided *qcl-info* is configured with QCL-TypeD for all resources in the resource set.

For FR1,

- $P=\frac{1}{1-\frac{T_{CSI-RS}}{MGRP}}$, when in the monitored cell there are measurement gaps configured for intra-frequency, inter-frequency or inter-RAT measurements, which are overlapping with some but not all occasions of the CSI-RS; and
- P=1 when in the monitored cell there are no measurement gaps overlapping with any occasion of the CSI-RS.

Where:

$T_{CSI\text{-}RS}$ = the periodicity of CSI-RS configured for L1-RSRP measurement

Longer evaluation period would be expected if the combination of CSI-RS, SMTC occasion and measurement gap configurations does not meet pervious conditions.

For an FR1 serving cell, longer evaluation period would be expected during the period $T_{identify_CGI}$ when the UE is requested to decode an NR CGI.

For an FR1 serving cell, longer L1 RSRP measurement period would be expected during the period $T_{identify_CGI,E-UTRAN}$ when the UE is requested to decode an LTE CGI.

Table 16.6.4.0.3-1: Measurement period $T_{L1\text{-}RSRP_Measurement_Period_CSI\text{-}RS_RedCap}$ (FR1) for 2 Rx RedCap

Configuration	$T_{L1\text{-}RSRP_Measurement_Period_CSI\text{-}RS_RedCap}$ (ms)
non-DRX	max(T_{Report}, ceil(M*P)*$T_{CSI\text{-}RS}$)
DRX cycle ≤ 320ms	max(T_{Report}, ceil(1.5*M*P)*max(T_{DRX},$T_{CSI\text{-}RS}$))
DRX cycle > 320ms	ceil(M*P)*T_{DRX}
Note 1: $T_{CSI\text{-}RS}$ is the periodicity of CSI-RS configured for L1-RSRP measurement. T_{DRX} is the DRX cycle length. T_{Report} is configured periodicity for reporting. Note 2: the requirements are applicable provided that the CSI-RS resource configured for L1-RSRP measurement is transmitted with Density = 3.	

Table 16.6.4.0.3-2: Measurement period $T_{L1\text{-}RSRP_Measurement_Period_CSI\text{-}RS_RedCap}$ (FR1) for 1 Rx RedCap

Configuration	$T_{L1\text{-}RSRP_Measurement_Period_CSI\text{-}RS_RedCap}$ (ms)
non-DRX	max(T_{Report}, ceil(M*P)*$T_{CSI\text{-}RS}$)
DRX cycle ≤ 320ms	max(T_{Report}, ceil(1.5*M*P)*max(T_{DRX},$T_{CSI\text{-}RS}$))
DRX cycle > 320ms	ceil(M*P)*T_{DRX}
Note 1: $T_{CSI\text{-}RS}$ is the periodicity of CSI-RS configured for L1-RSRP measurement. T_{DRX} is the DRX cycle length. T_{Report} is configured periodicity for reporting. Note 2: the requirements are applicable provided that the CSI-RS resource configured for L1-RSRP measurement is transmitted with Density = 3.	

For FR1, when the CSI-RS for L1-RSRP measurement is in the same OFDM symbol as SSB for RLM, BFD, CBD or L1-RSRP measurement, UE is not required to receive CSI-RS for L1-RSRP measurement in the PRBs that overlap with an SSB.

For FR1, when the SSB for RLM, BFD, CBD or L1-RSRP measurement is within the active BWP and has same SCS than CSI-RS for L1-RSRP measurement, the UE shall be able to perform CSI-RS measurement without restrictions.

For FR1, when the SSB for RLM, BFD, CBD or L1-RSRP measurement is within the active BWP and has different SCS than CSI-RS for L1-RSRP measurement, the UE shall be able to perform CSI-RS measurement with restrictions according to its capabilities:

- If the UE supports *simultaneousRxDataSSB-DiffNumerology* the UE shall be able to perform CSI-RS measurement without restrictions.
- If the UE does not support *simultaneousRxDataSSB-DiffNumerology*, UE is required to measure one of but not both CSI-RS for L1-RSRP measurement and SSB. Longer measurement period for CSI-RS based L1-RSRP measurement is expected, and no requirements are defined.

For FR1, when the CSI-RS for L1-RSRP measurement is in the same OFDM symbol as another CSI-RS for RLM, BFD, CBD or L1-RSRP measurement, UE shall be able to measure the CSI-RS for L1-RSRP measurement without any restriction.

The normative reference for this requirement is TS 38.133 [6] clauses 9.5B.2, 9.5B.4.2 and 9.5B.5.2.

16.6.4.1 NR SA FR1 SSB based L1-RSRP measurement when DRX is not used for 1 Rx UE

Editor's Notes: This test case is incomplete in following aspects:

- TT analysis is missing.
- Test requirements are still TBD.

16.6.4.1.1 Test purpose

To verify that the UE makes correct reporting of L1-RSRP measurement. This test will partly verify the L1-RSRP measurement requirements in 38.133 [6] clause 9.5B.4.1.

16.6.4.1.2 Test applicability

This test applies to all types of NR RedCap UE with 1Rx from release 17 onwards.

16.6.4.1.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 16.6.4.0.1 and 16.6.4.0.2.

The normative reference for this requirement is TS 38.133 [6] clause A.16.6.4.1.

16.6.4.1.4 Test description

16.6.4.1.4.1 Initial conditions

Same as the initial conditions given in clause 6.6.4.1.4.1 with following exceptions:

- Table 6.6.4.1.4.1-1 is replaced by Table 16.6.4.1.4.1-1.
- Table 6.6.4.1.4.1-2 is replaced by Table 16.6.4.1.4.1-3.
- Table 6.6.4.1.4.1-3 is replaced by Table 16.6.4.1.4.1-2.

Table 16.6.4.1.4.1-1: Supported test configurations

Config	Description
16.6.4.1-1	NR 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode
16.6.4.1-2	NR 15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode
16.6.4.1-3	NR 30 kHz SSB SCS, 20 MHz bandwidth, TDD duplex mode
16.6.4.1-4	NR 15 kHz SSB SCS, 10 MHz bandwidth, HD-FDD duplex mode
Note: The UE is only required to be tested in one of the supported test configurations	

Table 16.6.4.1.4.1-2: Test Environment parameters

Parameter	Value		Comment
Test environment	NC		As specified in TS 38.508-1 [14] clause 4.1.
Test frequencies	As specified in Annex E, Table E.2-1 and TS 38.508-1 [14] clause 4.3.1 and 4.4.2.		
Channel bandwidth	As specified by the test configuration selected from Table 4.6.3.1.4.1-1.		
Propagation conditions	AWGN		As specified in Annex C.2.2.
Connection Diagram	TE Part	A.3.1.8.1	As specified in TS 38.508-1 [14] Annex A.
	DUT Part	A.3.2.2.1	
Exceptions to connection diagram			

Table 16.6.4.1.4.1-3: General test parameters

Parameter	Config	Unit	Value
SSB GSCN	1~4		freq1
Duplex mode	1		FDD
	2,3		TDD
	4		HD-FDD
TDD Configuration	1,4		N/A
	2		TDDConf.1.1
	3		TDDConf.2.1
$BW_{channel}$	1,2,4	MHz	10: $N_{RB,c}$ = 52

	3		20: $N_{RB,c}$ = 51
PDSCH Reference measurement channel	1,4		SR.1.1 FDD
	2		SR.1.1 TDD
	3		SR.2.1 TDD
RMSI CORESET Reference Channel	1,4		CR.1.1 FDD
	2		CR.1.1 TDD
	3		CR.2.1 TDD
Dedicated CORESET Reference Channel	1,4		CCR.1.1 FDD
	2		CCR.1.1 TDD
	3		CCR.2.1 TDD
SSB configuration	1,2,4		SSB.3 FR1
	3		SSB.2 RedCap FR1
OCNG Patterns	1~4		OP.1
Initial BWP Configuration	1~4		DLBWP.0.1 ULBWP.0.1
Dedicated BWP configuration	1~4		DLBWP.1.1 ULBWP.1.1
SMTC configuration	1~4		SMTC.1 RedCap
TRS Configuration	1,4		TRS.1.1 FDD
	2		TRS.1.1 TDD
	3		TRS.1.2 TDD
DRX configuration	1~4		Off
reportConfigType	1~4		periodic
reportQuantity	1~4		ssb-Index-RSRP
Number of reported RS	1~4		2
L1-RSRP reporting period	1~4	slot	80
T1	1~4	s	5
T2	1~4	s	1
EPRE ratio of PSS to SSS	1~4	dB	0
EPRE ratio of PBCH DMRS to SSS			
EPRE ratio of PBCH to PBCH DMRS			
EPRE ratio of PDCCH DMRS to SSS			
EPRE ratio of PDCCH to PDCCH DMRS			
EPRE ratio of PDSCH DMRS to SSS			
EPRE ratio of PDSCH to PDSCH DMRS			
EPRE ratio of OCNG DMRS to SSS Note 1			
EPRE ratio of OCNG to OCNG DMRS Note 1			
Propagation condition	1~4		AWGN
Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.			

16.6.4.1.4.2 Test procedure

Same as the test procedure given in clause 6.6.4.1.4.2 with following exceptions:

- Step 5 in test procedure given in clause 6.6.4.1.4.2 is replaced by following step.

5. The UE shall start sending valid L1-RSRP reports. The SS shall check following requirements:

   - R1: the UE shall start to transmit valid reports no later than 720 ms for configuration 1, 2, 4 and no later than 680 ms for configuration 3 from the beginning of time period T2. A valid report shall meet the absolute L1-RSRP requirement for SSB#1 (Table 16.6.4.1.5-2 for test configurations 1, 2, 4 and Table 16.6.4.1.5-3 for test configurations 3) and the relative L1-RSRP requirement for SSB#0 in Table 16.6.4.1.5-4. If the first valid report is received earlier than the specified time, the number of passed iterations for R1 is increased by one. Otherwise, the number of failed iterations for R1 is increased by one.

   - R2: the UE shall transmit reports every 80 slots until the end of time period T2. If the reports are received accordingly, the number of passed iterations for R2 is increased by one. Otherwise, the number of failed iterations for R2 is increased by one.

   - R3: The L1-RSRP value of SSB#1 reported by the UE is compared to the expected L1-RSRP value for SSB#1. In all consecutive reports after the first valid value is received, if the resulting value is outside the limits in Table 16.6.4.1.5-2 for test configurations 1, 2, 4 and 5 and in Table 16.6.4.1.5-3 for test

configurations 3 and 6 or the UE fails to report the measurement value for SSB#1, the number of failed iterations for R3 is increased by one. Otherwise, the number of passed iterations for R3 is increased by one.

-R4: The DIFF RSRP value of SSB#0 reported by the UE is compared to the expected DIFF RSRP value. In all consecutive reports after the first valid value is received, if the resulting value is outside the limits in Table 16.6.4.1.5-4 or the UE fails to report the measurement value for SSB#0, the number of failed iterations for R4 is increased by one. Otherwise, the number of passed iterations for R4 is increased by one.

16.6.4.1.4.3 Message contents

Same as the message contents given in clause 6.6.4.1.4.3.

16.6.4.1.5 Test requirement

Same as the test requirements given in clause 6.6.4.1.5 with following exceptions:

- Table 6.6.4.1.5-1 is replaced by Table 16.6.4.1.5-1.
- Table 6.6.4.1.5-2 is replaced by Table 16.6.4.1.5-2.
- Table 6.6.4.1.5-3 is replaced by Table 16.6.4.1.5-3.
- Table 6.6.4.1.5-4 is replaced by Table 16.6.4.1.5-4.

Table 16.6.4.1.5-1: SSB specific test parameters

Parameter	Config	Unit	SSB#0		SSB#1	
			T1	T2	T1	T2
N_{oc} Note2	1~4	dBm/15kHz	-94.65			
N_{oc} Note2	1,2,4	dBm/SSB SCS	-94.65			
	3		-91.65			
$\hat{E}_s / I_{ot}$	1~4	dB	0	0	-Infinity	3
SSB RSRP Note3	1,2.4	dBm/SSB SCS	-94.65	-94.65	-Infinity	-91.65
	3		-91.65	-91.65	-Infinity	-88.65
Io Note3	1,2.4	dBm/9.36 MHz	-63.69	-63.69	-66.70	-61.93
	3	dBm/18.36 MHz	-60.77	-60.77	-63.79	-59.02
$\hat{E}_s / N_{oc}$	1~4	dB	0	0	-Infinity	3

Note 1: The resources for uplink transmission are assigned to the UE prior to the start of time period T2.
Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for N_{oc} to be fulfilled.
Note 3: SS-RSRP and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.

Table 16.6.4.1.5-2: L1-RSRP absolute accuracy requirements for the reported values for test configurations 1 and 2

Normal Conditions	T2
Lowest reported value (SSB#1)	TBD
Highest reported value (SSB#1)	TBD

Table 16.6.4.1.5-3: L1-RSRP absolute accuracy requirements for the reported values for test configurations 3

Normal Conditions	T2
Lowest reported value (SSB#1)	TBD
Highest reported value (SSB#1)	TBD

Table 16.6.4.1.5-4: L1-RSRP relative accuracy requirements for the reported values for all test configurations

	T2
Lowest DIFF RSRP reported (SSB#0)	TBD
Highest DIFF RSRP reported (SSB#0)	TBD

16.6.4.2 NR SA FR1 SSB based L1-RSRP measurement when DRX is not used for 2 Rx UE

16.6.4.2.1 Test purpose

To verify that the UE makes correct reporting of L1-RSRP measurement. This test will partly verify the L1-RSRP measurement requirements in 38.133 [6] clause 9.5B.4.1.

16.6.4.2.2 Test applicability

This test applies to all types of NR RedCap UE with 2Rx from release 17 onwards.

16.6.4.2.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 16.6.4.0.1 and 16.6.4.0.2.

The normative reference for this requirement is TS 38.133 [6] clause A.16.6.4.2.

16.6.4.2.4 Test description

16.6.4.2.4.1 Initial conditions

Same as the initial conditions given in clause 6.6.4.1.4.1 with following exceptions:

- Table 6.6.4.1.4.1-1 is replaced by Table 16.6.4.2.4.1-1.
- Table 6.6.4.1.4.1-2 is replaced by Table 16.6.4.2.4.1-3.
- Table 6.6.4.1.4.1-3 is replaced by Table 16.6.4.2.4.1-2.

Table 16.6.4.2.4.1-1: Supported test configurations

Config	Description
16.6.4.2-1	NR 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode
16.6.4.2-2	NR 15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode
16.6.4.2-3	NR 30 kHz SSB SCS, 20 MHz bandwidth, TDD duplex mode
16.6.4.2-4	NR 15 kHz SSB SCS, 10 MHz bandwidth, HD-FDD duplex mode
Note: The UE is only required to be tested in one of the supported test configurations	

Table 16.6.4.2.4.1-2: Test Environment parameters

Parameter	Value		Comment
Test environment	NC		As specified in TS 38.508-1 [14] clause 4.1.
Test frequencies	As specified in Annex E, Table E.2-1 and TS 38.508-1 [14] clause 4.3.1 and 4.4.2.		
Channel bandwidth	As specified by the test configuration selected from Table 4.6.3.1.4.1-1.		
Propagation conditions	AWGN		As specified in Annex C.2.2.
Connection Diagram	TE Part	A.3.1.7.1	As specified in TS 38.508-1 [14] Annex A.
	DUT Part	A.3.2.3.4	

Exceptions to connection diagram		

Table 16.6.4.2.4.1-3: General test parameters

Parameter	Config	Unit	Value
SSB GSCN	1~4		freq1
Duplex mode	1		FDD
	2,3		TDD
	4		HD-FDD
TDD Configuration	1,4		N/A
	2		TDDConf.1.1
	3		TDDConf.2.1
$BW_{channel}$	1,2,4	MHz	10: $N_{RB,c}$ = 52
	3		20: $N_{RB,c}$ = 51
PDSCH Reference measurement channel	1,4		SR.1.1 FDD
	2		SR.1.1 TDD
	3		SR.2.1 TDD
RMSI CORESET Reference Channel	1,4		CR.1.1 FDD
	2		CR.1.1 TDD
	3		CR.2.1 TDD
Dedicated CORESET Reference Channel	1,4		CCR.1.1 FDD
	2		CCR.1.1 TDD
	3		CCR.2.1 TDD
SSB configuration	1,2,4		SSB.3 FR1
	3		SSB.2 RedCap FR1
OCNG Patterns	1~4		OP.1
Initial BWP Configuration	1~4		DLBWP.0.1 ULBWP.0.1
Dedicated BWP configuration	1~4		DLBWP.1.1 ULBWP.1.1
SMTC configuration	1~4		SMTC.1 RedCap
TRS Configuration	1,4		TRS.1.1 FDD
	2		TRS.1.1 TDD
	3		TRS.1.2 TDD
DRX configuration	1~4		Off
reportConfigType	1~4		periodic
reportQuantity	1~4		ssb-Index-RSRP
Number of reported RS	1~4		2
L1-RSRP reporting period	1~4	slot	80
T1	1~4	s	5
T2	1~4	s	1
EPRE ratio of PSS to SSS	1~4	dB	0
EPRE ratio of PBCH DMRS to SSS			
EPRE ratio of PBCH to PBCH DMRS			
EPRE ratio of PDCCH DMRS to SSS			
EPRE ratio of PDCCH to PDCCH DMRS			
EPRE ratio of PDSCH DMRS to SSS			
EPRE ratio of PDSCH to PDSCH DMRS			
EPRE ratio of OCNG DMRS to SSS Note 1			
EPRE ratio of OCNG to OCNG DMRS Note 1			
Propagation condition	1~4		AWGN
Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.			

16.6.4.2.4.2 Test procedure

Same as the test procedure given in clause 6.6.4.1.4.2.

16.6.4.2.4.3 Message contents

Same as the message contents given in clause 6.6.4.1.4.3.

16.6.4.2.5 Test requirement

Same as the test requirements given in clause 6.6.4.1.5 with following exceptions:

- Table 6.6.4.1.5-1 is replaced by Table 16.6.4.2.5-1.

Table 16.6.4.2.5-1: SSB specific test parameters

Parameter	Config	Unit	SSB#0		SSB#1	
			T1	T2	T1	T2
N_{oc} Note2	1~4	dBm/15kHz	-94.65			
N_{oc} Note2	1,2,4	dBm/SSB SCS	-94.65			
	3		-91.65			
$\hat{E}_s / I_{ot}$	1~4	dB	0	0	-Infinity	3.5
SSB RSRP Note3	1,2.4	dBm/SSB SCS	-94.65	-94.65	-Infinity	-91.15
	3		-91.65	-91.65	-Infinity	-88.15
Io Note3	1,2.4	dBm/9.36 MHz	-63.69	-63.69	-66.70	-61.59
	3	dBm/18.36 MHz	-60.77	-60.77	-63.79	-58.67
$\hat{E}_s / N_{oc}$	1~4	dB	0	0	-Infinity	3.5 Note 4

Note 1: The resources for uplink transmission are assigned to the UE prior to the start of time period T2.
Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for N_{oc} to be fulfilled.
Note 3: SS-RSRP and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.
Note 4: Including the test tolerance given in Annex F.

16.6.4.3 NR SA FR1 SSB based L1-RSRP measurement when DRX is used for 1 Rx UE

Editor's Notes: This test case is incomplete in following aspects:

- TT analysis is missing.
- Test requirements are still TBD.

16.6.4.3.1 Test purpose

To verify that the UE makes correct reporting of L1-RSRP measurement. This test will partly verify the L1-RSRP measurement requirements in 38.133 [6] clause 9.5B.4.1.

16.6.4.3.2 Test applicability

This test applies to all types of NR RedCap UE with 1Rx from release 17 onwards and supporting long DRX cycle.

16.6.4.3.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 16.6.4.0.1 and 16.6.4.0.2.

The normative reference for this requirement is TS 38.133 [6] clause A.16.6.4.3.

16.6.4.3.4 Test description

16.6.4.3.4.1 Initial conditions

Same as the initial conditions given in clause 6.6.4.2.4.1 with following exceptions:

- Table 6.6.4.2.4.1-1 is replaced by Table 16.6.4.3.4.1-1.

- Table 6.6.4.2.4.1-2 is replaced by Table 16.6.4.3.4.1-3.
- Table 6.6.4.2.4.1-3 is replaced by Table 16.6.4.3.4.1-2.

Table 16.6.4.3.4.1-1: Supported test configurations

Config	Description
16.6.4.3-1	NR 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode
16.6.4.3-2	NR 15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode
16.6.4.3-3	NR 30 kHz SSB SCS, 20 MHz bandwidth, TDD duplex mode
16.6.4.3-4	NR 15 kHz SSB SCS, 10 MHz bandwidth, HD-FDD duplex mode
Note: The UE is only required to be tested in one of the supported test configurations	

Table 16.6.4.3.4.1-2: Test Environment parameters

Parameter	Value		Comment
Test environment	NC		As specified in TS 38.508-1 [14] clause 4.1.
Test frequencies	As specified in Annex E, Table E.2-1 and TS 38.508-1 [14] clause 4.3.1 and 4.4.2.		
Channel bandwidth	As specified by the test configuration selected from Table 4.6.3.1.4.1-1.		
Propagation conditions	AWGN		As specified in Annex C.2.2.
Connection Diagram	TE Part	A.3.1.8.1	As specified in TS 38.508-1 [14] Annex A.
	DUT Part	A.3.2.2.1	
Exceptions to connection diagram			

Table 16.6.4.3.4.1-3: General test parameters

Parameter	Config	Unit	Value
SSB GSCN	1~4		freq1
Duplex mode	1		FDD
	2,3		TDD
	4		HD-FDD
TDD Configuration	1,4		N/A
	2		TDDConf.1.1
	3		TDDConf.2.1
$BW_{channel}$	1,2,4	MHz	10: $N_{RB,c}$ = 52
	3		20: $N_{RB,c}$ = 51
PDSCH Reference measurement channel	1,4		SR.1.1 FDD
	2		SR.1.1 TDD
	3		SR.2.1 TDD
RMSI CORESET Reference Channel	1,4		CR.1.1 FDD
	2		CR.1.1 TDD
	3		CR.2.1 TDD
Dedicated CORESET Reference Channel	1,4		CCR.1.1 FDD
	2		CCR.1.1 TDD
	3		CCR.2.1 TDD
SSB configuration	1,2,4		SSB.3 FR1
	3		SSB.2 RedCap FR1
OCNG Patterns	1~4		OP.1
Initial BWP Configuration	1~4		DLBWP.0.1 ULBWP.0.1
Dedicated BWP configuration	1~4		DLBWP.1.1 ULBWP.1.1
SMTC configuration	1~4		SMTC.1 RedCap
TRS Configuration	1,4		TRS.1.1 FDD
	2		TRS.1.1 TDD
	3		TRS.1.2 TDD
DRX configuration	1~4		DRX.3
reportConfigType	1~4		periodic
reportQuantity	1~4		ssb-Index-RSRP

Number of reported RS	1~4		2
L1-RSRP reporting period	1~4	slot	80
T1	1~4	s	5
T2	1~4	s	1
EPRE ratio of PSS to SSS	1~4	dB	0
EPRE ratio of PBCH DMRS to SSS			
EPRE ratio of PBCH to PBCH DMRS			
EPRE ratio of PDCCH DMRS to SSS			
EPRE ratio of PDCCH to PDCCH DMRS			
EPRE ratio of PDSCH DMRS to SSS			
EPRE ratio of PDSCH to PDSCH DMRS			
EPRE ratio of OCNG DMRS to SSS Note 1			
EPRE ratio of OCNG to OCNG DMRS Note 1			
Propagation condition	1~4		AWGN
Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.			

16.6.4.3.4.2 Test procedure

Same as the test procedure given in clause 6.6.4.2.4.2 with following exceptions:

- Step 5 in test procedure given in clause 6.6.4.2.4.2 is replaced by following step.

5. The UE shall start sending valid L1-RSRP reports. The SS shall check following requirements:

   - R1: the UE shall start to transmit valid reports no later than 720 ms for configuration 1, 2, 4 and no later than 680 ms for configuration 3 from the beginning of time period T2. A valid report shall meet the absolute L1-RSRP requirement for SSB#1 (Table 16.6.4.3.5-2 for test configurations 1, 2, 4 and Table 16.6.4.3.5-3 for test configurations 3) and the relative L1-RSRP requirement for SSB#0 in Table 16.6.4.3.5-4. If the first valid report is received earlier than the specified time, the number of passed iterations for R1 is increased by one. Otherwise, the number of failed iterations for R1 is increased by one.

   - R2: the UE shall transmit reports every 80 slots until the end of time period T2. If the reports are received accordingly, the number of passed iterations for R2 is increased by one. Otherwise, the number of failed iterations for R2 is increased by one.

   - R3: The L1-RSRP value of SSB#1 reported by the UE is compared to the expected L1-RSRP value for SSB#1. In all consecutive reports after the first valid value is received, if the resulting value is outside the limits in Table 16.6.4.3.5-2 for test configurations 1, 2, 4 and 5 and in Table 16.6.4.3.5-3 for test configurations 3 and 6 or the UE fails to report the measurement value for SSB#1, the number of failed iterations for R3 is increased by one. Otherwise, the number of passed iterations for R3 is increased by one.

   -R4: The DIFF RSRP value of SSB#0 reported by the UE is compared to the expected DIFF RSRP value. In all consecutive reports after the first valid value is received, if the resulting value is outside the limits in Table 16.6.4.3.5-4 or the UE fails to report the measurement value for SSB#0, the number of failed iterations for R4 is increased by one. Otherwise, the number of passed iterations for R4 is increased by one.

16.6.4.3.4.3 Message contents

Same as the message contents given in clause 6.6.4.2.4.3.

16.6.4.3.5 Test requirement

Same as the test requirements given in clause 6.6.4.2.5 with following exceptions:

- Table 6.6.4.2.5-1 is replaced by Table 16.6.4.3.5-1.
- Table 6.6.4.2.5-2 is replaced by Table 16.6.4.3.5-2.
- Table 6.6.4.2.5-3 is replaced by Table 16.6.4.3.5-3.
- Table 6.6.4.2.5-4 is replaced by Table 16.6.4.3.5-4.

Table 16.6.4.3.5-1: SSB specific test parameters

Parameter	Config	Unit	SSB#0		SSB#1	
			T1	T2	T1	T2
N_{oc} Note2	1~4	dBm/15kHz	-94.65			
N_{oc} Note2	1,2,4	dBm/SSB SCS	-94.65			
	3		-91.65			
$\hat{E}_s/I_{ot}$	1~4	dB	0	0	-Infinity	3
SSB RSRP Note3	1,2.4	dBm/SSB SCS	-94.65	-94.65	-Infinity	-91.65
	3		-91.65	-91.65	-Infinity	-88.65
Io Note3	1,2.4	dBm/9.36 MHz	-63.69	-63.69	-66.70	-61.93
	3	dBm/18.36 MHz	-60.77	-60.77	-63.79	-59.02
$\hat{E}_s/N_{oc}$	1~4	dB	0	0	-Infinity	3

Note 1: The resources for uplink transmission are assigned to the UE prior to the start of time period T2.

Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for N_{oc} to be fulfilled.

Note 3: SS-RSRP and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.

Table 16.6.4.3.5-2: L1-RSRP absolute accuracy requirements for the reported values for test configurations 1 and 2

Normal Conditions	T2
Lowest reported value (SSB#1)	TBD
Highest reported value (SSB#1)	TBD

Table 16.6.4.3.5-3: L1-RSRP absolute accuracy requirements for the reported values for test configurations 3

Normal Conditions	T2
Lowest reported value (SSB#1)	TBD
Highest reported value (SSB#1)	TBD

Table 16.6.4.3.5-4: L1-RSRP relative accuracy requirements for the reported values for all test configurations

	T2
Lowest DIFF RSRP reported (SSB#0)	TBD
Highest DIFF RSRP reported (SSB#0)	TBD

16.6.4.4 NR SA FR1 SSB based L1-RSRP measurement when DRX is used for 2 Rx UE

16.6.4.4.1 Test purpose

To verify that the UE makes correct reporting of L1-RSRP measurement. This test will partly verify the L1-RSRP measurement requirements in 38.133 [6] clause 9.5B.4.1.

16.6.4.4.2 Test applicability

This test applies to all types of NR RedCap UE with 2Rx from release 17 onwards and supporting long DRX cycle.

16.6.4.4.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 16.6.4.0.1 and 16.6.4.0.2.

The normative reference for this requirement is TS 38.133 [6] clause A.16.6.4.4.

16.6.4.4.4 Test description

16.6.4.4.4.1 Initial conditions

Same as the initial conditions given in clause 6.6.4.2.4.1 with following exceptions:

- Table 6.6.4.2.4.1-1 is replaced by Table 16.6.4.4.4.1-1.
- Table 6.6.4.2.4.1-2 is replaced by Table 16.6.4.4.4.1-3.
- Table 6.6.4.2.4.1-3 is replaced by Table 16.6.4.4.4.1-2.

Table 16.6.4.4.4.1-1: Supported test configurations

Config	Description
16.6.4.4-1	NR 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode
16.6.4.4-2	NR 15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode
16.6.4.4-3	NR 30 kHz SSB SCS, 20 MHz bandwidth, TDD duplex mode
16.6.4.4-4	NR 15 kHz SSB SCS, 10 MHz bandwidth, HD-FDD duplex mode
Note: The UE is only required to be tested in one of the supported test configurations	

Table 16.6.4.4.4.1-2: Test Environment parameters

Parameter	Value		Comment
Test environment	NC		As specified in TS 38.508-1 [14] clause 4.1.
Test frequencies	As specified in Annex E, Table E.2-1 and TS 38.508-1 [14] clause 4.3.1 and 4.4.2.		
Channel bandwidth	As specified by the test configuration selected from Table 4.6.3.1.4.1-1.		
Propagation conditions	AWGN		As specified in Annex C.2.2.
Connection Diagram	TE Part	A.3.1.7.1	As specified in TS 38.508-1 [14] Annex A.
	DUT Part	A.3.2.3.4	
Exceptions to connection diagram			

Table 16.6.4.4.4.1-3: General test parameters

Parameter	Config	Unit	Value
SSB GSCN	1~4		freq1
Duplex mode	1		FDD
	2,3		TDD
	4		HD-FDD
TDD Configuration	1,4		N/A
	2		TDDConf.1.1
	3		TDDConf.2.1
$BW_{channel}$	1,2,4	MHz	10: $N_{RB,c}$ = 52
	3		20: $N_{RB,c}$ = 51
PDSCH Reference measurement channel	1,4		SR.1.1 FDD
	2		SR.1.1 TDD
	3		SR.2.1 TDD
RMSI CORESET Reference Channel	1,4		CR.1.1 FDD
	2		CR.1.1 TDD
	3		CR.2.1 TDD
Dedicated CORESET Reference Channel	1,4		CCR.1.1 FDD
	2		CCR.1.1 TDD

	3		CCR.2.1 TDD
SSB configuration	1,2,4		SSB.3 FR1
	3		SSB.2 RedCap FR1
OCNG Patterns	1~4		OP.1
Initial BWP Configuration	1~4		DLBWP.0.1 ULBWP.0.1
Dedicated BWP configuration	1~4		DLBWP.1.1 ULBWP.1.1
SMTC configuration	1~4		SMTC.1 RedCap
TRS Configuration	1,4		TRS.1.1 FDD
	2		TRS.1.1 TDD
	3		TRS.1.2 TDD
DRX configuration	1~4		DRX.3
reportConfigType	1~4		periodic
reportQuantity	1~4		ssb-Index-RSRP
Number of reported RS	1~4		2
L1-RSRP reporting period	1~4	slot	80
T1	1~4	s	5
T2	1~4	s	1
EPRE ratio of PSS to SSS	1~4	dB	0
EPRE ratio of PBCH DMRS to SSS			
EPRE ratio of PBCH to PBCH DMRS			
EPRE ratio of PDCCH DMRS to SSS			
EPRE ratio of PDCCH to PDCCH DMRS			
EPRE ratio of PDSCH DMRS to SSS			
EPRE ratio of PDSCH to PDSCH DMRS			
EPRE ratio of OCNG DMRS to SSS Note 1			
EPRE ratio of OCNG to OCNG DMRS Note 1			
Propagation condition	1~4		AWGN
Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.			

16.6.4.4.4.2 Test procedure

Same as the test procedure given in clause 6.6.4.2.4.2.

16.6.4.4.4.3 Message contents

Same as the message contents given in clause 6.6.4.2.4.3.

16.6.4.4.5 Test requirement

Same as the test requirements given in clause 6.6.4.2.5 with following exceptions:

- Table 6.6.4.2.5-1 is replaced by Table 16.6.4.4.5-1.

Table 16.6.4.4.5-1: SSB specific test parameters

Parameter	Config	Unit	SSB#0		SSB#1	
			T1	T2	T1	T2
N_{oc} Note2	1~4	dBm/15kHz	-94.65			
N_{oc} Note2	1,2,4	dBm/SSB SCS	-94.65			
	3		-91.65			
$\hat{E}_s / I_{ot}$	1~4	dB	0	0	-Infinity	3.5
SSB RSRP Note3	1,2.4	dBm/SSB SCS	-94.65	-94.65	-Infinity	-91.15
	3		-91.65	-91.65	-Infinity	-88.15
Io Note3	1,2.4	dBm/9.36 MHz	-63.69	-63.69	-66.70	-61.59
	3	dBm/18.36 MHz	-60.77	-60.77	-63.79	-58.67
$\hat{E}_s / N_{oc}$	1~4	dB	0	0	-Infinity	3.5 Note 4
Note 1: The resources for uplink transmission are assigned to the UE prior to the start of time period T2.						

Note 2:	Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for N_{oc} to be fulfilled.
Note 3:	SS-RSRP and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.

16.6.4.5 NR SA FR1 CSI-RS based L1-RSRP measurement when DRX is not used for 1 Rx UE

Editor's note: This test cases is incomplete in following aspects:

- TT analysis is still missing

16.6.4.5.1 Test purpose

To verify that the UE makes correct reporting of L1-RSRP measurement. This test will partly verify the L1-RSRP measurement requirements in TS 38.133 [6] clause 9.5B.4.2.

16.6.4.5.2 Test applicability

This test applies to all types of NR RedCap UE with 1 Rx from Release 17 onwards.

16.6.4.5.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 16.6.4.0.1 and 16.6.4.0.3.

The normative reference for this requirement is TS 38.133 [6] clause A.16.6.4.5.

16.6.4.5.4 Test description

16.6.4.5.4.1 Initial conditions

Same as the initial conditions given in clause 6.6.4.3.4.1 with following exceptions:

- Table 6.6.4.3.4.1-1 is replaced by Table 16.6.4.5.4.1-1.
- Table 6.6.4.3.4.1-2 is replaced by Table 16.6.4.5.4.1-2.
- Table 6.6.4.3.4.1-3 is replaced by Table 16.6.4.5.4.1-3.

Table 16.6.4.5.4.1-1: Supported test configurations

Configuration	Description
16.6.4.5-1	15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode
16.6.4.5-2	15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode
16.6.4.5-3	30 kHz SSB SCS, 20 MHz bandwidth, TDD duplex mode
16.6.4.5-4	15 kHz SSB SCS, 10 MHz bandwidth, HD-FDD duplex mode
Note: The UE is only required to pass in one of the supported test configurations in FR1	

Table 16.6.4.5.4.1-2: Initial conditions

Parameter	Value		Comment
Test environment	NC		As specified in TS 38.508-1 [14] clause 4.1.
Test frequencies	As specified in Annex E, Table E.14-1 and TS 38.508-1 [14] clause 4.3.1.		
Channel bandwidth	As specified by the test configuration selected from Table 16.6.4.5.4.1-1.		
Propagation conditions	AWGN		As specified in Annex C.2.2
Connection Diagram	TE Part	A.3.1.8.1	As specified in TS 38.508-1 [14] Annex A.
	DUT Part	A.3.2.2.1	

Exceptions to connection diagram		

Table 16.6.4.5.4.1-3: General test parameters

Parameter		Unit	Value
SSB GSCN			freq1
Duplex mode	Config 1		FDD
	Config 2,3		TDD
	Config 4		HD-FDD
TDD Configuration	Config 1,4		N/A
	Config 2		TDDConf.1.1
	Config 3		TDDConf.2.1
$BW_{channel}$	Config 1,2,4	MHz	10: $N_{RB,c}$ = 52
	Config 3		20: $N_{RB,c}$ = 51
PDSCH Reference measurement channel	Config 1,4		SR.1.1 FDD
	Config 2		SR.1.1 TDD
	Config 3		SR.2.1 TDD
RMSI CORESET Reference Channel	Config 1,4		CR.1.1 FDD
	Config 2		CR.1.1 TDD
	Config 3		CR.2.1 TDD
Dedicated CORESET Reference Channel	Config 1,4		CCR.1.1 FDD
	Config 2		CCR.1.1 TDD
	Config 3		CCR.2.1 TDD
SSB configuration	Config 1,2,4		SSB.3 FR1
	Config 3		SSB.2 Redcap FR1
CSI-RS configuration	Config 1,4		CSI-RS 1.3 FDD
	Config 2		CSI-RS 1.3 TDD
	Config 3		CSI-RS 2.3 TDD
OCNG Patterns			OP.1
TRS Configuration	Config 1,4		TRS.1.1 FDD
	Config 2		TRS.1.1 TDD
	Config 3		TRS.1.2 TDD
Initial BWP Configuration			DLBWP.0.1 ULBWP.0.1
Dedicated BWP configuration			DLBWP.1.1 ULBWP.1.1
SMTC configuration			SMTC.1 RedCap
DRX configuration			Off
reportConfigType			aperiodic
reportQuantity			cri-RSRP
Number of reported RS			2
qcl-Info			SSB#0 for resource#0
			SSB#1 for resource#1
reportSlotOffsetList		slots	8
T1		s	5
EPRE ratio of PSS to SSS		dB	0
EPRE ratio of PBCH DMRS to SSS			
EPRE ratio of PBCH to PBCH DMRS			
EPRE ratio of PDCCH DMRS to SSS			
EPRE ratio of PDCCH to PDCCH DMRS			
EPRE ratio of PDSCH DMRS to SSS			
EPRE ratio of PDSCH to PDSCH DMRS			
EPRE ratio of OCNG DMRS to SSS Note 1			
EPRE ratio of OCNG to OCNG DMRS Note 1			
Propagation condition			AWGN
Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.			

16.6.4.5.4.2 Test procedure

Same as the test procedure given in clause 6.6.4.3.4.2.

16.6.4.5.4.3 Message contents

Same as the message contents given in clause 6.6.4.3.4.3.

16.6.4.5.5 Test requirement

Same as the test requirements given in clause 6.6.4.3.5 with following exceptions:

- Table 6.6.4.3.5-1 is replaced by Table 16.6.4.5.5-1.

Table 16.6.4.5.5-1: Cell specific test parameters

Parameter		Unit	CSI-RS#0	CSI-RS#1
N_{oc} Note1		dBm/15kHz	-94.65	
N_{oc} Note1	Config 1,2,4	dBm/SCS	-94.65	
	Config 3		-91.65	
$\hat{E}_s / I_{ot}$		dB	0	3
CSI-RS RSRP Note2	Config 1,2,4	dBm/SSB SCS	-94.65	-91.65
	Config 3		-91.65	-88.65
Io Note2	Config 1,2,4	dBm/9.36 MHz	-63.69	-61.93
	Config 3	dBm/18.36 MHz	-60.77	-59.02
$\hat{E}_s / N_{oc}$		dB	0	3
Note 1: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for N_{oc} to be fulfilled.				
Note 2: CSI-RS RSRP and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.				

16.6.4.6 NR SA FR1 CSI-RS based L1-RSRP measurement when DRX is not used for 2 Rx UE

16.6.4.6.1 Test purpose

To verify that the UE makes correct reporting of L1-RSRP measurement. This test will partly verify the L1-RSRP measurement requirements in TS 38.133 [6] clause 9.5B.4.2.

16.6.4.6.2 Test applicability

This test applies to all types of NR RedCap UE with 2 Rx from Release 17 onwards.

16.6.4.6.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 16.6.4.0.1 and 16.6.4.0.3.

The normative reference for this requirement is TS 38.133 [6] clause A.16.6.4.6.

16.6.4.6.4 Test description

16.6.4.6.4.1 Initial conditions

Same as the initial conditions given in clause 6.6.4.3.4.1 with following exceptions:

- Table 6.6.4.3.4.1-1 is replaced by Table 16.6.4.6.4.1-1.

- Table 6.6.4.3.4.1-2 is replaced by Table 16.6.4.6.4.1-2.
- Table 6.6.4.3.4.1-3 is replaced by Table 16.6.4.6.4.1-3.

Table 16.6.4.6.4.1-1: Supported test configurations

Configuration	Description
16.6.4.6-1	15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode
16.6.4.6-2	15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode
16.6.4.6-3	30 kHz SSB SCS, 20 MHz bandwidth, TDD duplex mode
16.6.4.6-4	15 kHz SSB SCS, 10 MHz bandwidth, HD-FDD duplex mode
Note: The UE is only required to pass in one of the supported test configurations in FR1	

Table 16.6.4.6.4.1-2: Initial conditions

Parameter	Value		Comment
Test environment	NC		As specified in TS 38.508-1 [14] clause 4.1.
Test frequencies	As specified in Annex E, Table E.14-1 and TS 38.508-1 [14] clause 4.3.1.		
Channel bandwidth	As specified by the test configuration selected from Table 16.6.4.6.4.1-1.		
Propagation conditions	AWGN		As specified in Annex C.2.2
Connection Diagram	TE Part	A.3.1.8.2	As specified in TS 38.508-1 [14] Annex A.
	DUT Part	A.3.2.3.2	
Exceptions to connection diagram			

Table 16.6.4.6.4.1-3: General test parameters

Parameter		Unit	Value
SSB GSCN			freq1
Duplex mode	Config 1		FDD
	Config 2,3		TDD
	Config 4		HD-FDD
TDD Configuration	Config 1,4		N/A
	Config 2		TDDConf.1.1
	Config 3		TDDConf.2.1
$BW_{channel}$	Config 1,2,4	MHz	10: $N_{RB,c}$ = 52
	Config 3		20: $N_{RB,c}$ = 51
PDSCH Reference measurement channel	Config 1,4		SR.1.1 FDD
	Config 2		SR.1.1 TDD
	Config 3		SR.2.1 TDD
RMSI CORESET Reference Channel	Config 1,4		CR.1.1 FDD
	Config 2		CR.1.1 TDD
	Config 3		CR.2.1 TDD
Dedicated CORESET Reference Channel	Config 1,4		CCR.1.1 FDD
	Config 2		CCR.1.1 TDD
	Config 3		CCR.2.1 TDD
SSB configuration	Config 1,2,4		SSB.3 FR1
	Config 3		SSB.2 Redcap FR1
CSI-RS configuration	Config 1,4		CSI-RS 1.3 FDD
	Config 2		CSI-RS 1.3 TDD
	Config 3		CSI-RS 2.3 TDD
OCNG Patterns			OP.1
TRS Configuration	Config 1,4		TRS.1.1 FDD
	Config 2		TRS.1.1 TDD
	Config 3		TRS.1.2 TDD
Initial BWP Configuration			DLBWP.0.1 ULBWP.0.1
Dedicated BWP configuration			DLBWP.1.1

		ULBWP.1.1
SMTC configuration		SMTC.1 RedCap
DRX configuration		Off
reportConfigType		aperiodic
reportQuantity		cri-RSRP
Number of reported RS		2
qcl-Info		SSB#0 for resource#0
		SSB#1 for resource#1
reportSlotOffsetList	slots	8
T1	s	5
EPRE ratio of PSS to SSS	dB	0
EPRE ratio of PBCH DMRS to SSS		
EPRE ratio of PBCH to PBCH DMRS		
EPRE ratio of PDCCH DMRS to SSS		
EPRE ratio of PDCCH to PDCCH DMRS		
EPRE ratio of PDSCH DMRS to SSS		
EPRE ratio of PDSCH to PDSCH DMRS		
EPRE ratio of OCNG DMRS to SSS Note 1		
EPRE ratio of OCNG to OCNG DMRS Note 1		
Propagation condition		AWGN
Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.		

16.6.4.6.4.2 Test procedure

Same as the test procedure given in clause 6.6.4.3.4.2.

16.6.4.6.4.3 Message contents

Same as the message contents given in clause 6.6.4.3.4.3.

16.6.4.6.5 Test requirement

Same as the test requirements given in clause 6.6.4.3.5 with following exceptions:

- Table 6.6.4.3.5-1 is replaced by Table 16.6.4.6.5-1.

Table 16.6.4.6.5-1: Cell specific test parameters

Parameter		Unit	CSI-RS#0	CSI-RS#1
N_{oc} Note1		dBm/15kHz	-94.65	
N_{oc} Note1	Config 1,2,4	dBm/SCS	-94.65	
	Config 3		-91.65	
$\hat{E}_s / I_{ot}$		dB	0	3.5
CSI-RS RSRP Note2	Config 1,2,4	dBm/SSB SCS	-94.65	-91.15
	Config 3		-91.65	-88.14
Io Note2	Config 1,2,4	dBm/9.36 MHz	-63.69	-61.59
	Config 3	dBm/18.36 MHz	-60.77	-58.67
$\hat{E}_s / N_{oc}$		dB	0	3.5
Note 1: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for N_{oc} to be fulfilled.				
Note 2: CSI-RS RSRP and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.				

16.6.4.7 NR SA FR1 CSI-RS based L1-RSRP measurement when DRX is not used for 1 Rx UE

Editor's note: This test cases is incomplete in following aspects:

- TT analysis is still missing

16.6.4.7.1 Test purpose

To verify that the UE makes correct reporting of L1-RSRP measurement. This test will partly verify the L1-RSRP measurement requirements in TS 38.133 [6] clause 9.5B.4.2.

16.6.4.7.2 Test applicability

This test applies to all types of NR RedCap UE with 1 Rx from Release 17 onwards supporting long DRX cycle.

16.6.4.7.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 16.6.4.0.1 and 16.6.4.0.3.

The normative reference for this requirement is TS 38.133 [6] clause A.16.6.4.7.

16.6.4.7.4 Test description

16.6.4.7.4.1 Initial conditions

Same as the initial conditions given in clause 6.6.4.4.4.1 with following exceptions:

- Table 6.6.4.4.4.1-1 is replaced by Table 16.6.4.7.4.1-1.
- Table 6.6.4.4.4.1-2 is replaced by Table 16.6.4.7.4.1-2.
- Table 6.6.4.4.4.1-3 is replaced by Table 16.6.4.7.4.1-3.

Table 16.6.4.7.4.1-1: Supported test configurations

Configuration	Description
16.6.4.7-1	15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode
16.6.4.7-2	15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode
16.6.4.7-3	30 kHz SSB SCS, 20 MHz bandwidth, TDD duplex mode
16.6.4.7-4	15 kHz SSB SCS, 10 MHz bandwidth, HD-FDD duplex mode
Note: The UE is only required to pass in one of the supported test configurations in FR1	

Table 16.6.4.7.4.1-2: Initial conditions

Parameter	Value		Comment
Test environment	NC		As specified in TS 38.508-1 [14] clause 4.1.
Test frequencies	As specified in Annex E, Table E.14-1 and TS 38.508-1 [14] clause 4.3.1.		
Channel bandwidth	As specified by the test configuration selected from Table 16.6.4.7.4.1-1.		
Propagation conditions	AWGN		As specified in Annex C.2.2
Connection Diagram	TE Part	A.3.1.8.1	As specified in TS 38.508-1 [14] Annex A.
	DUT Part	A.3.2.2.1	
Exceptions to connection diagram			

Table 16.6.4.7.4.1-3: General test parameters

Parameter	Unit	Value

SSB GSCN			freq1
Duplex mode	Config 1		FDD
	Config 2,3		TDD
	Config 4		HD-FDD
TDD Configuration	Config 1,4		N/A
	Config 2		TDDConf.1.1
	Config 3		TDDConf.2.1
$BW_{channel}$	Config 1,2,4	MHz	10: $N_{RB,c}$ = 52
	Config 3		20: $N_{RB,c}$ = 51
PDSCH Reference measurement channel	Config 1,4		SR.1.1 FDD
	Config 2		SR.1.1 TDD
	Config 3		SR.2.1 TDD
RMSI CORESET Reference Channel	Config 1,4		CR.1.1 FDD
	Config 2		CR.1.1 TDD
	Config 3		CR.2.1 TDD
Dedicated CORESET Reference Channel	Config 1,4		CCR.1.1 FDD
	Config 2		CCR.1.1 TDD
	Config 3		CCR.2.1 TDD
SSB configuration	Config 1,2,4		SSB.3 FR1
	Config 3		SSB.2 Redcap FR1
CSI-RS configuration	Config 1,4		CSI-RS 1.3 FDD
	Config 2		CSI-RS 1.3 TDD
	Config 3		CSI-RS 2.3 TDD
OCNG Patterns			OP.1
TRS Configuration	Config 1,4		TRS.1.1 FDD
	Config 2		TRS.1.1 TDD
	Config 3		TRS.1.2 TDD
Initial BWP Configuration			DLBWP.0.1 ULBWP.0.1
Dedicated BWP configuration			DLBWP.1.1 ULBWP.1.1
SMTC configuration			SMTC.1 RedCap
DRX configuration			DRX.3
reportConfigType			aperiodic
reportQuantity			cri-RSRP
Number of reported RS			2
qcl-Info			SSB#0 for resource#0
			SSB#1 for resource#1
reportSlotOffsetList		slots	8
T1		s	5
EPRE ratio of PSS to SSS		dB	0
EPRE ratio of PBCH DMRS to SSS			
EPRE ratio of PBCH to PBCH DMRS			
EPRE ratio of PDCCH DMRS to SSS			
EPRE ratio of PDCCH to PDCCH DMRS			
EPRE ratio of PDSCH DMRS to SSS			
EPRE ratio of PDSCH to PDSCH DMRS			
EPRE ratio of OCNG DMRS to SSS Note 1			
EPRE ratio of OCNG to OCNG DMRS Note 1			
Propagation condition			AWGN
Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.			

16.6.4.7.4.2 Test procedure

Same as the test procedure given in clause 6.6.4.4.4.2.

16.6.4.7.4.3 Message contents

Same as the message contents given in clause 6.6.4.4.4.3.

16.6.4.7.5 Test requirement

Same as the test requirements given in clause 6.6.4.4.5 with following exceptions:

- Table 6.6.4.4.5-1 is replaced by Table 16.6.4.7.5-1.

Table 16.6.4.7.5-1: Cell specific test parameters

Parameter		Unit	CSI-RS#0	CSI-RS#1
N_{oc} Note1		dBm/15kHz	-94.65	
N_{oc} Note1	Config 1,2,4	dBm/SCS	-94.65	
	Config 3		-91.65	
$\hat{E}_s / I_{ot}$		dB	0	3
CSI-RS RSRP Note2	Config 1,2,4	dBm/SSB SCS	-94.65	-91.65
	Config 3		-91.65	-88.65
Io Note2	Config 1,2,4	dBm/9.36 MHz	-63.69	-61.93
	Config 3	dBm/18.36 MHz	-60.77	-59.02
$\hat{E}_s / N_{oc}$		dB	0	3
Note 1: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for N_{oc} to be fulfilled.				
Note 2: CSI-RS RSRP and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.				

16.6.4.8 NR SA FR1 CSI-RS based L1-RSRP measurement when DRX is used for 2 Rx UE

16.6.4.8.1 Test purpose

To verify that the UE makes correct reporting of L1-RSRP measurement. This test will partly verify the L1-RSRP measurement requirements in TS 38.133 [6] clause 9.5B.4.2.

16.6.4.8.2 Test applicability

This test applies to all types of NR RedCap UE with 2 Rx from Release 17 onwards supporting long DRX cycle.

16.6.4.8.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 16.6.4.0.1 and 16.6.4.0.3.

The normative reference for this requirement is TS 38.133 [6] clause A.16.6.4.8.

16.6.4.8.4 Test description

16.6.4.8.4.1 Initial conditions

Same as the initial conditions given in clause 6.6.4.4.4.1 with following exceptions:

- Table 6.6.4.4.4.1-1 is replaced by Table 16.6.4.8.4.1-1.
- Table 6.6.4.4.4.1-2 is replaced by Table 16.6.4.8.4.1-2.
- Table 6.6.4.4.4.1-3 is replaced by Table 16.6.4.8.4.1-3.

Table 16.6.4.8.4.1-1: Supported test configurations

Configuration	Description
16.6.4.8-1	15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode

16.6.4.8-2	15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode
16.6.4.8-3	30 kHz SSB SCS, 20 MHz bandwidth, TDD duplex mode
16.6.4.8-4	15 kHz SSB SCS, 10 MHz bandwidth, HD-FDD duplex mode
Note: The UE is only required to pass in one of the supported test configurations in FR1	

Table 16.6.4.8.4.1-2: Initial conditions

Parameter	Value		Comment
Test environment	NC		As specified in TS 38.508-1 [14] clause 4.1.
Test frequencies	As specified in Annex E, Table E.14-1 and TS 38.508-1 [14] clause 4.3.1.		
Channel bandwidth	As specified by the test configuration selected from Table 16.6.4.8.4.1-1.		
Propagation conditions	AWGN		As specified in Annex C.2.2
Connection Diagram	TE Part	A.3.1.8.2	As specified in TS 38.508-1 [14] Annex A.
	DUT Part	A.3.2.3.2	
Exceptions to connection diagram			

Table 16.6.4.8.4.1-3: General test parameters

Parameter		Unit	Value
SSB GSCN			freq1
Duplex mode	Config 1		FDD
	Config 2,3		TDD
	Config 4		HD-FDD
TDD Configuration	Config 1,4		N/A
	Config 2		TDDConf.1.1
	Config 3		TDDConf.2.1
$BW_{channel}$	Config 1,2,4	MHz	10: $N_{RB,c}$ = 52
	Config 3		20: $N_{RB,c}$ = 51
PDSCH Reference measurement channel	Config 1,4		SR.1.1 FDD
	Config 2		SR.1.1 TDD
	Config 3		SR.2.1 TDD
RMSI CORESET Reference Channel	Config 1,4		CR.1.1 FDD
	Config 2		CR.1.1 TDD
	Config 3		CR.2.1 TDD
Dedicated CORESET Reference Channel	Config 1,4		CCR.1.1 FDD
	Config 2		CCR.1.1 TDD
	Config 3		CCR.2.1 TDD
SSB configuration	Config 1,2,4		SSB.3 FR1
	Config 3		SSB.2 Redcap FR1
CSI-RS configuration	Config 1,4		CSI-RS 1.3 FDD
	Config 2		CSI-RS 1.3 TDD
	Config 3		CSI-RS 2.3 TDD
OCNG Patterns			OP.1
TRS Configuration	Config 1,4		TRS.1.1 FDD
	Config 2		TRS.1.1 TDD
	Config 3		TRS.1.2 TDD
Initial BWP Configuration			DLBWP.0.1 ULBWP.0.1
Dedicated BWP configuration			DLBWP.1.1 ULBWP.1.1
SMTC configuration			SMTC.1 RedCap
DRX configuration			DRX.3
reportConfigType			aperiodic
reportQuantity			cri-RSRP
Number of reported RS			2
qcl-Info			SSB#0 for resource#0

		SSB#1 for resource#1
reportSlotOffsetList	slots	8
T1	s	5
EPRE ratio of PSS to SSS	dB	0
EPRE ratio of PBCH DMRS to SSS		
EPRE ratio of PBCH to PBCH DMRS		
EPRE ratio of PDCCH DMRS to SSS		
EPRE ratio of PDCCH to PDCCH DMRS		
EPRE ratio of PDSCH DMRS to SSS		
EPRE ratio of PDSCH to PDSCH DMRS		
EPRE ratio of OCNG DMRS to SSS Note 1		
EPRE ratio of OCNG to OCNG DMRS Note 1		
Propagation condition		AWGN
Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.		

16.6.4.8.4.2 Test procedure

Same as the test procedure given in clause 6.6.4.4.4.2.

16.6.4.8.4.3 Message contents

Same as the message contents given in clause 6.6.4.4.4.3.

16.6.4.8.5 Test requirement

Same as the test requirements given in clause 6.6.4.4.5 with following exceptions:

- Table 6.6.4.4.5-1 is replaced by Table 16.6.4.8.5-1.

Table 16.6.4.8.5-1: Cell specific test parameters

Parameter		Unit	CSI-RS#0	CSI-RS#1
N_{oc} Note1		dBm/15kHz	-94.65	
N_{oc} Note1	Config 1,2,4	dBm/SCS	-94.65	
	Config 3		-91.65	
$\hat{E}_s / I_{ot}$		dB	0	3.5
CSI-RS RSRP Note2	Config 1,2,4	dBm/SSB SCS	-94.65	-91.15
	Config 3		-91.65	-88.14
Io Note2	Config 1,2,4	dBm/9.36 MHz	-63.69	-61.59
	Config 3	dBm/18.36 MHz	-60.77	-58.67
$\hat{E}_s / N_{oc}$		dB	0	3.5
Note 1: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for N_{oc} to be fulfilled.				
Note 2: CSI-RS RSRP and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.				

17

17.1

17.1.1

17.1.1.1 NR SA FR2 Cell reselection to FR2 intra-frequency NR case for 2 Rx

Editor's Note: This test case is incomplete in following aspects:

- Message contents are missing.
- Test procedure is TBD
- Test applicability is missing
- TT analysis is missing.
- Cell mapping is missing
- Connection diagram is missing

17.1.1.1.1 Test purpose

The purpose of this test is to verify the requirement for the NR SA intra-frequency cell reselection in FR2 for 2 Rx RedCap UEs. The requirements are specified in TS 38.133 [6] in clause TBD.

17.1.1.1.2 Test applicability

This test applies to all types of NR RedCap UE release 17 and forward.

17.1.1.1.3 Minimum conformance requirements

The minimum conformance requirements are defined in clause 17.1.1.0.x.

The normative reference for this requirement is TS 38.133 [6] clause A.17.1.1.1.

17.1.1.1.4 Test description

17.1.1.1.4.1 Initial conditions

This test shall be tested using any of the test configurations in Table 17.1.1.1.4.1-1.

Table 17.1.1.1.4.1-1: Supported test configurations for NR SA FR2 Cell reselection to FR2 intra-frequency NR case for 2 Rx

Configuration	Description
17.1.1.1-1	120 kHz SSB SCS, 100 MHz bandwidth, TDD duplex mode
17.1.1.1-2	240 kHz SSB SCS, 100 MHz bandwidth, TDD duplex mode
Note: The UE is only required to be tested in one of the supported test configurations.	

Configure the test equipment and the DUT according to the parameters in Table 17.1.1.1.4.1-2.

Table 17.1.1.1.4.1-2: Initial conditions for NR SA FR2 Cell reselection to FR2 intra-frequency NR case for 2 Rx

Parameter	Value	Comment
Test environment	NC	As specified in TS 38.508-1 [14] clause 4.1.
Test frequencies	As specified in Annex E, table E.4-1 and TS 38.508-1 [14] clause 4.3.1.	

Channel bandwidth	As specified by the test configuration selected from Table 6.1.1.2.4.1-1.		
Propagation conditions	AWGN		As specified in Annex C.2.2.
Connection Diagram	TE Part	TBD	As specified in TS 38.508-1 [14] Annex A.
	DUT Part	TBD	
Exceptions to connection diagram	Without faders.		

1. The general test parameter settings are set up according to Table 17.1.1.1.4.1-3.
2. Message contents are defined in clause 17.1.1.1.4.3.
3. The test scenario comprises of 1 NR carrier and 2 cells. Cell 1 and cell 2 belong to different tracking areas. Furthermore, UE has not registered with network for the tracking area containing cell 2.

Table 17.1.1.1.4.1-3: General test parameters for NR SA FR2 Cell reselection to FR2 intra-frequency NR case for 2 Rx

Parameter		Unit	Test configuration	Value	Comment
Initial condition	Active cell		1, 2	Cell1	
T2 end condition	Active cell		1, 2	Cell2	
	Neighbour cell		1, 2	Cell1	
Final condition	Active cell		1, 2	Cell1	
	Neighbour cell		1, 2	Cell2	
RF Channel Number			1, 2	1	
Time offset between cells			1, 2	3 μs	Synchronous cells
Access Barring Information		-	1, 2	Not Sent	No additional delays in random access procedure.
SMTC configuration			1, 2	SMTC.1	
DRX cycle length		s	1, 2	1.28	The value shall be used for all cells in the test.
PRACH configuration index			1, 2	190	The detailed configuration is specified in TS 38.211 clause 6.3.3.2
rangeToBestCell			1, 2	Not configured	
T1		s	1, 2	>7	During T1, Cell 2 shall be powered off, and during the off time the physical cell identity shall be changed, the intention is to ensure that Cell 2 has not been detected by the UE prior to the start of period T2
T2		s	1, 2	135	T2 needs to be defined so that cell re-selection reaction time is taken into account.
T3		s	1, 2	35	T3 needs to be defined so that cell re-selection reaction time is taken into account.

17.1.1.1.4.2 Test procedure

TBD

17.1.1.1.4.3 Message contents

Message contents are according to TS 38.508-1 [14] clause 7.3 with the following exceptions:

TBD

17.1.1.1.5 Test requirement

Table 17.1.1.1.5-1 defines the primary level settings including test tolerances for NR – E-UTRA cell re-selection test case in AWGN for UE fulfilling stationary relaxed measurement criterion for 2 Rx UE.

Table 17.1.1.1.5-1: Cell specific test parameters for NR SA FR2 Cell reselection to FR2 intra-frequency NR case for 2 Rx

Parameter	Unit	Test configuration	Cell 1			Cell 2		
			T1	T2	T3	T1	T2	T3
TDD configuration		1, 2	TDDConf.3.1			TDDConf.3.1		
PDSCH RMC configuration		1	SR.3.1 TDD			SR.3.1 TDD		
		2	SR.3.1 TDD			SR.3.1 TDD		
RMSI CORESET RMC configuration		1	CR.3.1 TDD			CR.3.1 TDD		
		2	CR.3.1 TDD			CR.3.1 TDD		
Dedicated CORESET RMC configuration		1	CCR.3.1 TDD			CCR.3.1 TDD		
		2	CCR.3.1 TDD			CCR.3.1 TDD		
SSB configuration		1	SSB.3 FR2			SSB.7 FR2		
		2	SSB.4 FR2			SSB.8 FR2		
OCNG Pattern		1, 2	OP.4			OP.4		
$BW_{channel}$	MHz	1, 2	100: $N_{RB,c}$ = 66			100: $N_{RB,c}$ = 66		
Data RBs allocated		1, 2	66			66		
Initial DL BWP configuration		1, 2	DLBWP.0.1			DLBWP.0.1		
Initial UL BWP configuration		1, 2	ULBWP.0.1			ULBWP.0.1		
RLM-RS		1, 2	SSB			SSB		
Qrxlevmin	dBm/SCS	1	-138			-138		
		2	-135			-135		
Pcompensation	dB	1, 2	0			0		
$Qhyst_s$	dB	1, 2	0			0		
$Qoffset_{s,n}$	dB	1, 2	0			0		
Cell_selection_and_reselection_quality_measurement		1, 2	SS-RSRP			SS-RSRP		
AoA setup		1, 2	Setup 1 defined in A.3.15.1			Setup 1 defined in A.3.15.1		
$\hat{E}_s / I_{ot}$	dB	1	8	-3	1.5	-infinity	1.5	-3
		2						
Beam assumption[Note 4]		1,2	Rough					
N_{oc} [Note2]	dBm/SCS	1	-93					
		2	-90					
N_{oc} [Note2]	dBm/15 kHz	1	-102					
		2						
$\hat{E}_s / N_{oc}$	dB	1	8	-3	1.5	-infinity	1.5	-3
		2						
SS-RSRP [Note3]	dBm/SCS	1	-85	-96	-91.5	-infinity	-91.5	-96
		2	-82	-93	-88.5	-infinity	-88.5	-93
Io on SSB symbols of each cell	dBm/95.04 MHz	1	-59.37	-63.40	-62.47	-64.01	-62.47	-63.40
		2	-57.18	-62.86	-61.67	-64.01	-61.67	-62.86
Treselection	s	1, 2	0	0	0	0	0	0
SintrasearchP	dB	1, 2	50			50		
Propagation Condition		1, 2	AWGN					

Note 1:	OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.
Note 2:	Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for N_{oc} to be fulfilled.
Note 3:	SS-RSRP levels have been derived from other parameters for information purposes. They are not settable parameters themselves.
Note 4:	Information about types of UE beam is given in B.2.1.3, and does not limit UE implementation or test system implementation

The cell reselection delay to a newly detectable cell is defined as the time from the beginning of time period T2, to the moment when the UE camps on Cell 2 and starts to send preambles on the PRACH for sending the *RRCSetupRequest* message to perform a registration procedure for mobility and periodic registration update on Cell 2.

The cell re-selection delay to a newly detectable cell shall be less than 130 s.

The cell reselection delay to an already detected cell is defined as the time from the beginning of time period T3, to the moment when the UE camps on cell 1 and starts to send preambles on the PRACH for sending the *RRCSetupRequest* message to perform a registration procedure for mobility and periodic registration update on cell 1.

The cell re-selection delay to an already detected cell shall be less than 27 s.

NOTE: The cell re-selection delay to a newly detectable cell can be expressed as: $T_{detect, NR_Intra} + T_{SI-NR}$, and to an already detected cell can be expressed as: $T_{evaluate, NR_ intra} + T_{SI-NR}$,

The rate of correct events observed during repeated tests shall be at least 90% with the confidence level of 95%.

17.1.1.2 NR SA FR2-FR2 Cell reselection to FR2 inter-frequency NR for 2 Rx

Editor's Note: This test case is incomplete in following aspects:

- Message contents are missing.
- Test procedure is TBD
- Test applicability is missing
- TT analysis is missing.
- Cell mapping is missing
- Connection diagram is missing

17.1.1.2.1 Test purpose

The purpose of this test is to verify the requirement for the NR SA intra-frequency cell reselection in FR2 for 2 Rx RedCap UEs. The requirements are specified in TS 38.133 [6] in clause TBD.

17.1.1.2.2 Test applicability

This test applies to all types of NR RedCap UE release 17 and forward.

17.1.1.2.3 Minimum conformance requirements

The minimum conformance requirements are defined in clause 17.1.1.0.x.

The normative reference for this requirement is TS 38.133 [6] clause A.17.1.1.2.

17.1.1.2.4 Test description

17.1.1.2.4.1 Initial conditions

This test shall be tested using any of the test configurations in Table 17.1.1.2.4.1-1.

Table 17.1.1.2.4.1-1: Supported test configurations for NR SA FR2-FR2 Cell reselection to FR2 inter-frequency NR for 2 Rx

Configuration	Description for serving cell	Description for target cell
17.1.1.2-1	120 kHz SSB SCS, 100 MHz bandwidth, TDD duplex mode	120 kHz SSB SCS, 100 MHz bandwidth, TDD duplex mode
17.1.1.2-2	240 kHz SSB SCS, 100 MHz bandwidth, TDD duplex mode	240 kHz SSB SCS, 100 MHz bandwidth, TDD duplex mode
Note: The UE is only required to be tested in one of the supported test configurations.		

Configure the test equipment and the DUT according to the parameters in Table 17.1.1.2.4.1-2.

Table 17.1.1.2.4.1-2: Initial conditions for NR SA FR2-FR2 Cell reselection to FR2 inter-frequency NR for 2 Rx

Parameter	Value		Comment
Test environment	NC		As specified in TS 38.508-1 [14] clause 4.1.
Test frequencies	As specified in Annex E, table E.4-1 and TS 38.508-1 [14] clause 4.3.1.		
Channel bandwidth	As specified by the test configuration selected from Table 6.1.1.2.4.1-1.		
Propagation conditions	AWGN		As specified in Annex C.2.2.
Connection Diagram	TE Part	TBD	As specified in TS 38.508-1 [14] Annex A.
	DUT Part	TBD	
Exceptions to connection diagram	Without faders.		

1. The general test parameter settings are set up according to Table 17.1.1.2.4.1-3.
2. Message contents are defined in clause 17.1.1.2.4.3.
3. The test scenario comprises of 2 cells on 2 different NR carriers. Both cell 1 and cell 2 are already identified by the UE prior to the start of the test. Cell 1 and cell 2 belong to different tracking areas and cell 2 is of higher priority than cell 1. Furthermore, UE has not registered with network for the tracking area containing cell 2.

Table 17.1.1.2.4.1-3: General test parameters for NR SA FR2-FR2 Cell reselection to FR2 inter-frequency NR for 2 Rx

Parameter		Unit	Test configuration	Value	Comment
Initial condition	Active cell		1, 2	Cell2	The UE camps on cell 2 in the initial phase and during T1 period the UE reselects to cell 1
	Neighbour cell		1, 2	Cell1	
T1 end condition	Active cell		1, 2	Cell1	The UE shall perform reselection to cell 1 during T1
	Neighbour cells		1, 2	Cell2	
T3 end condition	Active cell		1, 2	Cell2	The UE shall perform reselection to cell 2 with higher priority during T3
	Neighbour cell		1, 2	Cell1	
RF Channel Number			1, 2	1, 2	
Time offset between cells			1, 2	3 μs	Synchronous cells
Access Barring Information		-	1, 2	Not Sent	No additional delays in random access procedure.
SSB configuration			1	SSB.1 FR2	
			2	SSB.2 FR2	
SMTC configuration			1, 2	SMTC.1	
DRX cycle length		s	1, 2	1.28	The value shall be used for all cells in the test.
PRACH configuration index			1, 2	190	The detailed configuration is specified in TS 38.211 clause 6.3.3.2
rangeToBestCell			1, 2	Not configured	

T1	s	1, 2	35	T1 needs to be defined so that cell re-selection reaction time is taken into account.
T2	s	1, 2	>7	During T2, cell 2 shall be powered off, and during the off time the physical cell identity shall be changed. The intention is to ensure that cell 2 has not been detected by the UE prior to the start of period T3.
T3	s	1, 2	95	T3 needs to be defined so that cell re-selection reaction time is taken into account.

17.1.1.2.4.2 Test procedure

TBD

17.1.1.2.4.3 Message contents

Message contents are according to TS 38.508-1 [14] clause 7.3 with the following exceptions:

TBD

17.1.1.2.5 Test requirement

Table 17.1.1.2.5-1 defines the primary level settings including test tolerances for NR – E-UTRA cell re-selection test case in AWGN for UE fulfilling stationary relaxed measurement criterion for 2 Rx UE.

Table 17.1.1.2.5-1: Cell specific test parameters for NR SA FR2-FR2 Cell reselection to FR2 inter-frequency NR for 2 Rx

Parameter	Unit	Test configuration	Cell 1			Cell 2		
			T1	T2	T3	T1	T2	T3
TDD configuration		1, 2	TDDConf.3.1			TDDConf.3.1		
PDSCH RMC configuration		1, 2	SR.3.1 TDD			SR.3.1 TDD		
RMSI CORESET parameters		1, 2	CR.3.1 TDD			CR.3.1 TDD		
RMSI CORESET RMC configuration		1, 2	CCR.3.1 TDD			CCR.3.1 TDD		
OCNG Pattern		1, 2	OP.1 defined in A.3.2.1			OP.1 defined in A.3.2.1		
Initial DL BWP configuration		1, 2	DLBWP.0.1			DLBWP.0.1		
Initial UL BWP configuration		1, 2	ULBWP.0.1			ULBWP.0.1		
RLM-RS		1, 2	SSB			SSB		
Qrxlevmin	dBm/SCS	1	-140			-140		
		2	-137			-137		
Pcompensation	dB	1, 2	0			0		
$Qhyst_s$	dB	1, 2	0			0		
$Qoffset_{s,n}$	dB	1, 2	0			0		
Cell_selection_and_reselection_quality_measurement		1, 2	SS-RSRP			SS-RSRP		
AoA setup		1, 2	Setup 1 defined in A.3.15.1			Setup 1 defined in A.3.15.1		
Beam assumption[Note 4]		1,2	Rough			Rough		
$\hat{E}_s / I_{ot}$	dB	1	10.5	10.5	8	-10.5	-infinity	8.5
		2						
N_{oc} [Note2]	dBm/SCS	1	-93			-93		

		2	-90			-90		
N_{oc} Note2	dBm/15 kHz	1	-102			-102		
		2						
$\hat{E}_s / N_{oc}$	dB	1	10.5	10.5	8	-10.5	-infinity	8.5
		2						
SS-RSRP Note3	dBm/SCS	1	-83.5-	-83.5	-85	-103.5	-infinity	-84.5
		2	-80.5	-80.5	-82	-100.5	-infinity	-80.5
Io	dBm/95.04 MHz	1, 2	-54.05	-54.05	-55.37	-63.64	-54.01	-54.94
Treselection	s	1, 2	-54.05	-54.05	-55.37	-63.64	-54.01	-54.94
SnonintrasearchP	dB	1, 2	50			50		
$Thresh_{x, highP}$	dB	1, 2	48			48		
$Thresh_{serving, lowP}$	dB	1, 2	44			44		
$Thresh_{x, lowP}$	dB	1, 2	50			50		
Propagation Condition		1, 2	AWGN			AWGN		

Note 1: OCNG shall be used such that both cells are fully allocated, and a constant total transmitted power spectral density is achieved for all OFDM symbols.
Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for N_{oc} to be fulfilled.
Note 3: SS-RSRP levels have been derived from other parameters for information purposes. They are not settable parameters themselves.
Note 4: Information about types of UE beam is given in B.2.1.3, and does not limit UE implementation or test system implementation

The cell reselection delay to a higher priority cell is defined as the time from the beginning of time period T3, to the moment when the UE camps on cell 2 and starts to send preambles on the PRACH for sending the *RRCSetupRequest* message to perform a registration procedure for mobility and periodic registration update on cell 2.

The cell re-selection delay to a higher priority cell shall be less than 87 s.

The cell reselection delay to a lower priority cell is defined as the time from the beginning of time period T1, to the moment when the UE camps on cell 1 and starts to send preambles on the PRACH for sending the *RRCSetupRequest* message to perform a registration procedure for mobility and periodic registration update on cell 1.

The cell re-selection delay to a lower priority cell shall be less than 27 s.

The rate of correct cell reselections observed during repeated tests shall be at least 90%.

NOTE: The cell re-selection delay to a higher priority cell can be expressed as: $T_{higher_priority_search} + T_{evaluate, NR_ inter} + T_{SI-NR}$, and to a lower priority cell can be expressed as: $T_{evaluate, NR_ inter} + T_{SI-NR}$,

The rate of correct events observed during repeated tests shall be at least 90% with the confidence level of 95%.

17.1.1.3 NR SA FR2 Cell reselection to FR2 intra-frequency NR for UE fulfilling stationary relaxed measurement criterion for 2 Rx UE

Editor's Note: This test case is incomplete in following aspects:

- Message contents are missing.
- Test procedure is TBD
- Test applicability is missing
- TT analysis is missing.
- Cell mapping is missing

17.1.1.3.1 Test purpose

The purpose of this test is to verify the requirement for the NR SA intra-frequency cell reselection in FR2 for 2 Rx RedCap UEs. The requirements are specified in TS 38.133 [6] in clause TBD.

17.1.1.3.2 Test applicability

This test applies to all types of NR RedCap UE release 17 and forward.

17.1.1.3.3 Minimum conformance requirements

The minimum conformance requirements are defined in clause 17.1.1.0.x.

The normative reference for this requirement is TS 38.133 [6] clause A.17.1.1.3.

17.1.1.3.4 Test description

17.1.1.3.4.1 Initial conditions

This test shall be tested using any of the test configurations in Table 17.1.1.3.4.1-1.

Table 17.1.1.3.4.1-1: Supported test configurations for NR SA FR2 Cell reselection to FR2 intra-frequency NR for UE fulfilling stationary relaxed measurement criterion for 2 Rx UE

Configuration	Description
17.1.1.3-1	120 kHz SSB SCS, 100 MHz bandwidth, TDD duplex mode
17.1.1.3-2	240 kHz SSB SCS, 100 MHz bandwidth, TDD duplex mode
Note: The UE is only required to be tested in one of the supported test configurations.	

Configure the test equipment and the DUT according to the parameters in Table 17.1.1.3.4.1-2.

Table 17.1.1.3.4.1-2: Initial conditions for NR SA FR2 Cell reselection to FR2 intra-frequency NR for UE fulfilling stationary relaxed measurement criterion for 2 Rx UE

Parameter	Value		Comment
Test environment	NC		As specified in TS 38.508-1 [14] clause 4.1.
Test frequencies	As specified in Annex E, table E.4-1 and TS 38.508-1 [14] clause 4.3.1.		
Channel bandwidth	As specified by the test configuration selected from Table 6.1.1.2.4.1-1.		
Propagation conditions	AWGN		As specified in Annex C.2.2.
Connection Diagram	TE Part	TBD	As specified in TS 38.508-1 [14] Annex A.
	DUT Part	TBD	
Exceptions to connection diagram	Without faders.		

1. The general test parameter settings are set up according to Table 17.1.1.3.4.1-3.
2. Message contents are defined in clause 17.1.1.3.4.3.
3. The test scenario comprises of 1 NR carrier and 2 cells. Both cell 1 and cell 2 are already identified by the UE prior to the start of the test. Cell 1 and cell 2 belong to different tracking areas. During T1 and T2, only criteria *stationaryMobilityEvaluation* is configured and fulfilled. UE has not registered with network for the tracking area containing cell2.

Table 17.1.1.3.4.1-3: General test parameters for NR SA FR2 Cell reselection to FR2 intra-frequency NR for UE fulfilling stationary relaxed measurement criterion for 2 Rx UE

Parameter		Unit	Test configuration	Value	Comment
Initial condition	Active cell		1, 2	Cell1	The UE camps on cell 1 in the initial phase
	Neighbour cells		1, 2	Cell2	
T1 end condition	Active cell		1, 2	Cell2	The UE reselects to cell 2 during T1 period
	Neighbour cells		1, 2	Cell1	

Final condition	Active cell		1, 2	Cell1	The UE reselects to cell 1 during T2 period
	Neighbour cells		1,2	Cell2	
RF Channel Number			1, 2	1	
Time offset between cells			1, 2	3 µs	Synchronous cells
Access Barring Information		-	1, 2	Not Sent	No additional delays in random access procedure.
SMTC configuration			1, 2	TBD	
DRX cycle length		s	1, 2	0.64	The value shall be used for all cells in the test.
PRACH configuration index			1, 2	190	The detailed configuration is specified in TS 38.211 clause 6.3.3.2
rangeToBestCell			1, 2	Not configured	
T1		s	1, 2	100	
T2		s	1, 2	100	

17.1.1.3.4.2 Test procedure

TBD

17.1.1.3.4.3 Message contents

Message contents are according to TS 38.508-1 [14] clause 7.3 with the following exceptions:

TBD

17.1.1.3.5 Test requirement

Table 17.1.1.3.5-1 defines the primary level settings including test tolerances for NR – E-UTRA cell re-selection test case in AWGN for UE fulfilling stationary relaxed measurement criterion for 2 Rx UE.

Table 17.1.1.3.5-1: Cell specific test parameters for NR SA FR2 Cell reselection to FR2 intra-frequency NR for UE fulfilling stationary relaxed measurement criterion for 2 Rx UE

Parameter	Unit	Test configuration	Cell 1		Cell 2	
			T1	T2	T1	T2
TDD configuration		1, 2	TDDConf.3.1		TDDConf.3.1	
PDSCH RMC configuration		1	SR.3.1 TDD		SR.3.1 TDD	
		2	SR.3.1 TDD		SR.3.1 TDD	
RMSI CORESET RMC configuration		1	CR.3.1 TDD		CR.3.1 TDD	
		2	CR.3.1 TDD		CR.3.1 TDD	
Dedicated CORESET RMC configuration		1	CCR.3.1 TDD		CCR.3.1 TDD	
		2	CCR.3.1 TDD		CCR.3.1 TDD	
SSB configuration		1	SSB.3 FR2		SSB.7 FR2	
		2	SSB.4 FR2		SSB.8 FR2	
OCNG Pattern		1, 2	OP.4		OP.4	
Initial DL BWP configuration		1, 2	100: $N_{RB,c}$ = 66		100: $N_{RB,c}$ = 66	
Initial UL BWP configuration		1, 2	66		66	
RLM-RS		1, 2	SSB		SSB	
Qrxlevmin	dBm/SCS	1	-140		-140	
		2	-137		-137	
$S_{SearchDeltaP-Stationary}$	dB	1, 2	6		6	
$T_{SearchDeltaP-Stationary}$	s	1,2	5		5	
Pcompensation	dB	1, 2	0		0	
$Qhyst_s$	dB	1, 2	0		0	
$Qoffset_{s, n}$	dB	1, 2	0		0	

Cell_selection_and_reselection_quality_measurement		1, 2	SS-RSRP		SS-RSRP	
AoA setup		1, 2	Setup 1 defined in A.3.15.1		Setup 1 defined in A.3.15.1	
Beam assumption Note 4		1,2	Rough		Rough	
$\hat{E}_s/I_{ot}$	dB	1	-3	1.5	1.5	-3
		2				
N_{oc} Note2	dBm/SCS	1	-93			
		2	-90			
N_{oc} Note2	dBm/15 kHz	1	-102			
		2				
$\hat{E}_s/N_{oc}$	dB	1	-3	1.5	1.5	-3
		2				
SS-RSRP Note3	dBm/SCS	1	96	91.5	91.5	96
		2	93	-88.5	88.5	93
Io on SSB symbols of each cell	dBm/95.04 MHz	1	63.40	62.47	-62. 47	63.40
		2	62.86	61.67	-61.67	62.86
Treselection	s	1, 2	0	0	0	0
SintrasearchP	dB	1, 2	50		50	
Propagation Condition		1, 2	AWGN			

Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.
Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for N_{oc} to be fulfilled.
Note 3: SS-RSRP levels have been derived from other parameters for information purposes. They are not settable parameters themselves.
Note 4: Information about types of UE beam is given in B.2.1.3, and does not limit UE implementation or test system implementation

The cell reselection delay to an already detected cell for UE fulfilling stationary relaxed criterion is defined as the time from the beginning of time period T1, to the moment when the UE camps on Cell 2, and starts to send preambles on the PRACH for sending the *RRCSetupRequest* message to perform a Tracking Area Update procedure on Cell 2.

The cell re-selection delay to an already detected cell shall be less than 155 s.

The rate of correct cell reselections observed during repeated tests shall be at least 90%.

NOTE: The cell re-selection delay to an already detectable cell can be expressed as: $T_{evaluate,NR_Intra_RedCap_Relax} + T_{SI\text{-}NR}$,

Where:

$T_{evaluate,NR_Intra_RedCap_Relax}$ See Table 4.2B.2.9.2-2 in clause 4.2B.2.9.2,

$T_{SI\text{-}NR}$ Maximum repetition period of relevant system info blocks that needs to be received by the UE to camp on a cell; 1280 ms is assumed in this test case.

This gives a total of 154.88 s, allow 155 s for the cell re-selection delay to an already detected cell for UE fulfilling stationary criterion in the test case.

The rate of correct events observed during repeated tests shall be at least 90% with the confidence level of 95%.

17.1.1.4 NR SA FR2-FR2 Cell reselection to FR2 inter-frequency NR for UE fulfilling stationary mobility relaxed measurement criterion for 2 Rx UE

Editor's Note: This test case is incomplete in following aspects:

- Message contents are missing.

- Test procedure is TBD
- Test applicability is missing
- TT analysis is missing.
- Cell mapping is missing

17.1.1.4.1 Test purpose

The purpose of this test is to verify the requirement for the NR SA intra-frequency cell reselection in FR2 for 2 Rx RedCap UEs. The requirements are specified in TS 38.133 [6] in clause TBD.

17.1.1.4.2 Test applicability

This test applies to all types of NR RedCap UE release 17 and forward.

17.1.1.4.3 Minimum conformance requirements

The minimum conformance requirements are defined in clause 17.1.1.0.x.

The normative reference for this requirement is TS 38.133 [6] clause A.17.1.1.4.

17.1.1.4.4 Test description

17.1.1.4.4.1 Initial conditions

This test shall be tested using any of the test configurations in Table 17.1.1.4.4.1-1.

Table 17.1.1.4.4.1-1: Supported test configurations for NR SA FR2-FR2 Cell reselection to FR2 inter-frequency NR for UE fulfilling stationary mobility relaxed measurement criterion for 2 Rx UE

Configuration	Description for serving cell	Description for target cell
17.1.1.4-1	120 kHz SSB SCS, 100 MHz bandwidth, TDD duplex mode	120 kHz SSB SCS, 100 MHz bandwidth, TDD duplex mode
17.1.1.4-2	240 kHz SSB SCS, 100 MHz bandwidth, TDD duplex mode	240 kHz SSB SCS, 100 MHz bandwidth, TDD duplex mode
Note: The UE is only required to be tested in one of the supported test configurations.		

Configure the test equipment and the DUT according to the parameters in Table 17.1.1.4.4.1-2.

Table 17.1.1.4.4.1-2: Initial conditions for NR SA FR2-FR2 Cell reselection to FR2 inter-frequency NR for UE fulfilling stationary mobility relaxed measurement criterion for 2 Rx UE

Parameter	Value		Comment
Test environment	NC		As specified in TS 38.508-1 [14] clause 4.1.
Test frequencies	As specified in Annex E, table E.4-1 and TS 38.508-1 [14] clause 4.3.1.		
Channel bandwidth	As specified by the test configuration selected from Table 6.1.1.2.4.1-1.		
Propagation conditions	AWGN		As specified in Annex C.2.2.
Connection Diagram	TE Part	TBD	As specified in TS 38.508-1 [14] Annex A.
	DUT Part	TBD	
Exceptions to connection diagram	Without faders.		

1. The general test parameter settings are set up according to Table 17.1.1.4.4.1-3.
2. Message contents are defined in clause 17.1.1.4.4.3.
3. The test scenario comprises of 2 cells (Cell 1 and Cell 2) on 2 different NR carriers respectively. Both cell 1 and cell 2 are already identified by the UE prior to the start of the test. Cell 1 and Cell 2 belong to different tracking

areas. Furthermore, UE has not registered with network for the tracking area containing Cell 2. Cell 2 is of higher priority than Cell 1. The UE is configured with *stationaryMobilityEvaluation* criterion.

Table 17.1.1.4.4.1-3: General test parameters for NR SA FR2-FR2 Cell reselection to FR2 inter-frequency NR for UE fulfilling stationary mobility relaxed measurement criterion for 2 Rx UE

Parameter		Unit	Test configuration	Value	Comment
Initial condition	Active cell		1, 2	Cell2	The UE camps on cell2 and fulfils stationary (*stationaryMobilityEvaluation* [2]) criterion.
	Neighbour cell		1, 2	Cell1	
T1 final condition	Active cell		1, 2	Cell1	The UE reselects to low priority cell1 during T1
	Neighbour cell		1, 2	Cell2	
T2 final condition	Active cell		1, 2	Cell2	The UE reselects to high priority cell2 during T2
	Neighbour cell			Cell1	
RF Channel Number			1, 2	1, 2	
Time offset between cells			1, 2	3 μs	Synchronous cells
Access Barring Information		-	1, 2	Not Sent	No additional delays in random access procedure.
SSB configuration			1	TBD	
			2	TBD	
SMTC configuration			1, 2	TBD	
DRX cycle length		s	1, 2	0.64	The value shall be used for all cells in the test.
PRACH configuration index			1, 2	190	The detailed configuration is specified in TS 38.211 clause 6.3.3.2
rangeToBestCell			1, 2	Not configured	
T1		s	1, 2	85	T1 needs to be long enough to allow cell re-selection to already known cell1
T2		s	1, 2	85	T2 needs to be long enough to allow cell re-selection to already known cell2

17.1.1.4.4.2 Test procedure

TBD

17.1.1.4.4.3 Message contents

Message contents are according to TS 38.508-1 [14] clause 7.3 with the following exceptions:

TBD

17.1.1.4.5 Test requirement

Table 17.1.1.4.5-1 defines the primary level settings including test tolerances for NR – E-UTRA cell re-selection test case in AWGN for UE fulfilling stationary relaxed measurement criterion for 2 Rx UE.

Table 17.1.1.4.5-1: Cell specific test parameters for NR SA FR2-FR2 Cell reselection to FR2 inter-frequency NR for UE fulfilling stationary mobility relaxed measurement criterion for 2 Rx UE

Parameter	Unit	Test configuration	Cell 1		Cell 2	
			T1	T2	T1	T2
TDD configuration		1, 2	TDDConf.3.1		TDDConf.3.1	
PDSCH RMC configuration		1, 2	SR.3.1 TDD		SR.3.1 TDD	
RMSI CORESET parameters		1, 2	CR.3.1 TDD		CR.3.1 TDD	

RMSI CORESET RMC configuration		1, 2	CCR.3.1 TDD		CCR.3.1 TDD	
OCNG Pattern		1, 2	OP.1 defined in A.3.2.1		OP.1 defined in A.3.2.1	
Initial DL BWP configuration		1, 2	DLBWP.0.1		DLBWP.0.1	
Initial UL BWP configuration		1, 2	ULBWP.0.1		ULBWP.0.1	
RLM-RS		1, 2	SSB		SSB	
Qrxlevmin	dBm/SCS	1	-140		-140	
		2	-137		-137	
Pcompensation	dB	1, 2	0		0	
$Qhyst_s$	dB	1, 2	0		0	
$Qoffset_{s,n}$	dB	1, 2	0		0	
Cell_selection_and_reselection_quality_measurement		1, 2	SS-RSRP		SS-RSRP	
AoA setup		1, 2	Setup 1 defined in A.3.15.1		Setup 1 defined in A.3.15.1	
Beam assumption[Note 4]		1, 2	Rough		Rough	
$\hat{E}_s / I_{ot}$	dB	1, 2	10.5	8	-10.5	-8.5
N_{oc} [Note2]	dBm/SCS	1	-93		-93	
		2	-90		-90	
N_{oc} [Note2]	dBm/15 kHz	1, 2	-102		-102	
$\hat{E}_s / N_{oc}$	dB	1, 2	10.5	8	-10.5	8.5
SS-RSRP [Note3]	dBm/SCS	1	-82.5	-85	-103.5	-84.5
		2	-79.5	-82	-100.5	-81.5
Io	dBm/95.04 MHz	1	-53.14	-55.37	-63.64	-54.94
		2	-58.10	-60.189	-66.79	-59.79
TreselectionNR	s	1, 2	0		0	
SnonintrasearchP	dB	1, 2	50		Not sent	
$S_{SearchDeltaP-Stationary}$	dB	1, 2	6		6	
$T_{SearchDeltaP-Stationary}$	s	1, 2	5		5	
$Thresh_{x, highP}$	dB	1, 2	48		48	
$Thresh_{serving, lowP}$	dB	1, 2	44		44	
$Thresh_{x, lowP}$	dB	1, 2	50		50	
Propagation Condition		1, 2	AWGN		AWGN	

Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.

Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for N_{oc} to be fulfilled.

Note 3: SS-RSRP levels have been derived from other parameters for information purposes. They are not settable parameters themselves.

Note 4: Information about types of UE beam is given in B.2.1.3, and does not limit UE implementation or test system implementation

The cell reselection delay to an already detected low priority cell (Cell 1) for UE fulfilling stationary criterion is defined as the time from the beginning of time period T1, to the moment when the UE camps on Cell 1, and starts to send preambles on the PRACH for sending the *RRCSetupRequest* message to perform a Tracking Area Update procedure on Cell 1.

The cell re-selection delay to an already detected low priority cell, Cell 1, shall be less than 155 s.

The cell reselection delay to an already detected high priority cell (Cell 2) for UE fulfilling stationary criterion is defined as the time from the beginning of time period T2, to the moment when the UE camps on Cell 2, and starts to send preambles on the PRACH for sending the *RRCSetupRequest* message to perform a Tracking Area Update procedure on Cell 2.

The cell re-selection delay to an already detected high priority cell, Cell 2, shall be less than 155 s.

The rate of correct cell reselections observed during repeated tests shall be at least 90%.

NOTE 1: The cell re-selection delay to an already detected low priority cell can be expressed as: $T_{evaluate,NR_Inter_RedCap_Relax} + T_{SI-NR}$

NOTE 2: The cell re-selection delay to an already detected higher priority cell can be expressed as: $T_{evaluate,NR_Inter_RedCap_Relax} + T_{SI-NR}$

The rate of correct events observed during repeated tests shall be at least 90% with the confidence level of 95%.

17.2

17.3

17.3.1

17.3.2 RRC connection mobility control for RedCap

17.3.2.1 RRC re-establishment for RedCap

17.3.2.1.0 Minimum conformance requirements

The requirements in clause 7.3.2.1.0 shall apply.

The normative reference for this requirement is TS 38.133 [6] clause 6.2.1B.

17.3.2.1.1 NR SA FR2 Intra-frequency RRC Re-establishment in FR2

Editor's Note: This test case has been completed for the following configurations:

- Test frequency f ≤ 40.8 GHz
- UE PC3

The test is incomplete for UE power classes other than PC3 (e.g. PC7)

The test is incomplete for test frequencies > 40.8 GHz

17.3.2.1.1.1 Test purpose

To verify hat the NR intra-frequency RRC re-establishment delay in FR2 without known target cell is within the specified limits. These tests will verify the requirements in 38.133 [6] clause 6.2.1B

17.3.2.1.1.2 Test applicability

This test applies to all types of NR RedCap UEs from Release 17 onwards.

17.3.2.1.1.3 Minimum conformance requirement

The minimum conformance requirements are specified in clause 17.3.2.1.0

The normative reference for this requirement is TS 38.133 [6] clause A.17.3.2.1.1

17.3.2.1.1.4 Test description

17.3.2.1.1.4.1 Initial conditions

Same as the initial conditions given in clause 7.3.2.1.1.4.1 with following exceptions:

- Table 7.3.2.1.1.4.1-2 is replaced by Table 17.3.2.1.1.4.1-1.

Table 17.3.2.1.1.4.1-1: General test parameters

Parameter		Unit	Test configuration	Value	Comment
Initial condition	Active cell		1	Cell1	
	Neighbour cells		1	Cell2	
Final condition	Active cell		1	Cell2	
RF Channel Number			1	1	
Time offset between cells			1	3 μs	Synchronous cells
N310		-	1	1	Maximum consecutive out-of-sync indications from lower layers
N311		-	1	1	Minimum consecutive in-sync indications from lower layers
T310		ms	1	0	Radio link failure timer; T310 is disabled
T311		ms	1	5000	RRC re-establishment timer
Access Barring Information		-	1	Not Sent	No additional delays in random access procedure.
SSB configuration			1	SSB.1 RedCap FR2	
SMTC configuration			1	SMTC.1	
DRX cycle length		s	1	OFF	
PRACH configuration			1	PRACH.1 FR2	As specified in Annex A.7
T1		s	1	5	
T2		s	1	4.84	Time for the UE to detect RLF (Summation of $T_{Evaluate_out_SSB}$ defined in clause 8.1 in TS 38.133, T310 and the period for UE turns off transmitter defined in clause 8.1.5 in TS 38.133)
T3		s	1	5	

17.3.2.1.1.4.2 Test procedure

Same as the test procedure given in clause 7.3.2.1.1.4.2.

17.3.2.1.1.4.3 Message contents

Same as the message contents given in clause 7.3.2.1.1.4.3.

17.3.2.1.1.5 Test requirement

Same as the test requirements given in clause 7.3.2.1.1.5 with following exceptions:

- Table 7.3.2.1.1.5-1 is replaced by Table 17.3.2.1.1.5-1.

Table 17.3.2.1.1.5-1: Cell specific test parameters

Parameter	Unit	Test config	Cell 1			Cell 2		
			T1	T2	T3	T1	T2	T3
Assumption for UE beams[Note 4]			Rough			Rough		
TDD configuration		1	TDDConf.3.1			TDDConf.3.1		
$BW_{channel}$	MHz	1	100: $N_{RB,c}$ = 66			100: $N_{RB,c}$ = 66		
Data RBs allocated		1	24			24		
PDSCH RMC configuration		1	SR.3.1 TDD			N/A		
RMSI CORESET RMC configuration		1	CR.3.1 FDD			CR.3.1 FDD		
Dedicated CORESET RMC configuration		1	CCR.3.1 FDD			CCR.3.1 FDD		
TRS configuration		1	TRS.2.1 TDD			N/A		
PDSCH/PDCCH TCI state		1	TCI.State.2			N/A		
OCNG Pattern		1	OP.1			OP.1		
Initial DL BWP configuration		1	DLBWP.0.1			DLBWP.0.1		

Initial UL BWP configuration		1	ULBWP.0.1			ULBWP.0.1		
RLM-RS		1	SSB			SSB		
AoA setup		1	Setup 1			Setup 1		
$\hat{E}_s/I_{ot}$	dB	1	-0.12	-infinity	-infinity	-3.46	2	2
N_{oc} Note2	dBm/ SCS	1	-104.7					
N_{oc} Note2	dBm/ 15 kHz	1	-95.7					
$\hat{E}_s/N_{oc}$	dB	1	4	-infinity	-infinity	2	2	2
SS-RSRP Note3	dBm/ SCS	1	-91.7	-infinity	-infinity	-93.7	-93.7	-93.7
Io	dBm/ 95.04 MHz	1	-64.00	-66.95	-66.95	-64.00	-66.95	-66.95
Propagation Condition		1	AWGN					

Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.
Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for N_{oc} to be fulfilled.
Note 3: SS-RSRP levels have been derived from other parameters for information purposes. They are not settable parameters themselves.
Note 4: Information about types of UE beam is given in TS 38.133 [6] Annex B.2.1.3, and does not limit UE implementation or test system implementation

17.3.2.1.2 NR SA FR2-FR2 Inter-frequency RRC Re-establishment in FR2

Editor's Note: This test case has been completed for the following configurations:

- Test frequency f ≤ 40.8 GHz
- UE PC3

The test is incomplete for UE power classes other than PC3 (e.g. PC7)

The test is incomplete for test frequencies > 40.8 GHz

17.3.2.1.2.1 Test purpose

To verify that the NR inter-frequency RRC re-establishment delay in FR2 without known target cell is within the specified limits. These tests will verify the requirements in 38.133 [6] clause 6.2.1B

17.3.2.1.2.2 Test applicability

This test applies to all types of NR RedCap UEs from Release 17 onwards.

17.3.2.1.2.3 Minimum conformance requirement

The minimum conformance requirements are specified in clause 17.3.2.1.0

The normative reference for this requirement is TS 38.133 [6] clause A.17.3.2.1.2

17.3.2.1.2.4 Test description

17.3.2.1.2.4.1 Initial conditions

Same as the initial conditions given in clause 7.3.2.1.2.4.1 with following exceptions:

- Table 7.3.2.1.2.4.1-2 is replaced by Table 17.3.2.1.2.4.1-1.

Table 17.3.2.1.2.4.1-1: General test parameters

Parameter		Unit	Test configuration	Value	Comment
Initial condition	Active cell		1	Cell1	
	Neighbour cells		1	Cell2	
Final condition	Active cell		1	Cell2	
RF Channel Number			1	1,2	
Time offset between cells			1	3 μs	Synchronous cells
N310		-	1	1	Maximum consecutive out-of-sync indications from lower layers
N311		-	1	1	Minimum consecutive in-sync indications from lower layers
T310		ms	1	0	Radio link failure timer; T310 is disabled
T311		ms	1	5000	RRC re-establishment timer
Access Barring Information		-	1	Not Sent	No additional delays in random access procedure.
SSB configuration			1	SSB.1 RedCap FR2	
SMTC configuration			1	SMTC.1	
DRX cycle length		s	1	OFF	
PRACH configuration			1	PRACH.1 FR2	As specified in Annex A.7
T1		s	1	5	
T2		s	1	4.84	Time for the UE to detect RLF (Summation of $T_{Evaluate_out_SSB}$ defined in clause 8.1 in TS 38.133, T310 and the period for UE turns off transmitter defined in clause 8.1.5 in TS 38.133)
T3		s	1	6	

17.3.2.1.2.4.2 Test procedure

Same as the test procedure given in clause 7.3.2.1.2.4.2.

17.3.2.1.2.4.3 Message contents

Same as the message contents given in clause 7.3.2.1.2.4.3.

17.3.2.1.2.5 Test requirement

Same as the test requirements given in clause 7.3.2.1.2.5 with following exceptions:

- Table 7.3.2.1.2.5-1 is replaced by Table 17.3.2.1.2.5-1.

Table 17.3.2.1.2.5-1: Cell specific test parameters

Parameter	Unit	Test config	Cell 1			Cell 2		
			T1	T2	T3	T1	T2	T3
Assumption for UE beams[Note 4]			Rough			Rough		
AoA setup		1	Setup 3					
			AoA1			AoA2		
TDD configuration		1	TDDConf.3.1			TDDConf.3.1		
$BW_{channel}$	MHz	1	100: $N_{RB,c}$ = 66			100: $N_{RB,c}$ = 66		
Data RBs allocated		1	24			24		
PDSCH RMC configuration		1	SR.3.1 TDD			N/A		
RMSI CORESET RMC configuration		1	CR.3.1 TDD			CR.3.1 TDD		

Dedicated CORESET RMC configuration		1	CCR.3.1 TDD			CCR.3.1 TDD		
TRS configuration		1	TRS.2.1 TDD			N/A		
PDSCH/PDCCH TCI state		1	TCI.State.2			N/A		
OCNG Pattern		1	OP.1 defined in A.3.2.1			OP.1 defined in A.3.2.1		
Initial DL BWP configuration		1	DLBWP.0.1			DLBWP.0.1		
Initial UL BWP configuration		1	ULBWP.0.1			ULBWP.0.1		
RLM-RS		1	SSB			SSB		
N_{oc} Note2	dBm/15 kHz	1	-92.3 Note 6			-92.3 Note 6		
N_{oc} Note2	dBm/SCS	1	-83.3			-83.3		
$\hat{E}_s / N_{oc}$	dB	1	0	-infinity	-infinity	-infinity	-infinity	0
$\hat{E}_s / I_{ot}$ BB Note 5	dB	1	-1.05	-infinity	-infinity	-infinity	-infinity	-1.05
SSB_RP Note3	dBm/SCS	1	-83.3	-infinity	-infinity	-infinity	-infinity	-83.3
Io	dBm/95.04 MHz	1	-55.66	-58.68	-58.68	-58.68	-58.68	-55.66
Propagation Condition		1	AWGN			AWGN		

Note 1: OCNG shall be used such that a constant total transmitted power is achieved for all OFDM symbols.
Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for N_{oc} to be fulfilled.
Note 3: Es/Iot, SSB_RP and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.
Note 4: Information about types of UE beam is given in B.2.1.3, and does not limit UE implementation or test system implementation
Note 5: Calculation of Es/Iot_{BB} includes the effect of UE internal noise up to the value assumed for the associated Refsens requirement in clause 7.3.2 of TS 38.101-2 [19], and an allowance of 1dB for UE multi-band relaxation factor ΔMB_S from TS 38.101-2 [19] Table 6.2.1.3-4.
Note 6: Including the test tolerance given in Annex F.

17.3.2.1.3 NR SA FR2 RRC re-establishment without serving cell timing

Editor's note: This test case is incomplete in following aspects:

- TT analysis is missing.
- Message content is TBD

17.3.2.1.3.1 Test purpose

To verify that the NR intra-frequency RRC re-establishment delay in FR2 without serving cell timing is within the specified limits. These tests will verify the requirements in clause 6.2.1B.

17.3.2.1.3.2 Test applicability

This test applies to all types of NR RedCap UE from Release 17 onwards.

17.3.2.1.3.3 Minimum conformance requirement

The minimum conformance requirements are specified in clause 17.3.2.1.0

The normative reference for this requirement is TS 38.133 [6] clause A.17.3.2.1.3

17.3.2.1.3.4 Test description

17.3.2.1.3.4.1 Initial conditions

Same as the initial condition given in clause 7.3.2.1.3.4.1 with following exception:

- Table 7.3.2.1.3.4.1-1 is replaced by Table 17.3.2.1.3.4.1-1

- Table 7.3.2.1.3.4.1-2 is replaced by Table 17.3.2.1.3.4.1-2
- Table 7.3.2.1.3.4.1-3 is replaced by Table 17.3.2.1.3.4.1-3

Table 17.3.2.1.3.4.1-1: Supported test configurations

Configuration	Description
17.3.2.1.3-1	120 kHz SSB SCS, 100 MHz bandwidth, TDD duplex mode

Table 17.3.2.1.3.4.1-2: Initial conditions

Parameter	Value		Comment
Test environment	NC		As specified in TS 38.508-1 [14] clause 4.1.
Test frequencies	As specified in Annex E, Table E.5.1 and TS 38.508-1 [14] clause 4.3.1 and 4.4.2		
Channel bandwidth	As specified by the test configuration selected from Table 17.3.2.1.3.4.1-1		
Propagation conditions	AWGN		As specified in Annex C.2.2.
Connection Diagram	TE Part	A.3.3.3.1	As specified in TS 38.508-1 [14] Annex A.
	DUT Part	A.3.4.1.1	
Exceptions to connection diagram			

Table 17.3.2.1.3.4.1-3: General test parameters

Parameter		Unit	Test config	Value	Comment
Initial condition	Active cell		1	Cell1	
	Neighbour cells		1	Cell2	
Final condition	Active cell		1	Cell2	
RF Channel Number			1	1	
Time offset between cells			1	3 μs	Synchronous cells
N310		-	1	1	Maximum consecutive out-of-sync indications from lower layers
N311		-	1	1	Minimum consecutive in-sync indications from lower layers
T310		ms	1	6000	Radio link failure timer configured by *RLF-TimersAndConstants*
T311		ms	1	5000	RRC re-establishment timer
Access Barring Information		-	1	Not Sent	No additional delays in random access procedure.
SSB configuration			1	SSB.1 RedCap FR2	
SMTC configuration			1	SMTC.1	
DRX cycle length		s	1	OFF	
PRACH configuration			1	PRACH.1 FR2	Table A.3.8.3.1-1
T1		s	1	5	
T2		s	1	10.84	Time for the UE to detect RLF (Summation of $T_{Evaluate_out_SSB}$ defined in clause 8.1B in TS 38.133, T310 and the period for UE turns off transmitter defined in clause 8.1B.5 in TS 38.133 [6]
T3		s	1	5	

17.3.2.1.3.4.2 Test procedure

Same as the test procedure given in clause 7.3.2.1.3.4.2.

17.3.2.1.3.4.3 Message contents

TBD

17.3.2.1.3.5 Test requirement

Same as the test requirements given in clause 7.3.2.1.3.5 with following exceptions:

- Table 7.3.2.1.3.5-1 is replaced by Table 17.3.2.1.3.5-1.

Table 17.3.2.1.3.5-1: Cell specific test parameters

Parameter	Unit	Test configuration	Cell 1			Cell 2		
			T1	T2	T3	T1	T2	T3
Assumption for UE beams Note 4			Rough			Rough		
TDD configuration		1	TDDConf.3.1			TDDConf.3.1		
PDSCH RMC configuration		1	SR.3.1 TDD			N/A		
RMSI CORESET RMC configuration		1	CR.3.1 FDD			CR.3.1 FDD		
Dedicated CORESET RMC configuration		1	CCR.3.1 FDD			CCR.3.1 FDD		
TRS configuration		1	TRS.2.1 TDD			N/A		
PDSCH/PDCCH TCI state		1	TCI.State.2			N/A		
OCNG Pattern		1	OP.1 defined in A.3.2.1			OP.1 defined in A.3.2.1		
Initial DL BWP configuration		1	DLBWP.0.1			DLBWP.0.1		
Initial UL BWP configuration		1	ULBWP.0.1			ULBWP.0.1		
RLM-RS		1	SSB			SSB		
AoA setup		1	Setup 1			Setup 1		
$\hat{E}_s/I_{ot}$	dB	1	5	-infinity	-infinity	-infinity	-infinity	5
N_{oc} Note2	dBm/15 kHz	1	-104.7					
N_{oc} Note2	dBm/SCS	1	-95.7					
$\hat{E}_s/N_{oc}$	dB	1	5	-infinity	-infinity	-infinity	-infinity	5
SS-RSRP Note3	dBm/SCS	1	-90.7	-infinity	-infinity	-infinity	-infinity	-90.7
Io	dBm/95.04 MHz	1	-60.52	-66.71	-60.52	-60.52	-66.71	-60.52
Propagation Condition		1	AWGN					

Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.
Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for N_{oc} to be fulfilled.
Note 3: SS-RSRP levels have been derived from other parameters for information purposes. They are not settable parameters themselves.
Note 4: Information about types of UE beam is given in B.2.1.3, and does not limit UE implementation or test system implementation

17.3.2.2 Random access for RedCap

17.3.2.2.0 Minimum conformance requirements

17.3.2.2.0.1 Minimum conformance requirements for Contention based random access

The minimum conformance requirements given in clause 7.3.2.2.0.1 are applicable for TDD RedCap UEs.

The normative reference for this requirement is TS 38.133 [6] clause 6.2.2B.2.

17.3.2.2.0.2 Minimum conformance requirements for Non-Contention based random access

The minimum conformance requirements given in clause 7.3.2.2.0.2 are applicable for TDD RedCap UEs.

The normative reference for this requirement is TS 38.133 [6] clause 6.2.2B.2.

17.3.2.2.1 NR SA FR2 4-step RA type contention based random access test in FR2 for NR Standalone

Editor's note: This test case is incomplete. The following aspects are either missing or not yet determined:

- The settable window for first preamble uplink power and the uplink calibration process are FFS.
- The test requirement for absolute uplink power is FFS.
- The test requirement for relative uplink power is FFS.
- The uncertainty value and test requirement for PRACH timing are in [ ]
- TT analysis is missing.
- Antenna diagram and any exceptions are FFS
- Connection setup in Annex C is FFS

17.3.2.2.1.1 Test purpose

To verify that the behaviour of the random access procedure is according to the requirements and that the PRACH power settings and timing are within specified limits. This test will verify the requirements in TS 38.133 [6] clause 6.2.2B.2 and Clause 7.1A.2 in an AWGN model.

17.3.2.2.1.2 Test applicability

This test applies to all types of NR RedCap UE from Release 17 onwards.

17.3.2.2.1.3 Minimum conformance requirement

The minimum conformance requirements are specified in clause 17.3.2.2.0.1.

The normative reference for this requirement is TS 38.133 [6] clause A.17.3.2.2.1.

17.3.2.2.1.4 Test description

17.3.2.2.1.4.1 Initial conditions

Same as the initial conditions given in clause 7.3.2.2.1.4.1 with following exceptions:

- Table 7.3.2.2.1.4.1-1 is replaced by Table 17.3.2.2.1.4.1-1.
- Table 7.3.2.2.1.4.1-2 is replaced by Table 17.3.2.2.1.4.1-2.

Table 17.3.2.2.1.4.1-1: Supported test configurations

Config	Description
17.3.2.2.1-1	NR PCell 120 kHz SSB SCS, 100 MHz bandwidth, TDD duplex mode
Note: The UE is only required to be tested in one of the supported test configurations depending on UE capability	

Table 17.3.2.2.1.4.1-2: Test Environment

Parameter	Value		Comment
Test environment	NC		As specified in TS 38.508-1 [14] clause 4.1.
Test frequencies	As specified in Annex E, Table E.15-1 and TS 38.508-1 [14] subclause 4.3.1.		
Channel bandwidth	As specified by the test configuration selected from Table 17.3.2.2.1.4.1-1.		
Propagation conditions	No interference		As specified in Annex C.2.1.
Connection Diagram	TE Part	FFS	As specified in TS 38.508-1 [14] Annex A.
	DUT Part	FFS	
Exceptions to connection diagram			

17.3.2.2.1.4.2 Test procedure

Same as the test procedure given in clause 7.3.2.2.1.4.2.

17.3.2.2.1.4.3 Message contents

Same as the message contents given in clause 7.3.2.2.1.4.3.

17.3.2.2.1.5 Test requirement

Same as the test requirements given in clause 7.3.2.2.1.5 with following exception:

- Table 7.3.2.2.1.5-1 is replaced by Table 17.3.2.2.1.5-1.
- Table 7.3.2.2.1.5-2 is replaced by Table 17.3.2.2.1.5-2.

Table 17.3.2.2.1.5-1: General test parameters

Parameter	Unit	Test-1	Comments
SSB Configuration		SSB.1 FR2	As defined in A.3.2
CSI-RS for tracking		TRS.2.1 TDD	
Duplex Mode		TDD	
TDD Configuration		TDDConf.3.1	As defined in A.1.5
$BW_{channel}$	MHz	100: $N_{RB,c}$ = 66	
Data RBs allocated		24	
OCNG Pattern Note 1		OP.1	As defined in A.2.1
PDSCH Reference Channel Note 2		SR.3.1 TDD	As defined in A.1.1
RMSI CORESET Reference Channel		CR.3.1 TDD	As defined in A.1.2
NR RF Channel Number		1	
EPRE ratio of PSS to SSS	dB	0	
EPRE ratio of PBCH_DMRS to SSS	dB		
EPRE ratio of PBCH to PBCH_DMRS	dB		
EPRE ratio of PDCCH_DMRS to SSS	dB		
EPRE ratio of PDCCH to PDCCH_DMRS	dB		
EPRE ratio of PDSCH_DMRS to SSS	dB		
EPRE ratio of PDSCH to PDSCH_DMRS	dB		
ss-PBCH-BlockPower	dBm/SCS	+20 +Δ_{UL}	As defined in TS 38.331 [13]. Δ_{UL} is derived from the uplink calibration process Note 3

Configured UE transmitted power ($P_{CMAX,\ f,c}$)	dBm	maximum value configurable for certain power class	As defined in clause 6.2.4 of TS 38.101-2 [3]
PRACH Configuration		PRACH.1 FR2	As defined in A.7.2, with exceptions as defined below
rsrp-ThresholdSSB	dBm	RSRP_69 +Δ_{DL}	RSRP_69 corresponds to -88dBm. Δ_{DL} is derived from the downlink calibration process Note 4
preambleReceivedTargetPower	dBm	-100	As defined in TS 38.331 [13]

Note 1: OCNG shall be used such that a constant total transmitted power spectral density is achieved for all OFDM symbols. The OCNG pattern is chosen during the test according to the presence of a DL reference measurement channel.
Note 2: The DL PDSCH reference measurement channel is used in the test only when a downlink transmission dedicated to the UE under test is required.
Note 3: The Δ_{UL} value is calculated as -ROUND(P_{PRACH0} -1), where P_{PRACH0} is the measured first PRACH power with -80.6dBm/SCS applied, *preambleReceivedTargetPower* = -100dBm and *ss-PBCH-BlockPower* = 20dBm. These values are used during the uplink calibration process carried out before the test case is run, with the UE configured to send PRACH.
Note 4: The Δ_{DL} value is calculated as (RSRP_$_{REP}$ – RSRP_76), where RSRP_$_{REP}$ is the SS-RSRP Reported value in Table 10.1.6.1-1 with -80.6dBm/SCS applied. These values are used during the downlink calibration process carried out before the test case is run, with the UE configured to report SS-RSRP. For a Reported value RSRP_x, x is treated as a positive integer value.

Table 17.3.2.2.1.5-2: OTA-related test parameters

Parameter		Unit	Test-1	Comments
AoA setup			Setup 1	As defined in A.9.1
Assumption for UE beams Note 2			Rough	
SSB with index 0	Es Note1	dBm/SCS	-80.6	Power of SSB with index 0 is set to be above configured *rsrp-ThresholdSSB*
	SSB_RP	dBm/SCS	-80.6	
	Es/Iot_{BB}	dB	21.09	
	Io	dBm/95.04 MHz	-56.01	Io in symbols containing SSB index 0
SSB with index 1	Es Note1	dBm/SCS	-95.0	Power of SSB with index 1 is set to be below configured *rsrp-ThresholdSSB*
	SSB_RP	dBm/SCS	-95.0	
	Es/Iot_{BB}	dB	6.69	
	Io	dBm/95.04 MHz	-70.41	Io in symbols containing SSB index 1
Propagation Condition		-	AWGN	

Note 1: No artificial noise is applied in this test.
Note 2: Information about types of UE beam is given in TS 38.133 [6] clause B.2.1.3, and does not limit UE implementation or test system implementation

17.3.2.2.2 NR SA FR2 4-step RA type non-contention based random access test in FR2 for NR Standalone

Editor's note: This test case is incomplete. The following aspects are either missing or not yet determined:

- The settable window for first preamble uplink power and the uplink calibration process are FFS.
- The test requirement for absolute uplink power is FFS.
- The test requirement for relative uplink power is FFS.
- The uncertainty value and test requirement for PRACH timing are in [ ]
- TT analysis is missing
- Antenna diagram and any exceptions are FFS
- Connection setup in Annex C is FFS

17.3.2.2.2.1 Test purpose

To verify that the behaviour of the random access procedure is according to the requirements and that the PRACH power settings and timing are within specified limits. This test will verify the requirements in TS 38.133 [6] clause 6.2.2B.2 and Clause 7.1A.2 in an AWGN model.

17.3.2.2.2.2 Test applicability

This test applies to all types of NR RedCap UEs from Release 17 onwards. Additionally Test 2 is applicable to NR RedCap UEs that supports CSI-RS based Random Access Preamble.

17.3.2.2.2.3 Minimum conformance requirement

The minimum conformance requirements are specified in clause 17.3.2.2.0.2.

The normative reference for this requirement is TS 38.133 [6] clause A.17.3.2.2.2.

17.3.2.2.2.4 Test description

17.3.2.2.2.4.1 Initial conditions

Same as the initial conditions given in clause 7.3.2.2.2.4.1 with following exceptions:

- Table 7.3.2.2.2.4.1-1 is replaced by Table 17.3.2.2.2.4.1-1.
- Table 7.3.2.2.2.4.1-2 is replaced by Table 17.3.2.2.2.4.1-2.

Table 17.3.2.2.2.4.1-1: Supported test configurations

Config	Description
17.3.2.2.2-1	NR PCell 120 kHz SSB SCS, 100 MHz bandwidth, TDD duplex mode
Note: The UE is only required to be tested in one of the supported test configurations depending on UE capability	

Table 17.3.2.2.2.4.1-2: Test Environment

Parameter	Value		Comment
Test environment	NC		As specified in TS 38.508-1 [14] clause 4.1.
Test frequencies	As specified in Annex E, Table E.15-1 and TS 38.508-1 [14] subclause 4.3.1.		
Channel bandwidth	As specified by the test configuration selected from Table 17.3.2.2.2.4.1-1.		
Propagation conditions	No interference		As specified in Annex C.2.1.
Connection Diagram	TE Part	FFS	As specified in TS 38.508-1 [14] Annex A.
	DUT Part	FFS	
Exceptions to connection diagram			

17.3.2.2.2.4.2 Test procedure

Same as the test procedure given in clause 7.3.2.2.2.4.2.

17.3.2.2.2.4.3 Message contents

Same as the message contents given in clause 7.3.2.2.2.4.3.

17.3.2.2.2.5 Test requirement

Same as the test requirements given in clause 7.3.2.2.2.5 with following exception:

- Table 7.3.2.2.2.5-1 is replaced by Table 17.3.2.2.2.5-1.
- Table 7.3.2.2.2.5-2 is replaced by Table 17.3.2.2.2.5-2.

Table 17.3.2.2.2.5-1: General test parameters

Parameter	Unit	Test-1	Test-2	Comments
SSB Configuration		SSB.1 FR2	SSB.1 FR2	As defined in A.3.2
CSI-RS for tracking		TRS.2.1 TDD	TRS.2.1 TDD	
CSI-RS Configuration		N/A	CSI-RS.3.1 TDD	As defined in A.1.4
Duplex Mode		TDD	TDD	
TDD Configuration		TDDConf.3.1	TDDConf.3.1	As defined in A.1.5
$BW_{channel}$	MHz	100: $N_{RB,c}$ = 66	100: $N_{RB,c}$ = 66	
Data RBs allocated		24	24	
OCNG Pattern Note 1		OP.3	OP.3	As defined in A.2.1.
PDSCH Reference Channel Note 2		SR.3.1 TDD	SR.3.1 TDD	As defined in A.1.1.
RMSI CORESET Reference Channel		CR.3.1 TDD	CR.3.1 TDD	As defined in A.1.2
NR RF Channel Number		1	1	
EPRE ratio of PSS to SSS	dB	0	0	
EPRE ratio of PBCH_DMRS to SSS	dB			
EPRE ratio of PBCH to PBCH_DMRS	dB			
EPRE ratio of PDCCH_DMRS to SSS	dB			
EPRE ratio of PDCCH to PDCCH_DMRS	dB			
EPRE ratio of PDSCH_DMRS to SSS	dB			
EPRE ratio of PDSCH to PDSCH_DMRS	dB			
ss-PBCH-BlockPower	dBm/ SCS	+20 +Δ_{UL}	+20 +Δ_{UL}	As defined in TS 38.331 [13]. Δ_{UL} is derived from the uplink calibration process Note 3
Configured UE transmitted power ($P_{CMAX,\ f,c}$)	dBm	maximum value configurable for certain power class	maximum value configurable for certain power class	As defined in clause 6.2.4 in TS 38.101-2 [3]
PRACH Configuration		PRACH.2 FR2	PRACH.3 FR2	As defined in A.7.2, with exceptions as defined below.
rsrp-ThresholdSSB	dBm	RSRP_69 +Δ_{DL}	RSRP_69 +Δ_{DL}	RSRP_69 corresponds to -88dBm. Δ_{DL} is derived from the downlink calibration process Note 4
preambleReceivedTargetPower	dBm	-100	-100	As defined in TS 38.331 [13]

Note 1: OCNG shall be used such that a constant total transmitted power spectral density is achieved for all OFDM symbols. The OCNG pattern is chosen during the test according to the presence of a DL reference measurement channel.

Note 2: The DL PDSCH reference measurement channel is used in the test only when a downlink transmission dedicated to the UE under test is required.

Note 3: The Δ_{UL} value is calculated as -ROUND(P_{PRACH0} -1), where P_{PRACH0} is the measured first PRACH power with -80.6dBm/SCS applied, *preambleReceivedTargetPower* = -100dBm and *ss-PBCH-BlockPower* = 20dBm. These values are used during the uplink calibration process carried out before the test case is run, with the UE configured to send PRACH.

Note 4: The Δ_{DL} value is calculated as (RSRP_$_{REP}$ – RSRP_76), where RSRP_$_{REP}$ is the SS-RSRP Reported value in Table 10.1.6.1-1 with -80.6dBm/SCS applied. These values are used during the downlink calibration process carried out before the test case is run, with the UE configured to report SS-RSRP. For a Reported value RSRP_x, x is treated as a positive integer value.

Table 17.3.2.2.2.5-2: OTA-related test parameters

Parameter		Unit	Test-1	Test-2	Comments
AoA setup			Setup 1	Setup 1	As defined in A.9.1
Assumption for UE beams Note 2			Rough	Rough	
SSB with index 0	Es Note1	dBm/SCS	-80.6	-80.6	Power of SSB with index 0 is set to be above configured *rsrp-ThresholdSSB*
	SSB_RP	dBm/SCS	-80.6	-80.6	

	Es/Iot_{BB}	dB	21.09	21.09	
	Io	dBm/ 95.04 MHz	-56.01	-56.01	Io in symbols containing SSB index 0
SSB with index 1	Es Note1	dBm/SCS	-95.0	-95.0	Power of SSB with index 1 is set to be below configured *rsrp-ThresholdSSB*
	SSB_RP	dBm/SCS	-95.0	-95.0	
	Es/Iot_{BB}	dB	6.69	6.69	
	Io	dBm/ 95.04 MHz	-70.41	-70.41	Io in symbols containing SSB index 1
Propagation Condition		-	AWGN	AWGN	
Note 1: No artificial noise is applied in this test. Note 2: Information about types of UE beam is given in TS 38.133 [6] clause B.2.1.3, and does not limit UE implementation or test system implementation					

17.3.2.2.3 NR SA FR2 2-step RA type contention based random access test in FR2 for NR Standalone

Editor's note: This test case is incomplete. The following aspects are either missing or not yet determined:

- The settable window for first preamble uplink power and the uplink calibration process are FFS.
- The test requirement for absolute uplink power is FFS.
- The test requirement for relative uplink power is FFS.
- The uncertainty value and test requirement for PRACH timing are in [ ]
- TT analysis is missing
- Antenna diagram and any exceptions are FFS
- Connection setup in Annex C is FFS

17.3.2.2.3.1 Test purpose

To verify that the behaviour of the 2-step RA type random access procedure is according to the requirements and that the MsgA PRACH, MsgA PUSCH power settings and timing are within specified limits. This test will verify the requirements in TS 38.133 [6] clause 6.2.2B.2 and Clause 7.1A.2 in an AWGN model.

17.3.2.2.3.2 Test applicability

This test applies to all types of NR RedCap UE from Release 17 onwards supporting 2-step RACH.

17.3.2.2.3.3 Minimum conformance requirement

The minimum conformance requirements are specified in clause 17.3.2.2.0.2.

The normative reference for this requirement is TS 38.133 [6] clause A.17.3.2.2.3.

17.3.2.2.3.4 Test description

17.3.2.2.3.4.1 Initial conditions

Same as the initial conditions given in clause 7.3.2.2.3.4.1 with following exceptions:

- Table 7.3.2.2.3.4.1-1 is replaced by Table 17.3.2.2.3.4.1-1.
- Table 7.3.2.2.3.4.1-2 is replaced by Table 17.3.2.2.3.4.1-2.

Table 17.3.2.2.3.4.1-1: Supported test configurations

Config	Description
17.3.2.2.3-1	NR PCell 120 kHz SSB SCS, 100 MHz bandwidth, TDD duplex mode

Note:	The UE is only required to be tested in one of the supported test configurations depending on UE capability

Table 17.3.2.2.3.4.1-2: Test Environment

Parameter	Value		Comment
Test environment	NC		As specified in TS 38.508-1 [14] clause 4.1.
Test frequencies	As specified in Annex E, Table E.15-1 and TS 38.508-1 [14] subclause 4.3.1.		
Channel bandwidth	As specified by the test configuration selected from Table 17.3.2.2.3.4.1-1.		
Propagation conditions	No interference		As specified in Annex C.2.1.
Connection Diagram	TE Part	FFS	As specified in TS 38.508-1 [14] Annex A.
	DUT Part	FFS	
Exceptions to connection diagram			

17.3.2.2.3.4.2 Test procedure

Same as the test procedure given in clause 7.3.2.2.3.4.2.

17.3.2.2.3.4.3 Message contents

Same as the message contents given in clause 7.3.2.2.3.4.3.

17.3.2.2.3.5 Test requirement

Same as the test requirements given in clause 7.3.2.2.3.5 with following exception:

- Table 7.3.2.2.3.5-1 is replaced by Table 17.3.2.2.3.5-1.
- Table 7.3.2.2.3.5-2 is replaced by Table 17.3.2.2.3.5-2.

Table 17.3.2.2.3.5-1: General test parameters

Parameter	Unit	Test-1	Comments
SSB Configuration		SSB.1 RedCap FR2	As defined in A.3.10
Duplex Mode for Cell 1		TDD	
TDD Configuration		TDDConf.3.1	As defined in A.3.1.4
$BW_{channel}$	MHz	100: $N_{RB,c}$ = 24	
OCNG Pattern Note 1		OCNG pattern 1	As defined in A.3.2.1.
PDSCH Reference Channel Note 2		SR.3.1 TDD	As defined in A.3.1.1.
RMSI CORESET Reference Channel		CR.3.1 TDD	As defined in A.3.1.2
NR RF Channel Number		1	
EPRE ratio of PSS to SSS	dB	0	
EPRE ratio of PBCH_DMRS to SSS	dB		
EPRE ratio of PBCH to PBCH_DMRS	dB		
EPRE ratio of PDCCH_DMRS to SSS	dB		
EPRE ratio of PDCCH to PDCCH_DMRS	dB		
EPRE ratio of PDSCH_DMRS to SSS	dB		
EPRE ratio of PDSCH to PDSCH_DMRS	dB		
ss-PBCH-BlockPower	dBm/ SCS	+20 +Δ_{UL}	As defined in TS 38.331 [2]. Δ_{UL} is derived from the uplink calibration process Note 3
Configured UE transmitted power ($P_{CMAX,\ f,c}$)	dBm	maximum value configurable for certain power class	As defined in clause 6.2.4 in TS 38.101-2 [19]
MsgA Configuration		FR2 MsgA configuration 1	As defined in A.3.20.3, with exceptions as defined below

msgA-RSRP-ThresholdSSB	dBm	RSRP_69 +Δ_{DL}	RSRP_69 corresponds to -88dBm. Δ_{DL} is derived from the downlink calibration process Note 4
preambleReceivedTargetPower	dBm	-100	As defined in TS 38.331 [2]

Note 1: OCNG shall be used such that a constant total transmitted power spectral density is achieved for all OFDM symbols. The OCNG pattern is chosen during the test according to the presence of a DL reference measurement channel.
Note 2: The DL PDSCH reference measurement channel is used in the test only when a downlink transmission dedicated to the UE under test is required.
Note 3: The Δ_{UL} value is calculated as -ROUND(PMsgA0 -1), where PMsgA0 is the measured first MsgA PRACH power with -80.6dBm/SCS applied, *msgA-PreambleReceivedTargetPower* = -100dBm and *ss-PBCH-BlockPower* = 20dBm. These values are used during the uplink calibration process carried out before the test case is run, with the UE configured to send MsgA.
Note 4: The Δ_{DL} value is calculated as ($RSRP_{REP}$ – RSRP_76), where $RSRP_{REP}$ is the SS-RSRP Reported value in Table 10.1.6.1-1 with -80.6dBm/SCS applied. These values are used during the downlink calibration process carried out before the test case is run, with the UE configured to report SS-RSRP. For a Reported value RSRP_x, x is treated as a positive integer value.

Table 17.3.2.2.3.5-2: OTA-related test parameters

Parameter		Unit	Test-1	Comments
AoA setup			Setup 2b	As defined in A.3.15.2
Assumption for UE beams Note 2			Rough	
SSB with index 0	Es Note1	dBm/SCS	-80.6	Power of SSB with index 0 is set to be above configured *msgA-RSRP-ThresholdSSB*
	SSB_RP	dBm/SCS	-80.6	
	Es/Iot_{BB}	dB	21.09	
	Io	dBm/95.04 MHz	-56.01	Io in symbols containing SSB index 0
SSB with index 1	Es Note1	dBm/SCS	-95.0	Power of SSB with index 1 is set to be below configured *msgA-RSRP-ThresholdSSB*
	SSB_RP	dBm/SCS	-95.0	
	Es/Iot_{BB}	dB	6.69	
	Io	dBm/95.04 MHz	-70.41	Io in symbols containing SSB index 1
Propagation Condition		-	AWGN	

Note 1: No artificial noise is applied in this test.
Note 2: Information about types of UE beam is given in B.2.1.3, and does not limit UE implementation or test system implementation

17.3.2.2.4 NR SA FR2 2-step RA type non-contention based random access test in FR2 for NR Standalone

Editor's note: This test case is incomplete. The following aspects are either missing or not yet determined:

- The settable window for first preamble uplink power and the uplink calibration process are FFS.
- The test requirement for absolute uplink power is FFS.
- The test requirement for relative uplink power is FFS.
- The uncertainty value and test requirement for PRACH timing are in [ ]
- TT analysis is missing
- Antenna diagram and any exceptions are FFS
- Connection setup in Annex C is FFS

17.3.2.2.4.1 Test purpose

To verify that the behaviour of the 2-step RA type random access procedure is according to the requirements and that the MsgA PRACH, MsgA PUSCH power settings and timing are within specified limits. This test will verify the requirements in TS 38.133 [6] clause 6.2.2B.2 and Clause 7.1A.2 in an AWGN model.

17.3.2.2.4.2 Test applicability

This test applies to all types of NR RedCap UE from Release 17 onwards and supporting 2-step RACH.

17.3.2.2.4.3 Minimum conformance requirement

The minimum conformance requirements are specified in clause 17.3.2.2.0.2.

The normative reference for this requirement is TS 38.133 [6] clause A.17.3.2.2.4.

17.3.2.2.4.4 Test description

17.3.2.2.4.4.1 Initial conditions

Same as the initial conditions given in clause 7.3.2.2.4.4.1 with following exceptions:

- Table 7.3.2.2.4.4.1-1 is replaced by Table 17.3.2.2.4.4.1-1.
- Table 7.3.2.2.4.4.1-2 is replaced by Table 17.3.2.2.4.4.1-2.

Table 17.3.2.2.4.4.1-1: Supported test configurations

Config	Description
17.3.2.2.4-1	NR PCell 120 kHz SSB SCS, 100 MHz bandwidth, TDD duplex mode
Note: The UE is only required to be tested in one of the supported test configurations depending on UE capability	

Table 17.3.2.2.4.4.1-2: Test Environment

Parameter	Value		Comment
Test environment	NC		As specified in TS 38.508-1 [14] clause 4.1.
Test frequencies	As specified in Annex E, Table E.15-1 and TS 38.508-1 [14] subclause 4.3.1.		
Channel bandwidth	As specified by the test configuration selected from Table 17.3.2.2.4.4.1-1.		
Propagation conditions	No interference		As specified in Annex C.2.1.
Connection Diagram	TE Part	FFS	As specified in TS 38.508-1 [14] Annex A.
	DUT Part	FFS	
Exceptions to connection diagram			

17.3.2.2.4.4.2 Test procedure

Same as the test procedure given in clause 7.3.2.2.4.4.2.

17.3.2.2.4.4.3 Message contents

Same as the message contents given in clause 7.3.2.2.4.4.3.

17.3.2.2.4.5 Test requirement

Same as the test requirements given in clause 7.3.2.2.4.5 with following exception:

- Table 7.3.2.2.4.5-1 is replaced by Table 17.3.2.2.4.5-1.
- Table 7.3.2.2.4.5-2 is replaced by Table 17.3.2.2.4.5-2.

Table 17.3.2.2.4.5-1: General test parameters

Parameter	Unit	Test-1	Comments
SSB Configuration		SSB.1 RedCap FR2	As defined in A.3.10
Duplex Mode for Cell 1		TDD	
TDD Configuration		TDDConf.3.1	As defined in A.3.1.4
$BW_{channel}$	MHz	100: $N_{RB,c}$ = 24	
OCNG Pattern Note 1		OP.3	As defined in A.3.2.1.
PDSCH Reference Channel Note 2		SR.3.1 TDD	As defined in A.3.1.1.
NR RF Channel Number		1	
EPRE ratio of PSS to SSS	dB	0	
EPRE ratio of PBCH_DMRS to SSS	dB		
EPRE ratio of PBCH to PBCH_DMRS	dB		
EPRE ratio of PDCCH_DMRS to SSS	dB		
EPRE ratio of PDCCH to PDCCH_DMRS	dB		
EPRE ratio of PDSCH_DMRS to SSS	dB		
EPRE ratio of PDSCH to PDSCH_DMRS	dB		
ss-PBCH-BlockPower	dBm/ SCS	+20 +Δ_{UL}	As defined in TS 38.331 [2]. Δ_{UL} is derived from the uplink calibration process Note 3
Configured UE transmitted power ($P_{CMAX,\ f,c}$)	dBm	maximum value configurable for certain power class	As defined in clause 6.2.4 in TS 38.101-2 [19]
MsgA Configuration		FR2 MsgA configuration 1	As defined in A.3.20.3, with exceptions as defined below
msgA-RSRP-ThresholdSSB	dBm	RSRP_69 +Δ_{DL}	RSRP_69 corresponds to -88dBm. Δ_{DL} is derived from the downlink calibration process Note 4
preambleReceivedTargetPower	dBm	-100	As defined in TS 38.331 [2]

Note 1: OCNG shall be used such that a constant total transmitted power spectral density is achieved for all OFDM symbols. The OCNG pattern is chosen during the test according to the presence of a DL reference measurement channel.

Note 2: The DL PDSCH reference measurement channel is used in the test only when a downlink transmission dedicated to the UE under test is required.

Note 3: The Δ_{UL} value is calculated as -ROUND(PMsgA0 -1), where PMsgA0 is the measured first MsgA PRACH power with -80.6dBm/SCS applied, *msgA-PreambleReceivedTargetPower* = -100dBm and *ss-PBCH-BlockPower* = 20dBm. These values are used during the uplink calibration process carried out before the test case is run, with the UE configured to send MsgA.

Note 4: The Δ_{DL} value is calculated as (RSRP_$_{REP}$ – RSRP_76), where RSRP_$_{REP}$ is the SS-RSRP Reported value in Table 10.1.6.1-1 with -80.6dBm/SCS applied. These values are used during the downlink calibration process carried out before the test case is run, with the UE configured to report SS-RSRP. For a Reported value RSRP_x, x is treated as a positive integer value.

Table 17.3.2.2.4.5-2: OTA-related test parameters

Parameter		Unit	Test-1	Comments
AoA setup			Setup 2b	As defined in A.3.15.2
Assumption for UE beams Note 2			Rough	
SSB with index 0	Es Note1	dBm/SCS	-80.6	Power of SSB with index 0 is set to be above configured *msgA-RSRP-ThresholdSSB*
	SSB_RP	dBm/SCS	-80.6	
	Es/Iot_{BB}	dB	21.09	
	Io	dBm/95.04 MHz	-56.01	Io in symbols containing SSB index 0
SSB with index 1	Es Note1	dBm/SCS	-95.0	Power of SSB with index 1 is set to be below configured *msgA-RSRP-ThresholdSSB*
	SSB_RP	dBm/SCS	-95.0	
	Es/Iot_{BB}	dB	6.69	

	Io	dBm/95.04 MHz	-70.41	Io in symbols containing SSB index 1
Propagation Condition		-	AWGN	
Note 1: No artificial noise is applied in this test. Note 2: Information about types of UE beam is given in B.2.1.3, and does not limit UE implementation or test system implementation				

17.4

17.5 Signalling characteristics for RedCap

17.5.1 Radio link monitoring for RedCap

17.5.1.0 Minimum requirements

17.5.1.0.1 General

The UE shall monitor the downlink radio link quality based on the reference signal configured as RLM-RS resource(s) in order to detect the downlink radio link quality of the PCell as specified in TS 38.213 [3]. The configured RLM-RS resources can be all SSBs, or all CSI-RSs, or a mix of SSBs and CSI-RSs. UE is not required to perform RLM outside the active DL BWP. The SSB and SMTC in this section applies for both CD-SSB and NCD-SSB if it is not additional specified.

On each RLM-RS resource, the UE shall estimate the downlink radio link quality and compare it to the thresholds Q_{out} and Q_{in} for the purpose of monitoring downlink radio link quality of the cell.

The threshold Q_{out} is defined as the level at which the downlink radio link cannot be reliably received and shall correspond to the out-of-sync block error rate ($BLER_{out}$) as defined in Table 17.5.1.0.1-1. For SSB based radio link monitoring, $Q_{out_SSB,RedCap}$ is derived based on the hypothetical PDCCH transmission parameters listed in Table 17.5.1.0.1-2. For CSI-RS based radio link monitoring, $Q_{out_CSI\text{-}RS,RedCap}$ is derived based on the hypothetical PDCCH transmission parameters listed in Table 17.5.1.0.1-4.

The threshold Q_{in} is defined as the level at which the downlink radio link quality can be significantly more reliably received than at Q_{out} and shall correspond to the in-sync block error rate ($BLER_{in}$) as defined in Table 17.5.1.0.1-1. For SSB based radio link monitoring, $Q_{in_SSB,RedCap}$ is derived based on the hypothetical PDCCH transmission parameters listed in Table 17.5.1.0.1-3. For CSI-RS based radio link monitoring, $Q_{in_CSI\text{-}RS,RedCap}$ is derived based on the hypothetical PDCCH transmission parameters listed in Table 17.5.1.0.1-5.

The out-of-sync block error rate ($BLER_{out}$) and in-sync block error rate ($BLER_{in}$) are determined from the network configuration via parameter *rlmInSyncOutOfSyncThreshold* signalled by higher layers. When UE is not configured with *RLM-IS-OOS-thresholdConfig* from the network, UE determines out-of-sync and in-sync block error rates from Configuration #0 in Table 17.5.1.0.1-1 as default. All requirements here are applicable for BLER Configuration #0 in Table 17.5.1.0.1-1.

Table 17.5.1.0.1-1: Out-of-sync and in-sync block error rates

Configuration	$BLER_{out}$	$BLER_{in}$
0	10%	2%

UE shall be able to monitor up to N_{RLM} RLM-RS resources of the same or different types in each corresponding carrier frequency range, depending on a maximum number L_{max} of SSBs per half frame according to TS 38.213 [3], where N_{RLM} is specified in Table 17.5.1.0.1-6 according TS 38.213 [3], and meet the requirements as specified in 38.133 [6] clause 8.1B. UE is not required to meet the requirements in 38.133 [6] clause 8.1B if RLM-RS is not configured and no TCI state for PDCCH is activated.

Table 17.5.1.0.1-2: PDCCH transmission parameters for out-of-sync evaluation for RedCap UE

Attribute	Value for BLER Configuration #0

DCI format	1-0
Number of control OFDM symbols	2
Aggregation level (CCE)	16; for RedCap UE with 1Rx branch. 8; for RedCap UE with 2Rx branches.
Ratio of hypothetical PDCCH RE energy to average SSS RE energy	4dB
Ratio of hypothetical PDCCH DMRS energy to average SSS RE energy	4dB
Bandwidth (PRBs)	48; for RedCap UE with 1Rx branch. 24; for RedCap UE with 2Rx branches.
Sub-carrier spacing (kHz)	SCS of the active DL BWP
DMRS precoder granularity	REG bundle size
REG bundle size	6
CP length	Normal
Mapping from REG to CCE	Distributed
Note: SCS = 60KHz is not applicable for FR1.	

Table 17.5.1.0.1-3: PDCCH transmission parameters for in-sync evaluation for RedCap UE

Attribute	Value for BLER Configuration #0
DCI payload size	1-0
Number of control OFDM symbols	2
Aggregation level (CCE)	8; for RedCap UE with 1Rx branch. 4; for RedCap UE with 2Rx branches.
Ratio of hypothetical PDCCH RE energy to average SSS RE energy	0dB
Ratio of hypothetical PDCCH DMRS energy to average SSS RE energy	0dB
Bandwidth (PRBs)	48; for RedCap UE with 1Rx branch. 24; for RedCap UE with 2Rx branches.
Sub-carrier spacing (kHz)	SCS of the active DL BWP
DMRS precoder granularity	REG bundle size
REG bundle size	6
CP length	Normal
Mapping from REG to CCE	Distributed
Note: SCS = 60KHz is not applicable for FR1.	

Table 17.5.1.0.1-4: PDCCH transmission parameters for out-of-sync evaluation for RedCap UE

Attribute	Value for BLER Configuration #0
DCI format	1-0
Number of control OFDM symbols	2
Aggregation level (CCE)	16; for RedCap UE with 1Rx branch. 8; for RedCap UE with 2Rx branches.
Ratio of hypothetical PDCCH RE energy to average CSI-RS RE energy	4dB
Ratio of hypothetical PDCCH DMRS energy to average CSI-RS RE energy	4dB
Bandwidth (PRBs)	48
Sub-carrier spacing (kHz)	SCS of the active DL BWP
DMRS precoder granularity	REG bundle size
REG bundle size	6
CP length	Normal
Mapping from REG to CCE	Distributed

Note: SCS = 60KHz is not applicable for FR1.

Table 17.5.1.0.1-5: PDCCH transmission parameters for in-sync evaluation for RedCap UE

Attribute	Value for BLER Configuration #0
DCI payload size	1-0
Number of control OFDM symbols	2
Aggregation level (CCE)	8; for RedCap UE with 1Rx branch. 4; for RedCap UE with 2Rx branches.
Ratio of hypothetical PDCCH RE energy to average CSI-RS RE energy	0dB
Ratio of hypothetical PDCCH DMRS energy to average CSI-RS RE energy	0dB
Bandwidth (PRBs)	48
Sub-carrier spacing (kHz)	SCS of the active DL BWP
DMRS precoder granularity	REG bundle size
REG bundle size	6
CP length	Normal
Mapping from REG to CCE	Distributed
Note: SCS = 60KHz is not applicable for FR1.	

Table 17.5.1.0.1-6: Maximum number of RLM-RS resources X_{RLM-RS}

Carrier frequency range of PCell	L_{max}	Maximum number of RLM-RS resources, N_{RLM}
FR1, ≤ 3 GHz[Note]	4	2
FR1, > 3 GHz[Note]	8	4
FR2	64	8
NOTE: For unpaired spectrum operation with Case C - 30 kHz SCS, 3GHz is replaced by 1.88GHz, as specified in clause 4.1 in TS 38.213 [3].		

When the UE transitions between RLM CD-SSB resource and RLM NCD-SSB resource during one evaluation period, the UE is allowed to restart the ongoing evaluation using the second SSB type after BWP switching. Subsequent to this duration, the UE shall use an evaluation period corresponding to the second SSB type for each RLM-RS resource.

The requirements in 38.133 [6] clause 8.1.4 shall also apply except the scenarios described above.

The requirements in 38.133 [6] clause 8.1.5 shall apply.

When the downlink radio link quality on all the configured RLM-RS resources is worse than Q_{out}, Layer 1 of the UE shall send an out-of-sync indication for the cell to the higher layers. A Layer 3 filter shall be applied to the out-of-sync indications as specified in TS 38.331 [13].

When the downlink radio link quality on at least one of the configured RLM-RS resources is better than $Q_{in,RedCap}$, layer 1 of the UE shall send an in-sync indication for the cell to the higher layers. A layer 3 filter shall be applied to the in-sync indications as specified in TS 38.331 [2].

The out-of-sync and in-sync evaluations for the configured RLM-RS resources shall be performed as specified in clause 5 in TS 38.213 [8]. Two successive indications from layer 1 shall be separated by at least $T_{Indication_interval,RedCap}$.

When DRX is not used for RedCap UEs, $T_{Indication_interval,RedCap}$ is max(10ms, $T_{RLM-RS,M}$), where $T_{RLM,M}$ is the shortest periodicity of all configured RLM-RS resources for the monitored cell, which corresponds to T_{SSB} specified in clause 38.133 [6] 8.1B.2 if the RLM-RS resource is SSB, or T_{CSI-RS} specified in 38.133 [6] clause 8.1B.3 if the RLM-RS resource is CSI-RS.

In case DRX is used for RedCap UEs, $T_{Indication_interval,RedCap}$ is max(10ms, 1.5 × DRX_cycle_length, 1.5 × $T_{RLM-RS,M}$)) if DRX cycle_length is less than or equal to 320ms, and $T_{Indication_interval}$ is DRX_cycle_length if DRX cycle_length is greater than 320ms. Upon start of T310 timer as specified in TS 38.331 [2], the UE shall monitor the configured RLM-

RS resources for recovery using the evaluation period and layer 1 indication interval corresponding to the no DRX mode until the expiry or stop of T310 timer.

The following scheduling restriction applies due to radio link monitoring on an FR2 serving PCell.

- If the RLM-RS is CSI-RS which is type-D QCLed with active TCI state for PDCCH or PDSCH, and the CSI-RS is not in a CSI-RS resource set with repetition ON,
  - There are no scheduling restrictions due to radio link monitoring based on the CSI-RS.
- Otherwise
  - The UE is not expected to transmit PUCCH, PUSCH or SRS or receive PDCCH, PDSCH or CSI-RS for tracking or CSI-RS for CQI on RLM-RS symbols to be measured for radio link monitoring.

For FR2, if following conditions are met,

- UE has been notified about system information update through paging,
- The gap between UE's reception of PDCCH that UE monitors in the Type2-PDCCH CSS set and that notifies system information update, and the PDCCH that UE monitors in the Type0-PDCCH CSS set, is greater than 2 slots,

For the SSB for RLM and CORESET for RMSI scheduling multiplexing patterns 3, UE is expected to receive the PDCCH that UE monitors in the Type0-PDCCH CSS set, and the corresponding PDSCH, on SSB symbols to be measured for RLM; and

For the SSB for RLM and CORESET for RMSI scheduling multiplexing patterns 2, UE is expected to receive PDSCH that corresponds to the PDCCH that UE monitors in the Type0-PDCCH CSS set, on SSB symbols to be measured for RLM.

The normative reference for this requirement is TS 38.133 [6] clauses 8.1B.1, 8.1B.2, 8.1B.3, 8.1B.4, 8.1B.5, 8.1B.6 and 8.1B.7.

17.5.1.0.2 Minimum conformance requirements for SSB-based RLM

The requirements in this clause apply for each SSB based RLM-RS resource configured for PCell, provided that the SSB configured for RLM is actually transmitted within UE active DL BWP during the entire evaluation period specified in this clause.

UE shall be able to evaluate whether the downlink radio link quality on the configured RLM-RS resource estimated over the last $T_{Evaluate_out_SSB,RedCap}$ [ms] period becomes worse than the threshold $Q_{out_SSB,RedCap}$ within $T_{Evaluate_out_SSB,RedCap}$ [ms] evaluation period.

UE shall be able to evaluate whether the downlink radio link quality on the configured RLM-RS resource estimated over the last $T_{Evaluate_in_SSB,RedCap}$ [ms] period becomes better than the threshold $Q_{in_SSB,RedCap}$ within $T_{Evaluate_in_SSB,RedCap}$ [ms] evaluation period.

$T_{Evaluate_out_SSB,RedCap}$ and $T_{Evaluate_in_SSB,RedCap}$ are defined in Table 17.5.1.0.2-1 and for FR2 with scaling factor N=8 for 2Rx RedCap.

Table 17.5.1.0.2-1: Evaluation period $T_{Evaluate_out_SSB,RedCap}$ and $T_{Evaluate_in_SSB,RedCap}$ for FR2 for 2Rx RedCap UE

Configuration	$T_{Evaluate_out_SSB,RedCap}$ (ms)	$T_{Evaluate_in_SSB,RedCap}$ (ms)
no DRX	$\max(200, \lceil 10 \times P \times N \rceil \times T_{SSB})$	$\max(100, \lceil 5 \times P \times N \rceil \times T_{SSB})$
DRX cycle≤320ms	$\max(200, \lceil 15 \times P \times N \rceil \times \max(T_{DRX}, T_{SSB}))$	$\max(100, \lceil 7.5 \times P \times N \rceil \times \max(T_{DRX}, T_{SSB}))$
DRX cycle>320ms	$\lceil 10 \times P \times N \rceil \times T_{DRX}$	$\lceil 5 \times P \times N \rceil \times T_{DRX}$
NOTE: T_{SSB} is the periodicity of the SSB configured for RLM. T_{DRX} is the DRX cycle length.		

For FR2,

- $P = \frac{1}{1-\frac{T_{SSB}}{T_{SMTCperiod}}}$, when RLM-RS resource is not overlapped with measurement gap and the RLM-RS resource is partially overlapped with SMTC occasion ($T_{SSB} < T_{SMTCperiod}$).

- P is $P_{sharing\ factor}$, when the RLM-RS resource is not overlapped with measurement gap and RLM-RS resource is fully overlapped with SMTC period ($T_{SSB} = T_{SMTCperiod}$).

- $P = \frac{1}{1-\frac{T_{SSB}}{MGRP}-\frac{T_{SSB}}{T_{SMTCperiod}}}$, when the RLM-RS resource is partially overlapped with measurement gap and the RLM-RS resource is partially overlapped with SMTC occasion ($T_{SSB} < T_{SMTCperiod}$) and SMTC occasion is not overlapped with measurement gap and

  - $T_{SMTCperiod} \neq$ MGRP or

  - $T_{SMTCperiod}$ = MGRP and $T_{SSB} < 0.5*T_{SMTCperiod}$

- $P = \frac{P_{sharing\ factor}}{1-\frac{T_{SSB}}{MGRP}}$, when the RLM-RS is partially overlapped with measurement gap and the RLM-RS is partially overlapped with SMTC occasion ($T_{SSB} < T_{SMTCperiod}$) and SMTC occasion is not overlapped with measurement gap and $T_{SMTCperiod}$ = MGRP and $T_{SSB} = 0.5 \times T_{SMTCperiod}$

- $P = \frac{1}{1-\frac{T_{SSB}}{T_{SMTCperiod}}}$, when the RLM-RS resource is partially overlapped with measurement gap and the RLM-RS resource is partially overlapped with SMTC occasion ($T_{SSB} < T_{SMTCperiod}$) and SMTC occasion is partially or fully overlapped with measurement gap

- $P = \frac{P_{sharing\ factor}}{1-\frac{T_{SSB}}{MRGP}}$, when the RLM-RS resource is partially overlapped with measurement gap and the RLM-RS resource is fully overlapped with SMTC occasion ($T_{SSB} = T_{SMTCperiod}$) and SMTC occasion is partially overlapped with measurement gap ($T_{SMTCperiod}$ < MGRP)

- $P_{sharing\ factor}$ = 1, if the RLM-RS resource outside measurement gap is

  - not overlapped with the SSB symbols indicated by *SSB-ToMeasure* and 1 data symbol before each consecutive SSB symbols indicated by *SSB-ToMeasure* and 1 data symbol after each consecutive SSB symbols indicated by *SSB-ToMeasure*, given that *SSB-ToMeasure* is configured, where the *SSB-ToMeasure* is the union set of *SSB-ToMeasure* from all the configured measurement objects merged on the same serving carrier, and,

  - not overlapped by the RSSI symbols indicated by *ss-RSSI-Measurement* and 1 data symbol before each RSSI symbol indicated by *ss-RSSI-Measurement* and 1 data symbol after each RSSI symbol indicated by *ss-RSSI-Measurement*, given that *ss-RSSI-Measurement* is configured.

- $P_{sharing\ factor}$ = 3, otherwise.

where,

If the high layer in TS 38.331 [2] signalling of *smtc2* is present, $T_{SMTCperiod}$ follows *smtc2*; Otherwise $T_{SMTCperiod}$ follows *smtc1*.

If the high layer in TS 38.331 [13] signalling of *smtc2* is present, $T_{SMTCperiod}$ follows *smtc2*; otherwise $T_{SMTCperiod}$ follows *smtc1*.

Longer evaluation period would be expected if the combination of RLM-RS resource, SMTC occasion and measurement gap configurations does not meet previous conditions.

Longer evaluation period would be expected during the period $T_{identify_CGI}$ when the UE is requested to decode an NR CGI.

Longer evaluation period would be expected during the period $T_{identify_CGI,E\text{-}UTRAN}$ when the UE is requested to decode an LTE CGI.

For FR2, when the SSB for RLM measurement is in the same OFDM symbol as CSI-RS for RLM, BFD, CBD or L1-RSRP measurement, UE is required to measure one of but not both SSB for RLM and CSI-RS. Longer measurement period for SSB based RLM is expected, and no requirements are defined.

The normative reference for this requirement is TS 38.133 [6] clauses 8.1B.2.

17.5.1.0.3 Minimum conformance requirements for CSI-RS based RLM

The requirements in this clause apply for each CSI-RS based RLM-RS resource configured for PCell, provided that the CSI-RS configured for RLM is actually transmitted within UE active DL BWP during the entire evaluation period specified in this clause. UE is not expected to perform radio link monitoring measurements on the CSI-RS configured as RLM-RS if the CSI-RS is not in the active TCI state of any CORESET configured in the UE active BWP.

UE shall be able to evaluate whether the downlink radio link quality on the configured RLM-RS resource estimated over the last $T_{Evaluate_out_CSI-RS,RedCap}$ ms period becomes worse than the threshold $Q_{out_CSI-RS,RedCap}$ within $T_{Evaluate_out_CSI-RS,RedCap}$ ms evaluation period.

UE shall be able to evaluate whether the downlink radio link quality on the configured RLM-RS resource estimated over the last $T_{Evaluate_in_CSI-RS,RedCap}$ ms period becomes better than the threshold $Q_{in_CSI-RS,RedCap}$ within $T_{Evaluate_in_CSI-RS,RedCap}$ ms evaluation period.

$T_{Evaluate_out_CSI-RS,RedCap}$ and $T_{Evaluate_in_CSI-RS,RedCap}$ are defined in Table 17.5.1.0.3-1 for FR2 with scaling factor N=1 for 2 Rx RedCap.

Table 17.5.1.0.3-1: Evaluation period $T_{Evaluate_out_CSI-RS,RedCap}$ and $T_{Evaluate_in_CSI-RS,RedCap}$ for FR2 for 2Rx RedCap UE

Configuration	$T_{Evaluate_out_CSI-RS,RedCap}$ (ms)	$T_{Evaluate_in_CSI-RS,RedCap}$ (ms)
no DRX	Max(200, Ceil($M_{out,RedCap}$×P×N)×T_{CSI-RS})	Max(100, Ceil($M_{in,RedCap}$×P×N) × T_{CSI-RS})
DRX ≤ 320ms	Max(200, Ceil(1.5×$M_{out,RedCap}$×P×N)× Max(T_{DRX}, T_{CSI-RS}))	Max(100, Ceil(1.5×$M_{in,RedCap}$×P×N)× Max(T_{DRX}, T_{CSI-RS}))
DRX > 320ms	Ceil($M_{out,RedCap}$×P×N) × T_{DRX}	Ceil($M_{in,RedCap}$×P×N) × T_{DRX}
NOTE: T_{CSI-RS} is the periodicity of the CSI-RS resource configured for RLM. The requirements in this table apply for T_{CSI-RS} equal to 5 ms, 10 ms, 20 ms or 40 ms. T_{DRX} is the DRX cycle length.		

For FR2,

- P=1, when the RLM-RS resource is not overlapped with measurement gap and also not overlapped with SMTC occasion.
- $P = \frac{1}{1-\frac{T_{CSI-RS}}{MGRP}}$, when the RLM-RS resource is partially overlapped with measurement gap and the RLM-RS resource is not overlapped with SMTC occasion (T_{CSI-RS} < MGRP)
- $P = \frac{1}{1-\frac{T_{CSI-RS}}{T_{SMTCperiod}}}$, when the RLM-RS resource is not overlapped with measurement gap and the RLM-RS resource is partially overlapped with SMTC occasion ($T_{CSI-RS} < T_{SMTCperiod}$).
- P = $P_{sharing\ factor}$, when the RLM-RS resource is not overlapped with measurement gap and RLM-RS resource is fully overlapped with SMTC occasion ($T_{CSI-RS} = T_{SMTCperiod}$).
- $P = \frac{1}{1-\frac{T_{CSI-RS}}{MGRP}-\frac{T_{CSI-RS}}{T_{SMTCperiod}}}$, when the RLM-RS resource is partially overlapped with measurement gap and the RLM-RS resource is partially overlapped with SMTC occasion ($T_{CSI-RS} < T_{SMTCperiod}$) and SMTC occasion is not overlapped with measurement gap and
  - $T_{SMTCperiod} \neq$ MGRP or
  - $T_{SMTCperiod}$ = MGRP and $T_{CSI-RS} < 0.5 \times T_{SMTCperiod}$
- $P = \frac{P_{\text{sharing factor}}}{1-\frac{T_{CSI-RS}}{MGRP}}$, when the RLM-RS resource is partially overlapped with measurement gap and the RLM-RS resource is partially overlapped with SMTC occasion ($T_{CSI-RS} < T_{SMTCperiod}$) and SMTC occasion is not overlapped with measurement gap and $T_{SMTCperiod}$ = MGRP and $T_{CSI-RS} = 0.5 \times T_{SMTCperiod}$

- $P = \frac{1}{1-\frac{T_{CSI-RS}}{T_{SMTCperiod}}}$, when the RLM-RS resource is partially overlapped with measurement gap and the RLM-RS resource is partially overlapped with SMTC occasion ($T_{CSI-RS} < T_{SMTCperiod}$) and SMTC occasion is partially or fully overlapped with measurement gap

- $P = \frac{P_{\text{sharing factor}}}{1-\frac{T_{CSI-RS}}{MGRP}}$, when the RLM-RS resource is partially overlapped with measurement gap and the RLM-RS resource is fully overlapped with SMTC occasion ($T_{CSI-RS} = T_{SMTCperiod}$) and SMTC occasion is partially overlapped with measurement gap ($T_{SMTCperiod} < MGRP$)

- $P_{\text{sharing factor}} = 1$, if the RLM-RS resource outside measurement gap is

  - not overlapped with the SSB symbols indicated by *SSB-ToMeasure* and 1 data symbol before each consecutive SSB symbols indicated by *SSB-ToMeasure* and 1 data symbol after each consecutive SSB symbols indicated by *SSB-ToMeasure*, given that *SSB-ToMeasure* is configured, where the *SSB-ToMeasure* is the union set of *SSB-ToMeasure* from all the configured measurement objects merged on the same serving carrier, and,

  - not overlapped by the RSSI symbols indicated by *ss-RSSI-Measurement* and 1 data symbol before each RSSI symbol indicated by *ss-RSSI-Measurement* and 1 data symbol after each RSSI symbol indicated by *ss-RSSI-Measurement*, given that *ss-RSSI-Measurement* is configured.

- $P_{\text{sharing factor}} = 3$, otherwise.

where,

If the high layer in TS 38.331 [2] signalling of *smtc2* is present, $T_{SMTCperiod}$ follows *smtc2*; Otherwise $T_{SMTCperiod}$ follows *smtc1*.

If the high layer in TS 38.331 [2] signalling of *smtc2* is present, $T_{SMTCperiod}$ follows *smtc2*; Otherwise $T_{SMTCperiod}$ follows *smtc1*.

Note: The overlap between CSI-RS for RLM and SMTC means that CSI-RS based RLM is within the SMTC window duration.

The values of $M_{out,RedCap}$ and $M_{in,RedCap}$ used in Table 17.5.1.0.3-1 for UE with 2Rx are defined as:

- $M_{out,RedCap} = 20$ and $M_{in,RedCap} = 10$, if the CSI-RS resource configured for RLM is transmitted with higher layer CSI-RS parameter *density* set to 3 and over the bandwidth $\geqslant$ 24 PRBs.

Longer evaluation period would be expected if the combination of RLM-RS resource, SMTC occasion and measurement gap configurations does not meet previous conditions.

Longer evaluation period would be expected during the period $T_{identify_CGI}$ when the UE is requested to decode an NR CGI.

Longer evaluation period would be expected during the period $T_{identify_CGI,E-UTRAN}$ when the UE is requested to decode an LTE CGI.

The UE is required to be capable of measuring CSI-RS for RLM without measurement gaps. The UE is required to perform the CSI-RS measurements with measurement restrictions as described in the following clauses.

For FR2, when the CSI-RS for RLM is in the same OFDM symbol as SSB for RLM, BFD, CBD or L1-RSRP measurement, UE is not required to receive CSI-RS for RLM in the PRBs that overlap with an SSB.

For FR2, when the CSI-RS for RLM is in the same OFDM symbol as SSB for RLM, BFD, or L1-RSRP measurement, or in the same symbol as SSB for CBD when beam failure is detected, UE is required to measure one of but not both CSI-RS for RLM and SSB. Longer measurement period for CSI-RS based RLM is expected, and no requirements are defined.

For FR2, when the CSI-RS for RLM measurement is in the same OFDM symbol as another CSI-RS for RLM, BFD, CBD or L1-RSRP measurement,

- In the following cases, UE is required to measure one of but not both CSI-RS for RLM and the other CSI-RS. Longer measurement period for CSI-RS based RLM is expected, and no requirements are defined.

- The CSI-RS for RLM or the other CSI-RS in a resource set configured with repetition ON, or
- The other CSI-RS is configured in q1 and beam failure is detected, or
- The two CSI-RS-es are not QCL-ed w.r.t. QCL-TypeD, or the QCL information is not known to UE,

- Otherwise, UE shall be able to measure the CSI-RS for RLM without any restriction.

The normative reference for this requirement is TS 38.133 [6] clauses 8.1B.3.

17.5.1.1 NR SA FR2 Radio Link Monitoring Out-of-sync Test for FR2 PCell configured with SSB-based RLM RS in non-DRX mode

Editor's Note: This test case has been completed for the following configurations:

- Test frequency f ≤ 40.8 GHz
- UE PC3
- Normal conditions

The test is incomplete for UE power classes other than PC3 (e.g. PC7)

The test is incomplete for test frequencies > 40.8 GHz

The test is incomplete for extreme conditions

17.5.1.1.1 Test purpose

To verify that the UE properly detects the out of sync and in sync for the purpose of monitoring downlink radio link quality of the PCell. This test will partly verify the FR2 radio link monitoring requirements in 38.133[6] clause 8.1B.

17.5.1.1.2 Test applicability

This test applies to all types of NR RedCap UE from Release 17 onwards.

17.5.1.1.3 Minimum conformance requirement

The minimum conformance requirements are specified in clause 17.5.1.0.1.

The normative reference for this requirement is TS 38.133 [6] clause A.17.5.1.1.

17.5.1.1.4 Test description

Same as the test description given in clause 7.5.1.1.4.

17.5.1.1.4.1 Initial conditions

Same as the initial conditions given in clause 7.5.1.1.4.1 with following exceptions:

- Table 7.5.1.1.4.1-1 is replaced by Table 17.5.1.1.4.1-1.
- Table 7.5.1.1.4.1-2 is replaced by Table 17.5.1.1.4.1-2.
- Table 7.5.1.1.4.1-3 is replaced by Table 17.5.1.1.4.1-3.

Table 17.5.1.1.4.1-1: Supported test configurations

Configuration	Description
17.5.1.1-1	TDD, SSB SCS 120 KHz, data SCS 120KHz, BW 100 MHz

Table 17.5.1.1.4.1-2: Initial conditions

Parameter	Value		Comment
Test environment	NC		As specified in TS 38.508-1 [14] clause 4.1.
Test frequencies	As specified in Annex E.1.2, Table E.4-1 and TS 38.508-1 [14] clause 4.3.1.		
Channel bandwidth	As specified by the test configuration selected from Table 17.5.1.1.4.1-1		
Propagation conditions	AWGN		As specified in Annex C.2.2.
Connection Diagram	TE Part	A.3.3.3.1	As specified in TS 38.508-1 [14] Annex A.
	DUT Part	A.3.3.4.1	
Exceptions to connection diagram	N/A		

Table 17.5.1.1.4.1-3: General test parameters

Parameter			Unit	Value
				Test 1
Active PCell				Cell 1
RF Channel Number				1
Duplex mode		Config 1		TDD
$BW_{channel}$		Config 1		100: $N_{RB,c}$ = 66
Data RBs allocated		Config 1		24
DL initial BWP configuration		Config 1		DLBWP.0.1
DL dedicated BWP configuration		Config 1		DLBWP.1.1
UL initial BWP configuration		Config 1		ULBWP.0.1
UL dedicated BWP configuration		Config 1		ULBWP.1.1
TDD Configuration		Config 1		TDDConf.3.1
RMSI CORESET Reference Channel		Config 1		CR.3.1 TDD
Dedicated CORESET Reference Channel		Config 1		CCR.3.4 TDD
SSB Configuration		Config 1		SSB.1 FR2
SMTC Configuration		Config 1		SMTC.1
PDSCH/PDCCH subcarrier spacing		Config 1		120 KHz
PRACH Configuration		Config 1		PRACH.4 FR2
SSB index assigned as RLM RS		Config 1		0,1
OCNG parameters				OP.5
CP length				Normal
Out of sync transmission parameters	DCI format			1-0
	Number of Control OFDM symbols			2
	Aggregation level		CCE	8
	Ratio of hypothetical PDCCH RE energy to average SSS RE energy		dB	4
	Ratio of hypothetical PDCCH DMRS energy to average SSS RE energy		dB	4
	DMRS precoder granularity			REG bundle size
	REG bundle size			6
DRX				*OFF*
Gap pattern ID				*gp0*
Layer 3 filtering				*Enabled*
T310 timer			ms	*0*
T311 timer			ms	1000
N310				1
N311				1
CSI-RS for CSI reporting		Config 1		CSI-RS.3.1 TDD
reportConfigType				periodic
reportQuantity				cri-RI-PMI-CQI
CSI reporting periodicity			slot	40
CSI reporting offset			slot	4
TCI states for PDCCH/PDSCH				TCI.State.2

CSI-RS for tracking	Config 1		TRS.2.1 TDD
T1		s	0.2
T2		s	9.68
T3		s	9.68
D1		s	9.64
Note 1: All configurations are assigned to the UE prior to the start of time period T1. Note 2: UE-specific PDCCH is not transmitted after T1 starts.			

17.5.1.1.4.2 Test Procedure

Same as the test procedure given in clause 7.5.1.1.4.2.

17.5.1.1.4.3 Message Contents

Same as the message contents given in clause 7.5.1.1.4.3.

Message contents are according to TS 38.508-1 [14] clause 7.3.

17.5.1.1.5 Test Requirement

Same as the test requirements given in clause 7.5.1.1.5 with following exceptions:

- Table 7.5.1.1.5-1 is replaced by Table 17.5.1.1.5-1.

Table 17.5.1.1.5-1: Cell specific test parameters

Parameter		Unit	Test 1					
			T1	T2	T3	T1	T2	T3
AoA setup			Setup 3					
			AoA1			AoA2		
Assumption for UE beams Note 5			Rough			Rough		
EPRE ratio of PDCCH DMRS to SSS		dB	4			Not sent		
EPRE ratio of PDCCH to PDCCH DMRS		dB	0					
EPRE ratio of PBCH DMRS to SSS		dB						
EPRE ratio of PBCH to PBCH DMRS		dB						
EPRE ratio of PSS to SSS		dB						
EPRE ratio of PDSCH DMRS to SSS		dB						
EPRE ratio of PDSCH to PDSCH DMRS		dB						
EPRE ratio of OCNG DMRS to SSS		dB						
EPRE ratio of OCNG to OCNG DMRS		dB						
ssb-Index 0 SNR	Config 1	dB	4.1 Note 6,7	-3.9 Note 6,7	-15			
ssb-Index 1 SNR	Config 1		Not sent			4.1 Note 6,7	-15	-15
N_{oc}	Config 1	dBm/ 15kHz	-94.8 Note 7			-94.8 Note 7		
Time multiplexing of the downlink transmissions from each AoA			Defined in Figure 7.5.1.1.4-2					
Propagation condition			TDL-A 30ns 75Hz			TDL-A 30ns 75Hz		
Note 1: OCNG shall be used such a constant total transmitted power spectral density is achieved for all OFDM symbols. Note 2: The signal contains PDCCH for UEs other than the device under test as part of OCNG. Note 3: SNR levels correspond to the signal to noise ratio over the SSS REs. Note 4: The SNR values are specified for testing a UE which supports 2RX on at least one band. Note 5: Information about types of UE beam is given in B.2.1.3 and does not limit UE implementation or test system implementation. Note 6: This value allows up to 1dB degradation from applied SNR to UE baseband Note 7: Including test tolerance given in Annex F								

17.5.1.2 NR SA FR2 Radio Link Monitoring In-sync Test for FR2 PCell configured with SSB-based RLM RS in non-DRX mode

Editor's Note: This test case has been completed for the following configurations:

- Test frequency f ≤ 40.8 GHz
- UE PC3
- Normal conditions

The test is incomplete for UE power classes other than PC3 (e.g. PC7)

The test is incomplete for test frequencies > 40.8 GHz

The test is incomplete for extreme conditions

17.5.1.2.1 Test purpose

To verify that the UE properly detects the out of sync and in sync for the purpose of monitoring downlink radio link quality of the PCell. This test will partly verify the FR2 radio link monitoring requirements in 38.133[6] clause 8.1B.

17.5.1.2.2 Test applicability

This test applies to all types of NR RedCap UE from Release 17 onwards.

17.5.1.2.3 Minimum conformance requirement

The minimum conformance requirements are specified in clause 17.5.1.0.1.

The normative reference for this requirement is TS 38.133 [6] clause A.17.5.1.2.

17.5.1.2.4 Test description

Same as the test description given in clause 7.5.1.2.4.

17.5.1.2.4.1 Initial conditions

Same as the initial conditions given in clause 7.5.1.2.4.1 with following exceptions:

- Table 7.5.1.2.4.1-1 is replaced by Table 17.5.1.2.4.1-1.
- Table 7.5.1.2.4.1-2 is replaced by Table 17.5.1.2.4.1-2.
- Table 7.5.1.2.4.1-3 is replaced by Table 17.5.1.2.4.1-3.

Table 17.5.1.2.4.1-1: Supported test configurations

Configuration	Description
17.5.1.2-1	TDD, SSB SCS 120 KHz, data SCS 120KHz, BW 100 MHz

Table 17.5.1.2.4.1-2: Initial conditions

Parameter	Value		Comment
Test environment	NC		As specified in TS 38.508-1 [14] clause 4.1.
Test frequencies	As specified in Annex E.1.2, Table E.4-1 and TS 38.508-1 [14] clause 4.3.1.		
Channel bandwidth	As specified by the test configuration selected from Table 17.5.1.2.4.1-1		
Propagation conditions	AWGN		As specified in Annex C.2.2.
Connection Diagram	TE Part	A.3.3.3.1	As specified in TS 38.508-1 [14] Annex A.
	DUT Part	A.3.3.4.1	

Exceptions to connection diagram	N/A	

Table 17.5.1.2.4.1-3: General test parameters

Parameter			Unit	Value
				Test 1
Active PCell				Cell 1
RF Channel Number				1
Duplex mode		Config 1		TDD
$BW_{channel}$		Config 1		100: $N_{RB,c}$ = 66
Data RBs allocated		Config 1		24
DL initial BWP configuration		Config 1		DLBWP.0.1
DL dedicated BWP configuration		Config 1		DLBWP.1.1
UL initial BWP configuration		Config 1		ULBWP.0.1
UL dedicated BWP configuration		Config 1		ULBWP.1.1
TDD Configuration		Config 1		TDDConf.3.1
RMSI CORESET Reference Channel		Config 1		CR.3.1 TDD
Dedicated CORESET Reference Channel		Config 1		CCR.3.1 TDD
SSB Configuration		Config 1		SSB.1 FR2
SMTC Configuration		Config 1		SMTC.3
PDSCH/PDCCH subcarrier spacing		Config 1		120 KHz
PRACH Configuration		Config 1		PRACH.4 FR2
SSB index assigned as RLM RS		Config 1		0,1
OCNG parameters				OP.5
CP length				Normal
In sync transmission parameters	DCI format			1-0
	Number of Control OFDM symbols			2
	Aggregation level		CCE	4
	Ratio of hypothetical PDCCH RE energy to average SSS RE energy		dB	0
	Ratio of hypothetical PDCCH DMRS energy to average SSS RE energy		dB	0
	DMRS precoder granularity			REG bundle size
	REG bundle size			6
Out of sync transmission parameters	DCI format			1-0
	Number of Control OFDM symbols			2
	Aggregation level		CCE	8
	Ratio of hypothetical PDCCH RE energy to average SSS RE energy		dB	4
	Ratio of hypothetical PDCCH DMRS energy to average SSS RE energy		dB	4
	DMRS precoder granularity			REG bundle size
	REG bundle size			6
DRX				*OFF*
Gap pattern ID				N.A.
Layer 3 filtering				*Enabled*
T310 timer			ms	4000
T311 timer			ms	1000
N310				1
N311				1
CSI-RS for CSI reporting		Config 1		CSI-RS.3.1 TDD
reportConfigType				periodic
reportQuantity				cri-RI-PMI-CQI
CSI reporting periodicity			slot	40

CSI reporting offset		slot	4
TCI states for PDCCH/PDSCH			TCI.State.2
CSI-RS for tracking	Config 1		TRS.2.1 TDD
T1		s	0.2
T2		s	0.2
T3		s	1.88
T4		s	0.2
T5		s	3.84
D1		s	3.8
Note 1: All configurations are assigned to the UE prior to the start of time period T1. Note 2: UE-specific PDCCH is not transmitted after T1 starts.			

17.5.1.2.4.2 Test Procedure

Same as the test procedure given in clause 7.5.1.2.4.2.

17.5.1.2.4.3 Message Contents

Same as the message contents given in clause 7.5.1.2.4.3.

Message contents are according to TS 38.508-1 [14] clause 7.3.

17.5.1.2.5 Test Requirement

Same as the test requirements given in clause 7.5.1.2.5 with following exceptions:

- Table 7.5.1.2.5-1 is replaced by Table 17.5.1.2.5-1.

Table 17.5.1.2.5-1: Cell specific test parameters

Parameter		Unit	Test 1									
			T1	T2	T3	T4	T5	T1	T2	T3	T4	T5
AoA setup			Setup 3 defined in A.3.15									
			AoA1					AoA2				
Assumption for UE beams Note 5			Rough					Rough				
EPRE ratio of PDCCH DMRS to SSS		dB	0					Not sent				
EPRE ratio of PDCCH to PDCCH DMRS		dB										
EPRE ratio of PBCH DMRS to SSS		dB										
EPRE ratio of PBCH to PBCH DMRS		dB										
EPRE ratio of PSS to SSS		dB										
EPRE ratio of PDSCH DMRS to SSS		dB										
EPRE ratio of PDSCH to PDSCH DMRS		dB										
EPRE ratio of OCNG DMRS to SSS		dB										
EPRE ratio of OCNG to OCNG DMRS		dB										
ssb-Index 0 SNR	Config 1	dB	4.1 Note 6,7	-3.9 Note 6,7	-15	-4.5	4.1 Note 6,7	Not sent				
ssb-Index 1 SNR	Config 1		Not sent					4.1 Note 6,7	-15	-15	-15	-15
N_{oc}	Config 1	dBm/ 15kHz	-94.8 Note 7					-94.8 Note 7				

Time multiplexing of the downlink transmissions from each AoA		Defined in Figure 7.5.1.2.1-2	
Propagation condition		TDL-A 30ns 75Hz	TDL-A 30ns 75Hz

Note 1: OCNG shall be used such that a constant total transmitted power spectral density is achieved for all OFDM symbols.
Note 2: The signal contains PDCCH for UEs other than the device under test as part of OCNG.
Note 3: SNR levels correspond to the signal to noise ratio over the SSS REs.
Note 4: The SNR values are specified for testing a UE which supports 2RX on at least one band.
Note 5: Information about types of UE beam is given in B.2.1.3 and does not limit UE implementation or test system implementation.
Note 6: This value allows up to 1dB degradation from applied SNR to UE baseband
Note 7: Including test tolerance given in Annex F.

17.5.1.4 NR SA FR2 Radio Link Monitoring In-sync Test for FR2 PCell configured with SSB-based RLM RS in DRX mode

Editor's Note: This test case has been completed for the following configurations:

- Test frequency f ≤ 40.8 GHz
- UE PC3
- Normal conditions

The test is incomplete for UE power classes other than PC3 (e.g. PC7)

The test is incomplete for test frequencies > 40.8 GHz

The test is incomplete for extreme conditions

17.5.1.4.1 Test purpose

To verify that the UE properly detects the out of sync and in sync for the purpose of monitoring downlink radio link quality of the PCell. This test will partly verify the FR2 radio link monitoring requirements in 38.133[6] clause 8.1B.

17.5.1.4.2 Test applicability

This test applies to all types of NR RedCap UE from Release 17 onwards and supporting long DRX cycle.

17.5.1.4.3 Minimum conformance requirement

The minimum conformance requirements are specified in clause 17.5.1.0.1.

The normative reference for this requirement is TS 38.133 [6] clause A.17.5.1.4.

17.5.1.4.4 Test description

Same as the test description given in clause 7.5.1.4.4.

17.5.1.4.4.1 Initial conditions

Same as the initial conditions given in clause 7.5.1.4.4.1 with following exceptions:

- Table 7.5.1.4.4.1-1 is replaced by Table 17.5.1.4.4.1-1.
- Table 7.5.1.4.4.1-2 is replaced by Table 17.5.1.4.4.1-2.
- Table 7.5.1.4.4.1-3 is replaced by Table 17.5.1.4.4.1-3.

Table 17.5.1.4.4.1-1: Supported test configurations

Configuration	Description
17.5.1.4-1	TDD, SSB SCS 120 KHz, data SCS 120KHz, BW 100 MHz

Table 17.5.1.4.4.1-2: Initial conditions

Parameter	Value		Comment
Test environment	NC		As specified in TS 38.508-1 [14] clause 4.1.
Test frequencies	As specified in Annex E.1.2, Table E.4-1 and TS 38.508-1 [14] clause 4.3.1.		
Channel bandwidth	As specified by the test configuration selected from Table 17.5.1.4.4.1-1		
Propagation conditions	AWGN		As specified in Annex C.2.2.
Connection Diagram	TE Part	A.3.3.3.1	As specified in TS 38.508-1 [14] Annex A.
	DUT Part	A.3.3.4.1	
Exceptions to connection diagram	N/A		

Table 17.5.1.4.4.1-3: General test parameters

Parameter			Unit	Value
				Test 1
Active PCell				Cell 1
RF Channel Number				1
Duplex mode		Config 1		TDD
$BW_{channel}$		Config 1		100: $N_{RB,c}$ = 66
Data RBs allocated		Config 1		66
DL initial BWP configuration		Config 1		DLBWP.0.1
DL dedicated BWP configuration		Config 1		DLBWP.1.1
UL initial BWP configuration		Config 1		ULBWP.0.1
UL dedicated BWP configuration		Config 1		ULBWP.1.1
TDD Configuration		Config 1		TDDConf.3.1
RMSI CORESET Reference Channel		Config 1		CR.3.1 TDD
Dedicated CORESET Reference Channel		Config 1		CCR.3.1 TDD
SSB Configuration		Config 1		SSB.1 FR2
SMTC Configuration		Config 1		SMTC.3
PDSCH/PDCCH subcarrier spacing		Config 1		120 KHz
PRACH Configuration		Config 1		PRACH.4 FR2
SSB index assigned as RLM RS		Config 1		0,1
OCNG parameters				OP.1
CP length				Normal
In sync transmission parameters	DCI format			1-0
	Number of Control OFDM symbols			2
	Aggregation level		CCE	4
	Ratio of hypothetical PDCCH RE energy to average SSS RE energy		dB	0
	Ratio of hypothetical PDCCH DMRS energy to average SSS RE energy		dB	0
	DMRS precoder granularity			REG bundle size
	REG bundle size			6
Out of sync transmission parameters	DCI format			1-0
	Number of Control OFDM symbols			2
	Aggregation level		CCE	8
	Ratio of hypothetical PDCCH RE energy to average SSS RE energy		dB	4
	Ratio of hypothetical PDCCH DMRS energy to average SSS RE energy		dB	4
	DMRS precoder granularity			REG bundle size
	REG bundle size			6
DRX Configuration				DRX.11
Gap pattern ID				N.A.

Layer 3 filtering			*Enabled*
T310 timer		ms	4000
T311 timer		ms	1000
N310			1
N311			1
CSI-RS for CSI reporting	Config 1		CSI-RS.3.1 TDD
reportConfigType			periodic
reportQuantity			cri-RI-PMI-CQI
CSI reporting periodicity		slot	40
CSI reporting offset		slot	4
TCI states for PDCCH/PDSCH			TCI.State.2
CSI-RS for tracking	Config 1		TRS.2.1 TDD
T1		s	0.2
T2		s	0.2
T3		s	2.8
T4		s	0.2
T5		s	3.88
D1		s	3.84
Note 1: All configurations are assigned to the UE prior to the start of time period T1. Note 2: UE-specific PDCCH is not transmitted after T1 starts.			

17.5.1.4.4.2 Test Procedure

Same as the test procedure given in clause 7.5.1.4.4.2.

17.5.1.4.4.3 Message Contents

Same as the message contents given in clause 7.5.1.4.4.3.

Message contents are according to TS 38.508-1 [14] clause 7.3.

17.5.1.4.5 Test Requirement

Same as the test requirements given in clause 7.5.1.4.5 with following exceptions:

- Table 7.5.1.4.5-1 is replaced by Table 17.5.1.4.5-1.

Table 17.5.1.4.5-1: Cell specific test parameters

Parameter		Unit	Test 1				
			T1	T2	T3	T4	T5
AoA setup			Setup 1				
Assumption for UE beams Note 5			Rough				
EPRE ratio of PDCCH DMRS to SSS		dB	0				
EPRE ratio of PDCCH to PDCCH DMRS		dB	0				
EPRE ratio of PBCH DMRS to SSS		dB	0				
EPRE ratio of PBCH to PBCH DMRS		dB					
EPRE ratio of PSS to SSS		dB					
EPRE ratio of PDSCH DMRS to SSS		dB					
EPRE ratio of PDSCH to PDSCH DMRS		dB					
EPRE ratio of OCNG DMRS to SSS		dB					
EPRE ratio of OCNG to OCNG DMRS		dB					
ssb-Index 0 SNR	Config 1	dB	3.3 Note 6,7	-4.7 Note 6,7	-15.4 Note 7	-4.9 Note 7	3.3 Note 6,7
ssb-Index 1 SNR	Config 1		3.3 Note 6,7	-15.4 Note 7	-15.4 Note 7	-15.4 Note 7	-15.4 Note 7
N_{oc}	Config 1	dBm/15KHz	-104.7				
Propagation condition			TDL-A 30ns 75Hz				

Note 1:	OCNG shall be used such that the resources in Cell 1 are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.
Note 2:	The signal contains PDCCH for UEs other than the device under test as part of OCNG.3
Note 3:	SNR levels correspond to the signal to noise ratio over the SSS REs.
Note 4:	The SNR values are specified for testing a UE which supports 2RX on at least one band.
Note 5:	Information about types of UE beam is given in B.2.1.3 and does not limit UE implementation or test system implementation.
Note 6:	This value allows up to 1dB degradation from applied SNR to UE baseband.
Note 7:	Including the test tolerance given in Annex F.

17.5.1.9 NR SA FR2 radio link monitoring UE scheduling restrictions

Editor's note: This test case is incomplete. The following aspects are either missing or not yet determined:

- MU and TT analysis is still missing.
- Message content is TBD

17.5.1.9.1 Test purpose

To verify that the NR UE correctly follows the RLM scheduling restrictions requirements defined in 38.133 [6] clause 8.1B.7. This test verifies that the UE correctly receive the PDCCH scheduled on the symbols right before the RLM SSB symbols without overlap so that it sends ACK/NACK correctly.

17.5.1.9.2 Test applicability

This test applies to all types of NR RedCap UEs from Release 17 onwards supporting *pdcch-MonitoringAnyOccasions* or *pdcch-MonitoringAnyOccasionsWithSpanGap*.

17.5.1.9.3 Minimum conformance requirement

The minimum conformance requirements are specified in clause 17.5.1.0.1.

The normative reference for this requirement is TS 38.133 [6] clause A.17.5.1.9.

17.5.1.9.4 Test description

Same as the test description given in clause 7.5.1.9.4.

17.5.1.9.4.1 Initial conditions

Same as the initial conditions given in clause 7.5.1.9.4.1 with following exceptions:

- Table 7.5.1.9.4.1-1 is replaced by Table 17.5.1.9.4.1-1.
- Table 7.5.1.9.4.1-2 is replaced by Table 17.5.1.9.4.1-2.
- Table 7.5.1.9.4.1-3 is replaced by Table 17.5.1.9.4.1-3.

Table 17.5.1.9.4.1-1: Supported test configurations

Configuration	Description
17.5.1.9-1	120 kHz SSB SCS, 120 kHz RMC SCS, 100 MHz bandwidth, TDD duplex mode

Table 17.5.1.9.4.1-2: Initial conditions

Parameter	Value	Comment
Test environment	NC	As specified in TS 38.508-1 [14] clause 4.1.
Test frequencies	As specified in Annex E.1.2, Table E.15-1 and TS 38.508-1 [14] clause 4.3.1.	
Channel bandwidth	As specified by the test configuration selected from Table 17.5.1.9.4.1-1	

Propagation conditions	AWGN		As specified in Annex C.2.2.
Connection Diagram	TE Part	A.3.3.3.1	As specified in TS 38.508-1 [14] Annex A.
	DUT Part	A.3.3.4.1	
Exceptions to connection diagram	N/A		

Table 17.5.1.9.4.1-3: General test parameters

Parameter	Unit	Value	Comment
RF Channel Number		1	
SSB configuration		SSB.1 FR2	
SMTC configuration		SMTC.1	
DRX cycle length	s	OFF	
T1	s	5	During T1 the UE is required to correctly transmit ACK/NACK

17.5.1.9.4.2 Test Procedure

Same as the test procedure given in clause 7.5.1.9.4.2.

17.5.1.9.4.3 Message Contents

Same as the message contents given in clause 7.5.1.9.4.3.

17.5.1.9.5 Test Requirement

Same as the test requirements given in clause 7.5.1.9.5 with following exceptions:

- Table 7.5.1.9.5-1 is replaced by Table 17.5.1.9.5-1.

Table 17.5.1.9.5-1: Cell specific test parameters

Parameter	Unit	Cell 1	
AoA setup		Setup 3	
		AoA1	AoA2
Assumption for UE beams Note 1		Rough	Rough
TDD configuration		TDDConf.3.1	
$BW_{channel}$	MHz	100: $N_{RB,c}$ = 66	
Data RBs allocated		24	
PDSCH Reference measurement channel		SR.3.2 TDD	Not sent
RMSI CORESET RMC configuration		CR.3.1 TDD	Not sent
Dedicated CORESET RMC configuration		CCR.3.2 TDD	Not sent
TRS configuration		TRS.2.1 TDD	TRS.2.2 TDD
PDCCH/PDSCH TCI state		TCI.State.2	N/A
OCNG Pattern		OP.5	Not sent
Initial DL BWP configuration		DLBWP.0.1	
Initial UL BWP configuration		ULBWP.0.1	
RLM-RS		SSB with index 0	SSB with index 1
N_{oc}	dBm/15kHz	-92.1	-92.1
N_{oc} Note2	dBm/SCS	-83.1	-83.1
$\hat{E}_s / N_{oc}$	dB	2	2
$\hat{E}_s / I_{ot}$ BB Note 4	dB	1	1
SSB_RP Note3	dBm/SCS	-81.1	-81.1
Io	dBm/95.04 MHz	-54.35	-54.35
Time multiplexing of the downlink transmissions from each AoA		Defined in Figure A.7.5.1.9.1-1	

Propagation Condition		AWGN	AWGN

Note 1: Information about types of UE beam is given in B.2.1.3 and does not limit UE implementation or test system implementation.

Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for N_{oc} to be fulfilled.

Note 3: Es/Iot, SSB_RP and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.

Note 4: Calculation of Es/Iot_{BB} includes the effect of UE internal noise up to the value assumed for the associated Refsens requirement in clause 7.3.2 of TS 38.101-2 [19], and an allowance of 1dB for UE multi-band relaxation factor ΔMB_S from TS 38.101-2 [19] Table 6.2.1.3-4.

17.5.2 Beam Failure Detection and Link recovery procedures for RedCap

17.5.2.0 Minimum conformance requirements

17.5.2.0.1 Minimum conformance requirements for SSB-based BFD and link recovery procedures

The minimum requirements given in clause 5.5.5.0.1 applies.

The normative reference for this requirement is TS 38.133 [6] clause 8.5B.1, 8.5B.2, 8.5B.4, 8.5B.5 and 8.5B.9

17.5.2.0.2 Minimum conformance requirements for CSI-RS-based BFD and link recovery procedures

The minimum requirements given in clause 5.5.5.0.2 applies.

The normative reference for this requirement is TS 38.133 [6] clause 8.5B.1, 8.5B.3, 8.5B.4, 8.5B.6, 8.5B.9

17.5.2.0.3 Scheduling availability of UE during beam failure detection and candidate beam detection

The minimum requirements given in clause 5.5.5.0.3 applies.

The normative reference for this requirement is TS 38.133 [6] clause 8.5B.1, 8.5B.2, 8.5B.4, 8.5B.5, 8.5B.7, 8.5B.8 and 8.5B.9

17.5.2.1 – 17.5.2.2

17.5.2.3 NR SA FR2 Beam Failure Detection and Link Recovery Test for FR2 PCell configured with CSI-RS-based BFD and LR in non-DRX mode

Editor's Note: This test case is incomplete for the following configurations:

- MU and TT analysis is still missing.

17.5.2.3.1 Test purpose

To verify that the UE properly detects CSI-RS-based beam failure in the set q_0 configured for a serving cell and that the UE performs correct CSI-RS-based link recovery based on beam candidate set q_1. The purpose is to test the downlink monitoring for beam failure detection within the UEs active DL BWP, during the evaluation period, and link recovery, when no DRX is used. This test will partly verify the CSI-RS based beam failure detection and link recovery for an FR2 serving cell requirements in TS 38.133 [6] clause 8.5B.

17.5.2.3.2 Test applicability

This test applies to all types of NR RedCap UEs from Release 17 onwards supporting CSI-RS-based RLM and link recovery.

17.5.2.3.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 17.5.2.0.2.

The normative reference for this requirement is TS 38.133 [6] clause A.17.5.2.3.

17.5.2.3.4 Test description

Same as the test description given in clause 7.5.5.3.4.

17.5.2.3.4.1 Initial conditions

Same as the initial conditions given in clause 7.5.5.3.4.1 with following exceptions:

- Table 7.5.5.3.4.1-1 is replaced by Table 17.5.2.3.4.1-1.
- Table 7.5.5.3.4.1-2 is replaced by Table 17.5.2.3.4.1-2.
- Table 7.5.5.3.4.1-3 is replaced by Table 17.5.2.3.4.1-3.

Table 17.5.2.3.4.1-1: Supported test configurations

Configuration	Description
17.5.2.3-1	TDD duplex mode, 120 kHz SSB SCS, 100 MHz bandwidth

Table 17.5.2.3.4.1-2: Initial conditions

Parameter	Value		Comment
Test environment	NC		As specified in TS 38.508-1 [14] clause 4.1.
Test frequencies	As specified in Annex E, table E.15-1 and TS 38.508-1 [14] clause 4.3.1 and 4.4.2.		
Channel bandwidth	As specified by the test configuration selected from Table 17.5.2.3.4.1-1.		
Propagation conditions	Multi-path fading		As specified in Annex C.2.3.
Connection Diagram	TE Part	A.3.3.1.1	As specified in TS 38.508-1 [14] Annex A.
	DUT Part	A.3.4.1.1	
Exceptions to connection diagram	N/A		

Table 17.5.2.3.4.1-3: General test parameters

Parameter	Unit	Value	Comment
		Test 1	
Active PCell		Cell 1	
RF Channel Number		1	
Duplex mode		TDD	
TDD Configuration		TDDConf.3.1	
$BW_{channel}$		100: $N_{RB,c}$ = 66	
Data RBs allocated		66	
PDSCH/PDCCH subcarrier spacing	kHz	120	
DL initial BWP configuration		DLBWP.0.1	
DL dedicated BWP configuration		DLBWP.1.1	
UL initial BWP configuration		ULBWP.0.1	
UL dedicated BWP configuration		ULBWP.1.1	
PDSCH Reference Channel		SR.3.2 TDD	
RMSI CORESET Reference Channel		CR.3.1 TDD	

Dedicated CORESET Reference Channel			CCR.3.1 TDD	
OCNG parameters			OP.1	
CP length			Normal	
PDSCH/PDCCH TCI state			TCI.State.0	
CSI-RS for tracking			TRS.2.1 TDD	
SSB Configuration			SSB.1 FR2	
SMTC Configuration			SMTC.3	
PRACH Configuration			PRACH.4 FR2	A.3.8.3.4
DRX configuration			OFF	
CSI-RS configuration for BFD/CBD/RLM			CSI-RS.3.2 TDD	A.3.14.2
CSI-RS index assigned as BFD RS (q_0)			0	
CSI-RS index assigned as CBD RS (q_1)			1	
CSI-RS index assigned as RLM RS			0,1	
Beam failure detection transmission parameters	DCI format		1-0	
	Number of Control OFDM symbols		2	
	Aggregation level	CCE	8	
	Ratio of hypothetical PDCCH RE energy to average SSS RE energy	dB	0	
	Ratio of hypothetical PDCCH DMRS energy to average SSS RE energy	dB	0	
	DMRS precoder granularity		REG bundle size	
	REG bundle size		6	
Gap pattern ID			N/A	
rlmInSyncOutOfSyncThreshold			absent	Value 0 is applied. (Table 8.1.1-1).
rsrp-ThresholdSSB		dBm/ SCS	-109	Threshold used for $Q_{in_LR_SSB}$
powerControlOffsetSS			db0	Used for deriving rsrp-ThresholdCSI-RS
beamFailureInstanceMaxCount			n1	see TS 38.321 [7], clause 5.17
beamFailureDetectionTimer			pbfd4	see TS 38.321 [7], clause 5.17
CSI-RS configuration for CSI reporting			CSI-RS.3.1 TDD	A.3.14.2
reportConfigType			periodic	
reportQuantity			cri-RI-PMI-CQI	
CSI reporting periodicity		slot	40	
CSI reporting offset		slot	4	
T310		ms	1000	
N310			2	
T1		s	1	The UE shall be fully synchronized to cell 1 during T1
T2		s	1.17	
T3		s	0.9	
T4		s	0	
T5		s	0.31	
D1		s	0.27	
Note 1: UE-specific PDCCH is not transmitted after T1 starts.				

17.5.2.3.4.2 Test procedure

Same as the test procedure given in clause 7.5.5.3.4.2.

17.5.2.3.4.3 Message contents

Same as the message contents given in clause 7.5.5.3.4.3.

17.5.2.3.5 Test requirement

Same as the test requirements given in clause 7.5.5.3.5 with following exceptions:

- Table 7.5.5.3.5-1 is replaced by Table 17.5.2.3.5-1.

Table 17.5.2.3.5-1: NR Cell specific test parameters

Parameter	Unit	Test 1				
		T1	T2	T3	T4	T5
AoA setup		Setup 1 defined in A.9				
Assumption for UE beams Note 9		Rough				
EPRE ratio of PDCCH DMRS to SSS	dB	0				
EPRE ratio of PDCCH to PDCCH DMRS	dB					
EPRE ratio of PBCH DMRS to SSS	dB					
EPRE ratio of PBCH to PBCH DMRS	dB					
EPRE ratio of PSS to SSS	dB					
EPRE ratio of PDSCH DMRS to SSS	dB					
EPRE ratio of PDSCH to PDSCH DMRS	dB					
EPRE ratio of OCNG DMRS to SSS	dB					
EPRE ratio of OCNG to OCNG DMRS	dB					
SNR_CSI-RS of set q_0	dB	5 Note 10	5 Note 10	-12	-12	-12
SNR_CSI-RS of set q_1	dB	0.2	0.2	20.2	20.2	20.2
CSI-RS_RP of set q_1	dBm/SCS	-104.5	-104.5	-84.5	-84.5	-84.5
N_{oc}	dBm/ 120 KHz	-104.7				
Propagation condition		TDL-A 30ns 75Hz				

Note 1: OCNG shall be used such that the resources in Cell 1 are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.
Note 2: The uplink resources for CSI reporting are assigned to the UE prior to the start of time period T1.
Note 3: NZP CSI-RS resource set configuration for CSI reporting are assigned to the UE prior to the start of time period T1.
Note 4: The timers and layer 3 filtering related parameters are configured prior to the start of time period T1.
Note 5: The signal contains PDCCH for UEs other than the device under test as part of OCNG.
Note 6: SNR levels correspond to the signal to noise ratio over the REs carrying CSI-RS.
Note 7: The SNR in time periods T1, T2, T3, T4 and T5 is denoted as SNR1, SNR2 and SNR3 respectively in figure 7.5.5.3.4-1.
Note 8: The SNR values are specified for testing a UE which supports 2RX on at least one band.
Note 9: Information about types of UE beam is given in TS 38.133 [6] clause B.2.1.3 and does not limit UE implementation or test system implementation.
Note 10: This value allows up to 1dB degradation from applied SNR to UE baseband.

17.5.2.4 NR SA FR2 Beam Failure Detection and Link Recovery Test for FR2 PCell configured with CSI-RS-based BFD and LR in DRX mode

Editor's Note: This test case is incomplete for the following configurations:

- MU and TT analysis is still missing.

17.5.2.4.1 Test purpose

To verify that the UE properly detects CSI-RS-based beam failure in the set q_0 configured for a serving cell and that the UE performs correct CSI-RS-based link recovery based on beam candidate set q_1. The purpose is to test the downlink monitoring for beam failure detection within the UEs active DL BWP, during the evaluation period, and link recovery, when DRX is used. This test will partly verify the CSI-RS based beam failure detection and link recovery for an FR2 serving cell requirements in TS 38.133 [6] clause 8.5B.

17.5.2.4.2 Test applicability

This test applies to all types of NR RedCap UEs from Release 17 onwards supporting CSI-RS-based RLM, long DRX cycle and link recovery.

17.5.2.4.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 17.5.2.0.2.

The normative reference for this requirement is TS 38.133 [6] clause A.17.5.2.4.

17.5.2.4.4 Test description

Same as the test description given in clause 7.5.5.4.4.

17.5.2.4.4.1 Initial conditions

Same as the initial conditions given in clause 7.5.5.4.4.1 with following exceptions:

- Table 7.5.5.4.4.1-1 is replaced by Table 17.5.2.4.4.1-1.
- Table 7.5.5.4.4.1-2 is replaced by Table 17.5.2.4.4.1-2.
- Table 7.5.5.4.4.1-3 is replaced by Table 17.5.2.4.4.1-3.

Table 17.5.2.4.4.1-1: Supported test configurations

Configuration	Description
17.5.2.4-1	TDD duplex mode, 120 kHz SSB SCS, 100 MHz bandwidth

Table 17.5.2.4.4.1-2: Initial conditions

Parameter	Value		Comment
Test environment	NC		As specified in TS 38.508-1 [14] clause 4.1.
Test frequencies	As specified in Annex E, table E.15-1 and TS 38.508-1 [14] clause 4.3.1 and 4.4.2.		
Channel bandwidth	As specified by the test configuration selected from Table 17.5.2.4.4.1-1.		
Propagation conditions	Multi-path fading		As specified in Annex C.2.3.
Connection Diagram	TE Part	A.3.3.1.1	As specified in TS 38.508-1 [14] Annex A.
	DUT Part	A.3.4.1.1	
Exceptions to connection diagram	N/A		

Table 17.5.2.4.4.1-3: General test parameters

Parameter	Unit	Value	Comment
		Test 1	
Active PCell		Cell 1	
RF Channel Number		1	
Duplex mode		TDD	
TDD Configuration		TDDConf.3.1	
$BW_{channel}$		100: $N_{RB,c}$ = 66	
Data RBs allocated		66	
PDSCH/PDCCH subcarrier spacing	kHz	120	
DL initial BWP configuration		DLBWP.0.1	
DL dedicated BWP configuration		DLBWP.1.1	
UL initial BWP configuration		ULBWP.0.1	
UL dedicated BWP configuration		ULBWP.1.1	
PDSCH Reference Channel		SR.3.2 TDD	
RMSI CORESET Reference Channel		CR.3.1 TDD	
Dedicated CORESET Reference Channel		CCR.3.1 TDD	
OCNG parameters		OP.1	
CP length		Normal	
PDSCH/PDCCH TCI state		TCI.State.0	
CSI-RS for tracking		TRS.2.1 TDD	

SSB Configuration			SSB.1 FR2	
SMTC Configuration			SMTC.3	
PRACH Configuration			PRACH.4 FR2	A.3.8.3.4
DRX configuration			DRX.3	
CSI-RS configuration for BFD/CBD/RLM			CSI-RS.3.2 TDD	A.3.14.2
CSI-RS index assigned as BFD RS (q_0)			0	
CSI-RS index assigned as CBD RS (q_1)			1	
CSI-RS index assigned as RLM RS			0,1	
Beam failure detection transmission parameters	DCI format		1-0	
	Number of Control OFDM symbols		2	
	Aggregation level	CCE	8	
	Ratio of hypothetical PDCCH RE energy to average SSS RE energy	dB	0	
	Ratio of hypothetical PDCCH DMRS energy to average SSS RE energy	dB	0	
	DMRS precoder granularity		REG bundle size	
	REG bundle size		6	
Gap pattern ID			N/A	
rlmInSyncOutOfSyncThreshold			absent	Value 0 is applied. (Table 8.1.1-1).
rsrp-ThresholdSSB		dBm/ SCS	-109	Threshold used for $Q_{in_LR_SSB}$
powerControlOffsetSS			db0	Used for deriving rsrp-ThresholdCSI-RS
beamFailureInstanceMaxCount			n1	see TS 38.321 [7], clause 5.17
beamFailureDetectionTimer			pbfd4	see TS 38.321 [7], clause 5.17
CSI-RS configuration for CSI reporting			CSI-RS.3.1 TDD	A.3.14.2
reportConfigType			periodic	
reportQuantity			cri-RI-PMI-CQI	
CSI reporting periodicity		slot	40	
CSI reporting offset		slot	4	
T310		ms	1000	
N310			2	
T1		s	1	The UE shall be fully synchronized to cell 1 during T1
T2		s	5.43	
T3		s	5.16	
T4		s	0	
T5		s	0.31	
D1		s	0.27	
Note 1: UE-specific PDCCH is not transmitted after T1 starts.				

17.5.2.4.4.2 Test procedure

Same as the test procedure given in clause 7.5.5.4.4.2.

17.5.2.4.4.3 Message contents

Same as the message contents given in clause 7.5.5.4.4.3.

17.5.2.4.5 Test requirement

Same as the test requirements given in clause 7.5.5.4.5 with following exceptions:

- Table 7.5.5.4.5-1 is replaced by Table 17.5.2.4.5-1.

Table 17.5.2.4.5-1: NR Cell specific test parameters

Parameter	Unit	Test 1				
		T1	T2	T3	T4	T5
AoA setup		Setup 1 defined in A.9				
Assumption for UE beams Note 9		Rough				
EPRE ratio of PDCCH DMRS to SSS	dB	0				
EPRE ratio of PDCCH to PDCCH DMRS	dB					
EPRE ratio of PBCH DMRS to SSS	dB					
EPRE ratio of PBCH to PBCH DMRS	dB					
EPRE ratio of PSS to SSS	dB					
EPRE ratio of PDSCH DMRS to SSS	dB					
EPRE ratio of PDSCH to PDSCH DMRS	dB					
EPRE ratio of OCNG DMRS to SSS	dB					
EPRE ratio of OCNG to OCNG DMRS	dB					
SNR_CSI-RS of set q_0	dB	5 Note 10	5 Note 10	-12	-12	-12
SNR_CSI-RS of set q_1	dB	0.2	0.2	20.2	20.2	20.2
CSI-RS_RP of set q_1	dBm/SCS	-104.5	-104.5	-84.7[5]	-84.5	-84.5
N_{oc}	dBm/ 120 KHz	-104.7				
Propagation condition		TDL-A 30ns 75Hz				

Note 1: OCNG shall be used such that the resources in Cell 1 are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.
Note 2: The uplink resources for CSI reporting are assigned to the UE prior to the start of time period T1.
Note 3: NZP CSI-RS resource set configuration for CSI reporting are assigned to the UE prior to the start of time period T1.
Note 4: The timers and layer 3 filtering related parameters are configured prior to the start of time period T1.
Note 5: The signal contains PDCCH for UEs other than the device under test as part of OCNG.
Note 6: SNR levels correspond to the signal to noise ratio over the REs carrying CSI-RS.
Note 7: The SNR in time periods T1, T2, T3, T4 and T5 is denoted as SNR1, SNR2 and SNR3 respectively in figure 7.5.5.4.4-1.
Note 8: The SNR values are specified for testing a UE which supports 2RX on at least one band.
Note 9: Information about types of UE beam is given in TS 38.133 [6] clause B.2.1.3 and does not limit UE implementation or test system implementation.
Note 10: This value allows up to 1dB degradation from applied SNR to UE baseband.

17.5.2.5 NR SA FR2 Scheduling availability restriction during Beam Failure Detection and Link Recovery for FR2 PCell configured with SSB-based BFD and LR in non-DRX mode

Editor's Note: This test case is incomplete in following aspects:

-MU & TT analysis is still missing.

17.5.2.5.1 Test purpose

To test scheduling availability restrictions when the UE is performing beam failure detection or when the UE is performing L1-RSRP measurement for candidate beam detection, when no DRX is used. This test will verify the scheduling availability restriction requirements in 38.133 [6] clause 8.5B.7 and 8.5B.8.

17.5.2.5.2 Test applicability

This test applies to all types of NR RedCap UEs from Release 17 onwards supporting link recovery.

17.5.2.5.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 17.5.2.0.3.

The normative reference for this requirement is TS 38.133 [6] clause A.17.5.2.5.

17.5.2.5.4 Test description

Same as the test description given in clause 7.5.5.5.4.

17.5.2.5.4.1 Initial conditions

Same as the initial conditions given in clause 7.5.2.5.4.1 with following exceptions:

- Table 7.5.5.5.4.1-1 is replaced by Table 17.5.2.5.4.1-1.
- Table 7.5.5.5.4.1-2 is replaced by Table 17.5.2.5.4.1-2.
- Table 7.5.5.5.4.1-3 is replaced by Table 17.5.2.5.4.1-3.

Table 17.5.2.5.4.1-1: Supported test configurations

Configuration	Description
17.5.2.5-1	TDD duplex mode, 120 kHz SSB SCS, 100 MHz bandwidth
17.5.2.5-2	TDD duplex mode, 240 kHz SSB SCS, 100 MHz bandwidth

Table 17.5.2.5.4.1-2: Initial conditions

Parameter	Value		Comment
Test environment	NC		As specified in TS 38.508-1 [14] clause 4.1.
Test frequencies	As specified in Annex E, table E.15-1 and TS 38.508-1 [14] clause 4.3.1 and 4.4.2.		
Channel bandwidth	As specified by the test configuration selected from Table 17.5.2.5.4.1-1.		
Propagation conditions	Multi-path fading		As specified in Annex C.2.3.
Connection Diagram	TE Part	A.3.3.1.1	As specified in TS 38.508-1 [14] Annex A.
	DUT Part	A.3.4.1.1	
Exceptions to connection diagram	N/A		

Table 17.5.2.5.4.1-3: General test parameters

Parameter		Unit	Value	Comment
			Test 1	
Active PCell			Cell 1	
RF Channel Number			1	
Duplex mode			TDD	
TDD Configuration			TDDConf.3.1	Table A.1.5-3
$BW_{channel}$		MHz	100: $N_{RB,c}$ = 66	
Data RBs allocated			66	
PDSCH/PDCCH subcarrier spacing		kHz	120	
DL initial BWP configuration			DLBWP.0.1	Table A.8.1-1
DL dedicated BWP configuration			DLBWP.1.1	Table A.8.1-2
UL initial BWP configuration			ULBWP.0.1	Table A.8.2-1
UL dedicated BWP configuration			ULBWP.1.1	Table A.8.2-2
PDSCH Reference Channel	Config 1		SR.3.2 TDD	Table A.1.1.2-3
	Config 2		SR.3.3 TDD	
RMSI CORESET Reference Channel	Config 1		CR.3.1 TDD	Table A.1.2.2-3
	Config 2		CR.3.2 TDD	
Dedicated CORESET Reference Channel	Config 1		CCR.3.1 TDD	Table A.1.3.2-3
	Config 2		CCR.3.7 TDD	
OCNG parameters			OP.1	Table A.2.1-1
CP length			Normal	
PDSCH/PDCCH TCI state			TCI.State.0	Table A.10.2-1
CSI-RS for tracking			TRS.2.1 TDD	
SSB Configuration	Config 1		SSB.1 FR2	Table A.3.2-1
	Config 2		SSB.2 FR2	

SMTC Configuration			SMTC.1	Table A.4-1
PRACH Configuration			PRACH.2 FR2	Table A.7.2-1
DRX configuration			OFF	
SSB index assigned as BFD RS (q_0)			0	
SSB index assigned as CBD RS (q_1)			1	
Beam failure detection transmission parameters	DCI format		1-0	
	Number of Control OFDM symbols		2	
	Aggregation level	CCE	8	
	Ratio of hypothetical PDCCH RE energy to average SSS RE energy	dB	0	
	Ratio of hypothetical PDCCH DMRS energy to average SSS RE energy	dB	0	
	DMRS precoder granularity		REG bundle size	
	REG bundle size		6	
Gap pattern ID			N/A	
rlmInSyncOutOfSyncThreshold			absent	Value 0 is applied. (TS 38.133 [6] Table 8.1.1-1).
rsrp-ThresholdSSB	Config 1	dBm/SCS	-109	Threshold used for $Q_{in_LR_SSB}$
	Config 2		-106	
powerControlOffsetSS			db0	Used for deriving rsrp-ThresholdCSI-RS
beamFailureInstanceMaxCount			n1	see TS 38.321 [12], clause 5.17
beamFailureDetectionTimer			pbfd4	see TS 38.321 [12], clause 5.17
CSI-RS configuration for CSI reporting			CSI-RS.3.1 TDD	Table A.1.4.2-3
reportConfigType			periodic	
reportQuantity			cri-RI-PMI-CQI	
CSI reporting periodicity		slot	40	
CSI reporting offset		slot	4	
T310		ms	1000	
N310			2	
T1		s	1	The UE shall be fully synchronized to cell 1 during T1
T2		s	2.6	
T3		s	1.64	
T4		s	0	
T5		s	1.01	
D1		s	0.97	
Note 1: All configurations are assigned to the UE prior to the start of time period T1. Note 2: UE-specific PDCCH is not transmitted after T1 starts.				

17.5.2.5.4.2 Test procedure

Same as the test procedure given in clause 7.5.5.5.4.2.

17.5.2.5.4.3 Message contents

Same as the message contents given in clause 7.5.5.5.4.3.

17.5.2.5.5 Test requirement

Same as the test requirements given in clause 7.5.5.5.5 with following exceptions:

- Table 7.5.5.5.5-1 is replaced by Table 17.5.2.5.5-1.

Table 17.5.2.5.5-1: NR Cell specific test parameters

Parameter		Unit	Test 1				
			T1	T2	T3	T4	T5
AoA setup			Setup 1 defined in A.9				
Assumption for UE beams Note 9			Rough				
EPRE ratio of PDCCH DMRS to SSS		dB	0				
EPRE ratio of PDCCH to PDCCH DMRS		dB					
EPRE ratio of PBCH DMRS to SSS		dB					
EPRE ratio of PBCH to PBCH DMRS		dB					
EPRE ratio of PSS to SSS		dB					
EPRE ratio of PDSCH DMRS to SSS		dB					
EPRE ratio of PDSCH to PDSCH DMRS		dB					
EPRE ratio of OCNG DMRS to SSS		dB					
EPRE ratio of OCNG to OCNG DMRS		dB					
SNR_SSB of set q_0		dB	5 Note 10	-3 Note 10	-12	-12	-12
SNR_SSB of set q_1		dB	0.2	0.2	20.2	20.2	20.2
SSB_RP of set q_1	Config 1	dBm/ SCS	-104.5	-104.5	-84.5	-84.5	-84.5
	Config 2		-101.5	-101.5	-81.5	-81.5	-81.5
N_{oc}		dBm/ 120 KHz	-104.7				
Propagation condition			TDL-A 30ns 75Hz				

Note 1: OCNG shall be used such that the resources in Cell 1 are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.
Note 2: The uplink resources for CSI reporting are assigned to the UE prior to the start of time period T1.
Note 3: NZP CSI-RS resource set configuration for CSI reporting are assigned to the UE prior to the start of time period T1.
Note 4: The timers and layer 3 filtering related parameters are configured prior to the start of time period T1.
Note 5: The signal contains PDCCH for UEs other than the device under test as part of OCNG.
Note 6: SNR levels correspond to the signal to noise ratio over the REs carrying CSI-RS.
Note 7: The SNR in time periods T1, T2, T3, T4 and T5 is denoted as SNR1, SNR2 and SNR3 respectively in figure 7.5.5.5.4-1.
Note 8: The SNR values are specified for testing a UE which supports 2RX on at least one band.
Note 9: Information about types of UE beam is given in TS 38.133 [6] clause B.2.1.3 and does not limit UE implementation or test system implementation.
Note 10: This value allows up to 1dB degradation from applied SNR to UE baseband.

17.6 Measurement procedures for RedCap

17.6.1 Intra-frequency measurements for RedCap

17.6.1.0 Minimum conformance requirements

17.6.1.0.1 General

A measurement is defined as a SSB based intra-frequency measurement provided the centre frequency of the reference SSB of the serving cell and the centre frequency of the SSB of the neighbour cell are the same, and the subcarrier spacing of the two SSBs are also the same. The reference SSB is the SSB defined in BWP-specific *servingCellMO* under *BWP-DownlinkDedicated* of active DL BWP. If the field is absent, the reference SSB is the SSB defined in *servingCellMO* under *ServingCellConfig*.

The UE shall be able to identify new intra-frequency cells and perform SS-RSRP, SS-RSRQ, and SS-SINR measurements of identified intra-frequency cells if carrier frequency information is provided by PCell, even if no explicit neighbour list with physical layer cell identities is provided.

The UE can perform intra-frequency SSB based measurements without measurement gaps if

- the SSB is completely contained in the active BWP of the UE, or
- the active downlink BWP is initial BWP [3].

For intra-frequency SSB based measurements without measurement gaps, UE may cause scheduling restriction as specified in 38.133 [6] clause 9.2B.5.3.

SSB based measurements are configured along with one or two measurement timing configuration(s) (SMTC(s)) which provides periodicity, duration and offset information on a window of up to 5ms where the measurements are to be performed. For intra-frequency connected mode measurements, up to two measurement window periodicities may be configured. A single measurement window offset and measurement duration are configured per intra-frequency measurement object.

When measurement gaps are needed, the UE is not expected to detect SSB which start earlier than the gap starting time + switching time, nor detect SSB which end later than the gap end – switching time. Switching time is 0.5ms for frequency range FR1.

The requirements in this clause apply, provided:

- The cell being identified or measured is detectable.

An intra-frequency cell shall be considered detectable when for each relevant SSB:

- For 2Rx RedCap:
  - SS-RSRP related side conditions given in 38.133 [6] clauses 10.1.2 and 10.1.3 for FR1 and FR2, respectively, for a corresponding Band,
  - SS-RSRQ related side conditions given in 38.133 [6] clauses 10.1.7 and 10.1.8 for FR1 and FR2, respectively, for a corresponding Band,
  - SS-SINR related side conditions given in 38.133 [6] clauses 10.1.12 and 10.1.13 for FR1 and FR2, respectively, for a corresponding Band,
  - SSB_RP and SSB Ês/Iot according to Annex B.2.2 for a corresponding Band.

For 2Rx RedCap: The requirements in 38.133 [6] clause 9.2.4.3 shall apply.

The UE shall not send any event triggered measurement reports as long as no reporting criteria are fulfilled.

The measurement reporting delay is defined as the time between an event that will trigger a measurement report and the point when the UE starts to transmit the measurement report over the air interface. This requirement assumes that the measurement report is not delayed by other RRC signalling on the DCCH. This measurement reporting delay excludes a delay uncertainty resulted when inserting the measurement report to the TTI of the uplink DCCH. The delay uncertainty is: 2 x TTI_{DCCH}. This measurement reporting delay excludes a delay which caused by no UL resources being available for UE to send the measurement report on.

The event triggered measurement reporting delay, measured without L3 filtering shall be less than $T_{identify\ intra\ without\ index_RedCap}$ defined in clause 17.6.1.0.2 or clause 17.6.1.0.3. When L3 filtering is used an additional delay can be expected.

A cell is detectable only if at least one SSBs measured from the Cell being configured remains detectable during the time period $T_{identify_intra_without_index_RedCap}$ as defined in clause 17.6.1.0.2 or clause 17.6.1.0.3. If a cell which has been detectable at least for the time period $T_{identify\ intra\ without\ index_RedCap}$ defined in clause 17.6.1.0.2 or clause 17.6.1.0.3 becomes undetectable for a period ≤ 5 seconds and then the cell becomes detectable again with the same spatial reception parameter and triggers an event, the event triggered measurement reporting delay shall be less than $T_{SSB_measurement_period_intra_RedCap}$ provided the timing to that cell has not changed more than $\pm 3200/2^{\mu} T_c$ while the measurement gap has not been available and L3 filtering has not been used, where μ is the SCS configuration as defined in clause 4.2 of TS 38.211 [3]. When L3 filtering is used, an additional delay can be expected.

The normative reference for this requirement is TS 38.133 [6] clauses 9.2B.1 and 9.2B.4.3.

17.6.1.0.2 Minimum conformance requirements for event-triggered measurement without gap

The UE shall be able to identify a new detectable intra-frequency cell within $T_{identify_intra_without_index_RedCap}$ if the UE is not indicated to report SSB based RRM measurement result with the associated SSB index(*reportQuantityRsIndexes* or *maxNrofRSIndexesToReport* is not configured), or the UE is indicated that the neighbour cell is synchronous with the serving cell (*deriveSSB-IndexFromCell* is enabled). The UE shall be able to identify a new detectable intra frequency

SS block of an already detected cell within $T_{identify_intra_without_index_RedCap}$. It is assumed that *deriveSSB-IndexFromCell* is always enabled for FR2.

$$T_{identify_intra_without_index_RedCap} = (T_{PSS/SSS_sync_intra_RedCap} + T_{SSB_measurement_period_intra_RedCap}) \text{ ms}$$

Where:

$T_{PSS/SSS_sync_intra_RedCap}$: it is the time period used in PSS/SSS detection given in Table 17.6.1.0.2-1.

$T_{SSB_measurement_period_intra_RedCap}$: equal to a measurement period of SSB based measurement given in Table 17.6.1.0.2-2.

$CSSF_{intra_RedCap}$: it is a carrier specific scaling factor and is determined according to $CSSF_{outside_gap_RedCap,i}$ in 38.133[6] clause 9.1A.5.1 for measurement conducted outside measurement gaps, i.e. when intra-frequency SMTC is fully non overlapping or partially overlapping with measurement gaps, or according to $CSSF_{within_gap_RedCap,i}$ in 38.133[6] clause 9.1A.5.2 for measurement conducted within measurement gaps, i.e. when intra-frequency SMTC is fully overlapping with measurement gaps.

if the high layer in TS 38.331 [2] signalling of *smtc2* is configured, the assumed periodicity of intra-frequency SMTC occasions corresponds to the value of higher layer parameter *smtc2*; Otherwise the assumed periodicity of intra-frequency SMTC occasions corresponds to the value of higher layer parameter *smtc1*.

For 2Rx RedCap:

$M_{pss/sss_sync_w/o_gaps_RedCap}$: For a UE supporting FR2 power class 1 or 5, $M_{pss/sss_sync_w/o_gaps_RedCap}$ =40. For a UE supporting power class 2, $M_{pss/sss_sync_w/o_gaps_RedCap}$ =24. For a UE supporting FR2 power class 3, $M_{pss/sss_sync_w/o_gaps_RedCap}$ =24. For a UE supporting FR2 power class 4, $M_{pss/sss_sync_w/o_gaps_RedCap}$ =24, For a UE supporting FR2 power class 7, $M_{pss/sss_sync_w/o_gaps_RedCap}$ = 24.

$M_{meas_period_w/o_gaps_RedCap}$: For a UE supporting power class 1 or 5, $M_{meas_period_w/o_gaps_RedCap}$ =40. For a UE supporting FR2 power class 2, $M_{meas_period_w/o_gaps_RedCap}$ =24. For a UE supporting power class 3, $M_{meas_period_w/o_gaps_RedCap}$ =24. For a UE supporting power class 4, $M_{meas_period_w/o_gaps_RedCap}$ =24, For a UE supporting power class 7, $M_{meas_period_w/o_gaps_RedCap}$ = 24.

When intra-frequency SMTC is fully non overlapping with measurement gaps or intra-frequency SMTC is fully overlapping with MGs, Kp=1

When intra-frequency SMTC is partially overlapping with measurement gaps, Kp = 1/(1- (SMTC period /MGRP)), where SMTC period < MGRP. For calculation of Kp, if the high layer signalling (TS 38.331 [2]) of *smtc2* is configured, for cells indicated in the *pci-List* parameter in *smtc2*, the SMTC periodicity corresponds to the value of higher layer parameter *smtc2*; for the other cells, the SMTC periodicity corresponds to the value of higher layer parameter *smtc1*.

If the higher layer signalling in TS38.331 [2] signalling of *smtc2* is present and smtc1 is fully overlapping with measurement gaps and smtc2 is partially overlapping with measurement gaps, requirements are not specified for $T_{identify_intra_without_index_RedCap}$

For FR2,

$K_{layer1_measurement}$=1,

- if all of the reference signals configured for RLM, BFD, CBD or L1-RSRP for beam reporting on any FR2 serving frequency in the same band outside measurement gap are not fully overlapped by intra-frequency SMTC occasions, or

- if all of the reference signal configured for RLM, BFD, CBD or L1-RSRP for beam reporting on any FR2 serving frequency in the same band outside measurement gap and fully-overlapped by intra-frequency SMTC occasions are not overlapped with any of the SSB symbols and the RSSI symbols, and 1 symbol before each consecutive SSB symbols and the RSSI symbols, and 1 symbol after each consecutive SSB symbols and the RSSI symbols, given that *SSB-ToMeasure* and *SS-RSSI-Measurement* are configured, where SSB symbols are indicated by the union set of SSB-ToMeasure from all the configured measurement objects on the same serving carrier which can be merged. and RSSI symbols are indicated by *SS-RSSI-Measurement*;

$K_{layer1_measurement}$=1.5, otherwise.

If the above-mentioned reference signal configured for L1-RSRP measurement is aperiodic CSI-RS resource, longer cell identification delay would be expected.

If the higher layer signalling in TS38.331 [2] signalling of *smtc2* is present and smtc1 is fully overlapping with measurement gaps and smtc2 is partially overlapping with measurement gaps, requirements are not specified for $T_{SSB_measurement_period_intra_RedCap}$.

For FR2, a longer measurement period is allowed, if aperiodic CSI-RS resource is measured for L1-RSRP measurement on any FR2 serving frequency in the same band, and the CSI-RS resource is outside measurement gap and overlapped with any of the SSB symbols and the RSSI symbols, and 1 symbol before each consecutive SSB symbols and the RSSI symbols, and 1 symbol after each consecutive SSB symbols and the RSSI symbols. If *SSB-ToMeasure* or *SS-RSSI-Measurement* is configured, the SSB symbols are indicated by the union set of *SSB-ToMeasure* from all the configured measurement objects on the same band which can be merged and the RSSI symbols are indicated by *SS-RSSI-Measurement*.

Table 17.6.1.0.2-1: Time period for PSS/SSS detection, (Frequency range FR2) for 2Rx RedCap UE

DRX cycle	$T_{PSS/SSS_sync_intra_RedCap}$
No DRX	max(600ms, ceil($M_{pss/sss_sync_w/o_gaps_RedCap}$ x K_p x $K_{layer1_measurement}$) x SMTC period)[Note 1] x $CSSF_{intra_RedCap}$
DRX cycle≤ 320ms	max(600ms, ceil(1.5 x $M_{pss/sss_sync_w/o_gaps_RedCap}$ x K_p x $K_{layer1_measurement}$) x max(SMTC period,DRX cycle)) x $CSSF_{intra_RedCap}$
DRX cycle>320ms	ceil($M_{pss/sss_sync_w/o_gaps_RedCap}$ x K_p x $K_{layer1_measurement}$) x DRX cycle x $CSSF_{intra_RedCap}$
NOTE 1: If different SMTC periodicities are configured for different cells, the SMTC period in the requirement is the one used by the cell being identified	

Table 17.6.1.0.2-2: Measurement period for intra-frequency measurements without gaps (FR2) for 2Rx RedCap UE

DRX cycle	$T_{SSB_measurement_period_intra_RedCap}$
No DRX	max(400ms, ceil($M_{meas_period_w/o_gaps_RedCap}$ x K_p x $K_{layer1_measurement}$) x SMTC period)[Note 1] x $CSSF_{intra_RedCap}$
DRX cycle≤ 320ms	max(400ms, ceil(1.5x $M_{meas_period_w/o_gaps_RedCap}$ x K_p x $K_{layer1_measurement}$) x max(SMTC period,DRX cycle)) x $CSSF_{intra_RedCap}$
DRX cycle>320ms	ceil($M_{meas_period_w/o_gaps_RedCap}$ xK_p x $K_{layer1_measurement}$) x DRX cycle x $CSSF_{intra_RedCap}$
NOTE 1: If different SMTC periodicities are configured for different cells, the SMTC period in the requirement is the one used by the cell being identified	

Table 17.6.1.0.2-6: Measurement period for intra-frequency measurements without gaps (FR1) for 1Rx RedCap UE

DRX cycle	$T_{SSB_measurement_period_intra_RedCap}$
No DRX	max([200]ms, ceil([5] x K_p) x SMTC period)[Note 1] x $CSSF_{intra_RedCap}$
DRX cycle≤ 320ms	max([200]ms, ceil(1.5x [5] x K_p) x max(SMTC period,DRX cycle)) x $CSSF_{intra_RedCap}$
DRX cycle>320ms	ceil([5] x K_p) x DRX cycle x $CSSF_{intra_RedCap}$
NOTE 1: If different SMTC periodicities are configured for different cells, the SMTC period in the requirement is the one used by the cell being identified	

The following scheduling restriction applies due to SS-RSRP or SS-SINR measurement on an FR2 intra-frequency cell

The UE is not expected to transmit PUCCH/PUSCH/SRS or receive PDCCH/PDSCH/TRS/CSI-RS for CQI on SSB symbols to be measured, and on 1 data symbol before each consecutive SSB symbols to be measured and 1 data symbol after each consecutive SSB symbols to be measured within SMTC window duration (The signalling *deriveSSB_IndexFromCell* is always enabled for FR2). If the high layer signalling of *smtc2* is configured in TS 38.331 [2], the SMTC periodicity follows *smtc2*; Otherwise the SMTC periodicity follows *smtc1*.

The following scheduling restriction applies to SS-RSRQ measurement on an FR2 intra-frequency cell

- The UE is not expected to transmit PUCCH/PUSCH/SRS or receive PDCCH/PDSCH/TRS/CSI-RS for CQI on SSB symbols to be measured, RSSI measurement symbols, and on 1 data symbol before each consecutive SSB to be measured/RSSI symbols and 1 data symbol after each consecutive SSB to be measured/RSSI symbols within SMTC window duration (The signalling *deriveSSB_IndexFromCellc* is always enabled for FR2). If the

high layer signalling of *smtc2* is configured in TS 38.331 [2], the SMTC periodicity follows *smtc2*; Otherwise the SMTC periodicity follows *smtc1*.

If following conditions are met:

- The UE has been notified about system information update through paging,
- The gap between the UE's reception of PDCCH that UE monitors in the Type 2-PDCCH CSS set that notifies system information update, and the PDCCH that UE monitors in the Type0-PDCCH CSS set, is greater than 2 slots.

For the SSB and CORESET for RMSI scheduling multiplexing patterns 3, the UE is expected to receive the PDCCH that the UE monitors in the Type0-PDCCH CSS set, and the corresponding PDSCH, on SSB symbols to be measured; and

For the SSB and CORESET for RMSI scheduling multiplexing patterns 2, the UE is expected to receive PDSCH that corresponds to the PDCCH that the UE monitors in the Type0-PDCCH CSS set, on SSB symbols to be measured.

The normative reference for this requirement is TS 38.133 [6] clauses 9.2B.5.

17.6.1.0.3 Minimum conformance requirements for event-triggered measurement with gap

The UE shall be able to identify a new detectable intra frequency cell within $T_{identify_intra_without_index_RedCap}$ if UE is not indicated to report SSB based RRM measurement result with the associated SSB index (*reportQuantityRsIndexes* or *maxNrofRSIndexesToReport* is not configured), or the UE has been indicated that the neighbour cell is synchronous with the serving cell (*deriveSSB-IndexFromCell* is enabled). The UE shall be able to identify a new detectable intra frequency SS block of an already detected cell within $T_{identify_intra_without_index_RedCap}$. It is assumed that *deriveSSB-IndexFromCell* is always enabled for FR2.

$$T_{identify_intra_without_index_RedCap} = T_{PSS/SSS_sync_intra_RedCap} + T_{SSB_measurement_period_intra_RedCap} \text{ ms}$$

Where:

$T_{PSS/SSS_sync_intra_RedCap}$: it is the time period used in PSS/SSS detection given in Table 17.6.1.0.3-1.

$T_{SSB_measurement_period_intra_RedCap}$: equal to a measurement period of SSB based measurement given in Table 17.6.1.0.3-2.

$CSSF_{intra_RedCap}$: it is a carrier specific scaling factor and is determined according to $CSSF_{within_gap_RedCap,i}$ in 38.133 [6] clause 9.1A.5.2 for measurement conducted within measurement gaps.

For 2Rx RedCap:

$M_{pss/sss_sync_with_gaps_RedCap}$: For a UE supporting FR2 power class 1 or 5, $M_{pss/sss_sync\ with_gaps_RedCap}$ =40. For a UE supporting FR2 power class 2, $M_{pss/sss_sync\ with_gaps_RedCap}$ =24. For a UE supporting FR2 power class 3, $M_{pss/sss_sync\ with_gaps_RedCap}$ =24. For a UE supporting power class 4, $M_{pss/sss_sync\ with_gaps_RedCap}$ =24, For a UE supporting FR2 power class 7, $M_{pss/sss_sync\ with_gaps_RedCap}$ =24.

$M_{meas_period_with_gaps_RedCap}$: For a UE supporting power class 1 or 5, $M_{meas_period_with_gaps_RedCap}$ =40. For a UE supporting power class 2, $M_{meas_period_with_gaps_RedCap}$ =24. For a UE supporting power class 3, $M_{meas_period_with_gaps_RedCap}$ =24. For a UE supporting power class 4, $M_{meas_period\ with_gaps_RedCap}$ =24, For a UE supporting power class 7, $M_{meas_period_with_gaps_RedCap}$ =24.

If the higher layer signalling in TS 38.331 [2] of *smtc2* is present and smtc1 is fully overlapping with measurement gaps and smtc2 is partially overlapping with measurement gaps, requirements are not specified for $T_{identify_intra_without_index_RedCap}$ or $T_{identify_intra_with_index_RedCap}$.

Table 17.6.1.0.3-1: Time period for PSS/SSS detection (FR2) for 2Rx RedCap UE

DRX cycle	$T_{PSS/SSS_sync_intra_RedCap}$
No DRX	max(600ms, $M_{pss/sss_sync_with_gaps_RedCap}$ x max(MGRP, SMTC period)) x $CSSF_{intra_RedCap}$
DRX cycle≤ 320ms	max(600ms, ceil(1.5x $M_{pss/sss_sync_with_gaps_RedCap}$) x max(MGRP, SMTC period, DRX cycle)) x $CSSF_{intra_RedCap_RedCap}$
DRX cycle>320ms	$M_{pss/sss_sync_with_gaps_RedCap}$ x max(MGRP, DRX cycle) x $CSSF_{intra_RedCap}$

Table 17.6.1.0.3-2: Measurement period for intra-frequency measurements with gaps (FR2) for 2Rx RedCap UE

DRX cycle	$T_{SSB_measurement_period_intra_RedCap}$
No DRX	max(400ms, $M_{meas_period\ with_gaps_RedCap}$ x max(MGRP, SMTC period)) x $CSSF_{intra_RedCap}$
DRX cycle≤ 320ms	max(400ms, ceil(1.5 x $M_{meas_period\ with_gaps_RedCap}$) x max(MGRP, SMTC period, DRX cycle)) Note 1 x $CSSF_{intra_RedCap}$
DRX cycle>320ms	$M_{meas_period\ with_gaps_RedCap}$ x max(MGRP, DRX cycle) x $CSSF_{intra_RedCap}$

The normative reference for this requirement is TS 38.133 [6] clauses 9.2B.6.

17.6.1.1 NR SA FR2 Event triggered reporting test without gap under non-DRX

Editor's Note: This test case has been completed for the following configurations:

Test frequency f ≤ 40.8 GHz

UE PC3

This test case is incomplete for UE power classes other than PC3 (e.g. PC7)

This test case is incomplete for test frequencies > 40.8 GHz

17.6.1.1.1 Test purpose

To verify that the UE makes correct reporting of an event. This test will partly verify the TDD intra-frequency cell search requirements for RedCap in 38.133 [6] clause 9.2B.5.1 and 9.2B.5.2

17.6.1.1.2 Test applicability

This test applies to all types of NR RedCap UE from release 17 onwards.

17.6.1.1.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 17.6.1.0.1 and 17.6.1.0.2.

The normative reference for this requirement is TS 38.133 [6] clause A.17.6.1.1.

17.6.1.1.4 Test description

17.6.1.1.4.1 Initial conditions

Same as the initial conditions given in clause 7.6.1.1.4.1 with following exceptions:

- Table 7.6.1.1.4.1-1 is replaced by Table 17.6.1.1.4.1-1.
- Table 7.6.1.1.4.1-2 is replaced by Table 17.6.1.1.4.1-2.

Table 17.6.1.1.4.1-1: Supported test configurations

Test Config	Description
17.6.1.1-1	120 kHz SSB SCS, 100MHz bandwidth, TDD duplex mode
17.6.1.1-2	240 kHz SSB SCS, 100MHz bandwidth, TDD duplex mode
Note: The UE is only required to be tested in one of the supported test configurations.	

Configure the test requirement and the DUT according to the parameters in Table 17.6.1.1.4.1-2.

Table 17.6.1.1.4.1-2: Initial conditions

Parameter	Value	Comment
Test environment	NC	As specified in TS 38.508-1 [14] clause 4.1.
Test frequencies	As specified in Annex E, Table E.5-1 and TS 38.508-1 [14] clause 4.3.1.	

Channel bandwidth	As specified by the test configuration selected from Table 6.6.1.1.4.1-1.		
Propagation conditions	AWGN		As specified in Annex C.2.2
Connection Diagram	TE Part	A.3.3.1.1	As specified in TS 38.508-1 [14] Annex A.
	DUT Part	A.3.4.1.1	
Exceptions to connection diagram	N/A		

Table 17.6.1.1.4.1-3: General test parameters

Parameter	Unit	Config	Value	Comment
Active cell		1, 2	PCell (Cell 1)	
Neighbour cell		1, 2	Cell 2	Cell to be identified.
RF Channel Number		1, 2	1: Cell 1 and Cell 2	One TDD carrier frequency is used for the NR cells.
SMTC configuration		1, 2	SMTC.1	
A3-Offset	dB	1, 2	-11	
CP length		1, 2	Normal	
Hysteresis	dB	1, 2	0	
TimeToTrigger	s	1, 2	0	
Filter coefficient		1, 2	0	L3 filtering is not used
DRX		1, 2	OFF	
Time offset between Cell 1 and Cell 2		1, 2	3 μs	Synchronous cells
T1	s	1, 2	5	
T2	s	1, 2	5	

17.6.1.1.4.2 Test procedure

Same as the test procedure given in clause 7.6.1.1.4.2 with following exceptions:

- Step 6 in test procedure in clause 7.6.1.1.4.2 is replaced by following steps.

6. UE shall transmit a *MeasurementReport* message triggered by Event A3. If the overall delays measured from the beginning of time period T2 is less than X ms then the number of successful tests is increased by one. If the UE fails to report the event within the overall delays measured requirement then the number of failure tests is increased by one. Where X is

   - 2402 ms for UE supporting power class 1 or 5

   - 1442 ms for UE supporting power class 2, 3, 4 or 7,

17.6.1.1.4.3 Message contents

Same as the message contents given in clause 7.6.1.1.4.3.

17.6.1.1.5 Test requirement

Same as the test requirements given in clause 7.6.1.1.5 with following exceptions:

- Table 7.6.1.1.5-1 is replaced by Table 17.6.1.1.5-1.
- Table 7.6.1.1.5-2 is replaced by Table 17.6.1.1.5-2.
- X is
  - 2.4s for a UE supporting power class 1 or 5,
  - 1.44s for a UE supporting power class 2, 3, 4 or 7.

Table 17.6.1.1.5-1: NR Cell specific test parameters

Parameter	Unit	Config	Cell 1		Cell 2	
			T1	T2	T1	T2
TDD configuration		1,2	TDDConf.3.1		TDDConf.3.1	
$BW_{channel}$	MHz	1,2	100: $N_{RB,c}$ = 66		100: $N_{RB,c}$ = 66	
Data RBs allocated		1	24		24	
		2	48		48	
Initial BWP configuration		1,2	DLBWP.0.1 ULBWP.0.1		DLBWP.0.1 ULBWP.0.1	
Active DL BWP configuration		1,2	DLBWP.1.1		DLBWP.1.1	
Active UL BWP configuration		1,2	ULBWP.1.1		ULBWP.1.1	
RLM-RS		1,2	SSB		SSB	
PDSCH RMC configuration		1	SR.3.2 TDD		N/A	
		2	SR.3.3 TDD			
RMSI CORESET RMC configuration		1	CR.3.1 TDD		N/A	
		2	CR.3.2 TDD		N/A	
Dedicated CORESET RMC configuration		1	CCR.3.1 TDD		N/A	
		2	CCR.3.7 TDD		N/A	
TRS configuration		1,2	TRS.2.1 TDD		N/A	
PDSCH/PDCCH TCI states		1,2	TCI.State.2		N/A	
PDSCH/PDCCH subcarrier spacing	kHz	1,2	120		120	
OCNG Patterns		1,2	OP.5		N/A	
cellIndividualOffset	dB	1,2	N/A		16	
SSB		1	SSB.1 FR2		SSB.7 FR2	
		2	SSB.2 FR2		SSB.8 FR2	
Propagation Condition		1,2	AWGN		AWGN	

Table 17.6.1.1.5-2: NR OTA Cell specific test parameters

Parameter	Unit	Config	Cell 1		Cell 2	
			T1	T2	T1	T2
AoA setup		1, 2	Setup 3 defined in A.3.9.3			
			AoA1		AoA2	
Beam assumption[Note 4]		1,2	Rough		Rough	
E_s	dBm/ SCS	1	-89	-89	-Infinity	-89
		2	-86	-86	-Infinity	-86
$\hat{E}_s/I_{ot}$ BB Note 5	dB	1, 2	-0.12	-0.12	-Infinity	-0.12
SSB_RP	dBm/ SCS	1	-89	-89	-Infinity	-89
		2	-86	-86	-Infinity	-86
Io	dBm/ 95.04 MHz	1	-64.41	-64.41	-Infinity	-64.41
		2	-61.41	-61.41	-Infinity	-61.41
Time multiplexing of the downlink transmissions from each AoA		1, 2	Defined in Figure 7.6.1.1.5-1			

Note 1: The resources for uplink transmission are assigned to the UE prior to the start of time period T2.
Note 2: Void
Note 3: Es/Iot, SSB_RP and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.
Note 4: Information about types of UE beam is given in B.2.1.3, and does not limit UE implementation or test system implementation
Note 5: Calculation of Es/Iot_{BB} includes the effect of UE internal noise up to the value assumed for the associated Refsens requirement in clause 7.3.2 of TS 38.101-2 [19], and an allowance of 1dB for UE multi-band relaxation factor ΔMB_P from TS 38.101-2 [19] Table 6.2.1.3-4.

17.6.1.3 NR SA FR2 Event triggered reporting test with per-UE gaps under non-DRX

Editor's Note: This test case is incomplete in following aspects:

- MU and TT analysis is still missing.

17.6.1.3.1 Test purpose

The purpose of this test is to verify UE's ability to make a correct reporting of an event with gaps under non-DRX within intra-frequency cell search with gaps requirements. This test will partly verify the TDD intra-frequency cell search requirements in TS 38.133 [6] clause 9.2B.6.1 and 9.2B.6.2.

17.6.1.3.2 Test applicability

This test applies to all types of NR RedCap UEs from Release 17 onwards supporting CSI-RS based RLM and BWP operation without bandwidth restriction.

17.6.1.3.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 17.6.1.0.1 and 17.6.1.0.3.

The normative reference for this requirement is TS 38.133 [6] clause A.17.6.1.3.

17.6.1.3.4 Test description

Two cells are deployed in the test, which are FR1 PCell (Cell 1) and a FR1 neighbour cell (Cell 2) on the same frequency as the PCell. The general and cell specific test parameters for PCell and neighbour cell are given in Table 17.6.1.3.4.1-3, Table 17.6.1.3.5-1 and Table 17.6.1.3.5-2, respectively. In the measurement configuration a measurement object is configured for the frequency of the PCell and indicates to the UE that event-triggered reporting with Event A3 is used.

17.6.1.3.4.1 Initial conditions

This test shall be tested using any of the test configurations in Table 17.6.1.3.4.1-1.

Table 17.6.1.3.4.1-1: Supported test configurations

Test Case ID	Description
17.6.1.3-1	120 kHz SSB SCS, 100MHz bandwidth, TDD duplex mode
17.6.1.3-2	240 kHz SSB SCS, 100MHz bandwidth, TDD duplex mode
Note: The UE is only required to be tested in one of the supported test configurations.	

Configure the test equipment and the DUT according to the parameters in Table 17.6.1.3.4.1-2.

Table 17.6.1.3.4.1-2: Initial conditions for NR SA FR2 event-triggered reporting with gap in non-DRX

Parameter	Value		Comment
Test environment	NC		As specified in TS 38.508-1 [14] clause 4.1.
Test frequencies	As specified in Annex E, table E.15-1 and TS 38.508-1 [14] clause 4.3.1 and 4.4.2.		
Channel bandwidth	As specified by the test configuration selected from Table 6.6.1.3.4.1-1.		
Propagation conditions	AWGN		As specified in Annex C.2.2.
Connection Diagram	TE Part	A.3.3.1.1	As specified in TS 38.508-1 [14] Annex A.
	DUT Part	A.3.4.1.1	
Exceptions to connection diagram	N/A		

1. The general test parameter settings are set up according to Table 17.6.1.3.4.1-3.

2. Message contents are defined in clause 17.6.1.3.4.3.

3. There is one NR carrier and two cells specified in the test. Cell 1 is the cell used for connection setup with the power level set according to Annex C.1.1 and C.1.2 for this test.

Table 17.6.1.3.4.1-3: General test parameters for NR SA FR2 event-triggered reporting with gap in non-DRX

Parameter	Unit	Value	Comment
Active cell		PCell (Cell 1)	
Neighbour cell		Cell 2	Cell to be identified.
RF Channel Number		1: Cell 1 and Cell 2	One TDD carrier frequency is used for the NR cells.
Gap type		Per-UE gaps	
Measurement gap repitition periodicity	ms	40	
Measurement gap length	ms	6	
Measurement gap offset	ms	4	
SMTC configuration for CD-SSB		SMTC.1 RedCap	
SMTC configuration for NCD-SSB		SMTC.2 RedCap	
CSI-RS parameters		CSI-RS.3.2 TDD	
A3-Offset	dB	-11	
CP length		Normal	
Hysteresis	dB	0	
Time To Trigger	s	0	
Filter coefficient		0	L3 filtering is not used
DRX		OFF	
Time offset between Cell 1 and Cell 2	µs	3	Synchronous cells
T1	s	5	
T2	s	5	

17.6.1.3.4.2 Test procedure

The test consists of two successive time periods, with time duration of T1, and T2 respectively. During time duration T1, the UE shall not have any timing information of Cell 2.

There are two BWPs configured in Cell 1, BWP1 which contains the cell defining SSB, and BWP2 which does not contain any SSB of Cell 1. During the whole test, BWP2 is always scheduled as the active BWP for the UE.

1. Ensure the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity *NR*, Connected without release *On* and Test Mode *On* according to TS 38.508-1 [14] clause 4.5.

2. Set the parameters according to T1 in Table 17.6.1.3.5-1.

3. Set NR Cell 2 physical cell identity = (current NR cell 2 physical cell identity + 1) mod 14 + 2 for current iteration of the test procedure loop

4. SS shall transmit an *RRCReconfiguration* message to configure RedCap-specific dedicated BWP and Event A3 triggered reporting.

5. The UE shall transmit an *RRCReconfigurationComplete* message. T1 starts upon the SS receives the *RRCReconfigurationComplete* message.

6. When T1 expires, the SS shall switch the power setting from T1 to T2 as specified in Table 17.6.1.3.5-1. T2 starts.

7. The SS increases the number of successful tests by one if the UE transmits a *MeasurementReport* message triggered by event A3 satisfying the overall delay requirement specified in clause 17.6.1.3.5, otherwise the SS increases the number of failure tests by one.

8. After the SS receive the *MeasurementReport* message in step 7) or when T2 expires, the SS shall:

   - transmit *RRCRelease* message to release the RRC connection which includes the release of the established radio bearers as well as all radio resources

   or

   - switch the UE off.

9. Depending on the choice in step 8, the SS shall,

   - transmit in NR Cell 1 a *Paging* message including matched ng-5G-S-TMSI for the UE if an *RRCRelease* has been sent in step 8. If the paging fails, switches off and on the UE,

   or

   - switch on the UE if the UE is switched off in step 8.

10. Ensure the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity *NR*, Connected without release *On* and Test Mode *On* according to TS 38.508-1 [14] clause 4.5.

11. Repeat step 2-10 until the confidence level according to Tables G.2.3-1 in Annex G clause G.2 is achieved.

17.6.1.3.4.3 Message contents

Message contents are according to TS 38.508-1 [14] clause 4.6 with the following exceptions:

Table 17.6.1.3.4.3-1: Common Exception messages for NR SA FR1 event-triggered reporting with gap in non-DRX

Default Message Contents	
Common contents of system information blocks exceptions	
Default RRC messages and information elements contents exceptions	Table H.3.1-1 Table H.3.1-2 with Condition GAP NEEDED Table H.3.1-4 with A3-offset = -11dB Table H.3.1-6 with Condition gapUE, Pattern #0 and gapOffset is set to 4 Table H.3.1-7 with Condition INTRA-FREQ Table H.3.1-8 with Condition CSI-RS RLM

Table 17.6.1.3.4.3-2: MeasObjectNR (Step 4, test procedure)

Derivation Path: Table H.3.1-3 with condition INTRA-FREQ MO, Synchronous cells			
Information Element	**Value/remark**	**Comment**	**Condition**
MeasObjectNR::= SEQUENCE {			
ssbFrequency	ARFCN-ValueNR of NCD-SSB		
smtc1	SSB-MTC specified in 38.508-1 [14] Table 7.3.1-3 with condition SMTC.2 RedCap		
cellsToAddModList SEQUENCE (SIZE (1..maxNrofCellMeas)) OF CellsToAddMod {	1 entry		
CellsToAddMod[1] SEQUENCE {		entry 1	
physCellId	PhysCellId of Cell 2		
cellIndividualOffset SEQUENCE {			
rsrpOffsetSSB	dB16		
rsrqOffsetSSB	Not present		
sinrOffsetSSB	Not present		
rsrpOffsetCSI-RS	Not present		
rsrqOffsetCSI-RS	Not present		
sinrOffsetCSI-RS	Not present		
}			
}			
}			
}			

Table 17.6.1.3.4.3-3: *ServingCellConfig* (step 4, test procedure)

Derivation Path: TS 38.508-1 [14] Table 4.6.3-167 with condition MEAS			
Information Element	**Value/remark**	**Comment**	**Condition**
ServingCellConfig ::= SEQUENCE {			

downlinkBWP-ToAddModList SEQUENCE (SIZE (1..maxNrofBWPs)) OF BWP-Downlink {	1 entry		
BWP-Downlink[1]	BWP-Downlink	entry 1 Table 17.6.1.3.4.3-4	
}			
firstActiveDownlinkBWP-Id	1	Activate the RedCap-specific dedicated DL BWP	
uplinkConfig SEQUENCE {			
initialUplinkBWP	Not present		
uplinkBWP-ToAddModList SEQUENCE (SIZE (1..maxNrofBWPs)) OF BWP-Uplink {	1 entry		
BWP-Uplink[1]	BWP-Uplink	entry 1 Table 17.6.1.3.4.3-5	
}			
firstActiveUplinkBWP-Id	1	Activate the RedCap-specific dedicated UL BWP	
pusch-ServingCellConfig	Not present		
}			
}			
servingCellMO	Not present		
}			

Table 17.6.1.3.4.3-4: *BWP-Downlink* (Table 17.6.1.3.4.3-3)

Derivation Path: TS 38.508-1 [14], Table 4.6.3-9			
Information Element	**Value/remark**	**Comment**	**Condition**
BWP-Downlink ::= SEQUENCE {			
bwp-Id	1		
bwp-Common SEQUENCE {			
genericParameters SEQUENCE {			
locationAndBandwidth	The RIV corresponds to DLBWP.1.3 RedCap		
}			
}			
bwp-Dedicated SEQUENCE {			
nonCellDefiningSSB-r17 SEQUENCE {			
absoluteFrequencySSB-r17	ARFCN-ValueNR of NCD-SSB		
ssb-Periodicity-r17	ms40		
ssb-TimeOffset-r17	ms5		
}			
servingCellMO-r17	MeasId		
}			
}			

Table 17.6.1.3.4.3-5: *BWP-Uplink* (Table 17.6.1.3.4.3-3)

Derivation Path: TS 38.508-1 [14], Table 4.6.3-13			
Information Element	**Value/remark**	**Comment**	**Condition**
BWP-Uplink ::= SEQUENCE {			
bwp-Id	1		
bwp-Common SEQUENCE {	BWP-UplinkCommon		
genericParameters SEQUENCE {			
locationAndBandwidth	The RIV corresponds to ULBWP.1.3 RedCap		
}			
}			
}			

17.6.1.3.5 Test requirement

Table 17.6.1.3.4.1-3 and Table 17.6.1.3.5-1 define the primary level settings including test tolerances.

Table 17.6.1.3.5-1: NR Cell specific test parameters

Parameter		Unit	Cell 1		Cell 2	
			T1	T2	T1	T2
TDD configuration			TDDConf.3.1		TDDConf.3.1	
$BW_{channel}$		MHz	100: $N_{RB,c}$ = 66		100: $N_{RB,c}$ = 66	
Data RBs allocated	Config 1		24		24	
	Config 2		48		48	
Initial BWP configuration			DLBWP.0.1 ULBWP.0.1		DLBWP.0.1 ULBWP.0.1	
Dedicated DL BWP configuration			DLBWP.1.3 RedCap Note 1		DLBWP.1.3 RedCap Note 1	
Dedicated UL BWP configuration			ULBWP.1.3 RedCap Note 2		ULBWP.1.3 RedCap Note 2	
RLM-RS			CSI-RS		SSB	
PDSCH RMC configuration	Config 1		SR.3.2 TDD		N/A	
	Config 2		SR.3.3 TDD			
RMSI CORESET RMC configuration	Config 1		CR.3.1 TDD		CR.3.1 TDD	
	Config 2		CR.3.2 TDD		CR.3.2 TDD	
Dedicated CORESET RMC configuration	Config 1		CCR.3.1 TDD		CCR.3.1 TDD	
	Config 2		CCR.3.7 TDD		CCR.3.7 TDD	
TRS configuration			TRS.2.1 TDD		N/A	
PDSCH/PDCCH TCI states			TCI.State.2		N/A	
PDSCH/PDCCH subcarrier spacing		kHz	120		120	
OCNG Patterns			OP.1		OP.1	
cellIndividualOffset		dB	N/A		16	
CD-SSB	Config 1		SSB.2 RedCap FR2		SSB.2 RedCap FR2	
	Config 2		SSB.4 RedCap FR2		SSB.4 RedCap FR2	
NCD-SSB	Config 1		SSB.3 RedCap FR2		SSB.3 RedCap FR2	
	Config 2		SSB.5 RedCap FR2		SSB.5 RedCap FR2	
Propagation Condition			AWGN			

Note 1: The starting PRB index for dedicated DL BWP1 corresponding to CD-SSB PRB index; the starting PRB index for dedicated DL BWP2 corresponding to NCD-SSB PRB index;

Note 2: The starting PRB index for dedicated UL BWP1 is the same as the starting PRB index for dedicated DL BWP1; the starting PRB index for dedicated UL BWP2 is the same as the starting PRB index for dedicated DL BWP2.

Table 17.6.1.3.5-2: NR OTA Cell specific test parameters for intra-frequency event triggered reporting for SA with TDD PCell in FR2 with per-UE gaps without DRX

Parameter		Unit	Cell 1		Cell 2	
			T1	T2	T1	T2
AoA setup			Setup 3 defined in A.9			
			AoA1		AoA2	
Beam Assumption Note 4			Rough		Rough	
E_s	Config 1	dBm/ SCS	-89	-89	-Infinity	-89
	Config 2		-86	-86	-Infinity	-86
$\hat{E}_s / I_{ot}$ BB Note 5		dB	-0.12	-0.12	-Infinity	-0.12
SSB_RP	Config 1	dBm/ SCS	-89	-89	-Infinity	-89
	Config 2		-86	-86	-Infinity	86
Io	Config 1	dBm/ 95.04MHz	-64.41	-64.41	-Infinity	-64.41
	Config 2		-61.41	-61.41	-Infinity	-61.41
Time multiplexing of the downlink transmissions from each AoA			Defined in Figure 17.6.1.3.5-1			

Note 1:	The resources for uplink transmission are assigned to the UE prior to the start of time period T2.
Note 2:	Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for N_{oc} to be fulfilled.
Note 3:	SS-RSRP levels have been derived from other parameters for information purposes. They are not settable parameters themselves.
Note 4:	Information about types of UE beam is given in TS 38.133 [6] clause B.2.1.3, and does not limit UE implementation or test system implementation
Note 5:	Calculation of Es/Iot_{BB} includes the effect of UE internal noise up to the value assumed for the associated Refsens requirement in clause 7.3.2 of TS 38.101-2 [19], and an allowance of 1dB for UE multi-band relaxation factor ΔMB_P from TS 38.101-2 [19] Table 6.2.1.3-4.

The overall delay is measured from the beginning of time period T2 to the time that the SS receives the first *MeasurementReport* message triggered by event A3. It is allowed to be up to $2xTTI_{DCCH}$ higher than the measurement reporting delay specified in 38.133[6] clause 9.2B.4 due to the TTI insertion uncertainty of the measurement report in DCCH.

Then the overall delay shall be shall be no larger than: $T_{identify_intra_without_index} + 2xTTI_{DCCH}$, where

- $T_{identify_intra_without_index}$ = 3200 ms for UE supporting power class 1 or 5 and 1920 ms for UE supporting power class 2, 3, 4 or 7, is the time for intra-frequency cell identification specified in 38.133 [6] clause 9.2B.5.1,
- TTI_{DCCH} = 1 ms.

Which gives a total of 3202 ms for UE supporting power class 1 or 5 and 1922 ms for UE supporting power class 2, 3, 4 or 7.

The UE is not required to read the neighbour cell SSB index in this test.

The UE shall not send event triggered measurement reports, as long as the reporting criteria are not fulfilled.

For the test to pass, the total number of successful tests shall be more than 90% of the cases with a confidence level of 95%.

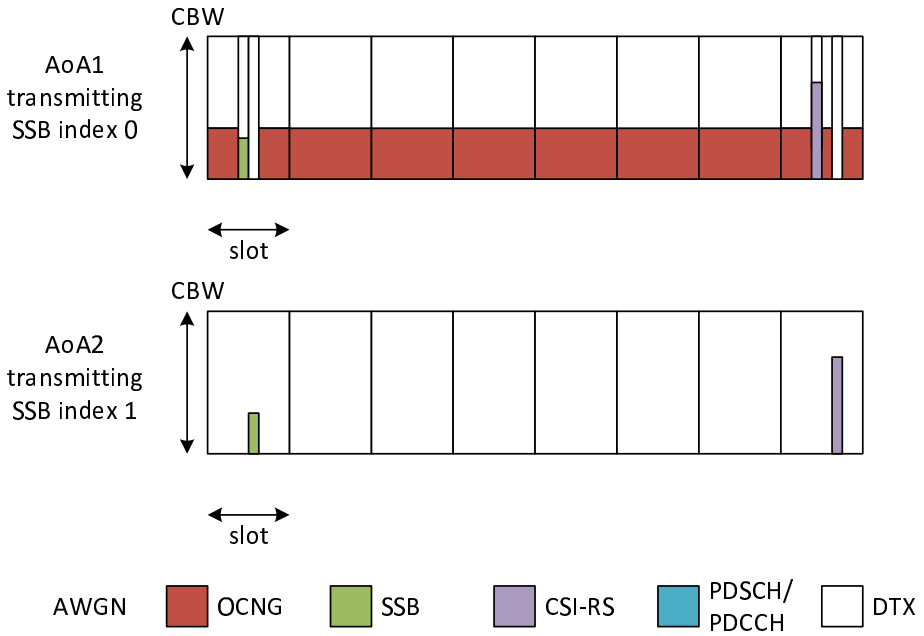

Figure 17.6.1.3.5-1: Time multiplexed downlink transmissions (Config 1 example)

17.6.1.4 NR SA FR2 event-triggered reporting with gap in DRX

Editor's Note: This test case is incomplete in following aspects:

- MU and TT analysis is missing.

17.6.1.4.1 Test purpose

To verify that the UE makes correct reporting of an event. This test will partly verify the TDD intra-frequency cell search requirements in TS 38.133 [6] clause 9.2B.6.1 and 9.2B.6.2

17.6.1.4.2 Test applicability

This test applies to all types of NR RedCap UEs from Release 17 onwards supporting CSI-RS based RLM, BWP operation without bandwidth restriction and long DRX cycle.

17.6.1.4.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 17.6.1.0.1 and 17.6.1.0.3.

The normative reference for this requirement is TS 38.133 [6] clause A.17.6.1.4.

17.6.1.4.4 Test description

17.6.1.4.4.1 Initial conditions

Same as the initial conditions given in clause 7.6.1.4.4.1 with following exceptions:

- Table 7.6.1.4.4.1-1 is replaced by Table 17.6.1.4.4.1-1.
- Table 7.6.1.4.4.1-2 is replaced by Table 17.6.1.4.4.1-2.
- Table 7.6.1.4.4.1-3 is replaced by Table 17.6.1.4.4.1-3.

Table 17.6.1.4.4.1-1: Supported test configurations

Test Case ID	Description
17.6.1.4-1	120 kHz SSB SCS, 100MHz bandwidth, TDD duplex mode
17.6.1.4-2	240 kHz SSB SCS, 100MHz bandwidth, TDD duplex mode
Note: The UE is only required to be tested in one of the supported test configurations.	

Table 17.6.1.4.4.1-2: Initial conditions

Parameter	Value		Comment
Test environment	NC		As specified in TS 38.508-1 [14] clause 4.1.
Test frequencies	As specified in Annex E, table E.15-1 and TS 38.508-1 [14] clause 4.3.1 and 4.4.2.		
Channel bandwidth	As specified by the test configuration selected from Table 17.6.1.4.4.1-1.		
Propagation conditions	AWGN		As specified in Annex C.2.2.
Connection Diagram	TE Part	A.3.3.1.1	As specified in TS 38.508-1 [14] Annex A.
	DUT Part	A.3.4.1.1	
Exceptions to connection diagram	N/A		

Table 17.6.1.4.4.1-3: General test parameters

Parameter	Unit	Value		Comment
		Test 1	Test 2	
Active cell		PCell (Cell 1)		

Neighbour cell		Cell 2		Cell to be identified.
RF Channel Number		1: Cell 1 and Cell 2		One TDD carrier frequency is used for the NR cells.
Gap type		Per-UE gaps		
Measurement gap repitition periodicity	ms	40		
Measurement gap length	ms	6		
Measurement gap offset	ms	39		
SMTC configuration		SMTC.1		
CSI-RS parameters		CSI-RS.3.2 TDD		
A3-Offset	dB	-7		
CP length		Normal		
Hysteresis	dB	0		
Time To Trigger	s	0		
Filter coefficient		0		L3 filtering is not used
DRX		DRX.1	DRX.7	
Time offset between Cell 1 and Cell 2		3 μs		Synchronous cells
T1	s	5		
T2	s	10	52	

17.6.1.4.4.2 Test procedure

Same as the test procedure given in clause 7.6.1.4.4.2 with following exceptions:

- Step 6 in clause 7.6.1.4.4.2 is replaced by:

6. UE shall transmit a *MeasurementReport* message triggered by Event A3. If the overall delays measured from the beginning of time period T2 is less than X ms for Test 1 or less than Y ms for Test 2 then the number of successful tests is increased by one. If the UE fails to report the event within the overall delays measured requirement then the number of failure tests is increased by one. Where X and Y is

   - X = 7202, Y = 51202 for UE supporting power class 1 or 5,

   - X = 4322, Y = 30722 for UE supporting power class 2, 3, 4 or 7,

17.6.1.4.4.3 Message contents

Same as the message contents given in clause 7.6.1.4.4.3.

17.6.1.4.5 Test requirement

Same as the test requirements given in clause 7.6.1.4.5 with following exceptions:

- Table 7.6.1.4.5-1 is replaced by Table 17.6.1.4.5-1.
- Table 7.6.1.4.5-2 is replaced by Table 17.6.1.4.5-2.
- In Test 1 the overall delay measured shall be less than a total of X ms, where
  - X = 7202 for UE supporting power class 1 or 5,
  - X = 4322 for UE supporting power class 2, 3, 4 or 7.
- In Test 2 the overall delay measured shall be less than a total of X ms, where
  - X = 51202 for UE supporting power class 1 or 5,
  - X = 30722 for UE supporting power class 2, 3, 4 or 7.

Table 17.6.1.4.5-1: NR Cell specific test parameters

Parameter	Unit	Cell 1		Cell 2	
		T1	T2	T1	T2
TDD configuration		TDDConf.3.1		TDDConf.3.1	

$BW_{channel}$		MHz	100: $N_{RB,c}$ = 66	100: $N_{RB,c}$ = 66
Data RBs allocated			66	66
Initial BWP configuration			DLBWP.0.1 ULBWP.0.1	DLBWP.0.1 ULBWP.0.1
Active DL BWP configuration			DLBWP.1.2	DLBWP.1.1
Active UL BWP configuration			ULBWP.1.2	ULBWP.1.1
RLM-RS			CSI-RS	SSB
PDSCH RMC configuration	Config 1		SR.3.2 TDD	N/A
	Config 2		SR.3.3 TDD	
RMSI CORESET RMC configuration	Config 1		CR.3.1 TDD	N/A
	Config 2		CR.3.2 TDD	
Dedicated CORESET RMC configuration	Config 1		CCR.3.1 TDD	N/A
	Config 2		CCR.3.7 TDD	
TRS configuration			TRS.2.1 TDD	N/A
PDSCH/PDCCH TCI state			TCI.State.2	N/A
PDSCH/PDCCH subcarrier spacing		kHz	120	120
OCNG Patterns			OP.1	OP.1
SSB	Config 1		SSB.3 FR2	SSB.3 FR2
	Config 2		SSB.4 FR2	SSB.4 FR2
Propagation Condition			AWGN	

Table 17.6.1.4.5-2: NR OTA Cell specific test parameters

Parameter		Unit	Cell 1		Cell 2	
			T1	T2	T1	T2
AoA setup			Setup 1 defined in A.3.15.1			
Beam Assumption Note 4			Rough			
$\hat{E}_s/I_{ot}$ BB Note 5		dB	3.77	-1.52	-Infinity	-1.52
N_{oc} Note 2		dBm/ 15 KHz	-98			
N_{oc} Note 2	Config 1	dBm/SCS	-89			
	Config 2		-86			
SSB_RPSS-RSRP	Config 1	dBm/SCS	-85	-85	-Infinity	-85
	Config 2		-82	-82	-Infinity	-82
$\hat{E}_s/N_{oc}$		dB	4	4	-Infinity	4
Io		dBm/ 95.04MHz	-54.53	-52.18	-54.53	-52.18

Note 1: The resources for uplink transmission are assigned to the UE prior to the start of time period T2.
Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for N_{oc} to be fulfilled.
Note 3: SS-RSRP levels have been derived from other parameters for information purposes. They are not settable parameters themselves.
Note 4: Information about types of UE beam is given in TS 38.133 [6] clause B.2.1.3, and does not limit UE implementation or test system implementation
Note 5: Calculation of Es/Iot_{BB} includes the effect of UE internal noise up to the value assumed for the associated Refsens requirement in clause 7.3.2 of TS 38.101-2 [19], and an allowance of 1dB for UE multi-band relaxation factor ΔMB_P from TS 38.101-2 [19] Table 6.2.1.3-4.

17.6.3 L1-RSRP measurement for beam reporting for RedCap

17.6.3.0 Minimum conformance requirements for L1-RSRP measurement for beam reporting

17.6.3.0.1 Minimum conformance requirements for SSB-based L1-RSRP measurement for beam reporting

The minimum requirements given in 5.6.3.0.1 applies.

The normative reference for this requirement is TS 38.133 [6] clause 9.5B.1, 9.5B.2, 9.5B.3.1, 9.5B.4.1 and 9.5B.5.1.

17.6.3.0.2 Minimum conformance requirements for CSI-RS-based L1-RSRP measurement for beam reporting

The minimum requirements given in clause 5.6.3.0.2 applies.

The normative reference for this requirement is TS 38.133 [6] clauses 9.5B.1, 9.5B.2, 9.5B.3.3, 9.5B.4.2 and 9.5B.5.1.

17.6.3.1 NR SA FR2 SSB based L1-RSRP measurement when DRX is not used

Editor's Note: This test case is incomplete in following aspects:

- MU & TT analysis is still missing.

17.6.3.1.1 Test purpose

To verify that the UE makes correct reporting of L1-RSRP measurement. This test will partly verify the L1-RSRP measurement requirements in TS 38.133 [6] clause 9.5B.4.1.

17.6.3.1.2 Test applicability

This test applies to all types of NR RedCap UEs from Release 17 onwards.

17.6.3.1.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 17.6.3.0.1.

The normative reference for this requirement is TS 38.133 [6] clause A.17.6.3.1.

17.6.3.1.4 Test description

17.6.3.1.4.1 Initial conditions

Same as the initial conditions given in clause 7.6.3.1.4.1 with following exceptions:

- Table 7.6.3.1.4.1-3 is replaced by Table 17.6.3.1.4.1-1.

Table 17.6.3.1.4.1-1: Test environment

Parameter	Value		Comment
Test environment	NC		As specified in TS 38.508-1 [14] clause 4.1.
Test frequencies	As specified in Annex E, table E.15-1 and TS 38.508-1 [14] clause 4.3.1 and 4.4.2.		
Channel bandwidth	As specified by the test configuration selected from Table 17.5.2.3.4.1-1.		
Propagation conditions	AWGN		As specified in Annex C.2.2.
Connection Diagram	TE Part	A.3.3.1.1	As specified in TS 38.508-1 [14] Annex A.
	DUT Part	A.3.4.1.1	
Exceptions to connection diagram	N/A		

17.6.3.1.4.2 Test procedure

Same as the test procedure given in clause 7.6.3.1.4.2.

17.6.3.1.4.3 Message contents

Same as the test procedure given in clause 7.6.3.1.4.3.

17.6.3.1.5 Test requirement

Same as the test requirements given in clause 7.6.3.1.5.

17.6.3.2 NR SA FR2 SSB based L1-RSRP measurement when DRX is used

Editor's Note: This test case is incomplete for the following configurations:

- MU and TT analysis is still missing.

17.6.3.2.1 Test purpose

To verify that the UE makes correct reporting of L1-RSRP measurement. This test will partly verify the L1-RSRP measurement requirements in TS 38.133 [6] clause 9.5B.4.1.

17.6.3.2.2 Test applicability

This test applies to all types of NR RedCap UEs from Release 17 onwards supporting long DRX cycle.

17.6.3.2.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 17.6.3.0.1.

The normative reference for this requirement is TS 38.133 [6] clause A.17.6.3.2.

17.6.3.2.4 Test description

17.6.3.2.4.1 Initial conditions

Same as the initial conditions given in 7.6.3.2.4.1 with following exceptions:

- Table 7.6.3.2.4.1-1 is replaced by Table 17.6.3.2.4.1-1.
- Table 7.6.3.2.4.1-3 is replaced by Table 17.6.3.2.4.1-2.
- Table 7.6.3.2.4.1-2 is replaced by Table 17.6.3.2.4.1-3.

Table 17.6.3.2.4.1-1: Supported test configurations

Test Config	Description
17.6.3.2-1	NR 120 kHz SSB SCS, 100 MHz bandwidth, TDD duplex mode
17.6.3.2-2	NR 240 kHz SSB SCS, 100 MHz bandwidth, TDD duplex mode
Note: The UE is only required to be tested in one of the supported test configurations	

Table 17.6.3.2.4.1-2: Initial conditions

Parameter	Value		Comment
Test environment	NC		As specified in TS 38.508-1 [14] clause 4.1.
Test frequencies	As specified in Annex E, table E.15-1 and TS 38.508-1 [14] clause 4.3.1 and 4.4.2.		
Channel bandwidth	As specified by the test configuration selected from Table 17.5.2.3.4.1-1.		
Propagation conditions	AWGN		As specified in Annex C.2.2.
Connection Diagram	TE Part	A.3.3.1.1	As specified in TS 38.508-1 [14] Annex A.
	DUT Part	A.3.4.1.1	
Exceptions to connection diagram	N/A		

Table 17.6.3.2.4.1-3: General test parameters

Parameter	Config	Unit	Value
SSB GSCN	1,2		freq1
Duplex mode	1,2		TDD
TDD Configuration	1,2		TDDConf.3.1
$BW_{channel}$	1,2	MHz	100: $N_{RB,c}$ = 66
Data RBs allocated	1,2		66
PDSCH Reference measurement channel	1		SR.3.2 TDD
	2		SR.3.3 TDD
RMSI CORESET Reference Channel	1		CR.3.1 TDD
	2		CR.3.2 TDD
Dedicated CORESET Reference Channel	1		CCR.3.1 TDD
	2		CCR.3.7 TDD
SSB configuration	1		SSB.1 FR2
	2		SSB.2 FR2
OCNG Patterns	1,2		OP.1
Initial BWP Configuration	1,2		DLBWP.0.1 ULBWP.0.1
Dedicated BWP configuration	1,2		DLBWP.1.3 ULBWP.1.3
SMTC configuration	1,2		SMTC.1
TRS Configuration	1,2		TRS.2.1 TDD
PDCCH/PDSCH TCI Configuration	1,2		TCI.State.2
DRX configuration	1,2		DRX.3
reportConfigType	1,2		periodic
reportQuantity	1,2		ssb-Index-RSRP
Number of reported RS	1,2		2
L1-RSRP reporting period	1,2	slot	320
T1	1,2	s	5
T2	1,2	s	3
EPRE ratio of PSS to SSS	1,2	dB	0
EPRE ratio of PBCH DMRS to SSS			
EPRE ratio of PBCH to PBCH DMRS			
EPRE ratio of PDCCH DMRS to SSS			
EPRE ratio of PDCCH to PDCCH DMRS			
EPRE ratio of PDSCH DMRS to SSS			
EPRE ratio of PDSCH to PDSCH DMRS			
EPRE ratio of OCNG DMRS to SSS Note 1			
EPRE ratio of OCNG to OCNG DMRS Note 1			
Propagation condition	1,2		AWGN
Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.			

17.6.3.2.4.2 Test procedure

Same as the test procedure given in clause 7.6.3.2.4.2.

17.6.3.2.4.3 Message contents

Same as the message content given in 7.6.3.2.4.3.

17.6.3.2.5 Test requirement

Same as the test requirements given in clause 7.6.3.2.5 with following exceptions:

- Table 7.6.3.2.5-1 is replaced by Table 17.6.3.2.5-1.

Table 17.6.3.2.5-1: Cell specific test parameters

Parameter	Config	Unit	SSB#0	SSB#1

			T1	T2	T1	T2
Angle of arrival configuration			Setup 1 according to A.9			
Assumption for UE beams Note 4	1,2		Rough			
N_{oc} Note2	1,2	dBm/15kHz	-105			
N_{oc} Note2	1	dBm/SSB SCS	-96			
	2		-93			
$\hat{E}_s / I_{ot}$	1,2	dB	0	0	-Infinity	9
SSB_RP Note3	1	dBm/SSB SCS	-96	-96	-Infinity	-87
	2		-93	-93	-Infinity	-84
Io Note3	1	dBm/95.04MHz	-63.97	-63.97	-66.98	-57.47
	2		-63.97	-63.97	-66.98	-57.47
$\hat{E}_s / N_{oc}$	1,2	dB	0	0	-Infinity	9

Note 1: The resources for uplink transmission are assigned to the UE prior to the start of time period T2.
Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for N_{oc} to be fulfilled.
Note 3: SSB_RP and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.
Note 4: Information about types of UE beam is given in TS 38.133 Annex B.2.1.3, and does not limit UE implementation or test system implementation

17.6.3.3 NR SA FR2 CSI-RS based L1-RSRP measurement when DRX is not used

Editor's Note: This test case is incomplete in following aspects:

- MU & TT analysis is still missing.

17.6.3.3.1 Test purpose

To verify that the UE makes correct reporting of L1-RSRP measurement. This test will partly verify the L1-RSRP measurement requirements in TS 38.133 [6] clause 9.5B.4.2.

17.6.3.3.2 Test applicability

This test applies to all types of NR RedCap UEs from Release 17 onwards.

17.6.3.3.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 17.6.3.0.2.

The normative reference for this requirement is TS 38.133 [6] clause A.17.6.3.3.

17.6.3.3.4 Test description

17.6.3.3.4.1 Initial conditions

Same as the initial conditions given in 7.6.3.3.4.1 with following exceptions:

- Table 7.6.3.3.4.1-1 is replaced by Table 17.6.3.3.4.1-1.
- Table 7.6.3.3.4.1-3 is replaced by Table 17.6.3.3.4.1-2.
- Table 7.6.3.3.4.1-2 is replaced by Table 17.6.3.3.4.1-3.

Table 17.6.3.3.4.1-1: Supported test configurations

Test Config	Description
17.6.3.3-1	NR 120 kHz CSI-RS SCS, 100 MHz bandwidth, TDD duplex mode

Note: The UE is only required to be tested in one of the supported test configurations

Table 17.6.3.3.4.1-2: Initial conditions

Parameter	Value		Comment
Test environment	NC		As specified in TS 38.508-1 [14] clause 4.1.
Test frequencies	As specified in Annex E, table E.15-1 and TS 38.508-1 [14] clause 4.3.1 and 4.4.2.		
Channel bandwidth	As specified by the test configuration selected from Table 17.5.2.3.4.1-1.		
Propagation conditions	AWGN		As specified in Annex C.2.2.
Connection Diagram	TE Part	A.3.3.1.1	As specified in TS 38.508-1 [14] Annex A.
	DUT Part	A.3.4.1.1	
Exceptions to connection diagram	N/A		

Table 17.6.3.3.4.1-3: General test parameters

Parameter	Config	Unit	Value
SSB GSCN	1		freq1
Duplex mode	1		TDD
TDD Configuration	1		TDDConf.3.1
$BW_{channel}$	1	MHz	100: $N_{RB,c}$ = 66
PDSCH Reference measurement channel	1		SR.3.1 TDD
RMSI CORESET Reference Channel	1		CR.3.1 TDD
Dedicated CORESET Reference Channel	1		CCR.3.1 TDD
SSB configuration	1		SSB.1 FR2
CSI-RS configuration	1		CSI-RS.3.3 TDD
OCNG Patterns	1		OP.1
Initial BWP Configuration	1		DLBWP.0.1 ULBWP.0.1
Dedicated BWP configuration	1		DLBWP.1.3 ULBWP.1.3
SMTC configuration	1		SMTC.1
TRS Configuration	1		TRS.2.1 TDD
PDCCH/PDSCH TCI Configuration	1		TCI.State.2
DRX configuration	1		Off
reportConfigType	1		aperiodic
reportQuantity	1		cri-RSRP
Number of reported RS	1		2
qcl-Info	1		SSB#0 for resource#0
			SSB#1 for resource#1
reportSlotOffsetList	1		8
Propagation condition	1		AWGN
T1	1	s	5
EPRE ratio of PSS to SSS	1	dB	0
EPRE ratio of PBCH DMRS to SSS			
EPRE ratio of PBCH to PBCH DMRS			
EPRE ratio of PDCCH DMRS to SSS			
EPRE ratio of PDCCH to PDCCH DMRS			
EPRE ratio of PDSCH DMRS to SSS			
EPRE ratio of PDSCH to PDSCH DMRS			
EPRE ratio of OCNG DMRS to SSS Note 1			
EPRE ratio of OCNG to OCNG DMRS Note 1			
Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.			

17.6.3.3.4.2 Test procedure

Same as the test procedure given in clause 7.6.3.3.4.2.

17.6.3.3.4.3 Message contents

Same as the message content given in 7.6.3.3.4.3.

17.6.3.3.5 Test requirement

Same as the test requirements given in clause 7.6.3.3.5 with following exceptions:

- Table 7.6.3.3.5-1 is replaced by Table 17.6.3.3.5-1.

Table 17.6.3.3.5-1: Cell specific test parameters

Parameter	Config	Unit	CSI-RS#0	CSI-RS#1
Angle of arrival configuration	1		Setup 1 according to A.9	
Beam Assumption Note 3	1		Rough	Rough
N_{oc} Note1	1	dBm/15kHz	-105	
N_{oc} Note1	1	dBm/SSB SCS	-95.97	
$\hat{E}_s / I_{ot}$	1	dB	0	9
CSI-RS RSRP Note 2	1	dBm/SSB SCS	-95.97	-86.97
Io Note 2	1	dBm/95.04MHz	-63.97	-57.47
$\hat{E}_s / N_{oc}$	1	dB	0	9

Note 1: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for N_{oc} to be fulfilled.

Note 2: CSI-RS RSRP and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.

Note 3: Information about types of UE beam is given in 38.133 [6] B.2.1.3, and does not limit UE implementation or test system implementation

17.6.3.4 NR SA FR2 CSI-RS based L1-RSRP measurement when DRX is used

Editor's Note: This test case is incomplete in following aspects:

- MU & TT analysis is still missing.

17.6.3.4.1 Test purpose

To verify that the UE makes correct reporting of L1-RSRP measurement. This test will partly verify the L1-RSRP measurement requirements in TS 38.133 [6] clause 9.5B.4.2.

17.6.3.4.2 Test applicability

This test applies to all types of NR RedCap UEs from Release 17 onwards supporting long DRX cycle.

17.6.3.4.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 17.6.3.0.2.

The normative reference for this requirement is TS 38.133 [6] clause A.17.6.3.4.

17.6.3.4.4 Test description

17.6.3.4.4.1 Initial conditions

Same as the initial conditions given in 7.6.3.4.4.1 with following exceptions:

- Table 7.6.3.4.4.1-1 is replaced by Table 17.6.3.4.4.1-1.
- Table 7.6.3.4.4.1-3 is replaced by Table 17.6.3.4.4.1-2.
- Table 7.6.3.4.4.1-2 is replaced by Table 17.6.3.4.4.1-3.

Table 17.6.3.4.4.1-1: Supported test configurations

Test Config	Description
17.6.3.4-1	NR 120 kHz CSI-RS SCS, 100 MHz bandwidth, TDD duplex mode
Note: The UE is only required to be tested in one of the supported test configurations	

Table 17.6.3.4.4.1-2: Initial conditions

Parameter	Value		Comment
Test environment	NC		As specified in TS 38.508-1 [14] clause 4.1.
Test frequencies	As specified in Annex E, table E.15-1 and TS 38.508-1 [14] clause 4.3.1 and 4.4.2.		
Channel bandwidth	As specified by the test configuration selected from Table 17.5.2.3.4.1-1.		
Propagation conditions	AWGN		As specified in Annex C.2.2.
Connection Diagram	TE Part	A.3.3.1.1	As specified in TS 38.508-1 [14] Annex A.
	DUT Part	A.3.4.1.1	
Exceptions to connection diagram	N/A		

Table 17.6.3.4.4.1-3: General test parameters

Parameter	Config	Unit	Value
SSB GSCN	1		freq1
Duplex mode	1		TDD
TDD Configuration	1		TDDConf.3.1
$BW_{channel}$	1	MHz	100: $N_{RB,c}$ = 66
PDSCH Reference measurement channel	1		SR.3.1 TDD
RMSI CORESET Reference Channel	1		CR.3.1 TDD
Dedicated CORESET Reference Channel	1		CCR.3.1 TDD
SSB configuration	1		SSB.1 FR2
CSI-RS configuration	1		CSI-RS.3.3 TDD
OCNG Patterns	1		OP.1
Initial BWP Configuration	1		DLBWP.0.1 ULBWP.0.1
Dedicated BWP configuration	1		DLBWP.1.3 ULBWP.1.3
SMTC configuration	1		SMTC.1
TRS Configuration	1		TRS.2.1 TDD
PDCCH/PDSCH TCI Configuration	1		TCI.State.2
DRX configuration	1		DRX.3
reportConfigType	1		aperiodic
reportQuantity	1		cri-RSRP
Number of reported RS	1		2
qcl-Info	1		SSB#0 for resource#0
			SSB#1 for resource#1
reportSlotOffsetList	1		8
Propagation condition	1		AWGN

T1	1	s	5
EPRE ratio of PSS to SSS	1	dB	0
EPRE ratio of PBCH DMRS to SSS			
EPRE ratio of PBCH to PBCH DMRS			
EPRE ratio of PDCCH DMRS to SSS			
EPRE ratio of PDCCH to PDCCH DMRS			
EPRE ratio of PDSCH DMRS to SSS			
EPRE ratio of PDSCH to PDSCH DMRS			
EPRE ratio of OCNG DMRS to SSS Note 1			
EPRE ratio of OCNG to OCNG DMRS Note 1			
Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.			

17.6.3.4.4.2 Test procedure

Same as the test procedure given in clause 7.6.3.4.4.2.

17.6.3.4.4.3 Message contents

Same as the message content given in 7.6.3.4.4.3.

17.6.3.4.5 Test requirement

Same as the test requirements given in clause 7.6.3.4.5 with following exceptions:

- Table 7.6.3.4.5-1 is replaced by Table 17.6.3.4.5-1.

Table 17.6.3.4.5-1: Cell specific test parameters

Parameter	Config	Unit	CSI-RS#0	CSI-RS#1
Angle of arrival configuration	1		Setup 1 according to A.9	
Beam Assumption Note 3	1		Rough	Rough
N_{oc} Note1	1	dBm/15kHz	-105	
N_{oc} Note1	1	dBm/SSB SCS	-95.97	
$\hat{E}_s / I_{ot}$	1	dB	0	9
CSI-RS RSRP Note 2	1	dBm/SSB SCS	-95.97	-86.97
Io Note 2	1	dBm/95.04MHz	-63.97	-57.47
$\hat{E}_s / N_{oc}$	1	dB	0	9
Note 1: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for N_{oc} to be fulfilled.				
Note 2: CSI-RS RSRP and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.				
Note 3: Information about types of UE beam is given in 38.133 [6] B.2.1.3, and does not limit UE implementation or test system implementation				

18 E-UTRA - NR inter-RAT with E-UTRA serving cell

18.1 RRC_IDLE state mobility

18.1.1 Inter-rat NR cell re-selection

18.1.1.0 Minimum conformance requirements

TBD

18.1.1.1 E-UTRA - NR SA FR1 E-UTRA Cell reselection to higher priority NR target Cell in FR1

Editor's Note: This test case is incomplete in following aspects:

- Message contents are missing.
- Test procedure is TBD
- Test applicability is missing
- TT analysis is missing.
- Cell mapping is missing

18.1.1.1.1 Test purpose

The purpose of this test is to verify the requirement for the E-UTRA - NR SA FR1 inter-RAT cell reselection for RedCap UEs. The requirements are specified in TS 38.133 [6] in clause TBD.

18.1.1.1.2 Test applicability

This test applies to all types of NR RedCap UE release 17 and forward.

18.1.1.1.3 Minimum conformance requirements

The minimum conformance requirements are defined in clause 18.1.1.0.x.

The normative reference for this requirement is TS 38.133 [6] clause A.18.1.1.1.

18.1.1.1.4 Test description

18.1.1.1.4.1 Initial conditions

This test shall be tested using any of the test configurations in Table 18.1.1.1.4.1-1.

Table 18.1.1.1.4.1-1: Supported test configurations for E-UTRA - NR SA FR1 E-UTRA Cell reselection to higher priority NR target Cell in FR1

Configuration	Description
18.1.1.1-1	LTE FDD, NR 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode
18.1.1.1-2	LTE FDD, NR 15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode
18.1.1.1-3	LTE FDD, NR 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode
18.1.1.1-4	LTE TDD, NR 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode
18.1.1.1-5	LTE TDD, NR 15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode
18.1.1.1-6	LTE TDD, NR 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode
18.1.1.1-7	LTE FDD, NR 15 kHz SSB SCS, 10 MHz bandwidth, HD-FDD duplex mode
18.1.1.1-8	LTE TDD, NR 15 kHz SSB SCS, 10 MHz bandwidth, HD-FDD duplex mode
Note: The UE is only required to be tested in one of the supported test configurations	

Configure the test equipment and the DUT according to the parameters in Table 18.1.1.1.4.1-2.

Table 18.1.1.1.4.1-2: Initial conditions for E-UTRA - NR SA FR1 E-UTRA Cell reselection to higher priority NR target Cell in FR1

Parameter	Value	Comment
Test environment	NC	As specified in TS 38.508-1 [14] clause 4.1.
Test frequencies	As specified in Annex E, table E.4-1 and TS 38.508-1 [14] clause 4.3.1.	
Channel bandwidth	As specified by the test configuration selected from Table 6.1.1.2.4.1-1.	

Propagation conditions	AWGN		As specified in Annex C.2.2.
Connection Diagram	TE Part	TBD	As specified in TS 38.508-1 [14] Annex A.
	DUT Part	TBD	
Exceptions to connection diagram	Without faders.		

1. The general test parameter settings are set up according to Table 18.1.1.1.4.1-3.
2. Message contents are defined in clause 18.1.1.1.4.3.
3. The test scenario comprises of 1 E-UTRA cell and 1 NR cell. E-UTRA cell 1 is already identified by the UE prior to the start of the test. Cell 2 is of higher priority than cell 1.

Table 18.1.1.1.4.1-3: General test parameters for E-UTRA - NR SA FR1 E-UTRA Cell reselection to higher priority NR target Cell in FR1

Parameter		Unit	Test configuration	Value	Comment
Initial condition	Active cell		1, 2, 3, 4, 5, 6, 7, 8	Cell2	The UE camps on cell 2 in the initial phase
	Neighbour cell		1, 2, 3, 4, 5, 6, 7, 8	Cell1	
T1 end condition	Active cell			Cell1	During T1 period the UE reselects to cell 1
	Neighbour cell			Cell2	
T3 end condition	Active cell		1, 2, 3, 4, 5, 6, 7, 8	Cell2	The UE shall perform reselection to cell 2 during T3
	Neighbour cell		1, 2, 3, 4, 5, 6, 7, 8	Cell1	
RF Channel Number			1, 2, 3, 4, 5, 6, 7, 8	1, 2	E-UTRAN radio channel (1) and NR radio channel (2) are used for this test
Time offset between cells			1, 4, 7, 8	3 ms	Asynchronous cells
			2, 5	3 μs	Synchronous cells
			3, 6	3 μs	Synchronous cells
Access Barring Information		-	1, 2, 3, 4, 5, 6, 7, 8	Not Sent	No additional delays in random access procedure.
DRX cycle length		s	1, 2, 3, 4, 5, 6, 7, 8	1.28	The value shall be used for all cells in the test.
NR PRACH configuration index			1, 2, 3, 4, 5, 6, 7, 8	102	The detailed configuration is specified in TS 38.211 clause 6.3.3.2
T1		s	1, 2, 3, 4, 5, 6, 7, 8	15	T1 needs to be defined so that cell re-selection reaction time is taken into account.
T2		s	1, 2, 3, 4, 5, 6, 7, 8	>7	During T2, cell 2 shall be powered off, and during the off time the physical cell identity shall be changed. The intention is to ensure that cell 2 has not been detected by the UE prior to the start of period T3.
T3		s	1, 2, 3, 4, 5, 6, 7, 8	75	T3 needs to be defined so that cell re-selection reaction time is taken into account.

18.1.1.1.4.2 Test procedure

TBD

18.1.1.1.4.3 Message contents

Message contents are according to TS 38.508-1 [14] clause 7.3 with the following exceptions:

TBD

18.1.1.1.5 Test requirement

Table 18.1.1.1.5-1 defines the primary level settings including test tolerances for NR – E-UTRA cell re-selection test case in AWGN for UE fulfilling stationary relaxed measurement criterion for 2 Rx UE.

Table 18.1.1.1.5-1: NR cell 2 specific test parameters for E-UTRA - NR SA FR1 E-UTRA Cell reselection to higher priority NR target Cell in FR1

Parameter	Unit	Test configuration	Cell 2		
			T1	T2	T3
TDD configuration		1, 4, 7, 8	N/A		
		2, 5	TDDConf.1.1		
		3, 6	TDDConf.2.1		
PDSCH Reference measurement channel		1, 4, 7, 8	SR.1.1 FDD		
		2, 5	SR.1.1 TDD		
		3, 6	SR.2.1 TDD		
RMSI CORESET Reference Channel		1, 4, 7, 8	CR.1.1 FDD		
		2, 5	CR.1.1 TDD		
		3, 6	CR.2.1 TDD		
RMC CORESET Reference Channel		1, 4, 7, 8	CCR.1.1 FDD		
		2, 5	CCR.1.1 TDD		
		3, 6	CCR.2.1 TDD		
OCNG Patterns		1, 2, 3, 4, 5, 6, 7, 8	OP.1		
SMTC configuration		1, 2, 3, 4, 5, 6, 7, 8	SMTC.1		
SSB configuration		1, 4	SSB.1 FR1		
		2, 5	SSB.1 FR1		
		3, 6	SSB.1 RedCap FR1		
Initial DL BWP configuration		1, 2, 3, 4, 5, 6, 7, 8	DLBWP.0.1		
Initial UL BWP configuration		1, 2, 3, 4, 5, 6, 7, 8	ULBWP.0.1		
RLM-RS		1, 2, 3, 4, 5, 6	SSB		
Qrxlevmin	dBm/SCS	1, 2, 4, 5	-140		
		3, 6	-137		
Pcompensation	dB	1, 2, 3, 4, 5, 6, 7, 8	0		
$Qhyst_s$	dB	1, 2, 3, 4, 5, 6	0		
$Qoffset_{s,n}$	dB	1, 2, 3, 4, 5, 6, 7, 8	0		
Cell_selection_and_reselection_quality_measurement		1, 2, 3, 4, 5, 6, 7, 8	SS-RSRP		
$\hat{E}_s / I_{ot}$	dB	1, 4, 7, 8	-4	-infinity	12
		2, 5			
		3, 6			
N_{oc} Note2	dBm/SCS	1, 4, 7, 8	-98		
		2, 5	-98		
		3, 6	-95		
N_{oc} Note2	dBm/15 kHz	1, 4, 7, 8	-98		
		2, 5			
		3, 6			
$\hat{E}_s / N_{oc}$	dB	1, 4, 7, 8	-4	-infinity	12
		2, 5			
		3, 6			
SS-RSRP Note3	dBm/SCS	1, 4, 7, 8	-102	-infinity	-86
		2, 5	-102	-infinity	-86
		3, 6	-99	-infinity	-83
Io	dBm/9.36 MHz	1, 4, 7, 8	-68.60	-70.05	-57.78
	dBm/9.36 MHz	2, 5	-68.60	-70.05	-57.78
	dBm/38.16 MHz	3, 6	-62.50	-63.95	-51.69

Treselection	s	1, 2, 3, 4, 5, 6, 7, 8	0	0	0
SnonintrasearchP	dB	1, 2, 3, 4, 5, 6, 7, 8	50		
$Thresh_{x, highP}$	dB	1, 2, 3, 4, 5, 6, 7, 8	48		
$Thresh_{serving, lowP}$	dB	1, 2, 3, 4, 5, 6, 7, 8	44		
$Thresh_{x, lowP}$	dB	1, 2, 3, 4, 5, 6, 7, 8	50		
Propagation Condition		1, 2, 3, 4, 5, 6, 7, 8	AWGN		

Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.

Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for N_{oc} to be fulfilled.

Note 3: SS-RSRP levels have been derived from other parameters for information purposes. They are not settable parameters themselves.

Table 18.1.1.1.5-2: E-UTRA cell 1 specific test parameters for E-UTRA - NR SA FR1 E-UTRA Cell reselection to higher priority NR target Cell in FR1

Parameter	Unit	Cell 1		
		T1	T2	T3
E-UTRA RF Channel number		1		
$BW_{channel}$	MHz	10		
OCNG Patterns defined in TS 36.133 [15] clause A.3.2		OP.2 TDD for test configuration 1, 2, 3; OP.2 FDD for test configuration 4, 5, 6		
PBCH_RA	dB	0		
PBCH_RB	dB			
PSS_RA	dB			
SSS_RA	dB			
PCFICH_RB	dB			
PHICH_RA	dB			
PHICH_RB	dB			
PDCCH_RA	dB			
PDCCH_RB	dB			
PDSCH_RA	dB			
PDSCH_RB	dB			
OCNG_RA Note 1	dB			
OCNG_RB Note 1	dB			
Qrxlevmin	dBm	-140		
N_{oc} Note 2	dBm/15 kHz	-98		
RSRP Note 3	dBm/15 KHz	-84	-84	-84
$\hat{E}_s / I_{ot}$	dB	14	14	14
$\hat{E}_s / N_{oc}$	dB	14	14	14
$Treselection_{EUTRAN}$	S	0		
SnonintrasearchP	dB	50		
$Thresh_{x, highP}$	dB	48		
$Thresh_{serving, lowP}$	dB	44		
$Thresh_{x, lowP}$	dB	50		
Propagation Condition		AWGN		

Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.

Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for N_{oc} to be fulfilled.

Note 3: RSRP levels have been derived from other parameters for information purposes. They are not settable parameters themselves.

The cell reselection delay to a higher priority NR cell is defined as the time from the beginning of time period T3, to the moment when the UE camps on cell 2 and starts to send preambles on the PRACH for sending the *RRCSetupRequest* message to perform a registration procedure for mobility and periodic registration update on cell 2.

The cell re-selection delay to a higher priority cell shall be less than 68 s.

NOTE: The cell re-selection delay to a higher priority cell can be expressed as: $T_{higher_priority_search} + T_{evaluate, NR} + T_{SI-NR,}$ and to a lower priority cell can be expressed as: $T_{evaluate, NR} + T_{SI-NR,}$

The rate of correct events observed during repeated tests shall be at least 90% with the confidence level of 95%.

18.2 RRC_CONNECTED state mobility for RedCap

18.2.1 Handover for RedCap

18.2.1.0 Minimum conformance requirements

Then minimum requirements given in clause 16.3.1.0.2 apply.

The normative reference for this requirement is TS 36.133 [23] clause 5.3.4B.

18.2.1.1 E-UTRA - NR FR1 handover for 2Rx UE

18.2.1.1.1 Test purpose

To verify the E-UTRAN to NR FR1 handover requirements for 2RX RedCap as specified in TS 36.133 [23] clause 5.3.4B.

18.2.1.1.2 Test applicability

This test applies to all E-UTRA UE from release 17 onwards and capable of NR RedCap with 2Rx.

18.2.1.1.3 Minimum conformance requirements

The minimum conformance requirements are defined in clause 18.2.1.0

The normative reference for this requirement is TS 38.133 [6] clause A.18.2.1.1.

18.2.1.1.4 Test description

Same as the test description given in clause 8.3.1.1.4.

18.2.1.1.4.1 Initial conditions

Same as the initial conditions given in clause 8.3.1.1.4.1 with following exceptions:

- Table 8.3.1.1.4.1-1 is replaced by Table 18.2.1.1.4.1-1.
- Table 8.3.1.1.4.1-2 is replaced by Table 18.2.1.1.4.1-2.
- Table 8.3.1.1.4.1-3 is replaced by Table 18.2.1.1.4.1-3.

Table 18.2.1.1.4.1-1: Supported test configurations

Configuration	Description
18.2.1.1-1	LTE FDD, NR 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode
18.2.1.1-2	LTE FDD, NR 15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode
18.2.1.1-3	LTE FDD, NR 30 kHz SSB SCS, 20 MHz bandwidth, TDD duplex mode
18.2.1.1-4	LTE FDD, NR 15 kHz SSB SCS, 10 MHz bandwidth, HD-FDD duplex mode
18.2.1.1-5	LTE TDD, NR 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode
18.2.1.1-6	LTE TDD, NR 15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode

18.2.1.1-7	LTE TDD, NR 30 kHz SSB SCS, 20 MHz bandwidth, TDD duplex mode
18.2.1.1-8	LTE TDD, NR 15 kHz SSB SCS, 10 MHz bandwidth, HD-FDD duplex mode
Note: The UE is only required to be tested in one of the supported test configurations	

Table 18.2.1.1.4.1-2: Initial conditions

Parameter	Value		Comment
Test environment	NC		As specified in TS 36.508 [25] clause 4.1.
Test frequencies	As specified in Annex E, Table E.6-1 and TS 38.508-1 [14] clause 4.3.1.		
Channel bandwidth	As specified by the test configuration selected from Table 18.2.1.1.4.1-1.		
Propagation conditions	AWGN		As specified in clause C.2.1
Connection Diagram	TE Part	A.3.1.8.2	As specified in TS 38.508-1 [14] Annex A.
	DUT Part	A.3.2.3.4	
Exceptions to connection diagram	N/A		

Table 18.2.1.1.4.1-3: General test parameters

Parameter		Unit	Value	Comment
NR RF Channel Number			1	1 NR carrier frequency is used in the test
LTE RF Channel Number			2	1 E-UTRAN carrier frequency is used in the test
Initial conditions	Active cell		Cell 1	E-UTRAN cell
	Neighbouring cell		Cell 2	NR cell
Final condition	Active cell		Cell 2	
NR measurement quantity			SS-RSRP	
E-UTRAN measurement quantity			RSRP	
b2-Threshold1		dBm	-83	Absolute E-UTRAN RSRP threshold for event B2
b2-Threshold2NR		dBm	As specified in Table 18.2.1.1.5-2	Absolute NR SS-RSRP threshold for event B2
Hysteresis		dB	0	
TimeToTrigger		s	0	
Filter coefficient			0	L3 filtering is not used
DRX			OFF	Non-DRX test
Access Barring Information		-	Not sent	No additional delays in random access procedure
Time offset between cells			3 ms	Asynchronous cells
Gap pattern configuration Id			0	As specified in Table 8.1.2.1-1 started before T2 starts [23]
T1		s	5	
T2		s	≤5	
T3		s	1	

18.2.1.1.4.2 Test procedure

Same as the test procedure given in clause 8.3.1.1.4.2.

18.2.1.1.4.3 Message contents

Same as the message contents given in clause 8.3.1.1.4.3 with following exceptions.

- Table 7.3.1-3 in TS 38.508-1 [14] is used with condition SMTC.1 RedCap.

18.2.1.1.5 Test requirement

Same as the test requirements given in clause 8.3.1.1.5 with following exceptions:

- Table 8.3.1.1.5-1 is replaced by Table 18.2.1.1.5-1.

- Table 8.3.1.1.5-2 is replaced by Table 18.2.1.1.5-2.

Table 18.2.1.1.5-1: Cell specific test parameters for E-UTRA PCell (Cell 1)

Parameter	Unit	Configuration	Cell 1		
			T1	T2	T3
RF channel number		1,2,3,4,5,6,7,8	2		
Duplex mode		1,2,3,4	FDD		
		5,6,7,8	TDD		
TDD special subframe configuration[Note1]		5,6,7,8	6		
TDD uplink-downlink configuration[Note1]		5,6,7,8	1		
$BW_{channel}$	MHz	1,2,3,4,5,6,7,8	5 MHz: $N_{RB,c}$ = 25 10 MHz: $N_{RB,c}$ = 50 20 MHz: $N_{RB,c}$ = 100		
PRACH Configuration[Note2]		1,2,3,4	4		
		5,6,7,8	53		
PDSCH parameters: DL Reference Measurement Channel[Note3]		1,2,3,4	5 MHz: R.7 FDD 10 MHz: R.3 FDD 20 MHz: R.6 FDD		
		5,6,7,8	5 MHz: R.4 TDD 10 MHz: R.0 TDD 20 MHz: R.3 TDD		
PCFICH/PDCCH/PHICH parameters: DL Reference Measurement Channel[Note3]		1,2,3,4	5 MHz: R.11 FDD 10 MHz: R.6 FDD 20 MHz: R.10 FDD		
		5,6,7,8	5 MHz: R.11 TDD 10 MHz: R.6 TDD 20 MHz: R.10 TDD		
OCNG Patterns[Note3]		1,2,3,4	5 MHz: OP.20 FDD 10 MHz: OP.10 FDD 20 MHz: OP.17 FDD		
		5,6,7,8	5 MHz: OP.9 TDD 10 MHz: OP.1 TDD 20 MHz: OP.7 TDD		
PBCH_RA	dB	1,2,3,4,5,6,7,8	0		
PBCH_RB					
PSS_RA					
SSS_RA					
PCFICH_RB					
PHICH_RA					
PHICH_RB					
PDCCH_RA					
PDCCH_RB					
PDSCH_RA					
PDSCH_RB					
OCNG_RA[Note4]					
OCNG_RB[Note4]					
N_{oc}[Note5]	dBm/15 kHz	1,2,3,4,5,6,7,8	-98		
$\hat{E}_s/N_{oc}$	dB	1,2,3,4,5,6,7,8	7	5.45 [Note 8]	5.45 [Note 8]
$\hat{E}_s/I_{ot}$[Note6]	dB	1,2,3,4,5,6,7,8	7	5.45	5.45
RSRP[Note6]	dBm/15 kHz	1,2,3,4,5,6,7,8	-91	-92.55	-92.55
SCH_RP[Note6]	dBm/15 kHz	1,2,3,4,5,6,7,8	-91	-92.55	-92.55
Io[Note6]	dBm/9 MHz	1,2,3,4,5,6,7,8	-62.43	-63.68	-63.68
Propagation Condition		1,2,3,4,5,6,7,8	AWGN		
Antenna Configuration and Correlation Matrix [Note7]		1,2,3,4,5,6,7,8	1x2 Low		

NOTE 1: Special subframe and uplink-downlink configurations are specified in table 4.2-1 in TS 36.211 [23].
NOTE 2: PRACH configurations are specified in table 5.7.1-2 and table 5.7.1-3 in TS 36.211 [23].
NOTE 3: DL RMCs and OCNG patterns are specified in clauses A 3.1 and A 3.2 of TS 36.133 [15] respectively.
NOTE 4: OCNG shall be used such that all cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.

Parameter	Unit	Configuration	Cell 1		
			T1	T2	T3
NOTE 5: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for N_{oc} to be fulfilled.					
NOTE 6: $\hat{E}_s/I_{ot}$, RSRP, SCH_RP and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.					
NOTE 7: Propagation condition and correlation matrix are defined in clause B.2 in TS 36.101 [27].					
NOTE 8: Including test tolerance given in Annex F.					

Table 18.2.1.1.5-2: NR neighbour Cell specific test parameters for NR neighbour (Cell 2)

Parameter		Unit	Configuration	Cell 2		
				T1	T2	T3
RF channel number			1,2,3,4,5,6,7,8	1		
Duplex mode			1,5	FDD		
			2,3,6,7	TDD		
			4.8	HD-FDD		
TDD Configuration			2 6	TDDConf.1.1		
			3,7	TDDConf.2.1		
$BW_{channel}$		MHz	1,4,5,8	10: $N_{RB,c}$ = 52 (FDD)		
			2,6	10: $N_{RB,c}$ = 52 (TDD)		
			3,7	20: $N_{RB,c}$ = 51 (TDD)		
PDSCH reference measurement channel			1,4,5,8	SR.1.1 FDD		
			2,6	SR.1.1 TDD		
			3,7	SR.2.1 TDD		
CORSET reference channel			1,4,5,8	CR.1.1 FDD		
			2,6	CR.1.1 TDD		
			3,7	CR.2.1 TDD		
PRACH configuration			1,2,3,4,5,6,7,8	PRACH.1 FR1		
OCNG pattern[Note1]			1,2,3,4,5,6,7,8	OP.1		
BWP	Initial DL BWP		1,2,3,4,5,6,7,8	DLBWP.0.1		
	Dedicated DL BWP			DLBWP.1.1		
	Initial UL BWP			ULBWP.0.1		
	Dedicated UL BWP			ULBWP.1.1		
SMTC configuration			1,2,3,4,5,6,7,8	SMTC.1 RedCap		
SSB configuration			1,2,4,5,6,8	SSB.1 RedCap FR1		
			3,7	SSB.2 RedCap FR1		
b2-Threshold2NR		dBm	1,2,4,5,6,8	-106		
			3,7	-103		
EPRE ratio of PSS to SSS		dB	1,2,3,4,5,6,7,8	0		
EPRE ratio of PBCH_DMRS to SSS						
EPRE ratio of PBCH to PBCH_DMRS						
EPRE ratio of PDCCH_DMRS to SSS						
EPRE ratio of PDCCH to PDCCH_DMRS						
EPRE ratio of PDSCH_DMRS to SSS						
EPRE ratio of PDSCH to PDSCH_DMRS						
EPRE ratio of OCNG DMRS to SSS						
EPRE ratio of OCNG to OCNG DMRS						
N_{oc}[Note2]		dBm/15 KHz	1,2,3,4,5,6,7,8	-98		
N_{oc}[Note2]		dBm/SCS	1,2,4,5,6,8	-98		
			3,7	-95		
$\hat{E}_s/N_{oc}$		dB	1,2,3,4,5,6,7,8	-infinity	1.55 [Note 4]	1.55 [Note 4]
$\hat{E}_s/I_{ot}$[Note3]		dB	1,2,3,4,5,6,7,8	-infinity	1.55	1.55
SS-RSRP[Note3]		dBm/SCS	1,2,4,5,6,8	-infinity	-96.45	-96.45
			3,7	-infinity	-93.44	-93.44
Io[Note3]		dBm/9.36 MHz	1,2,4,5,6,8	-70.05	-66.19	-66.19
		dBm/18.36 MHz	3,7	-67.13	-63.27	-63.27
Propagation condition			1,2,3,4,5,6,7,8	AWGN		
Antenna Configuration and Correlation Matrix			1,2,3,4,5,6,7,8	1x2 Low		
NOTE 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.						

NOTE 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for N_{oc} to be fulfilled.
NOTE 3: $\hat{E}_s/I_{ot}$, SS-RSRP, and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.
NOTE 4: Including test tolerance given in Annex F.

18.2.2 RRC connection release with redirection for RedCap

18.2.2.0 Minimum conformance requirements

18.2.2.0.1 Redirection from E-UTRA to FR1 RedCap UE

The RedCap UE shall be capable of performing the RRC connection release with redirection to the target NR cell within $T_{connection_release_redirect_NR_RedCap}$.

The time delay ($T_{connection_release_redirect_NR_RedCap}$) is the time between the end of the last TTI containing the RRC command, "*RRCConnectionRelease*" (TS 36.331 [2]) on the E-UTRAN PDSCH and the time the UE starts to send random access to the target NR cell. The time delay ($T_{connection_release_redirect_NR_RedCap}$) shall be less than:

$$T_{connection_release_redirect_NR_RedCap} = T_{RRC_procedure_delay} + T_{identify\text{-}NR_Redcap} + T_{SI\text{-}NR_RedCap} + T_{RACH_RedCap}$$

The target NR cell shall be considered detectable for 1 Rx RedCap when for each relevant SSB:

- SSB_RP and SSB $\hat{E}s/Iot$ according to Annex B.2.X of TS 38.133 [6] for a corresponding NR Band.

The target NR cell shall be considered detectable for 2 Rx RedCap when for each relevant SSB:

- SSB_RP and SSB $\hat{E}s/Iot$ according to Annex B.2.X of TS 38.133 [6] for a corresponding NR Band.

$T_{RRC_procedure_delay}$: It is the RRC procedure delay for processing the received message "*RRCConnectionRelease*" as defined in clause 6.2.2 of TS 36.331 [2]. It shall be less than 110 ms.

$T_{identify\text{-}NR_RedCap}$: It is the time to identify the target NR cell and depends on the frequency range (FR) of the target NR cell. It is defined in Table 18.2.2.0-1 for 1 Rx RedCap for FR1 and in Table 18.2.2.0-2 for 2 Rx RedCap. $T_{identify\text{-}NR_RedCap} = T_{PSS/SSS\text{-}sync_RedCap} + T_{meas_RedCap}$, where $T_{PSS/SSS\text{-}sync_RedCap}$ is the cell search time and T_{meas_RedCap} is the measurement time due to cell selection criteria evaluation. The RedCap UE operating in NR HD-FDD shall meet the requirements in this section provided that the SSB is available at the UE at least once every SMTC period during $T_{identify\text{-}NR_RedCap}$.

$T_{SI\text{-}NR_RedCap}$: It is the time required for acquiring all the relevant system information of the target NR cell. This time depends upon whether the UE is provided with the relevant system information of the target NR cell or not by the old NR cell before the RRC connection is released.

T_{RACH_RedCap}: It is the delay caused due to the random access procedure when sending random access to the target NR cell. T_{RACH_RedCap} can be up to the summation of SSB to PRACH occasion association period and 10 ms. SSB to PRACH occasion associated period is defined in the table 8.1-1 of TS 38.213 [39]. The RedCap UE operating in NR HD-FDD mode shall perform the PRACH transmission on the PRACH resource of the target NR cell provided that the UE has received at least one SSB associated with the PRACH resource during the last [TBD] period in the target NR cell.

T_{rs} is the SMTC periodicity of the target NR cell if the UE has been provided with an SMTC configuration for the target cell in the redirection command, otherwise T_{rs} is the SMTC periodicity configured in the *measObjectNR* having the same SSB frequency and subcarrier spacing configured for the RRC connection release with redirection. If the UE is not provided with SMTC configuration or measurement object for the frequency which is also configured for the RRC connection release with redirection then:

- the requirement in this section is applied with T_{rs} = 20 ms assuming the SSB transmission periodicity is not larger than 20 ms,

- there is no requirement if the SSB transmission periodicity is larger than 20 ms.

Table 18.2.2.0-1: Time to identify target NR cell for RRC connection release with redirection to NR for 1 Rx RedCap

Frequency range (FR) of target NR cell	$T_{identify-NR_RedCap}$
FR1	MAX (680 ms, 12 x Trs)

Table 18.2.2.0-2: Time to identify target NR cell for RRC connection release with redirection to NR for 2 Rx RedCap

Frequency range (FR) of target NR cell	$T_{identify-NR_RedCap}$
FR1	MAX (680 ms, 11 x Trs)
FR2	MAX (880 ms, 88 x Trs)

The normative reference for this requirement is TS 36.133 [23] clause 6.3.2.6.

18.2.2.1 Redirection from E-UTRA to NR SA FR1 for redcap UE

Editor's Notes: This test case is complete for RedCap UE with 2 Rx.

Editor's Notes: This test case is incomplete for RedCap UE with 1 Rx in following aspects.

- TT analysis is still missing.

18.2.2.1.1 Test purpose

To verify RRC connection release with redirection from E-UTRA to NR requirements specified in 36.133 [23] clause 6.3.2.6.

18.2.2.1.2 Test applicability

This test applies to all types of NR RedCap UE with 1Rx or 2Rx from Release 17 onwards.

18.2.2.1.3 Minimum conformance requirement

The minimum conformance requirements are specified in clause 18.2.2.0.1.

The normative reference for this requirement is TS 38.133 [6] clauses A.18.2.2.1.

18.2.2.1.4 Test description

18.2.2.1.4.1 Initial conditions

This test can be run in the configurations defined in Table 18.2.2.1.4.1-1

Table 18.2.2.1.4.1-1: Supported test configurations

Configuration	Description
18.2.2.1-1	NR 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode, LTE FDD
18.2.2.1-2	NR 15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode, LTE FDD
18.2.2.1-3	NR 30 kHz SSB SCS, 20 MHz bandwidth, TDD duplex mode, LTE FDD
18.2.2.1-4	NR 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode, LTE TDD
18.2.2.1-5	NR 15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode, LTE TDD
18.2.2.1-6	NR 30 kHz SSB SCS, 20 MHz bandwidth, TDD duplex mode, LTE TDD
18.2.2.1-7	NR 15 kHz SSB SCS, 10 MHz bandwidth, HD-FDD duplex mode, LTE FDD
18.2.2.1-8	NR 15 kHz SSB SCS, 10 MHz bandwidth, HD-FDD duplex mode, LTE TDD
Note: The UE is only required to be tested in one of the supported test configurations	

Configure the test equipment and the DUT according to the parameters in Table 18.2.2.1.4.1-2.

Table 18.2.2.1.4.1-2: Initial conditions

Parameter	Value		Comment
Test environment	NC		As specified in TS 38.508-1 [14] clause 4.1.
Test frequencies	As specified in Annex E, Table E.4-1 and TS 38.508-1 [14] clause 4.3.1.		
Channel bandwidth	As specified by the test configuration selected from Table 6.3.2.3.2.4.1-1.		
Propagation conditions	AWGN		As specified in Annex C.2.2.
Connection Diagram	TE Part	A.3.1.6.1	As specified in TS 38.508-1 [14] Annex A.
	DUT Part	A.3.2.3.2	
Exceptions to connection diagram	For 1Rx RedCap: - A.3.1.8.1 is used for TE part - A.3.2.2.1 is used for DUT part		

1. The general test parameters settings are given in Table 18.2.2.1.4.1-3 below.

2. Message contents are defined in clause 18.2.2.1.4.3.

3. There are two cells specified in the test. Cell 1 is the E-UTRA PCell and Cell 2 is the NR neighbour cell. Cell 1 is configured according to TS 36.521-3 [26] Annex C.1.0 and C.1.1, Cell 2 is configured according to Annex C.1.1 and C.1.2,

Table 18.2.2.1.4.1-3: General test parameters

Parameter		Unit	Value	Comment
Initial conditions	Active cell		Cell 1	E-UTRA Cell
	Neighbouring cell		Cell 2	NR Cell
Final condition	Active cell		Cell 2	
Filter coefficient			0	L3 filtering is not used
Access Barring Information		-	Not Sent	No additional delays in random access procedure.
Time offset between cells			3 µs	Synchronous cells
T1		s	5	
T2		s	2.3	

18.2.2.1.4.2 Test procedure

The test consists of two successive time periods, with time duration of T1, and T2 respectively. The *RRCConnectionRelease* message shall be sent to the UE during period T1 and the start of T2 is the instant when the last TTI containing the RRC message is sent to the UE. Prior to time duration T2, the UE shall not have any timing information of Cell 2. Cell 2 is powered up at the beginning of the T2.

1. Ensure the UE is in State 3A-RF according to TS 36.508 [25] clause 7.2A.3.

2. Set the parameters according to T1 in Table 18.2.2.1.5-1 for Cell 1 and 18.2.2.1.5-2 for Cell 2. T1 starts.

3. SS shall transmit an *RRCConnectionRelease* with *redirectedCarrierInfo* during period T1.

4. The SS shall start T2 timer when the last TTI containing the *RRCConnectionRelease* message is sent to UE.

5. When T2 starts, the SS shall switch the power setting from T1 to T2 as specified in Table 18.2.2.1.5-1 for Cell 1 and 18.2.2.1.5-2 for Cell 2.

6. The UE shall transmit an *RRCSetupRequest* message.

7. If the UE transmits the PRACH to Cell 2 less than 2205 ms from the beginning of time period T2 then the number of successful tests is increased by one. Otherwise, the number of failure tests is increased by one.

8. After T2 expires, the UE shall be switched off. Then ensure the UE is in State 3A-RF according to TS 36.508 [25] clause 7.2A.3. Cell 1 is the active cell and Cell 2 shall be powered OFF.

9. The SS shall set Cell 2 physical cell identity = ((current cell 2 physical cell identity + 1) mod 14+2) for next iteration of the test procedure loop.

10. Repeat step 2-9 until the confidence level according to Table G.2.3-1 in Annex G clause G.2 is achieved.

18.2.2.1.4.3 Message contents

Message contents are according to TS 38.508-1 [14] clause 7.3 with the following exceptions:

Table 18.2.2.1.4.3-1: RRCConnectionRelease (Test procedure, Step 3)

Derivation Path: 36.508 [25] Table 4.6.1-15			
Information Element	**Value/remark**	**Comment**	**Condition**
RRCConnectionRelease ::= SEQUENCE {			
criticalExtensions CHOICE {			
c1 CHOICE {			
rrcConnectionRelease-r8 SEQUENCE {			
redirectedCarrierInfo CHOICE {			
nr-r15 SEQUENCE {			
carrierFreq-r15	ARFCN-ValueNR-r15 of Cell 2		
subcarrierSpacingSSB-r15	khz15		Config 1,2,4,5,7,8
	Khz30		Config 3,6
smtc-r15 SEQUENCE {			
periodicityAndOffset-r15 CHOICE {			
sf40-r15	0		
}			
ssb-Duration-r15	sf1		
}			
}			
}			
}			
}			
}			
}			

18.2.2.1.5 Test requirement

Table 18.2.2.1.4.3-1 and Table 18.2.2.1.4.3-2 define the primary level settings for redirection from E-UTRA to NR RedCap test case.

Table 18.2.2.1.5-1: E-UTRA Cell specific test parameters (Cell 1)

Parameter	**Unit**	**Configuration**	**Cell 1**	
			T1	**T2**
RF channel number		1,2,3,4,5,6,7,8	2	
Duplex mode		1,2,3,7	FDD	
		4,5,6,8	TDD	
TDD special subframe configuration[Note1]		4,5,6,8	6	
TDD uplink-downlink configuration[Note1]		4,5,6,8	1	
$BW_{channel}$	MHz	1,2,3,4,5,6,7,8	5 MHz: $N_{RB,c}$ = 25 10 MHz: $N_{RB,c}$ = 50 20 MHz: $N_{RB,c}$ = 100	
PRACH Configuration[Note2]		1,2,3,7	4	
		4,5,6,8	53	
PDSCH parameters: DL Reference Measurement Channel[Note3]		1,2,3,7	5 MHz: R.7 FDD 10 MHz: R.3 FDD 20 MHz: R.6 FDD	
		4,5,6,8	5 MHz: R.4 TDD 10 MHz: R.0 TDD 20 MHz: R.3 TDD	
PCFICH/PDCCH/PHICH parameters:		1,2,3,7	5 MHz: R.11 FDD 10 MHz: R.6 FDD	

DL Reference Measurement Channel[Note3]			20 MHz: R.10 FDD	
		4,5,6,8	5 MHz: R.11 TDD 10 MHz: R.6 TDD 20 MHz: R.10 TDD	
OCNG Patterns[Note3]		1,2,3,7	5 MHz: OP.20 FDD 10 MHz: OP.10 FDD 20 MHz: OP.17 FDD	
		4,5,6,8	5 MHz: OP.9 TDD 10 MHz: OP.1 TDD 20 MHz: OP.7 TDD	
PBCH_RA	dB	1,2,3,4,5,6,7,8	0	
PBCH_RB				
PSS_RA				
SSS_RA				
PCFICH_RB				
PHICH_RA				
PHICH_RB				
PDCCH_RA				
PDCCH_RB				
PDSCH_RA				
PDSCH_RB				
OCNG_RA[Note4]				
OCNG_RB[Note4]				
N_{oc}[Note5]	dBm/15kHz	1,2,3,4,5,6,7,8	-98	
$\hat{E}_s/N_{oc}$	dB	1,2,3,4,5,6,7,8	4	4
$\hat{E}_s/I_{ot}$[Note6]	dB	1,2,3,4,5,6,7,8	4	4
RSRP[Note6]	dBm/15kHz	1,2,3,4,5,6,7,8	-94	-94
SCH_RP[Note6]	dBm/15kHz	1,2,3,4,5,6,7,8	-94	-94
Io[Note6]	dBm/9MHz	1,2,3,4,5,6,7,8	-64.76	-64.76
Propagation Condition		1,2,3,4,5,6,7,8	AWGN	

Note 1: Special subframe and uplink-downlink configurations are specified in table 4.2-1 in TS 36.211 [23].
Note 2: PRACH configurations are specified in table 5.7.1-2 and table 5.7.1-3 in TS 36.211 [23].
Note 3: DL RMCs and OCNG patterns are specified in clauses A 3.1 and A 3.2 of TS 36.133 [15] respectively.
Note 4: OCNG shall be used such that all cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.
Note 5: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for N_{oc} to be fulfilled.
Note 6: $\hat{E}_s/I_{ot}$, RSRP, SCH_RP and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.
Note 7: Propagation condition and correlation matrix are defined in clause B.2 in TS 36.101 [25].

Table 18.2.2.1.5-2: NR Cell specific test parameters (Cell 2)

Parameter		Unit	Cell 2	
			T1	T2
RF Channel Number			1	
Duplex mode	Config 1,4		FDD	
	Config 2,3,5,6		TDD	
	Config 7,8		HD-FDD	
SSB Configuration	Config 1,2,4,5,7,8		SSB.1 FR1	
	Config 3,6		SSB.1 RedCap FR1	
TDD configuration	Config 1,4,7,8		Not Applicable	
	Config 2,5		TDDConf.1.1	
	Config 3,6		TDDConf.2.1	
$BW_{channel}$	Config 1,2,4,5,7,8	MHz	10: $N_{RB,c}$ = 52	
	Config 3,6		20: $N_{RB,c}$ = 51	
BWP BW	Config 1,2,4,5,7,8	MHz	10: $N_{RB,c}$ = 52	
	Config 3,6		20: $N_{RB,c}$ = 51	
DRX Cycle		ms	Not Applicable	
PDSCH Reference measurement channel	Config 1,4,7,8		SR.1.1 FDD	
	Config 2,5		SR.1.1 TDD	
	Config 3,6		SR.2.1 TDD	

CORESET Reference Channel	Config 1,4,7,8		CR.1.1 FDD	
	Config 2,5		CR.1.1 TDD	
	Config 3,6		CR.2.1 TDD	
OCNG Patterns			OP.1	
SMTC configuration	Config 1,2,4,5,7,8		SMTC.1 RedCap FR1	
	Config 3,6		SMTC.1 RedCap FR1	
PDSCH/PDCCH subcarrier spacing	Config 1,2,4,5,7,8	kHz	15 kHz	
	Config 3,6		30 kHz	
PUCCH/PUSCH subcarrier spacing	Config 1,2,4,5,7,8	kHz	15 kHz	
	Config 3,6		30 kHz	
PRACH configuration			PRACH.1 FR1	
BWP configuration	Initial DL BWP		DLBWP.0.1	
	Dedicated DL BWP		DLBWP.1.1	
	Initial UL BWP		ULBWP.0.1	
	Dedicated UL BWP		ULBWP.1.1	
EPRE ratio of PSS to SSS		dB	0	
EPRE ratio of PBCH DMRS to SSS				
EPRE ratio of PBCH to PBCH DMRS				
EPRE ratio of PDCCH DMRS to SSS				
EPRE ratio of PDCCH to PDCCH DMRS				
EPRE ratio of PDSCH DMRS to SSS				
EPRE ratio of PDSCH to PDSCH				
EPRE ratio of OCNG DMRS to SSS Note 1				
EPRE ratio of OCNG to OCNG DMRS Note 1				
N_{oc} Note2		dBm/15kHz	-98	
N_{oc} Note2	Config 1,2,4,5,7,8	dBm/SCS	-98	
	Config 3,6		-95	
$\hat{E}_s/I_{ot}$		dB	-infinity	4
$\hat{E}_s/N_{oc}$		dB	-infinity	4
Io Note3	Config 1,2,4,5,7,8	dBm/ 9.36MHz	-70.05	-64.59
	Config 3,6	dBm/ 18.36MHz	-67.12	-61.67
Propagation condition		-	AWGN	

Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.

Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for N_{oc} to be fulfilled.

Note 3: Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.

The UE shall start to transmit the PRACH to Cell 2 less than 2240 ms from the beginning of time period T2.
The rate of correct RRC connection release redirection to NR observed during repeated tests shall be at least 90%.

NOTE: The redirection delay can be expressed as:

$$T_{connection_release_redirect_NR_RedCap} = T_{RRC_procedure_delay} + T_{identify\text{-}NR_Redcap} + T_{SI\text{-}NR_RedCap} + T_{RACH_RedCap}$$

where:

$T_{RRC_procedure_delay}$ = 110 ms and is specified in clause 12 in TS 38.331 [13].

$T_{identify\text{-}NR}$ = 680 ms in the test regardless RedCap UE is capable of 2 Rx or only supports 1 Rx.

$T_{SI\text{-}NR_RedCap}$ = 1280 ms, it is the time required for receiving all the relevant system information as defined in TS 38.331[13] for the target NR cell.

T_{RACH_RedCap} = 170 ms in the test.

This gives a total of 2240 ms.

18.3 Measurement procedure for RedCap

18.3.1 E-UTRA - NR Measurements for RedCap

18.3.1.0 Minimum conformance requirements

18.3.1.0.1 Minimum conformance requirements for E-UTRA - NR event-triggered measurement

The UE shall be able to identify new inter-RAT NR cells and perform SS-RSRP, SS-RSRQ, and SS-SINR measurements of identified inter-RAT cells if carrier frequency information is provided by the PCell, even if no explicit neighbour list with physical layer cell identities is provided.

Requirements in this clause are applicable to both E-UTRA FDD and E-UTRA TDD serving cell.

When measurement gaps are scheduled, the RedCap UE shall be able to identify a new detectable cell within $T_{identify_irat_without_index_RedCap}$ if UE is not indicated to report SSB based RRM measurement result with the associated SSB index (*reportQuantityRsIndexes* or *maxNrofRSIndexesToReport* is not configured). Otherwise, UE shall be able to identify a new detectable inter-RAT cell within $T_{identify_irat_with_index_RedCap}$. The UE shall be able to identify a new detectable inter-RAT SS block of an already detected cell within $T_{identify_irat_without_index_RedCap}$.

$$T_{identify_irat_without_index_RedCap} = (T_{PSS/SSS_sync_irat_RedCap} + T_{SSB_measurement_period_irat_RedCap}) \text{ ms}$$

$$T_{identify_irat_with_index_RedCap} = (T_{PSS/SSS_sync_irat_RedCap} + T_{SSB_measurement_period_irat_RedCap} + T_{SSB_time_index_irat_RedCap}) \text{ ms}$$

Where:

$T_{PSS/SSS_sync_irat_RedCap}$: it is the time period used in PSS/SSS detection given in Table 18.3.1.0.1-1 and Table 18.3.1.0.1-3 for 2 Rx RedCap, Table 18.3.1.0.1-2 for 1 Rx RedCap.

$T_{SSB_time_index_irat_RedCap}$: it is the time period used to acquire the index of the SSB being measured given in Table 18.3.1.0.1-4 and Table 18.3.1.0.1-6 for 2 Rx RedCap, Table 18.3.1.0.1-5 for 1 Rx RedCap.

$T_{SSB_measurement_period_irat_RedCap}$: equal to a measurement period of SSB based measurement given in Table 18.3.1.0.1-7 and Table 18.3.1.0.1-9 for 2 Rx RedCap, Table 18.3.1.0.1-8 for 1 Rx RedCap.

$M_{pss/sss_sync_irat_RedCap}$: For a 2 Rx RedCap supporting FR2 power class 7, $M_{pss/sss_sync_irat_RedCap}$ = 40 samples.

$M_{SSB_index_irat_RedCap}$: For a 2 Rx RedCap supporting FR2 power class 7, $M_{SSB_index_irat_RedCap}$ = 40 samples.

$M_{meas_period_irat_RedCap}$: For a 2 Rx RedCap supporting FR2 power class 7, $M_{meas_period_irat}$ = 40 samples.

N_{freq_RedCap} is defined in 38.133 [6] clause 8.1.2.1.1d.

Table 18.3.1.0.1-1: Time period for PSS/SSS detection for 2 Rx RedCap (Frequency range FR1)

Condition NOTE1	$T_{PSS/SSS_sync_irat_RedCap}$
No DRX	Max(600ms, 8 × Max(MGRP, SMTC period)) × N_{freq_RedCap}
DRX cycle ≤ 320ms	Max(600ms, Ceil(8×1.5) × Max(MGRP, SMTC period, DRX cycle)) × N_{freq_RedCap}
DRX cycle > 320ms	8 × DRX cycle × N_{freq_RedCap}
NOTE 1: DRX or non DRX requirements apply according to the conditions described in section 3.6.1 of TS 38.133 [50].	

Table 18.3.1.0.1-2: Time period for PSS/SSS detection for 1 Rx RedCap (Frequency range FR1)

Condition NOTE1	$T_{PSS/SSS_sync_irat_RedCap}$
No DRX	Max(600ms, 7 × Max(MGRP, SMTC period)) × N_{freq_RedCap}
DRX cycle ≤ 320ms	Max(600ms, Ceil(7 *1.5) × Max(MGRP, SMTC period, DRX cycle)) × N_{freq_RedCap}
DRX cycle > 320ms	7 × DRX cycle × N_{freq_RedCap}
NOTE 1: DRX or non DRX requirements apply according to the conditions described in section 3.6.1 of TS 38.133 [50].	

Table 18.3.1.0.1-3: Time period for PSS/SSS detection for 2 Rx RedCap (Frequency range FR2)

Condition NOTE1	$T_{PSS/SSS_sync_irat_RedCap}$
No DRX	$Max(600ms, M_{pss/sss_sync_irat_RedCap} \times Max(MGRP, SMTC\ period)) \times N_{freq_RedCap}$
DRX cycle ≤ 320ms	$Max(600ms, (1.5 \times M_{pss/sss_sync_irat_RedCap}) \times Max(MGRP, SMTC\ period, DRX\ cycle)) \times N_{freq_RedCap}$
DRX cycle > 320ms	$M_{pss/sss_sync_irat_RedCap} \times DRX\ cycle \times N_{freq_RedCap}$
NOTE 1: DRX or non DRX requirements apply according to the conditions described in section 3.6.1 of TS 38.133 [50].	

Table 18.3.1.0.1-4: Time period for time index detection for 2 Rx RedCap (Frequency range FR1)

Condition NOTE1	$T_{SSB_time_index_irat_RedCap}$
No DRX	$Max(120ms, 3 \times Max(MGRP, SMTC\ period)) \times N_{freq_RedCap}$
DRX cycle ≤ 320ms	$Max(120ms, Ceil(3 \times 1.5) \times Max(MGRP, SMTC\ period, DRX\ cycle)) \times N_{freq_RedCap}$
DRX cycle > 320ms	$3 \times DRX\ cycle \times N_{freq_RedCap}$
NOTE 1: DRX or non DRX requirements apply according to the conditions described in section 3.6.1 of TS 38.133 [50].	

Table 18.3.1.0.1-5: Time period for time index detection for 1 Rx RedCap (Frequency range FR1)

Condition NOTE1	$T_{SSB_time_index_irat_RedCap}$
No DRX	$Max(160ms, 6 \times Max(MGRP, SMTC\ period)) \times N_{freq_RedCap}$
DRX cycle ≤ 320ms	$Max(160ms, Ceil(6 \times 1.5) \times Max(MGRP, SMTC\ period, DRX\ cycle)) \times N_{freq_RedCap}$
DRX cycle > 320ms	$6 \times DRX\ cycle \times N_{freq_RedCap}$
NOTE 1: DRX or non DRX requirements apply according to the conditions described in section 3.6.1 of TS 38.133 [50].	

Table 18.3.1.0.1-6: Time period for time index detection for 2 Rx RedCap (Frequency range FR2)

Condition NOTE1	$T_{SSB_time_index_irat_RedCap}$
No DRX	$Max(200ms, M_{SSB_index_irat_RedCap} \times Max(MGRP, SMTC\ period)) \times N_{freq_RedCap}$
DRX cycle ≤ 320ms	$Max(200ms, (1.5 \times M_{SSB_index_irat_RedCap}) \times Max(MGRP, SMTC\ period, DRX\ cycle)) \times N_{freq_RedCap}$
DRX cycle > 320ms	$M_{SSB_index_irat_RedCap} \times DRX\ cycle \times N_{freq_RedCap}$
NOTE 1: DRX or non DRX requirements apply according to the conditions described in section 3.6.1 of TS 38.133 [50].	

In the requirements, an NR cell is considered detectable when:

- NR SS-RSRP related conditions in the accuracy requirements in Section 9.11.x are fulfilled for a corresponding Band, together with the corresponding side conditions in Annex B.2.3 of TS 38.133 [50],
- NR SS-RSRQ related conditions in the accuracy requirements in Section 9.11.y are fulfilled for a corresponding Band, together with the corresponding side conditions in Annex B.2.3 of TS 38.133 [50],
- NR SS-SINR related conditions in the accuracy requirements in Section 9.11.z are fulfilled for a corresponding Band, together with the corresponding side conditions in Annex B.2.3 of TS 38.133 [50].

The RedCap UE operating in NR HD-FDD shall meet the current PSS/SSS detection requirements provided that at least 5 SMTC windows are available at the UE during the PSS/SSS detection time.

The RedCap UE operating in NR HD-FDD shall meet the current time index detection requirements provided that at least 3 SMTC windows are available at the UE during the time index detection time.

When measurement gaps are scheduled for NR measurements the UE physical layer shall be capable of reporting NR SS-RSRP, SS-RSRQ and SS-SINR measurements to higher layers with measurement accuracy as specified in clause 9.11, with measurement period as shown in table 8.20.2.1-5 and 8.20.2.1-6 for 2Rx UE, table 8.20.2.1-5a for 1Rx UE:

Table 8.20.2.1-5: Measurement period for inter-RAT measurements for 2 Rx RedCap (Frequency range FR1)

Condition NOTE1	$T_{SSB_measurement_period_irat_RedCap}$
No DRX	$Max(200ms, 8 \times Max(MGRP, SMTC\ period)) \times N_{freq_RedCap}$
DRX cycle ≤ 320ms	$Max(200ms, Ceil(8 \times 1.5) \times Max(MGRP, SMTC\ period, DRX\ cycle)) \times N_{freq_RedCap}$
DRX cycle > 320ms	$8 \times DRX\ cycle \times N_{freq_RedCap}$
NOTE 1: DRX or non DRX requirements apply according to the conditions described in section 3.6.1 of TS 38.133 [50].	

Table 8.20.2.1-5a: Measurement period for inter-RAT measurements for 1 Rx RedCap (Frequency range FR1)

Condition NOTE1	$T_{SSB_measurement_period_irat_RedCap}$
No DRX	$Max(200ms, 8 \times Max(MGRP, SMTC\ period)) \times N_{freq_RedCap}$
DRX cycle ≤ 320ms	$Max(200ms, Ceil(8 \times 1.5) \times Max(MGRP, SMTC\ period, DRX\ cycle)) \times N_{freq_RedCap}$
DRX cycle > 320ms	$8 \times DRX\ cycle \times N_{freq_RedCap}$
NOTE 1: DRX or non DRX requirements apply according to the conditions described in section 3.6.1 of TS 38.133 [50].	

Table 8.20.2.1-6: Measurement period for inter-RAT measurements for 2 Rx RedCap (Frequency range FR2)

Condition NOTE1	$T_{SSB_measurement_period_irat_RedCap}$
No DRX	$Max(400ms, M_{meas_period_irat_RedCap} \times Max(MGRP, SMTC\ period)) \times N_{freq_RedCap}$
DRX cycle ≤ 320ms	$Max(400ms, (1.5 \times M_{meas_period_irat_RedCap}) \times Max(MGRP, SMTC\ period, DRX\ cycle)) \times N_{freq_RedCap}$
DRX cycle > 320ms	$M_{meas_period_irat_RedCap} \times DRX\ cycle \times N_{freq_RedCap}$
NOTE 1: DRX or non DRX requirements apply according to the conditions described in section 3.6.1 of TS 38.133 [50].	

The RedCap UE operating in NR HD-FDD shall meet the current measurement requirements provided that at least 5 SMTC windows are available at the UE during the measurement period.

Reported measurements in event triggered measurement reports shall meet the requirements in clause 9.

The UE shall not send any event triggered measurement reports, as long as the reporting criteria are not fulfilled.

The measurement reporting delay is defined as the time between any event that will trigger a measurement report until the UE starts to transmit the measurement report over the Uu interface. This requirement assumes that the measurement report is not delayed by other RRC signalling on the DCCH. This measurement reporting delay excludes a delay uncertainty resulted when inserting the measurement report to the TTI of the uplink DCCH. The delay uncertainty is twice the TTI of the uplink DCCH. This measurement reporting delay excludes a delay which caused by no UL resources for UE to send the measurement report.

The event triggered measurement reporting delay, measured without L3 filtering shall be less than $T_{identify_irat_without_index_RedCap}$ or $T_{identify_irat_with_index_RedCap}$ for the minimum requirements.

If an NR cell which has been detectable at least for the time period $T_{identify_irat_without_index_RedCap}$. or $T_{identify_irat_with_index_RedCap}$ defined in clause 8.20.2.1 for the minimum requirements and then triggers the measurement report as per TS 36.331 [2], the event triggered measurement reporting delay shall be less than $T_{SSB_measurement_period_irat_RedCap}$ defined in clause 8.20.2.1 provided the timing to that cell has not changed more than ±3200 Tc while measurement gap has not been available and the L3 filter has not been used.

18.3.1.1 E-UTRA - NR SA FR1 Event triggered reporting tests for FR1 without SSB time index detection when DRX is not used

18.3.1.1.1 Test purpose

To verify that the RedCap UE makes correct reporting of an event. This test will partly verify the NR inter-RAT cell search requirements in clause TS 36.133 [23] clause 8.20.2 for E-UTRAN FDD-NR measurements and TS 36.133 [23] clause 8.20.3 for E-UTRAN TDD-NR measurements.

18.3.1.1.2 Test applicability

This test applies to all E-UTRA UE from release 17 onwards and capable of NR RedCap with 2Rx. Test 1 applies to UEs not supporting per-FR gap and test 2 applies only to UEs supporting per-FR gap and gap pattern #4.

18.3.1.1.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 18.3.1.0.1.

The normative reference for this requirement is TS 38.133 [6] clause A.18.3.1.1.

18.3.1.1.4 Test description

Same as the test description given in clause 8.4.2.1.4.

18.3.1.1.4.1 Initial conditions

Same as the initial conditions given in clause 8.4.2.1.4.1 with following exceptions:

- Table 8.4.2.1.4.1-1 is replaced by Table 18.3.1.1.4.1-1.
- Table 8.4.2.1.4.1-2 is replaced by Table 18.3.1.1.4.1-2.
- Table 8.4.2.1.4.1-3 is replaced by Table 18.3.1.1.4.1-3.

Table 18.3.1.1.4.1-1: Supported test configurations

Configuration	Description
18.3.1.1-1	LTE FDD, NR 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode
18.3.1.1-2	LTE FDD, NR 15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode
18.3.1.1-3	LTE FDD, NR 30 kHz SSB SCS, 20 MHz bandwidth, TDD duplex mode
18.3.1.1-4	LTE TDD, NR 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode
18.3.1.1-5	LTE TDD, NR 15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode
18.3.1.1-6	LTE TDD, NR 30 kHz SSB SCS, 20 MHz bandwidth, TDD duplex mode
18.3.1.1-7	LTE FDD, NR 15 kHz SSB SCS, 10 MHz bandwidth, HD-FDD duplex mode
18.3.1.1-8	LTE TDD, NR 15 kHz SSB SCS, 10 MHz bandwidth, HD-FDD duplex mode
Note 1: The UE is only required to be tested in one of the supported test configurations.	

Table 18.3.1.1.4.1-2: Initial conditions

Parameter	Value		Comment
Test environment	NC		As specified in TS 36.508 [25] clause 4.1.
Test frequencies	As specified in Annex E, Table E.16-1 and TS 38.508-1 [14] clause 4.3.1.		
Channel bandwidth	As specified by the test configuration selected from Table 18.3.1.1.4.1-1.		
Propagation conditions	Multi-path fading		As specified in clause C.2.3
Connection Diagram	TE Part	A.3.1.8.2	As specified in TS 38.508-1 [14] Annex A.
	DUT Part	A.3.2.3.4	
Exceptions to connection diagram	N/A		

Table 18.3.1.1.4.1-3: General test parameters

Parameter		Unit	Value		Comment
			Test 1	Test 2	
E-UTRA RF Channel Numbers			1		One E-UTRA carrier frequency is used.
NR RF Chanel Number			1		One FR1 NR carrier frequency is used.
Active cell			E-UTRA cell 1		E-UTRA cell 1 is on E-UTRA RF channel number 1.
Neighbour cell			NR cell 2		NR cell 2 is on NR RF channel number 1.
Gap Pattern Id			0	4	As specified in Table 8.1.2.1-1 of TS 36.133 [23].
Measurement gap offset			39	19	As specified in TS 36.331 [29].
Hysteresis		dB	0		
CP length			Normal		
TimeToTrigger		s	0		
Filter coefficient			0		L3 filtering is not used
DRX			OFF		DRX is not used
Time offset between serving and neighbour cells	Config 1,4,7,8		3ms		Asynchronous cells. The timing of Cell 2 is 3ms later than the timing of Cell 1.
	Config 2,3,5,6		3μs		Synchronous cells.
T1		s	5		
T2		s	1		

18.3.1.1.4.2 Test procedure

Same as the test procedure given in clause 8.4.2.1.4.2.18.3.1.1.4.3 Message contents

Same as the message contents given in clause 8.4.2.1.4.3 with following exceptions:

- The specific message contents exceptions for test configuration 8.4.2.1-1 and 8.4.2.1-4 also apply to test configuration 8.4.2.1-7 and 8.4.2.1-8.

- Table 8.4.2.1.4.3-2 is replaced by table 18.3.1.1.4.3-1.

Table 18.3.1.1.4.3-1: SchedulingRequest-Config-DEFAULT

Derivation Path: TS 36.508 [25] Table 4.6.3-20			
Information Element	**Value/remark**	**Comment**	**Condition**
SchedulingRequest-Config-DEFAULT ::= CHOICE {			
setup SEQUENCE {			
sr-ConfigIndex	25		Config 8.4.2.1-1/2/3/7
	22		Config 8.4.2.1-4/5/6/8
}			
}			

18.3.1.1.5 Test requirement

Same as the test requirements given in clause 8.4.2.1.5 with following exceptions:

- Table 8.4.2.1.5-1 is replaced by Table 18.3.1.1.5-1.

- Table 8.4.2.1.5-2 is replaced by Table 18.3.1.1.5-2.

Table 18.3.1.1.5-1: E-UTRAN Cell specific test parameters

Parameter		Unit	Cell 1	
			T1	T2
RF channel number			1	
Duplex mode	Config 1,2,3,7		FDD	
	Config 4,5,6,8		TDD	
TDD special subframe configuration[Note1]	Config 4,5,6,8		6	

TDD uplink-downlink configuration[Note1]	Config 4,5,6,8		1	
$BW_{channel}$		MHz	5 MHz: $N_{RB,c}$ = 25 10 MHz: $N_{RB,c}$ = 50 20 MHz: $N_{RB,c}$ = 100	
PDSCH parameters: DL Reference Measurement Channel[Note2]	Config 1,2,3,7		5 MHz: R.7 FDD 10 MHz: R.3 FDD 20 MHz: R.6 FDD	
	Config 4,5,6,8		5 MHz: R.4 TDD 10 MHz: R.0 TDD 20 MHz: R.3 TDD	
PCFICH/PDCCH/PHICH parameters: DL Reference Measurement Channel[Note2]	Config 1,2,3,7		5 MHz: R.11 FDD 10 MHz: R.6 FDD 20 MHz: R.10 FDD	
	Config 4,5,6,8		5 MHz: R.11 TDD 10 MHz: R.6 TDD 20 MHz: R.10 TDD	
OCNG Patterns[Note2]	Config 1,2,3,7		5 MHz: OP.20 FDD 10 MHz: OP.10 FDD 20 MHz: OP.17 FDD	
	Config 4,5,6,8		5 MHz: OP.9 TDD 10 MHz: OP.1 TDD 20 MHz: OP.7 TDD	
b2-Threshold1		dBm	-77	
PBCH_RA		dB	0	
PBCH_RB				
PSS_RA				
SSS_RA				
PCFICH_RB				
PHICH_RA				
PHICH_RB				
PDCCH_RA				
PDCCH_RB				
PDSCH_RA				
PDSCH_RB				
OCNG_RA[Note3]				
OCNG_RB[Note3]				
N_{oc}[Note4]		dBm/15 kHz	-104	
$\hat{E}_s/N_{oc}$		dB	17	15.35
$\hat{E}_s/I_{ot}$[Note5]		dB	17	15.35
RSRP[Note5]		dBm/15 kHz	-87	-88.65
SCH_RP[Note5]		dBm/15 kHz	-87	-88.65
Io[Note5]		dBm/ 9 MHz	-59.13+10log($N_{RB,c}$ /50)	60.74+10log($N_{RB,c}$ /50)
Propagation Condition [Note6]			ETU70	
Antenna Configuration and Correlation Matrix [Note6]			1x2 Low	

Note 1: Special subframe and uplink-downlink configurations are specified in table 4.2-1 in TS 36.211 [24].
Note 2: DL RMCs and OCNG patterns are specified in clauses A 3.1 and A 3.2 of TS 36.133 [23] respectively.
Note 3: OCNG shall be used such that all cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.
Note 4: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for N_{oc} to be fulfilled.
Note 5: $\hat{E}_s/I_{ot}$, RSRP, SCH_RP and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.
Note 6: Propagation condition and correlation matrix are defined in clause B.2 in TS 36.101 [27].

Table 18.3.1.1.5-2: NR cell specific test parameters

Parameter		Unit	Cell 2	
			T1	T2
NR RF Channel Number			1	
Duplex mode	Config 1,4		FDD	
	Config 2,3,5,6		TDD	
	Config 7,8		HD-FDD	
TDD configuration	Config 2,5		TDDConf.1.1	

	Config 3,6		TDDConf.2.1	
$BW_{channel}$	Config 1,2,4,5,7,8	MHz	10: $N_{RB,c}$ = 52	
	Config 3,6		20: $N_{RB,c}$ = 51	
OCNG Patterns			OP.1	
SMTC configuration	Config 1,4,7,8		SMTC.2	
	Config 2,3,5,6		SMTC.1	
PDSCH/PDCCH subcarrier spacing	Config 1,2,4,5,7,8	kHz	15	
	Config 3,6		30	
b2-Threshold2NR	Config 1,2,4,5,7,8	dBm/SCS	-101	
	Config 3,6		-98	
EPRE ratio of PSS to SSS		dB	0	
EPRE ratio of PBCH DMRS to SSS				
EPRE ratio of PBCH to PBCH DMRS				
EPRE ratio of PDCCH DMRS to SSS				
EPRE ratio of PDCCH to PDCCH DMRS				
EPRE ratio of PDSCH DMRS to SSS				
EPRE ratio of PDSCH to PDSCH				
EPRE ratio of OCNG DMRS to SSS Note 1				
EPRE ratio of OCNG to OCNG DMRS Note 1				
N_{oc} Note2		dBm/15kHz	-98	
N_{oc} Note2	Config 1,2,4,5,7,8	dBm/SCS	-98	
	Config 3,6		-95	
SS-RSRP Note 3	Config 1,2,4,5,7,8	dBm/SCS	-Infinity	-89.35
	Config 3,6		-Infinity	-86.34
$\hat{E}_s/I_{ot}$		dB	-Infinity	8.65
$\hat{E}_s/N_{oc}$		dB	-Infinity	8.65
Io Note3	Config 1,2,4,5,7,8	dBm/9.36MHz	-70.05	-60.84
	Config 3,6	dBm/18.36MHz	-63.94	-57.92
Propagation Condition			TDL-C 300ns 100Hz	
Antenna Configuration and Correlation Matrix			1x2 Low	

Note 1: OCNG shall be used such that the cell is fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.

Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for N_{oc} to be fulfilled.

Note 3: SS-RSRP and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.

Note 4: SS-RSRP minimum requirements are specified assuming independent interference and noise at each receiver antenna port.

18.3.1.2 E-UTRA - NR SA FR1 Event triggered reporting tests for FR1 without SSB time index detection when DRX is used

18.3.1.2.1 Test purpose

To verify that the RedCap UE makes correct reporting of an event. This test will partly verify the NR inter-RAT cell search requirements in clause TS 36.133 [23] clause 8.20.2 for E-UTRAN FDD-NR measurements and TS 36.133 [23] clause 8.20.3 for E-UTRAN TDD-NR measurements.

18.3.1.2.2 Test applicability

This test applies to all E-UTRA UE from release 17 onwards supporting NR RedCap with 2Rx and long DRX cycle. Test 1 and test 2 apply to UEs not supporting per-FR gap. Test 3 and test 4 apply only to UEs supporting per-FR gap and gap pattern #4.

18.3.1.2.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 18.3.1.0.1.

The normative reference for this requirement is TS 38.133 [6] clause A.18.3.1.2.

18.3.1.2.4 Test description

Same as the test description given in clause 8.4.2.2.4.

18.3.1.2.4.1 Initial conditions

Same as the initial conditions given in clause 8.4.2.2.4.1 with following exceptions:

- Table 8.4.2.2.4.1-1 is replaced by Table 18.3.1.2.4.1-1.
- Table 8.4.2.2.4.1-2 is replaced by Table 18.3.1.2.4.1-2.
- Table 8.4.2.2.4.1-3 is replaced by Table 18.3.1.2.4.1-3.

Table 18.3.1.2.4.1-1: Supported test configurations

Configuration	Description
18.3.1.2-1	LTE FDD, NR 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode
18.3.1.2-2	LTE FDD, NR 15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode
18.3.1.2-3	LTE FDD, NR 30 kHz SSB SCS, 20 MHz bandwidth, TDD duplex mode
18.3.1.2-4	LTE TDD, NR 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode
18.3.1.2-5	LTE TDD, NR 15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode
18.3.1.2-6	LTE TDD, NR 30 kHz SSB SCS, 20 MHz bandwidth, TDD duplex mode
18.3.1.2-7	LTE FDD, NR 15 kHz SSB SCS, 10 MHz bandwidth, HD-FDD duplex mode
18.3.1.2-8	LTE TDD, NR 15 kHz SSB SCS, 10 MHz bandwidth, HD-FDD duplex mode
Note 1: The UE is only required to be tested in one of the supported test configurations.	

Table 18.3.1.2.4.1-2: Initial conditions

Parameter	Value		Comment
Test environment	NC		As specified in TS 36.508 [25] clause 4.1.
Test frequencies	As specified in Annex E, Table E.16-1 and TS 38.508-1 [14] clause 4.3.1.		
Channel bandwidth	As specified by the test configuration selected from Table 18.3.1.2.4.1-1.		
Propagation conditions	Multi-path fading		As specified in clause C.2.3
Connection Diagram	TE Part	A.3.1.8.2	As specified in TS 38.508-1 [14] Annex A.
	DUT Part	A.3.2.3.4	
Exceptions to connection diagram	N/A		

Table 18.3.1.2.4.1-3: General test parameters

Parameter	Unit	Value				Comment
		Test 1	Test 2	Test 3	Test 4	
E-UTRA RF Channel Numbers		1				One E-UTRA carrier frequency is used.
NR RF Channel Number		1				One FR1 NR carrier frequency is used.
Active cell		E-UTRA Cell 1				E-UTRA cell 1 is on E-UTRA RF channel number 1.
Neighbour cell		NR Cell 2				NR cell 2 is on NR RF channel number 1.
Gap Pattern Id		0		4		As specified in TS 36.133 [23] Table 8.1.2.1-1.
Measurement gap offset		39		19		As specified in TS 36.331 [29].
Hysteresis	dB	0				
CP length		Normal				

TimeToTrigger		s	0				
Filter coefficient			0				L3 filtering is not used
DRX			DRX.9	DRX.12	DRX.9	DRX.12	DRX is not used
Time offset between serving and neighbour cells	Config 1,4,7,8		3ms				Asynchronous cells. The timing of Cell 2 is 3ms later than the timing of Cell 1.
	Config 2,3,5,6		3µs				Synchronous cells.
T1		s	5				
T2		s	2	11	2	11	

18.3.1.2.4.2 Test procedure

Same as the test procedure given in clause 8.4.2.2.4.2.18.3.1.2.4.3 Message contents

Same as the message contents given in clause 8.4.2.2.4.3 with following exceptions:

- The specific message contents exceptions for test configuration 8.4.2.2-1 and 8.4.2.2-4 also apply to test configuration 8.4.2.2-7 and 8.4.2.2-8.
- Table 8.4.2.2.4.3-2 is replaced by table 18.3.1.2.4.3-1.

Table 18.3.1.2.4.3-1: SchedulingRequest-Config-DEFAULT

Derivation Path: TS 36.508 [25] Table 4.6.3-20			
Information Element	**Value/remark**	**Comment**	**Condition**
SchedulingRequest-Config-DEFAULT ::= CHOICE {			
setup SEQUENCE {			
sr-ConfigIndex	25		Config 8.4.2.2-1/2/3/7
	22		Config 8.4.2.2-4/5/6/8
}			
}			

18.3.1.2.5 Test requirement

Same as the test requirements given in clause 8.4.2.2.5 with following exceptions:

- Table 8.4.2.2.5-1 is replaced by Table 18.3.1.2.5-1.
- Table 8.4.2.2.5-2 is replaced by Table 18.3.1.2.5-2.

Table 18.3.1.2.5-1: E-UTRAN Cell specific test parameters

Parameter		**Unit**	**Cell 1**	
			T1	**T2**
RF channel number			1	
Duplex mode	Config 1,2,3,7		FDD	
	Config 4,5,6,8		TDD	
TDD special subframe configuration[Note1]	Config 4,5,6,8		6	
TDD uplink-downlink configuration[Note1]	Config 4,5,6,8		1	
$BW_{channel}$		MHz	5 MHz: $N_{RB,c}$ = 25 10 MHz: $N_{RB,c}$ = 50 20 MHz: $N_{RB,c}$ = 100	
PDSCH parameters: DL Reference Measurement Channel[Note2]	Config 1,2,3,7		5 MHz: R.7 FDD 10 MHz: R.3 FDD 20 MHz: R.6 FDD	
	Config 4,5,6,8		5 MHz: R.4 TDD 10 MHz: R.0 TDD 20 MHz: R.3 TDD	
PCFICH/PDCCH/PHICH parameters:	Config 1,2,3,7		5 MHz: R.11 FDD 10 MHz: R.6 FDD 20 MHz: R.10 FDD	

DL Reference Measurement Channel[Note2]	Config 4,5,6,8		5 MHz: R.11 TDD 10 MHz: R.6 TDD 20 MHz: R.10 TDD	
OCNG Patterns[Note2]	Config 1,2,3,7		5 MHz: OP.20 FDD 10 MHz: OP.10 FDD 20 MHz: OP.17 FDD	
	Config 4,5,6,8		5 MHz: OP.9 TDD 10 MHz: OP.1 TDD 20 MHz: OP.7 TDD	
b2-Threshold1		dBm	-77	
PBCH_RA		dB	0	
PBCH_RB				
PSS_RA				
SSS_RA				
PCFICH_RB				
PHICH_RA				
PHICH_RB				
PDCCH_RA				
PDCCH_RB				
PDSCH_RA				
PDSCH_RB				
OCNG_RA[Note3]				
OCNG_RB[Note3]				
N_{oc}[Note4]		dBm/15 kHz	-104	
$\hat{E}_s/N_{oc}$		dB	17	15.35
$\hat{E}_s/I_{ot}$[Note5]		dB	17	15.35
RSRP[Note5]		dBm/15 kHz	-87	-88.65
SCH_RP[Note5]		dBm/15 kHz	-87	-88.65
Io[Note5]		dBm/ 9 MHz	-59.13+10log($N_{RB,c}$ /50)	60.74+10log($N_{RB,c}$ /50)
Propagation Condition [Note6]			ETU70	
Antenna Configuration and Correlation Matrix [Note6]			1x2 Low	

Note 1: Special subframe and uplink-downlink configurations are specified in table 4.2-1 in TS 36.211 [24].
Note 2: DL RMCs and OCNG patterns are specified in clauses A 3.1 and A 3.2 of TS 36.133 [23] respectively.
Note 3: OCNG shall be used such that all cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.
Note 4: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for N_{oc} to be fulfilled.
Note 5: $\hat{E}_s/I_{ot}$, RSRP, SCH_RP and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.
Note 6: Propagation condition and correlation matrix are defined in clause B.2 in TS 36.101 [27].

Table 18.3.1.2.5-2: NR cell specific test parameters

Parameter		Unit	Cell 2	
			T1	T2
NR RF Channel Number			1	
Duplex mode	Config 1,4		FDD	
	Config 2,3,5,6		TDD	
	Config 7,8		HD-FDD	
TDD configuration	Config 2,5		TDDConf.1.1	
	Config 3,6		TDDConf.2.1	
$BW_{channel}$	Config 1,2,4,5,7,8	MHz	10: $N_{RB,c}$ = 52	
	Config 3,6		20: $N_{RB,c}$ = 51	
OCNG Patterns			OP.1	
SMTC configuration	Config 1,4,7,8		SMTC.2	
	Config 2,3,5,6		SMTC.1	
PDSCH/PDCCH subcarrier spacing	Config 1,2,4,5,7,8	kHz	15	
	Config 3,6		30	
b2-Threshold2NR	Config 1,2,4,5,7,8	dBm/SCS	-101	
	Config 3,6		-98	
EPRE ratio of PSS to SSS		dB	0	

EPRE ratio of PBCH DMRS to SSS				
EPRE ratio of PBCH to PBCH DMRS				
EPRE ratio of PDCCH DMRS to SSS				
EPRE ratio of PDCCH to PDCCH DMRS				
EPRE ratio of PDSCH DMRS to SSS				
EPRE ratio of PDSCH to PDSCH				
EPRE ratio of OCNG DMRS to SSS Note 1				
EPRE ratio of OCNG to OCNG DMRS Note 1				
N_{oc} Note2		dBm/15kHz	-98	
N_{oc} Note2	Config 1,2,4,5,7,8	dBm/SCS	-98	
	Config 3,6		-95	
SS-RSRP Note 3	Config 1,2,4,5,7,8	dBm/SCS	-Infinity	-89.35
	Config 3,6		-Infinity	-86.34
$\hat{E}_s/I_{ot}$		dB	-Infinity	8.65
$\hat{E}_s/N_{oc}$		dB	-Infinity	8.65
Io Note3	Config 1,2,4,5,7,8	dBm/9.36MHz	-70.05	-60.84
	Config 3,6	dBm/18.36MHz	-63.94	-57.92
Propagation Condition			TDL-C 300ns 100Hz	
Antenna Configuration and Correlation Matrix			1x2 Low	
NOTE 1: OCNG shall be used such that the cell is fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.				
NOTE 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for N_{oc} to be fulfilled.				
NOTE 3: SS-RSRP and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.				
NOTE 4: SS-RSRP minimum requirements are specified assuming independent interference and noise at each receiver antenna port.				

18.3.1.3 E-UTRA - NR SA FR1 Event triggered reporting tests for FR1 with SSB time index detection when DRX is not used

18.3.1.3.1 Test purpose

To verify that the RedCap UE makes correct reporting of an event. This test will partly verify the NR inter-RAT cell search requirements in clause TS 36.133 [23] clause 8.20.2 for E-UTRAN FDD-NR measurements and TS 36.133 [23] clause 8.20.3 for E-UTRAN TDD-NR measurements.

18.3.1.3.2 Test applicability

This test applies to all E-UTRA UE from release 17 onwards and capable of NR RedCap with 2Rx. Test 1 applies to UEs not supporting per-FR gap and test 2 applies only to UEs supporting per-FR gap and gap pattern #4.

18.3.1.3.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 18.3.1.0.1.

The normative reference for this requirement is TS 38.133 [6] clause A.18.3.1.3.

18.3.1.3.4 Test description

Same as the test description given in clause 8.4.2.3.4.

18.3.1.3.4.1 Initial conditions

Same as the initial conditions given in clause 8.4.2.3.4.1 with following exceptions:

- Table 8.4.2.3.4.1-1 is replaced by Table 18.3.1.3.4.1-1.

- Table 8.4.2.3.4.1-2 is replaced by Table 18.3.1.3.4.1-2.
- Table 8.4.2.3.4.1-3 is replaced by Table 18.3.1.3.4.1-3.

Table 18.3.1.3.4.1-1: Supported test configurations

Configuration	Description
18.3.1.3-1	LTE FDD, NR 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode
18.3.1.3-2	LTE FDD, NR 15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode
18.3.1.3-3	LTE FDD, NR 30 kHz SSB SCS, 20 MHz bandwidth, TDD duplex mode
18.3.1.3-4	LTE TDD, NR 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode
18.3.1.3-5	LTE TDD, NR 15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode
18.3.1.3-6	LTE TDD, NR 30 kHz SSB SCS, 20 MHz bandwidth, TDD duplex mode
18.3.1.3-7	LTE FDD, NR 15 kHz SSB SCS, 10 MHz bandwidth, HD-FDD duplex mode
18.3.1.3-8	LTE TDD, NR 15 kHz SSB SCS, 10 MHz bandwidth, HD-FDD duplex mode
Note 1: The UE is only required to be tested in one of the supported test configurations.	

Table 18.3.1.3.4.1-2: Initial conditions

Parameter	Value		Comment
Test environment	NC		As specified in TS 36.508 [25] clause 4.1.
Test frequencies	As specified in Annex E, Table E.16-1 and TS 38.508-1 [14] clause 4.3.1.		
Channel bandwidth	As specified by the test configuration selected from Table 18.3.1.3.4.1-1.		
Propagation conditions	Multi-path fading		As specified in clause C.2.3
Connection Diagram	TE Part	A.3.1.8.2	As specified in TS 38.508-1 [14] Annex A.
	DUT Part	A.3.2.3.4	
Exceptions to connection diagram	N/A		

Table 18.3.1.3.4.1-3: General test parameters

Parameter		Unit	Value		Comment
			Test 1	Test 2	
E-UTRA RF Channel Numbers			1		One E-UTRA carrier frequency is used.
NR RF Chanel Number			1		One FR1 NR carrier frequency is used.
Active cell			E-UTRA cell 1		E-UTRA cell 1 is on E-UTRA RF channel number 1.
Neighbour cell			NR cell 2		NR cell 2 is on NR RF channel number 1.
Gap Pattern Id			0	4	As specified in Table 8.1.2.1-1 of TS 36.133 [23].
Measurement gap offset			39	19	As specified in TS 36.331 [29].
Hysteresis		dB	0		
CP length			Normal		
TimeToTrigger		s	0		
Filter coefficient			0		L3 filtering is not used
DRX			OFF		DRX is not used
Time offset between serving and neighbour cells	Config 1,4,7,8		3ms		Asynchronous cells. The timing of Cell 2 is 3ms later than the timing of Cell 1.
	Config 2,3,5,6		3µs		Synchronous cells.
T1		s	5		
T2		s	2	1	

18.3.1.3.4.2 Test procedure

Same as the test procedure given in clause 8.4.2.3.4.2.

18.3.1.3.4.3 Message contents

Same as the message contents given in clause 8.4.2.3.4.3 with following exceptions:

- The specific message contents exceptions for test configuration 8.4.2.3-1 and 8.4.2.3-4 also apply to test configuration 8.4.2.3-7 and 8.4.2.3-8.

- Table 8.4.2.3.4.3-2 is replaced by table 18.3.1.3.4.3-1.

Table 18.3.1.3.4.3-1: SchedulingRequest-Config-DEFAULT

Derivation Path: TS 36.508 [25] Table 4.6.3-20			
Information Element	**Value/remark**	**Comment**	**Condition**
SchedulingRequest-Config-DEFAULT ::= CHOICE {			
setup SEQUENCE {			
sr-ConfigIndex	25		Config 8.4.2.3-1/2/3/7
	22		Config 8.4.2.3-4/5/6/8
}			
}			

18.3.1.3.5 Test requirement

Same as the test requirements given in clause 8.4.2.3.5 with following exceptions:

- Table 8.4.2.3.5-1 is replaced by Table 18.3.1.3.5-1.

- Table 8.4.2.3.5-2 is replaced by Table 18.3.1.3.5-2.

Table 18.3.1.3.5-1: E-UTRAN Cell specific test parameters

Parameter		**Unit**	**Cell 1**	
			T1	**T2**
RF channel number			1	
Duplex mode	Config 1,2,3,7		FDD	
	Config 4,5,6,8		TDD	
TDD special subframe configuration[Note1]	Config 4,5,6,8		6	
TDD uplink-downlink configuration[Note1]	Config 4,5,6,8		1	
$BW_{channel}$		MHz	5 MHz: $N_{RB,c}$ = 25 10 MHz: $N_{RB,c}$ = 50 20 MHz: $N_{RB,c}$ = 100	
PDSCH parameters: DL Reference Measurement Channel[Note2]	Config 1,2,3,7		5 MHz: R.7 FDD 10 MHz: R.3 FDD 20 MHz: R.6 FDD	
	Config 4,5,6,8		5 MHz: R.4 TDD 10 MHz: R.0 TDD 20 MHz: R.3 TDD	
PCFICH/PDCCH/PHICH parameters: DL Reference Measurement Channel[Note2]	Config 1,2,3,7		5 MHz: R.11 FDD 10 MHz: R.6 FDD 20 MHz: R.10 FDD	
	Config 4,5,6,8		5 MHz: R.11 TDD 10 MHz: R.6 TDD 20 MHz: R.10 TDD	
OCNG Patterns[Note2]	Config 1,2,3,7		5 MHz: OP.20 FDD 10 MHz: OP.10 FDD 20 MHz: OP.17 FDD	
	Config 4,5,6,8		5 MHz: OP.9 TDD 10 MHz: OP.1 TDD 20 MHz: OP.7 TDD	
b2-Threshold1		dBm	-77	
PBCH_RA		dB	0	
PBCH_RB				
PSS_RA				
SSS_RA				
PCFICH_RB				
PHICH_RA				
PHICH_RB				
PDCCH_RA				

PDCCH_RB			
PDSCH_RA			
PDSCH_RB			
OCNG_RA Note3			
OCNG_RB Note3			
N_{oc} Note4	dBm/15 kHz	-104	
$\hat{E}_s/N_{oc}$	dB	17	15.35
$\hat{E}_s/I_{ot}$ Note5	dB	17	15.35
RSRP Note5	dBm/15 kHz	-87	-88.65
SCH_RP Note5	dBm/15 kHz	-87	-88.65
Io Note5	dBm/ 9 MHz	-59.13+10log($N_{RB,c}$ /50)	60.74+10log($N_{RB,c}$ /50)
Propagation Condition Note6		ETU70	
Antenna Configuration and Correlation Matrix Note6		1x2 Low	

Note 1: Special subframe and uplink-downlink configurations are specified in table 4.2-1 in TS 36.211 [24].
Note 2: DL RMCs and OCNG patterns are specified in clauses A 3.1 and A 3.2 of TS 36.133 [23] respectively.
Note 3: OCNG shall be used such that all cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.
Note 4: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for N_{oc} to be fulfilled.
Note 5: $\hat{E}_s/I_{ot}$, RSRP, SCH_RP and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.
Note 6: Propagation condition and correlation matrix are defined in clause B.2 in TS 36.101 [27].

Table 18.3.1.3.5-2: NR cell specific test parameters

Parameter		Unit	Cell 2	
			T1	T2
NR RF Channel Number			1	
Duplex mode	Config 1,4		FDD	
	Config 2,3,5,6		TDD	
	Config 7,8		HD-FDD	
TDD configuration	Config 2,5		TDDConf.1.1	
	Config 3,6		TDDConf.2.1	
$BW_{channel}$	Config 1,2,4,5,7,8	MHz	10: $N_{RB,c}$ = 52	
	Config 3,6		20: $N_{RB,c}$ = 51	
OCNG Patterns			OP.1	
SMTC configuration	Config 1,4,7,8		SMTC.2	
	Config 2,3,5,6		SMTC.1	
PDSCH/PDCCH subcarrier spacing	Config 1,2,4,5,7,8	kHz	15	
	Config 3,6		30	
b2-Threshold2NR	Config 1,2,4,5,7,8	dBm/SCS	-101	
	Config 3,6		-98	
EPRE ratio of PSS to SSS		dB	0	
EPRE ratio of PBCH DMRS to SSS				
EPRE ratio of PBCH to PBCH DMRS				
EPRE ratio of PDCCH DMRS to SSS				
EPRE ratio of PDCCH to PDCCH DMRS				
EPRE ratio of PDSCH DMRS to SSS				
EPRE ratio of PDSCH to PDSCH				
EPRE ratio of OCNG DMRS to SSS Note 1				
EPRE ratio of OCNG to OCNG DMRS Note 1				
N_{oc} Note2		dBm/15kHz	-98	
N_{oc} Note2	Config 1,2,4,5,7,8	dBm/SCS	-98	
	Config 3,6		-95	
SS-RSRP Note 3	Config 1,2,4,5,7,8	dBm/SCS	-Infinity	-89.35
	Config 3,6		-Infinity	-86.34
$\hat{E}_s/I_{ot}$		dB	-Infinity	8.65
$\hat{E}_s/N_{oc}$		dB	-Infinity	8.65

Io[Note3]	Config 1,2,4,5,7,8	dBm/9.36MHz	-70.05	-60.84
	Config 3,6	dBm/18.36MHz	-63.94	-57.92
Propagation Condition			TDL-C 300ns 100Hz	
Antenna Configuration and Correlation Matrix			1x2 Low	
Note 1: OCNG shall be used such that the cell is fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols. Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for N_{oc} to be fulfilled. Note 3: SS-RSRP and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves. Note 4: SS-RSRP minimum requirements are specified assuming independent interference and noise at each receiver antenna port.				

18.3.1.4 E-UTRA - NR SA FR1 Event triggered reporting tests for FR1 with SSB time index detection when DRX is used

18.3.1.4.1 Test purpose

To verify that the RedCap UE makes correct reporting of an event. This test will partly verify the NR inter-RAT cell search requirements in clause TS 36.133 [23] clause 8.20.2 for E-UTRAN FDD-NR measurements and TS 36.133 [23] clause 8.20.3 for E-UTRAN TDD-NR measurements.

18.3.1.4.2 Test applicability

This test applies to all E-UTRA UE from release 17 onwards supporting NR RedCap with 2Rx and long DRX cycle. Test 1 and test 2 apply to UEs not supporting per-FR gap. Test 3 and test 4 apply only to UEs supporting per-FR gap and gap pattern #4.

18.3.1.4.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 18.3.1.0.1.

The normative reference for this requirement is TS 38.133 [6] clause A.18.3.1.4.

18.3.1.4.4 Test description

Same as the test description given in clause 8.4.2.4.4.

18.3.1.4.4.1 Initial conditions

Same as the initial conditions given in clause 8.4.2.4.4.1 with following exceptions:

- Table 8.4.2.4.4.1-1 is replaced by Table 18.3.1.4.4.1-1.
- Table 8.4.2.4.4.1-2 is replaced by Table 18.3.1.4.4.1-2.
- Table 8.4.2.4.4.1-3 is replaced by Table 18.3.1.4.4.1-3.

Table 18.3.1.4.4.1-1: Supported test configurations

Configuration	Description
18.3.1.4-1	LTE FDD, NR 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode
18.3.1.4-2	LTE FDD, NR 15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode
18.3.1.4-3	LTE FDD, NR 30 kHz SSB SCS, 20 MHz bandwidth, TDD duplex mode
18.3.1.4-4	LTE TDD, NR 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode
18.3.1.4-5	LTE TDD, NR 15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode
18.3.1.4-6	LTE TDD, NR 30 kHz SSB SCS, 20 MHz bandwidth, TDD duplex mode
18.3.1.4-7	LTE FDD, NR 15 kHz SSB SCS, 10 MHz bandwidth, HD-FDD duplex mode
18.3.1.4-8	LTE TDD, NR 15 kHz SSB SCS, 10 MHz bandwidth, HD-FDD duplex mode
Note 1: The UE is only required to be tested in one of the supported test configurations.	

Table 18.3.1.4.4.1-2: Initial conditions

Parameter	Value		Comment
Test environment	NC		As specified in TS 36.508 [25] clause 4.1.
Test frequencies	As specified in Annex E, Table E.16-1 and TS 38.508-1 [14] clause 4.3.1.		
Channel bandwidth	As specified by the test configuration selected from Table 18.3.1.4.4.1-1.		
Propagation conditions	Multi-path fading		As specified in clause C.2.3
Connection Diagram	TE Part	A.3.1.8.2	As specified in TS 38.508-1 [14] Annex A.
	DUT Part	A.3.2.3.4	
Exceptions to connection diagram	N/A		

Table 18.3.1.4.4.1-3: General test parameters

Parameter		Unit	Value				Comment
			Test 1	Test 2	Test 3	Test 4	
E-UTRA RF Channel Numbers			1				One E-UTRA carrier frequency is used.
NR RF Channel Number			1				One FR1 NR carrier frequency is used.
Active cell			E-UTRA Cell 1				E-UTRA cell 1 is on E-UTRA RF channel number 1.
Neighbour cell			NR Cell 2				NR cell 2 is on NR RF channel number 1.
Gap Pattern Id			0		4		As specified in TS 36.133 [23] Table 8.1.2.1-1.
Measurement gap offset			39		19		As specified in TS 36.331 [29].
Hysteresis		dB	0				
CP length			Normal				
TimeToTrigger		s	0				
Filter coefficient			0				L3 filtering is not used
DRX			DRX.9	DRX.12	DRX.9	DRX.12	DRX is not used
Time offset between serving and neighbour cells	Config 1,4,7,8		3ms				Asynchronous cells. The timing of Cell 2 is 3ms later than the timing of Cell 1.
	Config 2,3,5,6		3μs				Synchronous cells.
T1		s	5				
T2		s	2	13	2	13	

18.3.1.4.4.2 Test procedure

Same as the test procedure given in clause 8.4.2.4.4.2.

18.3.1.4.4.3 Message contents

Same as the message contents given in clause 8.4.2.4.4.3 with following exceptions:

- The specific message contents exceptions for test configuration 8.4.2.4-1 and 8.4.2.4-4 also apply to test configuration 8.4.2.4-7 and 8.4.2.4-8.
- Table 8.4.2.4.4.3-2 is replaced by table 18.3.1.4.4.3-1.

Table 18.3.1.4.4.3-1: SchedulingRequest-Config-DEFAULT

Derivation Path: TS 36.508 [25] Table 4.6.3-20			
Information Element	**Value/remark**	**Comment**	**Condition**
SchedulingRequest-Config-DEFAULT ::= CHOICE {			
setup SEQUENCE {			
sr-ConfigIndex	25		Config 8.4.2.4-1/2/3/7
	22		Config 8.4.2.4-4/5/6/8

}			
}			

18.3.1.4.5 Test requirement

Same as the test requirements given in clause 8.4.2.4.5 with following exceptions:

- Table 8.4.2.4.5-1 is replaced by Table 18.3.1.4.5-1.
- Table 8.4.2.4.5-2 is replaced by Table 18.3.1.4.5-2.

Table 18.3.1.4.5-1: E-UTRAN Cell specific test parameters

Parameter		Unit	Cell 1	
			T1	T2
RF channel number			1	
Duplex mode	Config 1,2,3,7		FDD	
	Config 4,5,6,8		TDD	
TDD special subframe configuration[Note1]	Config 4,5,6,8		6	
TDD uplink-downlink configuration[Note1]	Config 4,5,6,8		1	
$BW_{channel}$		MHz	5 MHz: $N_{RB,c}$ = 25 10 MHz: $N_{RB,c}$ = 50 20 MHz: $N_{RB,c}$ = 100	
PDSCH parameters: DL Reference Measurement Channel[Note2]	Config 1,2,3,7		5 MHz: R.7 FDD 10 MHz: R.3 FDD 20 MHz: R.6 FDD	
	Config 4,5,6,8		5 MHz: R.4 TDD 10 MHz: R.0 TDD 20 MHz: R.3 TDD	
PCFICH/PDCCH/PHICH parameters: DL Reference Measurement Channel[Note2]	Config 1,2,3,7		5 MHz: R.11 FDD 10 MHz: R.6 FDD 20 MHz: R.10 FDD	
	Config 4,5,6,8		5 MHz: R.11 TDD 10 MHz: R.6 TDD 20 MHz: R.10 TDD	
OCNG Patterns[Note2]	Config 1,2,3,7		5 MHz: OP.20 FDD 10 MHz: OP.10 FDD 20 MHz: OP.17 FDD	
	Config 4,5,6,8		5 MHz: OP.9 TDD 10 MHz: OP.1 TDD 20 MHz: OP.7 TDD	
b2-Threshold1		dBm	-77	
PBCH_RA		dB	0	
PBCH_RB				
PSS_RA				
SSS_RA				
PCFICH_RB				
PHICH_RA				
PHICH_RB				
PDCCH_RA				
PDCCH_RB				
PDSCH_RA				
PDSCH_RB				
OCNG_RA[Note3]				
OCNG_RB[Note3]				
N_{oc}[Note4]		dBm/15 kHz	-104	
$\hat{E}_s/N_{oc}$		dB	17	15.35
$\hat{E}_s/I_{ot}$[Note5]		dB	17	15.35
RSRP[Note5]		dBm/15 kHz	-87	-88.65
SCH_RP[Note5]		dBm/15 kHz	-87	-88.65
Io[Note5]		dBm/ 9 MHz	-59.13+10log($N_{RB,c}$ /50)	60.74+10log($N_{RB,c}$ /50)
Propagation Condition [Note6]			ETU70	

Antenna Configuration and Correlation Matrix Note6		1x2 Low

Note 1: Special subframe and uplink-downlink configurations are specified in table 4.2-1 in TS 36.211 [24].
Note 2: DL RMCs and OCNG patterns are specified in clauses A 3.1 and A 3.2 of TS 36.133 [23] respectively.
Note 3: OCNG shall be used such that all cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.
Note 4: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for N_{oc} to be fulfilled.
Note 5: $\hat{E}_s/I_{ot}$, RSRP, SCH_RP and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.
Note 6: Propagation condition and correlation matrix are defined in clause B.2 in TS 36.101 [27].

Table 18.3.1.4.5-2: NR cell specific test parameters

Parameter		Unit	Cell 2	
			T1	T2
NR RF Channel Number			1	
Duplex mode	Config 1,4		FDD	
	Config 2,3,5,6		TDD	
	Config 7,8		HD-FDD	
TDD configuration	Config 2,5		TDDConf.1.1	
	Config 3,6		TDDConf.2.1	
$BW_{channel}$	Config 1,2,4,5,7,8	MHz	10: $N_{RB,c}$ = 52	
	Config 3,6		20: $N_{RB,c}$ = 51	
OCNG Patterns			OP.1	
SMTC configuration	Config 1,4,7,8		SMTC.2	
	Config 2,3,5,6		SMTC.1	
PDSCH/PDCCH subcarrier spacing	Config 1,2,4,5,7,8	kHz	15	
	Config 3,6		30	
b2-Threshold2NR	Config 1,2,4,5,7,8	dBm/SCS	-101	
	Config 3,6		-98	
EPRE ratio of PSS to SSS		dB	0	
EPRE ratio of PBCH DMRS to SSS				
EPRE ratio of PBCH to PBCH DMRS				
EPRE ratio of PDCCH DMRS to SSS				
EPRE ratio of PDCCH to PDCCH DMRS				
EPRE ratio of PDSCH DMRS to SSS				
EPRE ratio of PDSCH to PDSCH				
EPRE ratio of OCNG DMRS to SSS Note 1				
EPRE ratio of OCNG to OCNG DMRS Note 1				
N_{oc} Note2		dBm/15kHz	-98	
N_{oc} Note2	Config 1,2,4,5,7,8	dBm/SCS	-98	
	Config 3,6		-95	
SS-RSRP Note 3	Config 1,2,4,5,7,8	dBm/SCS	-Infinity	-89.35
	Config 3,6		-Infinity	-86.34
$\hat{E}_s/I_{ot}$		dB	-Infinity	8.65
$\hat{E}_s/N_{oc}$		dB	-Infinity	8.65
Io Note3	Config 1,2,4,5,7,8	dBm/9.36MHz	-70.05	-60.84
	Config 3,6	dBm/18.36MHz	-63.94	-57.92
Propagation Condition			TDL-C 300ns 100Hz	
Antenna Configuration and Correlation Matrix			1x2 Low	

NOTE 1:	OCNG shall be used such that the cell is fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.
NOTE 2:	Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for N_{oc} to be fulfilled.
NOTE 3:	SS-RSRP and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.
NOTE 4:	SS-RSRP minimum requirements are specified assuming independent interference and noise at each receiver antenna port.

18.3.1.5 E-UTRA - NR SA FR2 Event triggered reporting tests for FR2 without SSB time index detection when DRX is not used

Editor's notes: This test case is incomplete in following aspects:

- Test tolerance analysis is missing.

18.3.1.5.1 Test purpose

To verify that the RedCap UE makes correct reporting of an event. This test will partly verify the NR inter-RAT cell search requirements in clause TS 36.133 [23] clause 8.20.2 for E-UTRAN FDD-NR measurements and TS 36.133 [23] clause 8.20.3 for E-UTRAN TDD-NR measurements.

18.3.1.5.2 Test applicability

This test applies to all E-UTRA UE from release 17 onwards and capable of NR RedCap with 2Rx. Test 1 applies to UEs not supporting per-FR gap and test 2 applies only to UEs supporting per-FR gap.

18.3.1.5.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 18.3.1.0.1.

The normative reference for this requirement is TS 38.133 [6] clause A.18.3.1.5.

18.3.1.5.4 Test description

18.3.1.5.4.1 Initial conditions

Same as the initial conditions given in clause 8.4.2.5.4.1 with following exceptions:

- Table 8.4.2.5.4.1-1 is replaced by Table 18.3.1.5.4.1-1.
- Table 8.4.2.5.4.1-2 is replaced by Table 18.3.1.5.4.1-2.
- Table 8.4.2.5.4.1-3 is replaced by Table 18.3.1.5.4.1-3.

Table 18.3.1.5.4.1-1: Supported test configurations

Configuration	Description
18.3.1.5-1	LTE FDD, NR 120 kHz SSB SCS, 100 MHz bandwidth, TDD duplex mode
18.3.1.5-2	LTE TDD, NR 120 kHz SSB SCS, 100 MHz bandwidth, TDD duplex mode
Note 1: The UE is only required to be tested in one of the supported test configurations.	

Table 18.3.1.5.4.1-2: Initial conditions

Parameter	Value	Comment
Test environment	NC	As specified in TS 36.508 [25] clause 4.1.
Test frequencies	As specified in Annex E, Table E.16-1 and TS 38.508-1 [14] clause 4.3.1.	
Channel bandwidth	As specified by the test configuration selected from Table 18.3.1.5.4.1-1.	
Propagation conditions	AWGN	As specified in clause C.2.2

Connection Diagram	TE Part	A.3.3.3.1	As specified in TS 38.508-1 [14] Annex A.
	DUT Part	A.3.4.1.1	
Exceptions to connection diagram	N/A		

Table 18.3.1.5.4.1-3: General test parameters

Parameter		Unit	Value		Comment
			Test 1	Test 2	
E-UTRA RF Channel Numbers			1		One E-UTRA carrier frequency is used.
NR RF Chanel Number			1		One FR1 NR carrier frequency is used.
Active cell			E-UTRA Cell 1		E-UTRA cell 1 is on E-UTRA RF channel number 1.
Neighbour cell			NR Cell 2		NR cell 2 is on NR RF channel number 1.
Gap Pattern Id			0	4	As specified in Table 8.1.2.1-1 of TS 36.133 [23].
Measurement gap offset			39	19	As specified in TS 36.331 [29].
Hysteresis		dB	0		
CP length			Normal		
TimeToTrigger		s	0		
Filter coefficient			0		L3 filtering is not used
DRX			OFF		DRX is not used
Time offset between serving and neighbour cells	Config 1		3ms		Asynchronous cells. The timing of Cell 2 is 3ms later than the timing of Cell 1.
	Config 2		3µs		Synchronous cells.
T1		s	10		
T2		s	6	3	

18.3.1.5.4.2 Test procedure

Same as the test procedure given in clause 8.4.2.5.4.2.

18.3.1.5.4.3 Message contents

Same as the message contents given in clause 8.4.2.5.4.3.

18.3.1.5.5 Test requirement

Same as the test requirements given in clause 8.4.2.5.5 with following exceptions:

- Table 8.4.2.5.5-1 is replaced by Table 18.3.1.5.5-1.

Table 18.3.1.5.5-1: NR cell specific test parameters

Parameter		Unit	Cell 2	
			T1	T2
AoA setup			Setup 2a	
Assumption for UE beams[Note 3]			Rough	
NR RF Channel Number			1	
Duplex mode			TDD	
TDD configuration			TDDConf.3.1	
$BW_{channel}$		MHz	100: $N_{RB,c}$ = 66	
OCNG patterns			OP.3	
SMTC configuration	Config 1		SMTC.2	
	Config 2		SMTC.1	
PDSCH/PDCCH subcarrier spacing		kHz	120	
b1-ThresholdNR	UE power class 3	dBm/SCS	-112	
EPRE ratio of PSS to SSS		dB	0	
EPRE ratio of PBCH DMRS to SSS				
EPRE ratio of PBCH to PBCH DMRS				
EPRE ratio of PDCCH DMRS to SSS				
EPRE ratio of PDCCH to PDCCH DMRS				

EPRE ratio of PDSCH DMRS to SSS			
EPRE ratio of PDSCH to PDSCH			
EPRE ratio of OCNG DMRS to SSS Note 1			
EPRE ratio of OCNG to OCNG DMRS Note 1			
$\hat{E}_s$	dBm/SCS	-Infinity	-80.6
SSB_RP Note 2	dBm/SCS	-Infinity	-80.6
$\hat{E}_s/Iot_{BB}$ Note 4	dB	-Infinity	8.3
Io^{Note3}	dBm/95.04MHz	-Infinity	-56.0
Propagation Condition		AWGN	
Note 1: OCNG shall be used such that a constant total transmitted power spectral density is achieved for all OFDM symbols.			
Note 2: SSB_RP and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.			
Note 3: Information about types of UE beam is given in B.2.1.3, and does not limit UE implementation or test system implementation			
Note 4: Calculation of Es/Iot_{BB} includes the effect of UE internal noise up to the value assumed for the associated Refsens requirement in clause 7.3.2 of TS 38.101-2 [19], and an allowance of 1dB for UE multi-band relaxation factor ΔMB_P from TS 38.101-2 [19] Table 6.2.1.3-4.			

18.3.1.6 E-UTRA - NR SA FR2 Event triggered reporting tests for FR2 without SSB time index detection when DRX is used

Editor's notes: This test case is incomplete in following aspects:

- Test tolerance analysis is missing.

18.3.1.6.1 Test purpose

To verify that the RedCap UE makes correct reporting of an event. This test will partly verify the NR inter-RAT cell search requirements in clause TS 36.133 [23] clause 8.20.2 for E-UTRAN FDD-NR measurements and TS 36.133 [23] clause 8.20.3 for E-UTRAN TDD-NR measurements.

18.3.1.6.2 Test applicability

This test applies to all E-UTRA UE from release 17 onwards and capable of NR RedCap with 2Rx. Test 1 and test 2 apply to UEs not supporting per-FR gap. Test 3 and test 4 apply only to UEs supporting per-FR gap.

18.3.1.6.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 18.3.1.0.1.

The normative reference for this requirement is TS 38.133 [6] clause A.18.3.1.6.

18.3.1.6.4 Test description

18.3.1.6.4.1 Initial conditions

Same as the initial conditions given in clause 8.4.2.6.4.1 with following exceptions:

- Table 8.4.2.6.4.1-1 is replaced by Table 18.3.1.6.4.1-1.
- Table 8.4.2.6.4.1-2 is replaced by Table 18.3.1.6.4.1-2.
- Table 8.4.2.6.4.1-3 is replaced by Table 18.3.1.6.4.1-3.

Table 18.3.1.6.4.1-1: Supported test configurations

Configuration	Description
18.3.1.6-1	LTE FDD, NR 120 kHz SSB SCS, 100 MHz bandwidth, TDD duplex mode
18.3.1.6-2	LTE TDD, NR 120 kHz SSB SCS, 100 MHz bandwidth, TDD duplex mode
Note 1: The UE is only required to be tested in one of the supported test configurations.	

Table 18.3.1.6.4.1-2: Initial conditions

Parameter	Value		Comment
Test environment	NC		As specified in TS 36.508 [25] clause 4.1.
Test frequencies	As specified in Annex E, Table E.16-1 and TS 38.508-1 [14] clause 4.3.1.		
Channel bandwidth	As specified by the test configuration selected from Table 18.3.1.6.4.1-1.		
Propagation conditions	AWGN		As specified in clause C.2.2
Connection Diagram	TE Part	A.3.3.3.1	As specified in TS 38.508-1 [14] Annex A.
	DUT Part	A.3.4.1.1	
Exceptions to connection diagram	N/A		

Table 18.3.1.6.4.1-3: General test parameters

Parameter		Unit	Value				Comment
			Test 1	Test 2	Test 3	Test 4	
E-UTRA RF Channel Numbers			1				One E-UTRA carrier frequency is used.
NR RF Chanel Number			1				One FR1 NR carrier frequency is used.
Active cell			E-UTRA Cell 1				E-UTRA cell 1 is on E-UTRA RF channel number 1.
Neighbour cell			NR Cell 2				NR cell 2 is on NR RF channel number 1.
Gap Pattern Id			0		4		As specified in Table 8.1.2.1-1 of TS 36.133 [23].
Measurement gap offset			39		19		As specified in TS 36.331 [29].
Hysteresis		dB	0				
CP length			Normal				
TimeToTrigger		s	0				
Filter coefficient			0				L3 filtering is not used
DRX			DRX.9	DRX.12	DRX.9	DRX.12	
Time offset between serving and neighbour cells	Config 1		3ms				Asynchronous cells. The timing of Cell 2 is 3ms later than the timing of Cell 1.
	Config 2		3µs				Synchronous cells.
T1		s	10				
T2		s	6	83	6	83	

18.3.1.6.4.2 Test procedure

Same as the test procedure given in clause 8.4.2.6.4.2.

18.3.1.6.4.3 Message contents

Same as the message contents given in clause 8.4.2.6.4.3.

18.3.1.6.5 Test requirement

Same as the test requirements given in clause 8.4.2.6.5 with following exceptions:

- Table 8.4.2.6.5-1 is replaced by Table 18.3.1.6.5-1.

Table 18.3.1.6.5-1: NR cell specific test parameters

Parameter	Unit	Cell 2	
		T1	T2
AoA setup		Setup 1	
Assumption for UE beams[Note 3]		Rough	
NR RF Channel Number		1	
Duplex mode		TDD	
TDD configuration		TDDConf.3.1	

$BW_{channel}$		MHz	100: $N_{RB,c}$ = 66	
OCNG patterns			OP.1	
SMTC configuration	Config 1		SMTC.2	
	Config 2		SMTC.1	
PDSCH/PDCCH subcarrier spacing		kHz	120	
b1-ThresholdNR	UE power class 3	dBm/SCS	-106	
EPRE ratio of PSS to SSS		dB	0	
EPRE ratio of PBCH DMRS to SSS				
EPRE ratio of PBCH to PBCH DMRS				
EPRE ratio of PDCCH DMRS to SSS				
EPRE ratio of PDCCH to PDCCH DMRS				
EPRE ratio of PDSCH DMRS to SSS				
EPRE ratio of PDSCH to PDSCH				
EPRE ratio of OCNG DMRS to SSS Note 1				
EPRE ratio of OCNG to OCNG DMRS Note 1				
N_{oc} Note2		dBm/15kHz	-104.7	
N_{oc} Note2		dBm/SCS	-95.7	
SS-RSRP Note 3		dBm/SCS	-Infinity	-87.7
$\hat{E}_s/I_{ot}$ Note 4		dB	-Infinity	8
$\hat{E}_s/N_{oc}$		dB	-Infinity	8
Io Note3		dBm/95.04MHz	-66.7	-58.0
Propagation Condition			AWGN	

Note 1: OCNG shall be used such that the cell is fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.

Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for N_{oc} to be fulfilled.

Note 3: SS-RSRP and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.

Note 4: SS-RSRP minimum requirements are specified assuming independent interference and noise at each receiver antenna port.

Note 5: Information about types of UE beam is given in B.2.1.3, and does not limit UE implementation or test system implementation

18.3.1.7 E-UTRA - NR SA FR2 Event triggered reporting tests for FR2 with SSB time index detection when DRX is not used

Editor's notes: This test case is incomplete in following aspects:

- Test tolerance analysis is missing.

18.3.1.7.1 Test purpose

To verify that the RedCap UE makes correct reporting of an event. This test will partly verify the NR inter-RAT cell search requirements in clause TS 36.133 [23] clause 8.20.2 for E-UTRAN FDD-NR measurements and TS 36.133 [23] clause 8.20.3 for E-UTRAN TDD-NR measurements.

18.3.1.7.2 Test applicability

This test applies to all E-UTRA UE from release 17 onwards and capable of NR RedCap with 2Rx. Test 1 applies to UEs not supporting per-FR gap and test 2 applies only to UEs supporting per-FR gap.

18.3.1.7.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 18.3.1.0.1.

The normative reference for this requirement is TS 38.133 [6] clause A.18.3.1.7.

18.3.1.7.4 Test description

18.3.1.7.4.1 Initial conditions

Same as the initial conditions given in clause 8.4.2.7.4.1 with following exceptions:

- Table 8.4.2.7.4.1-1 is replaced by Table 18.3.1.7.4.1-1.
- Table 8.4.2.7.4.1-2 is replaced by Table 18.3.1.7.4.1-2.
- Table 8.4.2.7.4.1-3 is replaced by Table 18.3.1.7.4.1-3.

Table 18.3.1.7.4.1-1: Supported test configurations

Configuration	Description
18.3.1.7-1	LTE FDD, NR 120 kHz SSB SCS, 100 MHz bandwidth, TDD duplex mode
18.3.1.7-2	LTE TDD, NR 120 kHz SSB SCS, 100 MHz bandwidth, TDD duplex mode
Note 1: The UE is only required to be tested in one of the supported test configurations.	

Table 18.3.1.7.4.1-2: Initial conditions

Parameter	Value		Comment
Test environment	NC		As specified in TS 36.508 [25] clause 4.1.
Test frequencies	As specified in Annex E, Table E.16-1 and TS 38.508-1 [14] clause 4.3.1.		
Channel bandwidth	As specified by the test configuration selected from Table 18.3.1.7.4.1-1.		
Propagation conditions	AWGN		As specified in clause C.2.2
Connection Diagram	TE Part	A.3.3.3.1	As specified in TS 38.508-1 [14] Annex A.
	DUT Part	A.3.4.1.1	
Exceptions to connection diagram	N/A		

Table 18.3.1.7.4.1-3: General test parameters

Parameter		Unit	Value		Comment
			Test 1	Test 2	
E-UTRA RF Channel Numbers			1		One E-UTRA carrier frequency is used.
NR RF Chanel Number			1		One FR1 NR carrier frequency is used.
Active cell			E-UTRA Cell 1		E-UTRA cell 1 is on E-UTRA RF channel number 1.
Neighbour cell			NR Cell 2		NR cell 2 is on NR RF channel number 1.
Gap Pattern Id			0	4	As specified in Table 8.1.2.1-1 of TS 36.133 [23].
Measurement gap offset			39	19	As specified in TS 36.331 [29].
Hysteresis		dB	0		
CP length			Normal		
TimeToTrigger		s	0		
Filter coefficient			0		L3 filtering is not used
DRX			OFF		DRX is not used
Time offset between serving and neighbour cells	Config 1		3ms		Asynchronous cells. The timing of Cell 2 is 3ms later than the timing of Cell 1.
	Config 2		3µs		Synchronous cells.
T1		s	5		
T2		s	5	3	

18.3.1.7.4.2 Test procedure

Same as the test procedure given in clause 8.4.2.7.4.2.

18.3.1.7.4.3 Message contents

Same as the message contents given in clause 8.4.2.7.4.3.

18.3.1.7.5 Test requirement

Same as the test requirements given in clause 8.4.2.7.5 with following exceptions:

- Table 8.4.2.7.5-1 is replaced by Table 18.3.1.7.5-1.

Table 18.3.1.7.5-1: NR cell specific test parameters

Parameter		Unit	Cell 2	
			T1	T2
AoA setup			Setup 1	
Assumption for UE beams Note 3			Rough	
NR RF Channel Number			1	
Duplex mode			TDD	
TDD configuration			TDDConf.3.1	
$BW_{channel}$		MHz	100: $N_{RB,c}$ = 66	
OCNG patterns			OP.1	
SMTC configuration	Config 1		SMTC.2	
	Config 2		SMTC.1	
PDSCH/PDCCH subcarrier spacing		kHz	120	
b1-ThresholdNR	UE power class 3	dBm/SCS	-106	
EPRE ratio of PSS to SSS		dB	0	
EPRE ratio of PBCH DMRS to SSS				
EPRE ratio of PBCH to PBCH DMRS				
EPRE ratio of PDCCH DMRS to SSS				
EPRE ratio of PDCCH to PDCCH DMRS				
EPRE ratio of PDSCH DMRS to SSS				
EPRE ratio of PDSCH to PDSCH				
EPRE ratio of OCNG DMRS to SSS Note 1				
EPRE ratio of OCNG to OCNG DMRS Note 1				
N_{oc} Note2			-104.7	
N_{oc} Note2			-95.7	
SS-RSRP Note 3		dBm/SCS	-Infinity	-87.7
$\hat{E}_s / I_{ot}$			-Infinity	8
$\hat{E}_s / N_{oc}$		dB	-Infinity	8
Io Note3		dBm/95.04MHz	-66.7	-58.0
Propagation Condition			AWGN	

Note 1: OCNG shall be used such that the cell is fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.

Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for N_{oc} to be fulfilled.

Note 3: SS-RSRP and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.

Note 4: SS-RSRP minimum requirements are specified assuming independent interference and noise at each receiver antenna port.

Note 5: Information about types of UE beam is given in B.2.1.3, and does not limit UE implementation or test system implementation

18.3.1.8 E-UTRA - NR SA FR2 Event triggered reporting tests for FR2 with SSB time index detection when DRX is used

Editor's notes: This test case is incomplete in following aspects:

- Test tolerance analysis is missing.

18.3.1.8.1 Test purpose

To verify that the RedCap UE makes correct reporting of an event. This test will partly verify the NR inter-RAT cell search requirements in clause TS 36.133 [23] clause 8.20.2 for E-UTRAN FDD-NR measurements and TS 36.133 [23] clause 8.20.3 for E-UTRAN TDD-NR measurements.

18.3.1.8.2 Test applicability

This test applies to all E-UTRA UE from release 17 onwards and capable of NR RedCap with 2Rx. Test 1 and test 2 apply to UEs not supporting per-FR gap. Test 3 and test 4 apply only to UEs supporting per-FR gap.

18.3.1.8.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 18.3.1.0.1.

The normative reference for this requirement is TS 38.133 [6] clause A.18.3.1.8.

18.3.1.8.4 Test description

18.3.1.8.4.1 Initial conditions

Same as the initial conditions given in clause 8.4.2.8.4.1 with following exceptions:

- Table 8.4.2.8.4.1-1 is replaced by Table 18.3.1.8.4.1-1.
- Table 8.4.2.8.4.1-2 is replaced by Table 18.3.1.8.4.1-2.
- Table 8.4.2.8.4.1-3 is replaced by Table 18.3.1.8.4.1-3.

Table 18.3.1.8.4.1-1: Supported test configurations

Configuration	Description
18.3.1.8-1	LTE FDD, NR 120 kHz SSB SCS, 100 MHz bandwidth, TDD duplex mode
18.3.1.8-2	LTE TDD, NR 120 kHz SSB SCS, 100 MHz bandwidth, TDD duplex mode
Note 1: The UE is only required to be tested in one of the supported test configurations.	

Table 18.3.1.8.4.1-2: Initial conditions

Parameter	Value		Comment
Test environment	NC		As specified in TS 36.508 [25] clause 4.1.
Test frequencies	As specified in Annex E, Table E.16-1 and TS 38.508-1 [14] clause 4.3.1.		
Channel bandwidth	As specified by the test configuration selected from Table 18.3.1.8.4.1-1.		
Propagation conditions	AWGN		As specified in clause C.2.2
Connection Diagram	TE Part	A.3.3.3.1	As specified in TS 38.508-1 [14] Annex A.
	DUT Part	A.3.4.1.1	
Exceptions to connection diagram	N/A		

Table 18.3.1.8.4.1-3: General test parameters

Parameter	Unit	Value				Comment
		Test 1	Test 2	Test 3	Test 4	
E-UTRA RF Channel Numbers		1				One E-UTRA carrier frequency is used.
NR RF Chanel Number		1				One FR1 NR carrier frequency is used.
Active cell		E-UTRA Cell 1				E-UTRA cell 1 is on E-UTRA RF channel number 1.
Neighbour cell		NR Cell 2				NR cell 2 is on NR RF channel number 1.
Gap Pattern Id		0		4		As specified in Table 8.1.2.1-1 of TS 36.133 [23].
Measurement gap offset		39		19		As specified in TS 36.331 [29].
Hysteresis	dB	0				
CP length		Normal				
TimeToTrigger	s	0				
Filter coefficient		0				L3 filtering is not used
DRX		DRX.9	DRX.12	DRX.9	DRX.12	

Time offset between serving and neighbour cells	Config 1		3ms				Asynchronous cells. The timing of Cell 2 is 3ms later than the timing of Cell 1.
	Config 2		3µs				Synchronous cells.
T1		s	5				
T2		s	7	70	7	70	

18.3.1.8.4.2 Test procedure

Same as the test procedure given in clause 8.4.2.8.4.2.

18.3.1.8.4.3 Message contents

Same as the message contents given in clause 8.4.2.8.4.3.

18.3.1.8.5 Test requirement

Same as the test requirements given in clause 8.4.2.8.5 with following exceptions:

- Table 8.4.2.8.5-1 is replaced by Table 18.3.1.8.5-1.

Table 18.3.1.8.5-1: NR cell specific test parameters

Parameter		Unit	Cell 2	
			T1	T2
AoA setup			Setup 1	
Assumption for UE beams Note 3			Rough	
NR RF Channel Number			1	
Duplex mode			TDD	
TDD configuration			TDDConf.3.1	
$BW_{channel}$		MHz	100: $N_{RB,c}$ = 66	
OCNG patterns			OP.1	
SMTC configuration	Config 1		SMTC.2	
	Config 2		SMTC.1	
PDSCH/PDCCH subcarrier spacing		kHz	120	
b1-ThresholdNR	UE power class 3	dBm/SCS	-106	
EPRE ratio of PSS to SSS		dB	0	
EPRE ratio of PBCH DMRS to SSS				
EPRE ratio of PBCH to PBCH DMRS				
EPRE ratio of PDCCH DMRS to SSS				
EPRE ratio of PDCCH to PDCCH DMRS				
EPRE ratio of PDSCH DMRS to SSS				
EPRE ratio of PDSCH to PDSCH				
EPRE ratio of OCNG DMRS to SSS Note 1				
EPRE ratio of OCNG to OCNG DMRS Note 1				
N_{oc} Note2		dBm/15kHz	-104.7	
N_{oc} Note2		dBm/SCS	-95.7	
SS-RSRP Note 3		dBm/SCS	-Infinity	-87.7
$\hat{E}_s/I_{ot}$ Note 4		dB	-Infinity	8
$\hat{E}_s/N_{oc}$		dB	-Infinity	8
Io Note3		dBm/95.04MHz	-66.7	-58.0
Propagation Condition			AWGN	

Note 1:	OCNG shall be used such that the cell is fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.
Note 2:	Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for N_{oc} to be fulfilled.
Note 3:	SS-RSRP and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.
Note 4:	SS-RSRP minimum requirements are specified assuming independent interference and noise at each receiver antenna port.
Note 5:	Information about types of UE beam is given in B.2.1.3, and does not limit UE implementation or test system implementation

Annex A (normative): RRM test configurations

A.1 Reference measurement channels

A.1.0 General

This clause contains the Reference Measurement Channels (RMC) to be used for the RRM test scenarios in Clauses 4 to 7 of this document.

A.1.1 PDSCH

A.1.1.1 FDD

Table A.1.1.1-1: PDSCH Reference Measurement Channels for SCS = 15 kHz for FDD

Parameter	Unit	Value
Reference channel		SR.1.1 FDD
Channel bandwidth	MHz	Defined in test case
Number of transmitter antennas		1
Allocated resource blocks for PDSCH Note 1		24
Allocated slots per Radio Frame		10
Radio frame containing SSB	slots	Note 5
Radio frame not containing SSB	slots	10
MCS index		4
Modulation		QPSK
Target Coding Rate		1/3
Number of control symbols		2
PDSCH mapping type		Type A
Information Bit Payload		
For slots with RMSI Note 2	Bits	1608
For slots without RMSI	Bits	1864
Number of Code Blocks per slot		1
Binary Channel Bits Per slot		
For slots with RMSI Note 2, 4	Bits	5184
For slots without RMSI Note 6	Bits	6048

NOTE 1: Allocated outside the SMTC duration in time and in resource blocks which do not overlap with the resource blocks allocated for SS/PBCH block.
NOTE 2: PDSCH is scheduled on the slots with RMSI.
NOTE 3: If necessary, the information bit payload size can be adjusted to facilitate the test implementation. The payload sizes are defined in 3GPP TS 38.213 [8].
NOTE 4: Derived based on the PDSCH DMRS assumption: dmrs-TypeA-Position=2, dmrs-Type=1, dmrs-AdditonalPositions=2, maxLength=1, Antenna port index: 1000, and Number of PDSCH DMRS CDM group(s) without data: 2.
NOTE 5: PDSCH is not scheduled in slots containing SSB according to the SSB configuration used in the test. SSB configurations are defined in clause A.3.
NOTE 6: Derived based on the PDSCH DMRS assumption: dmrs-TypeA-Position=2, dmrs-Type=1, dmrs-AdditonalPositions=2, maxLength=1, Antenna port index: 1000, and Number of PDSCH DMRS CDM group(s) without data: 1.
NOTE 7: When DRX is configured, PDCCH can be scheduled both for downlink assignment and/or UL grant only during ([10ms] – drx-InactivityTimer) from timing when *drx-onDurationTimer* starts, unless otherwise specified in the test case.

A.1.1.2 TDD

Table A.1.1.2-1: PDSCH Reference Measurement Channels for SCS = 15 kHz for TDD

Parameter	Unit	Value	Value

Reference channel		SR.1.1 TDD	SR.1.2 TDD
Channel bandwidth	MHz	Defined in test case	Defined in test case
Number of transmitter antennas		1	1
Allocated resource blocks for PDSCH Note 1		24	24
Allocated slots per Radio Frame			
Radio frame containing SSB	slots	Note 5	Note 5
Radio frame not containing SSB	slots	4	6
MCS table		64QAM	64QAM
MCS index		4	4
Modulation		QPSK	QPSK
Target Coding Rate		1/3	1/3
Number of control symbols		2	2
PDSCH mapping type		Type A	Type A
Information Bit Payload			
For slots with RMSI Note 2	Bits	1608	1608
For slots without RMSI	Bits	1864	1864
For special slots	Bits	N/A	1128
Number of Code Blocks per slot		1	
Binary Channel Bits Per slot			
For slots with RMSI Note 2, 4	Bits	5184	5184
For slots without RMSI Note 6	Bits	6048	6048
For special slots Note 6	Bits	-	3744

NOTE 1: Allocated outside the SMTC duration in time and in resource blocks which do not overlap with the resource blocks allocated for SS/PBCH block.
NOTE 2: PDSCH is scheduled on the slots with RMSI.
NOTE 3: If necessary, the information bit payload size can be adjusted to facilitate the test implementation. The payload sizes are defined in 3GPP TS 38.213 [8].
NOTE 4: Derived based on the PDSCH DMRS assumption: dmrs-TypeA-Position=2, dmrs-Type=1, dmrs-AdditonalPositions=2, maxLength=1, Antenna port index: 1000, and Number of PDSCH DMRS CDM group(s) without data: 2.
NOTE 5: PDSCH is not scheduled in slots containing SSB according to the SSB configuration used in the test. SSB configurations are defined in clause A.3.10.
NOTE 6: Derived based on the PDSCH DMRS assumption: dmrs-TypeA-Position=2, dmrs-Type=1, dmrs-AdditonalPositions=2, maxLength=1, Antenna port index: 1000, and Number of PDSCH DMRS CDM group(s) without data: 1.
NOTE 7: When DRX is configured, PDCCH can be scheduled both for downlink assignment and/or UL grant only during ([10]ms – drx-InactivityTimer) from timing when *drx-onDurationTimer* starts, unless otherwise specified in the test case.

Table A.1.1.2-2: PDSCH Reference Measurement Channels for SCS = 30 kHz for TDD

Parameter	Unit	Value
Reference channel		SR.2.1 TDD
Channel bandwidth	MHz	Defined in test case
Number of transmitter antennas		1
Allocated resource blocks for PDSCH Note 1		24
Allocated slots per Radio Frame		
Radio frame containing SSB	slots	Note 5
Radio frame not containing SSB	slots	10
MCS table		64QAM
MCS index		4
Modulation		QPSK
Target Coding Rate		1/3
Number of control symbols		2
PDSCH mapping type		Type A
Information Bit Payload		
For slots with RMSI Note 2	Bits	1608
For slots without RMSI	Bits	1864
Number of Code Blocks per slot		1
Binary Channel Bits Per slot		
For slots with RMSI Note 2, 4	Bits	5184
For slots without RMSI Note 6	Bits	6048

NOTE 1: Allocated outside the SMTC duration in time and in resource blocks which do not

overlap with the resource blocks allocated for SS/PBCH block.
NOTE 2: PDSCH is scheduled on the slots with RMSI.
NOTE 3: If necessary, the information bit payload size can be adjusted to facilitate the test implementation. The payload sizes are defined in 3GPP TS 38.213 [8].
NOTE 4: Derived based on the PDSCH DMRS assumption: dmrs-TypeA-Position=2, dmrs-Type=1, dmrs-AdditonalPositions=2, maxLength=1, Antenna port index: 1000, and Number of PDSCH DMRS CDM group(s) without data: 2.
NOTE 5: PDSCH is not scheduled in slots containing SSB according to the SSB configuration used in the test. SSB configurations are defined in clause A.3.10.
NOTE 6: Derived based on the PDSCH DMRS assumption: dmrs-TypeA-Position=2, dmrs-Type=1, dmrs-AdditonalPositions=2, maxLength=1, Antenna port index: 1000, and Number of PDSCH DMRS CDM group(s) without data: 1.
NOTE 7: When DRX is configured, PDCCH can be scheduled both for downlink assignment and/or UL grant only during ([10]ms – drxInactivityTimer) from timing when *drx-onDurationTimer* starts, unless otherwise specified in the test case.

Table A.1.1.2-3: PDSCH Reference Measurement Channels for SCS = 120 kHz for TDD

Parameter	Unit	Value		
Reference channel		SR.3.1 TDD	SR.3.2 TDD	SR.3.3 TDD
Channel bandwidth	MHz	100	100	100
Number of transmitter antennas		1	1	1
Allocated resource blocks for PDSCH		24 Note 1	24 Note 7	48 Note 7
Allocated slots per Radio Frame				
Radio frame containing SSB	slots	Note 5	Note 8	Note 5
Radio frame not containing SSB	slots	48	48	48
MCS table		64QAM	64QAM	64QAM
MCS index		4	4	4
Modulation		QPSK	QPSK	QPSK
Target Coding Rate		1/3	1/3	1/3
Number of control symbols		2	2	2
PDSCH mapping type		Type A	Type A	Type A
Information Bit Payload				
For slots with RMSI	Bits	1608	1608	3104
For slots without RMSI	Bits	1864	1864	3624
Number of Code Blocks per slot		1	1	1
Binary Channel Bits Per slot				
For slots with RMSI Note 4	Bits	5184	5184	10368
For slots without RMSI Note 6	Bits	6048	6048	12096

NOTE 1: Allocated in resource blocks which do not overlap with the resource blocks allocated for SS/PBCH block.
NOTE 2: Void
NOTE 3: If necessary, the information bit payload size can be adjusted to facilitate the test implementation. The payload sizes are defined in 3GPP TS 38.213 [8].
NOTE 4: Derived based on the PDSCH DMRS assumption: dmrs-TypeA-Position=2, dmrs-Type=1, dmrs-AdditonalPositions=2, maxLength=1, Antenna port index: 1000, and Number of PDSCH DMRS CDM group(s) without data: 2.
NOTE 5: PDSCH is not scheduled in slots containing SSB according to the SSB configuration used in the test. SSB configurations are defined in clause A.3.10.
NOTE 6: Derived based on the PDSCH DMRS assumption: dmrs-TypeA-Position=2, dmrs-Type=1, dmrs-AdditionalPositions=2, maxLength=1, Antenna port index: 1000, and Number of PDSCH DMRS CDM group(s) without data: 1.
NOTE 7: Allocated in the same resource blocks as the CORESET.
NOTE 8: When DRX is configured, PDSCH is scheduled only while *drx-onDurationTimer* is running, unless otherwise specified in the test case.

A.1.2 CORESET for RMSI scheduling

A.1.2.1 FDD

Table A.1.2.1-1: RMSI CORESET Reference Measurement Channels for SCS = 15 kHz for FDD

Parameter	Unit	Value
Reference channel		CR.1.1 FDD
Channel bandwidth	MHz	Defined in test

		case
Subcarrier spacing for RMSI CORESET	kHz	15
Allocated resource blocks for RMSI CORESET Note 7		24
Subcarrier spacing for SSB	kHz	15
SSB and RMSI CORESET multiplexing configuration		Pattern 1
Offset between SSB and RMSI CORESET Note 3, 7	RB	0 (Note 8)
Configuration of PDCCH monitoring occasions for RMSI CORESET Note 4		Index 4
Number of transmitter antennas		1
Duration of RMSI CORESET Note 7	symbols	2
DCI Format Note 1		Note 2
Aggregation level	CCE	8
DMRS precoder granularity		6
REG bundle size		6
Mapping from REG to CCE		Distributed
Cell ID		Note 5
Payload (without CRC)	Bits	Note 6

NOTE 1: DCI formats are defined in TS 38.212 [31].
NOTE 2: DCI format shall depend upon the test configuration.
NOTE 3: The offset is defined with respect to the subcarrier spacing of the CORESET from the smallest RB index of RMSI CORESET to the smallest RB index of the common RB overlapping with the first RB of the SS/PBCH block.
NOTE 4: The configuration of PDCCH monitoring occasions for RMSI CORESET is defined in Table 13-11 in TS 38.213 [8].
NOTE 5: Cell ID shall depend upon the test configuration.
NOTE 6: Payload size shall depend upon the test configuration.
NOTE 7: The configuration of set of resource blocks and slot symbols of control resource set for Type0-PDCCH search space corresponds to index 0 in Table 13-1 in TS 38.213 [8].
NOTE 8: Other values can be used to align with GSCN as long as SSB does not overlap the RMC

A.1.2.2 TDD

Table A.1.2.2-1: RMSI CORESET Reference Measurement Channels for SCS = 15 kHz for TDD

Parameter	Unit	Value
Reference channel		CR.1.1 TDD
Channel bandwidth	MHz	Defined in test case
Subcarrier spacing for RMSI CORESET	kHz	15
Allocated resource blocks for RMSI CORESET Note 7		24
SSB and RMSI CORESET multiplexing configuration		Pattern 1
Offset between SSB and RMSI CORESET Note 3, 7	RB	0 (Note 8)
Configuration of PDCCH monitoring occasions for RMSI CORESET Note 4		Index 4
Number of transmitter antennas		1
Duration of RMSI CORESET Note 7	symbols	2
DCI Format Note 1		Note 2
Aggregation level	CCE	8
DMRS precoder granularity		6
REG bundle size		6
Mapping from REG to CCE		Distributed
Cell ID		Note 5
Payload (without CRC)	Bits	Note 6

NOTE 1: DCI formats are defined in TS 38.212 [31].
NOTE 2: DCI format shall depend upon the test configuration.
NOTE 3: The offset is defined with respect to the subcarrier spacing of the CORESET from the smallest RB index of RMSI CORESET to the smallest RB index of the common RB overlapping with the first RB of the SS/PBCH block.
NOTE 4: The configuration of PDCCH monitoring occasions for RMSI CORESET is defined in Table 13-11 in TS 38.213 [8].
NOTE 5: Cell ID shall depend upon the test configuration.

NOTE 6: Payload size shall depend upon the test configuration.
NOTE 7: The configuration of set of resource blocks and slot symbols of control resource set for Type0-PDCCH search space corresponds to index 0 in Table 13-1 in TS 38.213 [8].
NOTE 8: Other values can be used to align with GSCN as long as SSB does not overlap the RMC

Table A.1.2.2-2: RMSI CORESET Reference Measurement Channels for SCS = 30 kHz for TDD

Parameter	Unit	Value
Reference channel		CR.2.1 TDD
Channel bandwidth	MHz	Defined in test case
Subcarrier spacing for RMSI CORESET	kHz	30
Allocated resource blocks for RMSI CORESET Note 7		24
SSB and RMSI CORESET multiplexing configuration		Pattern 1
Offset between SSB and RMSI CORESET Note 3, 7	RB	0 (Note 8)
Configuration of PDCCH monitoring occasions for RMSI CORESET Note 4		Index 4
Number of transmitter antennas		1
Duration of RMSI CORESET Note 7	symbols	2
DCI Format Note 1		Note 2
Aggregation level	CCE	8
DMRS precoder granularity		6
REG bundle size		6
Mapping from REG to CCE		Distributed
Cell ID		Note 5
Payload (without CRC)	Bits	Note 6

NOTE 1: DCI formats are defined in TS 38.212 [31].
NOTE 2: DCI format shall depend upon the test configuration.
NOTE 3: The offset is defined with respect to the subcarrier spacing of the CORESET from the smallest RB index of RMSI CORESET to the smallest RB index of the common RB overlapping with the first RB of the SS/PBCH block.
NOTE 4: The configuration of PDCCH monitoring occasions for RMSI CORESET is defined in Table 13-11 in TS 38.213 [8].
NOTE 5: Cell ID shall depend upon the test configuration.
NOTE 6: Payload size shall depend upon the test configuration.
NOTE 7: The configuration of set of resource blocks and slot symbols of control resource set for Type0-PDCCH search space corresponds to index 0 in Table 13-6 in TS 38.213 [8].
NOTE 8: Other values can be used to align with GSCN as long as SSB does not overlap the RMC

Table A.1.2.2-3: RMSI CORESET Reference Measurement Channels for SCS = 120 kHz for TDD

Parameter	Unit	Value	
Reference channel		CR.3.1 TDD	CR.3.2 TDD
Channel bandwidth	MHz	100	100
Subcarrier spacing for RMSI CORESET	kHz	120	120
Allocated resource blocks for RMSI CORESET		24 Note 7	48 Note 9
Subcarrier spacing for SSB	kHz	120	120
SSB and RMSI CORESET multiplexing configuration		Pattern 1 Note 7	Pattern 1 Note 9
Offset between SSB and RMSI CORESET Note 3	RB	0 (Note 8) Note 7	0 (Note 8) Note 9
Configuration of PDCCH monitoring occasions for RMSI CORESET Note 4		Index 4	Index 4
Number of transmitter antennas		1	1
Duration of RMSI CORESET	symbols	2 Note 7	2 Note 9
DCI Format Note 1		Note 2	Note 2
Aggregation level	CCE	8	8
DMRS precoder granularity		6	6
REG bundle size		6	6
Mapping from REG to CCE		Distributed	Distributed

Cell ID		Note 5	Note 5
Payload (without CRC)	Bits	Note 6	Note 6

NOTE 1: DCI formats are defined in TS 38.212 [31].
NOTE 2: DCI format shall depend upon the test configuration.
NOTE 3: The offset is defined with respect to the subcarrier spacing of the CORESET from the smallest RB index of RMSI CORESET to the smallest RB index of the common RB overlapping with the first RB of the SS/PBCH block.
NOTE 4: The configuration of PDCCH monitoring occasions for RMSI CORESET is defined in Table 13-11 in TS 38.213 [8].
NOTE 5: Cell ID shall depend upon the test configuration.
NOTE 6: Payload size shall depend upon the test configuration.
NOTE 7: The configuration of set of resource blocks and slot symbols of control resource set for Type0-PDCCH search space corresponds to index 0 in Table 13-8 in TS 38.213 [8].
NOTE 8: Other values can be used to align with GSCN as long as SSB does not overlap the RMC
NOTE 9: The configuration of set of resource blocks and slot symbols of control resource set for Type0-PDCCH search space corresponds to index 2 in Table 13-10 in TS 38.213 [8].

A.1.3 CORESET for RMC scheduling

A.1.3.1 FDD

Table A.1.3.1-1: Control Channel RMC for SCS = 15 kHz for FDD

Parameter	Unit	Value			
Reference channel		**CCR.1.1 FDD**	**CCR.1.2 FDD**	**CCR.1.3 FDD**	**CCR.1.4 FDD**
Channel bandwidth	MHz	Defined in test case	Defined in test case	Defined in test case	Defined in test case
Subcarrier spacing for RMSI CORESET	kHz	15	15	15	15
Allocated resource blocks for CORESET		24	18	24	18
Number of transmitter antenna		1	1	1	1
Duration of CORESET	symbols	2	2	2	2
REG bundle size		6	6	6	6
DMRS precoder granularity		Same as REG bundle size	Same as REG bundle size	Same as REG bundle size	Same as REG bundle size
CCE to REG mapping		Interleaved	Interleaved	Interleaved	Interleaved
Interleave n_shift		0	0	0	0
Interleave size		2	2	2	2
Beamforming Pre-Coder		N/A	N/A	N/A	N/A
Aggregation level	CCE	4	2	8	4
DCI formats		Note 1	Note 1	Note 1	Note 1
Payload size (without CRC)	bits	Note 2	Note 2	Note 2	Note 2

NOTE 1: DCI format shall depend upon the test configuration.
NOTE 2: Payload size shall depend upon the test configuration
NOTE 3: Allocated in the resource blocks where the associated RMC is scheduled.

A.1.3.2 TDD

Table A.1.3.2-1: Control Channel RMC for SCS = 15 kHz for TDD

Parameter	Unit	Value			
Reference channel		CCR.1.1 TDD	CCR.1.2 TDD	CCR.1.3 TDD	CCR.1.4 TDD
Channel bandwidth	MHz	Defined in test case	Defined in test case	Defined in test case	Defined in test case
Subcarrier spacing	kHz	15	15	15	15
Allocated resource blocks for CORESET Note3		24	18	24	18
Number of transmitter antennas		1	1	1	1
Duration of CORESET	symbols	2	2	2	2
REG bundle size		6	6	6	6
DMRS precoder granularity		Same as REG bundle size	Same as REG bundle size	Same as REG bundle size	Same as REG bundle size
CCE to REG mapping		Interleaved	Interleaved	Interleaved	Interleaved

Interleave n_shift		0	0	0	0
Interleave size		2	2	2	2
Beamforming Pre-Coder		N/A	N/A	N/A	N/A
Aggregation level	CCE	4	2	8	4
DCI formats		Note 1	Note 1	Note 1	Note 1
Payload size (without CRC)	bits	Note 2	Note 2	Note 2	Note 2
NOTE 1: DCI format shall depend upon the test configuration. NOTE 2: Payload size shall depend upon the test configuration NOTE 3: Allocated in the resource blocks where the associated RMC is scheduled.					

Table A.1.3.2-2: Control Channel RMC for SCS = 30 kHz for TDD

Parameter	Unit	Value			
Reference channel		CCR.2.1 TDD	CCR.2.2 TDD	CCR.2.3 TDD	CCR.2.4 TDD
Channel bandwidth	MHz	40	40	40	40
Subcarrier spacing for RMSI CORESET	kHz	30	30	30	30
Allocated resource blocks for CORESET[3]		24	24	18	18
Number of transmitter antenna		1	1	1	1
Duration of CORESET	symbols	2	2	2	2
REG bundle size		6	6	6	6
DMRS precoder granularity		Same as REG bundle size	Same as REG bundle size	Same as REG bundle size	Same as REG bundle size
CCE to REG mapping		Interleaved	Interleaved	Interleaved	Interleaved
Interleave n_shift		0	0	0	0
Interleave size		2	2	2	2
Beamforming Pre-Coder		N/A	N/A	N/A	N/A
Aggregation level	CCE	4	8	4	2
DCI formats		Note 1	Note 1	Note 1	Note 1
Payload size (without CRC)	bits	Note 2	Note 2	Note 2	Note 2
Note 1: DCI format shall depend upon the test configuration. Note 2: Payload size shall depend upon the test configuration. Note 3: Allocated in the same resource blocks where the associated RMC is scheduled.					

Table A.1.3.2-3: Control Channel RMC for SCS = 120 kHz for TDD

Parameter	Unit	Value						
Reference channel		CCR.3.1 TDD	CCR.3.2 TDD	CCR.3.3 TDD	CCR.3.4 TDD	CCR.3.5 TDD	CCR.3.6 TDD	CCR.3.7 TDD
Channel bandwidth	MHz	100	100	100	100	100	100	100
Subcarrier spacing for RMSI CORESET	kHz	120	120	120	120	120	120	120
Allocated resource blocks for CORESET[Note 3]		24	24	24	24	24	24	48
Number of transmitter antenna		1	1	1	1	1	1	1
monitoringSlotPeriodicityAndOffset[Note 4]		sl160 0	sl160 0	sl160 80	sl160 0	sl160 0	sl160 80	sl160 0
monitoringSymbolsWithinSlot		1100000 0000000	0011000 0000000	1100000 0000000	1000000 0000000	0001000 0000000	1000000 0000000	1100000 0000000
Duration of CORESET	symbols	1	1	1	2	2	2	1
REG bundle size		6	6	6	6	6	6	6
DMRS precoder granularity		Same as REG bundle size	Same as REG bundle size	Same as REG bundle size	Same as REG bundle size	Same as REG bundle size	Same as REG bundle size	Same as REG bundle size
CCE to REG mapping		Interleaved	Interleaved	Interleaved	Interleaved	Interleaved	Interleaved	Interleaved
Interleave n_shift		0	0	0	0	0	0	0
Interleave size		2	2	2	2	2	2	2
Beamforming Pre-Coder		N/A	N/A	N/A	N/A	N/A	N/A	N/A

Aggregation level	CCE	4	4	4	8	8	8	4
DCI formats		Note 1	Note 1	Note 1	Note 1	Note 1	Note 1	Note 1
Payload size (without CRC)	bits	Note 2	Note 2	Note 2	Note 2	Note 2	Note 2	Note 2

NOTE 1: DCI format shall depend upon the test configuration.
NOTE 2: Payload size shall depend upon the test configuration
NOTE 3: Allocated in the same resource blocks where the associated PDSCH RMC is scheduled.
NOTE 4: *monitoringSlotPeriodicityAndOffet* can be set to other values depending on test purpose of respective test cases, as needed, e.g. *monitoringSlotPeriodicityAndOffet* is set to “sl1 0” if it is specifically stated that cell(s) configured with one of the control channel RMCs above shall transmit PDCCHs continuously.

A.1.4 CSI-RS

A.1.4.1 FDD

Table A.1.4.1-1: CSI-RS Reference Measurement Channels for SCS = 15 kHz for FDD

	CSI-RS.1.1 FDD	**CSI-RS.1.2 FDD**	**CSI-RS.1.3 FDD**	**CSI-RS.1.4 FDD**	**CSI-RS.1.5 FDD**	**CSI-RS.1.6 FDD**	**CSI-RS.1.7 FDD**
Resource Type	**periodic**	**periodic**	**aperiodic**	**aperiodic**	**aperiodic**	**periodic**	**periodic**
Resource Set Config							
nzp-CSI-ResourceSetId	0	0	0	0	0	0	0
repetition	n.a.	off	off	on	off	n.a.	off
aperiodicTriggeringOffset	n.a.	n.a.	0	0	6	n.a.	n.a.
trs-Info	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.
Resource Config							
nzp-CSI-RS-ResourceId	0 for resource #0	0 for resource #0	0 for resource #0	0 for resource #0	0 for resource #0	0 for resource #0	2 for resource #
				1 for resource #1			
				2 for resource #2			
				3 for resource #3			
		1 for resource #1	1 for resource #1	4 for resource #4	1 for resource #1		3 for resource #
				5 for resource #5			
				6 for resource #6			
				7 for resource #7			
powerControlOffset	0	0	0	0	0	0	0
powerControlOffsetSS	db0	db0	db0	db0	db0	db0	db0
scramblingID	0	0	0	0	0	0	0
Period (slots)	slot5	slot10	n.a.	n.a.	n.a.	slot40	slot10
Offset	1	1	n.a.	n.a.	n.a.	1	1
qcl-InfoPeriodicCSI-RS	TCI.State.0	TCI.State.0	n.a.	n.a.	n.a.	TCI.State.0	TCI.State.0
		TCI.State.1					TCI.State.1
frequencyDomainAllocation	000001	0001	0001	0001	000001	000001	0100
nrofPorts	2	1	1	1	1	2	1
		6 for resource #0	6 for resource #0	0 for resource #0	Specified in the test case for resource #0		6 for resource #

firstOFDMSymbolInTimeDomain	4 for resource #0	10 for resource #1	10 for resource #1	1 for resource #1 2 for resource #2 3 for resource #3 4 for resource #4 5 for resource #5 6 for resource #6 7 for resource #7	n.a.	5 for resource #0	10 for resource #
cdm-Type	FD-CDM2	noCDM	noCDM	noCDM	noCDM	FD-CDM2	noCDM
density	1	3	3	3	3	1	3
startingRB	0	0	0	0	0	0	0
nrofRBs	276 (Note 1)	276 (Note 1)	276 (Note 1)	276 (Note 1)	276 (Note 1)	276 (Note 1)	276 (Note 1)
Note 1: If the configured value of PRBs is larger than the width of the corresponding BWP relevant for the test case, the Test Equipment shall implement CSI-RS only in the width of that BWP.							

Table A.1.4.1-1A: CSI-RS Reference Measurement Channels for SCS=15 kHz for FDD

	CSI-RS.1.1A FDD	CSI-RS.1.2A FDD	CSI-RS.1.3A FDD
Resource Type	**periodic**	**aperiodic**	**periodic**
Resource Set Config			
nzp-CSI-ResourceSetId	1	1	1
repetition	off	off	off
aperiodicTriggeringOffset	n.a.	0	n.a.
trs-Info	n.a.	n.a.	n.a.
Resource Config			
nzp-CSI-RS-ResourceId	12 for resource #0	22 for resource #0	14 for resource #0
	13 for resource #1	23 for resource #1	15 for resource #1
powerControlOffset	0	0	0
powerControlOffsetSS	db0	db0	db0
scramblingID	0	0	0
Period (slots)	slot20	n.a.	slot10
Offset	1	n.a.	2
qcl-InfoPeriodicCSI-RS	n.a.	n.a.	n.a.
frequencyDomainAllocation	0001	0001	0001
nrofPorts	1	1	1
firstOFDMSymbolInTimeDomain	6 for resource #0	7 for resource #0	6 for resource #0
	10 for resource #1	11 for resource #1	10 for resource #1
cdm-Type	noCDM	noCDM	noCDM

density	3	3	3
startingRB	0	0	0
nrofRBs	276 (Note 1)	276 (Note 1)	276 (Note 1)
Note 1: If the configured value of PRBs is larger than the width of the corresponding BWP relevant for the test case, the Test Equipment shall implement CSI-RS only in the width of that BWP.			

A.1.4.2 TDD

Table A.1.4.2-1: CSI-RS Reference Measurement Channels for SCS = 15 kHz for TDD

	CSI-RS.1.1 TDD	**CSI-RS.1.2 TDD**	**CSI-RS.1.3 TDD**	**CSI-RS.1.4 TDD**	**CSI-RS.1.5 TDD**	**CSI-RS.1.6 TDD**
Resource Type	periodic	periodic	aperiodic	aperiodic	periodic	periodic
Resource Set Config						
nzp-CSI-ResourceSetId	0	0	0	0	0	0
repetition	n.a.	off	off	on	n.a.	off
aperiodicTriggeringOffset	n.a.	n.a.	0	0	n.a.	n.a.
trs-Info	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.
Resource Config						
nzp-CSI-RS-ResourceId	0 for resource #0	0 for resource #0	0 for resource #0	0 for resource #0	0 for resource #0	2 for resource #0
				1 for resource #1		
				2 for resource #2		
				3 for resource #3		
		1 for resource #1	1 for resource #1	4 for resource #4		3 for resource #1
				5 for resource #5		
				6 for resource #6		
				7 for resource #7		
powerControlOffset	0	0	0	0	0	0
powerControlOffsetSS	db0	db0	db0	db0	db0	db0
scramblingID	0	0	0	0	0	0
Period (slots)	slot5	slot10	n.a.	n.a.	slot40	slot10
Offset	1	1	n.a.	n.a.	1	1
qcl-InfoPeriodicCSI-RS	TCI.State.0	TCI.State.0	n.a.	n.a.	TCI.State.0	TCI.State.0
		TCI.State.1				TCI.State.1
frequencyDomainAllocation	000001	0001	0001	0001	000001	0100
nrofPorts	2	1	1	1	2	1
firstOFDMSymbolInTimeDomain	4 for resource #0	6 for resource #0	6 for resource #0	0 for resource #0	5 for resource #0	6 for resource #0
				1 for resource #1		
				2 for resource #2		
				3 for resource #3		
		10 for resource #1	10 for resource #1	4 for resource #4		10 for resource #1
				5 for resource #5		
				6 for resource #6		
				7 for resource #7		
cdm-Type	FD-CDM2	noCDM	noCDM	noCDM	FD-CDM2	noCDM
density	1	3	3	3	1	3
startingRB	0	0	0	0	0	0

nrofRBs	276 (Note 1)	276 (Note 1)	276 (Note 1)	276 (Note 1)	276 (Note 1)	276 (Note 1)
Note 1: If the configured value of PRBs is larger than the width of the corresponding BWP relevant for the test case, the Test Equipment shall implement CSI-RS only in the width of that BWP.						

Table A.1.4.2-1A: CSI-RS Reference Measurement Channels for SCS=15 kHz for TDD

	CSI-RS.1.1A TDD	CSI-RS.1.2A TDD	CSI-RS.1.3A TDD
Resource Type	**periodic**	**aperiodic**	**periodic**
Resource Set Config			
nzp-CSI-ResourceSetId	1	1	1
repetition	off	off	off
aperiodicTriggeringOffset	n.a.	0	n.a.
trs-Info	n.a.	n.a.	n.a.
Resource Config			
nzp-CSI-RS-ResourceId	12 for resource #0	22 for resource #0	14 for resource #0
	13 for resource #1	23 for resource #1	15 for resource #1
powerControlOffset	0	0	0
powerControlOffsetSS	db0	db0	db0
scramblingID	0	0	0
Period (slots)	slot20	n.a.	slot10
Offset	1	n.a.	2
qcl-InfoPeriodicCSI-RS	n.a.	n.a.	n.a.
frequencyDomainAllocation	0001	0001	0001
nrofPorts	1	1	1
firstOFDMSymbolInTimeDomain	6 for resource #0	7 for resource #0	6 for resource #0
	10 for resource #1	11 for resource #1	10 for resource #1
cdm-Type	noCDM	noCDM	noCDM
density	3	3	3
startingRB	0	0	0
nrofRBs	276 (Note 1)	276 (Note 1)	276 (Note 1)
Note 1: If the configured value of PRBs is larger than the width of the corresponding BWP relevant for the test case, the Test Equipment shall implement CSI-RS only in the width of that BWP.			

Table A.1.4.2-2: CSI-RS Reference Measurement Channels for SCS = 30 kHz for TDD

	CSI-RS.2.1 TDD	CSI-RS.2.2 TDD	CSI-RS.2.3 TDD	CSI-RS.2.4 TDD	CSI-RS.2.5 TDD	CSI-RS.2.6 TDD	CSI-RS.2.7 TDD
Resource Type	**periodic**	**periodic**	**aperiodic**	**aperiodic**	**aperiodic**	**periodic**	**periodic**
Resource Set Config							
nzp-CSI-ResourceSetId	0	0	0	0	0	0	0
repetition	n.a.	off	off	on	off	n.a.	off
aperiodicTriggeringOffset	n.a.	n.a.	0	0	6	n.a.	n.a.
trs-Info	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.
Resource Config							
		0 for resource #0	0 for resource #0	0 for resource #0	0 for resource #0		2 for resource #0
				1 for resource #1			
				2 for			

nzp-CSI-RS-ResourceId	0 for resource #0	1 for resource #1	1 for resource #1	resource #2 3 for resource #3 4 for resource #4 5 for resource #5 6 for resource #6 7 for resource #7	1 for resource #1	0 for resource #0	3 for resource #1
powerControlOffset	0	0	0	0	0	0	0
powerControlOffsetSS	db0	db0	db0	db0	db0	db0	db0
scramblingID	0	0	0	0	0	0	0
Period (slots)	slot10	slot20	n.a.	n.a.	n.a.	slot80	slot20
Offset	2	2	n.a.	n.a.	n.a.	2	2
qcl-InfoPeriodicCSI-RS	TCI.State.0	TCI.State.0 TCI.State.1	n.a.	n.a.	n.a.	TCI.State.0	TCI.State.0 TCI.State.1
frequencyDomainAllocation	000001	0001	0001	0001	000001	000001	0100
nrofPorts	2	1	1	1	1	2	1
firstOFDMSymbolInTimeDomain	5 for resource #0	6 for resource #0 10 for resource #1	6 for resource #0 10 for resource #1	0 for resource #0 1 for resource #1 2 for resource #2 3 for resource #3 4 for resource #4 5 for resource #5 6 for resource #6 7 for resource #7	Specified in the test case for resource #0 n.a.	5 for resource #0	6 for resource #0 10 for resource #1
cdm-Type	FD-CDM2	noCDM	noCDM	noCDM	noCDM	FD-CDM2	noCDM
density	1	3	3	3	3	1	3
startingRB	0	0	0	0	0	0	0
nrofRBs	276 (Note 1)	276 (Note 1)	276 (Note 1)	276 (Note 1)	276 (Note 1)	276 (Note 1)	276 (Note 1)
Note 1: If the configured value of PRBs is larger than the width of the corresponding BWP relevant for the test case, the Test Equipment shall implement CSI-RS only in the width of that BWP.							

Table A.1.4.2-2A: CSI-RS Reference Measurement Channels for SCS=30 kHz for TDD

	CSI-RS.2.1A TDD	**CSI-RS.2.2A TDD**	**CSI-RS.2.3A TDD**
Resource Type	**periodic**	**aperiodic**	**periodic**
Resource Set Config			
nzp-CSI-ResourceSetId	1	1	1
repetition	off	off	off
aperiodicTriggeringOffset	n.a.	0	n.a.
trs-Info	n.a.	n.a.	n.a.
Resource Config			
nzp-CSI-RS-ResourceId	12 for resource #0 13 for resource #1	22 for resource #0 23 for resource #1	14 for resource #0 15 for resource #1
powerControlOffset	0	0	0

powerControlOffsetSS	db0	db0	db0
scramblingID	0	0	0
Period (slots)	slot40	n.a.	slot20
Offset	2	n.a.	4
qcl-InfoPeriodicCSI-RS	n.a.	n.a.	n.a.
frequencyDomainAllocation	0001	0001	0001
nrofPorts	1	1	1
firstOFDMSymbolInTimeDomain	6 for resource #0	7 for resource #0	6 for resource #0
	10 for resource #1	11 for resource #1	10 for resource #1
cdm-Type	noCDM	noCDM	noCDM
density	3	3	3
startingRB	0	0	0
nrofRBs	276 (Note 1)	276 (Note 1)	276 (Note 1)
Note 1: If the configured value of PRBs is larger than the width of the corresponding BWP relevant for the test case, the Test Equipment shall implement CSI-RS only in the width of that BWP.			

Table A.1.4.2-3: CSI-RS Reference Measurement Channels for SCS = 120 kHz for TDD

	CSI-RS.3.1 TDD	**CSI-RS.3.2 TDD**	**CSI-RS.3.3 TDD**	**CSI-RS.3.4 TDD**	**CSI-RS.3.5 TDD**	**CSI-RS.3.6 TDD**
Resource Type	periodic	periodic	aperiodic	aperiodic	periodic	periodic
Resource Set Config						
nzp-CSI-ResourceSetId	0	0	0	0	0	0
repetition	n.a.	off	off	on	n.a.	off
aperiodicTriggeringOffset	n.a.	n.a.	4	4	n.a.	n.a.
trs-Info	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.
Resource Config						
nzp-CSI-RS-ResourceId	0 for resource #0	0 for resource #0	0 for resource #0	0 for resource #0	0 for resource #0	2 for resource #0
				1 for resource #1		
				2 for resource #2		
				3 for resource #3		
		1 for resource #1	1 for resource #1	4 for resource #4		3 for resource #1
				5 for resource #5		
				6 for resource #6		
				7 for resource #7		
powerControlOffset	0	0	0	0	0	0
powerControlOffsetSS	db0	db0	db0	db0	db0	db0
scramblingID	0	0	0	0	0	0
Period (slots)	slot40	slot80	n.a.	n.a.	slot320	slot80
Offset	8	16	n.a.	n.a.	8	16
qcl-InfoPeriodicCSI-RS	TCI.State.0	TCI.State.0	n.a.	n.a.	TCI.State.0	TCI.State.0
		TCI.State.1				TCI.State.1
frequencyDomainAllocation	000001	0001	0001	0001	000001	0100
nrofPorts	2	1	1	1	1	1
		6 for resource #0	6 for resource #0	0 for resource #0		6 for resource #0
				1 for resource #1		

firstOFDMSymbolInTimeDomain	5 for resource #0	10 for resource #1	10 for resource #1	2 for resource #2 3 for resource #3 4 for resource #4 5 for resource #5 6 for resource #6 7 for resource #7	5 for resource #0	10 for resource #1
cdm-Type	FD-CDM2	noCDM	noCDM	noCDM	FD-CDM2	noCDM
density	1	3	3	3	1	3
startingRB	0	0	0	0	0	0
nrofRBs	276 (Note 1)	276 (Note 1)	276 (Note 1)	276 (Note 1)	276 (Note 1)	276 (Note 1)
Note 1: If the configured value of PRBs is larger than the width of the corresponding BWP relevant for the test case, the Test Equipment shall implement CSI-RS only in the width of that BWP.						

	CSI-RS.3.1 TDD	**CSI-RS.3.2 TDD**	**CSI-RS.3.3 TDD**	**CSI-RS.3.4 TDD**
Resource Type	periodic	periodic	aperiodic	aperiodic
Resource Set Config				
nzp-CSI-ResourceSetId	0	0	0	0
repetition	N/A	off	off	on
aperiodicTriggeringOffset	N/A	N/A	4	4
trs-Info	N/A	N/A	N/A	N/A
Resource Config				
nzp-CSI-RS-ResourceId	0 for resource #0	0 for resource #0	0 for resource #0	0 for resource #0 1 for resource #1 2 for resource #2 3 for resource #3
		1 for resource #1	1 for resource #1	4 for resource #4 5 for resource #5 6 for resource #6 7 for resource #7
powerControlOffset	0	0	0	0
powerControlOffsetSS	db0	db0	db0	db0
scramblingID	0	0	0	0
Period (slots)	slot40	slot80	N/A	N/A
Offset	8	16	N/A	N/A
qcl-InfoPeriodicCSI-RS	TCI.State.0	TCI.State.0 TCI.State.1	N/A	N/A
frequencyDomainAllocation	000001	0001	0001	0001
nrofPorts	2	1	1	1
firstOFDMSymbolInTimeDomain	5 for resource #0	6 for resource #0	6 for resource #0	0 for resource #0 1 for resource #1 2 for resource #2 3 for resource #3
		10 for resource #1	10 for resource #1	4 for resource #4 5 for resource #5 6 for resource #6 7 for resource #7
cdm-Type	FD-CDM2	noCDM	noCDM	noCDM
density	1	3	3	3
startingRB	0	0	0	0
nrofRBs	276	276	276	276

Table A.1.4.2-3A: CSI-RS Reference Measurement Channels for SCS=120 kHz for TDD

	CSI-RS.3.1A TDD	**CSI-RS.3.2A TDD**	**CSI-RS.3.3A TDD**
Resource Type	**periodic**	**aperiodic**	**periodic**
Resource Set Config			
nzp-CSI-ResourceSetId	1	1	1
repetition	off	off	off

aperiodicTriggeringOffset	n.a.	6	n.a.
trs-Info	n.a.	n.a.	n.a.
Resource Config			
nzp-CSI-RS-ResourceId	12 for resource #0	22 for resource #0	14 for resource #0
	13 for resource #1	23 for resource #1	15 for resource #1
powerControlOffset	0	0	0
powerControlOffsetSS	db0	db0	db0
scramblingID	0	0	0
Period (slots)	slot160	n.a.	slot80
Offset	8	n.a.	16
qcl-InfoPeriodicCSI-RS	n.a.	n.a.	n.a.
frequencyDomainAllocation	0001	0001	0001
nrofPorts	1	1	1
firstOFDMSymbolInTimeDomain	6 for resource #0	7 for resource #0	6 for resource #0
	10 for resource #1	11 for resource #1	10 for resource #1
cdm-Type	noCDM	noCDM	noCDM
density	3	3	3
startingRB	0	0	0
nrofRBs	276 (Note 1)	276 (Note 1)	276 (Note 1)
Note 1: If the configured value of PRBs is larger than the width of the corresponding BWP relevant for the test case, the Test Equipment shall implement CSI-RS only in the width of that BWP.			

A.1.4A CSI-RS for tracking

A.1.4A.1 FR1

A.1.4A.1.1 FDD

Table A.1.4A.1.1-1: CSI-RS for tracking FDD

Parameter	**Unit**	**Value**	
Reference channel		TRS.1.1 FDD	TRS.1.2 FDD
Bandwidth		BW of Active BWP[1]	BW of Active BWP[1]
SCS	kHz	15	30
First subcarrier index in the PRB used for CSI-RS		k_0=0 for CSI-RS resource 1,2,3,4	k_0=0 for CSI-RS resource 1,2,3,4
First OFDM symbol in the slot used for CSI-RS		l_0 = 5 for CSI-RS resource 1 and 3 l_0 = 9 for CSI-RS resource 2 and 4	l_0 = 5 for CSI-RS resource 1 and 3 l_0 = 9 for CSI-RS resource 2 and 4
Number of CSI-RS ports (X)		1 for CSI-RS resource 1,2,3,4	1 for CSI-RS resource 1,2,3,4
CDM Type		'No CDM' for CSI-RS resource 1,2,3,4	'No CDM' for CSI-RS resource 1,2,3,4
Density (ρ)		3 for CSI-RS resource 1,2,3,4	3 for CSI-RS resource 1,2,3,4
CSI-RS periodicity	slots	20 for CSI-RS resource 1,2,3,4	40 for CSI-RS resource 1,2,3,4
CSI-RS offset	slots	10 for CSI-RS resource 1 and 2 11 for CSI-RS resource 3 and 4	20 for CSI-RS resource 1 and 2 21 for CSI-RS resource 3 and 4
EPRE ratio to SSS	dB	0	0
TCI state		TCI.State.0	TCI.State.0

NOTE 1: BW of TRS is configured same as the BW size of UE active BWP in the RRM test cases

A.1.4A.1.2 TDD

Table A.1.4A.1.2-1: CSI-RS for TDD

Parameter	Unit	Value	
Reference channel		TRS.1.1 TDD	TRS.1.2 TDD
Bandwidth		BW of Active BWP[1]	BW of Active BWP[1]
SCS	kHz	15	30
First subcarrier index in the PRB used for CSI-RS		k_0=0 for CSI-RS resource 1,2,3,4	k_0=0 for CSI-RS resource 1,2,3,4
First OFDM symbol in the slot used for CSI-RS		l_0 = 5 for CSI-RS resource 1 and 3 l_0 = 9 for CSI-RS resource 2 and 4	l_0 = 5 for CSI-RS resource 1 and 3 l_0 = 9 for CSI-RS resource 2 and 4
Number of CSI-RS ports (X)		1 for CSI-RS resource 1,2,3,4	1 for CSI-RS resource 1,2,3,4
CDM Type		'No CDM' for CSI-RS resource 1,2,3,4	'No CDM' for CSI-RS resource 1,2,3,4
Density (ρ)		3 for CSI-RS resource 1,2,3,4	3 for CSI-RS resource 1,2,3,4
CSI-RS periodicity	slots	20 for CSI-RS resource 1,2,3,4	40 for CSI-RS resource 1,2,3,4
CSI-RS offset	slots	10 for CSI-RS resource 1 and 2 11 for CSI-RS resource 3 and 4	20 for CSI-RS resource 1 and 2 21 for CSI-RS resource 3 and 4
EPRE ratio to SSS	dB	0	0
TCI state		TCI.State.0	TCI.State.0
NOTE 1: BW of TRS is configured same as the BW size of UE active BWP in the RRM test cases			

A.1.4A.2 FR2

A.1.4A.2.1 TDD

Table A.1.4A.2.1-1: CSI-RS for tracking for TDD FR2

Parameter	Unit	Value	
Reference channel		TRS.2.1 TDD	TRS.2.2 TDD
Bandwidth		BW of Active BWP[Note 1, 2]	BW of Active BWP[Note 1,2]
SCS	kHz	120	120
First subcarrier index in the PRB used for CSI-RS		k_0=0 for CSI-RS resource 1,2,3,4	k_0=0 for CSI-RS resource 1,2,3,4
First OFDM symbol in the slot used for CSI-RS		l_0 = 1 for CSI-RS resource 1 and 3 l_0 = 5 for CSI-RS resource 2 and 4	l_0 = 2 for CSI-RS resource 1 and 3 l_0 = 6 for CSI-RS resource 2 and 4
Number of CSI-RS ports (X)		1 for CSI-RS resource 1,2,3,4	1 for CSI-RS resource 1,2,3,4
CDM Type		'No CDM' for CSI-RS resource 1,2,3,4	'No CDM' for CSI-RS resource 1,2,3,4
Density (ρ)		3 for CSI-RS resource 1,2,3,4	3 for CSI-RS resource 1,2,3,4
CSI-RS periodicity	slots	80 for CSI-RS resource 1,2,3,4	80 for CSI-RS resource 1,2,3,4
CSI-RS offset	slots	40 for CSI-RS resource 1 and 2 41 for CSI-RS resource 3 and 4	40 for CSI-RS resource 1 and 2 41 for CSI-RS resource 3 and 4
EPRE ratio to SSS	dB	0	0
TCI state		TCI.State.0	TCI.State.1
NOTE 1: BW of TRS is configured same as the BW size of UE active BWP in the RRM test cases NOTE 2: If active BWP is larger than 52RBs, BW of TRS is configured as 52RBs. Otherwise, same as active BWP size.			

A.1.4B CSI-IM configurations

A.1.4B.1 FDD

Table A.1.4B.1-1: CSI-IM Reference Measurement Channels for SCS=15kHz

	CSI-IM.1.1 FDD	CSI-IM.1.2 FDD	CSI-IM.1.3 FDD
Resource Type	**periodic**	**aperiodic**	**periodic**
Resource Set Config			
csi-IM-ResourceSetId	0	0	0
Resource Config			
csi-IM-ResourceId	0 for resource #0	10 for resource #0	2 for resource #0
	1 for resource #1	11 for resource #1	3 for resource #1
csi-IM-ResourceElementPattern	pattern1	pattern1	pattern1
subcarrierLocation-p1	s0	s0	s0
symbolLocation-p1	6 for resource #0	7 for resource #0	6 for resource #0
	10 for resource #1	11 for resource #1	10 for resource #1
Period (slots)	slot20	n.a.	slot10
Offset	1	n.a.	2
startingRB	0	0	0
nrofRBs	276 (Note 1)	276 (Note 1)	276 (Note 1)
Note 1: If the configured value of PRBs is larger than the width of the corresponding BWP relevant for the test case, the test Equipment shall implement CSI-RS only in the width of that BWP.			

A.1.4B.2 TDD

Table A.1.4B.2-1: CSI-IM Reference Measurement Channels for SCS=15kHz

	CSI-IM.1.1 TDD	CSI-IM.1.2 TDD	CSI-IM.1.3 TDD
Resource Type	**periodic**	**aperiodic**	**periodic**
Resource Set Config			
csi-IM-ResourceSetId	0	0	0
Resource Config			
csi-IM-ResourceId	0 for resource #0	10 for resource #0	2 for resource #0
	1 for resource #1	11 for resource #1	3 for resource #1
csi-IM-ResourceElementPattern	pattern1	pattern1	pattern1
subcarrierLocation-p1	s0	s0	s0
symbolLocation-p1	6 for resource #0	7 for resource #0	6 for resource #0
	10 for resource #1	11 for resource #1	10 for resource #1
Period (slots)	slot20	n.a.	slot10
Offset	1	n.a.	2
startingRB	0	0	0
nrofRBs	276 (Note 1)	276 (Note 1)	276 (Note 1)
Note 1: If the configured value of PRBs is larger than the width of the corresponding BWP relevant for the test case, the test Equipment shall implement CSI-RS only in the width of that BWP.			

Table A.1.4B.2-2: CSI-IM Reference Measurement Channels for SCS=30kHz

	CSI-IM.2.1 TDD	CSI-IM.2.2 TDD	CSI-IM.2.3 TDD
Resource Type	**periodic**	**aperiodic**	**periodic**
Resource Set Config			
csi-IM-ResourceSetId	0	0	0
Resource Config			
csi-IM-ResourceId	0 for resource #0	10 for resource #0	2 for resource #0
	1 for resource #1	11 for resource #1	3 for resource #1
csi-IM-ResourceElementPattern	pattern1	pattern1	pattern1
subcarrierLocation-p1	s0	s0	s0
symbolLocation-p1	6 for resource #0	7 for resource #0	6 for resource #0
	10 for resource #1	11 for resource #1	10 for resource #1
Period (slots)	slot40	n.a.	slot40
Offset	2	n.a.	4
startingRB	0	0	0
nrofRBs	276 (Note 1)	276 (Note 1)	276 (Note 1)
Note 1: If the configured value of PRBs is larger than the width of the corresponding BWP relevant for the test case, the test Equipment shall implement CSI-RS only in the width of that BWP.			

Table A.1.4B.2-3: CSI-RS Reference Measurement Channels for SCS=120kHz

	CSI-IM.3.1 TDD	CSI-IM.3.2 TDD	CSI-IM.3.3 TDD
Resource Type	**periodic**	**aperiodic**	**periodic**
Resource Set Config			
csi-IM-ResourceSetId	0	0	0
Resource Config			
csi-IM-ResourceId	0 for resource #0	10 for resource #0	2 for resource #0
	1 for resource #1	11 for resource #1	3 for resource #1
csi-IM-ResourceElementPattern	pattern1	pattern1	pattern1
subcarrierLocation-p1	s0	s0	s0
symbolLocation-p1	6 for resource #0	7 for resource #0	6 for resource #0
	10 for resource #1	11 for resource #1	10 for resource #1
Period (slots)	slot160	n.a.	slot80
Offset	8	n.a.	16
startingRB	0	0	0
nrofRBs	276 (Note 1)	276 (Note 1)	276 (Note 1)
Note 1: If the configured value of PRBs is larger than the width of the corresponding BWP relevant for the test case, the test Equipment shall implement CSI-RS only in the width of that BWP.			

A.1.5 TDD UL/DL configuration

Table A.1.5-1: TDD UL/DL configuration for SCS=15kHz

Parameter	Unit	Value		
Reference channel		TDDConf.1.1		
referenceSubcarrierSpacing	kHz	15		
TDD UL/DL pattern 1 Note 2		'DSUU'		

		S='10DL:2GP:2UL'		
dl-UL-TransmissionPeriodicity	ms	4		
nrofDownlinkSlots		1		
nrofDownlinkSymbols		10		
nrofUplinkSlot		2		
nrofUplinkSymbols		2		
TDD UL/DL pattern 2 Note 2		'D'		
dl-UL-TransmissionPeriodicity	ms	1		
nrofDownlinkSlots		1		
nrofDownlinkSymbols		0		
nrofUplinkSlot		0		
nrofUplinkSymbols		0		
NOTE 1: As specified in TS 38.213 [8] and TS 38.331 [13]. NOTE 2: For information				

Table A.1.5-2: TDD UL/DL configuration for SCS=30kHz

Parameter	Unit	Value		
Reference channel		TDDConf.2.1		
referenceSubcarrierSpacing	kHz	30		
TDD UL/DL pattern 1 Note 2		'3D1S4U' S='6DL:4GP:4UL'		
dl-UL-TransmissionPeriodicity	ms	4		
nrofDownlinkSlots		3		
nrofDownlinkSymbols		6		
nrofUplinkSlot		4		
nrofUplinkSymbols		4		
TDD UL/DL pattern 2 Note 2		'DD'		
dl-UL-TransmissionPeriodicity	ms	1		
nrofDownlinkSlots		2		
nrofDownlinkSymbols		0		
nrofUplinkSlot		0		
nrofUplinkSymbols		0		
NOTE 1: As specified in TS 38.213 [8] and TS 38.331 [13]. NOTE 2: For information				

Table A.1.5-3: TDD UL/DL configuration for SCS=120kHz

Parameter	Unit	Value		
Reference channel		TDDConf.3.1		
referenceSubcarrierSpacing	kHz	120		
TDD UL/DL pattern 1 Note 2		'DDDSU' S='10DL:2GP:2UL'		
dl-UL-TransmissionPeriodicity	ms	0.625		
nrofDownlinkSlots		3		
nrofDownlinkSymbols		10		
nrofUplinkSlot		1		
nrofUplinkSymbols		2		
TDD UL/DL pattern 2 Note 2		Not configured		
dl-UL-TransmissionPeriodicity	ms	Not configured		
nrofDownlinkSlots		Not configured		
nrofDownlinkSymbols		Not configured		
nrofUplinkSlot		Not configured		
nrofUplinkSymbols		Not configured		
NOTE 1: As specified in TS 38.213 [8] and TS 38.331 [13]. NOTE 2: For information				

A.1.6 PUSCH

This rule applies to NR cell(s), which the UE is connected to. The UE is in RRC_CONNECTED mode.

When signalling or data payloads are expected to be sent on the PUSCH, the UE may be provided in advance with PUSCH resources by the SS. For sake of simplicity, the PUSCH scheduling may also occur continuously over many consecutive subframes. These options shall not be used if:
1) stated otherwise in the test description, or
2) the transmission of PUSCH and UL scheduling information affects the test purpose (e.g. DRX, PUCCH reception etc.)

A.1A Reference measurement channels under CCA

A.1A.0 General

This clause contains the Reference Measurement Channels (RMC) under CCA to be used for the RRM test scenarios in Clauses 10 to 12 of this document.

A.1A.1 PDSCH

A.1A.1.1 FDD

Table A.1A.1.1-1: PDSCH Reference Measurement Channels under CCA for SCS=30kHz

Parameter	Unit	Value						
Reference channel		SR.1.1 CCA						
Channel bandwidth	MHz	40						
Number of transmitter antennas		1						
Allocated resource blocks for PDSCH Note 1		24						
Allocated slots per Radio Frame								
Radio frame containing SSB	slots	Note 5						
Radio frame not containing SSB	slots	Note 7						
MCS table		64QAM						
MCS index		4						
Modulation		QPSK						
Target Coding Rate		1/3						
Number of control symbols		2						
PDSCH mapping type		Type A						
Information Bit Payload								
For slots with RMSI Note 2	bits	1608						
For slots without RMSI	bits	1864						
Number of Code Blocks per slot		1						
Binary Channel Bits Per slot								
For slots with RMSI Note 2, Note 4	bits	5184						
For slots without RMSI Note 6	bits	6048						

Note 1: Allocated outside the discovery burst transmission window in time and in resource blocks which do not overlap with the resource blocks allocated for SS/PBCH block.
Note 2: PDSCH is scheduled on the slots with RMSI.
Note 3: If necessary the information bit payload size can be adjusted to facilitate the test implementation. The payload sizes are defined in TS 38.213 [8].
Note 4: Derived based on the PDSCH DMRS assumption: dmrs-TypeA-Position=2, dmrs-Type=1, dmrs-AdditonalPositions=2, maxLength=1, Antenna port index: 1000, and Number of PDSCH DMRS CDM group(s)

without data: 2.
Note 5: PDSCH is not scheduled in slots containing SSB according to the SSB configuration used in the test. SSB configurations are defined in clause A.3A.
Note 6: Derived based on the PDSCH DMRS assumption: dmrs-TypeA-Position=2, dmrs-Type=1, dmrs-AdditonalPositions=2, maxLength=1, Antenna port index: 1000, and Number of PDSCH DMRS CDM group(s) without data: 1.
Note 7: PDSCH is transmitted during the RMC burst as specified in A.1A.5.

A.1A.2 CORESET for RMSI scheduling

A.1A.2.1 TDD

Table A.1A.2.1-1: RMSI CORESET Reference Channel under CCA for SCS=30KHz

Parameter	Unit	Value						
Reference channel		CR.1.1 CCA						
Channel bandwidth	MHz	40						
Subcarrier spacing	kHz	30						
Allocated resource blocks for RMSI CORESET Note 7		48						
SSB and RMSI CORESET multiplexing configuration Note 7		Pattern 1						
Offset between SSB and RMSI CORESET Note 3, 7	RB	0 (Note 8)						
Configuration of PDCCH monitoring occasions for RMSI CORESET Note 4		Index 0						
Number of transmitter antennas		1						
Duration of RMSI CORESET Note 7	symbols	2						
DCI Format Note 1		Note 2						
Aggregation level	CCE	8						
DMRS precoder granularity		6						
REG bundle size		6						
Mapping from REG to CCE		Distributed						
Cell ID		Note 5						
Payload (without CRC)	bits	Note 6						

Note 1: DCI formats are defined in TS 38.212 [31].
Note 2: DCI format shall depend upon the test configuration.
Note 3: The offset is defined with respect to the subcarrier spacing of the CORESET from the smallest RB index of RMSI CORESET to the smallest RB index of the common RB overlapping with the first RB of the SS/PBCH block.
Note 4: The configuration of PDCCH monitoring occasions for RMSI CORESET is defined in Table 13-11 in TS 38.213 [8].
Note 5: Cell ID shall depend upon the test configuration.
Note 6: Payload size shall depend upon the test configuration.
Note 7: The configuration of set of resource blocks and slot symbols of control resource set for Type0-PDCCH search space corresponds to index 4 in Table 13-4A in TS 38.213 [8].
Note 8: Other values can be used to align with GSCN [13] as long as SSB does not overlap the RMC.

A.1A.3 CORESET for RMC scheduling

A.1A.3.1 TDD

Table A.1A.3.1-1: Control Channel RMC under CCA with SCS=30KHz

Parameter	Unit	Value						
Reference channel		CCR.1.1 CCA	CCR.1.2 CCA	CCR.1.3 CCA				
Channel bandwidth	MHz	40	40	40				

Subcarrier spacing	kHz	30	30	30				
Allocated resource blocks for CORESET Note 3		24	24	18				
Number of transmitter antennas		1	1	1				
Duration of CORESET	symbols	2	2	2				
REG bundle size		6	6	6				
DMRS precoder granularity		Same as REG bundle size	Same as REG bundle size	Same as REG bundle size				
CCE to REG mapping		Interleaved	Interleaved	Interleaved				
Interleave n_shift		0	0	0				
Interleave size		2	2	2				
Beamforming Pre-Coder		N/A	N/A	N/A				
Aggregation level	CCE	4	8	4				
DCI formats		Note 1	Note 1	Note 1				
Payload size (without CRC)	bits	Note 2	Note 2	Note 2				
Note 1: DCI format shall depend upon the test configuration. Note 2: Payload size shall depend upon the test configuration. Note 3: Allocated in the same resource blocks where the associated RMC is scheduled.								

A.1A.4 TDD UL/DL configuration

A.1A.4.1 TDD

Table A.3.1A.4-1: TDD UL/DL configuration under CCA for SCS=30kHz

Parameter	Unit	Value		
Reference channel		TDDConf.1.1 CCA		
referenceSubcarrierSpacing	kHz	N/A		
TDD UL/DL pattern 1 Note 2, Note 3		'3D1S4U' S='6DL:4GP:4UL'		
dl-UL-TransmissionPeriodicity	ms	N/A		
nrofDownlinkSlots		N/A		
nrofDownlinkSymbols		N/A		
nrofUplinkSlot		N/A		
nrofUplinkSymbols		N/A		
TDD UL/DL pattern 2 Note 2, Note 3		'DD'		
dl-UL-TransmissionPeriodicity	ms	N/A		
nrofDownlinkSlots		N/A		
nrofDownlinkSymbols		N/A		
nrofUplinkSlot		N/A		
nrofUplinkSymbols		N/A		
Note 1: As specified in TS 38.213 [8] and TS 38.331 [13]. Note 2: Do not configure *tdd-UL-DL-ConfigurationCommon* using RRC configuration Note 3: The UE will be scheduled via DCI according to the TDD pattern defined in the table.				

A.1A.5 RMC burst transmission model

RMC not conveying RMSI is scheduled during the RMC burst. The length of the transmission burst in slots is defined as N. The burst transmission format is determined according to the steps below:

1. Select N randomly from a given set of the number of slots $S_1 = \{1,3,5\}$ with equal probability as the total length of RMC burst transmission format.

2. A uniform random variable from 0 to 1 is generated. If the random variable is less than P_{CCA_DL}, a burst of N fully occupied slots is transmitted. Otherwise, the RMC burst transmission is muted and the muting duration is the same as the number N of slots for determined burst format.

RMC burst transmission is scheduled outside discovery burst transmission window. If transmission occurred in the previous slot, transmission is muted for a duration of one slot. Additionally, if the start time of the candidate RMC burst transmission is within 5 slots of the start of the discovery burst transmission window, RMC transmission is not performed.

A.2 Reference OCGN configuration

A.2.1 Generic OFDMA channel noise generator (OCNG)

The OCNGpattern is used in a test for modelling the allocation of unused resourced in the channel bandwidth to virtual UEs (UEs that are not under test). The OCNG pattern simulates both PDCCH and PDSCH transmissions to the virtual UEs.

Table A.2.1-1: OP.1: Generic OCNG pattern for all unused REs

OCNG Parameters	Control Region	Data Region
Resource allocation	Unused REs (Note 1)	Unused REs (Note 2)
Channel	PDCCH	PDSCH
Contents	Virtual UE IDs	Uncorrelated pseudo random QPSK modulated data
Antenna transmission scheme	Same as used in PDCCH RMC	Same as used in PDSCH RMC
Subcarrier spacing	Same as used in PDCCH RMC	Same as used in PDSCH RMC
Aggregation level	Same as used in PDCCH RMC	N/A
Code rate	Same as used in PDCCH RMC	Same as used in PDSCH RMC
Transmit Power	Same as used in PDCCH RMC	Same as used in PDSCH RMC
CP length	Same as used in PDCCH RMC	Same as used in PDSCH RMC
NOTE 1: REs not used in the active CORESETs where PDCCH is scheduled for the UE under test. NOTE 2: REs not allocated to any physical channels, CORESET, SSB or any other reference signal within the channel bandwidth of the cell, confined to $BW_{occupied}$ where specified in the test case.		

Table A.2.1-2: OP.2: Generic OCNG pattern for all unused REs for 2AoA setup

OCNG Parameters	Control Region	Data Region
Probe	Transmitting the serving beam	
Resource allocation	Unused REs (Note 1) in the symbols where SSB/CSI-RS are not transmitted from both the serving beam probe and non-serving beam probe.	Unused REs (Note 2) in the symbols where SSB/CSI-RS are not transmitted from both the serving beam probe and non-serving beam probe.
Channel	PDCCH	PDSCH
Contents	Virtual UE IDs	Uncorrelated pseudo random QPSK modulated data
Antenna transmission scheme	Same as used in PDCCH RMC	Same as used in PDSCH RMC
Subcarrier spacing	Same as used in PDCCH RMC	Same as used in PDSCH RMC
Aggregation level	Same as used in PDCCH RMC	N/A
Code rate	Same as used in PDCCH RMC	Same as used in PDSCH RMC
Transmit Power	Same as used in PDCCH RMC	Same as used in PDSCH RMC
CP length	Same as used in PDCCH RMC	Same as used in PDSCH RMC
NOTE 1: REs not used in the active CORESETs where PDCCH is scheduled for the UE under test. NOTE 2: REs not allocated to any physical channels, CORESET, SSB or any other reference signal within the channel bandwidth of the cell, confined to $BW_{occupied}$ where specified in the test case. NOTE 3: No OCNG is transmitted from the probe transmitting non-serving beam.		

Table A.2.1-3: OP.3: Generic OCNG pattern for unused REs in the same BW as CORESET

OCNG Parameters	Control Region	Data Region
Resource allocation	Unused REs (Note 1)	Unused REs (Note 2)
Channel	PDCCH	PDSCH
Contents	Virtual UE IDs	Uncorrelated pseudo random QPSK modulated data
Antenna transmission scheme	Same as used in PDCCH RMC	Same as used in PDSCH RMC
Subcarrier spacing	Same as used in PDCCH RMC	Same as used in PDSCH RMC
Aggregation level	Same as used in PDCCH RMC	N/A
Code rate	Same as used in PDCCH RMC	Same as used in PDSCH RMC
Transmit Power	Same as used in PDCCH RMC	Same as used in PDSCH RMC
CP length	Same as used in PDCCH RMC	Same as used in PDSCH RMC
NOTE 1: REs not used in the active CORESETs where PDCCH is scheduled for the UE under test. REs for OCNG shall not be allocated outside the allocated bandwidth of the CORESET of the serving cell. NOTE 2: REs not allocated to any physical channels, CORESET, SSB or any other reference signal within the allocated bandwidth of the CORESET of the serving cell. REs for OCNG shall not be allocated outside the allocated bandwidth of the CORESET of the serving cell.		

Table A.2.1-4: OP.4: Generic OCNG pattern for all unused REs outside SSB slot(s)

OCNG Parameters	Control Region	Data Region
Resource allocation	Unused REs (Note 1)	Unused REs (Note 2)
Channel	PDCCH	PDSCH
Contents	Virtual UE IDs	Uncorrelated pseudo random QPSK modulated data
Antenna transmission scheme	Same as used in PDCCH RMC	Same as used in PDSCH RMC
Subcarrier spacing	Same as used in PDCCH RMC	Same as used in PDSCH RMC
Aggregation level	Same as used in PDCCH RMC	N/A
Code rate	Same as used in PDCCH RMC	Same as used in PDSCH RMC
Transmit Power	Same as used in PDCCH RMC	Same as used in PDSCH RMC
CP length	Same as used in PDCCH RMC	Same as used in PDSCH RMC
NOTE 1: REs not used in the active CORESETs where PDCCH is scheduled for the UE under test. REs for OCNG shall not be allocated in the slot(s) containing SSB of the respective cell. NOTE 2: REs not allocated to any physical channels, CORESET, SSB or any other reference signal within the channel bandwidth of the cell. REs for OCNG shall not be allocated in the slot(s) containing SSB of the respective cell.		

Table A.2.1-5: OP.5: Generic OCNG pattern for unused REs in the same BW as CORESET for 2AoA setup

OCNG Parameters	Control Region	Data Region
Probe	Transmitting the serving beam	
Resource allocation	Unused REs (Note 1) in the symbols where SSB/CSI-RS are not transmitted from both the serving beam probe and non-serving beam probe.	Unused REs (Note 2) in the symbols where SSB/CSI-RS are not transmitted from both the serving beam probe and non-serving beam probe.
Channel	PDCCH	PDSCH
Contents	Virtual UE IDs	Uncorrelated pseudo random QPSK modulated data
Antenna transmission scheme	Same as used in PDCCH RMC	Same as used in PDSCH RMC
Subcarrier spacing	Same as used in PDCCH RMC	Same as used in PDSCH RMC
Aggregation level	Same as used in PDCCH RMC	N/A
Code rate	Same as used in PDCCH RMC	Same as used in PDSCH RMC
Transmit Power	Same as used in PDCCH RMC	Same as used in PDSCH RMC
CP length	Same as used in PDCCH RMC	Same as used in PDSCH RMC
NOTE 1: REs not used in the active CORESETs where PDCCH is scheduled for the UE under test. REs for OCNG shall not be allocated outside the allocated bandwidth of the CORESET of the serving cell.		

NOTE 2: REs not allocated to any physical channels, CORESET, SSB or any other reference signal within the allocated bandwidth of the CORESET of the serving cell. REs for OCNG shall not be allocated outside the allocated bandwidth of the CORESET of the serving cell.
NOTE 3: No OCNG is transmitted from the probe transmitting non-serving beam.

A.3 Reference SSB configuration

A.3.1 SSB configuration for FR1

Table A.3.1-1: SSB allocation for FR1

SSB Parameters	Unit	Value							
SSB Pattern		SSB.1 FR1	SSB.2 FR1	SSB.3 FR1		SSB.4 FR1		SSB.5 FR1	SSB.6 FR1
Channel bandwidth	MHz	10	40	10		40		10	40
SSB SCS	kHz	15	30	15		30		15	30
SSB periodicity (T_{SSB})	ms	20							
Number of SSBs per SS-burst		1	1	2		2		1	1
SS/PBCH block index		0	0	0	1	0	1	0	0
Indices of symbols containing SSB		2-5	4-7 or 2-5 Note 2	2-5	8-11	4-7 or 2-5 Note 2	8-11	2-5	4-7 or 2-5 Note 2
Indices of slots containing SSB		0							
Indices of SFN containing SSB		SFN mod (max(T_{SSB},10ms)/10ms) = 0						SFN mod (max(T_{SSB},10ms)/10ms) = 1	
RB numbers containing SSB within channel BW		(RB_J, RB_{J+1},…., RB_{J+19})Note 1							

NOTE 1: RBs containing SSB can be configured in any frequency location within the cell bandwidth according to the allowed synchronization raster defined in TS 38.104 [28].
NOTE 2: Symbols 4-7 are chosen if the SSB pattern Case B should be used for the current band as indicated by Table 5.4.3.3-1 of TS 38.104 [28]; Otherwise, symbols 2-5 are chosen.

A.3.2 SSB configuration for FR2

Table A.3.2-1: SSB allocation for FR2

SSB Parameters	Unit	Value											
SSB Pattern		SSB.1 FR2		SSB.2 FR2		SSB.3 FR2	SSB.4 FR2	SSB.5 FR2		SSB.6 FR2		SSB.7 FR2	SSB.8 FR2
Channel bandwidth	MHz	100											
SSB SCS	kHz	120		240		120	240	120		240		120	240
SSB periodicity (T_{SSB})	ms	20											
Number of SSBs per SS-burst		2		2		1	1	2		2		1	1
SS/PBCH block index		0	1	0	1	0	0	2	3	2	3	1	1
Indices of symbols containing SSB		4-7	8-11	8-11	12-13, 0-1	4-7	8-11	2-5	6-9	2-5	6-9	8-11	12-13, 0-1
Indices of slots containing SSB		0		0	0-1	0	0	1	1	1	1	0	0-1
Indices of SFN containing SSB		SFN mod (max(T_{SSB},10ms)/10ms) = 0											
RB numbers containing SSB within channel BW		(RB_J, RB_{J+1},…., RB_{J+19})Note 1											

NOTE 1: RBs containing SSB can be configured in any frequency location within the cell bandwidth according to the allowed synchronization raster defined in TS 38.104 [28].

A.3A Reference SSB configuration under CCA

A.3A.1 SSB configuration under CCA for FR1

A.3A.1.1 SSB pattern 1 under CCA for semi-static channel access: SSB allocation for SSB SCS=30kHz in 40MHz

Table A.3A.1.1-1: SSB.1 CCA: SSB Pattern 1 for SSB under CCA for SCS=30 kHz in 40 MHz channel

SSB Parameters	Values
Channel bandwidth	40 MHz
SSB SCS	30 kHz
SSB periodicity (T_{SSB})	20 ms
Number of SSB indexes per SS-burst (N_{SSB}^{QCL})	1
Number of SS/PBCH block candidates per SSB index	1
SS/PBCH block candidate position	0
SS/PBCH block index	0
Symbol numbers containing SSB Note 2	2-5
Slot numbers containing SSB Note 2	0
SFN containing SSB	SFN mod (max(T_{SSB},10ms)/10ms) = 0
RB numbers containing SSB within channel BW	(RB_J, RB_{J+1},…., RB_{J+19})Note 1
Note 1: RBs containing SSB can be configured in any frequency location within the cell bandwidth according to the allowed synchronization raster defined in TS 38.104 [28]. Note 2: These values have been derived from other parameters for information purposes (as per TS 38.213 [8]). They are not settable parameters themselves	

A.3A.1.2 SSB pattern 2 under CCA for dynamic channel access: SSB allocation for SSB SCS=30kHz in 40MHz

Table A.3A.1.2-1: SSB.2 CCA: SSB Pattern 2 for SSB under CCA for SCS=30 kHz in 40 MHz channel

SSB Parameters	Values	
Channel bandwidth	40 MHz	
SSB SCS	30 kHz	
SSB periodicity (T_{SSB})	20 ms	
Number of SSB indexes per SS-burst (N_{SSB}^{QCL})	1	
Number of SS/PBCH block candidates per SSB index	2	
SS/PBCH block candidate position	0	2
SS/PBCH block index	0	0
Symbol numbers containing SSB Note 2	2-5	2-5
Slot numbers containing SSB Note 2	0	1
SFN containing SSB	SFN mod (max(T_{SSB},10ms)/10ms) = 0	
RB numbers containing SSB within channel BW	(RB_J, RB_{J+1},…., RB_{J+19})Note 1	
Note 1: RBs containing SSB can be configured in any frequency location within the cell bandwidth according to the allowed synchronization raster defined in TS 38.104 [28]. Note 2: These values have been derived from other parameters for information purposes (as per TS 38.213 [8]). They are not settable parameters themselves		

A.3A.1.3 SSB pattern 3 under CCA for semi-static channel access: SSB allocation for SSB SCS=30 kHz in 40 MHz

Table A.3A.1.3-1: SSB.3 CCA: SSB Pattern 3 for SSB under CCA for SCS=30 kHz in 40 MHz channel

SSB Parameters	Values	
Channel bandwidth	40 MHz	
SSB SCS	30 kHz	
SSB periodicity (T_{SSB})	20 ms	
Number of SSB indexes per SS-burst (N_{SSB}^{QCL})	2	
Number of SS/PBCH block candidates per SSB index	1	
SS/PBCH block candidate position	0	1
SS/PBCH block index	0	1
Symbol numbers containing SSB Note 2	2-5	8-11
Slot numbers containing SSB Note 2	0	0
SFN containing SSB	SFN mod (max(T_{SSB},10ms)/10ms) = 0	
RB numbers containing SSB within channel BW	(RB_J, RB_{J+1},…., RB_{J+19}) Note 1	
Note 1: RBs containing SSB can be configured in any frequency location within the cell bandwidth according to the allowed synchronization raster defined in TS 38.104 [28].		
Note 2: These values have been derived from other parameters for information purposes (as per TS 38.213 [8]). They are not settable parameters themselves.		

A.3A.1.4 SSB pattern 4 under CCA for dynamic channel access: SSB allocation for SSB SCS=30 kHz in 40 MHz

Table A.3A.1.4-1: SSB.4 CCA: SSB Pattern 4 for SSB under CCA for SCS=30 kHz in 40 MHz channel

SSB Parameters	Values			
Channel bandwidth	40 MHz			
SSB SCS	30 kHz			
SSB periodicity (T_{SSB})	20 ms			
Number of SSB indexes per SS-burst (N_{SSB}^{QCL})	2			
Number of SS/PBCH block candidates per SSB index	2			
SS/PBCH block candidate position	0	2	1	3
SS/PBCH block index	0	0	1	1
Symbol numbers containing SSB Note 2	2-5	2-5	8-11	8-11
Slot numbers containing SSB Note 2	0	1	0	1
SFN containing SSB	SFN mod (max(T_{SSB},10ms)/10ms) = 0			
RB numbers containing SSB within channel BW	(RB_J, RB_{J+1},…., RB_{J+19}) Note 1			
Note 1: RBs containing SSB can be configured in any frequency location within the cell bandwidth according to the allowed synchronization raster defined in TS 38.104 [28].				
Note 2: These values have been derived from other parameters for information purposes (as per TS 38.213 [8]). They are not settable parameters themselves.				

A.3B Reference SSB configuration for RedCap

A.3B.1 SSB configuration for FR1

Table A.3B.1-1: SSB allocation for FR1

SSB Parameters	Unit	Value						
SSB Pattern		SSB.1 RedCap FR1	SSB.2 RedCap FR1	SSB.3 RedCap FR1	SSB.4 RedCap FR1	SSB.5 RedCap FR1	SSB.6 RedCap FR1	SSB.7 RedCap FR1
Channel bandwidth	MHz	20	20	20	10	20	10	20

SSB SCS		kHz	30	30	30	15	30	15	30
SSB periodicity (T_{SSB})		ms	20	20	20	20	20	80	80
Number of SSBs per SS-burst			1	2	1	1	1	1	1
Symbol numbers containing SSB Note 4	SSB #0		4-7 or 2-5 Note 3	4-7 or 2-5 Note 3	4-7 or 2-5 Note 3	2-5	4-7 or 2-5 Note 3	2-5	4-7 or 2-5 Note 3
	SSB #1		N/A	8-11	N/A	N/A	N/A	N/A	N/A
Slot numbers containing SSB Note 4			0					5	10
SFN containing SSB			SFN mod (T_{SSB} /10ms) = 0	SFN mod (T_{SSB} /10ms) = 0	SFN mod (T_{SSB} /10ms) = 1	SFN mod (T_{SSB} /10ms) = 0	SFN mod (T_{SSB} /10ms) = 0	SFN mod (T_{SSB} /10ms) = 0	SFN mod (T_{SSB} /10ms) = 0
RB numbers containing SSB within channel BW			(RB_J, RB_{J+1},…., RB_{J+19})Note 1					(RB_J, RB_{J+1},…., RB_{J+19})Note 2	

NOTE 1: RBs containing SSB can be configured in any frequency location within the cell bandwidth according to the allowed synchronization raster defined in TS 38.104 [28].
NOTE 2: RBs containing SSB can be configured in any frequency location within the associated bandwidth part except the RBs for allowed synchronization raster defined in TS 38.104 [28].
NOTE 3: Symbols 4-7 are chosen if the SSB pattern Case B should be used for the current band as indicated by Table 5.4.3.3-1 of TS 38.104 [28]; Otherwise, symbols 2-5 are chosen.
NOTE 4: These values have been derived from other parameters for information purposes (as per TS 38.213). They are not settable parameters themselves

A.3B.2 SSB configuration for FR2

Table A.3B.2-1: SSB allocation for FR2

SSB Parameters		Unit	Value				
SSB Pattern			SSB.1 RedCap FR2	SSB.2 RedCap FR2	SSB.3 RedCap FR2	SSB.4 RedCap FR2	SSB.5 RedCap FR2
Channel bandwidth		MHz	100	100	100	100	100
SSB SCS		kHz	120	120	120	240	240
SSB periodicity (T_{SSB})		ms	20	40	80	40	80
Number of SSBs per SS-burst			1	1	1	1	1
Symbol numbers containing SSB Note 3	SSB #0		4-7	4-7	4-7	8-11	8-11
	SSB #1		N/A	N/A	N/A	N/A	N/A
Indices of slots containing SSB Note 3			0		40	0	80
Indices of SFN containing SSB			SFN mod (T_{SSB} /10ms) = 0	SFN mod (T_{SSB} /10ms) = 0	SFN mod (T_{SSB} /10ms) = 0	SFN mod (T_{SSB} /10ms) = 0	SFN mod (T_{SSB} /10ms) = 0
RB numbers containing SSB within channel BW			(RB_J,RB_{J+1},….,RB_{J+19})Note 1		(RB_J,RB_{J+1},…., RB_{J+19})Note 2	(RB_J,RB_{J+1},…., RB_{J+19})Note 1	(RB_J,RB_{J+1},…., RB_{J+19})Note 2

NOTE 1: RBs containing SSB can be configured in any frequency location within the cell bandwidth according to the allowed synchronization raster defined in TS 38.104 [28].
NOTE 2: RBs containing SSB can be configured in any frequency location within the associated bandwidth part except the RBs for allowed synchronization raster defined in TS 38.104 [28].
NOTE 3: These values have been derived from other parameters for information purposes (as per TS 38.213). They are not settable parameters themselves

A.4 Reference SMTC configuration

Table A.4-1: SMTC configurations

SMTC Parameters	Unit	Value

SMTC Pattern		SMTC.1	SMTC.2	SMTC.3	SMTC.4	SMTC.5	SMTC.6
SMTC periodicity	ms	20	20	160	20	20	20
SMTC offset	ms	0	0	0	10	10	17
SMTC duration	ms	1	5	1	1	5	5

A.4A Reference SMTC configuration for RedCap

Table A.4A-1: SMTC configurations

SMTC Parameters	Unit	Value					
SMTC Pattern		SMTC.1 RedCap	SMTC.2 RedCap	SMTC.3 RedCap	SMTC.4 RedCap		
SMTC periodicity	ms	40	80	40	80		
SMTC offset	ms	0	5	20	5		
SMTC duration	ms	1	1	1	5		

A.5 Reference DRX configurations

The reference DRX configurations for the NR serving cell are captured in Table A.5-1. The reference DRX configurations for the E-UTRA serving cell for EN-DC and inter-RAT test cases are captured in Table A.5-2.

Table A.5-1: DRX configurations for NR serving cell

Parameter	Unit	Value						
DRX Configuration		DRX.1	DRX.2	DRX.3	DRX.6	DRX.7	DRX.8	DRX.11
drx-onDurationTimer	ms	1	1	6	1	6	6	6
drx-InactivityTimer	ms	1	1	1	1	1	1	1
drx-RetransmissionTimerDL	slot	1	1	1	1	1	1	1
drx-RetransmissionTimerUL	slot	1	1	1	1	1	1	1
drx-LongCycleStartOffset	ms	40	640	40	320	640	320	20
shortDRX	-	disabled	disabled	disabled	disabled	disabled	disabled	disabled
TimeAlignmentTimer	ms	500	500	Infinity	500	Infinity	Infinity	Infinity
NOTE 1: The DRX cycle and time alignment timer parameters are specified in clause 6.3.2 in TS 38.331 [13].								

Table A.5-2: DRX configurations for E-UTRA serving cell

Parameter	Unit	Value				
DRX Configuration		DRX.4	DRX.5	DRX.9	DRX.10	DRX.12
drx-onDurationTimer	ms	psf2	psf6	psf2	psf6	psf6
drx-InactivityTimer	ms	psf2	psf1920	psf100	psf1920	psf2
drx-RetransmissionTimerDL	slot	psf16	psf16	psf16	psf16	psf16
drx-LongCycleStartOffset	ms	sf160, 0	sf320. 0	sf40, 0	sf640. 0	sf640, 0
shortDRX	-	disabled	disabled	disabled	disabled	disabled
TimeAlignmentTimer	ms	Infinity	Infinity	500	500	Infinity
NOTE 1: The DRX cycle and time alignment timer parameters are specified in clause 6.3.2 in TS 36.331 [29]						

A.6 EN-DC test setup

The purpose of this Annex is to specify the EN-DC configuration for the test cases in Chapters 4 and 5 of this test specification.

A.6.1 E-UTRA serving cell parameters

This clause defines the cell power levels and other specific cell parameters of the E-UTRA serving cell for EN-DC.

A.6.1.1 E-UTRA serving cell parameters for EN-DC tests with NR FR1

Table A.6.1.1-1 defines the E-UTRA serving cell parameters for EN-DC tests with NR FR1 cell(s), defined in Chapter 4 of this test specification and for iRAT tests with E-UTRA serving cell and NR FR1 cell(s) defined in Chapter 8 of this test specification. Unless otherwise stated within the test, all measurements in Clauses 4 and 5 are performed only on the NR carrier. The E-UTRA PCell shall configured to not interfere with NR operation and the E-UTRA PCell signal power shall not be critical to the test purpose.

Table A.6.1.1-1: E-UTRAN cell specific test parameters for EN-DC tests with NR FR1

Parameter	Unit	E-UTRAN Cell1
E-UTRA RF Channel Number		1
Duplex mode		FDD or TDD
TDD special subframe configuration Note1		6
TDD uplink-downlink configuration Note1		1
$BW_{channel}$ Note 6		5MHz: $N_{RB,c}$ = 25 10MHz: $N_{RB,c}$ = 50 20MHz: $N_{RB,c}$ = 100
PDSCH parameters: DL Reference Measurement Channel Note2, Note 6		5MHz: R.7 FDD 10MHz: R.3 FDD 20MHz: R.6 FDD 5MHz: R.4 TDD 10MHz: R.0 TDD 20MHz: R.3 TDD
PCFICH/PDCCH/PHICH parameters: DL Reference Measurement Channel Note2, Note 6		5MHz: R.11 FDD 10MHz: R.6 FDD 20MHz: R.10 FDD 5MHz: R.11 TDD 10MHz: R.6 TDD 20MHz: R.10 TDD
OCNG Patterns Note 2		5MHz: OP.20 FDD 10MHz: OP.10 FDD 20MHz: OP.17 FDD 5MHz: OP.9 TDD 10MHz: OP.1 TDD 20MHz: OP.7 TDD
PBCH_RA	dB	0
PBCH_RB	dB	
PSS_RA	dB	
SSS_RA	dB	
PCFICH_RB	dB	
PHICH_RA	dB	
PHICH_RB	dB	
PDCCH_RA	dB	
PDCCH_RB	dB	
PDSCH_RA	dB	
PDSCH_RB	dB	
OCNG_RA Note 3	dB	
OCNG_RB Note 3	dB	
N_{oc} Note 4	dBm/15 kHz	-104
$\hat{E}_s/N_{oc}$	dB	17
$\hat{E}_s/I_{ot}$	dB	17
RSRP Note 5	dBm/15 kHz	-87
SCH_RP Note 5	dBm/15 kHz	-87
Io Note 5	dBm/Ch BW	-59.13 + 10log($N_{RB,c}$ /50)
Propagation Condition		AWGN
Antenna Configuration		1x2

NOTE 1: Special subframe and uplink-downlink configurations are specified in table 4.2-1 in TS 36.211 [24].
NOTE 2: DL RMCs and OCNG patterns are specified in clauses A.1, A.2 and D.1 of TS 36.521-3 [26].
NOTE 3: OCNG shall be used such that all cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.
NOTE 4: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for N_{oc} to be fulfilled.
NOTE 5: Es/Iot, RSRP, SCH_RP and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.
NOTE 6: For E-UTRA anchor configuration, pick 5 MHz as default channel bandwidth setting in the tests as it is supported by all E-UTRA bands. If none of the UE supported EN-DC band combos support 5MHz E-UTRA carrier, pick 20 MHz channel BW or 10 MHz channel BW, in that order,

Table A.6.1.1-2: *CQI-ReportConfig-DEFAULT:* Additional E-UTRA Anchor Configuration

Derivation Path: TS 36.508 [7] clause 4.6.3, Table 4.6.3-2 CQI-ReportConfig-DEFAULT			
Information Element	**Value/remark**	**Comment**	**Condition**
CQI-ReportConfig-DEFAULT ::= SEQUENCE {			
cqi-ReportModeAperiodic	NOT PRESENT		
cqi-ReportPeriodic	NOT PRESENT		
}			

Table A.6.1.1-3:*PhysicalConfigDedicated-DEFAULT:* Additional E-UTRA Anchor Configuration

Derivation Path: TS 36.508 [7] clause 4.8.2, Table 4.8.2.1.6-1 PhysicalConfigDedicated-DEFAULT			
Information Element	**Value/remark**	**Comment**	**Condition**
PhysicalConfigDedicated-DEFAULT ::= SEQUENCE {			
soundingRS-UL-ConfigDedicated	Not present		RBC
}			

Table A.6.1.1-4:*MAC-MainConfig-RBC*: Additional E-UTRA Anchor Configuration

Derivation Path: TS 36.508 [7] clause 4.8.2.1.5, Table 4.8.2.1.5-1 MAC-MainConfig-RBC			
Information Element	**Value/remark**	**Comment**	**Condition**
timeAlignmentTimerDedicated	Infinity		

A.6.1.2 E-UTRA serving cell parameters for EN-DC tests with NR FR2

Table A.6.1.2-1 defines the E-UTRA serving cell parameters for EN-DC tests with NR FR2 cell(s), defined in Chapter 5 of this test specification and for iRAT tests with E-UTRA serving cell and NR FR1 cell(s) defined in Chapter 8 of this test specification. Unless otherwise stated within the test, all measurements in Clauses 5 and 7 are performed only on the NR carrier. The E-UTRA PCell shall configured to not interfere with NR operation and the E-UTRA PCell signal power shall not be critical to the test purpose.

Table A.6.1.2-1: E-UTRAN cell specific test parameters for EN-DC tests with NR FR2

Parameter	Unit	E-UTRAN Cell1
E-UTRA RF Channel Number		1
Duplex mode		FDD or TDD
TDD special subframe configuration[Note1]		6
TDD uplink-downlink configuration[Note1]		1
$BW_{channel}$ [Note 5]	MHz	5MHz: $N_{RB,c}$ = 25 10MHz: $N_{RB,c}$ = 50 20MHz: $N_{RB,c}$ = 100
PDSCH parameters: DL Reference Measurement Channel[Note2, Note 5]		5MHz: R.7 FDD 10MHz: R.3 FDD 20MHz: R.6 FDD 5MHz: R.4 TDD 10MHz: R.0 TDD 20MHz: R.3 TDD

PCFICH/PDCCH/PHICH parameters: DL Reference Measurement Channel[Note2, Note 5]		5MHz: R.11 FDD 10MHz: R.6 FDD 20MHz: R.10 FDD 5MHz: R.11 TDD 10MHz: R.6 TDD 20MHz: R.10 TDD
OCNG Patterns[Note2, Note 5]		5MHz: OP.20 FDD 10MHz: OP.10 FDD 20MHz: OP.17 FDD 5MHz: OP.9 TDD 10MHz: OP.1 TDD 20MHz: OP.7 TDD
PBCH_RA	dB	0
PBCH_RB	dB	
PSS_RA	dB	
SSS_RA	dB	
PCFICH_RB	dB	
PHICH_RA	dB	
PHICH_RB	dB	
PDCCH_RA	dB	
PDCCH_RB	dB	
PDSCH_RA	dB	
PDSCH_RB	dB	
OCNG_RA[Note3]	dB	
OCNG_RB[Note3]	dB	

NOTE 1: Special subframe and uplink-downlink configurations are specified in table 4.2-1 in TS 36.211 [24].
NOTE 2: DL RMCs and OCNG patterns are specified in clauses A 1, A.2 and D.1 of TS 36.521-3 [26].
NOTE 3: OCNG shall be used such that all cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.
NOTE 4: The E-UTRA signal is required only to ensure the E-UTRA link to the DUT in the EN-DC operation. The Test System shall provide a stable and noise-free E-UTRA signal without need of precise propagation modelling, path loss and polarization control. Further details of the E-UTRA signal configuration are not defined as part of the cell specific test parameters, since the E-UTRA link is not under performance verification and is not expected to influence the NR FR2 requirement.
NOTE 5: The For E-UTRA anchor configuration, pick 5 MHz as default channel bandwidth setting in the tests as it is supported by all E-UTRA bands. If none of the UE supported EN-DC band combos support 5MHz E-UTRA carrier, pick 20 MHz channel BW or 10 MHz channel BW, in that order,

Table A.6.1.2-2: *CQI-ReportConfig-DEFAULT:* Additional E-UTRA Anchor Configuration

Derivation Path: TS 36.508 [7] clause 4.6.3, Table 4.6.3-2 CQI-ReportConfig-DEFAULT			
Information Element	**Value/remark**	**Comment**	**Condition**
CQI-ReportConfig-DEFAULT ::= SEQUENCE {			
cqi-ReportModeAperiodic	NOT PRESENT		
cqi-ReportPeriodic	NOT PRESENT		
}			

Table A.6.1.2-3:*PhysicalConfigDedicated-DEFAULT:* Additional E-UTRA Anchor Configuration

Derivation Path: TS 36.508 [7] clause 4.8.2, Table 4.8.2.1.6-1 PhysicalConfigDedicated-DEFAULT			
Information Element	**Value/remark**	**Comment**	**Condition**
PhysicalConfigDedicated-DEFAULT ::= SEQUENCE {			
soundingRS-UL-ConfigDedicated	Not present		RBC
}			

Table A.6.1.2-4:*MAC-MainConfig-RBC*: Additional E-UTRA Anchor Configuration

Derivation Path: TS 36.508 [7] clause 4.8.2.1.5, Table 4.8.2.1.5-1 MAC-MainConfig-RBC			
Information Element	**Value/remark**	**Comment**	**Condition**
timeAlignmentTimerDedicated	Infinity		

A.6A NR FR1-FR2 test setup

Some test cases in clause 7 have NR cells in both FR1 and FR2. Unless otherwise stated within the test, the NR FR1 Cell signal is required only to provide a link to the UE under test. The Test Equipment shall provide a stable and noise-free NR FR1 signal without need of precise propagation modelling, path loss and polarization control. Further details of the NR FR1 signal configuration are not defined as part of the cell specific test parameters, since the NR FR1 link is not under performance verification and is not expected to influence the test purpose.

A.7 Reference PRACH configurations

This clause provides the typical PRACH configurations used for all RRM test cases defined in this test specification. Parameters not listed in this clause can be derived from the configuration of each test.

A.7.1 PRACH configurations for FR1

Table A.7.1-1 defines the PRACH configurations for FR1. Each of the PRACH configurations defined in Table A.7.1-1 have different applicabilities:

- PRACH.1 FR1 for SSB-based contention based random access in FR1.
- PRACH.2 FR1 for SSB-based non-contention based random access in FR1.
- PRACH.3 FR1 for CSI-RS based non-contention based random access in FR1.
- PRACH.4 FR1 for CSI-RS based non-contention based random access in FR1 to convey BFR.

Table A.7.1-1 Parameters for PRACH Configurations for FR1

Field	Value				Comment
PRACH Configuration	PRACH.1 FR1	PRACH.2 FR1	PRACH.3 FR1	PRACH.4 FR1	
prach-ConfigurationIndex	102	102	102	102	10ms PRACH periodicity and other detailed configuration defined in table 6.3.3.2-2 in TS 38.211 [7].
msg1-SubcarrierSpacing	Same as UL carrier SCS	Same as UL carrier SCS	Same as UL carrier SCS	Same as UL carrier SCS	
totalNumberOfRA-Preambles	48	48	48	48	Total number of preambles used for contention based and contention free random access
numberOfRA-PreamblesGroupA	48	48	48	48	No group B.
prach-RootSequenceIndex	0	0	0	0	Logic sequence index = 0, resulting in root sequence = 1.
ssb-perRACH-OccasionAndCB-PreamblesPerSSB	oneFourth, n48	-	-	-	OneFourth: 1 SSB associated with 4 RACH occasions n48: 48 contention based preambles per SSB
ssb-perRACH-Occasion	-	oneFourth	oneFourth	oneFourth	OneFourth: 1 SSB associated with 4 RACH occasions
msg1-FDM	One	One	One	One	One PRACH transmission occasions FDMed in one time instance.
rsrp-ThresholdSSB	RSRP_51	RSRP_51	N/A	RSRP_51	The actual value of the threshold is -105dBm, as defined in TS 38.331 [13].
rsrp-ThresholdCSI-RS	N/A	N/A	RSRP_51	N/A	
ra-ContentionResolutionTimer	sf48	-	-	-	48 sub-frames
powerRampingStep	dB2	dB2	dB2	dB2	
preambleReceivedTargetPower	dBm-120	dBm-120	dBm-120	dBm-120	
preambleTransMax	n6	n6	n6	n200	Max number of RA preamble transmission performed before declaring a failure is 6
ra-ResponseWindow	sl10	sl10	sl10	sl1	10 slots

zeroCorrelationZoneConfig	11	11	11	11	N-CS configuration, N_{CS} = 23
Backoff Parameter Index	2	2	2	2	20ms, as defined in table 7.2-1 in TS 38.321 [12].
ssb-ResourceList	-	present	N/A	N/A	Associated with SSB index 0
ra-PreambleIndex	-	50	N/A	N/A	Associated with SSB index 0. UE doesn't use ssb-ResourceList and BFR-SSB-Resource IEs at the same time. UE doesn't use this field if is transmitting CFRA to convey BFR.
BFR-SSB-Resource	-	present	N/A	N/A	Associated with SSB index 0
ra-PreambleIndex	-	50	N/A	N/A	Associated with SSB index 0. UE doesn't use ssb-ResourceList and BFR-SSB-Resource IEs at the same time. UE uses this field only if is transmitting CFRA to convey BFR
csirs-ResourceList	N/A	N/A	present	presnt	Associated with CSI-RS configured
ra-PreambleIndex	N/A	N/A	50	50	Associated with CSI-RS configured
ra-OccasionList	-	-	1	1	RA occasions allowed corresponding to CSI-RS
ra-ssb-OccasionMaskIndex	-	1	N/A	N/A	PRACH occasion index 1 is allowed
NOTE: For further information see Clause 6.3.2 in TS 38.331 [13].					

A.7.2 PRACH configurations for FR2

Table A.7.2-1 defines the PRACH configurations for FR2. Each of the PRACH configurations defined in Table A.7.2-1 have different applicabilities:

- PRACH.1 FR2 for SSB-based contention based random access in FR2.
- PRACH.2 FR2 for SSB-based non-contention based random access in FR2.
- PRACH.3 FR2 for CSI-RS based non-contention based random access in FR2.
- PRACH.4 FR2 for CSI-RS based non-contention based random access in FR2 to convey BFR.

Table A.7.2-1 Parameters for PRACH Configurations for FR2

Field	Value				Comment
PRACH Configuration	PRACH.1 FR2	PRACH.2 FR2	PRACH.3 FR2	PRACH.4 FR2	
prach-ConfigurationIndex	190	190	190	190	Preamble format C2, 10ms PRACH periodicity and other detailed configuration defined in table 6.3.3.2-4 in TS 38.211 [7].
msg1-SubcarrierSpacing	Same as UL carrier SCS	Same as UL carrier SCS	Same as UL carrier SCS	Same as UL carrier SCS	
totalNumberOfRA-Preambles	48	48	48	48	Total number of preambles used for contention based and contention free random access
numberOfRA-PreamblesGroupA	48	48	48	48	No group B.
prach-RootSequenceIndex	0	0	0	0	Logic sequence index = 0, resulting in root sequence = 1.
ssb-perRACH-OccasionAndCB-PreamblesPerSSB	oneFourth, n48	N/A	N/A	N/A	OneFourth: 1 SSB associated with 4 RACH occasions n48: 48 contention based preambles per SSB
ssb-perRACH-Occasion	N/A	oneFourth	oneFourth	oneFourth	OneFourth: 1 SSB associated with 4 RACH occasions
msg1-FDM	One	One	One	One	One PRACH transmission occasions FDMed in one time instance.
rsrp-ThresholdSSB	RSRP_51	RSRP_51	N/A	RSRP_51	The actual value of the threshold is -105dBm, as defined in TS 38.331 [13].
rsrp-ThresholdCSI-RS	N/A	N/A	RSRP_51	N/A	
ra-ContentionResolutionTimer	sf48	N/A	N/A	N/A	48 sub-frames
powerRampingStep	dB2	dB2	dB2	dB2	

preambleReceivedTargetPower	dBm-120	dBm-120	dBm-120	dBm-120	
preambleTransMax	n6	n6	n6	n200	Max number of RA preamble transmission performed before declaring a failure
ra-ResponseWindow	sl10	sl10	sl10	sl40	
zeroCorrelationZoneConfig	11	11	11	11	N-CS configuration, N_{CS} = 23
Backoff Parameter Index	2	2	2	2	20ms, as defined in table 7.2-1 in TS 38.321 [12].
ssb-ResourceList	-	present	N/A	N/A	Associated with SSB index 0
ra-PreambleIndex	-	50	N/A	N/A	Associated with SSB index 0
csirs-ResourceList	N/A	present	present	present	Associated with CSI-RS configured
ra-PreambleIndex	N/A	50	50	50	Associated with CSI-RS configured
ra-OccasionList	-	-	1	1	RA occasions allowed corresponding to CSI-RS
ra-ssb-OccasionMaskIndex	-	1	N/A	N/A	PRACH occasion index 1 is allowed
NOTE: For further information see Clause 6.3.2 in TS 38.331 [13].					

A.7A Reference MsgA configurations

This clause provides the typical PRACH and PUSCH configurations for MsgA used for all RRM test cases defined in this test specification. Parameters not listed in this clause can be derived from the configuration of each test.

A.7A.1 MsgA configurations for FR1

Table A.7A.1-1 defines the MsgA configurations for FR1. Each of the MsgA configurations defined in Table A.7A.1-1 have different applicabilities:

- MsgA.1 FR1 for SSB-based 2-step contention based random access in FR1.
- MsgA.2 FR1 for SSB-based 2-step non-contention based random access in FR1.

Table A.7A.1-1 Parameters for MsgA Configurations for FR1

Field	Value		Comment
MsgA Configuration	MsgA.1 FR1	MsgA.2 FR1	
msgA-prach-ConfigurationIndex	102	102	10ms PRACH periodicity and other detailed configuration defined in table 6.3.3.2-2 in TS 38.211 [7].
msgA-SubcarrierSpacing	Same as UL carrier SCS	Same as UL carrier SCS	
msgA-totalNumberOfRA-Preambles	48	48	Total number of preambles used for contention based and contention free random access
numberOfRA-PreamblesGroupA	48	48	No group B.
msgA-PRACH-RootSequenceIndex	0	0	Logic sequence index = 0, resulting in root sequence = 1.
msgA-SSB-perRACH-OccasionAndCB-PreamblesPerSSB	oneFourth, n48	oneFourth	OneFourth: 1 SSB associated with 4 RACH occasions
msgA-RO-FDM	One	One	One PRACH transmission occasions FDMed in one time instance.
ra-ContentionResolutionTimer	sf48	-	48 sub-frames
msgA-PreamblePowerRampingStep	dB2	dB2	
msgA-PreambleReceivedTargetPower	dBm-120	dBm-120	
preambleTransMax	n6	n6	Max number of RA preamble transmission performed before declaring a failure is 6
msgB-ResponseWindow	sl10	sl10	10 slots

msgA-ZeroCorrelationZoneConfig	11	11	N-CS configuration, N_{CS} = 23
Backoff Parameter Index	2	2	20ms, as defined in table 7.2-1 in TS 38.321 [7].
ssb-ResourceList	-	ra-PreambleIndex = 50	Associated with SSB index 0. UE doesn't use ssb-ResourceList and BFR-SSB-Resource IEs at the same time. UE doesn't use this field if is transmitting CFRA to convey BFR.
BFR-SSB-Resource	-	ra-PreambleIndex = 50	Associated with SSB index 0. UE doesn't use ssb-ResourceList and BFR-SSB-Resource IEs at the same time. UE uses this field only if is transmitting CFRA to convey BFR
ra-ssb-OccasionMaskIndex	-	1	PRACH occasion index 1 is allowed
msgA-MCS	1	1	MCS index for MsgA PUSCH
nrofSlotsMsgA-PUSCH	1	1	Number of slots containing one or multiple PUSCH occasions
nrofMsgA-PO-PerSlot	1	1	Number of time domain PUSCH occasions in each slot
msgA-PUSCH-TimeDomainOffset	1	1	A single time offset with respect to the start of each PRACH slot, counted as the number of slots
PUSCH start symbol	0	0	
PUSCH allocation length	14	14	
mappingTypeMsgA-PUSCH	typeA	typeA	
nrofPRBs-PerMsgA-PO	2	2	Number of RBs per PUSCH occasion
nrofMsgA-PO-FDM	One	One	The number of MsgA PUSCH occasions FDMed in one time instance
msgA-DMRS-AdditionalPosition	pos1	pos1	Position for additional DM-RS
msgA-PUSCH-NrofPorts	1	1	Configure 1 port per CDM group
msgA-DeltaPreamble	3	3	Power offset of msgA PUSCH relative to the preamble received target power
msgA-Alpha	alpha1	alpha1	Alpha value for MsgA PUSCH. Set 1
deltaMCS	Disabled	Disabled	Whether to apply delta MCS
NOTE: For further information see clause 6.3.2 in TS 38.331 [13].			

A.7A.2 MsgA configurations for FR2

Table A.7A.2-1 defines the MsgA configurations for FR2. Each of the MsgA configurations defined in Table A.7A.2-1 have different applicabilities:

- MsgA.1 FR2 for SSB-based contention based random access in FR2.
- MsgA.2 FR2 for SSB-based non-contention based random access in FR2.

Table A.7A.2-1 Parameters for MsgA Configurations for FR2

Field	Value		Comment
MsgA Configuration	MsgA.1 FR2	MsgA.2 FR2	
msgA-prach-ConfigurationIndex	190	190	Preamble Format C2, 10ms PRACH periodicity and other detailed configuration defined in table 6.3.3.2-2 in TS 38.211 [7].
msgA-SubcarrierSpacing	Same as UL carrier SCS	Same as UL carrier SCS	
msgA-totalNumberOfRA-Preambles	48	48	Total number of preambles used for contention based and contention free random access
numberOfRA-PreamblesGroupA	48	48	No group B.
msgA-PRACH-RootSequenceIndex	0	0	Logic sequence index = 0, resulting in root sequence = 1.
msgA-SSB-perRACH-OccasionAndCB-PreamblesPerSSB	oneFourth, n48	oneFourth	OneFourth: 1 SSB associated with 4 RACH occasions

msgA-RO-FDM	One	One	One PRACH transmission occasions FDMed in one time instance.
ra-ContentionResolutionTimer	sf48	-	48 sub-frames
msgA-PreamblePowerRampingStep	dB2	dB2	
msgA-PreambleReceivedTargetPower	dBm-120	dBm-120	
preambleTransMax	n6	n6	Max number of RA preamble transmission performed before declaring a failure is 6
msgB-ResponseWindow	sl10	sl10	10 slots
msgA-ZeroCorrelationZoneConfig	11	11	N-CS configuration, N_{CS} = 23
Backoff Parameter Index	2	2	20ms, as defined in table 7.2-1 in TS 38.321 [7].
ssb-ResourceList	-	ra-PreambleIndex = 50	Associated with SSB index 0. UE doesn't use ssb-ResourceList and BFR-SSB-Resource IEs at the same time. UE doesn't use this field if is transmitting CFRA to convey BFR.
BFR-SSB-Resource	-	ra-PreambleIndex = 50	Associated with SSB index 0. UE doesn't use ssb-ResourceList and BFR-SSB-Resource IEs at the same time. UE uses this field only if is transmitting CFRA to convey BFR
ra-ssb-OccasionMaskIndex	-	1	PRACH occasion index 1 is allowed
msgA-MCS	1	1	MCS index for MsgA PUSCH
nrofSlotsMsgA-PUSCH	1	1	Number of slots containing one or multiple PUSCH occasions
nrofMsgA-PO-PerSlot	1	1	Number of time domain PUSCH occasions in each slot
msgA-PUSCH-TimeDomainOffset	1	1	A single time offset with respect to the start of each PRACH slot, counted as the number of slots
PUSCH start symbol	0	0	
PUSCH allocation length	10	10	
mappingTypeMsgA-PUSCH	typeA	typeA	
nrofPRBs-PerMsgA-PO	2	2	Number of RBs per PUSCH occasion
nrofMsgA-PO-FDM	One	One	The number of MsgA PUSCH occasions FDMed in one time instance
msgA-DMRS-AdditionalPosition	pos1	pos1	Position for additional DM-RS
msgA-PUSCH-NrofPorts	1	1	Configure 1 port per CDM group
msgA-DeltaPreamble	3	3	Power offset of msgA PUSCH relative to the preamble received target power
msgA-Alpha	alpha1	alpha1	Alpha value for MsgA PUSCH. Set 1
deltaMCS	Disabled	Disabled	Whether to apply delta MCS
NOTE: For further information see clause 6.3.2 in TS 38.331 [13].			

A.8 Reference BWP configurations

This clause provides the typical BWP configurations used for RRM test cases defined in this test specification. For downlink BWP, both initial BWP and dedicated BWP configurations are specified in clause A.8.1 and for uplink BWP, dedicated BWP configurations are specified in clause A.8.2. Parameters not listed in this clause can be derived from the configuration of each test.

A.8.1 Downlink BWP configurations

Table A.8.1-1 defines the different downlink initial BWP configurations. Table A.8.1-2 defines the different downlink dedicated BWP configurations.

Table A.8.1-1: Downlink BWP patterns for initial BWP configuration

BWP Parameters	Unit	Values

DL BWP		DLBWP.0.1	DLBWP.0.2	
Starting PRB index		0	RB_c Note 1	
Bandwidth		Same as RF channel defined in each test	same as RMSI CORSET(CORE SET #0) defined in each test	
NOTE 1: RB_c is the lowest PRB index to guarantee the BWP including CORESET #0 which is defined in Clause A.1.2.				

Table A.8.1-2: Downlink BWP patterns for dedicated BWP configuration

BWP Parameters	Unit	Values											
DL BWP		DLBWP.1.1	DLBWP.1.2				DLBWP.1.3				DLBWP.1.4		
Starting PRB index		0	RB_b Note 1				RB_a Note 2				0		
SSB SCS	kHz		15	30	120	240	15	30	120	240	120	240	
Bandwidth	RB	Same as RF channel defined for the serving cell in each test	25	51	32	48	25	51	32	48	24	24	
NOTE 1: RB_b is the lowest PRB index to guarantee the BWP not fully overlapped with SSB PRB index (RBJ, RBJ+1,…., RBJ+19) which is defined in Clause A.3. NOTE 2: RB_a is the lowest PRB index to guarantee the BWP including SSB PRB index (RBJ, RBJ+1,…., RBJ+19) which is defined in Clause A.3.													

A.8.2 Uplink BWP configurations

Table A.8.2-1 defines the uplink initial BWP configurations. Table A.8.2-2 defines the uplink dedicated BWP configurations.

Table A.8.2-1: Uplink BWP patterns for initial BWP configurations

BWP Parameters	Values	
UL BWP	ULBWP.0.1	ULBWP.0.2
Staring PRB index	0	RB_c Note 1
Bandwidth	Same as RF channel defined in each test	same as RMSI CORESET(CORSET #0) defined in each test
NOTE 1: RBc is the lowest PRB index to guarantee the BWP including CORESET #0 which is defined in Clause A.1.2.		

Table A.8.2-2: Uplink BWP patterns for dedicated BWP configurations

BWP Parameters	Unit	Values											
UL BWP		ULBWP.1.1	ULBWP.1.2				ULBWP.1.3				ULBWP.1.4		
Staring PRB index		0	RB_b Note 1				RB_a Note 2				0		
SSB SCS	kHz		15	30	120	240	15	30	120	240	120	240	
Bandwidth	RB	Same as RF channel defined for the serving cell in each test	25	51	32	48	25	51	32	48	24	24	
NOTE 1: RB_b is the lowest PRB index to guarantee the BWP not fully overlapped with SSB PRB index (RBJ, RBJ+1,…., RBJ+19) which is defined in Clause A.3. NOTE 2: RB_a is the lowest PRB index to guarantee the BWP including SSB PRB index (RBJ, RBJ+1,…., RBJ+19) which is defined in Clause A.3.													

A.8A Reference BWP configurations for RedCap

This clause provides the typical BWP configurations used for RedCap RRM test cases defined in Annex A. RedCap downlink dedicated BWP configurations are specified in clause A.8A.1 and RedCap uplink dedicated BWP configurations are specified in clause A.8A.2. Other parameters not listed in this clause can be derived from the set up of each test.

A.8A.1 Downlink BWP configurations

Table A.8A.1-1: Downlink BWP patterns for RedCap dedicated BWP configuration

BWP Parameters	Unit	Values											
DL BWP		DLBWP.1.1 RedCap				DLBWP.1.2 RedCap				DLBWP.1.3 RedCap			
Starting PRB index		RB_a Note 1				RB_b Note 2				RB_c Note 3			
SSB SCS	kHz	15	30	120	240	15	30	120	240	15	30	120	240
Bandwidth	RB	25	51	32	16	25	51	32	16	25	51	32	16
NOTE 1: RB_a is the lowest PRB index to guarantee the BWP including SSB PRB index (RB_J, RB_{J+1},…., RB_{J+19}) which is defined in Clause A.3.													
NOTE 2: RB_b is the lowest PRB index to guarantee the BWP not fully overlapped with SSB PRB index (RB_J, RB_{J+1},…., RB_{J+19}) which is defined in Clause A.3.													
NOTE 3: RB_c is the lowest PRB index to guarantee the BWP including SSB PRB index (RB_J, RB_{J+1},…., RB_{J+19}) which is defined in Clause A.3A.													

A.8A.2 Uplink BWP configurations

Table A.8A.2-1: Uplink BWP patterns for dedicated BWP configurations

BWP Parameters	Unit	Values											
UL BWP		ULBWP.1.1 RedCap				ULBWP.1.2 RedCap				ULBWP.1.3 RedCap			
Starting PRB index		RB_a Note 1				RB_b Note 2				RB_c Note 3			
SSB SCS	kHz	15	30	120	240	15	30	120	240	15	30	120	240
Bandwidth	RB	25	51	32	16	25	51	32	16	25	51	32	16
NOTE 1: RB_a is the same as RB_a for DLBWP.1.1 RedCap.													
NOTE 2: RB_b is the same as RB_b for DLBWP.1.2 RedCap.													
NOTE 3: RB_c is the same as RB_c for DLBWP.1.3 RedCap.													

A.9 Angle of Arrival (AoA) for FR2 RRM test cases

This clause specifies the AoA setups for FR2 RRM test cases in clause 5 and 7. The applicable AoA setup is defined in each test case in clause 5 and 7.

A.9.1 Setup 1: Single AoA in Rx beam peak direction

There is only one active probe in the test. The DL signals, and noise if applicable, transmitted from the probe, are aligned to the UE Rx beam peak direction (as defined in TS 38.101-2 [3]).

A.9.2 Setup 2: Single AoA in non Rx beam peak direction

A.9.2.1 Setup 2a: Single AoA in non Rx beam peak direction without change in direction

There is only one active probe in the test. The DL signals, and noise if applicable, transmitted from the probe, align to a direction (AoA) which is from the set of directions corresponding to the EIS spherical coverage percentile of the DUT as defined in clause 7.3.4 of TS 38.101-2 [3] for each UE power class. The direction (AoA) of the signals shall not be changed between test iterations.

A.9.2.2 Setup 2b: Single AoA in non Rx beam peak direction with change in direction

There is only one active probe in the test. The DL signals, and noise if applicable, transmitted from the probe, align to a direction (AoA) which is from the set of directions corresponding to the EIS spherical coverage percentile of the DUT as defined in clause 7.3.4 of TS 38.101-2 [3] for each UE power class. For UE power class 3, the direction (AoA) of the signals shall be changed for each test iteration (for UE power classes other than 3, this is FFS). Unless otherwise

specified by the test case, the TE shall alternate between a minimum of 33 different AoAs. The minimum separation between AoAs used in consecutive iterations shall be 30° in great-circle distance.

NOTE: if it is not possible to find at least 33 different test points meeting the required criteria (FFS), the test shall alternate between all the available test points.

A.9.3 Setup 3: 2 AoAs

There are 2 active probes in the test. The DL signals, and noise if applicable, transmitted from the two active probes, align to directions (AoAs) which are from the set of directions corresponding to the EIS spherical coverage percentile of the DUT as defined in clause 7.3.4 of TS 38.101-2 [3] for each UE power class. The relative angular offset between the directions (AoAs) of the 2 active probes, shall be changed for each test iteration. Unless otherwise specified by the test case, the TE shall alternate between a minimum of 33 different test points. A test point comprehends the relative angular offset between the active probes, and the AoA of each of the signals from the UE point of view. The relative angular offset between the active probes shall change for consecutive test points.

The applicable set of relative angular offsets between the 2 active probes is given in Table A.9.3-1 for each UE power class.

Table A.9.3-1: Set of relative angular offsets between active probes for each power class

UE Power class	Relative angular offset between active probes
1	FFS
2	FFS
3	30°, 60°, 90°, 120° and 150°
4	FFS

NOTE: if it is not possible to find at least 33 different test points meeting the required criteria (that is, the two AoAs are from the set of directions corresponding to the EIS spherical coverage percentile of the DUT as defined in clause 7.3.4 of TS 38.101-2 [3] and the angular offset between them corresponds to one of the offsets in Table A.9.3-1 for the corresponding UE power class), the test shall alternate between all the available test points.

A.9.4 Setup 4: 2 AoAs, 1 AoA in Rx beam peak direction, 1 in non Rx beam peak

A.9.4.1 Setup 4a: 2 AoAs, 1 AoA in Rx beam peak direction, 1 in non Rx beam peak without change in direction

There are 2 active probes in the test. The DL signals, and noise if applicable, are transmitted from the two active probes. One probe is aligned to the UE Rx beam peak direction as defined in TS 38.101-2 [3]. The second is aligned to a direction (AoA) which is from the set of directions corresponding to the EIS spherical coverage percentile of the DUT as defined in clause 7.3.4 of TS 38.101-2 [3] for each UE power class. The direction (AoA) of the non Rx beam peak signal shall not be changed between test iterations.

A.9.4.2 Setup 4b: 2 AoAs, 1 AoA in Rx beam peak direction, 1 in non Rx beam peak with change in direction

There are 2 active probes in the test. The DL signals, and noise if applicable, are transmitted from the two active probes. One probe is aligned to the UE Rx beam peak direction as defined in TS 38.101-2 [3]. The second is aligned to a direction (AoA) which is from the set of directions corresponding to the EIS spherical coverage percentile of the DUT as defined in clause 7.3.4 of TS 38.101-2 [3] for each UE power class.

For UE power class 3, the relative angular offset between the directions (AoAs) of the 2 active probes shall be changed for each test iteration, within the probe alignment described above. The applicable set of relative angular offsets between the 2 active probes is given in Table A.9.3-1 for each UE power class. Unless otherwise specified by the test case, the TE shall alternate between a minimum of 5 different test points. A test point comprehends the relative angular offset between the active probes, and the AoA of each of the signals from the UE point of view, one of them being the Rx beam peak direction. The relative angular offset between the active probes shall change for consecutive test points.

NOTE: if it is not possible to find at least 5 different test points meeting the required criteria (that is, the two AoAs are from the set of directions corresponding to the EIS spherical coverage percentile of the DUT as defined in clause 7.3.4 of TS 38.101-2 [3] and the angular offset between them corresponds to one of the offsets in Table A.9.3-1 for the corresponding UE power class), the test shall alternate between all the available test points.

A.10 TCI State Configuration

A.10.1 Introduction

This clause provides the configurations for TCI states towards either SSB or CSI-RS. The TCI states defined in this clause are configured in each test when applicable to indicate that certain DL signals are quasi-collocated with the referenceSignal configured in the TCI states.

A.10.2 TCI states

Table A.10.2-1: TCI States

Parameter	TCI.State.0	TCI.State.1	TCI.State.2	TCI.State.3
tci-StateId	Id0	Id1	Id2	Id3
qcl-Type1	typeC	typeC	typeA	typeA
qcl-Type2[Note1]	typeD	typeD	typeD	typeD
referenceSignal	SSB0	SSB1	Resource #4 in TRS resource set 1 [Note3]	Resource #4 in TRS resource set 2 [Note3]
NOTE 1: qcl-Type2 of typeD only where applicable. For RRM test cases, this will be only in FR2 NOTE 2: referenceSignal configurations towards which the TCI states are configured are defined in a test-specific manner. NOTE 3: Reference TRS resource sets are defined in A.3.17, and the applicable TRS resource set(s) are specified in each test case. When a single TRS resource set is configured in a test case, it is considered as resource set 1.				

A.11 NR sidelink communication

A.11.1 Introduction

This clause also defines the principle and the reference configurations that are applicable to test cases verifying RRM core requirements for V2X sidelink communication.

A.11.2 Reference resource pool configurations for NR Sidelink Communication

Table A.11.2-1: NR sidelink SL-BWP configuration

Field	Value	Comment
SL-BWP-ConfigCommon-r16		
sl-BWP-Generic-r16		
sl-LengthSymbols-r16	sym14	All 14 symbols in a slot without S-SSB are used for sidelink
sl-StartSymbol-r16	sym0	Symbol #0 is the starting symbol used for sidelink in a slot without S-SSB
sl-BWP-PoolConfigCommon-r16		
sl-RxPool-r16		Indicates the resource pool for reception on the configured BWP. 1 entry
SL-ResourcePool-r16[1]	Set according to Table A.11.2-2	Entry 1
sl-TxPoolSelectedNormal-r16		Indicates the resources pool for mode 2 sidelink communication on the configured BWP. 1 entry

SL-ResourcePoolConfig-r16[1]		Entry 1
sl-ResourcePool-r16	Set according to Table A.11.2-3	
sl-TxPoolExceptional-r16	Not present	

Table A.11.2-2:NR sidelink resource pool configuration

Field	Value	Comment
SL-ResourcePool-r16		
sl-PSCCH-Config-r16	Set according to Table A.11.3-1	
sl-PSSCH-Config-r16	Set according to Table A.11.3-2	
sl-PSFCH-Config-r16	Not present	
sl-SyncAllowed-r16		Indicates the allowed synchronization reference(s) which is (are) allowed to use the configured resource pool.
gnss-Sync-r16	true	
gnbEnb-Sync-r16	true	
ue-Sync-r16	true	
sl-SubchannelSize-r16	n10	Subchannel bandwidth is 10 RB
sl-StartRB-Subchannel-r16	0	The offset of lowest RB index of the subchannel with the lowest index in the resource pool with respect to the lowest RB index of a SL BWP
sl-NumSubchannel-r16	1	Number of subchannels for SL transmission
sl-UE-SelectedConfigRP-r16		
sl-Thres-RSRP-List-r16	Set according to the specific test configuration	Indicates a list of 64 thresholds, and the threshold should be selected based on the priority in the decoded SCI and the priority in the SCI to be transmitted. A resource is excluded if it is indicated or reserved by a decoded SCI and PSSCH RSRP in the associated data resource is above a threshold.
sl-MultiReserveResource-r16	Not present	
sl-MaxNumPerReserve-r16	n2	At most 2 PSCCH/PSSCH resources can be reserved by a single SCI.
sl-SensingWindow-r16	ms100	Length of resource sensing window specified in TS 38.214 [9] subclause 8.1.4. which is 100ms.
sl-SelectionWindowList-r16		Parameter that determines the end of the selection window for each priority level 8 entries
SL-SelectionWindowConfig-r16[k,k=1..8]		entry k
sl-Priority-r16	k	priority k
sl-SelectionWindow-r16	n20	Length of resource selection window specified in TS 38.214 [9] subclause 8.1.4. which is $20 \cdot 2^{\mu}$slots, where μ=0,1,2,3 refers to SCS 15,30,60,120 kHz respectively
sl-ResourceReservePeriodList-r16	Not present	
sl-RS-ForSensing-r16	pssch	PSSCH-RSRP measurement is used in the sensing operation.
sl-RxParametersNcell	Not present	
sl-ZoneConfigMCR-List-r16	Not present	
sl-PreemptionEnable-r16	enabled	
sl-MinMaxMCS-List-r16		1 entry
SL-MinMaxMCS-Config-r16[1]		Entry 1
sl-MCS-Table-r16	qam64	TS 38.214 [9] Table 5.1.3.1-1 is the MCS table used in the resource pool.
sl-TimeResource-r16	11111111111111 111111	Every slot in a period of 20 slots during a SFN or DFN cycle can be used for sidelink

Table A.11.3-3: NR sidelink UE autonomous resource selection configuration

Field	Value	Comment
SL-UE-SelectedConfig-r16		
sl-PSSCH-TxConfigList-r16		1 entry
SL-PSSCH-TxConfig-r16[1]		Entry 1
sl-TypeTxSync-r16	Not present	When this filed is absent, the configuration is applicable for all synchronization reference types.
sl-ThresUE-Speed-r16	kmph200	UE shall apply the parameters in sl-ParametersAboveThres-r16 if UE absolute speed is higher than 200 km/h, otherwise UE shall apply the parameters in sl-ParametersBelowThres-r16
sl-ParametersAboveThres-r16		
sl-MinMCS-PSSCH-r16	0	The minimum MCS index value can be used for PSSCH transmission.
sl-MaxMCS-PSSCH-r16	15	The maximum MCS index value can be used for PSSCH transmission.
sl-MinSubChannelNumPSSCH-r16	1	The minimum number of subchannels can be used for PSSCH transmission.
sl-MaxSubchannelNumPSSCH-r16	1	The maximum number of subchannels can be used for PSSCH transmission.
sl-MaxTxTransNumPSSCH-r16	1	The maximum transmission number for PSSCH (including new transmission and retransmission).
sl-MaxTxPower-r16	Not present	Not applicable
sl-ParametersBelowThres-r16		
sl-MinMCS-PSSCH-r16	4	Same as above
sl-MaxMCS-PSSCH-r16	25	Same as above
sl-MinSubChannelNumPSSCH-r16	1	Same as above
sl-MaxSubchannelNumPSSCH-r16	1	Same as above
sl-MaxTxTransNumPSSCH-r16	1	Same as above
sl-MaxTxPower-r16	Not present	Same as above
sl-ProbResourceKeep-r16	v0dot8	The probability of UE keeping current resource is 80% when the resource reselection counter reaches 0 (see TS 38.321 [12]).
sl-ReselectAfter-r16	n1	Resource reselection is triggered after 1 sidelink transmission is skipped (see TS 38.321 [12]).

A.11.3 Reference measurement channels for NR Sidelink Communication

Table A.11.3-1: PSCCH Reference Measurement Channels

Parameter		Unit	Value
Reference channel			CC.1A HD
Channel bandwidth		MHz	Note2
Number of PSCCH symbols per slot			2
Number of PSCCH RB			10
Modulation			QPSK
Information Bit Payload (without CRC)		Bits	26
Information Bit	Number of DMRS ports		0 (1 port)
	Priority		As set by higher layers
	Resource reservation period		N/A
	Modulation and coding scheme		Set as the PSSCH MCS specified in the test
	DMRS pattern		0 (2 DMRS)
	2nd stage SCI format		00 (SCI format 2-A)
	Beta offset indicator		Set as specified in the test

	Frequency resource assignment		Set as per PSSCH RB allocation specific in the test
	Time resource assignment		Set as per PSSCH slot allocation specific in the test
	Reserved bits		Set all these bits to 0
Transport block CRC		Bits	24
Binary Channel Bits (Note 1)		Bits	360
Note 1: Binary channel bits calculated under assumption of 2 CP-OFDM symbols per subframe. Note 2: Channel bandwidth depends on test configuration.			

Table A.11.3-2: PSSCH Reference Measurement Channels

Parameter	Unit	Value
Reference channel		CD.1A HD
Sidelink transmission mode		2
Channel bandwidth	MHz	Note1
Allocated PSSCH resource blocks		10
Number of PSSCH symbols per slot		10
Modulation		QPSK
Target Code Rate		1/3
Information Bit Payload (Transport block size)	Bits	672
Transport block CRC	Bits	24
Number of PSSCH HARQ retransmissions		0
Binary Channel Bits	Bits	2160
Note 1: Channel bandwidth depends on test configuration. Note 2: 2nd state SCI and PSFCH are not allocated per slot.		

A.12 Discovery Burst Transmission Window configuration under CCA

A.12.1 DBT Window pattern 1: DBT Window period = 20 ms with DBT Window duration = 1 ms

Table A.12.1-1: DBT.1: DBT Window Pattern 1 for DBT Window period = 20 ms and duration = 1 ms

SMTC Parameters	Values
Discovery burst transmission window periodicity	20 ms
Discovery burst transmission window offset	0 ms
Discovery burst transmission window duration	1 ms

A.13 Channel bandwidth (CBW) configurations

A.13.1 DL UE specific CBW

Table A.13.1-1: DL CBW patterns for UE specific CBW configuration

BWP Parameters	Unit	Values	
Reference CBW		DLCBW.1.1	DLCBW.1.2
OffsetToCarrier	RB	0	RB_x Note 1
carrierBandwidth	RB	Same as RF channel defined in each test	Same as RF channel defined in each test
Note 1: RB_x is offset in frequency domain between Point A (lowest subcarrier of common RB 0) and the lowest usable subcarrier on this carrier. Note that RB_x has to be within the CBW of BS.			

A.13.2 UL UE specific CBW

Table A.13.2-1: UL CBW patterns for UE specific CBW configuration

BWP Parameters	Unit	Values	
Reference CBW		ULCBW.1.1	ULCBW.1.2
OffsetToCarrier	RB	0	RB_x Note 1
carrierBandwidth	RB	Same as RF channel defined in each test	Same as RF channel defined in each test
Note 1: RB_x is offset in frequency domain between Point A (lowest subcarrier of common RB 0) and the lowest usable subcarrier on this carrier. Note that RB_x has to be within the CBW of BS.			

Annex B (normative): Conditions for RRM requirements applicability for operating bands

B.1 Conditions for NR RRC_IDLE state mobility

B.1.1 Introduction

In Annex B.1, the following conditions are specified:

- UE conditions which shall apply for UE intra-frequency idle state mobility test cases in clauses 6.1 and 7.1,
- UE conditions which shall apply for UE inter-frequency idle state mobility test cases in clauses 6.1 and 7.1.
- UE conditions which shall apply for RedCap UE intra-frequency idle state mobility test cases in clauses 16.1 and 17.1.
- UE conditions which shall apply for RedCap UE inter-frequency idle state mobility test cases in clauses 16.1 and 17.1.

B.1.2 Conditions for measurements on NR intra-frequency cells for cell re-selection

Editor's notes for Table B.1.2-2 (RAN4 dependant):

- The value of Y for Power classes 1 and 4 is FFS, where Y_1 and Y_4 are the rough/fine beam gain differences in Rx beam peak direction for Power classes 1 and 4 respectively
- The value of Z for Power classes 1 and 4 is FFS, where Z_1 and Z_4 are the rough/fine beam gain differences in spherical coverage directions for Power classes 1 and 4 respectively

This clause defines the following conditions for NR intra-frequency measurements performed based on SSBs for cell re-selection: SSB_RP and SSB Ês/Iot, applicable for a corresponding operating band.

The conditions are defined in Table B.1.2-1 for FR1 NR cells.

The conditions are defined in Table B.1.2-2 for FR2 NR cells.

Table B.1.2-1: Conditions for intra-frequency cell re-selection in FR1

Parameter	NR operating band groups Note1	Minimum SSB_RP		SSB Ês/Iot
		dBm / SCS_{SSB}		dB
		SCS_{SSB} = 15 kHz	SCS_{SSB} = 30 kHz	
Conditions	NR_FDD_FR1_A, NR_TDD_FR1_A	-124	-121	≥ -4
	NR_FDD_FR1_B	-123.5	-120.5	
	NR_TDD_FR1_C	-123	-120	
	NR_FDD_FR1_D, NR_TDD_FR1_D	-122.5	-119.5	
	NR_FDD_FR1_E, NR_TDD_FR1_E	-122	-119	
	NR_FDD_FR1_G	-121	-118	
	NR_FDD_FR1_H	-120.5	-117.5	
NOTE 1: NR operating band groups are defined in Clause 3A.4.				

Table B.1.2-2: Conditions for intra-frequency cell re-selection in FR2

Parameter	Angle of arrival	NR operating bands	Minimum SSB_RP Note 2, Note 3					SSB Ês/Iot
			dBm / SCS_{SSB}					dB
			SCS_{SSB} = 120 kHz				SCS_{SSB} = 240 kHz	
			UE Power class				UE Power class	
			1	2	3	4	1, 2, 3, 4	

Conditions	Rx Beam Peak	n257	-125.3+Y[1]	-110.8	-109.1	-124.8+Y[4]	(Value for SCS_{SSB} = 120 kHz) +3dB	≥-4
		n258	-125.3+Y[1]	-110.8	-109.1	-124.8+Y[4]		
		n259			-105.5			
		n260	-122.3+Y[1]		-106.5	-122.8+Y[4]		
		n261	-125.3+Y[1]	-110.8	-109.1	-124.8+Y[4]		
	Spherical coverage Note 1	n257	-117.3+Z[1]	-99.8	-98.2	-115.8+Z[4]	(Value for SCS_{SSB} = 120 kHz) +3dB	≥-4
		n258	-117.3+Z[1]	-99.8	-98.2	-115.8+Z[4]		
		n259			-92.7			
		n260	-114.3+Z[1]		-93.9	-110.8+Z[4]		
		n261	-117.3+Z[1]	-99.8	-98.2	-115.8+Z[4]		

NOTE 1: Values based on EIS spherical coverage as defined in clause 7.3.4 of TS 38.101-2 [19]. Side condition applies for directions in which EIS spherical coverage requirement is met.
NOTE 2: Values specified at the Reference point to give minimum SSB Ês/Iot, with no applied noise.
NOTE 3: For UEs that support multiple FR2 bands, Rx Beam Peak values are increased by $\Delta MB_{P,n}$ and Spherical coverage values are increased by $\Delta MB_{S,n}$, the UE multi-band relaxation factor in dB specified in clause 6.2.1 of TS 38.101-2 [19].

B.1.3 Conditions for measurements on NR inter-frequency cells for cell re-selection

This clause defines the following conditions for NR inter-frequency measurements performed based on SSBs for cell re-selection: SSB_RP and SSB Ês/Iot, applicable for a corresponding operating band.

The conditions defined in Table B.1.2-1 for FR1 NR intra-frequency cell re-selection shall also apply for FR1 NR inter-frequency cells in this clause.

The conditions defined in Table B.1.2-2 for FR2 NR intra-frequency cell re-selection shall also apply for FR2 NR inter-frequency cells in this clause.

B.1.4 Conditions for measurements on NR intra-frequency cells for cell re-selection for RedCap

This clause defines the following conditions for RedCap NR intra-frequency measurements performed based on SSBs for cell re-selection: SSB_RP and SSB Ês/Iot, applicable for a corresponding operating band.

The conditions are defined in Table B.1.4-1 and Table B.1.4-2 for 1 Rx and 2 Rx RedCap respectively for FR1 NR cells.

The conditions are defined in Table B.1.4-3 for FR2 NR cells.

Table B.1.4-1: Conditions for intra-frequency cell re-selection in FR1 for RedCap for 2Rx

Parameter	NR operating band groups Note1	Minimum SSB_RP		SSB Ês/Iot
		dBm / SCS_{SSB}		dB
		SCS_{SSB} = 15 kHz	SCS_{SSB} = 30 kHz	

Conditions	NR_FDD_RC_FR1_A, NR_TDD_RC_FR1_A	-124	-121	≥ -4
	NR_FDD_RC_FR1_B	-123.5	-120.5	
	NR_FDD_ RC_FR1_C NR_TDD_RC_FR1_C	-123	-120	
	NR_FDD_RC_FR1_D, NR_TDD_RC_FR1_D	-122.5	-119.5	
	NR_FDD_RC_FR1_E, NR_TDD_RC_FR1_E	-122	-119	
	NR_FDD_RC_FR1_F	-121.5	-118.5	
	NR_FDD_RC_FR1_G	-121	-118	
	NR_FDD_RC_FR1_H	-120.5	-117.5	
NOTE 1: NR operating band groups are defined in 38.133 [6] clause 3.5.2.				

Table B.1.4-2: Conditions for intra-frequency cell re-selection in FR1 for RedCap for 1Rx

Parameter	**NR operating band groups** Note1	**Minimum SSB_RP**		**SSB Ês/Iot**
		dBm / SCS_{SSB}		**dB**
		SCS_{SSB} = 15 kHz	**SCS_{SSB} = 30 kHz**	
Conditions	NR_FDD_RC_FR1_A, NR_TDD_RC_FR1_A	TBD	TBD	≥ -4
	NR_FDD_RC_FR1_B	TBD	TBD	
	NR_FDD_ RC_FR1_C NR_TDD_RC_FR1_C	TBD	TBD	
	NR_FDD_RC_FR1_D, NR_TDD_RC_FR1_D	TBD	TBD	
	NR_FDD_RC_FR1_E, NR_TDD_RC_FR1_E	TBD	TBD	
	NR_FDD_RC_FR1_F	TBD	TBD	
	NR_FDD_RC_FR1_G	TBD	TBD	
	NR_FDD_RC_FR1_H	TBD	TBD	
NOTE 1: NR operating band groups are defined in clause 3.5.2.				

Table B.1.4-3: Conditions for intra-frequency cell re-selection in FR2 for RedCap

Parameter	**Angle of arrival**	**NR operating bands**	**Minimum SSB_RP** Note 2, Note 3							**SSB Ês/Iot**
			dBm / SCS_{SSB}							**dB**
			SCS_{SSB} = 120 kHz						**SCS_{SSB} = 240 kHz**	
			UE Power class							
			1	**2**	**3**	**4**	**5**	**7**	**1,2,3, 4,5,7**	
Conditions	Rx Beam Peak	n257	-125.3+Y_1	-110.8	-109.1	-124.8+Y_4	-120.4+Y_5	TBD	(Value for SCS_{SSB} = 120 kHz) +3dB	≥-4
		n258	-125.3+Y_1	-110.8	-109.1	-124.8+Y_4	-120.6+Y_5	TBD		
		n261	-125.3+Y_1	-110.8	-109.1	-124.8+Y_4		TBD		
	Spherical coverage Note 1	n257	-117.3+Z_1	-99.8	-98.2	-115.8+Z_4	-112.4+Z_5	TBD	(Value for SCS_{SSB} = 120 kHz) +3dB	≥-4
		n258	-117.3+Z_1	-99.8	-98.2	-115.8+Z_4	-112.6+Z_5	TBD		
		n261	-117.3+Z_1	-99.8	-98.2	-115.8+Z_4		TBD		

NOTE 1: Values based on EIS spherical coverage as defined in clause 7.3.4 of TS 38.101-2 [19]. Side condition applies for directions in which EIS spherical coverage requirement is met.
NOTE 2: Values specified at the Reference point to give minimum SSB Ês/Iot, with no applied noise.
NOTE 3: For UEs that support multiple FR2 bands, Rx Beam Peak values are increased by $\Delta MB_{P,n}$ and Spherical coverage values are increased by $\Delta MB_{S,n}$, the UE multi-band relaxation factor in dB specified in clause 6.2.1 of TS 38.101-2 [19].

Editor's notes for Table B.1.4-3 (RAN4 dependant):

- The value of Y for Power classes 1, 4 and 5 is FFS, where Y1, Y4 and Y5 are the rough/fine beam gain differences in Rx beam peak direction for Power classes 1, 4 and 5 respectively

- The value of Z for Power classes 1, 4 and 5 is FFS, where Z1, Z4 and Z5 are the rough/fine beam gain differences in spherical coverage directions for Power classes 1, 4 and 5 respectively

B.1.5 Conditions for measurements on NR inter-frequency cells for cell re-selection for RedCap

This clause defines the following conditions for NR inter-frequency measurements performed based on SSBs for cell re-selection: SSB_RP and SSB Ês/Iot, applicable for a corresponding operating band.

The conditions defined in Table B.1.4-1 and Table B.1.4-2 for 1 Rx and 2 Rx RedCap respectively for FR1 RedCap NR intra-frequency cell re-selection shall also apply for FR1 RedCap NR inter-frequency cells in this clause.

The conditions defined in Table B.1.4-3 for FR2 RedCap NR intra-frequency cell re-selection shall also apply for FR2 RedCap NR inter-frequency cells in this clause.

B.2 Conditions for NR RRC_CONNECTED state

B.2.1 Introduction

In Annex B.2, the following conditions are specified:

- UE conditions which shall apply for UE intra-frequency measurement procedures and measurement performance tests in clauses 4.6, 4.7, 5.6, 5.7, 6.6, 6.7, 7.6 and 7.7,

  UE conditions which shall apply for UE inter-frequency measurements procedures and requirements in Clause 9,

- UE conditions which shall apply for UE intra-frequency measurements performance requirements in Clause 10,

- UE conditions which shall apply for UE inter-frequency measurements performance requirements in Clause 10.

B.2.2 Conditions for NR intra-frequency measurements

Editor's notes for Table B.2.2-2 (RAN4 dependant):

- The value of Y for power classes 1 and 4 is FFS, where Y_1 and Y_4 are the rough/fine beam gain differences in Rx beam peak direction for power classes 1 and 4 respectively

- The value of Z for power classes 1 and 4 is FFS, where Z_1 and Z_4 are the rough/fine beam gain differences in spherical coverage directions for power classes 1 and 4 respectively

This clause defines the following conditions for NR intra-frequency measurements and corresponding procedures performed based on SSBs: SSB_RP and SSB Ês/Iot, applicable for a corresponding operating band.

The conditions are defined in Table B.2.2-1 for FR1 NR cells.

The conditions are defined in Table B.2.2-2 for FR2 NR cells.

Table B.2.2-1: Conditions for intra-frequency measurements in FR1

Parameter	NR operating band groups Note1	Minimum SSB_RP		SSB Ês/Iot
		dBm / SCS_{SSB}		dB
		SCS_{SSB} = 15 kHz	SCS_{SSB} = 30 kHz	
Conditions	NR_FDD_FR1_A, NR_TDD_FR1_A	-127	-124	≥ -6
	NR_FDD_FR1_B	-126.5	-123.5	
	NR_TDD_FR1_C	-126	-123	
	NR_FDD_FR1_D, NR_TDD_FR1_D	-125.5	-122.5	
	NR_FDD_FR1_E, NR_TDD_FR1_E	-125	-122	
	NR_FDD_FR1_G	-124	-121	
	NR_FDD_FR1_H	-123.5	-120.5	
NOTE 1: NR operating band groups are defined in Clause 3A.4.				

Table B.2.2-2: Conditions for intra-frequency measurements in FR2

Parameter	Angle of arrival	NR operating bands	Minimum SSB_RP Note 2, Note 3				SSB Ês/Iot
			dBm / SCS_{SSB}				
			SCS_{SSB} = 120 kHz			SCS_{SSB} = 240 kHz	dB
			UE power class			UE power class	
			1	2	3	4	1, 2, 3, 4
Conditions	Rx Beam Peak	n257	-128.3+Y_1	-113.8	-112.1	-127.8+Y_4	(Value for SCS_{SSB} = 120 kHz) +3dB	≥-6
		n258	-128.3+Y_1	-113.8	-112.1	-127.8+Y_4		
		n259			-108.5			
		n260	-125.3+Y_1		-109.5	-125.8+Y_4		
		n261	-128.3+Y_1	-113.8	-112.1	-127.8+Y_4		
	Spherical coverage Note 1	n257	-120.3+Z_1	-102.8	-101.2	-118.8+Z_4	(Value for SCS_{SSB} = 120 kHz) +3dB	≥-6
		n258	-120.3+Z_1	-102.8	-101.2	-118.8+Z_4		
		n259			-95.7			
		n260	-117.3+Z_1		-96.9	-113.8+Z_4		
		n261	-120.3+Z_1	-102.8	-101.2	-118.8+Z_4		
NOTE 1: Values based on EIS spherical coverage as defined in clause 7.3.4 of TS 38.101-2 [19]. Side condition applies for directions in which EIS spherical coverage requirement is met. NOTE 2: Values specified at the Reference point to give minimum SSB Ês/Iot, with no applied noise. NOTE 3: For UEs that support multiple FR2 bands, Rx Beam Peak values are increased by $\Delta MB_{P,n}$ and spherical coverage values are increased by $\Delta MB_{S,n}$ the UE multi-band relaxation factor in dB specified in clause 6.2.1 of TS 38.101-2 [19].								

B.2.3 Conditions for NR inter-frequency measurements

Editor's notes for Table B.2.3-2 (RAN4 dependant):

- The value of Y for power classes 1 and 4 is FFS, where Y_1 and Y_4 are the rough/fine beam gain differences in Rx beam peak direction for power classes 1 and 4 respectively

- The value of Z for power classes 1 and 4 is FFS, where Z_1, and Z_4 are the rough/fine beam gain differences in spherical coverage directions for power classes 1 and 4 respectively

This clause defines the following conditions for NR inter-frequency measurements and corresponding procedures performed based on SSBs: SSB_RP and SSB Ês/Iot, applicable for a corresponding operating band.

The conditions are defined in Table B.2.3-1 for FR1 NR cells.

The conditions are defined in Table B.2.3-2 for FR2 NR cells.

Table B.2.3-1: Conditions for inter-frequency measurements in FR1

Parameter	NR operating band groups Note1	Minimum SSB_RP		SSB Ês/Iot
		dBm / SCS_{SSB}		dB
		SCS_{SSB} = 15 kHz	SCS_{SSB} = 30 kHz	
Conditions	NR_FDD_FR1_A, NR_TDD_FR1_A	-125	-122	≥ -4
	NR_FDD_FR1_B	-124.5	-121.5	
	NR_TDD_FR1_C	-124	-121	
	NR_FDD_FR1_D, NR_TDD_FR1_D	-124.5	-120.5	
	NR_FDD_FR1_E, NR_TDD_FR1_E	-123	-120	
	NR_FDD_FR1_G	-122	-119	
	NR_FDD_FR1_H	-121.5	-118.5	
NOTE 1: NR operating band groups are defined in Clause 3A.4.				

Table B.2.3-2: Conditions for inter-frequency measurements in FR2

Parameter	Angle of arrival	NR operating bands	Minimum SSB_RP Note 2, Note 3		SSB Ês/Iot
			dBm / SCS_{SSB}		
			SCS_{SSB} = 120 kHz	SCS_{SSB} = 240 kHz	dB
			UE power class	UE power class	

			1	2	3	4	1, 2, 3, 4	
Conditions	Rx Beam Peak	n257	-126.3+Y_1	-111.8	-110.1	-125.8+Y_4	(Value for SCS_{SSB} = 120 kHz) +3dB	≥-4
		n258	-126.3+Y_1	-111.8	-110.1	-125.8+Y_4		
		n259			-106.5			
		n260	-123.3+Y_1		-107.5	-123.8+Y_4		
		n261	-126.3+Y_1	-111.8	-110.1	-125.8+Y_4		
	Spherical coverage Note 1	n257	-118.3+Z_1	-100.8	-99.2	-116.8+Z_4	(Value for SCS_{SSB} = 120 kHz) +3dB	≥-4
		n258	-118.3+Z_1	-100.8	-99.2	-116.8+Z_4		
		n259			-93.7			
		n260	-115.3+Z_1		-94.9	-111.8+Z_4		
		n261	-118.3+Z_1	-100.8	-99.2	-116.8+Z_4		
NOTE 1: Values based on EIS spherical coverage as defined in clause 7.3.4 of TS 38.101-2 [19]. Side condition applies for directions in which EIS spherical coverage requirement is met. NOTE 2: Values specified at the Reference point to give minimum SSB Ês/Iot, with no applied noise. NOTE 3: For UEs that support multiple FR2 bands, Rx Beam Peak values are increased by $\Delta MB_{P,n}$ and Spherical coverage values are increased by $\Delta MB_{S,n}$, the UE multi-band relaxation factor in dB specified in clause 6.2.1 of TS 38.101-2 [19].								

B.2.4 Conditions for NR L1-RSRP reporting

B.2.4.1 Conditions for SSB based L1-RSRP reporting

Editor's notes for Table B.2.4.1-2 (RAN4 dependant):

- The value of Y for power classes 1 and 4 is FFS, where Y_1 and Y_4 are the rough/fine beam gain differences in Rx beam peak direction for power classes 1 and 4 respectively

- The value of Z for power classes 1 and 4 is FFS, where Z_1 and Z_4 are the rough/fine beam gain differences in spherical coverage directions for power classes 1 and 4 respectively

This clause defines the following conditions for NR L1-RSRP measurement reporting and corresponding procedures performed based on SSBs: SSB_RP and SSB Ês/Iot, applicable for a corresponding operating band.

The conditions are defined in Table B.2.4.1-1 for FR1 NR cells.

The conditions are defined in Table B.2.4.1-2 for FR2 NR cells.

Table B.2.4.1-1: Conditions for SSB based L1-RSRP measurements in FR1

Parameter	NR operating band groups Note1	Minimum SSB_RP		SSB Ês/Iot
		dBm / SCS_{SSB}		dB
		SCS_{SSB} = 15 kHz	SCS_{SSB} = 30 kHz	
Conditions	NR_FDD_FR1_A, NR_TDD_FR1_A, NR_SDL_FR1_A	-124	-121	≥ -3
	NR_FDD_FR1_B	-123.5	-120.5	
	NR_TDD_FR1_C	-123	-120	
	NR_FDD_FR1_D, NR_TDD_FR1_D	-122.5	-119.5	
	NR_FDD_FR1_E, NR_TDD_FR1_E	-122	-119	
	NR_FDD_FR1_G	-121	-118	
	NR_FDD_FR1_H	-120.5	-117.5	
NOTE 1: NR operating band groups are defined in clause 3A.4				

Table B.2.4.1-2: Conditions for SSB based L1-RSRP measurements in FR2

Parameter	Angle of arrival	NR operating bands	Minimum SSB_RP Note 2, Note 3					SSB Ês/Iot
			dBm / SCS_{SSB}					dB
			SCS_{SSB} = 120 kHz				SCS_{SSB} = 240 kHz	
			UE power class				UE power class	
			1	2	3	4	1, 2, 3, 4	
Conditions	Rx Beam Peak	n257	-125.3+Y_1	-110.8	-109.1	-124.8+Y_4	(Value for SCS_{SSB} = 120 kHz) +3dB	≥-3
		n258	-125.3+Y_1	-110.8	-109.1	-124.8+Y_4		
		n259			-105			
		n260	-122.3+Y_1		-106.5	-122.8+Y_4		

		n261	-125.3+Y_1	-110.8	-109.1	-124.8+Y_4		
	Spherical coverage Note 1	n257	-117.3+Z_1	-99.8	-98.2	-115.8+Z_4	(Value for SCS_{SSB} = 120 kHz) +3dB	≥-3
		n258	-117.3+Z_1	-99.8	-98.2	-115.8+Z_4		
		n259			-92.3			
		n260	-114.3+Z_1		-93.9	-110.8+Z_4		
		n261	-117.3+Z_1	-99.8	-98.2	-115.8+Z_4		
NOTE 1: Values based on EIS spherical coverage as defined in clause 7.3.4 of TS 38.101-2 [19]. Side condition applies for directions in which EIS spherical coverage requirement is met. NOTE 2: Values specified at the Reference point to give minimum SSB Ês/Iot, with no applied noise. NOTE 3: For UEs that support multiple FR2 bands, Rx Beam Peak values are increased by $\Delta MB_{P,n}$ and Spherical coverage values are increased by $\Delta MB_{S,n}$, the UE multi-band relaxation factor in dB specified in clause 6.2.1 of TS 38.101-2 [19].								

B.2.4.2 Conditions for CSI-RS based L1-RSRP reporting

Editor's notes for Table B.2.4.2-2 (RAN4 dependant):

- The value of Y for power classes 1 and 4 is FFS, where Y_1 and Y_4 are the rough/fine beam gain differences in Rx beam peak direction for power classes 1 and 4 respectively

- The value of Z for power classes 1 and 4 is FFS, where Z_1 and Z_4 are the rough/fine beam gain differences in spherical coverage directions for power classes 1 and 4 respectively

This clause defines the following conditions for NR L1-RSRP measurement reporting and corresponding procedures performed based on CSI-RS: CSI-RS_RP and CSI-RS Ês/Iot, applicable for a corresponding operating band.

The conditions are defined in Table B.2.4.2-1 for FR1 NR cells.

The conditions are defined in Table B.2.4.2-2 for FR2 NR cells.

Table B.2.4.2-1: Conditions for CSI-RS based L1-RSRP measurements in FR1

Parameter	NR operating band groups Note1	Minimum CSI-RS_RP			CSI-RS Ês/Iot
		dBm / SCS_{CSI-RS}			dB
		SCS_{CSI-RS} = 15 kHz	SCS_{CSI-RS} = 30 kHz	SCS_{CSI-RS} = 60 kHz	
Conditions	NR_FDD_FR1_A, NR_TDD_FR1_A, NR_SDL_FR1_A	-124	-121	-118	≥ -3
	NR_FDD_FR1_B	-123.5	-120.5	-117.5	
	NR_TDD_FR1_C	-123	-120	-117	
	NR_FDD_FR1_D, NR_TDD_FR1_D	-122.5	-119.5	-116.5	
	NR_FDD_FR1_E, NR_TDD_FR1_E	-122	-119	-116	
	NR_FDD_FR1_G	-121	-118	-115	
	NR_FDD_FR1_H	-120.5	-117.5	-114.5	
NOTE 1: NR operating band groups are defined in clause 3.5.2.					

Table B.2.4.2-2: Conditions for CSI-RS based L1-RSRP measurements in FR2

Parameter	Angle of arrival	NR operating bands	Minimum CSI-RS_RP Note 2, Note 3					CSI-RS Ês/Iot
			dBm / SCS_{CSI-RS}					dB
			SCS_{CSI-RS} = 60 kHz				SCS_{CSI-RS} = 120 kHz	
			UE power class				UE power class	
			1	2	3	4	1, 2, 3, 4	
Conditions	Rx Beam Peak	n257	-128.3+Y_1	-113.8	-112.1	-127.8+Y_4	(Value for SCS_{CSI-RS} = 60 kHz) +3dB	≥-3
		n258	-128.3+Y_1	-113.8	-112.1	-127.8+Y_4		
		n259			-108.5			
		n260	-125.3+Y_1		-109.5	-125.8+Y_4		
		n261	-128.3+Y_1	-113.8	-112.1	-127.8+Y_4		
	Spherical coverage	n257	-120.3+Z_1	-102.8	-101.2	-118.8+Z_4	(Value for SCS_{CSI-RS} = 60	≥-3
		n258	-120.3+Z_1	-102.8	-101.2	-118.8+Z_4		

	Note 1	n259			-95.7		kHz) +3dB	
		n260	-117.3+Z_1		-96.9	-113.8+Z_4		
		n261	-120.3+Z_1	-102.8	-101.2	-118.8+Z_4		
NOTE 1: Values based on EIS spherical coverage as defined in clause 7.3.4 of TS 38.101-2 [19]. Side condition applies for directions in which EIS spherical coverage requirement is met. NOTE 2: Values specified at the Reference point to give minimum CSI-RS Ês/Iot, with no applied noise. NOTE 3: For UEs that support multiple FR2 bands, Rx Beam Peak values are increased by $\Delta MB_{P,n}$ and Spherical coverage values are increased by $\Delta MB_{S,n}$, the UE multi-band relaxation factor in dB specified in clause 6.2.1 of TS 38.101-2 [19].								

B.2.5 Conditions for RRC connection release with redirection to NR

Editor's notes for Table B.2.5.2-2:

- The value of Y for power classes 1 and 4 is FFS, where Y_1 and Y_4 are the rough/fine beam gain differences in Rx beam peak direction for power classes 1 and 4 respectively

- The value of Z for power classes 1 and 4 is FFS, where Z_1 and Z_4 are the rough/fine

This clause defines the following conditions for RRC connection release with redirection to NR: SSB_RP and SSB Ês/Iot, applicable for a corresponding operating band.

The conditions are defined in Table B.2.5-1 for FR1 NR cells.

The conditions are defined in Table B.2.5-2 for FR2 NR cells.

Table B.2.5-1: Conditions for RRC connection release with redirection to NR in FR1

Parameter	NR operating band groups Note1	Minimum SSB_RP dBm / SCS_{SSB}		SSB Ês/Iot dB
		SCS_{SSB} = 15 kHz	SCS_{SSB} = 30 kHz	
Conditions	NR_FDD_FR1_A, NR_TDD_FR1_A	-125	-122	≥ -4
	NR_FDD_FR1_B	-124.5	-121.5	
	NR_TDD_FR1_C	-124	-121	
	NR_FDD_FR1_D, NR_TDD_FR1_D	-124.5	-120.5	
	NR_FDD_FR1_E, NR_TDD_FR1_E	-123	-120	
	NR_FDD_FR1_G	-122	-119	
	NR_FDD_FR1_H	-121.5	-118.5	
NOTE 1: NR operating band groups are defined in clause 3.5.2.				

Table B.2.5-2: Conditions for RRC connection release with redirection to NR in FR2

Parameter	Angle of arrival	NR operating bands	Minimum SSB_RP Note 2, Note 3 dBm / SCS_{SSB}					SSB Ês/Iot dB
			SCS_{SSB} = 120 kHz				SCS_{SSB} = 240 kHz	
			UE power class				UE power class	
			1	2	3	4	1, 2, 3, 4	
Conditions	Rx Beam Peak	n257	-126.3+Y_1	-111.8	-110.1	-125.8+Y_4	(Value for SCS_{SSB} = 120 kHz) +3dB	≥-4
		n258	-126.3+Y_1	-111.8	-110.1	-125.8+Y_4		
		n259			-106.5			
		n260	-123.3+Y_1		-107.5	-123.8+Y_4		
		n261	-126.3+Y_1	-111.8	-110.1	-125.8+Y_4		
	Spherical coverage Note 1	n257	-118.3+Z_1	-100.8	-99.2	-116.8+Z_4	(Value for SCS_{SSB} = 120 kHz) +3dB	≥-4
		n258	-118.3+Z_1	-100.8	-99.2	-116.8+Z_4		
		n259			-93.7			
		n260	-115.3+Z_1		-94.9	-111.8+Z_4		
		n261	-114.3	-100.8	-99.2	-116.8+Z_4		
NOTE 1: Values based on EIS spherical coverage as defined in clause 7.3.4 of TS 38.101-2 [19]. Side condition applies for directions in which EIS spherical coverage requirement is met.								

NOTE 2: Values specified at the Reference point to give minimum SSB Ês/Iot, with no applied noise.
NOTE 3: For UEs that support multiple FR2 bands, Rx Beam Peak values are increased by $\Delta MB_{P,n}$ and spherical coverage values are increased by $\Delta MB_{S,n}$, the UE multi-band relaxation factor in dB specified in clause 6.2.1 of TS 38.101-2 [19].

B.2.6 Conditions for UE transmit timing

B.2.6.1 Conditions for SSB based UE transmit timing

Editor's notes for Table B.2.6.1-2:

- The value of Y for power classes 1 and 4 is FFS, where Y_1 and Y_4 are the rough/fine beam gain differences in Rx beam peak direction for power classes 1 and 4 respectively

- The value of Z for power classes 1 and 4 is FFS, where Z_1 and Z_4 are the rough/fine beam gain differences in spherical coverage directions for power classes 1 and 4 respectively

This clause defines the following conditions for UE transmit timing adjustment performed based on SSBs: SSB_RP and SSB Ês/Iot and applicable for a corresponding operating band.

The conditions are defined in Table B.2.6.1-1 for FR1 SSB.

Table B.2.6.1-1: Conditions for SSB based UE transmit timing in FR1

Parameter	NR operating band groups Note1	Minimum SSB_RP dBm / SCS_{SSB}		SSB Ês/Iot dB
		SCS_{SSB}=15 kHz	SCS_{SSB}=30 kHz	
Conditions	NR_FDD_FR1_A, NR_TDD_FR1_A, NR_SDL_FR1_A	-124	-121	≥ -3
	NR_FDD_FR1_B	-123.5	-120.5	
	NR_TDD_FR1_C	-123	-120	
	NR_FDD_FR1_D, NR_TDD_FR1_D	-122.5	-119.5	
	NR_FDD_FR1_E, NR_TDD_FR1_E	-122	-119	
	NR_FDD_FR1_G	-121	-118	
	NR_FDD_FR1_H	-120.5	-117.5	
NOTE 1: NR operating band groups are defined in clause 3.5.2.				

The conditions are defined in Table B.2.6.1-2 for FR2 SSB.

Table B.2.6.1-2: Conditions for SSB based UE transmit timing in FR2

Parameter	Angle of arrival	NR operating bands	Minimum SSB_RP Note 2, Note 3 dBm / SCS_{SSB}				SSB Ês/Iot dB
			SCS_{SSB} = 120 kHz				SCS_{SSB} = 240 kHz
			UE power class				UE power class
			1	2	3	4	1, 2, 3, 4
Conditions	Rx Beam Peak	n257	-125.3+Y_1	-110.8	-109.1	-124.8+Y_4	(Value for SCS_{SSB} = 120 kHz) +3dB
		n258	-125.3+Y_1	-110.8	-109.1	-124.8+Y_4	
		n259			-105.5		
		n260	-122.3+Y_1		-106.5	-122.8+Y_4	
		n261	-125.3+Y_1	-110.8	-109.1	-124.8+Y_4	
	Spherical coverage Note 1	n257	-117.3+Z_1	-99.8	-98.2	-115.8+Z_4	(Value for SCS_{SSB} = 120 kHz) +3dB
		n258	-117.3+Z_1	-99.8	-98.2	-115.8+Z_4	
		n259			-92.7		
		n260	-114.3+Z_1		-93.9	-110.8+Z_4	
		n261	-117.3+Z_1	-99.8	-98.2	-115.8+Z_4	
NOTE 1: Values based on EIS spherical coverage as defined in clause 7.3.4 of TS 38.101-2 [19]. Side condition applies for directions in which EIS spherical coverage requirement is met. NOTE 2: Values specified at the Reference point to give minimum SSB Ês/Iot, with no applied noise. NOET 3: For UEs that support multiple FR2 bands, Rx Beam Peak values are increased by $\Delta MB_{P,n}$ and Spherical coverage values are increased by $\Delta MB_{S,n}$, the UE multi-band relaxation factor in dB specified in clause 6.2.1 of TS 38.101-2 [19].								

B.2.7 Conditions for NR intra-frequency measurements for RedCap

This clause defines the following conditions for RedCap NR intra-frequency measurements and corresponding procedures performed based on SSBs: SSB_RP and SSB Ês/Iot, applicable for a corresponding operating band.

The conditions are defined in Table B.2.7-1 and Table B.2.7-2 for 1 Rx and 2 Rx RedCap respectively for FR1 NR cells.

The conditions are defined in Table B.2.7-3 for FR2 NR cells.

Table B.2.7-1: Conditions for intra-frequency cell re-selection in FR1 for RedCap for 1 Rx

Parameter	NR operating band groups Note1	Minimum SSB_RP		SSB Ês/Iot
		dBm / SCS_{SSB}		dB
		SCS_{SSB} = 15 kHz	SCS_{SSB} = 30 kHz	
Conditions	NR_FDD_RC_FR1_A, NR_TDD_RC_FR1_A	TBD	TBD	≥ -6
	NR_FDD_RC_FR1_B	TBD	TBD	
	NR_TDD_RC_FR1_C	TBD	TBD	
	NR_FDD_RC_FR1_D, NR_TDD_RC_FR1_D	TBD	TBD	
	NR_FDD_RC_FR1_E, NR_TDD_RC_FR1_E	TBD	TBD	
	NR_FDD_RC_FR1_F	TBD	TBD	
	NR_FDD_RC_FR1_G	TBD	TBD	
	NR_FDD_RC_FR1_H	TBD	TBD	
NOTE 1: NR operating band groups are defined in clause 3.5.2.				

Table B.2.7-2: Conditions for intra-frequency cell re-selection in FR1 for RedCap for 2Rx

Parameter	NR operating band groups Note1	Minimum SSB_RP		SSB Ês/Iot
		dBm / SCS_{SSB}		dB
		SCS_{SSB} = 15 kHz	SCS_{SSB} = 30 kHz	
Conditions	NR_FDD_RC_FR1_A, NR_TDD_RC_FR1_A	-127	-124	≥ -6
	NR_FDD_RC_FR1_B	-126.5	-123.5	
	NR_TDD_RC_FR1_C	-126	-123	
	NR_FDD_RC_FR1_D, NR_TDD_RC_FR1_D	-125.5	-122.5	
	NR_FDD_RC_FR1_E, NR_TDD_RC_FR1_E	-125	-122	
	NR_FDD_RC_FR1_F	-124.5	-121.5	
	NR_FDD_RC_FR1_G	-124	-121	
	NR_FDD_RC_FR1_H	-123.5	-120.5	
NOTE 1: NR operating band groups are defined in clause 3.5.2.				

Table B.2.7-3: Conditions for intra-frequency measurements in FR2 for RedCap

Parameter	Angle of arrival	NR operating bands	Minimum SSB_RP Note 2, Note 3							SSB Ês/Iot
			dBm / SCS_{SSB}							dB
			SCS_{SSB} = 120 kHz						SCS_{SSB} = 240 kHz	
			UE Power class							
			1	2	3	4	5	7	1, 2, 3, 4, 5	

Conditions	Rx Beam Peak	n257	-128.3+Y_1	-113.8	-112.1	-127.8+Y_4	-123.4+Y_5	TBD	(Value for SCS_{SSB} = 120 kHz) +3dB	≥-6
		n258	-128.3+Y_1	-113.8	-112.1	-127.8+Y_4	-123.6+Y_5	TBD		
		n261	-128.3+Y_1	-113.8	-112.1	-127.8+Y_4		TBD		
	Spherical coverage Note 1	n257	-120.3+Z_1	-102.8	-101.2	-118.8+Z_4	-115.4+Z_5	TBD	(Value for SCS_{SSB} = 120 kHz) +3dB	≥-6
		n258	-120.3+Z_1	-102.8	-101.2	-118.8+Z_4	-115.6+Z_5	TBD		
		n261	-120.3+Z_1	-102.8	-101.2	-118.8+Z_4		TBD		

Note 1: Values based on EIS spherical coverage as defined in clause 7.3.4 of TS 38.101-2 [19]. Side condition applies for directions in which EIS spherical coverage requirement is met.
Note 2: Values specified at the Reference point to give minimum SSB Ês/Iot, with no applied noise.
Note 3: For UEs that support multiple FR2 bands, Rx Beam Peak values are increased by $\Delta MB_{P,n}$ and Spherical coverage values are increased by $\Delta MB_{S,n}$, the UE multi-band relaxation factor in dB specified in clause 6.2.1 of TS 38.101-2 [19].

Editor's notes for Table B.2.7-2 (RAN4 dependent):

- The value of Y for power classes 1, 4 and 5 is FFS, where Y1, Y4 and Y5 are the rough/fine beam gain differences in Rx beam peak direction for power classes 1, 4 and 5 respectively

- The value of Z for power classes 1, 4 and 5 is FFS, where Z1, Z4 and Z5 are the rough/fine beam gain differences in spherical coverage directions for power classes 1, 4 and 5 respectively

B.2.8 Conditions for NR inter-frequency measurements for RedCap

This clause defines the following conditions for RedCap NR inter-frequency measurements and corresponding procedures performed based on SSBs: SSB_RP and SSB Ês/Iot, applicable for a corresponding operating band.

The conditions are defined in Table B.2.8-1 and Table B.2.8-2 for 1 Rx and 2 Rx RedCap for FR1 NR cells.

The conditions are defined in Table B.2.8-3 for FR2 NR cells.

Table B.2.8-1: Conditions for inter-frequency measurements in FR1 for 1 Rx RedCap

Parameter	NR operating band groups Note1	Minimum SSB_RP		SSB Ês/Iot
		dBm / SCS_{SSB}		dB
		SCS_{SSB} = 15 kHz	SCS_{SSB} = 30 kHz	
Conditions	NR_FDD_RC_FR1_A, NR_TDD_RC_FR1_A	TBD	TBD	≥ -4
	NR_FDD_RC_FR1_B	TBD	TBD	
	NR_TDD_RC_FR1_C	TBD	TBD	
	NR_FDD_RC_FR1_D, NR_TDD_RC_FR1_D	TBD	TBD	
	NR_FDD_RC_FR1_E, NR_TDD_RC_FR1_E	TBD	TBD	
	NR_FDD_RC_FR1_F	TBD	TBD	
	NR_FDD_RC_FR1_G	TBD	TBD	
	NR_FDD_RC_FR1_H	TBD	TBD	

NOTE 1: NR operating band groups are defined in clause 3.5.2.

Table B.2.8-2: Conditions for inter-frequency measurements in FR1 for 2 Rx RedCap

Parameter	NR operating band groups Note1	Minimum SSB_RP		SSB Ês/Iot
		dBm / SCS_{SSB}		dB
		SCS_{SSB} = 15 kHz	SCS_{SSB} = 30 kHz	
Conditions	NR_FDD_RC_FR1_A, NR_TDD_RC_FR1_A	-125	-122	≥ -4
	NR_FDD_RC_FR1_B	-124.5	-121.5	
	NR_TDD_RC_FR1_C	-124	-121	
	NR_FDD_RC_FR1_D, NR_TDD_RC_FR1_D	-124.5	-120.5	
	NR_FDD_RC_FR1_E, NR_TDD_RC_FR1_E	-123	-120	
	NR_FDD_RC_FR1_F	-122.5	-119.5	
	NR_FDD_RC_FR1_G	-122	-119	
	NR_FDD_RC_FR1_H	-121.5	-118.5	
NOTE 1: NR operating band groups are defined in clause 3.5.2.				

Table B.2.8-3: Conditions for inter-frequency measurements in FR2 for RedCap

Parameter	Angle of arrival	NR operating bands	Minimum SSB_RP Note 2, Note 3							SSB Ês/Iot
			dBm / SCS_{SSB}							dB
			SCS_{SSB} = 120 kHz						SCS_{SSB} = 240 kHz	
			UE Power class							
			1	2	3	4	5	7	1, 2, 3, 4, 5	
Conditions	Rx Beam Peak	n257	-126.3+Y_1	-111.8	-110.1	-125.8+Y_4	-121.4+Y_5	TBD	(Value for SCS_{SSB} = 120 kHz) +3dB	≥-4
		n258	-126.3+Y_1	-111.8	-110.1	-125.8+Y_4	-121.6+Y_5	TBD		
		n261	-126.3+Y_1	-111.8	-110.1	-125.8+Y_4		TBD		
	Spherical coverage Note 1	n257	-118.3+Z_1	-100.8	-99.2	-116.8+Z_4	-113.4+Z_5	TBD	(Value for SCS_{SSB} = 120 kHz) +3dB	≥-4
		n258	-118.3+Z_1	-100.8	-99.2	-116.8+Z_4	-113.6+Z_5	TBD		
		n261	-118.3+Z_1	-100.8	-99.2	-116.8+Z_4		TBD		
NOTE 1: Values based on EIS spherical coverage as defined in clause 7.3.4 of TS 38.101-2 [19]. Side condition applies for directions in which EIS spherical coverage requirement is met. NOTE 2: Values specified at the Reference point to give minimum SSB Ês/Iot, with no applied noise. NOTE 3: For UEs that support multiple FR2 bands, Rx Beam Peak values are increased by $\Delta MB_{P,n}$ and Spherical coverage values are increased by $\Delta MB_{S,n}$, the UE multi-band relaxation factor in dB specified in clause 6.2.1 of TS 38.101-2 [19].										

Editor's notes for Table B.2.3-2 (RAN4 dependent):

- The value of Y for power classes 1, 4 and 5 is FFS, where Y1, Y4 and Y5 are the rough/fine beam gain differences in Rx beam peak direction for power classes 1, 4 and 5 respectively

- The value of Z for power classes 1, 4 and 5 is FFS, where Z1, Z4 and Z5 are the rough/fine beam gain differences in spherical coverage directions for power classes 1, 4 and 5 respectively

B.3 RRM requirement exceptions

B.3.1 Introduction

Annex B.3 covers exceptions for the side conditions based on receiver sensitivity for CA, DC, and SUL.

B.3.2 Receiver sensitivity relaxation for CA

B.3.2.1 Receiver sensitivity relaxation for UE supporting CA in FR1

For a UE supporting inter-band carrier aggregation configuration with uplink in NR band, if there is a relaxation of receiver sensitivity $\Delta R_{IB,c}$>0 dB as defined in TS 38.101-1 [18, Clause 7.3A.3], the relevant side conditions specifying received power levels (SSB_RP and Io) shall be increased by the amount $\Delta=\Delta R_{IB,c}$ defined for the corresponding downlink NR bands.

For a UE supporting CA configuration in FR1, the requirement in this clause applies for both SC and CA operation.

B.3.2.2 Receiver sensitivity relaxation for UE configured with CA in FR1

B.3.2.2.1 Inter-band carrier aggregation

For a UE configured with inter-band carrier aggregation with active uplink in NR band, if there is a relaxation of receiver sensitivity $\Delta R_{IB,c}$>0 dB as defined in TS 38.101-1, Clause 7.3A.3 [2], the relevant side conditions specifying received power levels (SSB_RP and Io) shall be increased by the amount $\Delta=\Delta R_{IB,c}$ defined for the corresponding downlink NR bands.

If the relaxation Δ specified in this clause applies, then the relaxation specified in Clause B.3.2.1 should not be applied.

B.3.2.2.2 Reference sensitivity exceptions due to UL harmonic interference for CA

In this clause, requirements exceptions are described for the UE configured with a band in FR1 when it is impacted by UL harmonic interference from another band in FR1 of the same CA configuration.

A relevant side condition (SSB_RP and Io) in a requirement shall be increased by the amount Δ=L2-L1, where L1 is the reference sensitivity level specified in TS 38.101-1 [2], Clause 7.3.2, and L2 is the reference sensitivity level based on the requirements in TS 38.101-1 [2], Clause 7.3A.4, when the following conditions are fulfilled,

- corresponding downlink component carriers on different NR bands are configured with CA and active,
- the uplink is configured in the NR low operating band and is active,
- the uplink configuration is as specified in TS 38.101-1 [2], Clause 7.3A.4, and
- the exception requirements specified in TS 38.101-1 [2], Clause 7.3A.4 apply.

If the relaxation Δ specified in this clause applies, then the relaxation specified in Clause B.3.2.1 should not be applied.

B.3.2.2.3 Reference sensitivity exceptions due to intermodulation interference due to 2UL CA

In this clause, requirements exceptions are described for the UE with an inter-band carrier aggregation with uplink assigned to two NR bands.

A relevant side condition (SSB_RP and Io) in a requirement shall be increased by the amount Δ=L2-L1, where L1 is the reference sensitivity level specified in TS 38.101-1 [2], Clause 7.3.2, and L2 is the reference sensitivity level based on the requirements in TS 38.101-1 [2], Clause 7.3A.5, when the following conditions are fulfilled,

- corresponding downlink component carriers on different bands are configured with CA and active,
- uplinks are assigned to two NR bands,
- the exception requirements specified in TS 38.101-1 [2], Clause 7.3A.5 apply.

If the relaxation Δ specified in this clause applies, then the relaxation specified in Clause B.3.2.1 should not be applied.

B.3.2.3 Receiver sensitivity relaxation for UE supporting CA in FR2

Editor's note: TBD

B.3.2.4 Receiver sensitivity relaxation for UE configured with CA in FR2

B.3.2.4.1 Intra-band contiguous carrier aggregation

For a UE configured with intra-band contiguous carrier aggregation in NR band in FR2, if there is a relaxation of receiver sensitivity ΔR_{IB}>0 dB as defined in TS 38.101-2 [3], Clause 7.3A.2.1 depending on the aggregated channel bandwidth, the relevant side conditions specifying received power levels (SSB_RP and Io) shall be increased by the amount $\Delta=\Delta R_{IB}$ defined for the corresponding downlink NR bands.

B.3.2.4.2 Intra-band non-contiguous carrier aggregation

For a UE configured with intra-band non-contiguous carrier aggregation in NR band in FR2, if there is a relaxation of receiver sensitivity ΔR_{IB}>0 dB as defined in TS 38.101-2 [3], Clause 7.3A.2.1 depending on the aggregated channel bandwidth, the relevant side conditions specifying received power levels (SSB_RP and Io) shall be increased by the amount $\Delta=\Delta R_{IB}$ defined for the corresponding downlink NR bands.

B.3.3 Receiver sensitivity relaxation for DC

Editor's note: TBD

B.3.4 Receiver sensitivity relaxation for SUL

B.3.4.1 Receiver sensitivity relaxation for UE supporting SUL in FR1

For a UE supporting a SUL configuration in FR1, if there is a relaxation of receiver sensitivity $\Delta R_{IB,c}$>0 dB as defined in TS 38.101-1 [2], Clause 7.3C.3, the relevant side conditions specifying received power levels (SSB_RP and Io) shall be increased by the amount $\Delta=\Delta R_{IB,c}$ defined for the corresponding downlink NR bands.

For a UE supporting a SUL configuration in FR1, the requirement in this clause applies for both SC and SUL operation.

B.3.4.2 Receiver sensitivity relaxation for UE configured with SUL in FR1

B.3.4.2.1 Reference sensitivity exceptions due to UL harmonic interference for SUL

In this clause, requirements exceptions are described for the UE with a band in FR1 when it is impacted by UL harmonic interference from another band in FR1 of the same SUL configuration.

A relevant side condition (SSB_RP and Io) in a requirement shall be increased by the amount Δ=L2-L1, where L1 is the reference sensitivity level specified in TS 38.101-1 [2], Clause 7.3.2, and L2 is the reference sensitivity level based on the requirements in TS 38.101-1 [2], Clause 7.3C.2, when the following conditions are fulfilled,

- a downlink component carrier is configured in NR band and is active,
- the uplink is configured in the NR low operating band and is active,
- the uplink configuration is as specified in TS 38.101-1 [2], Clause 7.3C.2, and
- the exception requirements specified in TS 38.101-1 [2], Clause 7.3C.2 apply.

If the relaxation Δ specified in this clause applies, then the relaxation specified in Clause B.3.4.1 should not be applied.

B.4 Conditions for NR sidelink

B.4.1 Test parameters for GNSS signals

This clause defines the reference signal power levels of generated satellites for a corresponding GNSS, which will be used in NR sidelink test cases.

Table B.4.1-1: GNSS Reference Signal Power Parameters

System	Parameters	Unit	Value
	Number of generated satellites per system	-	6
GPS[Note 1]	Reference signal power level for all satellites	dBm	-128.5
Galileo	Reference signal power level for all satellites	dBm	-127
GLONASS	Reference signal power level for all satellites	dBm	-131
BDS	Reference signal power level for all satellites	dBm	-133
NOTE 1: "GPS" here means GPS L1 C/A, Modernized GPS, or both, dependent on UE capabilities. NOTE 2: The DUT UE does not need to support all systems. The DUT UE shall support at least one system and will be test for the supported systems.			

B.4.2 Conditions for PSBCH-RSRP Accuracy Requirements

This clause defines the following conditions for PSBCH-RSRP measurement accuracy requirements applicable for a corresponding operating band.

The conditions are defined in Table B.4.2-1 for FR1.

Table B.4.2-1: Conditions for PSBCH-RSRP measurements in FR1

Parameter	NR sidelink operating band groups [Note1]	Minimum S-SSB_RP			S-SSB Ês/Iot
		dBm/$SCS_{S\text{-}SSB}$			
		$SCS_{S\text{-}SSB}$ = 15kHz	$SCS_{S\text{-}SSB}$ = 30kHz	$SCS_{S\text{-}SSB}$ = 60kHz	dB
	NR_TDD_FR1_B	-126.5	-123.5	-120.5	≥ -6
	NR_TDD_FR1_J	-122.5	-119.5	-116.5	
NOTE 1: NR sidelink operating band groups are as defined in Section 3A.4 for the corresponding NR operating bands.					

B.4.3 Conditions for Selection/Reselection to Intra-frequency SyncRef UE

This clause defines the S-SSB_RP and S-SSB Ês/Iot applicable for a corresponding operating band.

The conditions for selection/reselection to intra-frequency SyncRef UE are defined in Table B.4.3-1 for FR1.

Table B.4.3-1: NR sidelink synchronization measurements in FR1

Parameter	NR sidelink operating band groups Note1	Minimum S-SSB_RP			S-SSB Ês/Iot
		dBm/$SCS_{S\text{-}SSB}$			
		$SCS_{S\text{-}SSB}$ = 15kHz	$SCS_{S\text{-}SSB}$ = 30kHz	$SCS_{S\text{-}SSB}$ = 60kHz	dB
	NR_TDD_FR1_B	-120.5	-117.5	-114.5	≥ 0
	NR_TDD_FR1_J	-116.5	-113.5	-110.5	≥ 0
NOTE 1: NR sidelink operating band groups are as defined in Section 3A.4 for the corresponding NR operating bands.					

B.4.4 Conditions for L1 SL-RSRP Accuracy Requirements

This clause defines the following conditions for L1 SL-RSRP measurement accuracy requirements applicable for a corresponding operating band.

The conditions are defined in Table B.4.4-1 for FR1.

Table B.4.4-1: Conditions for L1 SL-RSRP measurements in FR1

Parameter	NR sidelink operating band groups Note1	Minimum L1 SL-RSRP			Ês/Iot
		dBm/SCS			dB
		SCS= 15kHz	SCS= 30kHz	SCS = 60kHz	
	NR_TDD_FR1_B	-120.5	-117.5	-114.5	≥ 0
	NR_TDD_FR1_J	-116.5	-113.5	-110.5	

NOTE 1: NR sidelink operating band groups are as defined in Section 3A.4 for the corresponding NR operating bands.
NOTE 2: The parameter Ês/Iot is the Ês/Iot of PSCCH-DMRS and/or PSSCH-DMRS.
NOTE 3: The SCS is for PSCCH and/or PSSCH.

Annex C (normative): Downlink physical channels and propagation conditions

C.1 Downlink physical channels

C.1.1 General

The following clauses describe the downlink physical channels that are needed for setting a connection and channels that are needed during a connection.

C.1.2 Default downlink signal levels

The downlink power settings in Table C.1.2-1 and Table C.1.2-2 are used unless otherwise specified in a test case for FR1 cell and FR2 cell, respectively. The downlink power settings in Table C.1.2-1 and Table C.1.2-2 are also used for the initial registration for NR /5GC test cases in clauses 6 and 7. For EN-DC test cases in clauses 4 and 5, the E-UTRA power settings used for initial registration are defined in Annex A.6.

For FR1, if the UE has more than one Rx antenna, the downlink signal is applied to each one. All UE Rx antennas shall be connected.

Table C.1.2-1: Default Downlink power levels for NR (FR1)

SCS (kHz)	Parameter	Unit	Value											
	Channel bandwidth	MHz	5	10	15	20	25	30	40	50	60	80	90	100
15	Number of RBs		25	50	75	100	128	160	215	270	N/A	N/A	N/A	N/A
	Channel BW power	dBm	-60	-57	-55	-54	-53	-52	-51	-50	N/A	N/A	N/A	N/A
30	Number of RBs		10	24	36	50	64	75	100	128	162	216	243	270
	Channel BW power	dBm	-61	-57	-55	-54	-53	-52	-51	-50	-49	-48	-47	-47
60	Number of RBs		N/A	10	18	24	30	36	50	64	75	100	120	135
	Channel BW power	dBm	N/A	-58	-56	-54	-53	-52	-51	-50	-49	-48	-47	-47
	RS EPRE	dBm/ 15kHz	-85	-85	-85	-85	-85	-85	-85	-85	-85	-85	-85	-85

NOTE 1: The channel bandwidth powers are informative, based on -85dBm/15kHz SS/PBCH SSS EPRE, then scaled according to the number of RBs and rounded to the nearest integer dBm value. Full RE allocation with no boost or deboost is assumed.
NOTE 2: The power level is specified at each UE Rx antenna.
NOTE 3: DL level is applied for any of the Subcarrier Spacing configuration ( ) with the same power spectrum density of -85dBm/15kHz.

Table C.1.2-2: Default Downlink power levels for NR (FR2)

SCS (kHz)		Unit	Channel Bandwidth			
			50 MHz	100 MHz	200 MHz	400 MHz
60	Number of RBs		66	132	264	N/A
	Channel BW power	dBm	-70	-67	-64	N/A
120	Number of RBs		32	66	132	264
	Channel BW power	dBm	-70	-67	-64	-61
	SS/PBCH SSS EPRE	dBm/60kHz	-99	-99	-99	-99

NOTE 1: The channel bandwidth powers are informative, based on -99dBm/60kHz SS/PBCH SSS EPRE, then scaled according to the number of RBs and rounded to the nearest integer dBm value. Full RE allocation with no boost or deboost is assumed.
NOTE 2: The power level is specified at the centre of quiet zone.

NOTE 3: DL level is applied for any of the Subcarrier Spacing configuration (μ) with the same power spectrum density of –99dBm/60kHz.

The default signal level uncertainty for FR1 is +/-3dB at each test port, for any level specified. The default signal level uncertainty for FR2 is +/-6dB at centre of quiet zone, for any level specified. If the uncertainty value is critical for the Test purpose, a tighter uncertainty is specified for the related test case in Annex F

C.1.3 Default connection setup

Table C.1.3-1 describes the downlink physical channels that are required for NR connection setup. For EN-DC test cases in clauses 4 and 5, the required E-UTRA downlink physical channels are defined in TS 36.521-3 [26] Annex C.2.

Table C.1.3-1: Downlink physical channels required for NR connection set-up

Physical Channel	EPRE Ratio	Note
PBCH	PBCH_RA = 0 dB	
	PBCH_RB = 0 dB	
PSS	PSS_RA = 0 dB	
SSS	SSS_RA = 0 dB	
PDCCH	PDCCH_RA = 0 dB	
	PDCCH_RB = 0 dB	
	MPDCCH_RB = 0 dB	
PDSCH	PDSCH_RA = 0 dB	
	PDSCH_RB = 0 dB	
DMRS	TBD	
CSI-RS	TBD	
NOTE 1: No boosting is applied		

As common PDSCH and PDCCH configuration parameters the parameters in Table A.1 and C.1.3-2 shall be used to bring up the connection setup for FR1 and FR2 NR cell.

Table C.1.3-2: PDSCH and PDCCH configuration

Parameter	Unit	Value
Number of HARQ processes		8 (TDD) 16 (FDD)
Maximum number of HARQ transmission		5

C.2 Propagation conditions

C.2.0 General

The propagation conditions and channel models for various environments are specified. For each environment a propagation model is used to evaluate the propagation pathless due to the distance. Channel models are formed by combining delay profiles with a Doppler spectrum, with the addition of correlation properties in the case of a multi-antenna scenario.

C.2.1 No interference

The downlink connection between the SS and the UE is without AWGN, and has no fading or multipath effects.

C.2.2 Static propagation conditions

C.2.2.0 General

The downlink connection between the SS and the UE is an AWGN environment (unless otherwise stated) with no fading or multipath effects.

C.2.2.1 UE receiver with 2Rx antenna connectors

For 1 port transmission to UE receiver with 2Rx the channel matrix is defined in the frequency domain by

$$\mathbf{H} = \begin{pmatrix} 1 \\ 1 \end{pmatrix}.$$

For 2 port transmission to UE Receiver with 2Rx the channel matrix is defined in the frequency domain by

$$\mathbf{H} = \begin{pmatrix} 1 & j \\ 1 & -j \end{pmatrix}$$

For 4 port transmission to UE Receiver with 2Rx the channel matrix is defined in the frequency domain by

$$\mathbf{H} = \begin{bmatrix} 1 & 1 & j & j \\ 1 & 1 & -j & -j \end{bmatrix}$$

C.2.2.2 UE receiver with 4Rx antenna connectors

For 1 port transmission to UE receiver with 4Rx the channel matrix is defined in the frequency domain by

$$\mathbf{H} = \begin{bmatrix} 1 \\ 1 \\ 1 \\ 1 \end{bmatrix}.$$

For 2 port transmission to UE Receiver with 4Rx the channel matrix is defined in the frequency domain by

$$\mathbf{H} = \begin{bmatrix} 1 & j \\ 1 & -j \\ 1 & j \\ 1 & -j \end{bmatrix}.$$

For 4 port transmission to UE Receiver with 4Rx the channel matrix is defined in the frequency domain by

$$\mathbf{H} = \begin{bmatrix} 1 & 1 & j & j \\ 1 & 1 & -j & -j \\ 1 & -1 & j & -j \\ 1 & -1 & -j & j \end{bmatrix}.$$

C.2.3 Multi-path fading propagation conditions

Same as defined in TS 38.521-4 [20] clause B.2.

Annex D (normative): Deviations from standard test configuration

D.1 Test cases with different numerologies

TBD

D.2 EN-DC test cases with different EN-DC configurations

D.2.0 General

In clauses 4 and 5, EN-DC test cases may be defined for two component carriers (CCs) as well as for more than two CCs to verify the same RRM requirement.

D.2.1 Principle of testing

If multiple EN-DC test cases are defined for two CCs as well as for more than two CCs to verify the same type of RRM requirement, and this requirement is dependent on the number of CCs, then from the UE performance point of view the test coverage can be considered fulfilled by executing only the EN-DC test cases with the maximum number of CCs in EN-DC supported by the UE. Otherwise if the same type of RRM requirement is independent of the number of CCs then from the UE performance point of view the test coverage can be considered fulfilled by executing only the EN-DC test cases with two CCs in EN-DC supported by the UE.

Editor's Note: The maximum number of CCs that can be used in FR2 tests in EN-DC would depend on the test equipment capability.

D.3 Carrier aggregation test cases with different CA configurations

D.3.0 General

In clauses 6 and 7, carrier aggregation test cases may be defined for two CCs as well as for more than two CCs to verify the same RRM requirement.

D.3.1 Principle of testing

If multiple carrier aggregation test cases are defined for two CCs as well as for more than two CCs to verify the same RRM requirement, and the test requirement is dependent on the number of CCs, then from the UE performance point of view the test coverage can be considered fulfilled by executing only the CA test cases with the maximum number of CCs in CA supported by the UE. Otherwise if the same type of RRM requirement is independent of the number of CCs then from the UE performance point of view the test coverage can be considered fulfilled by executing only the CA test cases with at least two CCs in CA supported by the UE.

Editor's Note: The maximum number of CCs that can be used in FR2 tests in CA would depend on the test equipment capability.

D.4 Antenna connection for 4Rx capable UEs

D.4.0 General

All the tests in this test specification are defined for UEs supporting 2Rx. This clause explains how to apply the 2Rx tests in clauses 4 and 6 to UEs supporting 4Rx antenna ports. No tests are currently specified in clauses 4 or 6 which are

applicable only to 4Rx antenna ports, so 4Rx capable UEs are always tested by reusing tests which were originally specified for 2Rx UEs. Please notice that 4Rx is in general not supported for the test cases in clauses 5 and 7.

D.4.1 Principle of testing

D.4.1.1 Single carrier tests

For 4Rx capable UEs supporting at least one band where 2Rx is supported and 4Rx is not supported, all single carrier tests specified in clauses 4 and 6, except 4.7 and 6.7 shall be tested with 2Rx on any band where 2Rx is supported and 4Rx is not supported, with the antenna connection defined in D.4.2.1. Single carrier tests specified clauses 4.7 and 6.7 are band dependent and shall be tested in all bands supported by the UE, using 2Rx and the antenna connection defined in D.4.2.1 for the bands where 2Rx is supported and 4Rx is not supported, and the antenna connection defined in D.4.2.2 for the bands where 2Rx is not supported.

For 4Rx capable UEs that do not support any band where 2Rx is supported and 4Rx is not supported, all single carrier tests in clauses 4 and 6 shall be tested with 4Rx using the antenna configuration defined in D.4.2.2.For radio link monitoring tests, the SNR levels are modified according to table D.4.1.1-1 and table D.4.1.1-2

Table D.4.1.1-1: Modified parameters for RLM out of sync testing with 4 RX antenna connection

Test case	SNR during T3 (dB)			
	Test 1	Test 2	Test 3	Test 4
4.5.1.1	-18	N/A	N/A	N/A
4.5.1.3	-18	N/A	N/A	N/A
4.5.1.5	-18	N/A	N/A	N/A
4.5.1.7	-18	N/A	N/A	N/A
5.5.1.1	-18	N/A	N/A	N/A
5.5.1.3	-18	N/A	N/A	N/A
5.5.1.5	-18	N/A	N/A	N/A
5.5.1.7	-18	N/A	N/A	N/A
6.5.1.1	-18	N/A	N/A	N/A
6.5.1.3	-18	N/A	N/A	N/A
6.5.1.5	-18	N/A	N/A	N/A
6.5.1.7	-18	N/A	N/A	N/A
7.5.1.1	-18	N/A	N/A	N/A
7.5.1.3	-18	N/A	N/A	N/A
7.5.1.5	-18	N/A	N/A	N/A
7.5.1.7	-18	N/A	N/A	N/A

Table D.4.1.1-2: Modified parameters for RLM in sync single carrier testing with 4 RX antenna connection

Test case	SNR during T3 (dB)		SNR during T4 (dB)	
	Test 1	Test 2	Test 1	Test 2
4.5.1.2	-18	N/A	-8	N/A
4.5.1.4	-18	N/A	-8	N/A
4.5.1.6	-18	N/A	-8	N/A
4.5.1.8	-18	N/A	-8	N/A
5.5.1.2	-18	N/A	-8	N/A
5.5.1.4	-18	N/A	-8	N/A
5.5.1.6	-18	N/A	-8	N/A
5.5.1.8	-18	N/A	-8	N/A
6.5.1.2	-18	N/A	-8	N/A
6.5.1.4	-18	N/A	-8	N/A
6.5.1.6	-18	N/A	-8	N/A
6.5.1.8	-18	N/A	-8	N/A
7.5.1.2	-18	N/A	-8	N/A
7.5.1.4	-18	N/A	-8	N/A
7.5.1.6	-18	N/A	-8	N/A
7.5.1.8	-18	N/A	-8	N/A

Table D.4.1.1-3: Modified parameters for Beam Failure Detection and Link Recovery testing with 4 RX antenna connection

Test case	SNR for RS in set q_0 during T3, T4 and T5.(dB)
	Test 1
4.5.5.1	-15
4.5.5.2	-15
4.5.5.3	-15
4.5.5.4	-15
5.5.5.1	-15
5.5.5.2	-15
5.5.5.3	-15
5.5.5.4	-15
6.5.5.1	-15
6.5.5.2	-15
6.5.5.3	-15
6.5.5.4	-15
7.5.5.1	-15
7.5.5.2	-15
7.5.5.3	-15
7.5.5.4	-15

D.4.1.2 Carrier aggregation tests

For carrier aggregation tests, the antenna connection is selected independently for each cell, the PCell and the SCell(s). If a cell (either PCell or any of the SCell(s)) is on a band where 2Rx is supported and 4Rx is not supported, antenna connection in Clause D.4.2.1 shall be used for this cell. If the cell is on a band where 2Rx is not supported, antenna connection in clause D.4.2.2 shall be used for this cell.

D.4.1.3 EN-DC tests

For all EN-DC tests, the antenna connection is selected independently for each cell. For the E-UTRA PCell, the antenna connection specified in D.4.2.3 shall be used if the PCell is on an E-UTRA band where 2Rx is supported and 4Rx is not supported, and the antenna connection specified in D.4.2.4 shall be used if the PCell is on an E-UTRA band not supporting 2Rx.

For the NR PSCell and SCell(s), the principle of testing is the same as in D.4.1.2.

D.4.2 Antenna connection

D.4.2.1 Antenna connection for NR bands where 2Rx is supported

For NR bands where 2Rx is supported and 4Rx is not supported, the UE shall decide via manufacturer declaration and antenna port configuration which 2 of the 4 antenna ports shall be connected with the downlink signal from the SS. The remaining 2 antenna ports shall be connected to zero input. The parameters and test requirements remain unmodified.

D.4.2.2 Antenna connection for NR bands where only 4Rx is supported

For NR bands where only 4Rx is supported, all 4Rx antenna ports shall be connected to the downlink signal from the SS. The system simulator shall provide independent noise and fading (low correlation) for each antenna port. Except for the modifications to radio link monitoring tests specified in D.4.1.1 and D.4.1.2, the parameters and test requirements remain unmodified.

D.4.2.3 Antenna connection for E-UTRA bands where 2Rx is supported

For E-UTRAN bands where 2Rx is supported and 4Rx is not supported, the UE shall decide via manufacturer declaration and antenna port configuration which 2 of the 4 antenna ports shall be connected with the downlink signal from the SS. The remaining 2Rx antenna ports shall be connected to zero input. The parameters and test requirements remain unmodified.

D.4.2.4 Antenna connection for E-UTRA bands where only 4Rx is supported

For E-UTRAN bands where only 4Rx is supported, all 4Rx antenna ports shall be connected to the downlink signal from the SS. The system simulator shall provide independent noise and fading (low correlation) for each antenna port. Except for the modifications to radio link monitoring tests specified in TS36.521-1 [26] clause 3A.4.1.2.1 and 3A.4.1.2.2, the parameters and test requirements remain unmodified.

D.4A Antenna configurations with unlicensed bands for 4Rx capable UEs

D.4A.1 Introduction

All tests in clauses 10, 11, 12 and 13 are specified for UEs supporting 2RX. In this clause, the antenna connection method for applying 2RX tests to UEs supporting 4RX antenna ports is specified. No tests are currently specified in clauses 10, 11, 12 or 13 which are applicable only to 4RX antenna ports, so 4RX capable UEs are always tested by reusing tests which were originally specified for 2RX UEs.

D.4A.2 Principle of Testing

D.4A.2.1 Single Carrier Tests

For 4RX capable UEs supporting at least one 2RX band, the, all single carrier tests specified in clauses 10, 11, 12 and 13 except those in 10.5, 11.6, 12.5 and 13.4, shall be tested on any band where 2RX is supported with the antenna connection specified in D.4A.2.4. For single carrier tests specified in clauses 10.5, 11.6, 12.5 or 13.4, all tests shall be tested with the antenna connection specified in D.4A.2.4 for bands where 2RX is supported, and the antenna connection specified in D.4A.2.5 for bands where 4RX is supported.

For 4RX capable UEs which do not support any 2RX band, all tests specified in clauses 10, 11, 12 and 13 shall be tested using the antenna connection specified in clause D.4A.2.5. For radio link monitoring tests, the SNR levels are modified according to table D.4A.2.1-1 and table D.4A.2.1-2.

Table D.4A.2.1-1: Modified parameters for RLM out of sync testing with 4 RX antenna connection

Test case	SNR during T3 (dB)			
	Test 1	Test 2	Test 3	Test 4
10.3.1.2	-18	N/A	N/A	N/A
10.3.1.4	TBD	N/A	N/A	N/A
11.4.1.2	-18	N/A	N/A	N/A
11.4.1.4	TBD	N/A	N/A	N/A

Table D.4A.2.1-2: Modified parameters for RLM in sync single carrier testing with 4 RX antenna connection

Test case	SNR during T3 (dB)		SNR during T4 (dB)	
	Test 1	Test 2	Test 1	Test 2
10.3.1.3	-18	N/A	-8	N/A
10.3.1.5	TBD	N/A	TBD	N/A
11.4.1.3	-18	N/A	-8	N/A
11.4.1.5	TBD	N/A	TBD	N/A

Table D.4A.2.1-3: Modified parameters for Beam Failure Detection and Link Recovery testing with 4 RX antenna connection

Test case	SNR for RS in set q_0 during T3, T4 and T5 (dB)	
	Test 1	Test 2
10.3.4.1	-15	N/A
10.3.4.2	-15	N/A
11.4.4.1	-15	N/A
11.4.4.2	-15	N/A

D.4A.2.2 Carrier Aggregation Tests

All carrier aggregation tests are performed using the antenna connection in clause D.4A.2.4 for the PCell antenna connection if the PCell is on a band where 2RX is supported or the antenna connection in D.4A.2.5 for the PCell antenna connection if the PCell is on a band where 4RX is supported.

All carrier aggregation tests are performed using the antenna connection in clause D.4A.2.4 for the SCell antenna connection if an SCell is on band where 2RX is supported or the testing procedure in D.4A.2.5 for the SCell antenna connection if an SCell is on a band where 4RX is supported.

D.4A.2.3 EN-DC Tests

All EN-DC tests are performed using the antenna connection in clause D.4A.2.6 for the PCell antenna connection if the PCell is on a band where 2RX is supported or the antenna connection in D.4A.2.7 for the PCell antenna connection if the PCell is on a band where 4RX is supported.

All EN-DC tests are performed using the antenna connection in clause D.4A.2.4 for the PSCell or SCell antenna connection if an SCell is on band where 2RX is supported or the testing procedure in D.4A.2.5 for the SCell antenna connection if an SCell or PSCell is on a band where 4RX is supported.

D.4A.2.4 Antenna connection for bands where 2RX is supported

For bands where 2RX is supported, it is left to the UE declaration and AP configuration to decide which 2 of the 4 Rx ports are connected with data source from system simulator. The remaining 2 Rx ports shall be connected with zero input**.** No test parameters or requirements are modified.

D.4A.2.5 Antenna connection for bands where 4RX is supported

For bands where 4RX is supported, all 4 RX antennas are connected with data source from system simulator**.** The system simulator shall provide independent noise and fading (low correlation) for each antenna port. Except for the modifications to radio link monitoring thresholds described in clauses D.4A.2.1 and D.4A.2.2, no test parameters or requirements are modified.

D.4A.2.6 EN-DC LTE Antenna connection for bands where 2RX is supported

For bands where LTE 2RX is supported, it is left to the UE declaration and AP configuration to decide which 2 of the 4 Rx ports are connected with data source from system simulator. The remaining 2 Rx ports shall be connected with zero input**.** No test parameters or requirements are modified.

D.4A.2.7 EN-DC LTE Antenna connection for bands where 4RX is supported

For bands where LTE 4RX is supported, all 4 RX antennas are connected with data source from system simulator**.** The system simulator shall provide independent noise and fading (low correlation) for each antenna port. Except for the modifications to radio link monitoring thresholds described in clauses A.3.8.1.2.1 and A.3.8.1.2.2 of TS 36.133 [23], no test parameters or requirements are modified.

D.5 Test Cases with Different Channel Bandwidths

D.5.1 Test Cases with Different E-UTRA Channel Bandwidths

D.5.1.1 Introduction

Test cases involving E-UTRA cell(s) may be defined with different E-UTRA channel bandwidths to verify the same type of RRM requirement.

D.5.1.2 Principle of testing

If multiple test cases involving E-UTRA cell(s) are defined with different E-UTRA channel bandwidths to verify the same type of RRM requirement that is E-UTRA channel bandwidth independent, then the UE needs to be tested with

only one channel bandwidth in each E-UTRA cell and with the same bandwidth in all the E-UTRA cells used in the test case.

D.6 Test Cases for Synchronous and Asynchronous DC Operations

D.6.1 EN-DC Test Cases for Synchronous and Asynchronous EN-DC Operations

D.6.1.1 Introduction

This clause defines a principle, which is applicable to test cases verifying RRM requirements for EN-DC operation in synchronous and asynchronous scenarios.

Test cases may be defined in both synchronous EN-DC and asynchronous EN-DC scenarios to verify the same type of RRM requirement.

D.6.1.2 Principle of Testing

If EN-DC test cases are defined in both synchronous and asynchronous EN-DC scenarios to verify the same type of RRM requirement then the UE capable of both synchronous and asynchronous EN-DC operations needs to be tested with one of the tests in either synchronous or asynchronous EN-DC scenarios.

D.7 CCA model

D.7.1 Introduction

The CCA model is used in some RRM test cases with at least one cell on a carrier frequency with CCA. The intention with the CCA model is to emulate in the test equipment the behaviour of a gNB or UE which performs channel measurement to check that the channel is clear prior to performing one or more downlink or uplink transmissions.

D.7.2 CCA model for operation on a carrier frequency with CCA in FR1

D.7.2.1 DL CCA model

The same DL CCA model is applicable regardless of whether DRX cycle is used or not with the following differences:

- The counter, $l_{CCA,}$ is used to monitor the number of unavailable DBT samples withing an evaluation window, $W_{CCA_DL.}$ DBT samples outside of the evaluation window W_{CCA_DL} are discarded.
- If DRX cycle is not used then prior to each DBT window, the test equipment shall determine whether the DL CCA attempt is successful (i.e., the corresponding signals have to be transmitted), based on probability P_{CCA_DL} of successful DL CCA configured in the corresponding test case. If DRX cycle is not used, then the DL CCA model shall increment the counter l_{CCA} for every unavailable DBT sample due to DL CCA failure.
- If DRX cycle is used, then the DL CCA model shall increment the counter, l_{CCA}, once per DRX cycle for a DRX cycle if the first DBT sample in that DRX cycle is unavailable due to DL CCA failure. DL CCA failures in a DRX cycle are determined as follows:
- The test system *in the first DBT window of each DRX cycle* determines whether the DL CCA attempt is successful or not using the principle as follows:
  - If the DL CCA is successful then the test system shall transmit in all DBT windows within that DRX cycle.
  - If the DL CCA is not successful then the test system shall not transmit in any of the DBT windows within that DRX cycle. In this case l_{CCA} is increased by 1.

- The parameters, L_{CCA_DL}, L_{CCA_UL}, W_{CCA_DL} and W_{CCA_UL} can be used as in non-DRX tests.

If the CCA attempt is successful for a transmission, then the test equipment shall transmit also other remaining transmissions, according to the configuration, within the same DBT window.

If the CCA attempt is not successful for a transmission within the DBT window, the test equipment shall determine whether the CCA attempt is successful for the next configured transmission, based on probability P_{CCA_DL}.

The probability can be different in different time intervals T_i during a test case. One probability value (per cell) applies at any time point during a test; one or more probability values can be configured in the entire test, one value P_{CCA_DL} per time interval T_i where $i \geq 1$, and the multiple time intervals (when $i>1$) do not overlap (e.g., $P_{CCA_DL}=1.0$ in T_1 and $P_{CCA_DL}=0.75$ in T_2)..

For semi-static channel access configuration, a single value P_{CCA_DL} is used to configure the probability of CCA success in different time intervals T_i during a test realization. An additional limit L_{CCA_DL} is used to determine the maximum number of unavailable DBT samples within an evaluation window W_{CCA_DL}. If the number of unavailable DBT samples on the last W_{CCA_DL} DBT samples is larger or equal to L_{CCA_DL}, the CCA attempt is considered successful for transmission.

For dynamic channel access configuration, the parameters $P_{CCA_DL_1}$ and $P_{CCA_DL_2}$ are used to configure the probability of CCA success on the first and second SSB candidate positions, respectively, in different time intervals T_i during a test realization. An additional limit L_{CCA_DL} is used to determine the maximum number of unavailable DBT samples within an evaluation window W_{CCA_DL}. If the number of unavailable DBT samples on the last W_{CCA_DL} DBT samples is larger or equal to L_{CCA_DL}, the CCA attempt is considered successful for transmission.

For semi-static channel access configuration or for dynamic channel access configuration where one candidate SSB position is modelled, prior to each discovery burst transmission window within a time interval Ti of the test, the test equipment shall:

1 - Generate a uniform random variable *p1* from the range [0, 1] for the first candidate position.

2 - Transmit the discovery burst based on *p1* in the first candidate position. If $p1 \leq P_{CCA_DL}$, the discovery burst is transmitted at the first candidate SSB location; else if l_{CCA} is larger than or equal to $L_{CCA_DL,}$ the discovery burst is transmitted at the first candidate SSB location, otherwise the discovery burst is muted. If DRX cycle is used, then the decision whether the discover burst is muted or not is repeated for the rest of the DRX cycle.

For dynamic channel access configuration where two candidate SSB positions are modelled, prior to each discovery burst transmission window within a time interval T_i of the test, the test equipment shall:

1 - Generate a uniform random variable *p1* from the range [0, 1] for the first candidate position.

2 - Transmit the discovery burst based on *p1* in the first candidate position: if $p1 \leq P_{CCA_DL1}$, the discovery burst is transmitted at first candidate SSB location, else the test equipment shall:

a - Generate a uniform random variable *p2* from the range [0, 1] for the second candidate SSB position.

b - Transmit the discovery burst based on *p2* in the second candidate position. If $p2 \leq P_{CCA_DL2}$, the discovery burst is transmitted at the second candidate SSB location; else if l_{CCA} is larger than or equal to L_{CCA_DL}, the discovery burst is transmitted at the second candidate SSB location, otherwise the discovery burst is muted. If DRX cycle is used, then the decision whether the discover burst is muted or not is repeated for the rest of the DRX cycle

The above steps are repeated for each discovery burst transmission window in each time interval T_i of the test. The limit L_{CCA_DL} and window W_{CCA_DL} is a configuration parameter for each test case.

In many test cases, the requirement under a test depends on the number of configured SSB transmissions which are not available during the test due to CCA failure, so the test equipment shall track how many such signal occasions are not transmitted in DL during the test period.

D.7.2.2 UL CCA model

For UL CCA, the modelling approach is based on probability P_{CCA_UL} of successful CCA. Probability P_{CCA_UL} is configured in the corresponding test case, based on a set S_{CCA_UL} of possible values including 75 % and 87% as typical values for dynamic and semi-static channel access configurations, 0% to model consistent UL CCA failures, and 100% to model no UL CCA failures.

Consistent UL CCA failures are modelled by configuring a low value for P_{CCA_UL}, e.g., P_{CCA_UL} = 0%.

In the same time interval T_i during the same test case, P_{CCA_UL} can be different from P_{CCA_DL}.

The probability can be different in different time intervals T_i during a test case. One probability value applies at any time point during a test; one or more probability values can be configured in the entire test, one value P_{CCA_UL} per time interval T_i where $I \geq 1$, and the multiple time intervals (when $I > 1$) do not overlap (e.g., P_{CCA_UL} = 1.0 in T_1 and P_{CCA_UL} = 0.75 in T_2).

T_{CCA} µs prior to each UL transmission burst in the test, the test equipment (TE) shall generate a uniform random variable p from the range [0, 1]. If $p<P_{CCA_UL}$, the TE transmits an OCNG noise pattern with an energy level X within the UE BW scheduled/configured for the UL transmission for at-least T_{CCA} µs. Where T_{CCA} µs is energy detection time for accessing the uplink channel as defined in section 5.1.1 of TS 37.106 [36]. Where:

- X is 3 dB above the energy detection threshold defined in section 5.1.1 of TS 37.106 [36].
- T_{CCA} is the channel sensing period depending on CCA category for the next UL transmission.

The TE shall count the number of UL CCA failures, and no further UL CCA failures are 2867modelled if the number of failures exceeds the limit L_{CCA_UL} within a window W_{CCA_UL}. For each UL CCA failure generated by the model, the TE shall monitor the corresponding UL resource for the desired UL signal, and based on when and/or whether the TE received the desired UL signal, it deems the test case to pass or fail.

In many cases, the requirement under a test depends on the number of configured signal occasions which are not available during the test, so the test equipment shall track how many such signal occasions are not transmitted in UL during the test period.

D.7.3 Test Cases with at Least One Cell on a Carrier Frequency with CCA

FFS

Editor's note: This clause will include applicability rules for the corresponding test cases.

D.8 Test Cases in SA and EN-DC Operations

D.8.0 General

This clause defines a principle which is applicable to test cases verifying RRM requirements in standalone (SA) or EN-DC operations. RRM test cases may be defined in SA and EN-DC operations to verify the same RRM requirement.

The normative reference for this section is TS 38.133 [6] clause A.3.13.

Editor's note: this clause may need to define further for NE-DC and NR-DC test cases, which subjects to the test cases defined in the future.

D.8.1 Principle of testing

If test cases are defined in both SA and EN-DC operations to verify the same RRM requirement then the UE capable of both SA and EN-DC operations needs to verify that RRM requirement by performing test case(s) in either SA operation or in EN-DC operation.

If test cases are defined in both SA and EN-DC operations to verify at least one common RRM requirement then the UE capable of both SA and EN-DC operations needs to verify RRM requirements by performing test case(s) in either SA operation or in EN-DC operation provided that the performed test case(s):

- verifies the largest number of RRM requirements and
- verifies at least all RRM requirements covered in the test case(s), which is not performed.

Annex E (normative): Cell configuration mapping

E.0 General

The cells used in TS 38.533 do not correspond to the cells defined in TS 38.508-1 [14] clause 4.4.2. This annex describes the mapping between the test cases in TS 38.533 and the cells defined in TS 38.508-1 [14]. The test case shall apply the RF parameters as defined in TS 38.533 according to the column heading.

NOTE: For example if the second cell in a test case is an inter-frequency cell then Cell3 from TS 38.508-1 [14] clause 4.4.2 is used with the radio parameters as defined for Cell2 in TS 38.533.

E.1 Test frequency selection

E.1.0 General

The requirements defined in this test specification comprise EN-DC and NR/5GC test cases. The test cases are defined with a single NR cell or with multiple NR cells. The multi-cell test cases can be either intra-frequency, i.e. the NR cells defined by the test are overlapping in the frequency domain, or inter-frequency, i.e. the NR cells defined by the test have different centre frequencies, separated from each other by a frequency value bigger than the respective cell bandwidths. This clause describes the general rule on how to select the test frequencies for the NR RRM test cases in this test specification.

E.1.1 E-UTRA PCell for EN-DC test cases

Unless otherwise stated, the E-UTRA PCell for EN-DC test cases shall be configured using the test frequency “Mid” as defined in TS 36.508 [25] for the corresponding E-UTRA band.

In case that the “Mid” test frequency overlaps with any of the NR test frequencies required by the test case, the E-UTRA PCell shall be shifted to an additional frequency within the E-UTRA same band. If the E-UTRA band channel bandwidth is not sufficient to allocate a non-overlapping E-UTRA PCell, the auxiliary band as defined in TS 36.521-3 [26] clause 3 shall be used.

E.1.2 Test cases with one NR cell

Unless otherwise stated, for NR test cases with one NR cell, this cell shall be configured using the test frequency “Mid” as defined in TS 38.508-1 [14] for the corresponding band under test.

E.1.3 Test cases with more than one NR cell

E.1.3.1 Intra-frequency test cases

Unless otherwise stated, multi-cell intra-frequency test cases shall be tested using the test frequency “Mid” as defined in TS 38.508-1 [14] for the corresponding NR band under test.

E.1.3.2 Inter-frequency test cases

For NR/5GC and EN-DC multi-cell inter-frequency test cases in FR1, unless otherwise stated, the serving cell shall be configured using the test frequency “Low” as defined in TS 38.508-1 [14] for the corresponding band under test. Any inter-frequency neighbour cell shall be configured using the test frequency “High” as defined in TS 38.508-1 [14] for the corresponding band under test.

For NR/5GC multi-cell inter-frequency test cases in FR2, unless otherwise stated, the serving cell (and any other neighbour cell in the same frequency carrier) shall be configured using the test frequency “Mid” as defined in TS 38.508-1 [14], clause 7.2.3.2 for the corresponding band under test. Any inter-frequency neighbour cell shall be configured using a non-overlapping test frequency adjacent to the serving cell frequency, as defined in TS 38.508-1 [14], clause 7.2.3.2.

For EN-DC multi-cell inter-frequency test cases in FR2, unless otherwise stated, the PSCell (and any other neighbour cell in the same frequency carrier) shall be configured using the test frequency “Mid” as defined in TS 38.508-1 [14] , clause 7.2.3.2 for the corresponding band under test. Any inter-frequency neighbour cell shall be configured using a non-overlapping test frequency adjacent to the PSCell frequency, as defined in TS 38.508-1 [14] , clause 7.2.3.2.

E.1.4 Carrier aggregation test cases

E.1.4.1 Inter-band carrier aggregation

For inter-band carrier aggregation test cases, each of the component carriers and their respective neighbour cells shall be configured following the same principles defined in E.1.2 and E.1.3.

E.1.4.2 Intra-band contiguous carrier aggregation

For intra-band contiguous carrier aggregation with 2 CCs in FR1, unless otherwise specified, the serving cells (and any other neighbour cell(s) in the same frequency carriers) shall be configured using the test frequency “Low” as defined in TS 38.508-1 [14], subclause 4.3.1.1.3 for the corresponding band under test (SpCC = CC1 and SCC = CC2).

For intra-band contiguous carrier aggregation with 2 CCs in FR2, unless otherwise specified, the serving cells (and any other neighbour cell(s) in the same frequency carriers) shall be configured using the test frequency “Mid” as defined in TS 38.508-1 [14], subclause 4.3.1.2.3 for the corresponding band under test (SpCC = CC1 and SCC = CC2).

E.1.4.3 Intra-band non-contiguous carrier aggregation

For intra-band non-contiguous carrier aggregation in FR1, unless otherwise specified, the test frequency selection shall be done following the maximum Wgap principle, i.e. selecting the test frequencies (of the test frequencies defined in TS 38.508-1 [14]) with the widest frequency separation within the band under test.

For intra-band non-contiguous carrier aggregation in FR2, the test frequency selection is TBD.

E.1.5 E-UTRA – NR inter RAT test cases

Unless otherwise stated, the E-UTRA serving/neighbour cell for E-UTRA – NR inter-RAT test cases shall be configured using the test frequency “Mid” as defined in TS 36.508 [25] for the corresponding E-UTRA band.

In case that the “Mid” test frequency overlaps with any of the NR test frequencies required by the test case, the E-UTRA cell shall be shifted to an additional frequency within the E-UTRA same band. If the E-UTRA band channel bandwidth is not sufficient to allocate a non-overlapping E-UTRA cell, the auxiliary band as defined in TS 36.521-3 [26] clause 3 shall be used.

E.1.6 Intra-band EN-DC test cases

E.1.6.1 Intra-band non-contiguous EN-DC

For intra-band non-contiguous EN-DC in FR1, unless otherwise specified, the test frequency selection shall be done following the maximum Wgap principle, i.e. selecting the test frequencies (of the test frequencies defined in TS 38.508-1 [14]) with the widest frequency separation within the band under test.

E.1.6.1.1 Inter frequency neighbour cell

Unless otherwise stated, any inter-frequency neighbour cell shall be configured using the test frequency “Mid” as defined in TS 38.508-1 [14] for the corresponding NR band under test. If the NR band channel bandwidth is not sufficient to allocate a non-overlapping the neighbour cell, the auxiliary band as defined in TBD shall be used.

E.1.6.2 Intra-band contiguous EN-DC

E.1.6.1.1 E-UTRA PCell

Unless otherwise stated, the E-UTRA PCell for intra-band contiguous EN-DC test cases shall be configured using same test frequency, e.g., “Mid” as for NR PSCell as defined in TS 38.508-1 [14].

E.1.7 NR sidelink test cases

Unless otherwise stated, for NR sidelink test cases the NR sidelink carrier shall be configured using the test frequency "Mid" as defined in TS 38.508-1 [14] for the corresponding band under test.

For con-current operation, unless otherwise stated, each of the NR Uu carriers and their respective cells shall be configured following the sample principles defined in E.1.2 and E.1.3.

E.2 Cell configuration mapping for EN-DC FR1 test cases in Chapter 4

Table E.2-1 defines the cell configuration mapping for EN-DC FR1 test cases in chapter 4 of this test specification.

Table E.2-1: Cell configuration mapping for EN-DC FR1 RRM testing

TC	Description	38.533 LTE Cell1	38.533 NR Cell2	38.533 NR Cell3	38.533 NR Cell4	CA Type
4.3.2.2.1	EN-DC FR1 contention based random access	LTE Cell 1	NR Cell 1			
4.3.2.2.2	EN-DC FR1 non-contention based random access	LTE Cell 1	NR Cell 1			
4.3.2.2.3	EN-DC FR1 2-step contention based random access	LTE Cell 1	NR Cell 1			
4.3.2.2.4	EN-DC FR1 2-step non-contention based random access	LTE Cell 1	NR Cell 1			
4.4.1.1	EN-DC FR1 UE transmit timing accuracy	LTE Cell 1	NR Cell 1			
4.4.3.1	EN-DC FR1 timing advance adjustment accuracy	LTE Cell 1	NR Cell 1			
4.5.1.1	EN-DC FR1 radio link monitoring out-of-sync test for PSCell configured with SSB-based RLM RS in non-DRX mode	LTE Cell 1	NR Cell 1			
4.5.1.2	EN-DC FR1 radio link monitoring in-sync test for PSCell configured with SSB-based RLM RS in non-DRX mode	LTE Cell 1	NR Cell 1			
4.5.1.3	EN-DC FR1 radio link monitoring out-of-sync test for PSCell configured with SSB-based RLM RS in DRX mode	LTE Cell 1	NR Cell 1			
4.5.1.4	EN-DC FR1 radio link monitoring in-sync test for PSCell configured with SSB-based RLM RS in DRX mode	LTE Cell 1	NR Cell 1			
4.5.1.5	EN-DC FR1 radio link monitoring out-of-sync test for PSCell configured with CSI-RS-based RLM RS in non-DRX mode	LTE Cell 1	NR Cell 1			
4.5.1.6	EN-DC FR1 radio link monitoring in-sync test for PSCell configured with CSI-RS-based RLM RS in non-DRX mode	LTE Cell 1	NR Cell 1			
4.5.1.7	EN-DC FR1 radio link monitoring out-of-sync test for PSCell configured with CSI-RS-based RLM RS in DRX mode	LTE Cell 1	NR Cell 1			
4.5.1.8	EN-DC FR1 radio link monitoring in-sync test for PSCell configured with CSI-RS-based RLM RS in DRX mode	LTE Cell 1	NR Cell 1			
4.5.2.1	EN-DC FR1 interruptions at transitions between active and non-active during DRX in synchronous EN-DC	LTE Cell 1	NR Cell 1			
4.5.2.2	EN-DC FR1 interruptions at transitions between active and non-active during DRX in asynchronous EN-DC	LTE Cell 1	NR Cell 1			
4.5.2.3	EN-DC FR1 interruptions during measurements on deactivated NR SCC in synchronous EN-DC	LTE Cell 1	NR Cell 1	NR Cell 6		intra-band
				NR Cell 10		inter-band
4.5.2.4	EN-DC FR1 interruptions during measurements on deactivated NR SCC in asynchronous EN-DC	LTE Cell 1	NR Cell 1	NR Cell 6		intra-band
				NR Cell 10		inter-band

TC	Description	38.533 LTE Cell1	38.533 NR Cell2	38.533 NR Cell3	38.533 NR Cell4	CA Type
4.5.2.5	EN-DC FR1 interruptions during measurements on deactivated E-UTRAN SCC in synchronous EN-DC	LTE Cell 6	NR Cell 1	LTE Cell 3		
4.5.2.6	EN-DC FR1 interruptions during measurements on deactivated E-UTRAN SCC in asynchronous EN-DC	LTE Cell 6	NR Cell 1	LTE Cell 3		
4.5.3.1	EN-DC FR1 SCell activation and deactivation of known SCell in non-DRX for 160ms SCell measurement cycle	LTE Cell 1	NR Cell 1	NR Cell 6		intra-band
				NR Cell 10		inter-band
4.5.3.2	EN-DC FR1 SCell activation and deactivation of known SCell in non-DRX for 640ms SCell measurement cycle	LTE Cell 1	NR Cell 1	NR Cell 6		intra-band
				NR Cell 10		inter-band
4.5.3.3	EN-DC FR1 SCell activation and deactivation of unknown SCell in non-DRX	LTE Cell 1	NR Cell 1	NR Cell 6		intra-band
				NR Cell 10		inter-band
4.5.3.5	Direct SCell activation at SCell addition of known SCell in FR1	LTE Cell 1	NR Cell 1	NR Cell 6		intra-band
				NR Cell 10		inter-band
4.5.4.1	EN-DC FR1 UE UL carrier RRC reconfiguration delay	LTE Cell 1	NR Cell 6	NR Cell 3		
4.5.5.1	EN-DC FR1 SSB-based beam failure detection and link recovery in non-DRX	LTE Cell 1	NR Cell 1			
4.5.5.2	EN-DC FR1 SSB-based beam failure detection and link recovery in DRX	LTE Cell 1	NR Cell 1			
4.5.5.3	EN-DC FR1 CSI-RS-based beam failure detection and link recovery in non-DRX	LTE Cell 1	NR Cell 1			
4.5.5.4	EN-DC FR1 CSI-RS-based beam failure detection and link recovery in DRX	LTE Cell 1	NR Cell 1			
4.5.5.5	EN-DC FR1 Scell CSI-RS-based beam failure detection and SSB-based link recovery in non-DRX	LTE Cell 1	NR Cell 1			
4.5.5.6	EN-DC FR1 Scell CSI-RS-based beam failure detection and SSB-based link recovery in DRX	LTE Cell 1	NR Cell 1			
4.5.6.1.1	EN-DC FR1 DCI-based DL active BWP switch in non-DRX in synchronous EN-DC	LTE Cell 1	NR Cell 1			
4.5.6.1.2	EN-DC FR1 DCI-based DL active BWP switch with SCell in non-DRX in synchronous EN-DC	LTE Cell 1	NR Cell 6	NR Cell 3		
4.5.6.2.1	EN-DC FR1 RRC-based DL active BWP switch in non-DRX in synchronous EN-DC	LTE Cell 1	NR Cell 1			
4.5.7.1	EN-DC FR1 addition and release delay of known PSCell	LTE Cell 1	NR Cell 1			
4.5.8.1	EN-DC FR1 interruptions at switching between two uplink carriers	LTE Cell 1	NR Cell 1			
4.6.1.1	EN-DC FR1 event-triggered reporting without gap in non-DRX	LTE Cell 1	NR Cell 1	NR Cell 2		
4.6.1.2	EN-DC FR1 event-triggered reporting without gap in DRX	LTE Cell 1	NR Cell 1	NR Cell 2		
4.6.1.3	EN-DC FR1 event-triggered reporting with gap in non-DRX	LTE Cell 1	NR Cell 1	NR Cell 2		
4.6.1.4	EN-DC FR1 event-triggered reporting with gap in DRX	LTE Cell 1	NR Cell 1	NR Cell 2		
4.6.1.5	EN-DC FR1 event-triggered reporting without gap in non-DRX with SSB time index detection	LTE Cell 1	NR Cell 1	NR Cell 2		
4.6.1.6	EN-DC FR1 event-triggered reporting with gap in non-DRX with SSB time index detection	LTE Cell 1	NR Cell 1	NR Cell 2		
4.6.1.7	EN-DC FR1 event-triggered reporting without gap in DRX for UE configured with highSpeedMeasFlag-r16	LTE Cell 1	NR Cell 1	NR Cell 2		
4.6.1.8	EN-DC FR1 event triggered reporting cell without SSB time index detection in DRX for UE configured with highSpeedMeasCA-Scell-r17	LTE Cell 1	NR Cell 6	NR Cell 3	NR Cell 12	
4.6.2.1	EN-DC FR1-FR1 event-triggered reporting	LTE Cell 1	NR Cell 6	NR Cell 3		

TC	Description	38.533 LTE Cell1	38.533 NR Cell2	38.533 NR Cell3	38.533 NR Cell4	CA Type
	in non-DRX					
4.6.2.2	EN-DC FR1-FR1 event-triggered reporting in DRX	LTE Cell 1	NR Cell 6	NR Cell 3		
4.6.2.5	EN-DC FR1-FR1 event-triggered reporting in non-DRX with SSB time index detection	LTE Cell 1	NR Cell 6	NR Cell 3		
4.6.2.6	EN-DC FR1-FR1 event-triggered reporting in DRX with SSB time index detection	LTE Cell 1	NR Cell 6	NR Cell 3		
4.6.2.9	EN-DC FR1-FR1 event triggered reporting without SSB time index detection in DRX for UE configured with highSpeedMeasInterFreq-r17	LTE Cell 1	NR Cell 6	NR Cell 3		
4.6.4.1	EN-DC FR1 SSB-based L1-RSRP measurement in non-DRX	LTE Cell 1	NR Cell 1			
4.6.4.2	EN-DC FR1 SSB-based L1-RSRP measurement in DRX	LTE Cell 1	NR Cell 1			
4.6.4.3	EN-DC FR1 CSI-RS-based L1-RSRP measurement in non-DRX	LTE Cell 1	NR Cell 1			
4.6.4.4	EN-DC FR1 CSI-RS-based L1-RSRP measurement in DRX	LTE Cell 1	NR Cell 1			
4.6.7.1	EN-DC FR1 CSI-RS based CMR and no dedicated IMR L1-SINR measurement in non-DRX	LTE Cell 1	NR Cell 1			
4.6.7.2	EN-DC FR1 SSB based CMR and dedicated IMR L1-SINR measurement in DRX	LTE Cell 1	NR Cell 1			
4.6.7.3	EN-DC FR1 CSI-RS based CMR and dedicated IMR L1-SINR measurement in DRX	LTE Cell 1	NR Cell 1			
4.7.1.1.1	EN-DC FR1 SS-RSRP absolute measurement accuracy	LTE Cell 1	NR Cell 489	NR Cell 1		
4.7.1.1.2	EN-DC FR1 SS-RSRP relative measurement accuracy	LTE Cell 1	NR Cell 489	NR Cell 1		
4.7.1.2.1	EN-DC FR1-FR1 SS-RSRP absolute measurement accuracy	LTE Cell 1	NR Cell 6	NR Cell 3		
4.7.1.2.2	EN-DC FR1-FR1 SS-RSRP relative measurement accuracy	LTE Cell 1	NR Cell 6	NR Cell 3		
4.7.2.1	EN-DC FR1 SS-RSRQ measurement accuracy	LTE Cell 1	NR Cell 1	NR Cell 2		
4.7.2.2.1	EN-DC FR1-FR1 SS-RSRQ absolute measurement accuracy	LTE Cell 1	NR Cell 6	NR Cell 3		
4.7.2.2.2	EN-DC FR1-FR1 SS-RSRQ relative measurement accuracy	LTE Cell 1	NR Cell 6	NR Cell 3		
4.7.3.1	EN-DC FR1 SS-SINR measurement accuracy	LTE Cell 1	NR Cell 1	NR Cell 2		
4.7.3.2.1	EN-DC FR1-FR1 SS-SINR absolute measurement accuracy	LTE Cell 1	NR Cell 6	NR Cell 3		
4.7.3.2.2	EN-DC FR1-FR1 SS-SINR relative measurement accuracy	LTE Cell 1	NR Cell 6	NR Cell 3		
4.7.4.1.1	EN-DC FR1 SSB based L1-RSRP absolute measurement accuracy	LTE Cell 1	NR Cell 1			
4.7.4.1.2	EN-DC FR1 SSB based L1-RSRP relative measurement accuracy	LTE Cell 1	NR Cell 1			
4.7.4.2.1	EN-DC FR1 CSI-RS based L1-RSRP absolute measurement accuracy	LTE Cell 1	NR Cell 1			
4.7.4.2.2	EN-DC FR1 CSI-RS based L1-RSRP relative measurement accuracy	LTE Cell 1	NR Cell 1			
4.7.5.1	EN-DC FR1 SFTD measurement accuracy	LTE Cell 1	NR Cell 1			
4.7.7.1	EN-DC FR1 CSI-RS based CMR and no dedicated IMR configured and CSI-RS resource set with repetition off L1-SINR measurement accuracy	LTE Cell 1	NR Cell 1			
4.7.7.2	EN-DC FR1 SSB based CMR and dedicated IMR L1-SINR absolute measurement accuracy	LTE Cell 1	NR Cell 1			
4.7.7.3	EN-DC FR1 CSI-RS based CMR and dedicated IMR L1-SINR measurement	LTE Cell 1	NR Cell 1			

TC	Description	38.533 LTE Cell1	38.533 NR Cell2	38.533 NR Cell3	38.533 NR Cell4	CA Type
	accuracy					

E.3 Cell configuration mapping for EN-DC FR2 test cases in Chapter 5

Table E.3-1 defines the cell configuration mapping for EN-DC FR2 test cases in chapter 5 of this test specification.

Table E.3-1: Cell configuration mapping for EN-DC FR2 RRM testing

TC	Description	38.533 LTE Cell1	38.533 NR Cell2	38.533 NR Cell3	38.533 NR Cell4	CA Type
5.3.2.2.1	EN-DC FR2 contention based random access	LTE Cell 1	NR Cell 1			
5.3.2.2.2	EN-DC FR2 non-contention based random access	LTE Cell 1	NR Cell 1			
5.3.2.2.3	EN-DC FR2 2-step contention based random access	LTE Cell 1	NR Cell 1			
5.3.2.2.4	EN-DC FR2 2-step non-contention based random access	LTE Cell 1	NR Cell 1			
5.4.1.1	EN-DC FR2 UE transmit timing accuracy	LTE Cell 1	NR Cell 1			
5.4.3.1	EN-DC FR2 timing advance adjustment accuracy	LTE Cell 1	NR Cell 1			
5.5.1.1	EN-DC FR2 radio link monitoring out-of-sync test for PSCell configured with SSB-based RLM RS in non-DRX mode	LTE Cell 1	NR Cell 6			
5.5.1.2	EN-DC FR2 radio link monitoring in-sync test for PSCell configured with SSB-based RLM RS in non-DRX mode	LTE Cell 1	NR Cell 6			
5.5.1.3	EN-DC FR2 radio link monitoring out-of-sync test for PSCell configured with SSB-based RLM RS in DRX mode	LTE Cell 1	NR Cell 6			
5.5.1.4	EN-DC FR2 radio link monitoring in-sync test for PSCell configured with SSB-based RLM RS in DRX mode	LTE Cell 1	NR Cell 6			
5.5.1.5	EN-DC FR2 radio link monitoring out-of-sync test for PSCell configured with CSI-RS-based RLM RS in non-DRX mode	LTE Cell 1	NR Cell 1			
5.5.1.6	EN-DC FR2 radio link monitoring in-sync test for PSCell configured with CSI-RS-based RLM RS in non-DRX mode	LTE Cell 1	NR Cell 1			
5.5.1.7	EN-DC FR2 radio link monitoring out-of-sync test for PSCell configured with CSI-RS-based RLM RS in DRX mode	LTE Cell 1	NR Cell 1			
5.5.1.8	EN-DC FR2 radio link monitoring in-sync test for PSCell configured with CSI-RS-based RLM RS in DRX mode	LTE Cell 1	NR Cell 1			
5.5.1.9	EN-DC FR2 radio link monitoring UE scheduling restrictions	LTE Cell 1	NR Cell 1			
5.5.2.1	EN-DC FR2 interruptions at transitions between active and non-active during DRX in synchronous EN-DC	LTE Cell 1	NR Cell 1			
5.5.2.2	EN-DC FR2 interruptions at transitions between active and non-active during DRX in asynchronous EN-DC	LTE Cell 1	NR Cell 1			
5.5.2.3	EN-DC FR2 interruptions during measurements on deactivated NR SCC in synchronous EN-DC	LTE Cell 1	NR Cell 1	NR Cell 6		intra-band
				NR Cell 10		inter-band
5.5.2.4	EN-DC FR2 interruptions during measurements on deactivated NR SCC in asynchronous EN-DC	LTE Cell 1	NR Cell 1	NR Cell 6		intra-band
				NR Cell 10		inter-band
5.5.2.5	EN-DC FR2 interruptions during measurements on deactivated E-UTRAN	LTE Cell 6	NR Cell 1	LTE Cell 3		

TC	Description	38.533 LTE Cell1	38.533 NR Cell2	38.533 NR Cell3	38.533 NR Cell4	CA Type
	SCC in synchronous EN-DC					
5.5.2.6	EN-DC FR2 interruptions during measurements on deactivated E-UTRAN SCC in asynchronous EN-DC	LTE Cell 6	NR Cell 1	LTE Cell 3		
5.5.3.1	EN-DC FR2 SCell activation and deactivation intra-band in non-DRX	LTE Cell 1	NR Cell 1	NR Cell 6		intra-band
5.5.3.7	Direct SCell activation at SCell addition of known SCell in FR2	LTE Cell 1	NR Cell 1	NR Cell 6		intra-band
5.5.5.1	EN-DC FR2 SSB-based beam failure detection and link recovery in non-DRX	LTE Cell 1	NR Cell 1			
5.5.5.2	EN-DC FR2 SSB-based beam failure detection and link recovery in DRX	LTE Cell 1	NR Cell 1			
5.5.5.3	EN-DC FR2 CSI-RS-based beam failure detection and link recovery in non-DRX	LTE Cell 1	NR Cell 1			
5.5.5.4	EN-DC FR2 CSI-RS-based beam failure detection and link recovery in DRX	LTE Cell 1	NR Cell 1			
5.5.5.5	EN-DC FR2 scheduling available restriction during SSB-based beam failure detection and link recovery in non-DRX	LTE Cell 1	NR Cell 1			
5.5.5.6	EN-DC FR2 SCell CSI-RS-based beam failure detection and link recovery in non-DRX	LTE Cell 1	NR Cell 1	NR Cell 6		
5.5.5.7	EN-DC FR2 SCell CSI-RS-based beam failure detection and link recovery in DRX	LTE Cell 1	NR Cell 1	NR Cell 6		
5.5.6.2.1	EN-DC FR2 RRC-based DL active BWP switch in non-DRX in synchronous EN-DC	LTE Cell 1	NR Cell 1			
5.5.8.1	EN-DC FR2 MAC-CE based active TCI state switch	LTE Cell 1	NR Cell 1			
5.5.8.2	EN-DC FR2 RRC based active TCI state switch	LTE Cell 1	NR Cell 1			
5.6.1.1	EN-DC FR2 event-triggered reporting without gap in non-DRX	LTE Cell 1	NR Cell 1	NR Cell 2		
5.6.1.2	EN-DC FR2 event-triggered reporting without gap in DRX	LTE Cell 1	NR Cell 1	NR Cell 2		
5.6.1.3	EN-DC FR2 event-triggered reporting with gap in non-DRX	LTE Cell 1	NR Cell 1	NR Cell 2		
5.6.1.4	EN-DC FR2 event-triggered reporting with gap in DRX	LTE Cell 1	NR Cell 1	NR Cell 2		
5.6.2.1	EN-DC FR2-FR2 event-triggered reporting in non-DRX	LTE Cell 1	NR Cell 6	NR Cell 3		
5.6.2.2	EN-DC FR2-FR2 event-triggered reporting in DRX	LTE Cell 1	NR Cell 6	NR Cell 3		
5.6.2.3	EN-DC FR2-FR2 event-triggered reporting in non-DRX with SSB time index detection	LTE Cell 1	NR Cell 6	NR Cell 3		
5.6.2.4	EN-DC FR2-FR2 event-triggered reporting in DRX with SSB time index detection	LTE Cell 1	NR Cell 6	NR Cell 3		
5.6.2.5	EN-DC FR1-FR2 event-triggered reporting in non-DRX	LTE Cell 1	NR Cell 6	NR Cell 3		
5.6.2.6	EN-DC FR1-FR2 event-triggered reporting in DRX	LTE Cell 1	NR Cell 6	NR Cell 3		
5.6.2.7	EN-DC FR1-FR2 event-triggered reporting in non-DRX with SSB time index detection	LTE Cell 1	NR Cell 6	NR Cell 3		
5.6.2.8	EN-DC FR1-FR2 event-triggered reporting in DRX with SSB time index detection	LTE Cell 1	NR Cell 6	NR Cell 3		
5.6.3.1	EN-DC FR2 SSB-based L1-RSRP measurement in non-DRX	LTE Cell 1	NR Cell 1			
5.6.3.2	EN-DC FR2 SSB-based L1-RSRP measurement in DRX	LTE Cell 1	NR Cell 1			
5.6.3.3	EN-DC FR2 CSI-RS-based L1-RSRP measurement in non-DRX	LTE Cell 1	NR Cell 1			
5.6.3.4	EN-DC FR2 CSI-RS-based L1-RSRP measurement in DRX	LTE Cell 1	NR Cell 1			
5.6.6.1	EN-DC FR2 CSI-RS based CMR and no dedicated IMR L1-SINR measurement in DRX	LTE Cell 1	NR Cell 1			

5.6.6.2	EN-DC FR2 SSB based CMR and dedicated IMR L1-SINR measurement in non-DRX	LTE Cell 1	NR Cell 1			
5.6.6.3	EN-DC FR2 CSI-RS based CMR and dedicated IMR L1-SINR measurement in non-DRX	LTE Cell 1	NR Cell 1			
5.7.1.1	EN-DC FR2 SS-RSRP measurement accuracy	LTE Cell 1	NR Cell 489	NR Cell 1		
5.7.1.2	EN-DC FR2-FR2 SS-RSRP measurement accuracy	LTE Cell 1	NR Cell 6	NR Cell 3		
5.7.1.3	EN-DC FR1-FR2 SS-RSRP measurement accuracy	LTE Cell 1	NR Cell 6	NR Cell 3		
5.7.2.1	EN-DC FR2 SS-RSRQ measurement accuracy	LTE Cell 1	NR Cell 1	NR Cell 2		
5.7.2.2	EN-DC FR2-FR2 SS-RSRQ measurement accuracy	LTE Cell 1	NR Cell 6	NR Cell 3		
5.7.3.1	EN-DC FR2 SS-SINR measurement accuracy	LTE Cell 1	NR Cell 1	NR Cell 2		
5.7.3.2	EN-DC FR2-FR2 SS-SINR measurement accuracy	LTE Cell 1	NR Cell 6	NR Cell 3		
5.7.6.1	EN-DC FR2 CSI-RS based CMR and no dedicated IMR configured and CSI-RS resource set with repetition off L1-SINR measurement accuracy	LTE Cell 1	NR Cell 1			
5.7.6.2	EN-DC FR2 SSB based CMR and dedicated IMR L1-SINR absolute measurement accuracy	LTE Cell 1	NR Cell 1			
5.7.6.3	EN-DC FR2 CSI-RS based CMR and dedicated IMR L1-SINR measurement accuracy	LTE Cell 1	NR Cell 1			

E.4 Cell configuration mapping for SA FR1 test cases in Chapter 6

Table E.4-1 defines the cell configuration mapping for NR/5GC FR1 test cases in chapter 6 of this test specification.

Table E.4-1: Cell configuration mapping for SA FR1 RRM testing

TC	Description	38.533 NR Cell1	38.533 NR Cell2	38.533 NR Cell3	38.533 NR Cell4	CA Type
6.1.1.1	NR SA FR1 cell re-selection	NR Cell 1	NR Cell 11			
6.1.1.2	NR SA FR1-FR1 cell re-selection	NR Cell 6	NR Cell 23			
6.1.1.3	NR SA FR1 cell re-selection for UE fulfilling low mobility relaxed measurement criterion	NR Cell 1	NR Cell 11			
6.1.1.4	NR SA FR1 cell re-selection for UE fulfilling not-at-cell edge relaxed measurement criterion	NR Cell 1	NR Cell 11			
6.1.1.5	NR SA FR1-FR1 cell re-selection for UE fulfilling low mobility relaxed measurement criterion	NR Cell 1	NR Cell 23			
6.1.1.6	NR SA FR1-FR1 cell re-selection for UE fulfilling not-at-cell edge relaxed measurement criterion	NR Cell 1	NR Cell 23			
6.1.1.7	NR SA FR1 cell re-selection for UE configured with highSpeedMeasFlag-r16	NR Cell 1	NR Cell 11			
6.1.1.8	NR SA FR1-FR1 Cell reselection for UE configured with highSpeedMeasInterFreq-r17	NR Cell 1	NR Cell 11			
6.3.1.1	NR SA FR1 handover with known target cell	NR Cell 1	NR Cell 2			
6.3.1.2	NR SA FR1 handover with unknown target cell	NR Cell 1	NR Cell 2			
6.3.1.3	NR SA FR1-FR1 Handover with unknown Target Cell	NR Cell 6	NR Cell 3			
6.3.1.7	NR SA FR1 synchronous DAPS handover	NR Cell 1	NR Cell 2			
6.3.1.8	NR SA FR1 asynchronous DAPS handover	NR Cell 1	NR Cell 2			

TC	Description	38.533 NR Cell1	38.533 NR Cell2	38.533 NR Cell3	38.533 NR Cell4	CA Type
6.3.1.9	NR SA FR1 Intra-band inter-frequency synchronous DAPS handover	NR Cell 6	NR Cell 3			
6.3.1.10	NR SA FR1 Intra-band inter-frequency asynchronous DAPS handover	NR Cell 6	NR Cell 3			
6.3.1.11	NR SA FR1 Inter-band inter-frequency synchronous DAPS handover	NR Cell 1	NR Cell 10			
6.3.1.12	NR SA FR1 Inter-band inter-frequency asynchronous DAPS handover	NR Cell 1	NR Cell 10			
6.3.2.1.1	NR SA FR1 RRC re-establishment	NR Cell 1	NR Cell 2			
6.3.2.1.2	NR SA FR1 - FR1 RRC re-establishment	NR Cell 6	NR Cell 3			
6.3.2.1.3	NR SA FR1 RRC re-establishment without serving cell timing	NR Cell 1	NR Cell 2			
6.3.2.2.1	NR SA FR1 contention based random access	NR Cell 1				
6.3.2.2.2	NR SA FR1 non-contention based random access	NR Cell 1				
6.3.2.2.3	NR SA FR1 2-step contention based random access	NR Cell 1				
6.3.2.2.4	NR SA FR1 2-step non-contention based random access	NR Cell 1				
6.3.2.3.1	NR SA FR1 RRC connection release with redirection	NR Cell 6	NR Cell 2			
6.3.3.1	NR SA FR1 conditional handover	NR Cell 1	NR Cell 2			
6.3.3.2	NR SA FR1-FR1 conditional handover	NR Cell 1	NR Cell 6			
6.4.3.1	NR SA FR1 timing advance adjustment accuracy	NR Cell 1				
6.5.1.1	NR SA FR1 radio link monitoring out-of-sync test for PCell configured with SSB-based RLM RS in non-DRX mode	NR Cell 1				
6.5.1.2	NR SA FR1 radio link monitoring in-sync test for PCell configured with SSB-based RLM RS in non-DRX mode	NR Cell 1				
6.5.1.3	NR SA FR1 radio link monitoring out-of-sync test for PCell configured with SSB-based RLM RS in DRX mode	NR Cell 1				
6.5.1.4	NR SA FR1 radio link monitoring in-sync test for PCell configured with SSB-based RLM RS in DRX mode	NR Cell 1				
6.5.1.5	NR SA FR1 radio link monitoring out-of-sync test for PCell configured with CSI-RS-based RLM RS in non-DRX mode	NR Cell 1				
6.5.1.6	NR SA FR1 radio link monitoring in-sync test for PCell configured with CSI-RS-based RLM RS in non-DRX mode	NR Cell 1				
6.5.1.7	NR SA FR1 radio link monitoring out-of-sync test for PCell configured with CSI-RS-based RLM RS in DRX mode	NR Cell 1				
6.5.1.8	NR SA FR1 radio link monitoring in-sync test for PCell configured with CSI-RS-based RLM RS in DRX mode	NR Cell 1				
6.5.2.1	NR SA FR1 interruptions during measurements on deactivated NR SCC	NR Cell 1	NR Cell 6			intra-band
			NR Cell 10			inter-band
6.5.3.1	NR SA FR1 SCell activation and deactivation of known SCell in non-DRX for 160ms SCell measurement cycle	NR Cell 1	NR Cell 6			intra-band
			NR Cell 10			inter-band
6.5.3.2	NR SA FR1 SCell activation and deactivation of known SCell in non-DRX for 640ms SCell measurement cycle	NR Cell 1	NR Cell 6			intra-band
			NR Cell 10			inter-band
6.5.3.3	NR SA FR1 SCell activation and deactivation of unknown SCell in non-DRX	NR Cell 1	NR Cell 6			intra-band
			NR Cell 10			inter-band
6.5.3.4	Direct SCell activation at SCell addition of known SCell in FR1	NR Cell 1	NR Cell 6			intra-band
6.5.4.1	NR SA FR1 UE UL carrier RRC reconfiguration delay	NR Cell 1	NR Cell 33			
6.5.5.1	NR SA FR1 SSB-based beam failure	NR Cell 1				

TC	Description	38.533 NR Cell1	38.533 NR Cell2	38.533 NR Cell3	38.533 NR Cell4	CA Type
	detection and link recovery in non-DRX					
6.5.5.2	NR SA FR1 SSB-based beam failure detection and link recovery in DRX	NR Cell 1				
6.5.5.3	NR SA FR1 CSI-RS-based beam failure detection and link recovery in non-DRX	NR Cell 1				
6.5.5.4	NR SA FR1 CSI-RS-based beam failure detection and link recovery in DRX	NR Cell 1				
6.5.5.5	NR SA FR1 Scell CSI-RS-based beam failure detection and SSB-based link recovery in non-DRX	NR Cell 1	NR Cell 10			
6.5.5.6	NR SA FR1 Scell CSI-RS-based beam failure detection and SSB-based link recovery in DRX	NR Cell 1	NR Cell 10			
6.5.6.1.1	NR SA FR1-FR1 DCI-based DL active BWP switch in non-DRX	NR Cell 6	NR Cell 3			
6.5.6.1.2	NR SA FR1 DCI-based DL active BWP switch in non-DRX	NR Cell 1				
6.5.6.2.1	NR SA FR1 RRC-based DL active BWP switch in non-DRX	NR Cell 1				
6.5.7.1	NR SA FR1 DL Interruptions at switching between two uplink carriers in FDD-TDD CA	NR Cell 1	NR Cell 10			inter-band
6.5.7.2	NR SA FR1 DL Interruptions at switching between two uplink carriers in TDD-TDD CA	NR Cell 1	NR Cell 10			inter-band
6.5.8.1	UE specific CBW change on PCell in FR1 in non-DRX	NR Cell 1				
6.6.1.1	SA event triggered reporting tests without gap under non-DRX	NR Cell 1	NR Cell 2			
6.6.1.2	SA event triggered reporting tests without gap under DRX	NR Cell 1	NR Cell 2			
6.6.1.3	SA event triggered reporting tests with per-UE gaps under non-DRX	NR Cell 1	NR Cell 2			
6.6.1.4	SA event triggered reporting tests with per-UE gaps under DRX	NR Cell 1	NR Cell 2			
6.6.1.5	SA event triggered reporting tests without gap under non-DRX with SSB index reading	NR Cell 1	NR Cell 2			
6.6.1.6	SA event triggered reporting tests with per-UE gaps under non-DRX with SSB index reading	NR Cell 1	NR Cell 2			
6.6.1.7	NR SA FR1 event-triggered reporting without gap in DRX for UE configured with highSpeedMeasFlag-r16	NR Cell 1	NR Cell 2			
6.6.1.8	NR SA FR1 event triggered reporting without gap in DRX for UE configured with highSpeedMeasCA-Scell-r17	NR Cell 1	NR Cell 2			
6.6.2.1	NR SA FR1-FR1 event-triggered reporting in non-DRX	NR Cell 6	NR Cell 3			
6.6.2.2	NR SA FR1-FR1 event-triggered reporting in DRX	NR Cell 6	NR Cell 3			
6.6.2.5	NR SA FR1-FR1 event-triggered reporting in non-DRX with SSB time index detection	NR Cell 6	NR Cell 3			
6.6.2.6	NR SA FR1-FR1 event-triggered reporting in DRX with SSB time index detection	NR Cell 6	NR Cell 3			
6.6.2.12	NR SA FR1-FR1 event triggered reporting tests without SSB time index detection in DRX for UE configured with highSpeedMeasInterFreq-r17	NR Cell 6	NR Cell 3			
6.6.4.1	NR SA FR1 SSB-based L1-RSRP measurement in non-DRX	NR Cell 1				
6.6.4.2	NR SA FR1 SSB-based L1-RSRP measurement in DRX	NR Cell 1				
6.6.4.3	NR SA FR1 CSI-RS-based L1-RSRP measurement in non-DRX	NR Cell 1				
6.6.4.4	NR SA FR1 CSI-RS-based L1-RSRP measurement in DRX	NR Cell 1				
6.6.4.5	NR SA FR1 SSB-based L1-RSRP	NR Cell 1				

TC	Description	38.533 NR Cell1	38.533 NR Cell2	38.533 NR Cell3	38.533 NR Cell4	CA Type
	measurement in DRX for UE configured with highSpeedMeasFlag-r16					
6.6.8.1	NR SA FR1 CSI-RS based CMR and no dedicated IMR L1-SINR measurement in DRX	NR Cell 1				
6.6.8.2	NR SA FR1 SSB based CMR and dedicated IMR L1-SINR measurement in non-DRX	NR Cell 1				
6.6.8.3	NR SA FR1 CSI-RS based CMR and dedicated IMR L1-SINR measurement in non-DRX	NR Cell 1				
6.6.9.1	NR SA FR1 Idle mode CA/DC measurement for FR1	NR Cell 1	NR Cell 6			intra-band
			NR Cell 10			inter-band
6.6.18.1	NR SA FR1 event-triggered reporting for concurrent gaps non-overlap with SSB-based measurements in both inter-frequency layers	NR Cell 1	NR Cell 3	NR Cell 6		
6.6.18.2	NR SA FR1 event-triggered reporting for concurrent gaps partially-overlap with SSB-based measurements in both inter-frequency layers	NR Cell 1	NR Cell 3	NR Cell 6		
6.6.20	UE Rx-Tx time difference measurement for propagation delay compensation	NR Cell 1				
6.6.21	UE Rx-Tx time difference measurement for propagation delay compensation with TRS	NR Cell 1				
6.7.1.1.1	NR SA FR1 SS-RSRP absolute measurement accuracy	NR Cell 489	NR Cell 1			
6.7.1.1.2	NR SA FR1 SS-RSRP relative measurement accuracy	NR Cell 489	NR Cell 1			
6.7.1.2.1	NR SA FR1-FR1 SS-RSRP absolute measurement accuracy	NR Cell 6	NR Cell 3			
6.7.1.2.2	NR SA FR1-FR1 SS-RSRP relative measurement accuracy	NR Cell 6	NR Cell 3			
6.7.1.3.1	NR SA FR1-FR2 SS-RSRP absolute measurement accuracy	NR Cell 1	NR Cell 2			
6.7.1.3.2	NR SA FR1-FR2 SS-RSRP relative measurement accuracy	NR Cell 1	NR Cell 2			
6.7.2.1	NR SA FR1 SS-RSRQ measurement accuracy	NR Cell 1	NR Cell 2			
6.7.2.2.1	NR SA FR1-FR1 SS-RSRQ absolute measurement accuracy	NR Cell 6	NR Cell 3			
6.7.2.2.2	NR SA FR1-FR1 SS-RSRQ relative measurement accuracy	NR Cell 6	NR Cell 3			
6.7.3.1	NR SA FR1 SS-SINR measurement accuracy	NR Cell 1	NR Cell 2			
6.7.3.2.1	NR SA FR1-FR1 SS-SINR absolute measurement accuracy	NR Cell 6	NR Cell 3			
6.7.3.2.2	NR SA FR1-FR1 SS-SINR relative measurement accuracy	NR Cell 6	NR Cell 3			
6.7.4.1.1	NR SA FR1 SSB based L1-RSRP absolute measurement accuracy	NR Cell 1				
6.7.4.1.2	NR SA FR1 SSB based L1-RSRP relative measurement accuracy	NR Cell 1				
6.7.4.2.1	NR SA FR1 CSI-RS based L1-RSRP absolute measurement accuracy	NR Cell 1				
6.7.4.2.2	NR SA FR1 CSI-RS based L1-RSRP relative measurement accuracy	NR Cell 1				
6.7.9.1	NR SA FR1 CSI-RS based CMR and no dedicated IMR configured and CSI-RS resource set with repetition off L1-SINR measurement accuracy	NR Cell 1				
6.7.9.2	NR SA FR1 SSB based CMR and dedicated IMR L1-SINR absolute measurement accuracy	NR Cell 1				
6.7.9.3	NR SA FR1 CSI-RS based CMR and dedicated IMR L1-SINR measurement	NR Cell 1				

TC	Description	38.533 NR Cell1	38.533 NR Cell2	38.533 NR Cell3	38.533 NR Cell4	CA Type
	accuracy					

Table E.4-2 defines the cell configuration mapping for NR/5GC FR1 – E-UTRA Inter-RAT test cases (serving cell in NR) in chapter 6 of this test specification.

Table E.4-2: Cell configuration mapping for SA FR1 – E-UTRA Inter-RAT RRM testing

TC	Description	38.533 NR Cell1	38.533 LTE Cell2	38.533 LTE Cell3	38.533 LTE Cell4	CA Type
6.1.2.1	NR SA FR1 – E-UTRA cell re-selection to higher priority E-UTRA	NR Cell 1	LTE Cell 1			
6.1.2.2	NR SA FR1 – E-UTRA cell re-selection to lower priority E-UTRA	NR Cell 1	LTE Cell 1			
6.1.2.3	NR SA FR1 – E-UTRA cell re-selection to lower priority E-UTRAN for UE fulfilling low mobility relaxed measurement criterion	NR Cell 1	LTE Cell 1			
6.1.2.4	NR SA FR1 – E-UTRA cell re-selection to lower priority E-UTRAN for UE fulfilling not-at-cell edge relaxed measurement criterion	NR Cell 1	LTE Cell 1			
6.1.2.5	NR SA FR1 – E-UTRA cell re-selection to lower priority E-UTRA for UE configured with highSpeedMeasFlag-r16	NR Cell 1	LTE Cell 11			
6.3.1.4	NR SA FR1 – E-UTRA handover with known target cell	NR Cell 1	LTE Cell 1			
6.3.1.5	NR SA FR1 – E-UTRA handover with unknown target cell	NR Cell 1	LTE Cell 1			
6.3.2.3.2	NR SA FR1 – E-UTRA RRC connection release with redirection	NR Cell 1	LTE Cell 1			
6.6.3.1	NR SA FR1 – E-UTRAN event-triggered reporting in non-DRX	NR Cell 1	LTE Cell 1			
6.6.3.2	NR SA FR1 – E-UTRAN event-triggered reporting in DRX	NR Cell 1	LTE Cell 1			
6.6.3.3	NR SA FR1 – E-UTRAN event-triggered reporting in DRX for UE configured with highSpeedMeasFlag-r16	NR Cell 1	LTE Cell 1			
6.6.15.1	NR SA FR1 Idle Mode measurements of inter-RAT CA candidate cells for early reporting	NR Cell 1	LTE Cell 1			
6.7.5.1	NR SA FR1 – E-UTRAN RSRP absolute measurement accuracy	NR Cell 1	LTE Cell 1			
6.7.6.1	NR SA FR1 – E-UTRAN RSRQ absolute measurement accuracy	NR Cell 1	LTE Cell 1			
6.7.7.1	NR SA FR1 – E-UTRAN RS-SINR absolute measurement accuracy	NR Cell 1	LTE Cell 1			

Table E.4-3: Cell configuration mapping for SA FR1 – UTRA FDD Inter-RAT RRM testing

TC	Description	38.533 NR Cell1	38.533 UTRA Cell2	38.533 UTRA Cell3	38.533 UTRA Cell4	CA Type
6.3.1.6	NR SA FR1 – UTRA cell re-selection to higher priority UTRA	NR Cell 1	UTRA Cell 1			
6.6.5.1	NR SA FR1 – UTRAN event-triggered reporting in non-DRX	NR Cell 1	UTRA Cell 1			

E.5 Cell configuration mapping for SA FR2 test cases in Chapter 7

Table E.5-1 defines the cell configuration mapping for NR/5GC FR2 test cases in chapter 7 of this test specification.

Table E.5-1: Cell configuration mapping for SA FR2 RRM testing

TC	Description	38.533 NR Cell1	38.533 NR Cell2	38.533 NR Cell3	38.533 NR Cell4	CA Type
7.1.1.1	NR SA FR2 cell re-selection	NR Cell 1	NR Cell 11			
7.1.1.2	NR SA FR2-FR2 cell re-selection	NR Cell 1	NR Cell 23			
7.1.1.3	NR SA FR2 cell re-selection for UE fulfilling low mobility relaxed measurement criterion	NR Cell 1	NR Cell 2			
7.1.1.4	NR SA FR2 cell re-selection for UE fulfilling not-at-cell edge relaxed measurement criterion	NR Cell 1	NR Cell 2			
7.1.1.5	NR SA FR2-FR2 cell re-selection for UE fulfilling low mobility relaxed measurement criterion	NR Cell 1	NR Cell 2			
7.1.1.6	NR SA FR2-FR2 cell re-selection for UE fulfilling not-at-cell edge relaxed measurement criterion	NR Cell 1	NR Cell 2			
7.2.1.1	TA validation for CG-SDT in FR2	NR Cell 1				
7.3.1.1	NR SA FR1-FR2 Inter-frequency handover; unknown target cell	NR Cell 1	NR Cell 6			
7.3.1.2	NR SA FR2 Intra-frequency handover; unknown target cell	NR Cell 1	NR Cell 2			
7.3.1.3	NR SA FR2-FR2 Inter-frequency handover; unknown target cell	NR Cell 1	NR Cell 6			
7.3.1.4	NR SA FR1-FR2 synchronous DAPS handover	NR Cell 1	NR Cell 10			
7.3.1.5	NR SA FR1-FR2 asynchronous DAPS handover	NR Cell 1	NR Cell 10			
7.3.2.1.1	NR SA FR2 RRC re-establishment	NR Cell 1				
7.3.2.1.2	NR SA FR2-FR2 re-establishment	NR Cell 1				
7.3.2.1.3	NR SA FR2 RRC re-establishment without serving cell timing	NR Cell 1	NR Cell 2			
7.3.2.2.1	NR SA FR2 contention based random access	NR Cell 1				
7.3.2.2.2	NR SA FR2 non-contention based random access	NR Cell 1				
7.3.2.2.4	NR SA FR2 2-step non-contention based random access	NR Cell 1				
7.3.2.3.1	NR SA FR2-FR2 RRC connection release with redirection	NR Cell 1	NR Cell 6			
7.3.3.1	NR SA FR2 conditional handover	NR Cell 1	NR Cell 2			
7.3.3.2	NR SA FR2-FR2 conditional handover	NR Cell 1	NR Cell 6			
7.4.1.1	NR SA FR2 UE transmit timing accuracy	NR Cell 1				
7.4.3.1	NR SA FR2 timing advance adjustment accuracy	NR Cell 1				
7.5.1.1	Radio Link Monitoring Out-of-sync Test for FR2 PCell configured with SSB-based RLM RS in non-DRX mode	NR Cell 1				
7.5.1.2	Radio Link Monitoring In-sync Test for FR2 PCell configured with SSB-based RLM RS in non-DRX mode	NR Cell 1				
7.5.1.3	Radio Link Monitoring Out-of-sync Test for FR2 PCell configured with SSB-based RLM RS in DRX mode	NR Cell 1				
7.5.1.4	Radio Link Monitoring In-sync Test for FR2 PCell configured with SSB-based RLM RS in DRX mode	NR Cell 1				
7.5.1.9	NR SA FR2 radio link monitoring UE scheduling restrictions	NR Cell 1				
7.5.5.1	NR SA FR2 SSB-based beam failure detection and link recovery in non-DRX	NR Cell 1				
7.5.5.2	NR SA FR2 SSB-based beam failure detection and link recovery in DRX	NR Cell 1				
7.5.5.3	NR SA FR2 CSI-RS-based beam failure detection and link recovery in non-DRX	NR Cell 1				
7.5.5.4	NR SA FR2 CSI-RS-based beam failure detection and link recovery in DRX	NR Cell 1				

TC	Description	38.533 NR Cell1	38.533 NR Cell2	38.533 NR Cell3	38.533 NR Cell4	CA Type
7.5.5.6	NR SA FR2 Scell CSI-RS-based beam failure detection and link recovery in non-DRX	NR Cell 1	NR Cell 6			
7.5.5.7	NR SA FR2 Scell CSI-RS-based beam failure detection and link recovery in DRX	NR Cell 1	NR Cell 6			
7.5.6.1	NR SA FR2 DCI-based DL active BWP switch in non-DRX	NR Cell 1				
7.5.11.1	NR SA FR2 UE UL carrier RRC reconfiguration delay	NR Cell 1	NR Cell 2			
7.6.1.1	NR SA FR2 event-triggered reporting without gap in non-DRX	NR Cell 1	NR Cell 2			
7.6.1.2	NR SA FR2 event-triggered reporting without gap in DRX	NR Cell 1	NR Cell 2			
7.6.1.3	NR SA FR2 event-triggered reporting with gap in non-DRX	NR Cell 1	NR Cell 2			
7.6.1.4	NR SA FR2 event-triggered reporting with gap in DRX	NR Cell 1	NR Cell 2			
7.6.2.1	NR SA FR2-FR2 event-triggered reporting in non-DRX	NR Cell 6	NR Cell 3			
7.6.2.2	NR SA FR2-FR2 event-triggered reporting in DRX	NR Cell 6	NR Cell 3			
7.6.2.3	NR SA FR2-FR2 event-triggered reporting in non-DRX with SSB time index detection	NR Cell 6	NR Cell 3			
7.6.2.4	NR SA FR2-FR2 event-triggered reporting in DRX with SSB time index detection	NR Cell 6	NR Cell 3			
7.6.2.5	NR SA FR1-FR2 event-triggered reporting in non-DRX	NR Cell 6	NR Cell 3			
7.6.2.6	NR SA FR1-FR2 event-triggered reporting in DRX	NR Cell 6	NR Cell 3			
7.6.2.7	NR SA FR1-FR2 event-triggered reporting in non-DRX with SSB time index detection	NR Cell 6	NR Cell 3			
7.6.2.8	NR SA FR1-FR2 event-triggered reporting in DRX with SSB time index detection	NR Cell 6	NR Cell 3			
7.6.3.1	NR SA FR2 SSB-based L1-RSRP measurement in non-DRX	NR Cell 1				
7.6.3.2	NR SA FR2 SSB-based L1-RSRP measurement in DRX	NR Cell 1				
7.6.3.3	NR SA FR2 CSI-RS-based L1-RSRP measurement in non-DRX	NR Cell 1				
7.6.3.4	NR SA FR2 CSI-RS-based L1-RSRP measurement in DRX	NR Cell 1				
7.6.6.1	NR SA FR2 CSI-RS based CMR and no dedicated IMR configured and CSI-RS resource set with repetition off L1-SINR measurement accuracy	NR Cell 1				
7.6.6.2	NR SA FR2 SSB based CMR and dedicated IMR L1-SINR measurement accuracy	NR Cell 1				
7.6.6.3	NR SA FR2 CSI-RS based CMR and dedicated IMR L1-SINR measurement accuracy	NR Cell 1				
7.6.13.1	UE Rx-Tx time difference measurement for propagation delay compensation using PRS in FR2	NR Cell 1				
7.7.1.1	NR SA FR2 SS-RSRP measurement accuracy	NR Cell 489	NR Cell 1			
7.7.1.2	NR SA FR2-FR2 SS-RSRP measurement accuracy	NR Cell 6	NR Cell 3			
7.7.1.3.1	NR SA FR1-FR2 SS-RSRP absolute measurement accuracy	NR Cell 1	NR Cell 10			
7.7.1.3.2	Void					
7.7.2.1	NR SA FR2 SS-RSRQ measurement accuracy	NR Cell 1	NR Cell 2			
7.7.2.2	NR SA FR2-FR2 SS-RSRQ measurement accuracy	NR Cell 6	NR Cell 3			
7.7.3.1	NR SA FR2 SS-SINR measurement	NR Cell 1	NR Cell 2			

TC	Description	38.533 NR Cell1	38.533 NR Cell2	38.533 NR Cell3	38.533 NR Cell4	CA Type
	accuracy					
7.7.3.2	NR SA FR2-FR2 SS-SINR measurement accuracy	NR Cell 6	NR Cell 3			
7.7.6.1	NR SA FR2 CSI-RS based CMR and no dedicated IMR configured and CSI-RS resource set with repetition off L1-SINR measurement accuracy	NR Cell 1				
7.7.6.2	NR SA FR2 SSB based CMR and dedicated IMR L1-SINR measurement accuracy	NR Cell 1				
7.7.6.3	NR SA FR2 CSI-RS based CMR and dedicated IMR L1-SINR measurement accuracy	NR Cell 1				

E.6 Cell configuration mapping for E-UTRAN – SA test cases in Chapter 8

Table E.6-1 defines the cell configuration mapping for E-UTRAN - NR/5GC FR1 Inter-RAT test cases (serving cell in LTE) in chapter 8 of this test specification.

Table E.6-1: Cell configuration mapping for E-UTRA – SA FR1 Inter-RAT RRM testing

TC	Description	38.533 LTE Cell1	38.533 NR Cell2	38.533 NR Cell3	38.533 NR Cell4	CA Type
8.2.1.1	E-UTRA – NR FR1 cell re-selection to higher priority NR target cell	LTE Cell 1	NR Cell 1			
8.2.1.2	E-UTRA – NR FR1 Cell reselection to lower priority NR target Cell in FR1 for UE configured with highSpeedInterRAT-NR-r16	LTE Cell 1	NR Cell 1			
8.2.2.1	E-UTRA – NR FR1 Early Measurement Reporting	LTE Cell 1	NR Cell 1			
8.3.1.1	E-UTRA – NR FR1 handover with unknown target cell	LTE Cell 1	NR Cell 1			
8.4.1.1	E-UTRA – NR FR1 SFTD measurement delay in non-DRX	LTE Cell 1	NR Cell 1			
8.4.1.2	E-UTRA – NR FR1 SFTD measurement delay in DRX	LTE Cell 1	NR Cell 1			
8.4.2.1	E-UTRA event-triggered reporting of a NR FR1 neighbour cell without SSB time index detection in non-DRX	LTE Cell 1	NR Cell 1			
8.4.2.2	E-UTRA event-triggered reporting of a NR FR1 neighbour cell without SSB time index detection in DRX	LTE Cell 1	NR Cell 1			
8.4.2.3	E-UTRA event-triggered reporting of a NR FR1 neighbour cell with SSB time index detection in non-DRX	LTE Cell 1	NR Cell 1			
8.4.2.4	E-UTRA event-triggered reporting of a NR FR1 neighbour cell with SSB time index detection in DRX	LTE Cell 1	NR Cell 1			
8.4.2.9	E-UTRA – NR Inter-RAT event triggered reporting tests for FR1 with SSB time index detection in DRX for UE configured with highSpeedInterRAT-NR-r16	LTE Cell 1	NR Cell 1			
8.5.1.1	E-UTRA – NR FR1 SFTD measurement accuracy	LTE Cell 1	NR Cell 1			
8.5.2.1.1.1	E-UTRA SS-RSRP absolute measurement accuracy of a NR FR1 neighbour cell	LTE Cell 1	NR Cell 1			
8.5.2.2.1	Void	LTE Cell 1	NR Cell 1			
8.5.2.3.1	E-UTRA SS-RSRP absolute measurement accuracy of a NR FR2 neighbour cell	LTE Cell 1	NR Cell 1			

Table E.6-2 defines the cell configuration mapping for E-UTRAN - NR/5GC FR2 Inter-RAT test cases (serving cell in LTE) in chapter 8 of this test specification.

Table E.6-2: Cell configuration mapping for E-UTRA – SA FR2 Inter-RAT RRM testing

TC	Description	38.533 LTE Cell1	38.533 NR Cell2	38.533 NR Cell3	38.533 NR Cell4	CA Type
8.2.2.2	E-UTRA – NR FR2 Early Measurement Reporting	LTE Cell 1	NR Cell 1			
8.4.2.5	E-UTRA event-triggered reporting of a NR FR2 neighbour cell without SSB time index detection in non-DRX	LTE Cell 1	NR Cell 1			
8.4.2.6	E-UTRA event-triggered reporting of a NR FR2 neighbour cell without SSB time index detection in DRX	LTE Cell 1	NR Cell 1			
8.4.2.7	E-UTRA event-triggered reporting of a NR FR2 neighbour cell with SSB time index detection in non-DRX	LTE Cell 1	NR Cell 1			
8.4.2.8	E-UTRA event-triggered reporting of a NR FR2 neighbour cell with SSB time index detection in DRX	LTE Cell 1	NR Cell 1			
8.5.2.1.2	E-UTRA SS-RSRP absolute measurement accuracy of a NR FR2 neighbour cell	LTE Cell 1	NR Cell 1			
8.5.2.2.2	SS-RSRQ	LTE Cell 1	NR Cell 1			
8.5.2.3.2	E-UTRA SS-RSRQ absolute measurement accuracy of a NR FR1 neighbour cell	LTE Cell 1	NR Cell 1			

E.7 Cell configuration mapping for NR sidelink test cases in Chapter 9

Table E.7-1 defines the cell configuration mapping for NR PC5 – NR SA FR1 Uu con-current test cases (serving cell in FR1) in chapter 9 of this test specification.

Table E.7-1: Cell configuration mapping for NR PC5 – NR SA FR1 Uu con-current RRM testing

TC	Description	38.533 NR Cell1	38.533 NR Cell2	38.533 NR Cell3	38.533 NR Cell4	CA Type
9.1.1.3	NR SA FR1 UE transmit timing accuracy for FR1 NR cell as synchronization reference source	NR Cell 1				
9.1.2.1	NR SA FR1 initiation/cease of S-SSB transmission for FR1 NR cell as synchronization reference source	NR Cell 1				
9.1.5.1	NR SA FR1 congestion control measurement for concurrent operation	NR Cell 1				
9.1.6.1	NR SA FR1 interruption to WAN due to NR sidelink communication	NR Cell 1				

Table E.7-2 defines the cell configuration mapping for NR PC5 – NR SA FR2 Uu con-current test cases (serving cell in FR2) in chapter 9 of this test specification.

Table E.7-2: Cell configuration mapping for NR PC5 – SA FR2 con-current RRM testing

FFS

E.8 to E.13

E.14 Cell configuration mapping for SA FR1 test cases for RedCap in Chapter 16

Table E.14-1 defines the cell configuration mapping for NR/5GC FR1 test cases in chapter 16 of this test specification.

Table E.14-1: Cell configuration mapping for SA FR1 RRM testing for RedCap

TC	Description	38.533 NR Cell1	38.533 NR Cell2	38.533 NR Cell3	38.533 NR Cell4
16.1.1.1	NR SA FR1 Cell reselection for 1 Rx UE	NR Cell 1	NR Cell 11		
16.1.1.2	NR SA FR1 Cell reselection for 2 Rx UE	NR Cell 1	NR Cell 11		
16.1.1.3	NR SA FR1-FR1 Cell reselection for 1 Rx UE	NR Cell 6	NR Cell 23		
16.1.1.4	NR SA FR1-FR1 Cell reselection for 2 Rx UE	NR Cell 6	NR Cell 23		
16.1.1.5	NR SA FR1 Cell reselection for UE fulfilling stationary relaxed measurement criterion for 1 Rx UE	NR Cell 1	NR Cell 11		
16.1.1.6	NR SA FR1 Cell reselection for UE fulfilling stationary relaxed measurement criterion for 2 Rx UE	NR Cell 1	NR Cell 11		
16.1.1.7	NR SA FR1-FR1 Cell reselection for UE fulfilling stationary relaxed measurement criterion for 1 Rx UE	NR Cell 6	NR Cell 23		
16.1.1.8	NR SA FR1-FR1 Cell reselection for UE fulfilling stationary relaxed measurement criterion for 2 Rx UE	NR Cell 6	NR Cell 23		
16.3.1.1	NR SA FR1 Intra-frequency handover from FR1 to FR1 with known target cell for 1 Rx UE	NR Cell 1	NR Cell 2		
16.3.1.2	NR SA FR1 Intra-frequency handover from FR1 to FR1 with known target cell for 2 Rx UE	NR Cell 1	NR Cell 2		
16.3.1.3	NR SA FR1 Intra-frequency handover from FR1 to FR1 with unknown target cell for 1 Rx UE	NR Cell 1	NR Cell 2		
16.3.1.4	NR SA FR1 Intra-frequency handover from FR1 to FR1 with unknown target cell for 2 Rx UE	NR Cell 1	NR Cell 2		
16.3.1.5	NR SA FR1-FR1 Inter-frequency handover from FR1 to FR1 with unknown target cell for 1 Rx UE	NR Cell 6	NR Cell 3		
16.3.1.6	NR SA FR1-FR1 Inter-frequency handover from FR1 to FR1 with unknown target cell for 2 Rx UE	NR Cell 6	NR Cell 3		
16.3.2.1.1	NR SA FR1 Intra-frequency RRC Re-establishment in FR1 for 1 Rx UE	NR Cell 1	NR Cell 2		
16.3.2.1.2	NR SA FR1 Intra-frequency RRC Re-establishment in FR1 for 2 Rx UE	NR Cell 1	NR Cell 2		
16.3.2.1.3	NR SA FR1-FR1 Inter-frequency RRC Re-establishment in FR1 for 1 Rx UE	NR Cell 6	NR Cell 3		
16.3.2.1.4	NR SA FR1-FR1 Inter-frequency RRC Re-establishment in FR1 for 2 Rx UE	NR Cell 6	NR Cell 3		
16.3.2.1.5	NR SA FR1 Intra-frequency RRC Re-establishment in FR1 for 1 Rx UE without serving cell timing	NR Cell 1	NR Cell 2		
16.3.2.1.6	NR SA FR1 Intra-frequency RRC Re-establishment in FR1 for 2 Rx UE without serving cell timing	NR Cell 1	NR Cell 2		
16.3.2.2.1	NR SA FR1 4-step RA type contention based random access test in FR1 for NR standalone for 1 Rx UE	Cell 1			

TC	Description	38.533 NR Cell1	38.533 NR Cell2	38.533 NR Cell3	38.533 NR Cell4
16.3.2.2.2	NR SA FR1 4-step RA type contention based random access test in FR1 for NR standalone for 2 Rx UE	Cell 1			
16.3.2.2.3	NR SA FR1 4-step RA type non-contention based random access test in FR1 for NR standalone for 1 Rx UE	Cell 1			
16.3.2.2.4	NR SA FR1 4-step RA type non-contention based random access test in FR1 for NR standalone for 2 Rx UE	Cell 1			
16.3.2.2.5	NR SA FR1 2-step RA type contention based random access test in FR1 for NR standalone for 1 Rx UE	Cell 1			
16.3.2.2.6	NR SA FR1 2-step RA type contention based random access test in FR1 for NR standalone for 2 Rx UE	Cell 1			
16.3.2.2.7	NR SA FR1 2-step RA type non-contention based test in FR1 for NR standalone for 1 RX UE	Cell 1			
16.3.2.2.8	NR SA FR1 2-step RA type non-contention based test in FR1 for NR standalone for 2 RX UE	Cell 1			
16.3.2.3.1	NR SA FR1-FR1 Redirection from NR in FR1 to NR in FR1 for 1 Rx UE	NR Cell 6	NR Cell 2		
16.3.2.3.2	NR SA FR1-FR1 Redirection from NR in FR1 to NR in FR1 for 2 Rx UE	NR Cell 6	NR Cell 2		
16.4.1.1	NR SA FR1 NR UE Transmit Timing Test for FR1 for 1Rx RedCap UE	NR Cell 1			
16.4.1.2	NR SA FR1 NR UE Transmit Timing Test for FR1 for 2Rx RedCap UE	NR Cell 1			
16.4.3.1	NR SA FR1 SA FR1 timing advance adjustment accuracy for 1 Rx UE	NR Cell 1			
16.4.3.2	NR SA FR1 SA FR1 timing advance adjustment accuracy for 2 Rx UE	NR Cell 1			
16.5.1.1	NR SA FR1 Radio Link Monitoring Out-of-sync Test for FR1 PCell configured with SSB-based RLM RS in non-DRX mode for 1 Rx UE	NR Cell 1			
16.5.1.2	NR SA FR1 Radio Link Monitoring Out-of-sync Test for FR1 PCell configured with SSB-based RLM RS in non-DRX mode for 2 Rx UE	NR Cell 1			
16.5.1.3	NR SA FR1 Radio Link Monitoring In-sync Test for FR1 PCell configured with SSB-based RLM RS in non-DRX mode for 1 Rx UE	NR Cell 1			
16.5.1.4	NR SA FR1 Radio Link Monitoring In-sync Test for FR1 PCell configured with SSB-based RLM RS in non-DRX mode for 2 Rx UE	NR Cell 1			
16.5.1.7	NR SA FR1 Radio Link Monitoring In-sync Test for FR1 PCell configured with SSB-based RLM RS in DRX mode for 1 Rx UE	NR Cell 1			
16.5.1.8	NR SA FR1 Radio Link Monitoring In-sync Test for FR1 PCell configured with SSB-based RLM RS in DRX mode for 2 Rx UE	NR Cell 1			
16.5.1.9	NR SA FR1 Radio Link Monitoring Out-of-sync Test for FR1 PCell configured with CSI-RS-based RLM in non-DRX mode for 1 Rx UE	NR Cell 1			
16.5.1.10	NR SA FR1 Radio Link Monitoring Out-of-sync Test for FR1 PCell configured with CSI-RS-based RLM in non-DRX mode for 2 Rx UE	NR Cell 1			
16.5.1.11	NR SA FR1 Radio Link Monitoring In-sync Test for FR1 PCell configured with CSI-RS-	NR Cell 1			

TC	Description	38.533 NR Cell1	38.533 NR Cell2	38.533 NR Cell3	38.533 NR Cell4
	based RLM in non-DRX mode for 1 Rx UE				
16.5.1.12	NR SA FR1 Radio Link Monitoring In-sync Test for FR1 PCell configured with CSI-RS-based RLM in non-DRX mode for 2 Rx UE	NR Cell 1			
16.5.1.13	NR SA FR1 Radio Link Monitoring Out-of-sync Test for FR1 PCell configured with CSI-RS-based RLM in DRX mode for 1 Rx UE	NR Cell 1			
16.5.1.14	NR SA FR1 Radio Link Monitoring Out-of-sync Test for FR1 PCell configured with CSI-RS-based RLM in DRX mode for 2 Rx UE	NR Cell 1			
16.5.1.15	NR SA FR1 Radio Link Monitoring In-sync Test for FR1 PCell configured with CSI-RS-based RLM in DRX mode for 1 Rx UE	NR Cell 1			
16.5.1.16	NR SA FR1 Radio Link Monitoring In-sync Test for FR1 PCell configured with CSI-RS-based RLM in DRX mode for 2 Rx UE	NR Cell 1			
16.5.2.1	NR SA FR1 Beam Failure Detection and Link Recovery Test for FR1 PCell configured with SSB-based BFD and LR in non-DRX mode for 1 Rx UE	NR Cell 1			
16.5.2.2	NR SA FR1 Beam Failure Detection and Link Recovery Test for FR1 PCell configured with SSB-based BFD and LR in non-DRX mode for 2 Rx UE	NR Cell 1			
16.5.2.5	NR SA FR1 Beam Failure Detection and Link Recovery Test for FR1 PCell configured with CSI-RS-based BFD and LR in non-DRX mode for 1 Rx UE	NR Cell 1			
16.5.2.6	NR SA FR1 Beam Failure Detection and Link Recovery Test for FR1 PCell configured with CSI-RS-based BFD and LR in non-DRX mode for 2 Rx UE	NR Cell 1			
16.5.2.7	NR SA FR1 Beam Failure Detection and Link Recovery Test for FR1 PCell configured with CSI-RS-based BFD and LR in DRX mode for 1 Rx UE	NR Cell 1			
16.5.2.8	NR SA FR1 Beam Failure Detection and Link Recovery Test for FR1 PCell configured with CSI-RS-based BFD and LR in DRX mode for 2 Rx UE	NR Cell 1			
16.5.4.1	NR SA FR1 UE specific CBW change on PCell in non-DRX for 1 Rx UE	NR Cell 1			
16.5.4.2	NR SA FR1 UE specific CBW change on PCell in non-DRX for 2 Rx UE	NR Cell 1			
16.6.1.1	NR SA FR1 Event triggered reporting tests without gap under non-DRX for 1 Rx UE	NR Cell 1	NR Cell 2		
16.6.1.2	NR SA FR1 Event triggered reporting tests without gap under non-DRX for 2 Rx UE	NR Cell 1	NR Cell 2		
16.6.1.3	NR SA FR1 Event triggered reporting tests without gap under DRX for 1 Rx UE	NR Cell 1	NR Cell 2		
16.6.1.4	NR SA FR1 Event triggered reporting tests without gap under DRX for 2 Rx UE	NR Cell 1	NR Cell 2		
16.6.1.5	NR SA FR1 Event triggered reporting tests with per-UE gaps under non-DRX for 1 Rx UE	NR Cell 1	NR Cell 2		
16.6.1.6	NR SA FR1 Event triggered reporting tests with per-UE gaps under non-DRX for 2 Rx UE	NR Cell 1	NR Cell 2		
16.6.1.7	NR SA FR1 Event triggered reporting tests with per-UE gaps under DRX for 1 Rx UE	NR Cell 1	NR Cell 2		
16.6.1.8	NR SA FR1 Event triggered reporting tests with per-UE gaps under DRX for 2 Rx UE	NR Cell 1	NR Cell 2		
16.6.1.9	NR SA FR1 Event triggered reporting tests	NR Cell 1	NR Cell 2		

TC	Description	38.533 NR Cell1	38.533 NR Cell2	38.533 NR Cell3	38.533 NR Cell4
	without gap under non-DRX with SSB index reading for 1 Rx UE				
16.6.1.10	NR SA FR1 Event triggered reporting tests without gap under non-DRX with SSB index reading for 2 Rx UE	NR Cell 1	NR Cell 2		
16.6.1.11	NR SA FR1 Event triggered reporting tests with per-UE gaps under non-DRX with SSB index reading for 1 Rx UE	NR Cell 1	NR Cell 2		
16.6.1.12	NR SA FR1 Event triggered reporting tests with per-UE gaps under non-DRX with SSB index reading for 2 Rx UE	NR Cell 1	NR Cell 2		
16.6.4.1	NR SA FR1 SSB based L1-RSRP measurement when DRX is not used for 1 Rx UE	NR Cell 1			
16.6.4.2	NR SA FR1 SSB based L1-RSRP measurement when DRX is not used for 2 Rx UE	NR Cell 1			
16.6.4.3	NR SA FR1 SSB based L1-RSRP measurement when DRX is used for 1 Rx UE	NR Cell 1			
16.6.4.4	NR SA FR1 SSB based L1-RSRP measurement when DRX is used for 2 Rx UE	NR Cell 1			
16.6.4.5	NR SA FR1 CSI-RS based L1-RSRP measurement when DRX is not used for 1 Rx UE	NR Cell 1			
16.6.4.6	NR SA FR1 CSI-RS based L1-RSRP measurement when DRX is not used for 2 Rx UE	NR Cell 1			
16.6.4.7	NR SA FR1 CSI-RS based L1-RSRP measurement when DRX is used for 1 Rx UE	NR Cell 1			
16.6.4.8	NR SA FR1 CSI-RS based L1-RSRP measurement when DRX is used for 2 Rx UE	NR Cell 1			

Table E.14-2 defines the cell configuration mapping for NR/5GC FR1 – E-UTRA Inter-RAT test cases (serving cell in NR) for RedCap in chapter 16 of this test specification.

Table E.14-2: Cell configuration mapping for SA FR1 – E-UTRA Inter-RAT RRM testing for RedCap

TC	Description	38.533 NR Cell1	38.533 LTE Cell2	38.533 LTE Cell3	38.533 LTE Cell4	CA Type
16.1.2.1	NR SA FR1 - E-UTRA Cell reselection to higher priority E-UTRA for 1RX	NR Cell 1	LTE Cell 1			
16.1.2.2	NR SA FR1 - E-UTRA Cell reselection to higher priority E-UTRA for 2RX	NR Cell 1	LTE Cell 1			
16.1.2.3	NR SA FR1 - E-UTRA Cell reselection to lower priority E-UTRA for 1RX	NR Cell 1	LTE Cell 1			
16.1.2.4	NR SA FR1 - E-UTRA Cell reselection to lower priority E-UTRA for 2RX	NR Cell 1	LTE Cell 1			
16.1.2.5	NR SA FR1 - E-UTRA Cell reselection to lower priority E-UTRA for UE fulfilling stationary relaxed measurement criterion for 1 Rx UE	NR Cell 1	LTE Cell 1			
16.1.2.6	NR SA FR1 - E-UTRA Cell reselection to lower priority E-UTRA for UE fulfilling stationary relaxed measurement criterion for 2 Rx UE	NR Cell 1	LTE Cell 1			
16.3.1.7	NR - E-UTRA handover for 1Rx UE	NR Cell 1	LTE Cell 1			
16.3.1.8	NR - E-UTRA handover for 2Rx UE	NR Cell 1	LTE Cell 1			
16.3.1.9	NR - E-UTRA handover with unknown target cell for 1 Rx UE	NR Cell 1	LTE Cell 1			
16.3.1.10	NR - E-UTRA handover with unknown target	NR Cell 1	LTE Cell 1			

TC	Description	38.533 NR Cell1	38.533 LTE Cell2	38.533 LTE Cell3	38.533 LTE Cell4	CA Type
	cell for 2 Rx UE					
16.3.2.3.3	NR SA FR1-FR1 Redirection from NR in FR1 to E-UTRAN for 1 Rx UE	NR Cell 1	LTE Cell 1			
16.3.2.3.4	NR SA FR1-FR1 Redirection from NR in FR1 to E-UTRAN for 2 Rx UE	NR Cell 1	LTE Cell 1			

E.15 Cell configuration mapping for SA FR2 test cases for RedCap in Chapter 17

Table E.15-1 defines the cell configuration mapping for NR/5GC FR2 test cases in chapter 17 of this test specification.

Table E.15-1: Cell configuration mapping for SA FR2 RRM testing for RedCap

TC	Description	38.533 NR Cell1	38.533 NR Cell2	38.533 NR Cell3	38.533 NR Cell4	CA Type
17.1.1.1	NR SA FR2 Cell reselection to FR2 intra-frequency NR case for 2 Rx	NR Cell 1				
17.1.1.2	NR SA FR2-FR2 Cell reselection to FR2 inter-frequency NR for 2 Rx					
17.1.1.3	NR SA FR2 Cell reselection to FR2 intra-frequency NR for UE fulfilling stationary relaxed measurement criterion for 2 Rx UE					
17.1.1.4	NR SA FR2-FR2 Cell reselection to FR2 inter-frequency NR for UE fulfilling stationary mobility relaxed measurement criterion for 2 Rx UE					
17.3.2.1.1	NR SA FR2 Intra-frequency RRC Re-establishment in FR2	NR Cell 1				
17.3.2.1.2	NR SA FR2-FR2 Inter-frequency RRC Re-establishment in FR2	NR Cell 1				
17.3.2.1.3	NR SA FR2 Intra-frequency RRC Re-establishment in FR2 without serving cell timing	NR Cell 1	NR Cell 2			
17.3.2.2.1	NR SA FR2 4-step RA type contention based random access test in FR2 for NR Standalone	NR Cell 1				
17.3.2.2.2	NR SA FR2 4-step RA type non-contention based random access test in FR2 for NR Standalone	NR Cell 1				
17.3.2.2.3	NR SA FR2 2-step RA type contention based random access test in FR2 for NR Standalone	NR Cell 1				
17.3.2.2.4	NR SA FR2 2-step RA type non-contention based random access test in FR2 for NR Standalone	NR Cell 1				
17.5.1.1	NR SA FR2 Radio Link Monitoring Out-of-sync Test for FR2 PCell configured with SSB-based RLM RS in non-DRX mode	NR Cell 1				
17.5.1.2	NR SA FR2 Radio Link Monitoring In-sync Test for FR2 PCell configured with SSB-based RLM RS in non-DRX mode	NR Cell 1				
17.5.1.4	NR SA FR2 Radio Link Monitoring In-sync Test for FR2 PCell configured with SSB-based RLM RS in DRX mode	NR Cell 1				
17.5.1.9	NR SA FR2 UE Radio Link Monitoring Scheduling Restrictions on FR2	NR Cell 1				
17.5.2.3	NR SA FR2 Beam Failure Detection and Link Recovery Test for FR2 PCell configured with CSI-RS-based BFD and LR in non-DRX mode	NR Cell 1				
17.5.2.4	NR SA FR2 Beam Failure Detection and Link Recovery Test for FR2 PCell	NR Cell 1				

TC	Description	38.533 NR Cell1	38.533 NR Cell2	38.533 NR Cell3	38.533 NR Cell4	CA Type
	configured with CSI-RS-based BFD and LR in DRX mode					
17.5.2.5	NR SA FR2 Scheduling availability restriction during Beam Failure Detection and Link Recovery for FR2 PCell configured with SSB-based BFD and LR in non-DRX mode	NR Cell 1				
17.6.1.1	NR SA FR2 Event triggered reporting test without gap under non-DRX	NR Cell 1	NR Cell 2			
17.6.1.3	NR SA FR2 Event triggered reporting test with per-UE gaps under non-DRX	NR Cell 1	NR Cell 2			
17.6.1.4	NR SA FR2 Event triggered reporting test with per-UE gaps under DRX	NR Cell 1	NR Cell 2			
17.6.3.1	NR SA FR2 SSB based L1-RSRP measurement when DRX is not used	NR Cell 1				
17.6.3.2	NR SA FR2 SSB based L1-RSRP measurement when DRX is used	NR Cell 1				
17.6.3.3	NR SA FR2 CSI-RS based L1-RSRP measurement when DRX is not used	NR Cell 1				
17.6.3.4	NR SA FR2 CSI-RS based L1-RSRP measurement when DRX is used	NR Cell 1				

E.16 Cell configuration mapping for E-UTRAN – SA test cases for RedCap in Chapter 18

Table E.16-1 defines the cell configuration mapping for E-UTRAN - NR/5GC FR1 Inter-RAT test cases for RedCap (serving cell in LTE) in chapter 18 of this test specification.

Table E.16-1: Cell configuration mapping for E-UTRA – SA FR1 Inter-RAT RRM testing for RedCap

TC	Description	38.533 LTE Cell1	38.533 NR Cell2	38.533 NR Cell3	38.533 NR Cell4	CA Type
18.1.1.1	E-UTRA - NR SA FR1 E-UTRA Cell reselection to higher priority NR target Cell in FR1					
18.2.1.1	E-UTRA - NR SA FR1 E-UTRAN - NR handover in FR1	LTE Cell 1	NR Cell 1			
18.2.2.1	E-UTRA - NR SA FR1 Redirection from E-UTRA to NR SA FR1 for redcap UE	LTE Cell 1	NR Cell 1			
18.3.1.1	E-UTRA - NR SA FR1 Event triggered reporting tests for FR1 without SSB time index detection when DRX is not used	LTE Cell 1	NR Cell 1			
18.3.1.2	E-UTRA - NR SA FR1 Event triggered reporting tests for FR1 without SSB time index detection when DRX is used	LTE Cell 1	NR Cell 1			
18.3.1.3	E-UTRA - NR SA FR1 Event triggered reporting tests for FR1 with SSB time index detection when DRX is not used	LTE Cell 1	NR Cell 1			
18.3.1.4	E-UTRA - NR SA FR1 Event triggered reporting tests for FR1 with SSB time index detection when DRX is used	LTE Cell 1	NR Cell 1			
18.3.1.5	E-UTRA - NR SA FR2 Event triggered reporting tests for FR2 without SSB time index detection when DRX is not used	LTE Cell 1	NR Cell 1			
18.3.1.6	E-UTRA - NR SA FR2 Event triggered reporting tests for FR2 without SSB time index detection when DRX is used	LTE Cell 1	NR Cell 1			
18.3.1.7	E-UTRA - NR SA FR2 Event triggered reporting tests for FR2 with SSB time index detection when DRX is not used	LTE Cell 1	NR Cell 1			

18.3.1.8	E-UTRA - NR SA FR2 Event triggered reporting tests for FR2 with SSB time index detection when DRX is used	LTE Cell 1	NR Cell 1			

Annex F (normative): Measurement uncertainties and test tolerances

The requirements of this clause apply to all tests in the present document.

F.1 Measurement uncertainties and test tolerances for FR1 and FR2

F.1.1 Acceptable uncertainty of test system (normative)

See TS 38.521-1 [17] annex F.1.

F.1.1.1 Measurement of test environments

See TS 38.521-1 [17] Annex F1.1.

F.1.1.2 Measurement of RRM requirements

This clause defines the maximum test system uncertainty for the RRM requirements. The maximum uncertainty values allowed for the typical RRM measurement uncertainty contributors is defined in Table F.1.1.2-1 and Table F.1.1.2-2. Unless explicitly stated for a particular test case, these maximum uncertainty values should be used as starting point to perform the test tolerance analysis in TR 38.903 [22] for each of the test cases. Specific test cases might require a tighter measurement uncertainty value for some of the contributors. Exceptions to the general values in Table F.1.1.2-1 and Table F.1.1.2-2 shall be handled case by case.

Table F.1.1.2-1: Maximum allowed measurement uncertainty values for the test system for FR1 (up to 6 GHz) and Cell BW ≤ 40 MHz

MU contributor	Unit	Value	Comment
AWGN absolute power, N_{oc} averaged over BW_{Config}	dB	±1.5	
AWGN absolute power, N_{oc} for Measurement PRB	dB	±1.5	Measurement PRB may be for example #RB_J to RB_{J+19} for SSB-based, or selected RBs in the range #RB_0 to RB_{105} for CSI-RS-based
Ratio of cell X signal / AWGN, $\hat{E}s_x$ / N_{oc} averaged over BW_{Config}	dB	±0.3	Same as in LTE
Ratio of cell X signal / AWGN, $\hat{E}s_x$ / N_{oc} for Measurement PRB	dB	±0.3	Measurement PRB may be for example #RB_J to RB_{J+19} for SSB-based, or selected RBs in the range #RB_0 to RB_{105} for CSI-RS-based
Fading profile uncertainty	dB	±0.5 for 1 Tx ±0.7 for 2 Tx	Depends on fading profile, can be referenced from TS 38.101-4 [20]
AWGN and signal flatness*	dB	±2.0	Same as in LTE, can be referenced from TS 38.101-4 [20]
Uplink absolute power measurement	dB	±1.5	Same as in TS 38.521-1 [17]
Uplink relative power measurement	dB	±0.7	Same as in TS 38.521-1 [17]
Uplink signal transmit timing relative to downlink	Tc	±112	
Relative transmit timing accuracy during UE timing adjustment	Tc	±88	
Timing Advance Adjustment accuracy	Tc	±88	
Note 1: The values in this table are specified per cell. Multi-cell test cases need to combined these values in the TT analysis in TR 38.903 Note 2:These values apply for cell BW ≤ 40 MHz. The maximum allowed measurement uncertainty for higher cell BW is FFS.			

MU contributor	Unit	Value	Comment
Note 3: Void			

Table F.1.1.2-2: Maximum allowed measurement uncertainty values for the test system for FR2 (up to 40GHz) and Cell BW ≤ 400 MHz

MU contributor	Unit	Value	Comment
AWGN absolute power, N_{oc} averaged over BW_{Config}	dB	PC3: ±5.65[4,5] PC1: FFS	
AWGN absolute power, N_{oc} for Measurement PRB	dB	PC3: ±5.65[4,5] PC1: FFS	Measurement PRB may be for example #RB_J to RB_{J+19} for SSB-based, or selected RBs in the range #RB_0 to RB_{274} for CSI-RS-based
Ratio of cell X signal / AWGN, $\hat{E}s_x$ / N_{oc} averaged over BW_{Config}	dB	±0.3	
Ratio of cell X signal / AWGN, $\hat{E}s_x$ / N_{oc} for Measurement PRB	dB	±0.3	Measurement PRB may be for example #RB_J to RB_{J+19} for SSB-based, or selected RBs in the range #RB_0 to RB_{274} for CSI-RS-based
$\hat{E}s_x$[Note 3] absolute power, N_{oc} averaged over BW_{Config}	dB	PC3: ±5.65[4,5] PC1: FFS	
$\hat{E}s_x$[Note 3] absolute power, N_{oc} for Measurement PRB	dB	PC3: ±5.65[4,5] PC1: FFS	Measurement PRB may be for example #RB_J to RB_{J+19} for SSB-based, or selected RBs in the range #RB_0 to RB_{274} for CSI-RS-based
Relative power between any two $\hat{E}s$ levels at the same frequency	dB	±2.0	
Fading profile uncertainty	dB	±0.5 for 1 Tx ±0.7 for 2 Tx	
AWGN and signal flatness*	dB	±3.6	Same as in Demod Performance test cases, can be referenced from TS 38.521-4 [20]
Uplink absolute power measurement	dB	TBD	
Uplink relative power measurement	dB	TBD	
Uplink signal transmit timing relative to downlink	Tc	±48	
Relative transmit timing during UE timing adjustment	Tc	±40	
Timing Advance Adjustment	Tc	±40	

NOTE 1: The values in this table are specified per cell. Multi-cell test cases need to combine these values in the TT analysis in TR 38.903
NOTE 2: These values apply for cell BW ≤ 400 MHz. The maximum allowed measurement uncertainty for higher cell BW is FFS.
NOTE 3: Applies for test cases that use $\hat{E}s$ without AWGN
NOTE 4: Total Expanded MU for IFF for Max device size ≤ 30cm in TR 38.903 [22] Table E.3.1.1-2 for PC3 UEs and in Table FFS for PC1 UEs.
NOTE 5: If the TT analysis for a specific test case based on this MU value results in an unsolvable conflict, making the test case untestable, even after the alternative solutions listed in TR 38.903 [22] clause A.4 have been considered for the test case in TS 38.133 [6] Annex A, the TT analysis shall be repeated using a lower MU value, taking into account the values defined in clause E.3.1 TR 38.903 [22]. The test case will be applicable for the subset of the test systems meeting this reduced MU Threshold.

The maximum test system uncertainty for the EN-DC FR1 test cases in chapter 4 is defined in Table F.1.1.2-3.

The maximum test system uncertainty for the NE-DC FR1 test cases in chapter 4 is defined in Table F.1.1.2-3a.

The maximum test system uncertainty for the NR/5GC FR1 test cases in chapter 6 is defined in Table F.1.1.2-4.

The maximum test system uncertainty for the EN-DC FR2 test cases in chapter 5 is defined in Table F.1.1.2-5.

The maximum test system uncertainty for the NR/5GC FR2 test cases in chapter 7 is defined in Table F.1.1.2-6.

The maximum test system uncertainty for the E-UTRA – NR inter-RAT with E-UTRA serving cell test cases in chapter 8 is defined in Table F.1.1.2-7.

The maximum test system uncertainty for the FR1 NR sidelink test cases in chapter 9 is defined in Table F.1.1.2-8.

The maximum test system uncertainty for the NR/5GC FR1 test cases for RedCap in chapter 16 is defined in Table F.1.1.2-9.

The maximum test system uncertainty for the NR/5GC FR2 test cases for RedCap in chapter 17 is defined in Table F.1.1.2-10.

The maximum test system uncertainty for the E-UTRA – NR inter-RAT with E-UTRA serving cell test cases for RedCap in chapter 18 is defined in Table F.1.1.2-11.

Table F.1.1.2-3: Maximum test system uncertainty for RRM requirements for EN-DC FR1 test cases

Subclause	Maximum Test System Uncertainty[1]	Derivation of Test System Uncertainty
4.3.2.2.1 Contention based random access test in FR1 for PSCell in EN-DC	Noc ±1.5 dB $\hat{E}s_2$ / Noc ±0.3 dB Uplink absolute power measurement ±1.5 dB Uplink relative power measurement ±0.7 dB ±112T_c Uplink signal transmit timing relative to downlink	$\hat{E}s_2$ / N_{oc} is the ratio of cell 2 signal / AWGN T_c = 1/(480000 x 4096) seconds, the basic timing unit defined in TS 38.211 [7]
4.3.2.2.2 Non-contention based random access test in FR1 for PSCell in EN-DC	Same as 4.3.2.2.1	Same as 4.3.2.2.1
4.3.2.2.3 EN-DC FR1 2-step contention based random access	Same as 4.3.2.2.1	Same as 4.3.2.2.1
4.3.2.2.4 EN-DC FR1 2-step non-contention based random access	Same as 4.3.2.2.1	Same as 4.3.2.2.1
4.4.1.1 EN-DC FR1 UE transmit timing accuracy	Noc ±1.5 dB $\hat{E}s_2$ / N_{oc} ±0.3 dB ±112Tc Uplink signal transmit timing relative to downlink	$\hat{E}s_2$ / Noc is the ratio of cell 2 signal / AWGN Tc = 1/(480000 x 4096) seconds, the basic timing unit defined in TS 38.211 [7]
4.4.3.1 EN-DC FR1 timing advance adjustment accuracy	Noc ±1.5 dB $\hat{E}s_2$ / N_{oc} ±0.3 dB ±88T_c Timing Advance Adjustment accuracy	$\hat{E}s_2$ / N_{oc} is the ratio of cell 2 signal / AWGN T_c = 1/(480000 x 4096) seconds, the basic timing unit defined in TS 38.211 [7]
4.5.1.1 EN-DC FR1 radio link monitoring out-of-sync test for PSCell configured with SSB-based RLM RS in non-DRX mode	Average Noc_2 ±1.5 dB Average $\hat{E}s_2$ / Noc_2 ±0.3 dB Meas PRB Noc_2 ±1.5 dB Meas PRB $\hat{E}s_2$ / Noc_2 ±0.3 dB Fading profile ±0.7 dB	Note: Noc_2 is the AWGN on cell 2 frequency $\hat{E}s_2$ / Noc_2 is the SNR Meas PRB are the measurement PRB for SSB-based RLM #RB_J to RB_{J+19}
4.5.1.2 EN-DC FR1 radio link monitoring in-sync test for PSCell configured with SSB-based RLM RS in non-DRX mode	Same as 4.5.1.1	Same as 4.5.1.1
4.5.1.3 EN-DC FR1 radio link monitoring out-of-sync test for PSCell configured with SSB-based RLM RS in DRX mode	Same as 4.5.1.1	Same as 4.5.1.1
4.5.1.4 EN-DC FR1 radio link monitoring in-sync test for PSCell configured with SSB-based RLM RS in DRX mode	Same as 4.5.1.1	Same as 4.5.1.1
4.5.1.5 EN-DC FR1 radio link monitoring out-of-sync test for PSCell configured with CSI-RS-based RLM RS in non-DRX mode	Same as 4.5.1.1	Same as 4.5.1.1

4.5.1.6 EN-DC FR1 radio link monitoring in-sync test for PSCell configured with CSI-RS-based RLM RS in non-DRX mode	Same as 4.5.1.1	Same as 4.5.1.1
4.5.1.7 EN-DC FR1 radio link monitoring out-of-sync test for PSCell configured with CSI-RS-based RLM RS in DRX mode	Same as 4.5.1.1	Same as 4.5.1.1
4.5.1.8 EN-DC FR1 radio link monitoring in-sync test for PSCell configured with CSI-RS-based RLM RS in DRX mode	Same as 4.5.1.1	Same as 4.5.1.1
4.5.2.1 EN-DC FR1 interruptions at transitions between active and non-active during DRX in synchronous EN-DC	± 0.6dB (AWGN conditions)	Overall system uncertainty for AWGN condition comprises two quantities: 1. Signal-to-noise ratio uncertainty 2. Effect of AWGN flatness and signal flatness Items 1 and 2 are assumed to be uncorrelated so can be root sum squared: AWGN flatness and signal flatness has x 0.25 effect on the required SNR, so use sensitivity factor of x 0.25 for the uncertainty contribution. Test System uncertainty = SQRT (Signal-to-noise ratio uncertainty 2 + (0.25 x AWGN flatness and signal flatness) 2) Signal-to-noise ratio uncertainty ±0.3 dB AWGN flatness and signal flatness ±2.0 dB
4.5.2.2 EN-DC FR1 interruptions at transitions between active and non-active during DRX in asynchronous EN-DC	Same as 4.5.2.1	Same as 4.5.2.1
4.5.2.3 EN-DC FR1 interruptions during measurements on deactivated NR SCC in synchronous EN-DC	Noc_2 ±1.5 dB Noc_3 ±1.5 dB $\hat{E}s_2 / Noc_2$ ±0.3 dB $\hat{E}s_3 / Noc_3$ ±0.3 dB	Note: $\hat{E}s_2 / Noc_2$ is the ratio of cell 2 signal / AWGN $\hat{E}s_3 / Noc_3$ is the ratio of cell 3 signal / AWGN
4.5.2.4 EN-DC FR1 interruptions during measurements on deactivated NR SCC in asynchronous EN-DC	Same as 4.5.2.3	Same as 4.5.2.3
4.5.2.5 EN-DC FR1 interruptions during measurements on deactivated E-UTRAN SCC in synchronous EN-DC	Noc_1 ±1.5 dB Noc_2 ±1.5 dB Noc_3 ±1.5 dB $\hat{E}s_1 / Noc$ ±0.3 dB $\hat{E}s_2 / Noc$ ±0.3 dB $\hat{E}s_3 / Noc$ ±0.3 dB	Note: Noc_1 is the AWGN on E-UTRAN cell 1 frequency $\hat{E}s_1 / Noc_1$ is the ratio of E-UTRAN cell 1 signal / AWGN Noc_2 is the AWGN on NR cell 2 frequency $\hat{E}s_2 / Noc_2$ is the ratio of NR cell 2 signal / AWGN Noc_3 is the AWGN on E-UTRAN cell 3 frequency $\hat{E}s_3 / Noc_3$ is the ratio of E-UTRAN cell 3 signal / AWGN
4.5.2.6 EN-DC FR1 interruptions during measurements on deactivated E-UTRAN SCC in asynchronous EN-DC	Same as 4.5.2.5	Same as 4.5.2.5
4.5.3.1 EN-DC FR1 SCell activation and deactivation of known SCell in non-DRX for 160ms SCell measurement cycle	Average Noc_2 ±1.5 dB Average Noc_3 ±1.5 dB Average $\hat{E}s_2 / Noc_2$ ±0.3 dB Average $\hat{E}s_3 / Noc_3$ ±0.3 dB Meas PRB Noc_2 ±1.5 dB Meas PRB Noc_3 ±1.5 dB Meas PRB $\hat{E}s_2 / Noc_2$ ±0.3 dB Meas PRB $\hat{E}s_3 / Noc_3$ ±0.3 dB	Note: Noc_2 is the AWGN on cell 2 frequency $\hat{E}s_2 / Noc_2$ is the ratio of cell 2 signal / AWGN Noc_3 is the AWGN on cell 3 frequency $\hat{E}s_3 / Noc_3$ is the ratio of cell 3 signal / AWGN Meas PRB are the measurement PRB for SS-RSRP #RB_J to RB_{J+19}
4.5.3.2 EN-DC FR1 SCell activation and deactivation of known SCell in non-DRX for 640ms SCell measurement cycle	Same as 4.5.3.1	Same as 4.5.3.1
4.5.3.3 EN-DC FR1 SCell activation and deactivation of unknown SCell in non-DRX	Same as 4.5.3.1	Same as 4.5.3.1

4.5.4.1 EN-DC FR1 UE UL carrier RRC reconfiguration delay	Noc2 ±1.5 dB Ês2 / Noc2 ±0.3 dB Noc3 ±1.5 dB Ês3 / Noc3 ±0.3 dB	Note: Noc2 is the AWGN on cell 2 frequency Ês2 / Noc2 is the ratio of cell 2 signal / AWGN Noc3 is the AWGN on cell 3 frequency Ês3 / Noc3 is the ratio of cell 3 signal / AWGN
4.5.5.1 EN-DC FR1 SSB-based beam failure detection and link recovery in non-DRX	Average Noc_2 ±1.5 dB Average $\hat{E}s_2$ / Noc_2 ±0.3 dB Meas PRB Noc2 ±1.5 dB Meas PRB $\hat{E}s_2$ / Noc_2 ±0.3 dB Fading profile ±0.7 dB	Note: Noc_2 is the AWGN on cell 2 frequency $\hat{E}s_2$ / Noc_2 is the SNR for the SSB Meas PRB is the measurement PRB for SS-RSRP #RB_J to RB_{J+19}
4.5.5.2 EN-DC FR1 SSB-based beam failure detection and link recovery in DRX	Same as 4.5.5.1	Same as 4.5.5.1
4.5.5.3 EN-DC FR1 CSI-RS-based beam failure detection and link recovery in non-DRX	Average Noc_2 ±1.5 dB Average $\hat{E}s_2$ / Noc_2 ±0.3 dB Meas PRB Noc2 ±1.5 dB Meas PRB $\hat{E}s_2$ / Noc_2 ±0.3 dB Fading profile ±0.7 dB	Note: Noc_2 is the AWGN on cell 2 frequency $\hat{E}s_2$ / Noc_2 is the SNR for the CSI-RS Meas PRB is the measurement PRB for CSI-RSRP #RB_0 to RB_{274}
4.5.5.4 EN-DC FR1 CSI-RS-based beam failure detection and link recovery in DRX	Same as 4.5.5.3	Same as 4.5.5.3
4.5.5.5 EN-DC FR1 Scell CSI-RS-based beam failure detection and SSB-based link recovery in non-DRX	Average Noc_2 ±1.5 dB Average $\hat{E}s_2$ / Noc_2 ±0.3 dB Meas PRB Noc2 ±1.5 dB Meas PRB $\hat{E}s_2$ / Noc_2 ±0.3 dB Fading profile ±0.7 dB	Note: Noc_2 is the AWGN on cell 2 frequency $\hat{E}s_2$ / Noc_2 is the SNR for the SSB Meas PRB is the measurement PRB for SS-RSRP #RB_J to RB_{J+19} Noc_2 is the AWGN on cell 2 frequency $\hat{E}s_2$ / Noc_2 is the SNR for the CSI-RS Meas PRB is the measurement PRB for CSI-RSRP #RB_0 to RB_{274}
4.5.5.6 EN-DC FR1 Scell CSI-RS-based beam failure detection and SSB-based link recovery in DRX	Same as 4.5.5.5	Same as 4.5.5.5
4.5.6.1.1 EN-DC FR1 DCI-based DL active BWP switch in non-DRX in synchronous EN-DC	±0.6 dB	Overall system uncertainty for AWGN conditions comprises two quantities: 1. Signal-to-noise ratio uncertainty 2. Effect of AWGN flatness and signal flatness Items 1 and 2 are assumed to be uncorrelated so can be root sum squared: AWGN flatness and signal flatness has x 0.25 effect on the required SNR, so use sensitivity factor of x 0.25 for the uncertainty contribution. Test System uncertainty = SQRT (Signal-to-noise ratio uncertainty^2 + (0.25 x AWGN flatness and signal flatness)^2) Signal-to-noise ratio uncertainty ±0.3 dB AWGN flatness and signal flatness ±2.0 dB
4.5.6.1.2 EN-DC FR1 DCI-based DL active BWP switch with SCell in non-DRX in synchronous EN-DC	Same as 4.5.6.1.1	Same as 4.5.6.1.1

4.5.6.2.1 EN-DC FR1 RRC-based DL active BWP switch in non-DRX in synchronous EN-DC	±0.6 dB	Overall system uncertainty for AWGN conditions comprises two quantities: 1. Signal-to-noise ratio uncertainty 2. Effect of AWGN flatness and signal flatness Items 1 and 2 are assumed to be uncorrelated so can be root sum squared: AWGN flatness and signal flatness has x 0.25 effect on the required SNR, so use sensitivity factor of x 0.25 for the uncertainty contribution. Test System uncertainty = SQRT (Signal-to-noise ratio uncertainty^2 + (0.25 x AWGN flatness and signal flatness)^2) Signal-to-noise ratio uncertainty ±0.3 dB AWGN flatness and signal flatness ±2.0 dB
4.5.7.1 EN-DC FR1 addition and release delay of known PSCell	Average Noc_1 ±1.5 dB Average $\hat{E}s_1$ / Noc_1 ±0.3 dB Meas PRB Noc_1 ±1.5 dB Meas PRB $\hat{E}s_1$ / Noc_1 ±0.3 dB	Noc_1 is the AWGN on NR freq1 $\hat{E}s_1$ / Noc_1 is the ratio of cell 1 signal / AWGN Meas PRB are the measurement PRB for SS-RSRP #RB_J to RB_{J+19}
4.5.8.1 EN-DC FR1 interruptions at switching between two uplink carriers	Average Noc ±1.5 dB Average $\hat{E}s$ / Noc ±0.3 dB	Noc is the AWGN on cell 2 frequency $\hat{E}s$ / Noc is the ratio of cell 2 signal / AWGN
4.6.1.1 EN-DC FR1 event-triggered reporting without gap in non-DRX	Noc ±1.5 dB $\hat{E}s_2$ / Noc ±0.3 dB $\hat{E}s_3$ / Noc ±0.3 dB	Note: $\hat{E}s_2$ / Noc is the ratio of cell 2 signal / AWGN $\hat{E}s_3$ / Noc is the ratio of cell 3 signal / AWGN
4.6.1.2 EN-DC FR1 event-triggered reporting without gap in DRX	Same as 4.6.1.1	Same as 4.6.1.1
4.6.1.3 EN-DC FR1 event-triggered reporting with gap in non-DRX	Same as 4.6.1.1	Same as 4.6.1.1
4.6.1.4 EN-DC FR1 event-triggered reporting with gap in DRX	Same as 4.6.1.1	Same as 4.6.1.1
4.6.1.5 EN-DC FR1 event-triggered reporting without gap in non-DRX with SSB time index detection	Same as 4.6.1.1	Same as 4.6.1.1
4.6.1.6 EN-DC FR1 event-triggered reporting with gap in non-DRX with SSB time index detection	Same as 4.6.1.1	Same as 4.6.1.1
4.6.1.7 EN-DC FR1 event-triggered reporting without gap in DRX for UE configured with highSpeedMeasFlag-r16	Same as 4.6.1.1	Same as 4.6.1.1
4.6.2.1 EN-DC FR1-FR1 event-triggered reporting in non-DRX	Average Noc_2 ±1.5 dB Average Noc_3 ±1.5 dB Average $\hat{E}s_2$ / Noc_2 ±0.3 dB Average $\hat{E}s_3$ / Noc_3 ±0.3 dB Meas PRB Noc_2 ±1.5 dB Meas PRB Noc_3 ±1.5 dB Meas PRB $\hat{E}s_2$ / Noc_2 ±0.3 dB Meas PRB $\hat{E}s_3$ / Noc_3 ±0.3 dB	Noc_2 is the AWGN on NR freq2 Noc_3 is the AWGN on NR freq3 $\hat{E}s_2$ / Noc_2 is the ratio of cell 2 signal / AWGN $\hat{E}s_3$ / Noc_3 is the ratio of cell 3 signal / AWGN Meas PRB are the measurement PRB for SS-RSRP #RB_J to RB_{J+19}
4.6.2.2 EN-DC FR1-FR1 event-triggered reporting in DRX	Same as 4.6.2.1	Same as 4.6.2.1
4.6.2.5 EN-DC FR1-FR1 event-triggered reporting in non-DRX with SSB time index detection	Same as 4.6.2.1	Same as 4.6.2.1
4.6.2.6 EN-DC FR1-FR1 event-triggered reporting in DRX with SSB time index detection	Same as 4.6.2.1	Same as 4.6.2.1
4.6.4.1 EN-DC FR1 SSB-based L1-RSRP measurement in non-DRX	Average Noc ±1.5 dB Average $\hat{E}s_0$ / Noc ±0.3 dB Average $\hat{E}s_1$ / Noc ±0.3 dB Meas PRB Noc ±1.5 dB Meas PRB $\hat{E}s_0$ / Noc ±0.3 dB Meas PRB $\hat{E}s_1$ / Noc ±0.3 dB	Noc is the AWGN on NR freq1 $\hat{E}s_0$ / Noc is the SNR for the SSB#0 $\hat{E}s_1$ / Noc is the SNR for the SSB#1 Meas PRB is the measurement PRB for SS-RSRP #RB_J to RB_{J+19}
4.6.4.2 EN-DC FR1 SSB-based L1-RSRP measurement in DRX	Same as 4.6.4.1	Same as 4.6.4.1

4.6.4.3 EN-DC FR1 CSI-RS-based L1-RSRP measurement in non-DRX	Average Noc ±1.5 dB Average $\hat{E}s_0$ / Noc ±0.3 dB Average $\hat{E}s_1$ / Noc ±0.3 dB Meas PRB Noc ±1.5 dB Meas PRB $\hat{E}s_0$ / N_{oc} ±0.3 dB Meas PRB $\hat{E}s_1$ / N_{oc} ±0.3 dB	Noc is the AWGN on NR freq1 $\hat{E}s_0$ / Noc is the SNR for the CSI-RS#0 $\hat{E}s_1$ / Noc is the SNR for the CSI-RS#1 Meas PRB is the measurement PRB for CSI-RSRP #RB_0 to RB_{274}
4.6.4.4 EN-DC FR1 CSI-RS-based L1-RSRP measurement in DRX	Same as 4.6.4.3	Same as 4.6.4.3
4.6.4.5 EN-DC FR1 SSB-based L1-RSRP measurement in DRX for UE configured with highSpeedMeasFlag-r16	Same as 4.6.4.1	Same as 4.6.4.1
4.6.5.2 EN-DC FR1 CLI-RSSI measurement with non-DRX	Noc2 ±1.5 dB $\hat{E}s2$ / Noc2 ±0.3 dB	Note: Noc2 is the AWGN on cell 2 (NR) frequency $\hat{E}s2$ / Noc2 is the ratio of cell 2 signal / AWGN
4.6.7.1 EN-DC FR1 CSI-RS based CMR and no dedicated IMR L1-SINR measurement in non-DRX	Average Noc ±1.5 dB Average $\hat{E}s_0$ / Noc ±0.3 dB Average $\hat{E}s_1$ / Noc ±0.3 dB Meas PRB Noc ±1.5 dB Meas PRB $\hat{E}s_0$ / N_{oc} ±0.3 dB Meas PRB $\hat{E}s_1$ / N_{oc} ±0.3 dB	Noc is the AWGN on Cell 2 frequency $\hat{E}s_0$ / Noc is the SNR for the CSI-RS#0 $\hat{E}s_1$ / Noc is the SNR for the CSI-RS#1 Meas PRB is the measurement PRB for CSI-SINR #RB_0 to RB_{275}
4.6.7.2 EN-DC FR1 SSB based CMR and dedicated IMR L1-SINR measurement in DRX	Average Noc ±1.5 dB Average $\hat{E}s_0$ / Noc ±0.3 dB Average $\hat{E}s_1$ / Noc ±0.3 dB Meas PRB Noc ±1.5 dB Meas PRB $\hat{E}s_0$ / N_{oc} ±0.3 dB Meas PRB $\hat{E}s_1$ / N_{oc} ±0.3 dB	Noc is the AWGN on Cell 2 frequency $\hat{E}s_0$ / Noc is the SNR for the SSB#0 $\hat{E}s_1$ / Noc is the SNR for the SSB#1 Meas PRB is the measurement PRB for SS-SINR #RB_J to RB_{J+19}
4.6.7.3 EN-DC FR1 CSI-RS based CMR and dedicated IMR L1-SINR measurement in DRX	Average Noc ±1.5 dB Average $\hat{E}s_0$ / Noc ±0.3 dB Average $\hat{E}s_1$ / Noc ±0.3 dB Meas PRB Noc ±1.5 dB Meas PRB $\hat{E}s_0$ / N_{oc} ±0.3 dB Meas PRB $\hat{E}s_1$ / N_{oc} ±0.3 dB	Noc is the AWGN on Cell 2 frequency $\hat{E}s_0$ / Noc is the SNR for the CSI-RS#0 $\hat{E}s_1$ / Noc is the SNR for the CSI-RS#1 Meas PRB is the measurement PRB for CSI-SINR #RB_0 to RB_{275}
4.7.1.1.1 EN-DC FR1 SS-RSRP absolute measurement accuracy	Average Noc ±1.5 dB Average $\hat{E}s_2$ / Noc ±0.3 dB Average $\hat{E}s_3$ / Noc ±0.3 dB Meas PRB Noc ±1.5 dB Meas PRB $\hat{E}s_2$ / Noc ±0.3 dB Meas PRB $\hat{E}s_3$ / Noc ±0.3 dB	Noc is the AWGN on NR freq1 $\hat{E}s_2$ / Noc is the cell 2 SNR $\hat{E}s_3$ / Noc is the cell 3 SNR Meas PRB is the measurement PRB for SS-RSRP #RB_J to RB_{J+19}
4.7.1.1.2 EN-DC FR1 SS-RSRP relative measurement accuracy	Same as 4.7.1.1.1	Same as 4.7.1.1.1
4.7.1.2.1 EN-DC FR1-FR1 SS-RSRP absolute measurement accuracy	Average Noc_1 ±1.5 dB Average Noc_2 ±1.5 dB Average $\hat{E}s_2$ / Noc_1 ±0.3 dB Average $\hat{E}s_3$ / Noc_2 ±0.3 dB Meas PRB Noc_1 ±1.5 dB Meas PRB Noc_2 ±1.5 dB Meas PRB $\hat{E}s_2$ / Noc_1 ±0.3 dB Meas PRB $\hat{E}s_3$ / Noc_2 ±0.3 dB	Noc_1 is the AWGN on NR freq1 Noc_2 is the AWGN on NR freq2 $\hat{E}s_2$ / Noc_1 is the cell 2 SNR $\hat{E}s_3$ / Noc_2 is the cell 3 SNR Meas PRB is the measurement PRB for SS-RSRP #RB_J to RB_{J+19}
4.7.1.2.2 EN-DC FR1-FR1 SS-RSRP relative measurement accuracy	Same as 4.7.1.2.1	Same as 4.7.1.2.1
4.7.2.1 EN-DC FR1 SS-RSRQ measurement accuracy	Same as 4.7.1.1.1	Same as 4.7.1.1.1
4.7.2.2.1 EN-DC FR1-FR1 SS-RSRQ absolute measurement accuracy	Same as 4.7.1.2.1	Same as 4.7.1.2.1
4.7.2.2.2 EN-DC FR1-FR1 SS-RSRQ relative measurement accuracy	Same as 4.7.1.2.1	Same as 4.7.1.2.1
4.7.3.1 EN-DC FR1 SS-SINR measurement accuracy	Same as 4.7.1.1.1	Same as 4.7.1.1.1
4.7.3.2.1 EN-DC FR1-FR1 SS-SINR absolute measurement accuracy	Same as 4.7.1.2.1	Same as 4.7.1.2.1
4.7.3.2.2 EN-DC FR1-FR1 SS-SINR relative measurement accuracy	Same as 4.7.1.2.1	Same as 4.7.1.2.1
4.7.4.1.1 EN-DC FR1 SSB based L1-RSRP absolute measurement accuracy	Average Noc ±1.5 dB Average $\hat{E}s_2$ / Noc ±0.3 dB Meas PRB $\hat{E}s_2$ / Noc ±0.8 dB	Noc is the AWGN on NR freq1 $\hat{E}s_2$ / Noc is the cell 2 SNR Meas PRB is the measurement PRB for SS-RSRP #RB_J to RB_{J+19}

4.7.4.1.2 EN-DC FR1 SSB based L1-RSRP relative measurement accuracy	Same as 4.7.4.1.1	Same as 4.7.4.1.1
4.7.4.2.1 EN-DC FR1 CSI-RS based L1-RSRP absolute measurement accuracy	Same as 4.7.4.1.1	Same as 4.7.4.1.1
4.7.4.2.2 EN-DC FR1 CSI-RS based L1-RSRP relative measurement accuracy	Same as 4.7.4.1.1	Same as 4.7.4.1.1
4.7.5.1 EN-DC FR1 SFTD measurement accuracy	Average Noc_1 ±1.5 dB Average $\hat{E}s_1$ / Noc_1 ±0.3 dB Meas PRB Noc_1 ±1.5 dB Meas PRB $\hat{E}s_1$ / Noc_1 ±0.3 dB Average Noc_2 ±1.5 dB Average $\hat{E}s_2$ / Noc_2 ±0.3 dB Meas PRB Noc_2 ±1.5 dB Meas PRB $\hat{E}s_2$ / Noc_2 ±0.8 dB	Noc_1 is the AWGN on NR freq1 $\hat{E}s_1$ / Noc_1 is the ratio of cell 1 signal / AWGN Meas PRB are the measurement PRB for SS-RSRP #RB_J to RB_{J+19} Noc_2 is the AWGN on E-UTRA freq2 $\hat{E}s_2$ / Noc_2 is the ratio of cell 2 signal / AWGN Meas PRB are the measurement PRB for SS-RSRP #RB_{22} to RB_{27}
4.7.7.1.1 EN-DC FR1 CSI-RS based CMR and no dedicated IMR configured and CSI-RS resource set with repetition off L1-SINR absolute measurement accuracy	Average Noc ±1.5 dB Average $\hat{E}s_2$ / Noc ±0.3 dB Meas PRB $\hat{E}s_2$ / Noc ±0.8 dB	Noc is the AWGN on NR freq1 $\hat{E}s_2$ / Noc is the SNR for the CSI-RS#0 & CSI-RS#1 Meas PRB is the measurement PRB for CSI-SINR #RB_0 to RB_{275}
4.7.7.1.2 EN-DC FR1 CSI-RS based CMR and no dedicated IMR configured and CSI-RS resource set with repetition off L1-SINR relative measurement accuracy	Same as 4.7.7.1.1	Same as 4.7.7.1.1
4.7.7.2 EN-DC FR1 SSB based CMR and dedicated IMR L1-SINR absolute measurement accuracy	Average Noc ±1.5 dB Average $\hat{E}s_2$ / Noc ±0.3 dB Meas PRB $\hat{E}s_2$ / Noc ±0.8 dB	Noc is the AWGN on NR freq1 $\hat{E}s_2$ / Noc is the SNR for the SSB#0 & SSB#1 Meas PRB is the measurement PRB for SS-SINR #RB_J to RB_{J+19}
4.7.7.3.1 EN-DC FR1 CSI-RS based CMR and dedicated IMR L1-SINR absolute measurement accuracy	Same as 4.7.7.1.1	Same as 4.7.7.1.1
4.7.7.3.2 EN-DC FR1 CSI-RS based CMR and dedicated IMR L1-SINR relative measurement accuracy	Same as 4.7.7.1.1	Same as 4.7.7.1.1

Table F.1.1.2-3a Maximum test system uncertainty for RRM requirements for NE-DC FR1 test cases

Subclause	Maximum Test System Uncertainty[1]	Derivation of Test System Uncertainty
4A.1.1.1 NE-DC FR1 addition and release delay of known PSCell	Noc ±1.5 dB Ês / Noc ±0.3 dB	Note: Ês / Noc is the ratio of E-UTRA cell signal / AWGN
4A.2.1.1 NE-DC FR1 SFTD accuracy	Noc1 ±1.5 dB Ês1 / Noc1 ±0.3 dB Noc2 ±1.5 dB Ês2 / Noc2 ±0.8 dB	Note: Ês / Noc is the ratio of NR cell signal / AWGN Ês2 / Noc2 is the ratio of E-UTRA cell signal / AWGN

Table F.1.1.2-4 Maximum test system uncertainty for RRM requirements for SA FR1 test cases

Subclause	Maximum Test System Uncertainty[1]	Derivation of Test System Uncertainty
6.1.1.1 NR SA FR1 cell re-selection	Noc ±1.5 dB Ês1 / Noc ±0.3 dB Ês2 / Noc ±0.3 dB	Note: Ês1 / Noc is the ratio of cell 1 signal / AWGN Ês2 / Noc is the ratio of cell 2 signal / AWGN

6.1.1.2 NR SA FR1-FR1 cell re-selection	Noc1 ±1.5 dB Ês1 / Noc1 ±0.3 dB Noc2 ±1.5 dB Ês2 / Noc2 ±0.3 dB	Note: Noc1 is the AWGN on cell 1 frequency Ês1 / Noc1 is the ratio of cell 1 signal / AWGN Noc2 is the AWGN on cell 2 frequency Ês2 / Noc2 is the ratio of cell 2 signal / AWGN
6.1.1.3 NR SA FR1 cell re-selection for UE fulfilling low mobility relaxed measurement criterion	Same as 6.1.1.1	Same as 6.1.1.1
6.1.1.4 NR SA FR1 cell re-selection for UE fulfilling not-at-cell edge relaxed measurement criterion	Same as 6.1.1.1	Same as 6.1.1.1
6.1.1.5 NR SA FR1-FR1 cell re-selection for UE fulfilling low mobility relaxed measurement criterion	Same as 6.1.1.2	Same as 6.1.1.2
6.1.1.6 NR SA FR1-FR1 cell re-selection for UE fulfilling not-at-cell edge relaxed measurement criterion	Same as 6.1.1.2	Same as 6.1.1.2
6.1.1.7 NR SA FR1 cell re-selection for UE configured with highSpeedMeasFlag-r16	Same as 6.1.1.1	Same as 6.1.1.1
6.1.2.1 NR SA FR1 – E-UTRA cell re-selection to higher priority E-UTRA	Noc1 ±1.5 dB Ês1 / Noc1 ±0.3 dB Noc2 ±1.5 dB Ês2 / Noc2 ±0.3 dB	Note: Noc1 is the AWGN on cell 1 (NR) frequency Ês1 / Noc1 is the ratio of cell 1 signal / AWGN Noc2 is the AWGN on cell 2 (E-UTRAN) frequency Ês2 / Noc2 is the ratio of cell 2 signal / AWGN
6.1.2.2 NR SA FR1 – E-UTRA cell re-selection to lower priority E-UTRA	Same as 6.1.2.1	Same as 6.1.2.1
6.1.2.3 NR SA FR1 – E-UTRA cell re-selection to lower priority E-UTRAN for UE fulfilling low mobility relaxed measurement criterion	Same as 6.1.2.1	Same as 6.1.2.1
6.1.2.4 NR SA FR1 – E-UTRA cell re-selection to lower priority E-UTRAN for UE fulfilling not-at-cell edge relaxed measurement criterion	Same as 6.1.2.1	Same as 6.1.2.1
6.1.2.5 NR SA FR1 – E-UTRA cell re-selection to lower priority E-UTRA for UE configured with highSpeedMeasFlag-r16	Same as 6.1.2.1	Same as 6.1.2.1
6.3.1.1 NR SA FR1 handover with known target cell	Average Noc ±1.5 dB Average Ês1 / Noc ±0.3 dB Average Ês2 / Noc ±0.3 dB Meas PRB Noc ±1.5 dB Meas PRB $Ês_1$ / Noc ±0.3 dB Meas PRB $Ês_2$ / Noc ±0.3 dB	Note: Ês1 / Noc is the ratio of cell 1 signal / AWGN Ês2 / Noc is the ratio of cell 2 signal / AWGN Meas PRB are the measurement PRB for SS-RSRP #RB_J to RB_{J+19}
6.3.1.2 NR SA FR1 handover with unknown target cell	Same as 6.3.1.1	Same as 6.3.1.1
6.3.1.3 NR SA FR1-FR1 Handover with unknown Target Cell	Noc1 ±1.5 dB Ês1 / Noc1 ±0.3 dB Noc2 ±1.5 dB Ês2 / Noc2 ±0.3 dB	Note: Noc1 is the AWGN on cell 1 frequency Ês1 / Noc1 is the ratio of cell 1 signal / AWGN Noc2 is the AWGN on cell 2 frequency Ês2 / Noc2 is the ratio of cell 2 signal / AWGN
6.3.1.4 NR SA FR1 – E-UTRA handover with known target cell	Same as 6.1.2.1	Same as 6.1.2.1
6.3.1.5 NR SA FR1 – E-UTRA handover with unknown target cell	Same as 6.1.2.1	Same as 6.1.2.1

6.3.1.6 NR SA FR1 – UTRAN FDD handover with known target cell	Noc ±1.5 dB Ês / Noc ±0.3 dB Ioc ±0.7 dB Îor / Ioc ± 0.3dB CPICH Ec / Ior ± 0.1dB SCH Ec / Ior ± 0.1dB	Note: Noc is the AWGN on cell 1 frequency Ês / Noc is the ratio of cell 1 signal / AWGN Ioc is the AWGN on cell 2 frequency Îor / Ioc is the ratio of cell 2 signal / AWGN CPICH Ec / Ior is the ratio of cell 2 CPICH code level / Ior SCH Ec / Ior is the ratio of cell 2 SCH code level / Ior
6.3.1.7 NR SA FR1 synchronous DAPS handover	Same as 6.3.1.1	Same as 6.3.1.1
6.3.1.8 NR SA FR1 asynchronous DAPS handover	Same as 6.3.1.1	Same as 6.3.1.1
6.3.1.9 NR SA FR1 Intra-band inter-frequency synchronous DAPS handover	Same as 6.3.1.3	Same as 6.3.1.3
6.3.1.10 NR SA FR1 Intra-band inter-frequency asynchronous DAPS handover	Same as 6.3.1.3	Same as 6.3.1.3
6.3.1.11 NR SA FR1 Inter-band inter-frequency synchronous DAPS handover	Same as 6.3.1.3	Same as 6.3.1.3
6.3.1.12 NR SA FR1 Inter-band inter-frequency asynchronous DAPS handover	Same as 6.3.1.3	Same as 6.3.1.3
6.3.2.1.1 NR SA FR1 RRC re-establishment	Same as 6.1.1.1	Same as 6.1.1.1
6.3.2.1.2 NR SA FR1 – FR1 RRC re-establishment	Same as 6.1.1.2	Same as 6.1.1.2
6.3.2.1.3 NR SA FR1 RRC re-establishment without serving cell timing	Average Noc ±1.5 dB Average $\hat{E}s_1$ / Noc ±0.3 dB Average $\hat{E}s_2$ / Noc ±0.3 dB Meas PRB Noc ±1.5 dB Meas PRB $\hat{E}s_1$ / Noc ±0.3 dB Meas PRB $\hat{E}s_2$ / Noc ±0.3 dB	Note: $\hat{E}s_1$ / Noc is the ratio of cell 1 signal / AWGN $\hat{E}s_2$ / Noc is the ratio of cell 2 signal / AWGN Meas PRB is the measurement PRB for SS-RSRP #RB_J to RB_{J+19}
6.3.2.2.1	N_{oc} ±1.5 dB $\hat{E}s$ / N_{oc} ±0.3 dB Uplink absolute power measurement ±1.5 dB Uplink relative power measurement ±0.7 dB ±112Tc Uplink signal transmit timing relative to downlink	$\hat{E}s_1$ / N_{oc} is the ratio of cell 1 signal / AWGN T_c = 1/(480000 x 4096) seconds, the basic timing unit defined in TS 38.211 [7]
6.3.2.2.2	Same as 6.3.2.2.1	Same as 6.3.2.2.1
6.3.2.2.3	Same as 6.3.2.2.1	Same as 6.3.2.2.1
6.3.2.2.4	Same as 6.3.2.2.1	Same as 6.3.2.2.1
6.3.2.3.1 NR SA FR1 RRC connection release with redirection	Same as 6.1.1.2	Same as 6.1.1.2
6.3.2.3.2 NR SA FR1 – E-UTRA RRC connection release with redirection	Same as 6.1.2.1	Same as 6.1.2.1
6.3.3.1 NR SA FR1 conditional handover	Same as 6.3.1.1	Same as 6.3.1.1
6.3.3.2 NR SA FR1-FR1 conditional handover	Same as 6.3.1.3	Same as 6.3.1.3
6.4.1.1 EN-DC FR1 UE transmit timing accuracy	Noc ±1.5 dB $\hat{E}s_1$ / N_{oc} ±0.3 dB ±112Tc Uplink signal transmit timing relative to downlink	$\hat{E}s_1$ / Noc is the ratio of cell 1 signal / AWGN Tc = 1/(480000 x 4096) seconds, the basic timing unit defined in TS 38.211 [7]

6.4.3.1 NR SA FR1 timing advance adjustment accuracy	Noc ±1.5 dB $\hat{E}s_1 / N_{oc}$ ±0.3 dB ±88T_c Timing Advance Adjustment accuracy	$\hat{E}s_1 / N_{oc}$ is the ratio of cell 1 signal / AWGN T_c = 1/(480000 x 4096) seconds, the basic timing unit defined in TS 38.211 [7]
6.5.1.1 NR SA FR1 radio link monitoring out-of-sync test for PCell configured with SSB-based RLM RS in non-DRX mode	Average Noc ±1.5 dB Average $\hat{E}s$ / Noc ±0.3 dB Meas PRB Noc ±1.5 dB Meas PRB $\hat{E}s$ / Noc ±0.3 dB Fading profile ±0.7 dB	Noc is the AWGN on cell 1 frequency $\hat{E}s$ / Noc is the SNR Meas PRB are the measurement PRB for SSB-based RLM #RB_J to RB_{J+19}
6.5.1.2 NR SA FR1 radio link monitoring in-sync test for PCell configured with SSB-based RLM RS in non-DRX mode	Same as 6.5.1.1	Same as 6.5.1.1
6.5.1.3 NR SA FR1 radio link monitoring out-of-sync test for PCell configured with SSB-based RLM RS in DRX mode	Same as 6.5.1.1	Same as 6.5.1.1
6.5.1.4 NR SA FR1 radio link monitoring in-sync test for PCell configured with SSB-based RLM RS in DRX mode	Same as 6.5.1.1	Same as 6.5.1.1
6.5.1.5 NR SA FR1 radio link monitoring out-of-sync test for PCell configured with CSI-RS-based RLM RS in non-DRX mode	Same as 6.5.1.1	Same as 6.5.1.1
6.5.1.6 NR SA FR1 radio link monitoring in-sync test for PCell configured with CSI-RS-based RLM RS in non-DRX mode	Same as 6.5.1.1	Same as 6.5.1.1
6.5.1.7 NR SA FR1 radio link monitoring out-of-sync test for PCell configured with CSI-RS-based RLM RS in DRX mode	Same as 6.5.1.1	Same as 6.5.1.1
6.5.1.8 NR SA FR1 radio link monitoring in-sync test for PCell configured with CSI-RS-based RLM RS in DRX mode	Same as 6.5.1.1	Same as 6.5.1.1
6.5.2.1 NR SA FR1 interruptions during measurements on deactivated NR SCC	Noc_1 ±1.5 dB Noc_2 ±1.5 dB $\hat{E}s_1 / Noc_1$ ±0.3 dB $\hat{E}s_2 / Noc_2$ ±0.3 dB	Note: $\hat{E}s_1 / Noc_1$ is the ratio of cell 1 signal / AWGN $\hat{E}s_2 / Noc_2$ is the ratio of cell 2 signal / AWGN
6.5.3.1 NR SA FR1 SCell activation and deactivation of known SCell in non-DRX for 160ms SCell measurement cycle	Average Noc_1 ±1.5 dB Average Noc_2 ±1.5 dB Average $\hat{E}s_1 / Noc_1$ ±0.3 dB Average $\hat{E}s_2 / Noc_2$ ±0.3 dB Meas PRB Noc_1 ±1.5 dB Meas PRB Noc_2 ±1.5 dB Meas PRB $\hat{E}s_1 / Noc_1$ ±0.3 dB Meas PRB $\hat{E}s_2 / Noc_2$ ±0.3 dB	Note: Noc_1 is the AWGN on cell 1 frequency Noc_2 is the AWGN on cell 2 frequency $\hat{E}s_1 / Noc_1$ is the ratio of cell 1 signal / AWGN $\hat{E}s_2 / Noc_2$ is the ratio of cell 2 signal / AWGN Meas PRB are the measurement PRB for SS-RSRP #RB_J to RB_{J+19}
6.5.3.2 NR SA FR1 SCell activation and deactivation of known SCell in non-DRX for 640ms SCell measurement cycle	Same as 6.5.3.1	Same as 6.5.3.1
6.5.3.3 NR SA FR1 SCell activation and deactivation of unknown SCell in non-DRX	Same as 6.5.3.1	Same as 6.5.3.1
6.5.5.1 NR SA FR1 SSB-based beam failure detection and link recovery in non-DRX	Average Noc_1 ±1.5 dB Average $\hat{E}s_1 / Noc_1$ ±0.3 dB Meas PRB Noc_1 ±1.5 dB Meas PRB $\hat{E}s_1 / Noc_1$ ±0.3 dB Fading profile ±0.7 dB	Note: Noc_1 is the AWGN on cell 1 frequency $\hat{E}s_1 / Noc_1$ is the SNR for the SSB Meas PRB is the measurement PRB for SS-RSRP #RB_J to RB_{J+19}
6.5.5.2 NR SA FR1 SSB-based beam failure detection and link recovery in DRX	Same as 6.5.5.1	Same as 6.5.5.1

6.5.5.3 NR SA FR1 CSI-RS-based beam failure detection and link recovery in non-DRX	Average Noc_1 ±1.5 dB Average $\hat{E}s_1$ / Noc_1 ±0.3 dB Meas PRB Noc_1 ±1.5 dB Meas PRB $\hat{E}s_1$ / Noc_1 ±0.3 dB Fading profile ±0.7 dB	Note: Noc_1 is the AWGN on cell 1 frequency $\hat{E}s_1$ / Noc_1 is the SNR for the CSI-RS Meas PRB is the measurement PRB for CSI-RSRP #RB_0 to RB_{274}
6.5.5.4 NR SA FR1 CSI-RS-based beam failure detection and link recovery in DRX	Same as 6.5.5.3	Same as 6.5.5.3
6.5.5.5 NR SA FR1 Scell CSI-RS-based beam failure detection and SSB-based link recovery in non-DRX	Average Noc_2 ±1.5 dB Average $\hat{E}s_2$ / Noc_2 ±0.3 dB Meas PRB Noc_2 ±1.5 dB Meas PRB $\hat{E}s_2$ / Noc_2 ±0.3 dB Fading profile ±0.7 dB	Note: Noc_2 is the AWGN on cell 2 frequency $\hat{E}s_2$ / Noc_2 is the SNR for the SSB and CSI-RS Meas PRB is the measurement PRB for SS-RSRP #RB_J to RB_{J+19}
6.5.5.6 NR SA FR1 Scell CSI-RS-based beam failure detection and SSB-based link recovery in DRX	Same as 6.5.5.5	Same as 6.5.5.5
6.5.6.1.1 NR SA FR1-FR1 DCI-based DL active BWP switch in non-DRX	±0.6 dB	Overall system uncertainty for AWGN conditions comprises two quantities: 1. Signal-to-noise ratio uncertainty 2. Effect of AWGN flatness and signal flatness Items 1 and 2 are assumed to be uncorrelated so can be root sum squared: AWGN flatness and signal flatness has x 0.25 effect on the required SNR, so use sensitivity factor of x 0.25 for the uncertainty contribution. Test System uncertainty = SQRT (Signal-to-noise ratio uncertainty^2 + (0.25 x AWGN flatness and signal flatness)^2) Signal-to-noise ratio uncertainty ±0.3 dB AWGN flatness and signal flatness ±2.0 dB
6.5.6.1.2 NR SA FR1 DCI-based DL active BWP switch in non-DRX	Same as 6.5.6.1.1	Same as 6.5.6.1.1
6.5.6.2.1 NR SA FR1 RRC-based DL active BWP switch in non-DRX	±0.6 dB	Overall system uncertainty for AWGN conditions comprises two quantities: 1. Signal-to-noise ratio uncertainty 2. Effect of AWGN flatness and signal flatness Items 1 and 2 are assumed to be uncorrelated so can be root sum squared: AWGN flatness and signal flatness has x 0.25 effect on the required SNR, so use sensitivity factor of x 0.25 for the uncertainty contribution. Test System uncertainty = SQRT (Signal-to-noise ratio uncertainty^2 + (0.25 x AWGN flatness and signal flatness)^2) Signal-to-noise ratio uncertainty ±0.3 dB AWGN flatness and signal flatness ±2.0 dB
6.5.7.1 NR SA FR1 DL Interruptions at switching between two uplink carriers in FDD-TDD CA	Noc1 ±1.5 dB Noc2 ±1.5 dB Ês1 / Noc ±0.3 dB Ês2 / Noc ±0.3 dB	Note: Ês1 / Noc1 is the ratio of cell 1 signal / AWGN Ês2 / Noc2 is the ratio of cell 2 signal / AWGN
6.5.7.2 NR SA FR1 DL Interruptions at switching between two uplink carriers in TDD-TDD CA	Same as 6.5.7.1	Same as 6.5.7.1

6.5.8.1 UE specific CBW change on PCell in FR1 in non-DRX	Test System uncertainty on Cell1: ±0.6 dB	Overall system uncertainty for AWGN conditions comprises two quantities: 1. Signal-to-noise ratio uncertainty: ±0.3 dB, 2. Effect of AWGN flatness and signal flatness: ±2.0 dB. Items 1 and 2 are assumed to be uncorrelated so can be root sum squared: AWGN flatness and signal flatness has x 0.25 effect on the required SNR, so use sensitivity factor of x 0.25 for the uncertainty contribution. Test System uncertainty = SQRT (Signal-to-noise ratio uncertainty^2 + (0.25 x AWGN flatness and signal flatness)^2) = 0.58dB, round up to 0.6dB.
6.6.1.1 SA event triggered reporting tests without gap under non-DRX	Noc ±1.5 dB $\hat{E}s_1$ / Noc ±0.3 dB $\hat{E}s_2$ / Noc ±0.3 dB	Note: $\hat{E}s_1$ / Noc is the ratio of cell 1 signal / AWGN $\hat{E}s_2$ / Noc is the ratio of cell 2 signal / AWGN
6.6.1.2 SA event triggered reporting tests without gap under DRX	Same as 6.6.1.1	Same as 6.6.1.1
6.6.1.3 SA event triggered reporting tests with per-UE gaps under non-DRX	Same as 6.6.1.1	Same as 6.6.1.1
6.6.1.4 SA event triggered reporting tests with per-UE gaps under DRX	Same as 6.6.1.1	Same as 6.6.1.1
6.6.1.5 SA event triggered reporting tests without gap under non-DRX with SSB index reading	Same as 6.6.1.1	Same as 6.6.1.1
6.6.1.6 SA event triggered reporting tests with per-UE gaps under non-DRX with SSB index reading	Same as 6.6.1.1	Same as 6.6.1.1
6.6.1.7 NR SA FR1 event-triggered reporting without gap in DRX for UE configured with highSpeedMeasFlag-r16	Same as 6.6.1.1	Same as 6.6.1.1
6.6.2.1 NR SA FR1-FR1 event-triggered reporting in non-DRX	Average Noc_1 ±1.5 dB Average Noc_2 ±1.5 dB Average $\hat{E}s_1$ / Noc_1 ±0.3 dB Average $\hat{E}s_2$ / Noc_2 ±0.3 dB Meas PRB Noc_1 ±1.5 dB Meas PRB Noc_2 ±1.5 dB Meas PRB $\hat{E}s_1$ / Noc_1 ±0.3 dB Meas PRB $\hat{E}s_2$ / Noc_2 ±0.3 dB	Noc_1 is the AWGN on NR freq1 Noc_2 is the AWGN on NR freq2 $\hat{E}s_1$ / Noc_1 is the ratio of cell 1 signal / AWGN $\hat{E}s_2$ / Noc_2 is the ratio of cell 2 signal / AWGN Meas PRB are the measurement PRB for SS-RSRP #RB_J to RB_{J+19}
6.6.2.2 NR SA FR1-FR1 event-triggered reporting in DRX	Same as 6.6.2.1	Same as 6.6.2.1
6.6.2.5 NR SA FR1-FR1 event-triggered reporting in non-DRX with SSB time index detection	Same as 6.6.2.1	Same as 6.6.2.1
6.6.2.6 NR SA FR1-FR1 event-triggered reporting in DRX with SSB time index detection	Same as 6.6.2.1	Same as 6.6.2.1
6.6.3.1 NR SA FR1 – E-UTRAN event-triggered reporting in non-DRX	Freq 1 Noc ±1.5 dB Freq 2 Noc ±1.5 dB $\hat{E}s1$ / Noc ±0.3 dB $\hat{E}s2$ / Noc ±0.3 dB	Note: $\hat{E}s1$ / Noc is the ratio of cell 1 signal / AWGN $\hat{E}s2$ / Noc is the ratio of cell 2 signal / AWGN
6.6.3.2 NR SA FR1 – E-UTRAN event-triggered reporting in DRX	Same as 6.6.3.1	Same as 6.6.3.1
6.6.3.3 NR SA FR1 – E-UTRAN event-triggered reporting in DRX for UE configured with highSpeedMeasFlag-r16	Freq 1 Noc ±1.5 dB Freq 2 Noc ±1.5 dB $\hat{E}s1$ / Noc ±0.3 dB $\hat{E}s2$ / Noc ±0.3 dB	Note: $\hat{E}s1$ / Noc is the ratio of cell 1 signal / AWGN $\hat{E}s2$ / Noc is the ratio of cell 2 signal / AWGN

6.6.4.1 NR SA FR1 SSB-based L1-RSRP measurement in non-DRX	Average Noc ±1.5 dB Average $\hat{E}s_0$ / Noc ±0.3 dB Average $\hat{E}s_1$ / Noc ±0.3 dB Meas PRB Noc ±1.5 dB Meas PRB $\hat{E}s_0$ / Noc ±0.3 dB Meas PRB $\hat{E}s_1$ / Noc ±0.3 dB	Noc is the AWGN on NR freq1 $\hat{E}s_0$ / Noc is the SNR for the SSB#0 $\hat{E}s_1$ / Noc is the SNR for the SSB#1 Meas PRB is the measurement PRB for SS-RSRP #RB_J to RB_{J+19}
6.6.4.2 NR SA FR1 SSB-based L1-RSRP measurement in DRX	Same as 6.6.4.1	Same as 6.6.4.1
6.6.4.3 NR SA FR1 CSI-RS-based L1-RSRP measurement in non-DRX	Average Noc ±1.5 dB Average $\hat{E}s_0$ / Noc ±0.3 dB Average $\hat{E}s_1$ / Noc ±0.3 dB Meas PRB Noc ±1.5 dB Meas PRB $\hat{E}s_0$ / N_{oc} ±0.3 dB Meas PRB $\hat{E}s_1$ / N_{oc} ±0.3 dB	Noc is the AWGN on NR freq1 $\hat{E}s_0$ / Noc is the SNR for the CSI-RS#0 $\hat{E}s_1$ / Noc is the SNR for the CSI-RS#1 Meas PRB is the measurement PRB for CSI-RSRP #RB_0 to RB_{274}
6.6.4.4 NR SA FR1 CSI-RS-based L1-RSRP measurement in DRX	Same as 6.6.4.3	Same as 6.6.4.3
6.6.4.5 NR SA FR1 SSB-based L1-RSRP measurement in DRX for UE configured with highSpeedMeasFlag-r16	Same as 6.6.4.1	Same as 6.6.4.1
6.6.5.1 NR SA FR1 – UTRAN event-triggered reporting in non-DRX	Noc ±1.5 dB Ês / Noc ±0.3 dB Ioc ±0.7 dB Îor / Ioc ± 0.3dB CPICH Ec / Ior ± 0.1dB SCH Ec / Ior ± 0.1dB	Note: Noc is the AWGN on cell 1 frequency Ês / Noc is the ratio of cell 1 signal / AWGN Ioc is the AWGN on cell 2 frequency Îor / Ioc is the ratio of cell 2 signal / AWGN CPICH Ec / Ior is the ratio of cell 2 CPICH code level / Ior SCH Ec / Ior is the ratio of cell 2 SCH code level / Ior
6.6.8.1 NR SA FR1 CSI-RS based CMR and no dedicated IMR L1-SINR measurement in DRX	Average Noc ±1.5 dB Average $\hat{E}s_0$ / Noc ±0.3 dB Average $\hat{E}s_1$ / Noc ±0.3 dB Meas PRB Noc ±1.5 dB Meas PRB $\hat{E}s_0$ / N_{oc} ±0.3 dB Meas PRB $\hat{E}s_1$ / N_{oc} ±0.3 dB	Noc is the AWGN on Cell 1 frequency $\hat{E}s_0$ / Noc is the SNR for the CSI-RS#0 $\hat{E}s_1$ / Noc is the SNR for the CSI-RS#1 Meas PRB is the measurement PRB for CSI-SINR #RB_0 to RB_{275}
6.6.8.2 NR SA FR1 SSB based CMR and dedicated IMR L1-SINR measurement in non-DRX	Average Noc ±1.5 dB Average $\hat{E}s_0$ / Noc ±0.3 dB Average $\hat{E}s_1$ / Noc ±0.3 dB Meas PRB Noc ±1.5 dB Meas PRB $\hat{E}s_0$ / N_{oc} ±0.3 dB Meas PRB $\hat{E}s_1$ / N_{oc} ±0.3 dB	Noc is the AWGN on Cell 1 frequency $\hat{E}s_0$ / Noc is the SNR for the SSB#0 $\hat{E}s_1$ / Noc is the SNR for the SSB#1 Meas PRB is the measurement PRB for SS-SINR #RB_J to RB_{J+19}
6.6.8.3 NR SA FR1 CSI-RS based CMR and dedicated IMR L1-SINR measurement in non-DRX	Average Noc ±1.5 dB Average $\hat{E}s_0$ / Noc ±0.3 dB Average $\hat{E}s_1$ / Noc ±0.3 dB Meas PRB Noc ±1.5 dB Meas PRB $\hat{E}s_0$ / N_{oc} ±0.3 dB Meas PRB $\hat{E}s_1$ / N_{oc} ±0.3 dB	Noc is the AWGN on Cell 1 frequency $\hat{E}s_0$ / Noc is the SNR for the CSI-RS#0 $\hat{E}s_1$ / Noc is the SNR for the CSI-RS#1 Meas PRB is the measurement PRB for CSI-SINR #RB_0 to RB_{275}
6.6.9.1 NR SA FR1 Idle mode CA/DC measurement for FR1	Average Noc_1 ±1.5 dB Average Noc_2 ±1.5 dB Average $\hat{E}s_1$ / Noc_1 ±0.3 dB Average $\hat{E}s_2$ / Noc_2 ±0.3 dB Meas PRB Noc_1 ±1.5 dB Meas PRB Noc_2 ±1.5 dB Meas PRB $\hat{E}s_1$ / Noc_1 ±0.3 dB Meas PRB $\hat{E}s_2$ / Noc_2 ±0.3 dB	Noc_1 is the AWGN on NR freq1 Noc_2 is the AWGN on NR freq2 $\hat{E}s_1$ / Noc_1 is the ratio of cell 1 signal / AWGN $\hat{E}s_2$ / Noc_2 is the ratio of cell 2 signal / AWGN Meas PRB are the measurement PRB for SS-RSRP #RB_J to RB_{J+19}
6.6.15.1 NR SA FR1 Idle Mode measurements of inter-RAT CA candidate cells for early reporting	Average Noc_1 ±1.5 dB Average Noc_2 ±1.5 dB Average $\hat{E}s_1$ / Noc_1 ±0.3 dB Average $\hat{E}s_2$ / Noc_2 ±0.3 dB Meas PRB Noc_1 ±1.5 dB Meas PRB Noc_2 ±1.5 dB Meas PRB $\hat{E}s_1$ / Noc_1 ±0.3 dB Meas PRB $\hat{E}s_2$ / Noc_2 ±0.3 dB	Noc_1 is the AWGN on NR freq1 Noc_2 is the AWGN on LTE freq2 $\hat{E}s_1$ / Noc_1 is the ratio of cell 1 signal / AWGN $\hat{E}s_2$ / Noc_2 is the ratio of cell 2 signal / AWGN Meas PRB are the measurement PRB for SS-RSRP #RB_J to RB_{J+19}

6.7.1.1.1 NR SA FR1 SS-RSRP absolute measurement accuracy	Average Noc ±1.5 dB Average Ês1 / Noc ±0.3 dB Average Ês2 / Noc ±0.3 dB meas PRB Ês1 / Noc ±0.3 dB meas PRB Ês2 / Noc ±0.3 dB	Noc is the AWGN on NR freq1 Ês1 / Noc is the cell 1 SNR Ês2 / Noc is the cell 2 SNR meas PRB is the measurement PRB for SS-RSRP #RBJ to RBJ+19
6.7.1.1.2 NR SA FR1 SS-RSRP relative measurement accuracy	Same as 6.7.1.1.1	Same as 6.7.1.1.1
6.7.1.2.1 NR SA FR1-FR1 SS-RSRP absolute measurement accuracy	Average Noc1 ±1.5 dB Average Noc2 ±1.5 dB Average Ês1 / Noc1 ±0.3 dB Average Ês2 / Noc2 ±0.3 dB meas PRB Ês1 / Noc1 ±0.3 dB meas PRB Ês2 / Noc2 ±0.3 dB	Noc1 is the AWGN on NR freq1 Noc2 is the AWGN on NR freq2 Ês1 / Noc1 is the cell 2 SNR Ês2 / Noc2 is the cell 3 SNR meas PRB is the measurement PRB for SS-RSRP #RBJ to RBJ+19
6.7.1.2.2 NR SA FR1-FR1 SS-RSRP relative measurement accuracy	Same as 6.7.1.2.1	Same as 6.7.1.2.1
6.7.2.1 NR SA FR1 SS-RSRQ measurement accuracy	Same as 6.7.1.1.1	Same as 6.7.1.1.1
6.7.2.2.1 NR SA FR1-FR1 SS-RSRQ absolute measurement accuracy	Same as 6.7.1.2.1	Same as 6.7.1.2.1
6.7.2.2.2 NR SA FR1-FR1 SS-RSRQ relative measurement accuracy	Same as 6.7.1.2.1	Same as 6.7.1.2.1
6.7.3.1 NR SA FR1 SS-SINR measurement accuracy	Same as 6.7.1.1.1	Same as 6.7.1.1.1
6.7.3.2.1 NR SA FR1-FR1 SS-SINR absolute measurement accuracy	Same as 6.7.1.2.1	Same as 6.7.1.2.1
6.7.3.2.2 NR SA FR1-FR1 SS-SINR relative measurement accuracy	Same as 6.7.1.2.1	Same as 6.7.1.2.1
6.7.4.1.1 NR SA FR1 SSB based L1-RSRP absolute measurement accuracy	Average Noc ±1.5 dB Average Ês1 / Noc ±0.3 dB Meas PRB Ês1 / Noc ±0.8 dB	Noc is the AWGN on NR freq1 Ês2 / Noc is the cell 1 SNR Meas PRB is the measurement PRB for SS-RSRP #RBJ to RBJ+19
6.7.4.1.2 NR SA FR1 SSB based L1-RSRP relative measurement accuracy	Same as 6.7.4.1.1	Same as 6.7.4.1.1
6.7.4.2.1 NR SA FR1 CSI-RS based L1-RSRP absolute measurement accuracy	Same as 6.7.4.1.1	Same as 6.7.4.1.1
6.7.4.2.2 NR SA FR1 CSI-RS based L1-RSRP relative measurement accuracy	Same as 6.7.4.1.1	Same as 6.7.4.1.1
6.7.5.1 NR SA FR1 – E-UTRAN RSRP absolute measurement accuracy	Average Noc ±1.5 dB Average Ês / Noc ±0.3 dB Meas PRB Noc ±1.5 dB Meas PRB Ês / Noc ±0.8 dB	Noc is the AWGN on E-UTRA freq1 Ês / Noc is the ratio of cell 1 signal / AWGN Meas PRB are the measurement PRB for RSRP #RB_{22} to RB_{27}
6.7.6.1 NR SA FR1 – E-UTRAN RSRQ absolute measurement accuracy	Same as 6.7.5.1	Same as 6.7.5.1
6.7.7.1 NR SA FR1 – E-UTRAN RS-SINR absolute measurement accuracy	Same as 6.7.5.1	Same as 6.7.5.1
6.7.9.1.1 NR SA FR1 CSI-RS based CMR and no dedicated IMR configured and CSI-RS resource set with repetition off L1-SINR absolute measurement accuracy	Average Noc ±1.5 dB Average Ês2 / Noc ±0.3 dB Meas PRB Ês2 / Noc ±0.8 dB	Noc is the AWGN on NR freq1 Ês2 / Noc is the SNR for the CSI-RS#0 & CSI-RS#1 Meas PRB is the measurement PRB for CSI-SINR #RB0 to RB275
6.7.9.1.2 NR SA FR1 CSI-RS based CMR and no dedicated IMR configured and CSI-RS resource set with repetition off L1-SINR relative measurement accuracy	Same as 6.7.9.1.1	Same as 6.7.9.1.1

6.7.9.2 NR SA FR1 SSB based CMR and dedicated IMR L1-SINR absolute measurement accuracy	Average Noc ±1.5 dB Average Ês2 / Noc ±0.3 dB Meas PRB Ês2 / Noc ±0.8 dB	Noc is the AWGN on NR freq1 Ês2 / Noc is the SNR for the SSB#0 & SSB#1 Meas PRB is the measurement PRB for SS-SINR #RBJ to RBJ+19
6.7.9.3.1 NR SA FR1 CSI-RS based CMR and dedicated IMR L1-SINR absolute measurement accuracy	Same as 6.7.9.1.1	Same as 6.7.9.1.1
6.7.9.3.2 NR SA FR1 CSI-RS based CMR and dedicated IMR L1-SINR relative measurement accuracy	Same as 6.7.9.1.1	Same as 6.7.9.1.1

Table F.1.1.2-5: Maximum test system uncertainty for RRM requirements for EN-DC FR2 test cases

Subclause	**Maximum Test System Uncertainty[1]**	**Derivation of Test System Uncertainty**
5.3.2.2.1 EN-DC FR2 contention based random access	Average Ês ±6.0 dB Meas PRB Ês ±6.0 dB Uplink absolute power measurement ±6.0 dB Uplink relative power measurement ±FFS dB ±[48]T_c Uplink signal transmit timing relative to downlink	Meas PRB is the measurement PRB for SS-RSRP #RB_J to RB_{J+19} T_c = 1/(480000 x 4096) seconds, the basic timing unit defined in TS 38.211 [7]
5.3.2.2.2 EN-DC FR2 non-contention based random access	Same as 5.3.2.2.1	Same as 5.3.2.2.1
5.4.1.1 EN-DC FR2 UE transmit timing accuracy	Noc ±5.65 dB, f<=40.8 GHz $Ês_2$ / N_{oc} ±0.3 dB ±48T_c Uplink signal transmit timing relative to downlink ±40T_c Relative during UE timing adjustment	 $Ês_2$ / Noc is the ratio of cell 2 signal / AWGN T_c = 1/(480000 x 4096) seconds, the basic timing unit defined in TS 38.211 [7]
5.4.3.1 EN-DC FR2 UE timing advance adjustment accuracy	Noc ±5.65 dB, f<=40.8 GHz Ês1 / Noc ±0.3 dB ±40Tc timing advance adjustment	 Ês1 / Noc is the ratio of cell 1 signal / AWGN Tc = 1/(480000 x 4096) seconds, the basic timing unit defined in TS 38.211 [7]
5.5.1.1 EN-DC FR2 radio link monitoring out-of-sync test for PSCell configured with SSB-based RLM RS in non-DRX mode	Average Noc ±5.65 dB, f<=40.8 GHz Average Ês1 / Noc ±0.3 dB Average Ês2 / Noc ±0.3 dB Fading profile ±0.5 dB for 1Tx	Ês1 / Noc is the SNR of RLM-RS1 Ês2 / Noc is the SNR of RLM-RS2
5.5.1.2 EN-DC FR2 radio link monitoring in-sync test for PSCell configured with SSB-based RLM RS in non-DRX mode	Same as 5.5.1.1	Same as 5.5.1.1
5.5.1.3 EN-DC FR2 radio link monitoring out-of-sync test for PSCell configured with SSB-based RLM RS in DRX mode	Same as 5.5.1.1	Same as 5.5.1.1
5.5.1.4 EN-DC FR2 radio link monitoring in-sync test for PSCell configured with SSB-based RLM RS in DRX mode	Same as 5.5.1.1	Same as 5.5.1.1
5.5.1.5 EN-DC FR2 radio link monitoring out-of-sync test for PSCell configured with CSI-RS-based RLM RS in non-DRX mode	Average Noc ±5.65 dB, f<=40.8 GHz Average Ês1 / Noc ±0.3 dB Average Ês2 / Noc ±0.3 dB Fading profile ±0.5 dB for 1Tx	 Ês1 / Noc is the SNR of RLM-RS1 Ês2 / Noc is the SNR of RLM-RS2

5.5.1.6 EN-DC FR2 radio link monitoring in-sync test for PSCell configured with CSI-RS-based RLM RS in non-DRX mode	Same as 5.5.1.5	Same as 5.5.1.5
5.5.1.7 EN-DC FR2 radio link monitoring out-of-sync test for PSCell configured with CSI-RS-based RLM RS in DRX mode	Same as 5.5.1.5	Same as 5.5.1.5
5.5.1.8 EN-DC FR2 radio link monitoring in-sync test for PSCell configured with CSI-RS-based RLM RS in DRX mode	Same as 5.5.1.5	Same as 5.5.1.5
5.5.2.1 EN-DC FR2 interruptions at transitions between active and non-active during DRX in synchronous EN-DC	Noc ±5.65 dB, f<=40.8 GHz $\hat{E}s_2$ / N_{oc} ±0.3 dB	 $\hat{E}s_2$ / Noc is the ratio of cell 2 signal / AWGN
5.5.2.2 EN-DC FR2 interruptions at transitions between active and non-active during DRX in asynchronous EN-DC	Same as 5.5.2.1	Same as 5.5.2.1
5.5.2.3 EN-DC FR2 interruptions during measurements on deactivated NR SCC in synchronous EN-DC	Noc ±5.65 dB, f<=40.8 GHz $\hat{E}s_1$ / N_{oc} ±0.3 dB $\hat{E}s_2$ / N_{oc} ±0.3 dB	$\hat{E}s_1$ / Noc is the ratio of cell 1 signal / AWGN $\hat{E}s_2$ / Noc is the ratio of cell 2 signal / AWGN
5.5.2.4 EN-DC FR2 interruptions during measurements on deactivated NR SCC in asynchronous EN-DC	Same as 5.5.2.4	Same as 5.5.2.4
5.5.5.1 EN-DC FR2 SSB-based beam failure detection and link recovery in non-DRX	Noc averaged over BW_{Config}, ±5.65 dB, f<=40.8 GHz Noc averaged over measured PRBs, ±5.65 dB, f<=40.8 GHz $\hat{E}s$ / N_{oc} averaged over BW_{Config}: ±0.3 dB $\hat{E}s$ / N_{oc} averaged over measured PRBs: ±0.3 dB Fading profile ±0.7 dB, 2Tx	Noc averaged over BW_{Config} is the AWGN absolute power averaged over BW_{Config} Noc averaged over measured PRBs is the AWGN absolute power averaged over measured PRBs $\hat{E}s$ / N_{oc} averaged over BW_{Config} is the Ratio of cell signal / AWGN averaged over BW_{Config} $\hat{E}s$ / N_{oc} averaged over measured PRBs is the Ratio of cell signal / AWGN averaged over measured PRBs
5.5.5.2 EN-DC FR2 SSB-based beam failure detection and link recovery in DRX	Same as 5.5.5.1	Same as 5.5.5.1
5.5.5.3 EN-DC FR2 CSI-RS-based beam failure detection and link recovery in non-DRX	Noc ±5.65 dB, f<=40.8 GHz $\hat{E}s_2$ / N_{oc} ±0.3 dB Fading profile ±0.7 dB for 2Tx	Note: Noc is the AWGN on cell 2 frequency $\hat{E}s_2$ / Noc is the SNR for the CSI-RS
5.5.5.4 EN-DC FR2 CSI-RS-based beam failure detection and link recovery in DRX	Same as 5.5.5.3	Same as 5.5.5.3
5.5.5.5 EN-DC FR2 scheduling available restriction during SSB-based beam failure detection and link recovery in non-DRX	Same as 5.5.5.1	Same as 5.5.5.1
5.5.5.6 EN-DC FR2 SCell CSI-RS-based beam failure detection and link recovery in non-DRX	Noc ±5.65 dB, f<=40.8 GHz $\hat{E}s_3$ / N_{oc} ±0.3 dB Fading profile ±0.7 dB for 2Tx	Note: Noc is the AWGN on cell 3 frequency $\hat{E}s_3$ / Noc is the SNR for the CSI-RS
5.5.5.7 EN-DC FR2 SCell CSI-RS-based beam failure detection and link recovery in DRX	Same as 5.5.5.6	Same as 5.5.5.6

5.5.6.2.1 EN-DC FR2 RRC-based DL active BWP switch in non-DRX in synchronous EN-DC	±1.0 dB	Overall system uncertainty for fading conditions comprises two quantities: 1. gNB emulator Signal-to-noise ratio uncertainty 2. Effect of AWGN flatness and signal flatness Items 1 and 2 are assumed to be uncorrelated so can be root sum squared: AWGN flatness and signal flatness has x 0.25 effect on the required SNR, so use sensitivity factor of x 0.25 for the uncertainty contribution. Test System uncertainty = SQRT (gNB emulator Signal-to-noise ratio uncertainty ^{2} + (0.25 x AWGN flatness and signal flatness) ^{2}) gNB emulator Signal-to-noise ratio uncertainty ±0.3 dB AWGN flatness and signal flatness ±3.6 dB
5.6.1.1 EN-DC FR2 event-triggered reporting without gap in non-DRX	$\hat{E}s_2$ averaged over BW ±5.65 dB, f <= 40.8 GHz $\hat{E}s_2$ averaged over measured PRB ±5.65 dB, f <= 40.8 GHz $\hat{E}s_3$ averaged over BW ±5.65 dB, f <= 40.8 GHz $\hat{E}s_3$ averaged over measured PRB ±5.65 dB, f <= 40.8 GHz	$\hat{E}s_2$ averaged over BW is the absolute power of cell 2 signal averaged over BW $\hat{E}s_2$ averaged over measured PRB is the absolute power of cell 2 signal averaged over measured PRB $\hat{E}s_3$ averaged over BW is the absolute power of cell 3 signal averaged over BW $\hat{E}s_3$ averaged over measured PRB is the absolute power of cell 3 signal averaged over measured PRB
5.6.1.2 EN-DC FR2 event-triggered reporting without gap in DRX	Noc ±5.65 dB $\hat{E}s2$ / Noc ±0.3 dB $\hat{E}s3$ / Noc ±0.3 dB	 $\hat{E}s2$ / Noc is the ratio of cell 2 signal / AWGN $\hat{E}s3$ / Noc is the ratio of cell 3 signal / AWGN
5.6.1.3 EN-DC FR2 event-triggered reporting without gap in non-DRX	Same as 5.6.1.1	Same as 5.6.1.1
5.6.1.4 EN-DC FR2 event-triggered reporting with gap in DRX	Same as 5.6.1.2	Same as 5.6.1.2
5.6.2.1 EN-DC FR2-FR2 event-triggered reporting in non-DRX	Average $\hat{E}s1$ ±5.65 dB, f <= 40.8 GHz Meas PRB $\hat{E}s1$ ±5.65 dB, f <= 40.8 GHz Average $\hat{E}s2$ ±5.65 dB Meas PRB $\hat{E}s2$ ±5.65 dB	$\hat{E}s1$ is NR cell 2 signal $\hat{E}s2$ is NR cell 3 signal Meas PRB is the measurement PRB for SS-RSRP #RBJ to RBJ+19
5.6.2.2 EN-DC FR2-FR2 event-triggered reporting in DRX	Average Noc ±5.65 dB, f <= 40.8 GHz Noc over meas PRBs ±5.65 dB f <= 40.8 GHz Average $\hat{E}s1$ / Noc ±0.3 dB $\hat{E}s1$ / Noc over meas PRBs ±0.3 dB Average $\hat{E}s2$ / Noc ±0.3 dB $\hat{E}s2$ / Noc over meas PRBs ±0.3 dB	$\hat{E}s1$ is NR cell 2 signal $\hat{E}s2$ is NR cell 3 signal Meas PRB is the measurement PRB for SS-RSRP #RBJ to RBJ+19
5.6.2.3 EN-DC FR2-FR2 event-triggered reporting in non-DRX with SSB time index detection	Same as 5.6.2.1	Same as 5.6.2.1
5.6.2.4 EN-DC FR2-FR2 event-triggered reporting in DRX with SSB time index detection	Same as 5.6.2.2	Same as 5.6.2.2
5.6.2.5 EN-DC FR1-FR2 event-triggered reporting in non-DRX	Average $\hat{E}s2$ ±5.65, f <= 40.8 GHz	$\hat{E}s2$ is NR cell 2 signal Meas PRB is the measurement PRB for SS-RSRP #RBJ to RBJ+19
5.6.2.6 EN-DC FR1-FR2 event-triggered reporting in DRX	Noc ±5.65 dB, f <= 40.8 GHz $\hat{E}s2$ / Noc ±0.3 dB	$\hat{E}s2$ / Noc is the ratio of cell 2 signal / AWGN

5.6.2.7 EN-DC FR1-FR2 event-triggered reporting in non-DRX with SSB time index detection	Same as 5.6.2.5	Same as 5.6.2.5
5.6.2.8 EN-DC FR1-FR2 event-triggered reporting in DRX with SSB time index detection	Same as 5.6.2.6	Same as 5.6.2.6
5.6.3.1 EN-DC FR2 SSB-based L1-RSRP measurement in non-DRX	Average Noc ±5.65 dB, f <= 40.8 GHz Noc over meas PRBs ±5.65 dB f <= 40.8 GHz Average Ês0 / Noc ±0.3 dB Ês0 / Noc over meas PRBs ±0.3 dB Average Ês1 / Noc ±0.3 dB Ês1 / Noc over meas PRBs ±0.3 dB	Ês0 / Noc is the SNR for the SSB#0 Ês1 / Noc is the SNR for the SSB#1 Meas PRB is the measurement PRB for SS-RSRP #RBJ to RBJ+19
5.6.3.2 EN-DC FR2 SSB-based L1-RSRP measurement in DRX	Same as 5.6.3.1	Same as 5.6.3.1
5.6.3.3 EN-DC FR2 CSI-RS-based L1-RSRP measurement in non-DRX	Average Noc ±5.65 dB, f <= 40.8 GHz Noc over meas PRBs ±5.65 dB f <= 40.8 GHz Average Ês0 / Noc ±0.3 dB Ês0 / Noc over meas PRBs ±0.3 dB Average Ês1 / Noc ±0.3 dB Ês1 / Noc over meas PRBs ±0.3 dB	Ês0 / Noc is the SNR for the CSI-RS#0 Ês1 / Noc is the SNR for the CSI-RS#1 Meas PRB is the measurement PRB for CSI-RS-RSRP #RBJ to RBJ+65
5.6.3.4 EN-DC FR2 CSI-RS-based L1-RSRP measurement in DRX	Same as 5.6.3.3	Same as 5.6.3.3
5.6.4.1 EN-DC FR2 SRS-RSRP measurement in non-DRX	Noc ±5.65 dB, f <= 40.8 GHz Noc over meas PRBs ±5.65 dB f <= 40.8 GHz Ês1 / Noc ±0.3 dB Meas PRB Ês1 / Noc ±0.3 dB	Noc is the AWGN on the NR freq Ês1 / Noc is the ratio of cell2 signal/AWGN
5.6.6.1 EN-DC FR2 CSI-RS based CMR and no dedicated IMR L1-SINR measurement in DRX	Average Noc ±5.65 dB, f <= 40.8 GHz Noc over meas PRBs ±5.65 dB f <= 40.8 GHz Average Ês0 / Noc ±0.3 dB Ês0 / Noc over meas PRBs ±0.3 dB Average Ês1 / Noc ±0.3 dB Ês1 / Noc over meas PRBs ±0.3 dB	Ês0 / Noc is the SNR for the CSI-RS#0 Ês1 / Noc is the SNR for the CSI-RS#1 Meas PRB is the measurement PRB for CSI-RS-SINR #RBJ to RBJ+275
5.6.6.2 EN-DC FR2 SSB based CMR and dedicated IMR L1-SINR measurement in non-DRX	Average Noc ±5.65 dB, f <= 40.8 GHz Noc over meas PRBs ±5.65 dB f <= 40.8 GHz Average Ês0 / Noc ±0.3 dB Ês0 / Noc over meas PRBs ±0.3 dB Average Ês1 / Noc ±0.3 dB Ês1 / Noc over meas PRBs ±0.3 dB	Ês0 / Noc is the SNR for the SSB#0 Ês1 / Noc is the SNR for the SSB#1 Meas PRB is the measurement PRB for SS-SINR#RBJ to RBJ+19
5.6.6.3 EN-DC FR2 CSI-RS based CMR and dedicated IMR L1-SINR measurement in non-DRX	Same as 5.6.6.1	Same as 5.6.6.1

5.7.1.1 EN-DC FR2 SS-RSRP measurement accuracy	Test 1 Noc ±5.65 dB, f <= 40.8 GHz Noc over meas PRBs ±5.65 dB f <= 40.8 GHz Ês1 / Noc ±0.3 dB Ês2 / Noc ±0.3 dB Meas PRB Ês1 / Noc ±0.3 dB Meas PRB Ês2 / Noc ±0.3 dB Test 2 Average Ês1 ±5.65 dB, f <= 40.8 GHz Meas PRB Ês1 ±5.65 dB, f <= 40.8 GHz Average Ês2 ±5.65 dB, f <= 40.8 GHz Meas PRB Ês2 ±5.65 dB, f <= 40.8 GHz	Test 1 Noc is the AWGN on the NR freq Ês1 / Noc is the ratio of cell 2 signal / AWGN Ês2 / Noc is the ratio of cell 3 signal / AWGN Meas PRB is the measurement PRB for SS-RSRP #RBJ to RBJ+19 Test 2 Ês1 is NR cell 2 signal Ês2 is NR cell 3 signal Meas PRB is the measurement PRB for SS-RSRP #RBJ to RBJ+19
5.7.1.2 EN-DC FR2-FR2 SS-RSRP measurement accuracy	Noc1 ±5.65 dB, f <= 40.8 GHz Noc1 over measPRBs ±5.65 dB, f <= 40.8 GHz Noc2 ±5.65 dB, f <= 40.8 GHz Noc2 over measPRBs ±5.65 dB, f <= 40.8 GHz Ês1 / Noc1 ±0.3 dB Ês2 / Noc2 ±0.3 dB Meas PRB Ês1 / Noc1 ±0.3 dB Meas PRB Ês2 / Noc2 ±0.3 dB	Noc1 is the AWGN on the NR freq 1 Noc2 is the AWGN on the NR freq 2 Ês1 / Noc1 is the ratio of cell 2 signal / AWGN Ês2 / Noc2 is the ratio of cell 3 signal / AWGN Meas PRB is the measurement PRB for SS-RSRP #RBJ to RBJ+19
5.7.1.3 EN-DC FR1-FR2 SS-RSRP measurement accuracy	Test 1 Noc ±5.65 dB, f <= 40.8 GHz Noc over meas PRBs ±5.65 dB f <= 40.8 GHz Ês2 / Noc ±0.3 dB Meas PRB Ês2 / Noc ±0.3 dB Test 2 Average Ês2 ±5.65 dB, f <= 40.8 GHz Meas PRB Ês2 ±5.65 dB, f <= 40.8 GHz	Test 1 Noc is the AWGN on the NR freq Ês2 / Noc is the ratio of cell 3 signal / AWGN Meas PRB is the measurement PRB for SS-RSRP #RBJ to RBJ+19 Test 2 Ês2 is NR cell 3 signal Meas PRB is the measurement PRB for SS-RSRP #RBJ to RBJ+19
5.7.2.1 EN-DC FR2 SS-RSRQ measurement accuracy	Noc ±5.65 dB, f <= 40.8 GHz Noc over meas PRBs ±5.65 dB, f <= 40.8 GHz Ês1 / Noc ±0.3 dB Ês2 / Noc ±0.3 dB Meas PRB Ês1 / Noc ±0.3 dB Meas PRB Ês2 / Noc ±0.3 dB	Noc is the AWGN on the NR freq Ês1 / Noc is the ratio of cell 2 signal / AWGN Ês2 / Noc is the ratio of cell 3 signal / AWGN Meas PRB is the measurement PRB for SS-RSRP #RBJ to RBJ+19
5.7.2.2 EN-DC FR2-FR2 SS-RSRQ measurement accuracy	Same as 5.7.1.2	Same as 5.7.1.2
5.7.3.1 EN-DC FR2 SS-SINR measurement accuracy	Same as 5.7.2.1	Same as 5.7.2.1
5.7.3.2 EN-DC FR2-FR2 SS-SINR measurement accuracy	Same as 5.7.1.2	Same as 5.7.1.2

5.7.4.1 EN-DC FR2 SSB based L1-RSRP measurement accuracy	Test 1 Noc ±5.65 dB, f <= 40.8 GHz Noc over meas PRBs ±5.65 dB f <= 40.8 GHz Ês1 / Noc ±0.3 dB Meas PRB Ês1 / Noc ±0.3 dB Test 2 Average Ês1 ±5.65 dB, f <= 40.8 GHz Meas PRB Ês1 ±5.65 dB, f <= 40.8 GHz	Test 1 Noc is the AWGN on the NR freq Ês1 / Noc is the ratio of cell 2 signal / AWGN Meas PRB is the measurement PRB for SS-RSRP #RBJ to RBJ+19 Test 2 Ês1 is NR cell 2 signal Meas PRB is the measurement PRB for SS-RSRP #RBJ to RBJ+19
5.7.4.2 EN-DC FR2 CSI-RS based L1-RSRP measurement accuracy	Test 1 Noc ±5.65 dB, f <= 40.8 GHz Noc over meas PRBs ±5.65 dB f <= 40.8 GHz Ês1 / Noc ±0.3 dB Meas PRB Ês1 / Noc ±0.3 dB Test 2 Average Ês1 ±5.65 dB, f <= 40.8 GHz Meas PRB Ês1 ±5.65 dB, f <= 40.8 GHz	Test 1 Noc is the AWGN on the NR freq Ês1 / Noc is the ratio of cell 2 signal / AWGN Meas PRB is the measurement PRB for CSI-RS-RSRP Test 2 Ês1 is NR cell 2 signal Meas PRB is the measurement PRB for CSI-RS-RSRP
5.7.5.1 EN-DC FR2 SRS-RSRP measurement accuracy	Noc ±5.65 dB, f <= 40.8 GHz Noc over meas PRBs ±5.65 dB f <= 40.8 GHz Ês1 / Noc ±0.3 dB Meas PRB Ês1 / Noc ±0.3 dB	Noc is the AWGN on the NR freq Ês1 / Noc is the ratio of cell2 signal/AWGN
5.7.6.1 EN-DC FR2 CSI-RS based CMR and no dedicated IMR configured and CSI-RS resource set with repetition off L1-SINR measurement accuracy	Test 1 Noc ±5.65 dB, f <= 40.8 GHz Noc over meas PRBs ±5.65 dB f <= 40.8 GHz Ês1 / Noc ±0.3 dB Meas PRB Ês1 / Noc ±0.3 dB	Test 1 Noc is the AWGN on the NR freq Ês1 / Noc is the ratio of cell 2 signal / AWGN Meas PRB is the measurement PRB for CSI-RS-RSRP
5.7.6.2 EN-DC FR2 SSB based CMR and dedicated IMR L1-SINR absolute measurement accuracy	Test 1 Noc ±5.65 dB, f <= 40.8 GHz Noc over meas PRBs ±5.65 dB f <= 40.8 GHz Ês1 / Noc ±0.3 dB Meas PRB Ês1 / Noc ±0.3 dB	Test 1 Noc is the AWGN on the NR freq Ês1 / Noc is the ratio of cell 2 signal / AWGN Meas PRB is the measurement PRB for SSB or CSI-RS
5.7.6.3 EN-DC FR2 CSI-RS based CMR and dedicated IMR L1-SINR measurement accuracy	Test 1 Noc ±5.65 dB, f <= 40.8 GHz Noc over meas PRBs ±5.65 dB f <= 40.8 GHz Ês1 / Noc ±0.3 dB Meas PRB Ês1 / Noc ±0.3 dB	Test 1 Noc is the AWGN on the NR freq Ês1 / Noc is the ratio of cell 2 signal / AWGN Meas PRB is the measurement PRB for CSI-RS-RSRP

Table F.1.1.2-6: Maximum test system uncertainty for RRM requirements for SA FR2 test cases

Subclause	Maximum Test System Uncertainty[1]	Derivation of Test System Uncertainty

7.1.1.1 NR SA FR2 cell re-selection	Noc, averaged over BW_{Config}, ±5.65 dB Noc, averaged over Measurement PRB, ±5.65 dB Es_1/Noc averaged over BW_{Config} ±0.3 dB Es_1/Noc averaged over Measurement PRB ±0.3 dB Es_2/Noc averaged over BW_{Config} ±0.3 dB Es_2/Noc averaged over Measurement PRB ±0.3 dB	Noc averaged over BW_{Config} is the AWGN absolute power of RF channel 1 averaged over BW_{Config} Noc averaged over Measurement PRB is the AWGN absolute power of RF channel 1 averaged over Measurement PRB Es_1/Noc averaged over BW_{Config} is Ratio of cell 1 signal / AWGN averaged over BW_{Config} Es_1/Noc averaged over Measurement PRB is Ratio of cell 1 signal / AWGN averaged over Measurement PRB Es_2/Noc averaged over BW_{Config} is Ratio of cell 2 signal / AWGN averaged over BW_{Config} Es_2/Noc averaged over Measurement PRB is Ratio of cell 2 signal / AWGN averaged over Measurement PRB
7.1.1.2 NR SA FR2-FR2 cell re-selection	Noc_1, averaged over BW_{Config}, ±5.65 dB Noc_1, averaged over Measurement PRB, ±5.65 dB Noc_2, averaged over BW_{Config}, ±5.65 dB Noc_2, averaged over Measurement PRB, ±5.65 dB Es_1/Noc_1 averaged over BW_{Config} ±0.3 dB Es_1/Noc_1 averaged over Measurement PRB ±0.3 dB Es_2/Noc_2 averaged over BW_{Config} ±0.3 dB Es_2/Noc_2 averaged over Measurement PRB ±0.3 dB	Noc_1 averaged over BW_{Config} is the AWGN absolute power of RF channel 1 averaged over BW_{Config} Noc_1 averaged over Measurement PRB is the AWGN absolute power of RF channel 1 averaged over Measurement PRB Noc_2 averaged over BW_{Config} is the AWGN absolute power of RF channel 2 averaged over BW_{Config} Noc_2 averaged over Measurement PRB is the AWGN absolute power of RF channel 2 averaged over Measurement PRB Es_1/Noc_1 averaged over BW_{Config} is Ratio of cell 1 signal / AWGN averaged over BW_{Config} Es_1/Noc_1 averaged over Measurement PRB is Ratio of cell 1 signal / AWGN averaged over Measurement PRB Es_2/Noc_2 averaged over BW_{Config} is Ratio of cell 2 signal / AWGN averaged over BW_{Config} Es_2/Noc_2 averaged over Measurement PRB is Ratio of cell 2 signal / AWGN averaged over Measurement PRB
7.1.1.3 NR SA FR2 cell re-selection for UE fulfilling low mobility relaxed measurement criterion	Same as 7.1.1.1	Same as 7.1.1.1
7.1.1.4 NR SA FR2 cell re-selection for UE fulfilling not-at-cell edge relaxed measurement criterion	Same as 7.1.1.1	Same as 7.1.1.1
7.1.1.5 NR SA FR2-FR2 cell re-selection for UE fulfilling low mobility relaxed measurement criterion	Same as 7.1.1.2	Same as 7.1.1.2
7.1.1.6 NR SA FR2-FR2 cell re-selection for UE fulfilling not-at-cell edge relaxed measurement criterion	Same as 7.1.1.2	Same as 7.1.1.2

7.3.1.2 NR SA FR2 Intra-frequency handover; unknown target cell	Average Noc over BW, ±5.65 dB, f <= 40.8 GHz Noc over meas PRBs ±5.65 dB f <= 40.8 GHz Average Ês1 / Noc over BW, ±0.3 dB, f <= 40.8 GHz Average Ês1 / Noc over meas PRB, ±0.3 dB, f <= 40.8 GHz Average Ês2 / Noc over BW, ±0.3 dB, f <= 40.8 GHz Average Ês2 / Noc over meas PRB, ±0.3 dB, f <= 40.8 GHz	Average Noc over BW is AWGN absolute power averaged over BW. Average Noc over meas PRB is AWGN absolute power averaged over measured PRB. Average Ês1 / Noc over BW is the ratio of cell 1 signal / AWGN averaged over BW Average Ês1 / Noc over measured PRB is the ratio of cell 1 signal / AWGN averaged over measured PRB Average Ês2 / Noc over BW is the ratio of cell 2 signal / AWGN averaged over BW. Average Ês2 / Noc over measured PRB is the ratio of cell 2 signal / AWGN averaged over measured PRB. Ês1 is NR cell 1 signal Ês2 is NR cell 2 signal Meas PRB is the measurement PRB for SS-RSRP #RBJ to RBJ+19
7.3.1.3 NR SA FR2-FR2 Inter-frequency handover; unknown target cell	Average Noc1 over BW ±5.65 dB, f <= 40.8 GHz Noc1 over meas PRBs ±5.65 dB f <= 40.8 GHz Average Noc2 over BW ±5.65 dB, f <= 40.8 GHz Noc2 over meas PRBs ±5.65 dB f <= 40.8 GHz Average Ês1 / Noc1 over BW, ±0.3 dB, f <= 40.8 GHz Average Ês1 / Noc1 over meas PRB, ±0.3 dB, f <= 40.8 GHz Average Ês2 / Noc2 over BW, ±0.3 dB, f <= 40.8 GHz Average Ês2 / Noc2 over meas PRB, ±0.3 dB, f <= 40.8 GHz	Average Noc1 over BW is AWGN absolute power averaged over BW on freq 1. Average Noc1 over meas PRB is AWGN absolute power averaged over measured PRB on freq 1. Average Noc2 over BW is AWGN absolute power averaged over BW on freq 2. Average Noc2 over meas PRB is AWGN absolute power averaged over measured PRB on freq 2. Average Ês1 / Noc1 over BW is the ratio of cell 1 signal / AWGN averaged over BW on freq 1. Average Ês1 / Noc1 over measured PRB is the ratio of cell 1 signal / AWGN averaged over measured PRB on freq 1. Average Ês2 / Noc2 over BW is the ratio of cell 2 signal / AWGN averaged over BW on freq 2. Average Ês2 / Noc2 over measured PRB is the ratio of cell 2 signal / AWGN averaged over measured PRB on freq 2. Ês1 is NR cell 1 signal Ês2 is NR cell 2 signal Meas PRB is the measurement PRB for SS-RSRP #RBJ to RBJ+19
7.3.1.4 NR SA FR1-FR2 synchronous DAPS handover	Noc, averaged over BW_{Config}, ±5.65 dB Noc, averaged over Measurement PRB, ±5.65 dB Es_2/Noc averaged over BW_{Config} ±0.3 dB Es_2/Noc averaged over Measurement PRB ±0.3 dB	Noc averaged over BW_{Config} is the AWGN absolute power of RF channel 2 averaged over BW_{Config} Noc averaged over Measurement PRB is the AWGN absolute power of RF channel 2 averaged over Measurement PRB Es_2/Noc averaged over BW_{Config} is Ratio of cell 2 signal / AWGN averaged over BW_{Config} Es_2/Noc averaged over Measurement PRB is Ratio of cell 2 signal / AWGN averaged over Measurement PRB

7.3.1.5 NR SA FR1-FR2 asynchronous DAPS handover	Same as 7.3.1.4	Same as 7.3.1.4
7.3.2.1.1 NR SA FR2 RRC re-establishment	Average Noc ±5.65 dB, f <= 40.8 GHz Noc over meas PRBs ±5.65 dB f <= 40.8 GHz Average Ês1 / Noc ±0.3 dB Ês1 / Noc over meas PRBs ±0.3 dB Average Ês2 / Noc ±0.3 dB Ês2 / Noc over meas PRBs ±0.3 dB	Ês1 is NR cell 1 signal Ês2 is NR cell 2 signal Meas PRB is the measurement PRB for SS-RSRP #RBJ to RBJ+19
7.3.2.1.2 NR SA FR2 - FR2 RRC re-establishment	Average Noc_1 ±5.65 dB, f <= 40.8 GHz Noc_1 over meas PRBs ±5.65 dB f <= 40.8 GHz Average Noc_2 ±5.65 dB, f <= 40.8 GHz Noc_2 over meas PRBs ±5.65 dB f <= 40.8 GHz Average Ês1 / Noc_1 ±0.3 dB Ês1 / Noc over meas PRBs ±0.3 dB Average Ês2 / Noc_2 ±0.3 dB Ês2 / Noc over meas PRBs ±0.3 dB	Ês1 is NR cell 1 signal Ês2 is NR cell 2 signal Meas PRB is the measurement PRB for SS-RSRP #RBJ to RBJ+19
7.3.2.2.1 NR SA FR2 contention based random access	Average Ês ±6.0 dB Meas PRB Ês ±6.0 dB Uplink absolute power measurement ±6.0 dB Uplink relative power measurement ±FFS dB ±[48]T_c Uplink signal transmit timing relative to downlink	Meas PRB is the measurement PRB for SS-RSRP #RB_J to RB_{J+19} T_c = 1/(480000 x 4096) seconds, the basic timing unit defined in TS 38.211 [7]
7.3.2.2.2 NR SA FR2 non-contention based random access	Same as 7.3.2.2.1	Same as 7.3.2.2.1
7.3.2.3.1 NR SA FR2-FR2 RRC connection release with redirection	Same as 7.3.1.3	Same as 7.3.1.3
7.3.3.1 NR SA FR2 conditional handover	Noc averaged over BW_{Config}, ±5.65 dB Noc, averaged over Measurement PRB, ±5.65 dB Es_1/Noc averaged over BW_{Config} ±0.3 dB Es_1/Noc averaged over Measurement PRB ±0.3 dB Es_2/Noc ±0.3 dB Noc, averaged over BW_{Config}, ±5.65 dB Es_2/Noc averaged over Measurement PRB ±0.3 dB	Noc averaged over BW_{Config},is the AWGN absolute power of RF channel 1 averaged over BW_{Config}, Noc averaged over Measurement PRB,is the AWGN absolute power of RF channel 1 averaged over Measurement PRB, Es_1/Noc averaged over BW_{Config} is Ratio of cell 1 signal / AWGN averaged over BW_{Config} Es_1/Noc averaged over Measurement PRB is Ratio of cell 1 signal / AWGN averaged over Measurement PRB Es_2/Noc averaged over BW_{Config} is Ratio of cell 2 signal / AWGN averaged over BW_{Config} Es_2/Noc averaged over Measurement PRB is Ratio of cell 2 signal / AWGN averaged over Measurement PRB

7.4.1.1 SA FR2 UE transmit timing accuracy	Noc ±5.65 dB $\hat{E}s_1$ / N_{oc} ±0.3 dB ±48T_c Uplink signal transmit timing relative to downlink ±40T_c Relative during UE timing adjustment	$\hat{E}s_1$ / Noc is the ratio of cell 1 signal / AWGN T_c = 1/(480000 x 4096) seconds, the basic timing unit defined in TS 38.211 [7]
7.4.3.1 NR SA FR2 UE timing advance adjustment accuracy	Noc ±5.65 dB Ês1 / Noc ±0.3 dB ±40Tc timing advance adjustment	 Ês1 / Noc is the ratio of cell 1 signal / AWGN Tc = 1/(480000 x 4096) seconds, the basic timing unit defined in TS 38.211 [7]
7.5.1.1 Radio Link Monitoring Out-of-sync Test for FR2 PCell configured with SSB-based RLM RS in non-DRX mode	Same as 5.5.1.1	Same as 5.5.1.1
7.5.1.2 Radio Link Monitoring In-sync Test for FR2 PCell configured with SSB-based RLM RS in non-DRX mode	Same as 5.5.1.1	Same as 5.5.1.1
7.5.1.3 Radio Link Monitoring Out-of-sync Test for FR2 PCell configured with SSB-based RLM RS in DRX mode	Same as 5.5.1.1	Same as 5.5.1.1
7.5.1.4 Radio Link Monitoring In-sync Test for FR2 PCell configured with SSB-based RLM RS in DRX mode	Same as 5.5.1.1	Same as 5.5.1.1
7.5.5.1 NR SA FR2 SSB-based beam failure detection and link recovery in non-DRX	Same as 5.5.5.1	Same as 5.5.5.1
7.5.5.2 NR SA FR2 SSB-based beam failure detection and link recovery in DRX	Same as 5.5.5.1	Same as 5.5.5.1
7.5.5.3 NR SA FR2 CSI-RS-based beam failure detection and link recovery in non-DRX	Noc ±5.65 dB, f<=40.8 GHz $\hat{E}s_1$ / N_{oc} ±0.3 dB Fading profile ±0.7 dB for 2Tx	Note: Noc is the AWGN on cell 1 frequency $\hat{E}s_1$ / Noc is the SNR for the CSI-RS
7.5.5.4 NR SA FR2 CSI-RS-based beam failure detection and link recovery in DRX	Same as 7.5.5.3	Same as 7.5.5.3
7.5.5.5 NR SA FR2 scheduling available restriction during SSB-based beam failure detection and link recovery in non-DRX	Same as 5.5.5.1	Same as 5.5.5.1
7.5.5.6 NR SA FR2 SCell CSI-RS-based beam failure detection and link recovery in non-DRX	Noc ±5.65 dB, f<=40.8 GHz $\hat{E}s_2$ / N_{oc} ±0.3 dB Fading profile ±0.7 dB for 2Tx	Note: Noc is the AWGN on cell 2 frequency $\hat{E}s_2$ / Noc is the SNR for the CSI-RS
7.5.5.7 NR SA FR2 SCell CSI-RS-based beam failure detection and link recovery in DRX	Same as 7.5.5.6	Same as 7.5.5.6

7.5.6.2.1 NR SA FR2 RRC-based DL active BWP switch in non-DRX	±1.0 dB	Overall system uncertainty for fading conditions comprises two quantities: 1. gNB emulator Signal-to-noise ratio uncertainty 2. Effect of AWGN flatness and signal flatness Items 1 and 2 are assumed to be uncorrelated so can be root sum squared: AWGN flatness and signal flatness has x 0.25 effect on the required SNR, so use sensitivity factor of x 0.25 for the uncertainty contribution. Test System uncertainty = SQRT (gNB emulator Signal-to-noise ratio uncertainty ^{2} + (0.25 x AWGN flatness and signal flatness) ^{2}) gNB emulator Signal-to-noise ratio uncertainty ±0.3 dB AWGN flatness and signal flatness ±3.6 dB
7.6.1.1 NR SA FR2 event-triggered reporting without gap in non-DRX	$\hat{E}s_1$ averaged over BW ±5.65 dB, f <= 40.8 GHz $\hat{E}s_1$ averaged over measured PRB ±5.65 dB, f <= 40.8 GHz $\hat{E}s_2$ averaged over BW ±5.65 dB, f <= 40.8 GHz $\hat{E}s_2$ averaged over measured PRB ±5.65 dB, f <= 40.8 GHz	$\hat{E}s_1$ averaged over BW is the absolute power of cell 1 signal averaged over BW $\hat{E}s_1$ averaged over measured PRB is the absolute power of cell 1 signal averaged over measured PRB $\hat{E}s_2$ averaged over BW is the absolute power of cell 2 signal averaged over BW $\hat{E}s_2$ averaged over measured PRB is the absolute power of cell 2 signal averaged over measured PRB
7.6.1.2 NR SA FR2 event-triggered reporting without gap in DRX	Noc averaged over BW, ±5.65 dB, f <= 40.8 GHz Noc averaged over measured PRB, ±5.65 dB, f <= 40.8 GHz Ês1 / Noc averaged over BW, ±0.3 dB, f <= 40.8 GHz Ês1 / Noc averaged over measured PRB, ±0.3 dB, f <= 40.8 GHz Ês2 / Noc averaged over BW, ±0.3 dB, f <= 40.8 GHz Ês2 / Noc averaged over measured PRB, ±0.3 dB, f <= 40.8 GHz	Noc averaged over BW is AWGN absolute power averaged over BW. Noc averaged over measured PRB is AWGN absolute power averaged over measured PRB. Ês1 / Noc averaged over BW is the ratio of cell 1 signal / AWGN averaged over BW Ês1 / Noc averaged over measured PRB is the ratio of cell 1 signal / AWGN averaged over measured PRB Ês2 / Noc averaged over BW is the ratio of cell 2 signal / AWGN averaged over BW. Ês2 / Noc averaged over measured PRB is the ratio of cell 2 signal / AWGN averaged over measured PRB.
7.6.1.3 NR SA FR2 event-triggered reporting without gap in non-DRX	Same as 7.6.1.1	Same as 7.6.1.1
7.6.1.4 NR SA FR2 event-triggered reporting with gap in DRX	Same as 7.6.1.2	Same as 7.6.1.2
7.6.2.1 NR SA FR2-FR2 event-triggered reporting in non-DRX	Average Ês1 ±5.65 dB, f <= 40.8 GHz Meas PRB Ês1 ±5.65 dB, f <= 40.8 GHz Average Ês2 ±5.65 dB Meas PRB Ês2 ±5.65 dB	Ês1 is NR cell 1 signal Ês2 is NR cell 2 signal Meas PRB is the measurement PRB for SS-RSRP #RBJ to RBJ+19

7.6.2.2 NR SA FR2-FR2 event-triggered reporting in DRX	Average Noc_1 ±5.65 dB, f <= 40.8 GHz Noc_1 over meas PRBs ±5.65 dB f <= 40.8 GHz Average Noc_2 ±5.65 dB, f <= 40.8 GHz Noc_2 over meas PRBs ±5.65 dB f <= 40.8 GHz Average Ês1 / Noc_1 ±0.3 dB Ês1 / Noc over meas PRBs ±0.3 dB Average Ês2 / Noc_2 ±0.3 dB Ês2 / Noc_2 over meas PRBs ±0.3 dB	Ês1 is NR cell 1 signal Ês2 is NR cell 2 signal Meas PRB is the measurement PRB for SS-RSRP #RBJ to RBJ+19
7.6.2.3 NR SA FR2-FR2 event-triggered reporting in non-DRX with SSB time index detection	Same as 7.6.2.1	Same as 7.6.2.1
7.6.2.4 NR SA FR2-FR2 event-triggered reporting in DRX with SSB time index detection	Same as 7.6.2.2	Same as 7.6.2.2
7.6.2.5 NR SA FR1-FR2 event-triggered reporting in non-DRX	Average Ês2 ±5.65 dB, f <= 40.8 GHz	Ês2 is NR cell 2 signal Meas PRB is the measurement PRB for SS-RSRP #RBJ to RBJ+19
7.6.2.6 NR SA FR1-FR2 event-triggered reporting in DRX	Noc ±5.65 dB, f <= 40.8 GHz Ês2 / Noc ±0.3 dB	Ês2 / Noc is the ratio of cell 2 signal / AWGN
7.6.2.7 NR SA FR1-FR2 event-triggered reporting in non-DRX with SSB time index detection	Same as 7.6.2.5	Same as 7.6.2.5
7.6.2.8 NR SA FR1-FR2 event-triggered reporting in DRX with SSB time index detection	Same as 7.6.2.6	Same as 7.6.2.6
7.6.3.1 NR SA FR2 SSB-based L1-RSRP measurement in non-DRX	Average Noc ±5.65 dB, f <= 40.8 GHz Noc over meas PRBs ±5.65 dB f <= 40.8 GHz Average Ês0 / Noc ±0.3 dB Ês0 / Noc over meas PRBs ±0.3 dB Average Ês1 / Noc ±0.3 dB Ês1 / Noc over meas PRBs ±0.3 dB	Ês0 / Noc is the SNR for the SSB#0 Ês1 / Noc is the SNR for the SSB#1 Meas PRB is the measurement PRB for SS-RSRP #RBJ to RBJ+19
7.6.3.2 NR SA FR2 SSB-based L1-RSRP measurement in DRX	Same as 7.6.3.1	Same as 7.6.3.1
7.6.3.3 NR SA FR2 CSI-RS-based L1-RSRP measurement in non-DRX	Average Noc ±5.65 dB, f <= 40.8 GHz Noc over meas PRBs ±5.65 dB f <= 40.8 GHz Average Ês0 / Noc ±0.3 dB Ês0 / Noc over meas PRBs ±0.3 dB Average Ês1 / Noc ±0.3 dB Ês1 / Noc over meas PRBs ±0.3 dB	Ês0 / Noc is the SNR for the CSI-RS#0 Ês1 / Noc is the SNR for the CSI-RS#1 Meas PRB is the measurement PRB for CSI-RS-RSRP
7.6.3.4 NR SA FR2 CSI-RS-based L1-RSRP measurement in DRX	Same as 7.6.3.3	Same as 7.6.3.3
7.6.4.1 NR SA FR2 SRS-RSRP measurement in non-DRX	Same as 5.6.4.1	Same as 5.6.4.1

7.6.6.1 NR SA FR2 CSI-RS based CMR and no dedicated IMR configured and CSI-RS resource set with repetition off L1-SINR measurement accuracy	Average Noc ±5.65 dB, f <= 40.8 GHz Noc over meas PRBs ±5.65 dB f <= 40.8 GHz Average Ês0 / Noc ±0.3 dB Ês0 / Noc over meas PRBs ±0.3 dB Average Ês1 / Noc ±0.3 dB Ês1 / Noc over meas PRBs ±0.3 dB	Ês0 / Noc is the SNR for the CSI-RS#0 Ês1 / Noc is the SNR for the CSI-RS#1 Meas PRB is the measurement PRB for CSI-RS-SINR #RBJ to RBJ+275
7.6.6.2 NR SA FR2 SSB based CMR and dedicated IMR L1-SINR measurement accuracy	Average Noc ±5.65 dB, f <= 40.8 GHz Noc over meas PRBs ±5.65 dB f <= 40.8 GHz Average Ês0 / Noc ±0.3 dB Ês0 / Noc over meas PRBs ±0.3 dB Average Ês1 / Noc ±0.3 dB Ês1 / Noc over meas PRBs ±0.3 dB	Ês0 / Noc is the SNR for the SSB#0 Ês1 / Noc is the SNR for the SSB#1 Meas PRB is the measurement PRB for SS-SINR #RBJ to RBJ+19
7.6.6.3 NR SA FR2 CSI-RS based CMR and dedicated IMR L1-SINR measurement accuracy	Same as 7.6.6.1	Same as 7.6.6.1
7.7.1.1 NR SA FR2 SS-RSRP measurement accuracy	Test 1 Noc ±5.65 dB, f <= 40.8 GHz Noc over meas PRBs ±5.65 dB f <= 40.8 GHz Ês1 / Noc ±0.3 dB Ês2 / Noc ±0.3 dB Meas PRB Ês1 / Noc ±0.3 dB Meas PRB Ês2 / Noc ±0.3 dB Test 2 Average Ês1 ±5.65 dB, f <= 40.8 GHz Meas PRB Ês1 ±5.65 dB, f <= 40.8 GHz Average Ês2 ±5.65 dB, f <= 40.8 GHz Meas PRB Ês2 ±5.65 dB, f <= 40.8 GHz	Test 1 Noc is the AWGN on the NR freq Ês1 / Noc is the ratio of cell 1 signal / AWGN Ês2 / Noc is the ratio of cell 1 signal / AWGN Meas PRB is the measurement PRB for SS-RSRP #RBJ to RBJ+19 Test 2 Ês1 is NR cell 1 signal Ês2 is NR cell 2 signal Meas PRB is the measurement PRB for SS-RSRP #RBJ to RBJ+19
7.7.1.2 NR SA FR2-FR2 SS-RSRP measurement accuracy	Noc1 ±5.65 dB, f <= 40.8 GHz Noc1 over measPRBs ±5.65 dB, f <= 40.8 GHz Noc2 ±5.65 dB, f <= 40.8 GHz Noc2 over measPRBs ±5.65 dB, f <= 40.8 GHz Ês1 / Noc1 ±0.3 dB Ês2 / Noc2 ±0.3 dB Meas PRB Ês1 / Noc1 ±0.3 dB Meas PRB Ês2 / Noc2 ±0.3 dB	Noc1 is the AWGN on the NR freq 1 Noc2 is the AWGN on the NR freq 2 Ês1 / Noc1 is the ratio of cell 1 signal / AWGN Ês2 / Noc2 is the ratio of cell 2 signal / AWGN Meas PRB is the measurement PRB for SS-RSRP #RBJ to RBJ+19

7.7.1.3 NR SA FR1-FR2 SS-RSRP measurement accuracy	Test 1 Noc ±5.65 dB, f <= 40.8 GHz Noc over meas PRBs ±5.65 dB f <= 40.8 GHz Ês2 / Noc ±0.3 dB Meas PRB Ês2 / Noc ±0.3 dB Test 2 Average Ês2 ±5.65 dB, f <= 40.8 GHz Meas PRB Ês2 ±5.65 dB, f <= 40.8 GHz	Test 1 Noc is the AWGN on the NR freq Ês2 / Noc is the ratio of cell 1 signal / AWGN Meas PRB is the measurement PRB for SS-RSRP #RBJ to RBJ+19 Test 2 Ês2 is NR cell 2 signal Meas PRB is the measurement PRB for SS-RSRP #RBJ to RBJ+19
7.7.2.1 NR SA FR2 SS-RSRQ measurement accuracy	Noc ±5.65 dB, f <= 40.8 GHz Noc over meas PRBs ±5.65 dB, f <= 40.8 GHz Ês1 / Noc ±0.3 dB Ês2 / Noc ±0.3 dB Meas PRB Ês1 / Noc ±0.3 dB Meas PRB Ês2 / Noc ±0.3 dB	Noc is the AWGN on the NR freq Ês1 / Noc is the ratio of cell 1 signal / AWGN Ês2 / Noc is the ratio of cell 2 signal / AWGN Meas PRB is the measurement PRB for SS-RSRP #RBJ to RBJ+19
7.7.2.2 NR SA FR2-FR2 SS-RSRQ measurement accuracy	Same as 7.7.1.2	Same as 7.7.1.2
7.7.3.1 NR SA FR2 SS-SINR measurement accuracy	Same as 7.7.2.1	Same as 7.7.2.1
7.7.3.3 NR SA FR2-FR2 SS-SINR measurement accuracy	Same as 7.7.1.2	Same as 7.7.1.2
7.7.4.1 NR SA FR2 SSB based L1-RSRP measurement accuracy	Test 1 Noc ±5.65 dB, f <= 40.8 GHz Noc over meas PRBs ±5.65 dB f <= 40.8 GHz Ês1 / Noc ±0.3 dB Meas PRB Ês1 / Noc ±0.3 dB Test 2 Average Ês1 ±5.65 dB, f <= 40.8 GHz Meas PRB Ês1 ±5.65 dB, f <= 40.8 GHz	Test 1 Noc is the AWGN on the NR freq Ês1 / Noc is the ratio of cell 1 signal / AWGN Meas PRB is the measurement PRB for SS-RSRP #RBJ to RBJ+19 Test 2 Ês1 is NR cell 1 signal Meas PRB is the measurement PRB for SS-RSRP #RBJ to RBJ+19
7.7.4.2 NR SA FR2 CSI-RS based L1-RSRP measurement accuracy	Test 1 Noc ±5.65 dB, f <= 40.8 GHz Noc over meas PRBs ±5.65 dB f <= 40.8 GHz Ês1 / Noc ±0.3 dB Meas PRB Ês1 / Noc ±0.3 dB Test 2 Average Ês1 ±5.65 dB, f <= 40.8 GHz Meas PRB Ês1 ±5.65 dB, f <= 40.8 GHz	Test 1 Noc is the AWGN on the NR freq Ês1 / Noc is the ratio of cell 1 signal / AWGN Meas PRB is the measurement PRB for CSI-RS-RSRP Test 2 Ês1 is NR cell 1 signal Meas PRB is the measurement PRB for CSI-RS-RSRP
7.7.5.1 NR SA FR2 SRS-RSRP measurement accuracy	Same as 5.7.5.1	Same as 5.7.5.1
7.7.6.1 NR SA FR2 CSI-RS based CMR and no dedicated IMR configured and CSI-RS resource set with repetition off L1-SINR measurement accuracy	Same as 7.6.6.1	Same as 7.6.6.1
7.7.6.2 NR SA FR2 SSB based CMR and dedicated IMR L1-SINR measurement accuracy	Same as 7.6.6.2	Same as 7.6.6.2
7.7.6.3 NR SA FR2 CSI-RS based CMR and dedicated IMR L1-SINR measurement accuracy	Same as 7.6.6.1	Same as 7.6.6.1

Table F.1.1.2-7: Maximum test system uncertainty for RRM requirements for E-UTRA – NR inter-RAT test cases with E-UTRA serving cell

Subclause	Maximum Test System Uncertainty[1]	Derivation of Test System Uncertainty
8.2.1.1 E-UTRA – NR FR1 cell re-selection to higher priority NR target cell	Average Noc_1 ±1.5 dB Average Noc_2 ±1.5 dB Average $\hat{E}s_1$ / Noc_1 ±0.3 dB Average $\hat{E}s_2$ / Noc_2 ±0.3 dB Meas PRB Noc_2 ±1.5 dB Meas PRB $\hat{E}s_2$ / Noc_2 ±0.3 dB	Note: Noc_1 is the AWGN on cell 1 frequency Noc_2 is the AWGN on cell 2 frequency $\hat{E}s_1$ / Noc_1 is the ratio of cell 1 signal / AWGN $\hat{E}s_2$ / Noc_2 is the ratio of cell 2 signal / AWGN Meas PRB on cell 2 are the measurement PRB for SS-RSRP #RB_J to RB_{J+19}
8.2.1.2 E-UTRA – NR FR1 Cell reselection to lower priority NR target Cell in FR1 for UE configured with highSpeedInterRAT-NR-r16	Average Noc_1 ±1.5 dB Average Noc_2 ±1.5 dB Average $\hat{E}s_1$ / Noc_1 ±0.3 dB Average $\hat{E}s_2$ / Noc_2 ±0.3 dB Meas PRB Noc_2 ±1.5 dB Meas PRB $\hat{E}s_2$ / Noc_2 ±0.3 dB	Note: Noc_1 is the AWGN on cell 1 frequency Noc_2 is the AWGN on cell 2 frequency $\hat{E}s_1$ / Noc_1 is the ratio of cell 1 signal / AWGN $\hat{E}s_2$ / Noc_2 is the ratio of cell 2 signal / AWGN Meas PRB on cell 2 are the measurement PRB for SS-RSRP #RB_J to RB_{J+19}
8.2.2.1 E-UTRA – NR FR1 Early Measurement Reporting	Average Noc_1 ±1.5 dB Average Noc_2 ±1.5 dB Average $\hat{E}s_1$ / Noc_1 ±0.3 dB Average $\hat{E}s_2$ / Noc_2 ±0.3 dB Meas PRB Noc_2 ±1.5 dB Meas PRB $\hat{E}s_2$ / Noc_2 ±0.3 dB	Note: Noc_1 is the AWGN on cell 1 frequency Noc_2 is the AWGN on cell 2 frequency $\hat{E}s_1$ / Noc_1 is the ratio of cell 1 signal / AWGN $\hat{E}s_2$ / Noc_2 is the ratio of cell 2 signal / AWGN Meas PRB on cell 2 are the measurement PRB for SS-RSRP #RB_J to RB_{J+19}
8.2.2.2 E-UTRA – NR FR2 Early Measurement Reporting	Average Noc_1 ±5.65 dB Average Noc_2 ±5.65 dB Average $\hat{E}s_1$ / Noc_1 ±0.3 dB Average $\hat{E}s_2$ / Noc_2 ±0.3 dB Meas PRB Noc_2 ±5.65 dB Meas PRB $\hat{E}s_2$ / Noc_2 ±0.3 dB	Noc_1 is the AWGN on cell 1 frequency Noc_2 is the AWGN on cell 2 frequency $\hat{E}s_1$ / Noc_1 is the ratio of cell 1 signal / AWGN $\hat{E}s_2$ / Noc_2 is the ratio of cell 2 signal / AWGN Meas PRB is the measurement PRB for SS-RSRP #$RB_{J\ to\ RBJ+19}$
8.3.1.1 E-UTRA – NR FR1 handover with known target cell	Average Noc_1 ±1.5 dB Average Noc_2 ±1.5 dB Average $\hat{E}s_1$ / Noc_1 ±0.3 dB Average $\hat{E}s_2$ / Noc_2 ±0.3 dB Meas PRB Noc_2 ±1.5 dB Meas PRB $\hat{E}s_2$ / Noc_2 ±0.3 dB	Note: Noc_1 is the AWGN on cell 1 frequency Noc_2 is the AWGN on cell 2 frequency $\hat{E}s_1$ / Noc_1 is the ratio of cell 1 signal / AWGN $\hat{E}s_2$ / Noc_2 is the ratio of cell 2 signal / AWGN Meas PRB on cell 2 are the measurement PRB for SS-RSRP #RB_J to RB_{J+19}
8.4.1.1 E-UTRA – NR FR1 SFTD measurement delay in non-DRX	Average Noc_1 ±1.5 dB Average Noc_2 ±1.5 dB Average $\hat{E}s_1$ / Noc_1 ±0.3 dB Average $\hat{E}s_2$ / Noc_2 ±0.3 dB Meas PRB Noc_2 ±1.5 dB Meas PRB $\hat{E}s_2$ / Noc_2 ±0.3 dB	Note: Noc_1 is the AWGN on cell 1 frequency Noc_2 is the AWGN on cell 2 frequency $\hat{E}s_1$ / Noc_1 is the ratio of cell 1 signal / AWGN $\hat{E}s_2$ / Noc_2 is the ratio of cell 2 signal / AWGN Meas PRB on cell 2 are the measurement PRB for SS-RSRP #RB_J to RB_{J+19}
8.4.1.2 E-UTRA – NR FR1 SFTD measurement delay in DRX	Same as 8.4.1.1	Same as 8.4.1.1
8.4.2.1 E-UTRA event-triggered reporting of a NR FR1 neighbour cell without SSB time index detection in non-DRX	Average Noc_1 ±1.5 dB Average Noc_2 ±1.5 dB Average $\hat{E}s_1$ / Noc_1 ±0.3 dB Average $\hat{E}s_2$ / Noc_2 ±0.3 dB Meas PRB Noc_2 ±1.5 dB Meas PRB $\hat{E}s_2$ / Noc_2 ±0.3 dB Fading profile ±0.5 dB	Note: Noc_1 is the AWGN on cell 1 frequency Noc_2 is the AWGN on cell 2 frequency $\hat{E}s_1$ / Noc_1 is the ratio of cell 1 signal / AWGN $\hat{E}s_2$ / Noc_2 is the ratio of cell 2 signal / AWGN Meas PRB on cell 2 are the measurement PRB for SS-RSRP #RB_J to RB_{J+19}
8.4.2.2 E-UTRA event-triggered reporting of a NR FR1 neighbour cell without SSB time index detection in DRX	Same as 8.4.2.1	Same as 8.4.2.1
8.4.2.3 E-UTRA event-triggered reporting of a NR FR1 neighbour cell with SSB time index detection in non-DRX	Same as 8.4.2.1	Same as 8.4.2.1

8.4.2.4 E-UTRA event-triggered reporting of a NR FR1 neighbour cell with SSB time index detection in DRX	Same as 8.4.2.1	Same as 8.4.2.1
8.4.2.5 E-UTRA event-triggered reporting of a NR FR2 neighbour cell without SSB time index detection in non-DRX	Average Noc_2 ±5.65 dB Average $\hat{Es}_2$ / Noc_2 ±0.3 dB Meas PRB Noc_2 ±5.65 dB Meas PRB $\hat{Es}_2$ / Noc_2 ±0.3 dB	Noc_2 is the AWGN on cell 2 frequency $\hat{Es}_2$ / Noc_2 is the ratio of cell 2 signal / AWGN Meas PRB on cell 2 are the measurement PRB for SS-RSRP #$RB_{J\ to\ RBJ+19}$
8.4.2.6 E-UTRA event-triggered reporting of a NR FR2 neighbour cell without SSB time index detection in DRX	Average Noc_2 ±5.65 dB Average $\hat{Es}_2$ / Noc_2 ±0.3 dB Meas PRB Noc_2 ±5.65 dB Meas PRB $\hat{Es}_2$ / Noc_2 ±0.3 dB	Noc_2 is the AWGN on cell 2 frequency $\hat{Es}_2$ / Noc_2 is the ratio of cell 2 signal / AWGN Meas PRB on cell 2 are the measurement PRB for SS-RSRP #$RB_{J\ to\ RBJ+19}$
8.4.2.7 E-UTRA event-triggered reporting of a NR FR2 neighbour cell with SSB time index detection in non-DRX	Same as 8.4.2.6	Same as 8.4.2.6
8.4.2.8 E-UTRA event-triggered reporting of a NR FR2 neighbour cell with SSB time index detection in DRX	Same as 8.4.2.6	Same as 8.4.2.6
8.4.2.9 E-UTRA – NR Inter-RAT event triggered reporting tests for FR1 with SSB time index detection in DRX for UE configured with highSpeedInterRAT-NR-r16	Average Noc_1 ±1.5 dB Average Noc_2 ±1.5 dB Average $\hat{Es}_1$ / Noc_1 ±0.3 dB Average $\hat{Es}_2$ / Noc_2 ±0.3 dB Meas PRB Noc_2 ±1.5 dB Meas PRB $\hat{Es}_2$ / Noc_2 ±0.3 dB	Average Noc_1 ±1.5 dB Average Noc_2 ±1.5 dB Average $\hat{Es}_1$ / Noc_1 ±0.3 dB Average $\hat{Es}_2$ / Noc_2 ±0.3 dB Meas PRB Noc_2 ±1.5 dB Meas PRB $\hat{Es}_2$ / Noc_2 ±0.3 dB
8.5.1.1 E-UTRA – NR FR1 SFTD measurement accuracy	Average $\hat{Es}_1$ / Noc_1 ±0.8 dB Average $\hat{Es}_2$ / Noc_2 ±0.3 dB Meas PRB $\hat{Es}_1$ / Noc_1 ±0.8 dB Meas PRB $\hat{Es}_2$ / Noc_2 ±0.3 dB	$\hat{Es}_1$ / Noc_1 is the ratio of cell 1 signal / AWGN $\hat{Es}_2$ / Noc_2 is the ratio of cell 2 signal / AWGN Meas PRB on cell 2 are the measurement PRB for SS-RSRP #RB_J to RB_{J+19}
8.5.2.1.1.1 E-UTRA SS-RSRP absolute measurement accuracy of a NR FR1 neighbour cell	Average Noc ±1.5 dB Noc over meas PRBs #RB_{J-J+19} ±1.5 dB Average $\hat{Es}$ / Noc ±0.3 dB meas PRB $\hat{Es}$1 / Noc1 ±0.8 dB	Noc is the AWGN on the NR freq $\hat{Es}$ / Noc is the cell SNR meas PRB is the measurement PRB for SS-RSRP #RBJ to RBJ+19
8.5.2.1.2 E-UTRA SS-RSRP absolute measurement accuracy of a NR FR2 neighbour cell	<u>Test 1</u> Average Noc ±5.65 dB Noc over meas PRBs ±5.65 dB Average $\hat{Es}$ / Noc ±0.3 dB $\hat{Es}$ / Noc over meas PRBs ±0.3 dB <u>Test 2</u> Average Es ±5.65 dB Es over meas PRBs ±5.65 dB	<u>Test 1</u> Noc is the AWGN on the NR freq $\hat{Es}$ / Noc is the cell SNR meas PRB is the measurement PRB for SS-RSRP #$RB_{J\ to\ RBJ+19}$
8.5.2.2.1 E-UTRA SS-RSRQ absolute measurement accuracy of a NR FR1 neighbour cell	Same as 8.5.2.1.1.1	Same as 8.5.2.1.1.1
8.5.2.2.2 E-UTRA SS-RSRQ absolute measurement accuracy of a NR FR2 neighbour cellA	Same as 8.5.2.1.2	Same as 8.5.2.1.2
8.5.2.3.1 E-UTRA SS-SINR absolute measurement accuracy of a NR FR1 neighbour cell	Same as 8.5.2.1.1.1	Same as 8.5.2.1.1.1
8.5.2.3.2 E-UTRA SS-SINR absolute measurement accuracy of a NR FR2 neighbour cell	Same as 8.5.2.1.2	Same as 8.5.2.1.2

Table F.1.1.2-8: Maximum test system uncertainty for RRM requirements for FR1 NR sidelink test cases

Subclause	Maximum Test System Uncertainty	Derivation of Test System Uncertainty
9.1.1.1 NR SA FR1 UE transmit timing accuracy for GNSS as synchronization reference source	Sidelink signal transmit timing relative to GNSS timing: ±192 Tc	Tc is the basic timing unit defined in TS 38.211 [7], Tc = 1/(480000 x 4096) seconds
9.1.1.2 NR SA FR1 UE transmit timing accuracy for SyncRef UE as synchronization reference source	Sidelink signal transmit timing relative to SyncRef UE: ±128 Tc for SL SCS = 30kHz Average Noc: ±1.5 dB Average $\hat{E}s_1$ / Noc: ±0.3 dB Meas PRB Noc: ±1.5 dB Meas PRB $\hat{E}s_1$ / Noc: ±0.3 dB	Tc is the basic timing unit defined in TS 38.211 [7], Tc = 1/(480000 x 4096) seconds Noc is the AWGN absolute power on PC5 carrier. $\hat{E}s_1$ / Noc is the ratio of SyncRef UE 1 signal / AWGN Meas PRB is the meaurement PRB for PSBCH-RSRP #RB_J to RB_{J+10}
9.1.1.3 NR SA FR1 UE transmit timing accuracy for FR1 NR cell as synchronization reference source	Sidelink signal transmit timing relative to downlink timing: ±192 Tc for DL SCS = 15kHz and SL SCS = 30kHz ±160 Tc for DL SCS = 30kHz and SL SCS = 30kHz Average Noc: ±1.5 dB Average $\hat{E}s_1$ / Noc: ±0.3 dB Meas PRB Noc: ±1.5 dB Meas PRB $\hat{E}s_1$ / Noc: ±0.3 dB	Tc is the basic timing unit defined in TS 38.211 [7], Tc = 1/(480000 x 4096) seconds Noc is the AWGN absolute power on Uu carrier. $\hat{E}s_1$ / Noc is the ratio of Cell 1 signal / AWGN Meas PRB is the meaurement PRB for SS-RSRP #RB_J to RB_{J+19}
9.1.2.1 NR SA FR1 initiation/cease of S-SSB transmission for FR1 NR cell as synchronization reference source	Average Noc: ±1.5 dB Average $\hat{E}s_1$ / Noc: ±0.3 dB Meas PRB Noc: ±1.5 dB Meas PRB $\hat{E}s_1$ / Noc: ±0.3 dB	Noc is the AWGN absolute power on Uu carrier. $\hat{E}s_1$ / Noc is the ratio of Cell 1 signal / AWGN Meas PRB is the meaurement PRB for SS-RSRP #RB_J to RB_{J+19}
9.1.2.2 NR SA FR1 initiation/cease of S-SSB transmission for SyncRef UE as synchronization reference source	Average Noc: ±1.5 dB Average $\hat{E}s_1$ / Noc: ±0.3 dB Meas PRB Noc: ±1.5 dB Meas PRB $\hat{E}s_1$ / Noc: ±0.3 dB	Noc is the AWGN absolute power on PC5 carrier. $\hat{E}s_1$ / Noc is the ratio of SyncRef UE 1 signal / AWGN Meas PRB is the meaurement PRB for PSBCH-RSRP #RB_J to RB_{J+10}
9.1.3.1 NR SA FR1 synchronization reference selection/reselection for GNSS configured as the highest priority synchronization reference source	Average Noc: ±1.5 dB Average $\hat{E}s_i$ / Noc: ±0.3 dB, i=1,2,3 Meas PRB Noc: ±1.5 dB Meas PRB $\hat{E}s_i$ / Noc: ±0.3 dB, i=1,2,3	Noc is the AWGN absolute power on PC5 carrier. $\hat{E}s_i$ / Noc is the ratio of SyncRef UE i signal / AWGN, i = 1,2,3 Meas PRB is the meaurement PRB for PSBCH-RSRP #RB_J to RB_{J+10}
9.1.3.2 NR SA FR1 synchronization reference selection/reselection for FR1 NR Cell configured as the highest priority synchronization reference source	Average Noc: ±1.5 dB Average $\hat{E}s_i$ / Noc: ±0.3 dB, i=1,2 Meas PRB Noc: ±1.5 dB Meas PRB $\hat{E}s_i$ / Noc: ±0.3 dB, i=1,2	Noc is the AWGN absolute power on PC5 carrier. $\hat{E}s_i$ / Noc is the ratio of SyncRef UE i signal / AWGN, i = 1,2 Meas PRB is the meaurement PRB for PSBCH-RSRP #RB_J to RB_{J+10}

9.1.4.1 NR SA FR1 L1 SL-RSRP measurement for autonomous resource selection/reselection	Average Noc: ±1.5 dB Average $\hat{E}s_i$ / Noc: ±0.3 dB, i=0,1,...,49 Meas PRB Noc: ±1.5 dB Meas PRB $\hat{E}s_i$ / Noc: ±0.3 dB, i=0,1,...,49	Noc is the AWGN absolute power on PC5 carrier. $\hat{E}s_i$ / Noc is the ratio of active sidelink UE i signal / AWGN, i = 0,1,...,49 Meas PRB is the meaurement PRB for SL-RSRP #RB_J to RB_{J+599}
9.1.4.2 NR SA FR1 L1 SL-RSRP measurement for resource pre-emption	Average Noc: ±1.5 dB Average $\hat{E}s_1$ / Noc: ±0.3 dB, Meas PRB Noc: ±1.5 dB Meas PRB $\hat{E}s_1$ / Noc: ±0.3 dB,	Noc is the AWGN absolute power on PC5 carrier. $\hat{E}s_1$ / Noc is the ratio of active sidelink UE 1 signal / AWGN, Meas PRB is the meaurement PRB for SL-RSRP #RB_J to RB_{J+119}
9.1.4.3 NR SA FR1 L1 SL-RSRP measurement for resource re-evaluation	Average Noc: ±1.5 dB Average $\hat{E}s_i$ / Noc: ±0.3 dB, i=0,1,...,129 Meas PRB Noc: ±1.5 dB Meas PRB $\hat{E}s_i$ / Noc: ±0.3 dB, i=0,1,...,129	Noc is the AWGN absolute power on PC5 carrier. $\hat{E}s_i$ / Noc is the ratio of active sidelink UE i signal / AWGN, i = 0,1,...,129 Meas PRB is the meaurement PRB for SL-RSRP #RB_J to RB_{J+119}
9.1.5.1 NR SA FR1 congestion control measurement for concurrent operation	Average Noc: ±1.5 dB Average $\hat{E}s_i$ / Noc: ±0.3 dB, i=0,1,2,3 Meas PRB Noc: ±1.5 dB Meas PRB $\hat{E}s_i$ / Noc: ±0.3 dB, i=0,1,2,3	Noc is the AWGN absolute power on PC5 carrier. $\hat{E}s_i$ / Noc is the ratio of active sidelink UE i signal / AWGN, i = 0,1,2,3 Meas PRB is the meaurement PRB for SL-RSSI #RB_J to RB_{J+119}
9.1.5.2 NR SA FR1 congestion control measurement for PC5-only operation	Same as 9.1.5.1	Same as 9.1.5.1
9.1.6.1 NR SA FR1 interruption to WAN due to NR sidelink communication	± 0.6dB (AWGN conditions)	Overall system uncertainty for AWGN condition comprises two quantities: 1. Signal-to-noise ratio uncertainty 2. Effect of AWGN flatness and signal flatness Items 1 and 2 are assumed to be uncorrelated so can be root sum squared: AWGN flatness and signal flatness has x 0.25 effect on the required SNR, so use sensitivity factor of x 0.25 for the uncertainty contribution. Test System uncertainty = SQRT (Signal-to-noise ratio uncertainty 2 + (0.25 x AWGN flatness and signal flatness) 2) Signal-to-noise ratio uncertainty ±0.3 dB AWGN flatness and signal flatness ±2.0 dB

Table F.1.1.2-9: Maximum test system uncertainty for RRM requirements for SA FR1 test cases for RedCap

Subclause	Maximum Test System Uncertainty[1]	Derivation of Test System Uncertainty
16.1.1.1 NR SA FR1 Cell reselection for 1 Rx UE	TBD	TBD
16.1.1.2 NR SA FR1 Cell reselection for 2 Rx UE	Same as 6.1.1.1	Same as 6.1.1.1
16.1.1.3 NR SA FR1-FR1 Cell reselection for 1 Rx UE	TBD	TBD
16.1.1.4 NR SA FR1-FR1 Cell reselection for 2 Rx UE	Same as 6.1.1.2	Same as 6.1.1.2

16.1.1.5 NR SA FR1 Cell reselection for UE fulfilling stationary relaxed measurement criterion for 1 Rx UE	TBD	TBD
16.1.1.6 NR SA FR1 Cell reselection for UE fulfilling stationary relaxed measurement criterion for 2 Rx UE	Same as 6.1.1.4	Same as 6.1.1.4
16.1.1.7 NR SA FR1-FR1 Cell reselection for UE fulfilling stationary relaxed measurement criterion for 1 Rx UE	TBD	TBD
16.1.1.8 NR SA FR1-FR1 Cell reselection for UE fulfilling stationary relaxed measurement criterion for 2 Rx UE	Same as 6.1.1.5	Same as 6.1.1.5
16.1.2.1 NR SA FR1 - E-UTRA Cell reselection to higher priority E-UTRA for 1RX	TBD	TBD
16.1.2.2 NR SA FR1 - E-UTRA Cell reselection to higher priority E-UTRA for 2RX	Same as 6.1.2.1	Same as 6.1.2.1
16.1.2.3 NR SA FR1 - E-UTRA Cell reselection to lower priority E-UTRA for 1RX	TBD	TBD
16.1.2.4 NR SA FR1 - E-UTRA Cell reselection to lower priority E-UTRA for 2RX	Same as 6.1.2.2	Same as 6.1.2.2
16.1.2.5 NR SA FR1 - E-UTRA Cell reselection to lower priority E-UTRA for UE fulfilling stationary relaxed measurement criterion for 1 Rx UE	TBD	TBD
16.1.2.6 NR SA FR1 - E-UTRA Cell reselection to lower priority E-UTRA for UE fulfilling stationary relaxed measurement criterion for 2 Rx UE	Same as 6.1.2.2	Same as 6.1.2.2
16.3.1.2 NR SA FR1 Intra-frequency handover from FR1 to FR1 with known target cell for 2 Rx UE	Same as 6.3.1.1	Same as 6.3.1.1
16.3.1.4 NR SA FR1 Intra-frequency handover from FR1 to FR1 with unknown target cell for 2 Rx UE	Same as 6.3.1.1	Same as 6.3.1.1
16.3.1.6 NR SA FR1-FR1 Inter-frequency handover from FR1 to FR1 with unknown target cell for 2 Rx UE	Same as 6.3.1.3	Same as 6.3.1.3
16.3.1.8 NR - E-UTRA handover for 2Rx UE	Same as 6.1.2.1	Same as 6.1.2.1
16.3.1.10 NR - E-UTRA handover with unknown target cell for 2 Rx UE	Same as 6.1.2.1	Same as 6.1.2.1
16.3.2.1.2 NR SA FR1 Intra-frequency RRC Re-establishment in FR1 for 2 Rx UE	Same as 6.1.1.1	Same as 6.1.1.1
16.3.2.1.4 NR SA FR1-FR1 Inter-frequency RRC Re-establishment in FR1 for 2 Rx UE	Same as 6.1.1.2	Same as 6.1.1.2
16.3.2.1.6 NR SA FR1 Intra-frequency RRC Re-establishment in FR1 for 2 Rx UE without serving cell timing	Same as 6.3.2.1.3	Same as 6.3.2.1.3
16.3.2.2.2 NR SA FR1 4-step RA type contention based random access test in FR1 for NR standalone for 2 Rx UE	Same as 6.3.2.2.1	Same as 6.3.2.2.1
16.3.2.2.4 NR SA FR1 4-step RA type non-contention based random access test in FR1 for NR standalone for 2 Rx UE	Same as 6.3.2.2.1	Same as 6.3.2.2.1

16.3.2.2.6 NR SA FR1 2-step RA type contention based random access test in FR1 for NR standalone for 2 Rx UE	Same as 6.3.2.2.1	Same as 6.3.2.2.1
16.3.2.2.8 NR SA FR1 2-step RA type non-contention based test in FR1 for NR standalone for 2 RX UE	Same as 6.3.2.2.1	Same as 6.3.2.2.1
16.3.2.3.2 NR SA FR1-FR1 Redirection from NR in FR1 to NR in FR1 for 2 Rx UE	Same as 6.1.1.1	Same as 6.1.1.1
16.3.2.3.4 NR SA FR1-FR1 Redirection from NR in FR1 to E-UTRAN for 2 Rx UE	Same as 6.1.2.1	Same as 6.1.2.1
16.4.1.1 NR SA FR1 NR UE Transmit Timing Test for FR1 for 1Rx RedCap UE	Same as 6.4.1.1	Same as 6.4.1.1
16.4.1.2 NR SA FR1 NR UE Transmit Timing Test for FR1 for 2Rx RedCap UE	Same as 6.4.1.1	Same as 6.4.1.1
16.4.3.1 NR SA FR1 SA FR1 timing advance adjustment accuracy for 1 Rx UE	Same as 6.4.3.1	Same as 6.4.3.1
16.4.3.2 NR SA FR1 SA FR1 timing advance adjustment accuracy for 2 Rx UE	Same as 6.4.3.1	Same as 6.4.3.1
16.5.1.2 NR SA FR1 Radio Link Monitoring Out-of-sync Test for FR1 PCell configured with SSB-based RLM RS in non-DRX mode for 2 Rx UE	Same as 6.5.1.1	Same as 6.5.1.1
16.5.1.4 NR SA FR1 Radio Link Monitoring In-sync Test for FR1 PCell configured with SSB-based RLM RS in non-DRX mode for 2 Rx UE	Same as 6.5.1.1	Same as 6.5.1.1
16.5.1.8 NR SA FR1 Radio Link Monitoring In-sync Test for FR1 PCell configured with SSB-based RLM RS in DRX mode for 2 Rx UE	Same as 6.5.1.1	Same as 6.5.1.1
16.5.1.10 NR SA FR1 Radio Link Monitoring Out-of-sync Test for FR1 PCell configured with CSI-RS-based RLM in non-DRX mode for 2 Rx UE	Same as 6.5.1.1	Same as 6.5.1.1
16.5.1.12 NR SA FR1 Radio Link Monitoring In-sync Test for FR1 PCell configured with CSI-RS-based RLM in non-DRX mode for 2 Rx UE	Same as 6.5.1.1	Same as 6.5.1.1
16.5.1.14 NR SA FR1 Radio Link Monitoring Out-of-sync Test for FR1 PCell configured with CSI-RS-based RLM in DRX mode for 2 Rx UE	Same as 6.5.1.1	Same as 6.5.1.1
16.5.1.16 NR SA FR1 Radio Link Monitoring In-sync Test for FR1 PCell configured with CSI-RS-based RLM in DRX mode for 2 Rx UE	Same as 6.5.1.1	Same as 6.5.1.1
16.5.2.2 NR SA FR1 Beam Failure Detection and Link Recovery Test for FR1 PCell configured with SSB-based BFD and LR in non-DRX mode for 2 Rx UE	Same as 6.5.5.1	Same as 6.5.5.1
16.5.2.6 NR SA FR1 Beam Failure Detection and Link Recovery Test for FR1 PCell configured with CSI-RS-based BFD and LR in non-DRX mode for 2 Rx UE	Same as 6.5.5.3	Same as 6.5.5.3
16.5.2.8 NR SA FR1 Beam Failure Detection and Link Recovery Test for FR1 PCell configured with CSI-RS-based BFD and LR in DRX mode for 2 Rx UE	Same as 6.5.5.3	Same as 6.5.5.3

16.5.4.1 NR SA FR1 UE specific CBW change on PCell in non-DRX for 1 Rx UE	Same as 6.5.8.1	Same as 6.5.8.1
16.5.4.2 NR SA FR1 UE specific CBW change on PCell in non-DRX for 2 Rx UE	Same as 6.5.8.1	Same as 6.5.8.1
16.6.1.2 NR SA FR1 Event triggered reporting tests without gap under non-DRX for 2 Rx UE	Same as 6.6.1.1	Same as 6.6.1.1
16.6.1.4 NR SA FR1 Event triggered reporting tests without gap under DRX for 2 Rx UE	Same as 6.6.1.1	Same as 6.6.1.1
16.6.1.6 NR SA FR1 Event triggered reporting tests with per-UE gaps under non-DRX for 2 Rx UE	Same as 6.6.1.1	Same as 6.6.1.1
16.6.1.8 NR SA FR1 Event triggered reporting tests with per-UE gaps under DRX for 2 Rx UE	Same as 6.6.1.1	Same as 6.6.1.1
16.6.1.10 NR SA FR1 Event triggered reporting tests without gap under non-DRX with SSB index reading for 2 Rx UE	Same as 6.6.1.1	Same as 6.6.1.1
16.6.1.12 NR SA FR1 Event triggered reporting tests with per-UE gaps under non-DRX with SSB index reading for 2 Rx UE	Same as 6.6.1.1	Same as 6.6.1.1
16.6.4.2 NR SA FR1 SSB based L1-RSRP measurement when DRX is not used for 2 Rx UE	Same as 6.6.4.1	Same as 6.6.4.1
16.6.4.4 NR SA FR1 SSB based L1-RSRP measurement when DRX is used for 2 Rx UE	Same as 6.6.4.1	Same as 6.6.4.1
16.6.4.6 NR SA FR1 CSI-RS based L1-RSRP measurement when DRX is not used for 2 Rx UE	Same as 6.6.4.3	Same as 6.6.4.3
16.6.4.8 NR SA FR1 CSI-RS based L1-RSRP measurement when DRX is used for 2 Rx UE	Same as 6.6.4.3	Same as 6.6.4.3

Table F.1.1.2-10: Maximum test system uncertainty for RRM requirements for SA FR2 test cases for RedCap

Subclause	**Maximum Test System Uncertainty[1]**	**Derivation of Test System Uncertainty**
17.3.2.1.1 NR SA FR2 Intra-frequency RRC Re-establishment in FR2	Same as 7.3.2.1.1	Same as 7.3.2.1.1
17.3.2.1.2 NR SA FR2-FR2 Inter-frequency RRC Re-establishment in FR2	Same as 7.3.2.1.2	Same as 7.3.2.1.2
17.5.1.1 NR SA FR2 Radio Link Monitoring Out-of-sync Test for FR2 PCell configured with SSB-based RLM RS in non-DRX mode	Same as 5.5.1.1	Same as 5.5.1.1
17.5.1.2 NR SA FR2 Radio Link Monitoring In-sync Test for FR2 PCell configured with SSB-based RLM RS in non-DRX mode	Same as 5.5.1.1	Same as 5.5.1.1
17.5.1.4 NR SA FR2 Radio Link Monitoring In-sync Test for FR2 PCell configured with SSB-based RLM RS in DRX mode	Same as 5.5.1.1	Same as 5.5.1.1
17.6.1.1 NR SA FR2 Event triggered reporting test without gap under non-DRX	Same as 7.6.1.1	Same as 7.6.1.1

Table F.1.1.2-11: Maximum test system uncertainty for RRM requirements for E-UTRA – NR inter-RAT test cases with E-UTRA serving cell for RedCap

Subclause	Maximum Test System Uncertainty[1]	Derivation of Test System Uncertainty
18.2.1.1 E-UTRA - NR SA FR1 E-UTRAN - NR handover in FR1	Same as 8.2.1.1	Same as 8.2.1.1
18.2.2.1 E-UTRA - NR SA FR1 Redirection from E-UTRA to NR SA FR1 for redcap UE	Same as 6.1.1.1	Same as 6.1.1.1
18.3.1.1 E-UTRA - NR SA FR1 Event triggered reporting tests for FR1 without SSB time index detection when DRX is not used	Same as 8.4.2.1	Same as 8.4.2.1
18.3.1.2 E-UTRA - NR SA FR1 Event triggered reporting tests for FR1 without SSB time index detection when DRX is used	Same as 8.4.2.1	Same as 8.4.2.1
18.3.1.3 E-UTRA - NR SA FR1 Event triggered reporting tests for FR1 with SSB time index detection when DRX is not used	Same as 8.4.2.1	Same as 8.4.2.1
18.3.1.4 E-UTRA - NR SA FR1 Event triggered reporting tests for FR1 with SSB time index detection when DRX is used	Same as 8.4.2.1	Same as 8.4.2.1

F.1.2 Interpretation of measurement results (normative)

See TS 38.521-1 [17] Annex F.2.

F.1.3 Test Tolerance and Derivation of Test Requirements (informative)

See TS 38.521-1 [17] Annex F.3.

F.1.3.1 Measurement of test environments

See TS 38.521-1 [17] Annex F.3.1.

F.1.3.2 Measurement of RRM requirements

Because the relationships between the test system uncertainties and the test tolerances are often complex, it is not always possible to give a simple derivation of the test requirement in this document. The analysis is recorded in 3GPP TR 38 903 [22].

The derivation of the test requirements for the EN-DC FR1 test cases in chapter 4 is defined in Table F.1.3.2-1.

The derivation of the test requirements for the NE-DC FR1 test cases in chapter 4 is defined in Table F.1.3.2-1a.

The derivation of the test requirements for the NR/5GC FR1 test cases in chapter 6 is defined in Table F.1.3.2-2.

The derivation of the test requirements for the EN-DC FR2 test cases in chapter 5 is defined in Table F.1.3.2-3.

The derivation of the test requirements for the NR/5GC FR2 test cases in chapter 7 is defined in Table F.1.3.2-4.

The derivation of the test requirements for the E-UTRA – NR inter-RAT with E-UTRA serving cell test cases in chapter 8 is defined in Table F.1.3.2-5.

The derivation of the test requirements for the FR1 NR sidelink test cases in chapter 9 is defined in Table F.1.3.2-6.

The derivation of the test requirements for the NR/5GC FR1 test cases for RedCap in chapter 16 is defined in Table F.1.3.2-7.

The derivation of the test requirements for the NR/5GC FR2 test cases for RedCap in chapter 17 is defined in Table F.1.3.2-8.

The derivation of the test requirements for the E-UTRA – NR inter-RAT with E-UTRA serving cell test cases for RedCap in chapter 18 is defined in Table F.1.3.2-9.

Table F.1.3.2-1: Derivation of test requirements for EN-DC FR1 RRM tests

Test	Minimum requirement in TS 38.133 [6]	Test tolerance (TT)	Test requirement in TS 38.533
4.3.2.2.1	Absolute uplink power: Normal conditions ±9dB Relative uplink power step: Normal conditions ±2.5dB Uplink timing: 15kHz SCS T_e ±12*64*T_c 30kHz SCS T_e ±8*64*T_c	 2.1dB 0.7dB 112T_c 112T_c	Absolute uplink power: Normal conditions ±11.1dB Relative uplink power step: Normal conditions ±3.2dB Uplink timing: 15kHz SCS T_e ±880*T_c 30kHz SCS Te ±624*T_c
4.3.2.2.2	Same as 4.3.2.2.1	Same as 4.3.2.2.1	Same as 4.3.2.2.1
4.3.2.2.3	Same as 4.3.2.2.1	Same as 4.3.2.2.1	Same as 4.3.2.2.1
4.3.2.2.4	Same as 4.3.2.2.1	Same as 4.3.2.2.1	Same as 4.3.2.2.1
4.4.1.1 EN-DC FR1 UE transmit timing accuracy	Test 1 (no DRX): Uplink timing: ±12*64 T_c for 15 KHz SSB SCS,15 kHz UL SCS ±10*64 T_c for 15 KHz SSB SCS,30 kHz UL SCS ±10*64 T_c for 15 KHz SSB SCS,60 kHz UL SCS ±8*64 T_c for 30 KHz SSB SCS,15 kHz UL SCS ±8*64 T_c for 30 KHz SSB SCS,30 kHz UL SCS ±7*64 T_c for 30 KHz SSB SCS,60 kHz UL SCS Max step size T_q: 5.5*64*T_c Min adjust rate T_p: 5.5*64*T_c Max adjust rate: 5.5*64*T_c $\hat{E}s_2$ / N_{oc}: +3.00dB N_{oc} = -98 dBm/15 kHz (Config 1,2,3) Test 2 (with DRX): ±12*64 T_c for 15 KHz SSB SCS,15 kHz UL SCS ±10*64 T_c for 15 KHz SSB SCS,30 kHz UL SCS ±10*64 T_c for 15 KHz SSB SCS,60 kHz UL SCS ±8*64 T_c for 30 KHz SSB SCS,15 kHz UL SCS ±8*64 T_c for 30 KHz SSB SCS,30 kHz UL SCS ±7*64 T_c for 30 KHz SSB SCS,60 kHz UL SCS $\hat{E}s_2$ / N_{oc}: +3.00dB	 ±1.75*64*T_c ±1.75*64*T_c ±1.75*64*T_c ±1.75*64*T_c ±1.75*64*T_c ±1.75*64*T_c +0.5*64T_c -3.6*64*T_c +1.1*64*T_c +0.3 dB +1.5 dB ±1.75*64*T_c ±1.75*64*T_c ±1.75*64*T_c ±1.75*64*T_c ±1.75*64*T_c ±1.75*64*T_c +0.3dB	Test 1 (10MHz Ch BW): Uplink timing: ±13.75*64*T_c Uplink timing: ±11.75*64*T_c Uplink timing: ±11.75*64*T_c Uplink timing: ±9.75*64*T_c Uplink timing: ±9.75*64*T_c Uplink timing: ±8.75*64*T_c Max step size T_q: 6.0*64*T_c Min adjust rate: 1.9*64*T_c Max adjust rate: 6.6*64*T_c $\hat{E}s_2$ / N_{oc}: +3.30dB N_{oc} = -98 dBm/15 kHz (Config 1,2,3) +1.5 dB Test 2 (with DRX): Uplink timing: ±13.75*64*T_c Uplink timing: ±11.75*64*T_c Uplink timing: ±11.75*64*T_c Uplink timing: ±9.75*64*T_c Uplink timing: ±9.75*64*T_c Uplink timing: ±8.75*64*T_c $\hat{E}s_2$ / N_{oc}: +3.30dB
4.4.3.1 EN-DC FR1 timing advance adjustment accuracy	N_{oc} = -98 dBm/15 kHz (Config 1, 2, 4, 5) N_{oc} = -95 dBm/15 kHz (Config 3, 6) $\hat{E}s_x$ / N_{oc} = 3 dB UE Timing Advance Adjustment Accuracy for 15kHz SCS = ±256 T_c+ TT UE Timing Advance Adjustment Accuracy for 30kHz SCS = ±256 T_c+ TT	0 0 0 +/- 88 Tc +/- 88 Tc	N_{oc} = -98 dBm/15 kHz (Config 1, 2, 4, 5) N_{oc} = -95 dBm/15 kHz (Config 3, 6) $\hat{E}s_x$ / N_{oc} = 3 dB UE TAAA for 15kHz SCS = ±344 T_c UE TAAA for 30kHz SCS = ±344 T_c
4.5.1.1 EN-DC FR1 radio link monitoring out-of-sync test for PSCell configured with SSB-based RLM RS in non-DRX mode	SNR during T1: 1dB T2: -7dB T3: -15dB	Offset during T1: +0.8dB T2: +0.8dB T3: -0.8dB	SNR during T1: 1.8dB T2: -6.2dB T3: -15.8dB
4.5.1.2 EN-DC FR1 radio link monitoring in-sync test for PSCell configured	SNR during T1: 1dB T2: -7dB	Offset during T1: +0.8dB T2: +0.8dB	SNR during T1: 1.8dB T2: -6.2dB

with SSB-based RLM RS in non-DRX mode	T3: -15dB T4: -4.5dB T5: 1dB	T3: -0.8dB T4: -0.8dB T5: +0.8dB	T3: -15.8dB T4: -5.3dB T5: 1.8dB For testing of a UE which supports 4RX on all bands, the SNR during T3 and T4 is modified as specified in clause D.4.1.1
4.5.1.3 EN-DC FR1 radio link monitoring out-of-sync test for PSCell configured with SSB-based RLM RS in DRX mode	Same as 4.5.1.1	Same as 4.5.1.1	Same as 4.5.1.1
4.5.1.4 EN-DC FR1 radio link monitoring in-sync test for PSCell configured with SSB-based RLM RS in DRX mode	Same as 4.5.1.2	Same as 4.5.1.2	Same as 4.5.1.2
4.5.1.5 EN-DC FR1 radio link monitoring out-of-sync test for PSCell configured with CSI-RS-based RLM RS in non-DRX mode	Same as 4.5.1.1	Same as 4.5.1.1	Same as 4.5.1.1
4.5.1.6 EN-DC FR1 radio link monitoring in-sync test for PSCell configured with CSI-RS-based RLM RS in non-DRX mode	Same as 4.5.1.2	Same as 4.5.1.2	Same as 4.5.1.2
4.5.1.7 EN-DC FR1 radio link monitoring out-of-sync test for PSCell configured with CSI-RS-based RLM RS in DRX mode	Same as 4.5.1.1	Same as 4.5.1.1	Same as 4.5.1.1
4.5.1.8 EN-DC FR1 radio link monitoring in-sync test for PSCell configured with CSI-RS-based RLM RS in DRX mode	Same as 4.5.1.2	Same as 4.5.1.2	Same as 4.5.1.2
4.5.2.1 EN-DC FR1 interruptions at transitions between active and non-active during DRX in synchronous EN-DC	SNRs as specified	0.6dB	Formula: SNR + TT
4.5.2.2 EN-DC FR1 interruptions at transitions between active and non-active during DRX in asynchronous EN-DC	Same as 4.5.2.1	Same as 4.5.2.1	Same as 4.5.2.1
4.5.2.3 EN-DC FR1 interruptions during measurements on deactivated NR SCC in synchronous EN-DC	During T1: Noc2: -104dBm/15kHz Noc3: -104dBm/15kHz Ês2 / Noc2: +17dB Ês3 / Noc3: +17dB	During T1: 0dB 0dB 0dB 0dB	During T1: Noc2: -104dBm/15kHz Noc3: -104dBm/15kHz Ês2 / Noc2: +17dB Ês3 / Noc3: +17dB
4.5.2.4 EN-DC FR1 interruptions during measurements on deactivated NR SCC in asynchronous EN-DC	Same as 4.5.2.3	Same as 4.5.2.3	Same as 4.5.2.3
4.5.2.5 EN-DC FR1 interruptions during measurements on deactivated E-UTRAN SCC in synchronous EN-	During T1: Noc_1: -104dBm/15kHz Noc_2: -104dBm/15kHz Noc_3: -104dBm/15kHz $Ês_1$ / Noc_1: +17dB	During T1: 0dB 0dB 0dB 0dB	During T1: Noc_1: -104dBm/15kHz Noc_2: -104dBm/15kHz Noc_3: -104dBm/15kHz $Ês_1$ / Noc1: +17dB

DC	$\hat{E}s_2$ / Noc_2: +17dB $\hat{E}s_3$ / Noc_3: +17dB		$\hat{E}s_2$ / Noc2: +17dB $\hat{E}s_3$ / Noc3: +17dB
4.5.2.6 EN-DC FR1 interruptions during measurements on deactivated E-UTRAN SCC in asynchronous EN-DC	Same as 4.5.2.5	Same as 4.5.2.5	Same as 4.5.2.5
4.5.3.1 EN-DC FR1 SCell activation and deactivation of known SCell in non-DRX for 160ms SCell measurement cycle	During T1: Noc_2: -104dBm/15kHz Noc_3: -104dBm/15kHz $\hat{E}s_2$ / Noc_2: +17dB $\hat{E}s_3$ / Noc_3: +17dB During T2: Noc_2: -104dBm/15kHz Noc_3: -104dBm/15kHz $\hat{E}s_2$ / Noc_2: +17dB $\hat{E}s_3$ / Noc_3: +17dB During T3: Noc_2: -104dBm/15kHz Noc_3: -104dBm/15kHz $\hat{E}s_2$ / Noc_2: +17dB $\hat{E}s_3$ / Noc_3: +17dB	During T1: 0dB 0dB 0dB 0dB During T2: 0dB 0dB 0dB 0dB During T3: 0dB 0dB 0dB 0dB	During T1: Noc_2: -104dBm/15kHz Noc_3: -104dBm/15kHz $\hat{E}s_2$ / Noc_2: +17dB $\hat{E}s_3$ / Noc_3: +17dB During T2: Noc_2: -104dBm/15kHz Noc_3: -104dBm/15kHz $\hat{E}s_2$ / Noc_2: +17dB $\hat{E}s_3$ / Noc_3: +17dB During T3: Noc_2: -104dBm/15kHz Noc_3: -104dBm/15kHz $\hat{E}s_2$ / Noc_2: +17dB $\hat{E}s_3$ / Noc_3: +17dB
4.5.3.2 EN-DC FR1 SCell activation and deactivation of known SCell in non-DRX for 640ms SCell measurement cycle	Same as 4.5.3.1	Same as 4.5.3.1	Same as 4.5.3.1
4.5.3.3 EN-DC FR1 SCell activation and deactivation of unknown SCell in non-DRX	Same as 4.5.3.1	Same as 4.5.3.1	Same as 4.5.3.1
4.5.4.1 EN-DC FR1 UE UL carrier RRC reconfiguration delay	During T1: Noc2: -102dBm/15kHz Noc3: -102dBm/15kHz $\hat{E}s_2$ / Noc2: +16dB $\hat{E}s_3$ / Noc3: +16dB During T2: Noc2: -102dBm/15kHz Noc3: -102dBm/15kHz $\hat{E}s_2$ / Noc2: +16dB $\hat{E}s_3$ / Noc3: +16dB During T3: Noc2: -102dBm/15kHz Noc3: -102dBm/15kHz $\hat{E}s_2$ / Noc2: +16dB $\hat{E}s_3$ / Noc3: +16dB	During T1: 0dB 0dB 0dB 0dB During T2: 0dB 0dB 0dB 0dB During T3: 0dB 0dB 0dB 0dB	During T1: Noc2: -102dBm/15kHz Noc3: -102dBm/15kHz $\hat{E}s_2$ / Noc2: +16dB $\hat{E}s_3$ / Noc3: +16dB During T2: Noc2: -102dBm/15kHz Noc3: -102dBm/15kHz $\hat{E}s_2$ / Noc2: +16dB $\hat{E}s_3$ / Noc3: +16dB During T3: Noc2: -102dBm/15kHz Noc3: -102dBm/15kHz $\hat{E}s_2$ / Noc2: +16dB $\hat{E}s_3$ / Noc3: +16dB
4.5.5.1 EN-DC FR1 SSB-based beam failure detection and link recovery in non-DRX	q0 SSB SNR during: T1: 5dB T2: -3dB T3: -12dB T4: -12dB T5: -12dB q1 SSB during T1: Noc_2: -98dBm/15kHz $\hat{E}s_2$ / Noc_2: -10dB	Offset during: T1: +0.8dB T2: +0.8dB T3: -0.8dB T4: -0.8dB T5: -0.8dB q1 SSB during T1: 0dB -0.2dB	SNR during: T1: +5.8dB T2: -2.2dB T3: -12.8dB T4: -12.8dB T5: -12.8dB For testing of a UE which supports 4RX on all bands, the SNR during T3, T4 and T5 is modified as specified in clause D.4.1.1 q1 SSB during T1: Noc_2: -98dBm/15kHz $\hat{E}s_2$ / Noc_2: -10.2dB

	q1 SSB during T2: Noc_2: -98dBm/15kHz $\hat{E}s_2 / Noc_2$: -10dB q1 SSB during T3, T4 and T5: Noc_2: -98dBm/15kHz $\hat{E}s_2 / Noc_2$: +10dB	q1 SSB during T2: 0dB -0.2dB q1 SSB during T3, T4 and T5: 0dB +0.2dB	q1 SSB during T2: Noc_2: -98dBm/15kHz $\hat{E}s_2 / Noc_2$: -10.2dB q1 SSB during T3, T4 and T5: Noc_2: -98dBm/15kHz $\hat{E}s_2 / Noc_2$: +10.2dB
4.5.5.2 EN-DC FR1 SSB-based beam failure detection and link recovery in DRX	Same as 4.5.5.1	Same as 4.5.5.1	Same as 4.5.5.1
4.5.5.3 EN-DC FR1 CSI-RS-based beam failure detection and link recovery in non-DRX	q0 CSI-RS SNR during: T1: 5dB T2: -3dB T3: -12dB T4: -12dB T5: -12dB q1 CSI-RS during T1: Noc_2: -98dBm/15kHz $\hat{E}s_2 / Noc_2$: -10dB q1 CSI-RS during T2: Noc_2: -98dBm/15kHz $\hat{E}s_2 / Noc_2$: -10dB q1 CSI-RS during T3, T4 and T5: Noc_2: -98dBm/15kHz $\hat{E}s_2 / Noc_2$: +10dB	Offset during: T1: +0.8dB T2: +0.8dB T3: -0.8dB T4: -0.8dB T5: -0.8dB q1 CSI-RS during T1: 0dB -0.2dB q1 CSI-RS during T2: 0dB -0.2dB q1 CSI-RS during T3, T4 and T5: 0dB +0.2dB	SNR during: T1: +5.8dB T2: -2.2dB T3: -12.8dB T4: -12.8dB T5: -12.8dB For testing of a UE which supports 4RX on all bands, the SNR during T3, T4 and T5 is modified as specified in clause D.4.1.1 q1 CSI-RS during T1: Noc_2: -98dBm/15kHz $\hat{E}s_2 / Noc_2$: -10.2dB q1 CSI-RS during T2: Noc_2: -98dBm/15kHz $\hat{E}s_2 / Noc_2$: -10.2dB q1 CSI-RS during T3, T4 and T5: Noc_2: -98dBm/15kHz $\hat{E}s_2 / Noc_2$: +10.2dB
4.5.5.4 EN-DC FR1 CSI-RS-based beam failure detection and link recovery in DRX	Same as 4.5.5.3	Same as 4.5.5.3	Same as 4.5.5.3
4.5.5.5 EN-DC FR1 Scell CSI-RS-based beam failure detection and SSB-based link recovery in non-DRX	q0 SSB SNR during: T1: 5dB T2: -3dB T3: -12dB T4: -12dB T5: -12dB q1 SSB during T1: Noc_2: -98dBm/15kHz $\hat{E}s_2 / Noc_2$: -10dB q1 SSB during T2: Noc_2: -98dBm/15kHz $\hat{E}s_2 / Noc_2$: -10dB q1 SSB during T3, T4 and T5: Noc_2: -98dBm/15kHz $\hat{E}s_2 / Noc_2$: +10dB q1 CSI-RS during T1: Noc_2: -98dBm/15kHz	Offset during: T1: +0.8dB T2: +0.8dB T3: -0.8dB T4: -0.8dB T5: -0.8dB q1 SSB during T1: 0dB -0.2dB q1 SSB during T2: 0dB -0.2dB q1 SSB during T3, T4 and T5: 0dB +0.2dB q1 CSI-RS during	SNR during: T1: +5.8dB T2: -2.2dB T3: -12.8dB T4: -12.8dB T5: -12.8dB For testing of a UE which supports 4RX on all bands, the SNR during T3, T4 and T5 is modified as specified in section D.4.1.1 q1 SSB during T1: Noc_2: -98dBm/15kHz $\hat{E}s_2 / Noc_2$: -10.2dB q1 SSB during T2: Noc_2: -98dBm/15kHz $\hat{E}s_2 / Noc_2$: -10.2dB q1 SSB during T3, T4 and T5: Noc_2: -98dBm/15kHz $\hat{E}s_2 / Noc_2$: +10.2dB q1 CSI-RS during T1: Noc_2: -98dBm/15kHz

	$\hat{E}s_2$ / Noc_2: -10dB q1 CSI-RS during T2: Noc_2: -98dBm/15kHz $\hat{E}s_2$ / Noc_2: -10dB q1 CSI-RS during T3, T4 and T5: Noc_2: -98dBm/15kHz $\hat{E}s_2$ / Noc_2: +10dB	T1: 0dB -0.2dB q1 CSI-RS during T2: 0dB -0.2dB q1 CSI-RS during T3, T4 and T5: 0dB +0.2dB	$\hat{E}s_2$ / Noc_2: -10.2dB q1 CSI-RS during T2: Noc_2: -98dBm/15kHz $\hat{E}s_2$ / Noc_2: -10.2dB q1 CSI-RS during T3, T4 and T5: Noc_2: -98dBm/15kHz $\hat{E}s_2$ / Noc_2: +10.2dB
4.5.5.6 EN-DC FR1 Scell CSI-RS-based beam failure detection and SSB-based link recovery in DRX	Same as 4.5.5.5	Same as 4.5.5.5	Same as 4.5.5.5
4.5.6.1.1 EN-DC FR1 DCI-based DL active BWP switch in non-DRX in synchronous EN-DC	During T1: Noc_2: -104dBm/15kHz $\hat{E}s_2$ / Noc_2: +17dB During T2: Noc_2: -104dBm/15kHz $\hat{E}s_2$ / Noc_2: +17dB During T3: Noc_2: -104dBm/15kHz $\hat{E}s_2$ / Noc_2: +17dB	During T1: 0dB 0dB During T2: 0dB 0dB During T3: 0dB 0dB	During T1: Noc_2: -104dBm/15kHz $\hat{E}s_2$ / Noc_2: +17dB During T2: Noc_2: -104dBm/15kHz $\hat{E}s_2$ / Noc_2: +17dB During T3: Noc_2: -104dBm/15kHz $\hat{E}s_2$ / Noc_2: +17dB
4.5.6.1.2 EN-DC FR1 DCI-based DL active BWP switch with SCell in non-DRX in synchronous EN-DC	During T1: Noc_2: -104dBm/15kHz $\hat{E}s_2$ / Noc_2: +17dB Noc_3: -104dBm/15kHz $\hat{E}s_3$ / Noc_3: +17dB During T2: Noc_2: -104dBm/15kHz $\hat{E}s_2$ / Noc_2: +17dB Noc_3: -104dBm/15kHz $\hat{E}s_3$ / Noc_3: +17dB During T3: Noc_2: -104dBm/15kHz $\hat{E}s_2$ / Noc_2: +17dB Noc_3: -104dBm/15kHz $\hat{E}s_3$ / Noc_3: +17dB	During T1: 0dB 0dB 0dB 0dB During T2: 0dB 0dB 0dB 0dB During T3: 0dB 0dB 0dB 0dB	During T1: Noc_2: -104dBm/15kHz $\hat{E}s_2$ / Noc_2: +17dB Noc_3: -104dBm/15kHz $\hat{E}s_3$ / Noc_3: +17dB During T2: Noc_2: -104dBm/15kHz $\hat{E}s_2$ / Noc_2: +17dB Noc_3: -104dBm/15kHz $\hat{E}s_3$ / Noc_3: +17dB During T3: Noc_2: -104dBm/15kHz $\hat{E}s_2$ / Noc_2: +17dB Noc_3: -104dBm/15kHz $\hat{E}s_3$ / Noc_3: +17dB
4.5.6.2.1 EN-DC FR1 RRC-based DL active BWP switch in non-DRX in synchronous EN-DC	During T1: Noc_2: -104dBm/15kHz $\hat{E}s_2$ / Noc_2: +17dB	During T1: 0dB 0dB	During T1: Noc_2: -104dBm/15kHz $\hat{E}s_2$ / Noc_2: +17dB
4.5.7.1 EN-DC FR1 addition and release delay of known PSCell	For Test Configurations 1,2,4,5 N_{oc}: -88dBm/15kHz $\hat{E}_s$ / N_{oc}: 0.0dB B1-Threshold: -96 dBm/SCS For Test Configurations 3,6 N_{oc}: -88dBm/15kHz $\hat{E}_s$ / N_{oc}: 0.0dB B1-Threshold: -93 dBm/SCS	-0.6dB 0dB -3dB -0.6dB 0dB -3dB	N_{oc}: -88.6dBm/15kHz $\hat{E}s$ / N_{oc}: 0.0dB B1-Threshold: -99 dBm/SCS N_{oc}: -88.6dBm/15kHz $\hat{E}s$ / N_{oc}: 0.0dB B1-Threshold: -96 dBm/SCS
4.5.8.1 EN-DC FR1 interruptions at switching between two uplink carriers	N_{oc}: -104dBm/15kHz $\hat{E}_s$ / N_{oc}: 17dB	0dB 0dB	N_{oc}: -104dBm/15kHz $\hat{E}s$ / N_{oc}: 17dB
4.6.1.1 EN-DC FR1 event-triggered reporting without gap in non-DRX	During T1: Noc: -98dBm/15kHz $\hat{E}s1$ / Noc: +4.00dB $\hat{E}s2$ / Noc: -infinity	During T1: 0dB 0dB 0dB	During T1: Noc: -98dBm/15kHz $\hat{E}s1$ / Noc: +4.00dB $\hat{E}s2$ / Noc: -infinity

	During T2: Noc: -98dBm/15kHz Ês1 / Noc: +4.00dB Ês2 / Noc: +4.00dB	During T2: 0dB 0dB 0dB	During T2: Noc: -98dBm/15kHz Ês1 / Noc: +4.00dB Ês2 / Noc: +4.00dB
4.6.1.2 EN-DC FR1 event-triggered reporting without gap in DRX	Same as 4.6.1.1	Same as 4.6.1.1	Same as 4.6.1.1
4.6.1.3 EN-DC FR1 event-triggered reporting with gap in non-DRX	Same as 4.6.1.1	Same as 4.6.1.1	Same as 4.6.1.1
4.6.1.4 EN-DC FR1 event-triggered reporting with gap in DRX	Same as 4.6.1.1	Same as 4.6.1.1	Same as 4.6.1.1
4.6.1.5 EN-DC FR1 event-triggered reporting without gap in non-DRX with SSB time index detection	Same as 4.6.1.1	Same as 4.6.1.1	Same as 4.6.1.1
4.6.1.6 EN-DC FR1 event-triggered reporting with gap in non-DRX with SSB time index detection	Same as 4.6.1.1	Same as 4.6.1.1	Same as 4.6.1.1
4.6.1.7 EN-DC FR1 event-triggered reporting without gap in DRX for UE configured with highSpeedMeasFlag-r16	Same as 4.6.1.1	Same as 4.6.1.1	Same as 4.6.1.1
4.6.2.1 EN-DC FR1-FR1 event-triggered reporting in non-DRX	During T1: Freq 2 Noc: -98dBm/15kHz Freq 3 Noc: -98dBm/15kHz Ês2 / Noc: +4.00dB Ês3 / Noc: -infinity During T2: Freq 2 Noc: -98dBm/15kHz Freq 3 Noc: -98dBm/15kHz Ês2 / Noc: +4.00dB Ês3 / Noc: +7.00dB	During T1: 0dB 0dB 0dB 0dB During T2: 0dB 0dB 0dB 0dB	During T1: Freq 2 Noc: -98dBm/15kHz Freq 3 Noc: -98dBm/15kHz Ês2 / Noc: +4.00dB Ês3 / Noc: -infinity During T2: Freq 2 Noc: -98dBm/15kHz Freq 3 Noc: -98dBm/15kHz Ês2 / Noc: +4.00dB Ês3 / Noc: +7.00dB
4.6.2.2 EN-DC FR1-FR1 event-triggered reporting in DRX	Same as 4.6.2.1	Same as 4.6.2.1	Same as 4.6.2.1
4.6.2.5 EN-DC FR1-FR1 event-triggered reporting in non-DRX with SSB time index detection	Same as 4.6.2.1	Same as 4.6.2.1	Same as 4.6.2.1
4.6.2.6 EN-DC FR1-FR1 event-triggered reporting in DRX with SSB time index detection	Same as 4.6.2.1	Same as 4.6.2.1	Same as 4.6.2.1
4.6.4.1 EN-DC FR1 SSB-based L1-RSRP measurement in non-DRX	During T1: Noc: -94.65dBm/15kHz $Ês_0$ / Noc: +0.00dB $Ês_1$ / Noc: -infinity During T2: Noc: -94.65dBm/15kHz $Ês_0$ / Noc: 0.00dB $Ês_1$ / Noc: +3.00dB Reported SSB#0 SS-RSRP values ± 10dB Reported SSB#1 SS-RSRP values ± 10dB Reported Differential SS-RSRP values ± 3dB	During T1: 0dB 0dB 0dB During T2: 0dB 0dB 0.5dB Via mapping	During T1: Noc: -94.65dBm/15kHz $Ês_0$ / Noc: +0.00dB $Ês_1$ / Noc: -infinity During T2: Noc: -94.65dBm/15kHz $Ês_0$ / Noc: 0.00dB $Ês_1$ / Noc: +3.50dB **For configuration 1,2,4,5** SSB#1: RSRP_55 to RSRP_75 SSB#0: DIFFRSRP_0 to DIFFRSRP_3 **For configuration 3,6** SSB#1: RSRP_58 to RSRP_78 SSB#0: DIFFRSRP_0 to

			DIFFRSRP_3
4.6.4.2 EN-DC FR1 SSB-based L1-RSRP measurement in DRX	Same as 4.6.4.1	Same as 4.6.4.1	Same as 4.6.4.1
4.6.4.3 EN-DC FR1 CSI-RS-based L1-RSRP measurement in non-DRX	Noc: -94.65dBm/15kHz $\hat{E}s_0$ / Noc: 0.00dB $\hat{E}s_1$ / Noc: +3.00dB Reported CSI-RSRP values ± 10dB Reported Differential CSI-RSRP values ± 3dB	0dB 0dB 0.5dB Via mapping	Noc: -94.65dBm/15kHz $\hat{E}s_0$ / Noc: 0.00dB $\hat{E}s_1$ / Noc: +3.50dB **For configuration 1,2,4,5** CSI-RS#1: RSRP_55 to RSRP_75 CSI-RS#0: DIFFRSRP_0 to DIFFRSRP_3 **For configuration 3,6** CSI-RS#1: RSRP_58 to RSRP_78 CSI-RS#0: DIFFRSRP_0 to DIFFRSRP_3
4.6.4.4 EN-DC FR1 CSI-RS-based L1-RSRP measurement in DRX	Same as 4.6.4.3	Same as 4.6.4.3	Same as 4.6.4.3
4.6.4.5 EN-DC FR1 SSB-based L1-RSRP measurement in DRX for UE configured with highSpeedMeasFlag-r16	Same as 4.6.4.1	Same as 4.6.4.1	Same as 4.6.4.1
4.6.5.2 EN-DC FR1 CLI-RSSI measurement with non-DRX	During T1: Noc on CLI RSSI: -116 dBm/15kHz Io on CLI RSSI : -97.43 dBm/ 1.08 MHz During T2: Noc on CLI RSSI: -108dBm/15kHz Io on CLI RSSI : -89.43 dBm/ 1.08 Mhz	During T1: 0dB 0dB During T2: 0dB 0.5dB	During T1: Noc: -116 dBm/15kHz Io on CLI RSSI : -97.43 dBm/ 1.08 MHz During T2: Noc: -116 dBm/15kHz Io on CLI RSSI : -88.93 dBm/ 1.08 MHz
4.6.7.1 EN-DC FR1 CSI-RS based CMR and no dedicated IMR L1-SINR measurement in non-DRX	Noc: -94.65dBm/15kHz $\hat{E}s_0$ / Noc: 0.00dB $\hat{E}s_1$ / Noc: +3.00dB Reported CSI-SINR values ± 5.5dB Reported Differential CSI-SINR values ± 4.5dB	0dB 0dB 0dB Via mapping	Noc: -94.65dBm/15kHz $\hat{E}s_0$ / Noc: 0.00dB $\hat{E}s_1$ / Noc: +3.00dB **For configuration 1,2,3,4,5,6** CSI-RS#1: SINR_41 to SINR_64 CSI-RS#0: DIFFSINR_0 to DIFFSINR_7
4.6.7.2 EN-DC FR1 SSB based CMR and dedicated IMR L1-SINR measurement in DRX	Noc: -94.65dBm/15kHz $\hat{E}s_0$ / Noc: 0.00dB $\hat{E}s_1$ / Noc: +3.00dB Reported SS-SINR values ±4.5dB Reported Differential SS-SINR values ±3.5dB	0dB 0dB 0dB Via mapping	Noc: -94.65dBm/15kHz $\hat{E}s_0$ / Noc: 0.00dB $\hat{E}s_1$ / Noc: +3.00dB **For configuration 1,2,3,4,5,6** SSB#1: SINR_43 to SINR_62 SSB#0: DIFFSINR_0 to DIFFSINR_6
4.6.7.3 EN-DC FR1 CSI-RS based CMR and dedicated IMR L1-SINR measurement in DRX	Noc: -94.65dBm/15kHz $\hat{E}s_0$ / Noc: 0.00dB $\hat{E}s_1$ / Noc: +3.00dB Reported CSI-SINR values ±4dB Reported Differential CSI-SINR values ±3dB	0dB 0.5dB 0dB Via mapping	Noc: -94.65dBm/15kHz $\hat{E}s_0$ / Noc: 0.50dB $\hat{E}s_1$ / Noc: +3.00dB **For configuration 1,2,3,4,5,6** CSI-RS#1: SINR_44 to SINR_61 CSI-RS#0: DIFFSINR_0 to DIFFSINR_5
4.7.1.1.1 EN-DC FR1 SS-RSRP absolute measurement accuracy	**TEST CONFIGURATION 1, 2, 4, 5**		
	Test 1: N_{oc}: -106dBm/15kHz $\hat{E}s_2$ / N_{oc}: +6.0dB $\hat{E}s_3$ / N_{oc}: +1.0dB	Test 1: -1.5dB 0dB +0.4dB	Test 1: N_{oc}: -107.5dBm/15kHz $\hat{E}s_2$ / N_{oc}: +6.0dB $\hat{E}s_3$ / N_{oc}: +1.4dB

	Reported RSRP values: ±4.5dB	Via mapping	RSRP_44 to RSRP_56
	Test 2: N_{oc}: -88dBm/15kHz $\hat{E}s_2$ / N_{oc}: +6.0dB $\hat{E}s_3$ / N_{oc}: +1.0dB Reported RSRP values: ±8dB	Test 2: 0dB 0dB +0.4dB Via mapping	Test 2: N_{oc}: -88dBm/15kHz $\hat{E}s_2$ / N_{oc}: +6.0dB $\hat{E}s_3$ / N_{oc}: +1.4dB RSRP_60 to RSRP_79
	Test 3: N_{oc}: -116dBm/15kHz + Δ_{BG_offset} $\hat{E}s_2$ / N_{oc}: +3.0dB $\hat{E}s_3$ / N_{oc}: -1.0dB Reported RSRP values: ±6dB	Test 3: 0dB 0dB +0.2dB Via mapping	Test 3: N_{oc}: -116dBm/15kHz + Δ_{BG_offset} $\hat{E}s_2$ / N_{oc}: +3.0dB $\hat{E}s_3$ / N_{oc}: -0.8dB RSRP_34 to RSRP_46 RSRP_34 to RSRP_46 RSRP_35 to RSRP_47 RSRP_35 to RSRP_47 RSRP_36 to RSRP_48 RSRP_37 to RSRP_49 RSRP_37 to RSRP_49 depending on operating band
	TEST CONFIGURATION 3, 6		
	Test 1: N_{oc}: -110dBm/30kHz $\hat{E}s_2$ / N_{oc}: +6.0dB $\hat{E}s_3$ / N_{oc}: +1.0dB Reported RSRP values: ±4.5dB	Test 1: -0.8dB 0dB +0.4dB Via mapping	Test 1: N_{oc}: -110.8dBm/30kHz $\hat{E}s_2$ / N_{oc}: +6.0dB $\hat{E}s_3$ / N_{oc}: +1.4dB RSRP_41 to RSRP_53
	Test 2: N_{oc}: -91dBm/30kHz $\hat{E}s_2$ / N_{oc}: +6.0dB $\hat{E}s_3$ / N_{oc}: +1.0dB Reported RSRP values: ±8dB	Test 2: 0dB 0dB +0.4dB Via mapping	Test 2: N_{oc}: -91dBm/30kHz $\hat{E}s_2$ / N_{oc}: +6.0dB $\hat{E}s_3$ / N_{oc}: +1.4dB RSRP_57 to RSRP_76
	Test 3: N_{oc}: -113dBm/30kHz + Δ_{BG_offset} $\hat{E}s_2$ / N_{oc}: +3.0dB $\hat{E}s_3$ / N_{oc}: -1.0dB Reported RSRP values: ±6dB	Test 3: 0dB 0dB +0.2dB Via mapping	Test 3: N_{oc}: -113dBm/30kHz + Δ_{BG_offset} $\hat{E}s_2$ / N_{oc}: +3.0dB $\hat{E}s_3$ / N_{oc}: -0.8dB RSRP_37 to RSRP_49 RSRP_37 to RSRP_49 RSRP_38 to RSRP_50 RSRP_38 to RSRP_50 RSRP_39 to RSRP_51 RSRP_40 to RSRP_52 RSRP_40 to RSRP_52 depending on operating band
The derivation of the RSRP values takes into account the uncertainty in Cell 3 SS-RSRP from N_{oc} and $\hat{E}s_3$ / N_{oc}, the allowed UE reporting accuracy, and the UE mapping function. The SS-RSRP values given above are for normal conditions. In all cases the RSRP values are 4.5dB wider at each end for extreme conditions.			
4.7.1.1.2 EN-DC FR1 SS-RSRP relative measurement accuracy	Test 1: N_{oc}: Test configuration 1, 2, 4, 5:-106dBm/15kHz Test configuration 3, 6:-110dBm/30kHz $\hat{E}s_2$ / N_{oc}: +6.0dB $\hat{E}s_3$ / N_{oc}: +1.0dB Reported relative SS-RSRP values: ±3dB	Test 1: 0 dB 0 dB 0 dB +1.0dB Via mapping	Test 1: N_{oc}: -106 dBm/15kHz N_{oc}: -110 dBm/30kHz $\hat{E}s_2$ / N_{oc}: +6.0dB $\hat{E}s_3$ / N_{oc}: +2.0dB RSRP_x-8 to RSRP_x-1
	Test 2: N_{oc}: -88dBm/15kHz $\hat{E}s_2$ / N_{oc}: +6.0dB $\hat{E}s_3$ / N_{oc}: +1.0dB Reported relative SS-RSRP values: ±3dB	Test 2: 0dB 0dB +1.0dB Via mapping	Test 2: N_{oc}: -88dBm/15kHz $\hat{E}s_2$ / N_{oc}: +6.0dB $\hat{E}s_3$ / N_{oc}: +2.0dB RSRP_x-8 to RSRP_x-1
	Test 3: N_{oc}: -116dBm/15kHz + Δ_{BG_offset}	Test 3: 0dB	Test 3: N_{oc}: -116dBm/15kHz + Δ_{BG_offset}

	$\hat{E}s_2$ / N_{oc}: +3.0dB $\hat{E}s_3$ / N_{oc}: -1.0dB Reported relative SS-RSRP values: ±3dB	0dB +1.0dB Via mapping	$\hat{E}s_2$ / N_{oc}: +3.0dB $\hat{E}s_3$ / N_{oc}: 0dB RSRP_x-7 to RSRP_x+1
The derivation of the SS-RSRP values takes into account the uncertainty in Cell 2 and Cell 3 RSRP from N_{oc}, $\hat{E}s_2$ / N_{oc} and $\hat{E}s_3$ / N_{oc}, the allowed UE reporting accuracy, and the UE mapping function. The RSRP values given above are for both normal and extreme conditions.			
4.7.1.2.1 EN-DC FR1-FR1 SS-RSRP absolute measurement accuracy	**TEST CONFIGURATION 1, 2, 4, 5**		
	Test 1: N_{oc1}: -94.65 dBm/15kHz N_{oc2}: -94.65 dBm/15kHz $\hat{E}s_2$ / N_{oc1}: +10.0dB $\hat{E}s_3$ / N_{oc2}: +10.0dB Reported RSRP values: ±8dB Test 2: N_{oc1}: -107dBm/15kHz + Δ_{BG_offset} N_{oc2}: -118dBm/15kHz + Δ_{BG_offset} $\hat{E}s_2$ / N_{oc1}: +13.0dB $\hat{E}s_3$ / N_{oc2}: -3.0dB Reported RSRP values: ±4.5dB	Test 1: 0dB 0dB 0dB 0dB Via mapping Test 2: 0dB 0dB 0dB 0dB Via mapping	Test 1: N_{oc1}: -94.65dBm/15kHz N_{oc2}: -94.65dBm/15kHz $\hat{E}s_2$ / N_{oc1}: +10.0dB $\hat{E}s_3$ / N_{oc2}: +10.0dB RSRP_62 to RSRP_81 Test 2: N_{oc1}: -107dBm/15kHz + Δ_{BG_offset} N_{oc2}: -118dBm/15kHz + Δ_{BG_offset} $\hat{E}s_2$ / N_{oc1}: +13.0dB $\hat{E}s_3$ / N_{oc2}: -3.0dB RSRP_32 to RSRP_45 RSRP_33 to RSRP_45 RSRP_33 to RSRP_46 RSRP_34 to RSRP_46 RSRP_34 to RSRP_47 RSRP_35 to RSRP_48 RSRP_36 to RSRP_48 depending on operating band
	TEST CONFIGURATION 3, 6		
	Test 1: N_{oc1}: -94.65 dBm/15kHz N_{oc2}: -94.65 dBm/15kHz $\hat{E}s_2$ / N_{oc1}: +10.0dB $\hat{E}s_3$ / N_{oc2}: +10.0dB Reported RSRP values: ±8dB Test 2: N_{oc1}: -107dBm/15kHz + Δ_{BG_offset} N_{oc1}: -118dBm/15kHz + Δ_{BG_offset} $\hat{E}s_2$ / N_{oc1}: +13.0dB $\hat{E}s_3$ / N_{oc2}: -3.0dB Reported RSRP values: ±4.5dB	Test 1: -1.35dB -1.35dB 0dB 0dB Via mapping Test 2: 0dB 0dB 0dB 0dB Via mapping	Test 1: N_{oc1}: -96dBm/15kHz N_{oc2}: -96dBm/15kHz $\hat{E}s_2$ / N_{oc1}: +10.0dB $\hat{E}s_3$ / N_{oc2}: +10.0dB RSRP_64 to RSRP_83 Test 2: N_{oc}: -107dBm/15kHz + Δ_{BG_offset} N_{oc1}: -118dBm/15kHz + Δ_{BG_offset} $\hat{E}s_2$ / N_{oc1}: +13.0dB $\hat{E}s_3$ / N_{oc2}: -3.0dB RSRP_35 to RSRP_48 RSRP_36 to RSRP_48 RSRP_36 to RSRP_49 RSRP_37 to RSRP_49 RSRP_37 to RSRP_50 RSRP_38 to RSRP_51 RSRP_39 to RSRP_51 depending on operating band
The derivation of the RSRP values takes into account the uncertainty in Cell 3 SS-RSRP from N_{oc2} and $\hat{E}s_3$ / N_{oc2}, the allowed UE reporting accuracy, and the UE mapping function. The SS-RSRP values given above are for normal conditions. For extreme conditions, the RSRP values are 3.0dB wider at each end for Test 1, and 4.5 dB wider at each for Test 2.			
4.7.1.2.2 EN-DC FR1-FR1 SS-RSRP relative measurement accuracy	Test 1: N_{oc1}: -94.65 dBm/15kHz N_{oc2}: -94.65 dBm/15kHz $\hat{E}s_2$ / N_{oc1}: +10.0dB $\hat{E}s_3$ / N_{oc2}: +10.0dB Reported relative RSRP values: ±4.5dB Test 2: N_{oc1}: -107dBm/15kHz + Δ_{BG_offset} N_{oc1}: -118dBm/15kHz + Δ_{BG_offset} $\hat{E}s_2$ / N_{oc1}: +13.0dB $\hat{E}s_3$ / N_{oc2}: -3.0dB	Test 1: 0dB 0dB 0dB 0dB Via mapping Test 2: 0dB 0dB 0dB 0dB	Test 1: N_{oc1}: -94.65dBm/15kHz N_{oc2}: -94.65dBm/15kHz $\hat{E}s_2$ / N_{oc1}: +10.0dB $\hat{E}s_3$ / N_{oc2}: +10.0dB RSRP_x-7 to RSRP_x+7 Test 2: N_{oc}: -107dBm/15kHz + Δ_{BG_offset} N_{oc1}: -118dBm/15kHz + Δ_{BG_offset} $\hat{E}s_2$ / N_{oc1}: +13.0dB $\hat{E}s_3$ / N_{oc2}: -3.0dB

	Reported relative RSRP values: ±4.5dB	Via mapping	RSRP_x-31 to RSRP_x-18
The derivation of the SS-RSRP values takes into account the uncertainty in Cell 2 and Cell 3 RSRP from N_{oc}, $\hat{E}s_2$ / N_{oc} and $\hat{E}s_3$ / N_{oc}, the allowed UE reporting accuracy, and the UE mapping function. The SS-RSRP values given above are for normal conditions. For extreme conditions, the RSRP values are 1.5dB wider at each end.			
4.7.2.1 EN-DC FR1 SS-RSRQ measurement accuracy	**TEST CONFIGURATION 1, 2, 4, 5**		
	Test 1: N_{oc}: -85dBm/15kHz $\hat{E}s_2$ / N_{oc}: +3.0dB $\hat{E}s_3$ / N_{oc}: +3.0dB Reported RSRQ values: ±2.5dB	Test 1: -1.5dB 0dB 0dB Via mapping	Test 1: N_{oc}: -86.5dBm/15kHz $\hat{E}s_2$ / N_{oc}: +3.0dB $\hat{E}s_3$ / N_{oc}: +3.0dB RSRQ_52 to RSRQ_62
	Test 2: N_{oc}: -101dBm/15kHz $\hat{E}s_2$ / N_{oc}: -2.9dB $\hat{E}s_3$ / N_{oc}: -2.9dB Reported RSRQ values: ±3.5dB	Test 2: 0dB 0dB 0dB Via mapping	Test 2: N_{oc}: -101dBm/15kHz $\hat{E}s_2$ / N_{oc}: -2.9dB $\hat{E}s_3$ / N_{oc}: -2.9dB RSRQ_46 to RSRQ_60
	Test 3: N_{oc}: -114dBm/15kHz + Δ_{BG_offset} $\hat{E}s_2$ / N_{oc}: -4.0dB $\hat{E}s_3$ / N_{oc}: -4.0dB Reported RSRQ values: ±3.5dB	Test 3: 0dB 0dB 0dB Via mapping	Test 3: N_{oc}: -114dBm/15kHz + Δ_{BG_offset} $\hat{E}s_2$ / N_{oc}: -4.0dB $\hat{E}s_3$ / N_{oc}: -4.0dB RSRQ_44 to RSRQ_59
	TEST CONFIGURATION 3, 6		
	Test 1: N_{oc}: -91dBm/15kHz $\hat{E}s_2$ / N_{oc}: +3.0dB $\hat{E}s_3$ / N_{oc}: +3.0dB Reported RSRQ values: ±2.5dB	Test 1: -1.6dB 0dB 0dB Via mapping	Test 1: N_{oc}: -92.6dBm/15kHz $\hat{E}s_2$ / N_{oc}: +3.0dB $\hat{E}s_3$ / N_{oc}: +3.0dB RSRQ_52 to RSRQ_62
	Test 2: N/A	Test 2: N/A	Test 2: N/A
	Test 3: N_{oc}: -114dBm/15kHz + Δ_{BG_offset} $\hat{E}s_2$ / N_{oc}: -4.0dB $\hat{E}s_3$ / N_{oc}: -4.0dB Reported RSRQ values: ±3.5dB	Test 3: 0dB 0dB 0dB Via mapping	Test 3: N_{oc}: -114dBm/15kHz + Δ_{BG_offset} $\hat{E}s_2$ / N_{oc}: -4.0dB $\hat{E}s_3$ / N_{oc}: -4.0dB RSRQ_44 to RSRQ_59
The derivation of the RSRQ values takes into account the uncertainty in Cell 3 SS-RSRQ from N_{oc} and $\hat{E}s_3$ / N_{oc}, the allowed UE reporting accuracy, and the UE mapping function. The SS-RSRQ values given above are for normal conditions. For extreme conditions, the SS-RSRQ values are 1.5dB wider at each end for Test 1, and 0.5 dB wider at each for Tests 2 and 3.			
4.7.2.2.1 EN-DC FR1-FR1 SS-RSRQ absolute measurement accuracy	**TEST CONFIGURATION 1, 2, 4, 5**		
	Test 1: N_{oc1}: -80.18 dBm/15kHz N_{oc2}: -80.18 dBm/15kHz $\hat{E}s_2$ / N_{oc1}: -1.75dB $\hat{E}s_3$ / N_{oc2}: -1.75dB Reported RSRQ values: ±2.5dB	Test 1: -1.5dB -1.5dB 0dB 0dB Via mapping	Test 1: N_{oc1}: -81.68dBm/15kHz N_{oc2}: -81.68dBm/15kHz $\hat{E}s_2$ / N_{oc1}: -1.75dB $\hat{E}s_3$ / N_{oc2}: -1.75dB RSRQ_52 to RSRQ_62
	Test 2: N_{oc1}: -106dBm/15kHz N_{oc2}: -106dBm/15kHz $\hat{E}s_2$ / N_{oc1}: -1.75dB $\hat{E}s_3$ / N_{oc2}: -1.75dB Reported RSRQ values: ±2.5dB	Test 2: 0dB 0dB 0dB 0dB Via mapping	Test 2: N_{oc1}: -106dBm/15kHz N_{oc2}: -106dBm/15kHz $\hat{E}s_2$ / N_{oc1}: -1.75dB $\hat{E}s_3$ / N_{oc2}: -1.75dB RSRQ_52 to RSRQ_62
	Test 3: N_{oc1}: -116dBm/15kHz + Δ_{BG_offset} N_{oc2}: -116dBm/15kHz + Δ_{BG_offset}	Test 3: 0dB 0dB	Test 3: N_{oc1}: -116dBm/15kHz + Δ_{BG_offset} N_{oc2}: -116dBm/15kHz + Δ_{BG_offset}

	$\hat{E}s_2$ / N_{oc1}: 3dB $\hat{E}s_3$ / N_{oc2}: -1.75dB Reported RSRQ values: ±2.5dB	0dB 0dB Via mapping	$\hat{E}s_2$ / N_{oc1}: 3dB $\hat{E}s_3$ / N_{oc2}: -1.75dB RSRQ_52 to RSRQ_62
	TEST CONFIGURATION 3, 6		
	Test 1: N_{oc1}: -86.27 dBm/15kHz N_{oc2}: -86.27 dBm/15kHz $\hat{E}s_2$ / N_{oc1}: -1.75dB $\hat{E}s_3$ / N_{oc2}: -1.75dB Reported RSRQ values: ±2.5dB Test 2: N_{oc1}: -106dBm/15kHz N_{oc2}: -106dBm/15kHz $\hat{E}s_2$ / N_{oc1}: -1.75dB $\hat{E}s_3$ / N_{oc2}: -1.75dB Reported RSRQ values: ±2.5dB Test 3: N_{oc1}: -116dBm/15kHz + Δ_{BG_offset} N_{oc2}: -116dBm/15kHz + Δ_{BG_offset} $\hat{E}s_2$ / N_{oc1}: 3dB $\hat{E}s_3$ / N_{oc2}: -1.75dB Reported RSRQ values: ±2.5dB	Test 1: -1.53dB -1.53dB 0dB 0dB Via mapping Test 2: 0dB 0dB 0dB 0dB Via mapping Test 3: 0dB 0dB 0dB 0dB Via mapping	Test 1: N_{oc1}: -87.8dBm/15kHz N_{oc2}: -87.8dBm/15kHz $\hat{E}s_2$ / N_{oc1}: -1.75dB $\hat{E}s_3$ / N_{oc2}: -1.75dB RSRQ_52 to RSRQ_62 Test 2: N_{oc1}: -106dBm/15kHz N_{oc2}: -106dBm/15kHz $\hat{E}s_2$ / N_{oc1}: -1.75dB $\hat{E}s_3$ / N_{oc2}: -1.75dB RSRQ_52 to RSRQ_62 Test 3: N_{oc1}: -116dBm/15kHz + Δ_{BG_offset} N_{oc2}: -116dBm/15kHz + Δ_{BG_offset} $\hat{E}s_2$ / N_{oc1}: 3dB $\hat{E}s_3$ / N_{oc2}: -1.75dB RSRQ_52 to RSRQ_62
The derivation of the RSRQ values takes into account the uncertainty in Cell 3 SS-RSRQ from N_{oc2} and $\hat{E}s_3$ / N_{oc2}, the allowed UE reporting accuracy, and the UE mapping function. The SS-RSRQ values given above are for normal conditions. For extreme conditions, the RSRQ values are 1.5dB wider at each end.			
4.7.2.2.2 EN-DC FR1-FR1 SS-RSRQ relative measurement accuracy	**TEST CONFIGURATION 1, 2, 4, 5**		
	Test 1: N_{oc1}: -80.18 dBm/15kHz N_{oc2}: -80.18 dBm/15kHz $\hat{E}s_2$ / N_{oc1}: -1.75dB $\hat{E}s_3$ / N_{oc2}: -1.75dB Reported RSRQ values: ±3dB Test 2: N_{oc1}: -106dBm/15kHz N_{oc2}: -106dBm/15kHz $\hat{E}s_2$ / N_{oc1}: -1.75dB $\hat{E}s_3$ / N_{oc2}: -1.75dB Reported RSRQ values: ±3dB Test 3: N_{oc1}: -116dBm/15kHz + Δ_{BG_offset} N_{oc2}: -116dBm/15kHz + Δ_{BG_offset} $\hat{E}s_2$ / N_{oc1}: 3dB $\hat{E}s_3$ / N_{oc2}: -1.75dB Reported RSRQ values: ±3dB	Test 1: -1.5dB -1.5dB 0dB 0dB Via mapping Test 2: 0dB 0dB 0dB 0dB Via mapping Test 3: 0dB 0dB 0dB 0dB Via mapping	Test 1: N_{oc1}: -81.68dBm/15kHz N_{oc2}: -81.68dBm/15kHz $\hat{E}s_2$ / N_{oc1}: -1.75dB $\hat{E}s_3$ / N_{oc2}: -1.75dB RSRQ_x-7 to RSRQ_x+7 Test 2: N_{oc1}: -106dBm/15kHz N_{oc2}: -106dBm/15kHz $\hat{E}s_2$ / N_{oc1}: -1.75dB $\hat{E}s_3$ / N_{oc2}: -1.75dB RSRQ_x-7 to RSRQ_x+7 Test 3: N_{oc1}: -116dBm/15kHz + Δ_{BG_offset} N_{oc2}: -116dBm/15kHz + Δ_{BG_offset} $\hat{E}s_2$ / N_{oc1}: 3dB $\hat{E}s_3$ / N_{oc2}: -1.75dB RSRQ_x-11 to RSRQ_x+2
	TEST CONFIGURATION 3, 6		
	Test 1: N_{oc1}: -86.27 dBm/15kHz N_{oc2}: -86.27 dBm/15kHz $\hat{E}s_2$ / N_{oc1}: -1.75dB $\hat{E}s_3$ / N_{oc2}: -1.75dB Reported RSRQ values: ±2.5dB Test 2: N_{oc1}: -106dBm/15kHz N_{oc2}: -106dBm/15kHz $\hat{E}s_2$ / N_{oc1}: -1.75dB	Test 1: -1.53dB -1.53dB 0dB 0dB Via mapping Test 2: 0dB 0dB 0dB	Test 1: N_{oc1}: -87.8dBm/15kHz N_{oc2}: -87.8dBm/15kHz $\hat{E}s_2$ / N_{oc1}: -1.75dB $\hat{E}s_3$ / N_{oc2}: -1.75dB RSRQ_x-7 to RSRQ_x+7 Test 2: N_{oc1}: -106dBm/15kHz N_{oc2}: -106dBm/15kHz $\hat{E}s_2$ / N_{oc1}: -1.75dB

	$\hat{E}s_3$ / N_{oc2}: -1.75dB	0dB	$\hat{E}s_3$ / N_{oc2}: -1.75dB
	Reported RSRQ values: ±3dB	Via mapping	RSRQ_x-7 to RSRQ_x+7
	Test 3:	Test 3:	Test 3:
	N_{oc1}: -116dBm/15kHz + Δ_{BG_offset}	0dB	N_{oc1}: -116dBm/15kHz + Δ_{BG_offset}
	N_{oc2}: -116dBm/15kHz + Δ_{BG_offset}	0dB	N_{oc2}: -116dBm/15kHz + Δ_{BG_offset}
	$\hat{E}s_2$ / N_{oc1}: 3dB	0dB	$\hat{E}s_2$ / N_{oc1}: 3dB
	$\hat{E}s_3$ / N_{oc2}: -1.75dB	0dB	$\hat{E}s_3$ / N_{oc2}: -1.75dB
	Reported RSRQ values: ±3dB	Via mapping	RSRQ_x-11 to RSRQ_x+2
The derivation of the RSRQ values takes into account the uncertainty in Cell 2 and Cell 3 SS-RSRQ from N_{oc2} and $\hat{E}s_3$ / N_{oc2}, the allowed UE reporting accuracy, and the UE mapping function. The SS-RSRQ values given above are for normal conditions. For extreme conditions, the RSRQ values are 1dB wider at each end.			
4.7.3.1 EN-DC FR1 SS-SINR measurement accuracy	**TEST CONFIGURATION 1, 2, 4, 5**		
	Test 1:	Test 1:	Test 1:
	N_{oc}: -93dBm/15kHz	0dB	N_{oc}: -93dBm/15kHz
	$\hat{E}s_2$ / N_{oc}: +4.54dB	0dB	$\hat{E}s_2$ / N_{oc}: +4.54dB
	$\hat{E}s_3$ / N_{oc}: +4.54dB	0dB	$\hat{E}s_3$ / N_{oc}: +4.54dB
	Reported SINR values: ±3.5dB	Via mapping	SINR_31 to SINR_49
	Test 2:	Test 2:	Test 2:
	N_{oc}: -116dBm/15kHz+ Δ_{BG_offset}	0dB	N_{oc}: -116dBm/15kHz+ Δ_{BG_offset}
	$\hat{E}s_2$ / N_{oc}: -4dB	0.5dB	$\hat{E}s_2$ / N_{oc}: -3.5dB
	$\hat{E}s_3$ / N_{oc}: -4dB	0.5dB	$\hat{E}s_3$ / N_{oc}: -3.5dB
	Reported SINR values: ±3.5dB	Via mapping	SINR_28 to SINR_45
	TEST CONFIGURATION 3, 6		
	Test 1:	Test 1:	Test 1:
	N_{oc}: -93dBm/15kHz	-0.2dB	N_{oc}: -93.2dBm/15kHz
	$\hat{E}s_2$ / N_{oc}: +4.54dB	0dB	$\hat{E}s_2$ / N_{oc}: +4.54dB
	$\hat{E}s_3$ / N_{oc}: +4.54dB	0dB	$\hat{E}s_3$ / N_{oc}: +4.54dB
	Reported SINR values: ±3.5dB	Via mapping	SINR_31 to SINR_49
	Test 2:	Test 2:	Test 2:
	N_{oc}: -116dBm/15kHz+ Δ_{BG_offset}	0dB	N_{oc}: -116dBm/15kHz+ Δ_{BG_offset}
	$\hat{E}s_2$ / N_{oc}: -4dB	0.5dB	$\hat{E}s_2$ / N_{oc}: -3.5dB
	$\hat{E}s_3$ / N_{oc}: -4dB	0.5dB	$\hat{E}s_3$ / N_{oc}: -3.5dB
	Reported SINR values: ±3.5dB	Via mapping	SINR_28 to SINR_45
The derivation of the SINR values takes into account the uncertainty in Cell 3 SS- SINR from N_{oc} and $\hat{E}s_3$ / N_{oc}, the allowed UE reporting accuracy, and the UE mapping function. The SS- SINR values given above are for normal conditions. For extreme conditions, the SS- SINR values are 0.5dB wider at each end.			
4.7.3.2.1 EN-DC FR1-FR1 SS-SINR absolute measurement accuracy	**TEST CONFIGURATION 1, 2, 3, 4, 5, 6**		
	Test 1:	Test 1:	Test 1:
	N_{oc1}: -88 dBm/15kHz	0dB	N_{oc1}: -88 dBm/15kHz
	N_{oc2}: -88 dBm/15kHz	0dB	N_{oc2}: -88 dBm/15kHz
	$\hat{E}s_2$ / N_{oc1}: -1.75dB	0dB	$\hat{E}s_2$ / N_{oc1}: -1.75dB
	$\hat{E}s_3$ / N_{oc2}: -1.75dB	0dB	$\hat{E}s_3$ / N_{oc2}: -1.75dB
	Reported SINR values: ±3dB	Via mapping	SINR_35 to SINR_51
	Test 2:	Test 2:	Test 2:
	N_{oc1}: -108.5dBm/15kHz	0dB	N_{oc1}: -108.5dBm/15kHz
	N_{oc2}: -108.5dBm/15kHz	0dB	N_{oc2}: -108.5dBm/15kHz
	$\hat{E}s_2$ / N_{oc1}: 20dB	0dB	$\hat{E}s_2$ / N_{oc1}: 20dB
	$\hat{E}s_3$ / N_{oc2}: 20dB	0dB	$\hat{E}s_3$ / N_{oc2}: 20dB
	Reported SINR values: ±3dB	Via mapping	SINR_79 to SINR_94
	Test 3:	Test 3:	Test 3:
	N_{oc1}: -119.5dBm/15kHz + Δ_{BG_offset}	0dB	N_{oc1}: -119.5dBm/15kHz + Δ_{BG_offset}
	N_{oc2}: -119.5dBm/15kHz + Δ_{BG_offset}	0dB	N_{oc2}: -119.5dBm/15kHz + Δ_{BG_offset}
	$\hat{E}s_2$ / N_{oc1}: -4dB	0.8dB	$\hat{E}s_2$ / N_{oc1}: -3.2dB

	$\hat{E}s_3 / N_{oc2}$: -4dB Reported SINR values: ±3.5dB	0.8dB Via mapping	$\hat{E}s_3 / N_{oc2}$: -3.2dB SINR_32 to SINR_49
The derivation of the SINR values takes into account the uncertainty in Cell 3 SS- SINR from N_{oc} and $\hat{E}s_3 / N_{oc}$, the allowed UE reporting accuracy, and the UE mapping function. The SS- SINR values given above are for normal conditions. For extreme conditions, the SS- SINR values are 1dB wider at each for Tests 1 and 2 and 0.5dB wider at each end for Test 3.			
4.7.3.2.2 EN-DC FR1-FR1 SS-SINR relative measurement accuracy	**TEST CONFIGURATION 1, 2, 3, 4, 5, 6**		
	Test 1: N_{oc1}: -88 dBm/15kHz N_{oc2}: -88 dBm/15kHz $\hat{E}s_2 / N_{oc1}$: -1.75dB $\hat{E}s_3 / N_{oc2}$: -1.75dB Reported SINR values: ±3.5dB Test 2: N_{oc1}: -108.5dBm/15kHz N_{oc2}: -108.5dBm/15kHz $\hat{E}s_2 / N_{oc1}$: 20dB $\hat{E}s_3 / N_{oc2}$: 20dB Reported SINR values: ±3.5dB Test 3: N_{oc1}: -119.5dBm/15kHz + Δ_{BG_offset} N_{oc2}: -119.5dBm/15kHz + Δ_{BG_offset} $\hat{E}s_2 / N_{oc1}$: -4dB $\hat{E}s_3 / N_{oc2}$: -4dB Reported SINR values: ±4dB	Test 1: 0dB 0dB 0dB 0dB Via mapping Test 2: 0dB 0dB 0dB 0dB Via mapping Test 3: 0dB 0dB 0.8dB 0.8dB Via mapping	Test 1: N_{oc1}: -88 dBm/15kHz N_{oc2}: -88 dBm/15kHz $\hat{E}s_2 / N_{oc1}$: -1.75dB $\hat{E}s_3 / N_{oc2}$: -1.75dB SINR_x-10 to SINR_x+10 Test 2: N_{oc1}: -108.5dBm/15kHz N_{oc2}: -108.5dBm/15kHz $\hat{E}s_2 / N_{oc1}$: 20dB $\hat{E}s_3 / N_{oc2}$: 20dB SINR_x-10 to SINR_x+10 Test 3: N_{oc1}: -119.5dBm/15kHz + Δ_{BG_offset} N_{oc2}: -119.5dBm/15kHz + Δ_{BG_offset} $\hat{E}s_2 / N_{oc1}$: -3.2dB $\hat{E}s_3 / N_{oc2}$: -3.2dB SINR_x-11 to SINR_x+11
The derivation of the SINR values takes into account the uncertainty in Cell 3 SS- SINR from N_{oc} and $\hat{E}s_3 / N_{oc}$, the allowed UE reporting accuracy, and the UE mapping function. The SS- SINR values given above are for normal conditions. For extreme conditions, the SS- SINR values are 0.5dB wider at each for Tests 1 and 2 and 0dB wider at each end for Test 3.			
4.7.4.1.1 EN-DC FR1 SSB based L1-RSRP absolute measurement accuracy			
Test Configuration 1,2,4,5	Test 1: N_{oc1}: -94.65 dBm/15kHz $\hat{E}s_2 / N_{oc1}$: 10dB Reported L1-RSRP values: ±8.5dB (±4.5dB additionally for extreme conditions) Test 2: N_{oc1}: -119.5dBm/15kHz + Δ_{BG_offset} $\hat{E}s_2 / N_{oc1}$: -3dB Reported L1-RSRP values: ±5dB (±3dB additionally for extreme conditions)	Test 1: 0dB 0dB Via mapping Test 2: 0dB 0.8dB Via mapping	Test 1: N_{oc1}: -94.65dBm/15kHz $\hat{E}s_2 / N_{oc1}$: 10dB RSRP_62 to RSRP_82 Test 2: N_{oc1}: -119.2dBm/15kHz + Δ_{BG_offset} $\hat{E}s_2 / N_{oc1}$: -2.2dB RSRP_31 to RSRP_44 RSRP_31 to RSRP_45 RSRP_32 to RSRP_45 RSRP_32 to RSRP_46 RSRP_33 to RSRP_46 RSRP_34 to RSRP_47 RSRP_34 to RSRP_48 depending on operating band
Test Configuration 3,6	Test 1: N_{oc1}: -94.65 dBm/15kHz $\hat{E}s_2 / N_{oc1}$: 10dB Reported L1-RSRP values: ±8.5dB (±4.5dB additionally for extreme conditions) Test 2: N_{oc1}: -119.5dBm/15kHz + Δ_{BG_offset} $\hat{E}s_2 / N_{oc1}$: -3dB	Test 1: -1.35dB 0dB Via mapping Test 2: 0dB 0.8dB	Test 1: N_{oc1}: -96dBm/15kHz $\hat{E}s_2 / N_{oc1}$: 10dB RSRP_63 to RSRP_84 Test 2: N_{oc1}: -116.2dBm/15kHz + Δ_{BG_offset} $\hat{E}s_2 / N_{oc1}$: -2.2dB

	Reported L1-RSRP values: ±5dB (±3dB additionally for extreme conditions)	Via mapping	RSRP_34 to RSRP_47 RSRP_34 to RSRP_48 RSRP_35 to RSRP_48 RSRP_35 to RSRP_49 RSRP_36 to RSRP_49 RSRP_37 to RSRP_50 RSRP_37 to RSRP_51 depending on operating band
4.7.4.1.2 EN-DC FR1 SSB based L1-RSRP relative measurement accuracy			
Test Configuration 1,2,4,5	Test 1: N_{oc1}: -94.65 dBm/15kHz $\hat{E}_{s2}$ / N_{oc1}: 10dB Reported L1-RSRP values: ±8.5dB (±1dB additionally for extreme conditions) Test 2: N_{oc1}: -119.5dBm/15kHz + Δ_{BG_offset} $\hat{E}_{s2}$ / N_{oc1}: -3dB Reported L1-RSRP values: ±5dB (±1dB additionally for extreme conditions)	Test 1: 0dB 0dB Via mapping Test 2: 0dB 0.8dB Via mapping	Test 1: N_{oc1}: -94.65dBm/15kHz $\hat{E}_{s2}$ / N_{oc1}: 10dB RSRP_x-3 to RSRP_x+3 Test 2: N_{oc1}: -119.2dBm/15kHz + Δ_{BG_offset} $\hat{E}_{s2}$ / N_{oc1}: -2.2dB RSRP_x-3 to RSRP_x+3
Test Configuration 3,6	Test 1: N_{oc1}: -94.65 dBm/15kHz $\hat{E}_{s2}$ / N_{oc1}: 10dB Reported L1-RSRP values: ±8.5dB (±1dB additionally for extreme conditions) Test 2: N_{oc1}: -119.5dBm/15kHz + Δ_{BG_offset} $\hat{E}_{s2}$ / N_{oc1}: -3dB Reported L1-RSRP values: ±5dB (±1dB additionally for extreme conditions)	Test 1: -1.35dB 0dB Via mapping Test 2: 0dB 0.8dB Via mapping	Test 1: N_{oc1}: -96dBm/15kHz $\hat{E}_{s2}$ / N_{oc1}: 10dB RSRP_x-3 to RSRP_x+3 Test 2: N_{oc1}: -116.2dBm/15kHz + Δ_{BG_offset} $\hat{E}_{s2}$ / N_{oc1}: -2.2dB RSRP_x-3 to RSRP_x+3
4.7.4.2.1 EN-DC FR1 CSI-RS based L1-RSRP absolute measurement accuracy	Same as 4.7.4.1.1	Same as 4.7.4.1.1	Same as 4.7.4.1.1
4.7.4.2.2 EN-DC FR1 CSI-RS based L1-RSRP relative measurement accuracy	Same as 4.7.4.1.2	Same as 4.7.4.1.2	Same as 4.7.4.1.2
4.7.5.1 EN-DC FR1 SFTD measurement accuracy	N_{oc1}: -104dBm/15kHz $\hat{E}_{s1}$ / N_{oc1}: -3.0dB N_{oc2}: -104dBm/15kHz $\hat{E}_{s2}$ / N_{oc2}: 17.0dB	0dB 0.3dB 0dB 0dB	N_{oc1}: -104dBm/15kHz $\hat{E}_{s1}$ / N_{oc1}: -2.7dB N_{oc2}: -104dBm/15kHz $\hat{E}_{s2}$ / N_{oc2}: 17.0dB
4.7.7.1.1 EN-DC FR1 CSI-RS based CMR and no dedicated IMR configured and CSI-RS resource set with repetition off L1-SINR measurement accuracy			
Test Configuration 1,2,4,5	Test 1: N_{oc1}: -94.65 dBm/15kHz $\hat{E}_{s2}$ / N_{oc1}: 10dB Reported CSI-SINR values: ±5.5dB (±1dB additionally for extreme conditions) Test 2: N_{oc1}: -119.5dBm/15kHz + ΔBG_offset $\hat{E}_{s2}$ / N_{oc1}: -3dB Reported CSI-SINR values: ±5.5dB (±1dB additionally for extreme conditions)	Test 1: 0dB 0dB Via mapping Test 2: 0dB 0.8dB Via mapping	Test 1: N_{oc1}: -94.65dBm/15kHz $\hat{E}_{s2}$ / N_{oc1}: 10dB All bands: L1-SINR_28 to L1-SINR_57 Test 2: N_{oc1}: -119.2dBm/15kHz + Δ_{BG_offset} $\hat{E}_{s2}$ / N_{oc1}: -2.2dB All bands: L1-SINR_27 to L1-SINR_58
Test Configuration 3,6	Test 1: N_{oc1}: -94.65 dBm/15kHz $\hat{E}_{s2}$ / N_{oc1}: 10dB	Test 1: -1.35dB 0dB	Test 1: N_{oc1}: -96dBm/15kHz $\hat{E}_{s2}$ / N_{oc1}: 10dB

	Reported CSI-SINR values: ±5.5dB (±1dB additionally for extreme conditions) Test 2: N_{oc1}: -119.5dBm/15kHz + ΔBG_offset $\hat{E}_{s2}$ / N_{oc1}: -3dB Reported CSI-SINR values: ±5.5dB (±1dB additionally for extreme conditions)	Via mapping Test 2: 0dB 0.8dB Via mapping	All bands: L1-SINR_28 to L1-SINR_57 Test 2: N_{oc1}: -116.2dBm/15kHz + ΔBG_offset $\hat{E}_{s2}$ / N_{oc1}: -2.2dB All bands: L1-SINR_27 to L1-SINR_58
4.7.7.1.2 EN-DC FR1 CSI-RS based CMR and no dedicated IMR configured and CSI-RS resource set with repetition off L1-SINR relative measurement accuracy			
Same as 4.7.7.1.1	Same as 4.7.7.1.1	Same as 4.7.7.1.1	Test 1: N_{oc1}: -94.65dBm/15kHz $\hat{E}_{s2}$ / N_{oc1}: 10dB L1-SINR_x-9 to L1-SINR_x+9 Test 2: N_{oc1}: -119.2dBm/15kHz + Δ_{BG_offset} $\hat{E}_{s2}$ / N_{oc1}: -2.2dB L1-SINR_x-9 to L1-SINR_x+9
Same as 4.7.7.1.1	Same as 4.7.7.1.1	Same as 4.7.7.1.1	Test 1: N_{oc1}: -96dBm/15kHz $\hat{E}_{s2}$ / N_{oc1}: 10dB L1-SINR_x-9 to L1-SINR_x+9 Test 2: N_{oc1}: -116.2dBm/15kHz + ΔBG_offset $\hat{E}_{s2}$ / N_{oc1}: -2.2dB L1-SINR_x-9 to L1-SINR_x+9
4.7.7.2 EN-DC FR1 SSB based CMR and dedicated IMR L1-SINR absolute measurement accuracy			
Test Configuration 1,2,4,5	Test 1: N_{oc1}: -94.65 dBm/15kHz $\hat{E}_{s2}$ / N_{oc1}: 10dB Reported SS-SINR values: ±4.5dB (±1dB additionally for extreme conditions) Test 2: N_{oc1}: -119.5dBm/15kHz + ΔBG_offset $\hat{E}_{s2}$ / N_{oc1}: -3dB Reported SS-SINR values: ±4.5dB (±1dB additionally for extreme conditions)	Test 1: 0dB 0dB Via mapping Test 2: 0dB 0.8dB Via mapping	Test 1: N_{oc1}: -94.65dBm/15kHz $\hat{E}_{s2}$ / N_{oc1}: 10dB All bands: L1-SINR_30 to L1-SINR_55 Test 2: N_{oc1}: -119.2dBm/15kHz + Δ_{BG_offset} $\hat{E}_{s2}$ / N_{oc1}: -2.2dB All bands: L1-SINR_29 to L1-SINR_56
Test Configuration 3,6	Test 1: N_{oc1}: -94.65 dBm/15kHz $\hat{E}_{s2}$ / N_{oc1}: 10dB Reported CSI-SINR values: ±4.5dB (±1dB additionally for extreme conditions) Test 2: N_{oc1}: -119.5dBm/15kHz + ΔBG_offset $\hat{E}_{s2}$ / N_{oc1}: -3dB Reported CSI-SINR values: ±4.5dB (±1dB additionally for extreme conditions)	Test 1: -1.35dB 0dB Via mapping Test 2: 0dB 0.8dB Via mapping	Test 1: N_{oc1}: -96dBm/15kHz $\hat{E}_{s2}$ / N_{oc1}: 10dB All bands: L1-SINR_30 to L1-SINR_55 Test 2: N_{oc1}: -116.2dBm/15kHz + ΔBG_offset $\hat{E}_{s2}$ / N_{oc1}: -2.2dB All bands: L1-SINR_29 to L1-SINR_56
4.7.7.3.1 EN-DC FR1 CSI-RS based CMR and dedicated IMR L1-SINR absolute measurement accuracy			
Test Configuration	Test 1:	Test 1:	Test 1:

1,2,4,5	N_{oc1}: -94.65 dBm/15kHz $\hat{E}_{s2}$ / N_{oc1}: 10dB Reported CSI-SINR values: ±4.5dB (±1dB additionally for extreme conditions) Test 2: N_{oc1}: -119.5dBm/15kHz + ΔBG_offset $\hat{E}_{s2}$ / N_{oc1}: -3dB Reported CSI-SINR values: ±4.5dB (±1dB additionally for extreme conditions)	0dB 0dB Via mapping <u>Test 2:</u> 0dB 0.8dB Via mapping	N_{oc1}: -94.65dBm/15kHz $\hat{E}_{s2}$ / N_{oc1}: 10dB All bands: L1-SINR_30 to L1-SINR_55 Test 2: N_{oc1}: -119.2dBm/15kHz + Δ_{BG_offset} $\hat{E}_{s2}$ / N_{oc1}: -2.2dB All bands: L1-SINR_29 to L1-SINR_56
Test Configuration 3,6	Test 1: N_{oc1}: -94.65 dBm/15kHz $\hat{E}_{s2}$ / N_{oc1}: 10dB Reported CSI-SINR values: ±4.5dB (±1dB additionally for extreme conditions) Test 2: N_{oc1}: -119.5dBm/15kHz + ΔBG_offset $\hat{E}_{s2}$ / N_{oc1}: -3dB Reported CSI-SINR values: ±4.5dB (±1dB additionally for extreme conditions)	Test 1: -1.35dB 0dB Via mapping Test 2: 0dB 0.8dB Via mapping	Test 1: N_{oc1}: -96dBm/15kHz $\hat{E}_{s2}$ / N_{oc1}: 10dB All bands: L1-SINR_30 to L1-SINR_55 Test 2: N_{oc1}: -116.2dBm/15kHz + ΔBG_offset $\hat{E}_{s2}$ / N_{oc1}: -2.2dB All bands: L1-SINR_29 to L1-SINR_56
4.7.7.3.2 EN-DC FR1 CSI-RS based CMR and dedicated IMR L1-SINR relative measurement accuracy			
Same as 4.7.7.1.2	Same as 4.7.7.1.2	Same as 4.7.7.1.2	Same as 4.7.7.1.2
Same as 4.7.7.1.2	Same as 4.7.7.1.2	Same as 4.7.7.1.2	Same as 4.7.7.1.2

Table F.1.3.2-1a: Derivation of test requirements for NE-DC FR1 RRM tests

Test	Minimum requirement in TS 38.133 [6]	Test tolerance (TT)	Test requirement in TS 38.533
4A.1.1.1 NE-DC FR1 addition and release delay of known PSCell	Noc: -104dBm/15kHz Ês / Noc: +17dB B1 Threshold Test Configuration 1, 2, 4, 5: -96 dBm/15kHz Test Configuration 3,6: -93 dBm/15kHz	0dB 0dB -1dB -4dB	Noc: -104dBm/15kHz Ês / Noc: +17dB Test Configuration 1, 2, 4, 5: -97 dBm/15kHz Test Configuration 3,6: -97 dBm/15kHz
4A.2.1.1 NE-DC FR1 SFTD accuracy	Noc1: Test Configuration 1, 2, 4, 5: -104dBm/15kHz Test Configuration 3,6: -101dBm/15kHz Ês1 / Noc1: -3dB Noc2: -104dBm/15kHz Ês2 / Noc2: +17dB	0dB 0dB 0.3dB 0dB 0dB	Noc1: Test Configuration 1, 2, 4, 5: -104dBm/15kHz Test Configuration 3,6: -101dBm/15kHz Ês1 / Noc1: -2.7dB Noc2: -104dBm/15kHz Ês2 / Noc2: +17dB

Table F.1.3.2-2: Derivation of test requirements for NR SA FR1 RRM tests

Test	Minimum requirement in TS 38.133 [6]	Test tolerance (TT)	Test requirement in TS 38.533
6.1.1.1 NR SA FR1 cell re-selection	During T1: Noc: -98dBm/15kHz Ês1 / Noc: +16dB Ês2 / Noc: -infinity During T2: Noc: -98dBm/15kHz Ês1 / Noc: +13dB Ês2 / Noc: +16dB	During T1: 0dB 0dB 0dB During T2: 0dB 0dB 0.45dB	During T1: Noc: -98dBm/15kHz Ês1 / Noc: +16dB Ês2 / Noc: -infinity During T2: Noc: -98dBm/15kHz Ês1 / Noc: +13dB Ês2 / Noc: +16.45dB

	During T3: Noc: -98dBm/15kHz Ês1 / Noc: +16dB Ês2 / Noc: +13dB	During T3: 0dB 0.45dB 0dB	During T3: Noc: -98dBm/15kHz Ês1 / Noc: +16.45dB Ês2 / Noc: +13dB
6.1.1.2 NR SA FR1-FR1 cell re-selection	During T1: Noc1: -98dBm/15kHz Noc2: -98dBm/15kHz Ês1 / Noc1: +14dB Ês2 / Noc2: -4dB During T2: Noc1: -98dBm/15kHz Noc2: -98dBm/15kHz Ês1 / Noc1: +14dB Ês2 / Noc2: -infinity During T3: Noc1: -98dBm/15kHz Noc2: -98dBm/15kHz Ês1 / Noc1: +14dB Ês2 / Noc2: +12dB	During T1: 0dB -2dB 1.6dB 0.4dB During T2: 0dB 0dB 1.6dB 0dB During T3: 0dB 0dB 1.6dB 1.6dB	During T1: Noc1: -98dBm/15kHz Noc2: -100dBm/15kHz Ês1 / Noc1: +15.6dB Ês2 / Noc2: -3.6dB During T2: Noc1: -98dBm/15kHz Noc2: -98dBm/15kHz Ês1 / Noc1: +15.6dB Ês2 / Noc2: -infinity During T3: Noc1: -98dBm/15kHz Noc2: -98dBm/15kHz Ês1 / Noc1: +15.6dB Ês2 / Noc2: 13.6dB
6.1.1.3 NR SA FR1 cell re-selection for UE fulfilling low mobility relaxed measurement criterion	During T1: Noc: -98dBm/15kHz Ês1 / Noc: +13dB Ês2 / Noc: +16dB During T2: Noc: -98dBm/15kHz Ês1 / Noc: +16dB Ês2 / Noc: +13dB In Signalling SSearchDeltaP = 3dB	During T1: 0dB -0.45dB 0dB During T2: 0dB 0dB -0.45dB In Signalling 3dB	During T1: Noc: -98dBm/15kHz Ês1 / Noc: +12.55dB Ês2 / Noc: +16dB During T2: Noc: -98dBm/15kHz Ês1 / Noc: +16dB Ês2 / Noc: +12.55dB In Signalling SSearchDeltaP = 6dB
6.1.1.4 NR SA FR1 cell re-selection for UE fulfilling not-at-cell edge relaxed measurement criterion	During T1: Noc: -98dBm/15kHz Ês1 / Noc: +13dB Ês2 / Noc: +16dB During T2: Noc: -98dBm/15kHz Ês1 / Noc: +16dB Ês2 / Noc: +13dB	During T1: 0dB -0.45dB 0dB During T2: 0dB 0dB -0.45dB	During T1: Noc: -98dBm/15kHz Ês1 / Noc: +12.55dB Ês2 / Noc: +16dB During T2: Noc: -98dBm/15kHz Ês1 / Noc: +16dB Ês2 / Noc: +12.55dB
6.1.1.5 NR SA FR1-FR1 cell re-selection for UE fulfilling low mobility relaxed measurement criterion	During T1: Noc1: -98dBm/15kHz Ês1 / Noc1: +14dB Noc2: -98dBm/15kHz Ês2 / Noc2: -4dB During T2: Noc1: -98dBm/15kHz Ês1 / Noc1: +14dB Noc2: -98dBm/15kHz Ês2 / Noc2: +12dB In signalling: Thresh_X_HighP of Cell 1 = 48dB Thresh_X_HighP of Cell 2 = 48dB Thresh_X_LowP of Cell 1 = 50dB Thresh_X_LowP of Cell 2 = 50dB Thresh_Serving_LowP of Cell 1 = 44dB Thresh_Serving_LowP of Cell 2 = 44dB SSearchDeltaP of Cell 1 = 3dB SSearchDeltaP of Cell 2 = 3dB	During T1: 0dB 0dB 0dB 0.3dB During T2: 0dB 0dB 0dB -2.25dB In signalling: 0dB -4dB -2dB 0dB 0dB 2dB 0dB 12dB	During T1: Noc1: -98dBm/15kHz Ês1 / Noc1: +14dB Noc2: -98dBm/15kHz Ês2 / Noc2: -3.7dB During T2: Noc1: -98dBm/15kHz Ês1 / Noc1: +14dB Noc1: -98dBm/15kHz Ês2 / Noc2: +9.75dB In signalling: Thresh_X_HighP of Cell 1 = 48dB Thresh_X_HighP of Cell 2 = 44dB Thresh_X_LowP of Cell 1 = 48dB Thresh_X_LowP of Cell 2 = 50dB Thresh_Serving_LowP of Cell 1 = 44dB Thresh_Serving_LowP of Cell 2 = 46dB

			SSearchDeltaP of Cell 1 = 3dB SSearchDeltaP of Cell 2 = 15dB
6.1.1.6 NR SA FR1-FR1 cell re-selection for UE fulfilling not-at-cell edge relaxed measurement criterion	During T1: Noc1: -98dBm/15kHz Ês1 / Noc1: +14dB Noc2: -98dBm/15kHz Ês2 / Noc2: -4dB During T2: Noc1: -98dBm/15kHz Ês1 / Noc1: +14dB Noc2: -98dBm/15kHz Ês2 / Noc2: +12dB In signalling: SSearchThresholdP of Cell 1 = 50dB SSearchThresholdP of Cell 2 = 50dB	During T1: 0dB 2dB -2dB 0.35dB During T2: 0dB 0dB -2dB 4dB In signalling: 0dB -16dB	During T1: Noc1: -98dBm/15kHz Ês1 / Noc1: +16dB Noc2: -100dBm/15kHz Ês2 / Noc2: -3.65dB During T2: Noc1: -98dBm/15kHz Ês1 / Noc1: +14dB Noc1: -100dBm/15kHz Ês2 / Noc2: +16dB In signalling: SSearchThresholdP of Cell 1 = 50dB SSearchThresholdP of Cell 2 = 34dB
6.1.1.7 NR SA FR1 cell re-selection for UE configured with highSpeedMeasFlag-r16	During T1: Noc: -98dBm/15kHz Ês1 / Noc: +16dB Ês2 / Noc: -infinity During T2: Noc: -98dBm/15kHz Ês1 / Noc: +13dB Ês2 / Noc: +16dB During T3: Noc: -98dBm/15kHz Ês1 / Noc: +16dB Ês2 / Noc: +13dB	During T1: 0dB 0dB 0dB During T2: 0dB 0dB 0.45dB During T3: 0dB 0.45dB 0dB	During T1: Noc: -98dBm/15kHz Ês1 / Noc: +16dB Ês2 / Noc: -infinity During T2: Noc: -98dBm/15kHz Ês1 / Noc: +13dB Ês2 / Noc: +16.45dB During T3: Noc: -98dBm/15kHz Ês1 / Noc: +16.45dB Ês2 / Noc: +13dB
6.1.2.1 NR SA FR1 – E-UTRA cell re-selection to higher priority E-UTRA	During T1: Noc1: -98dBm/15kHz Noc2: -98dBm/15kHz Ês1 / Noc1: +14dB Ês2 / Noc2: -infinity During T2: Noc1: -98dBm/15kHz Noc2: -98dBm/15kHz Ês1 / Noc1: +14dB Ês2 / Noc2: +12dB During T3: Noc1: -98dBm/15kHz Noc2: -98dBm/15kHz Ês1 / Noc1: +14dB Ês2 / Noc2: -4dB	During T1: 0dB 0dB 0dB 0dB During T2: 0dB 0dB 1.6dB 1.6dB During T3: 0dB -2dB 1.6dB 0.4dB	During T1: Noc1: -98dBm/15kHz Noc2: -98dBm/15kHz Ês1 / Noc1: +14dB Ês2 / Noc2: -infinity During T2: Noc1: -98dBm/15kHz Noc2: -98dBm/15kHz Ês1 / Noc1: +15.6dB Ês2 / Noc2: 13.6dB During T3: Noc1: -98dBm/15kHz Noc2: -100dBm/15kHz Ês1 / Noc1: +15.6dB Ês2 / Noc2: -3.6dB
6.1.2.2 NR SA FR1 – E-UTRA cell re-selection to lower priority E-UTRA	During T1: Noc1: -98dBm/15kHz Noc2: -98dBm/15kHz Ês1 / Noc1: -4dB Ês2 / Noc2: +14dB During T2: Noc1: -98dBm/15kHz Noc2: -98dBm/15kHz Ês1 / Noc1: +12dB Ês2 / Noc2: +14dB	During T1: -2dB 0dB 0.4dB 1.6dB During T2: 0dB 0dB 1.6dB 0dB	During T1: Noc1: -100dBm/15kHz Noc2: -98dBm/15kHz Ês1 / Noc1: -3.6dB Ês2 / Noc2: +15.6dB During T2: Noc1: -98dBm/15kHz Noc2: -98dBm/15kHz Ês1 / Noc1: +13.6dB Ês2 / Noc2: +14dB
6.1.2.3 NR SA FR1 – E-UTRA cell re-selection to lower priority E-UTRAN for UE fulfilling low mobility relaxed measurement criterion	During T1: Noc1: -98dBm/15kHz Noc2: -98dBm/15kHz Ês1 / Noc1: -4dB Ês2 / Noc2: +14dB During T2:	During T1: -2dB 0dB 0.4dB 1.6dB During T2:	During T1: Noc1: -100dBm/15kHz Noc2: -98dBm/15kHz Ês1 / Noc1: -3.6dB Ês2 / Noc2: +15.6dB During T2:

	Noc1: -98dBm/15kHz Noc2: -98dBm/15kHz Ês1 / Noc1: +12dB Ês2 / Noc2: +14dB	0dB 0dB 1.6dB 0dB	Noc1: -98dBm/15kHz Noc2: -98dBm/15kHz Ês1 / Noc1: +13.6dB Ês2 / Noc2: +14dB
6.1.2.4 NR SA FR1 – E-UTRA cell re-selection to lower priority E-UTRAN for UE fulfilling not-at-cell edge relaxed measurement criterion	During T1: Noc1: -98dBm/15kHz Noc2: -98dBm/15kHz Ês1 / Noc1: -4dB Ês2 / Noc2: +14dB During T2: Noc1: -98dBm/15kHz Noc2: -98dBm/15kHz Ês1 / Noc1: +12dB Ês2 / Noc2: +14dB	During T1: -2dB 0dB 0.4dB 1.6dB During T2: 0dB 0dB 1.6dB 0dB	During T1: Noc1: -100dBm/15kHz Noc2: -98dBm/15kHz Ês1 / Noc1: -3.6dB Ês2 / Noc2: +15.6dB During T2: Noc1: -98dBm/15kHz Noc2: -98dBm/15kHz Ês1 / Noc1: +13.6dB Ês2 / Noc2: +14dB
6.1.2.5 NR SA FR1 – E-UTRA cell re-selection to lower priority E-UTRA for UE configured with highSpeedMeasFlag-r16	Same as 6.1.2.2	Same as 6.1.2.2	Same as 6.1.2.2
6.3.1.1 NR SA FR1 handover with known target cell	TEST CONFIGURATION 1, 2 A3-Offset: 0dB	 -1dB	 A3-Offset: -1dB
	During T1: Noc1: -98dBm/15kHz Noc2: -98dBm/15kHz Ês1 / Noc1: 8dB Ês2 / Noc2: -infinity During T2: Noc1: -98dBm/15kHz Noc2: -98dBm/15kHz Ês1 / Noc1: +8dB Ês2 / Noc2: +11dB During T3: Noc1: -98dBm/15kHz Noc2: -98dBm/15kHz Ês1 / Noc1: +8dB Ês2 / Noc2: +11dB	During T1: 0dB 0dB 0dB 0dB During T2: 0dB 0dB 0dB -1dB During T3: 0dB 0dB 0dB -1dB	During T1: Noc1: -98dBm/15kHz Noc2: -98dBm/15kHz Ês1 / Noc1: 8dB Ês2 / Noc2: -infinity During T2: Noc1: -98dBm/15kHz Noc2: -98dBm/15kHz Ês1 / Noc1: +8dB Ês2 / Noc2: +10dB During T3: Noc1: -98dBm/15kHz Noc2: -98dBm/15kHz Ês1 / Noc1: +8dB Ês2 / Noc2: +10dB
	TEST CONFIGURATION 3 A3-Offset: 0dB	 -1dB	 A3-Offset: -1dB
	During T1: Noc1: -98dBm/15kHz Noc2: -98dBm/15kHz Ês1 / Noc1: 8dB Ês2 / Noc2: -infinity During T2: Noc1: -98dBm/15kHz Noc2: -98dBm/15kHz Ês1 / Noc1: +8dB Ês2 / Noc2: +11dB During T3: Noc1: -98dBm/15kHz Noc2: -98dBm/15kHz Ês1 / Noc1: +8dB Ês2 / Noc2: +11dB	During T1: 0dB 0dB 0dB 0dB During T2: 0dB 0dB 0dB -1dB During T3: 0dB 0dB 0dB -1dB	During T1: Noc1: -98dBm/15kHz Noc2: -98dBm/15kHz Ês1 / Noc1: 8dB Ês2 / Noc2: -infinity During T2: Noc1: -98dBm/15kHz Noc2: -98dBm/15kHz Ês1 / Noc1: +8dB Ês2 / Noc2: +10dB During T3: Noc1: -98dBm/15kHz Noc2: -98dBm/15kHz Ês1 / Noc1: +8dB Ês2 / Noc2: +10dB
6.3.1.2 NR SA FR1 handover with unknown target cell	During T1: Noc1: -98dBm/15kHz Noc2: -98dBm/15kHz Ês1 / Noc1: 8dB Ês2 / Noc2: -infinity During T2: Noc1: -98dBm/15kHz Noc2: -98dBm/15kHz Ês1 / Noc1: +8dB	During T1: 0dB 0dB 0dB 0dB During T2: 0dB 0dB 0dB	During T1: Noc1: -98dBm/15kHz Noc2: -98dBm/15kHz Ês1 / Noc1: 8dB Ês2 / Noc2: -infinity During T2: Noc1: -98dBm/15kHz Noc2: -98dBm/15kHz Ês1 / Noc1: +8dB

	Ês2 / Noc2: +8dB	0dB	Ês2 / Noc2: +8dB
6.3.1.3 NR SA FR1-FR1 Handover with unknown Target Cell	During T1: Noc1: -98dBm/15kHz Noc2: -98dBm/15kHz Ês1 / Noc1: 4dB Ês2 / Noc2: -infinity During T2: Noc1: -98dBm/15kHz Noc2: -98dBm/15kHz Ês1 / Noc1: +4dB Ês2 / Noc2: +5dB	During T1: 0dB 0dB 0dB 0dB During T2: 0dB 0dB 0dB 0dB	During T1: Noc1: -98dBm/15kHz Noc2: -98dBm/15kHz Ês1 / Noc1: 4dB Ês2 / Noc2: -infinity During T2: Noc1: -98dBm/15kHz Noc2: -98dBm/15kHz Ês1 / Noc1: +4dB Ês2 / Noc2: +5dB
6.3.1.4 NR SA FR1 – E-UTRA handover with known target cell	During T1: Noc1: -100dBm/15kHz Noc2: -98dBm/15kHz Ês1 / Noc1: +12dB Ês2 / Noc2: -infinity During T2: Noc1: -100dBm/15kHz Noc2: -98dBm/15kHz Ês1 / Noc1: -4dB Ês2 / Noc2: +8dB During T3: Noc1: -100dBm/15kHz Noc2: -98dBm/15kHz Ês1 / Noc1: -4dB Ês2 / Noc2: +8dB	During T1: 0dB 0dB 1.55dB 0dB During T2: 0dB 0dB -1.55dB 1.55dB During T3: 0dB 0dB -1.55dB 1.55dB	During T1: Noc1: -100dBm/15kHz Noc2: -98dBm/15kHz Ês1 / Noc1: +13.55dB Ês2 / Noc2: -infinity During T2: Noc1: -100dBm/15kHz Noc2: -98dBm/15kHz Ês1 / Noc1: -5.55dB Ês2 / Noc2: +9.55dB During T3: Noc1: -100dBm/15kHz Noc2: -98dBm/15kHz Ês1 / Noc1: -5.55dB Ês2 / Noc2: +9.55dB
6.3.1.5 NR SA FR1 – E-UTRA handover with unknown target cell	During T1: Noc1: -98dBm/15kHz Noc2: -98dBm/15kHz Ês1 / Noc1: 0dB Ês2 / Noc2: -infinity During T2: Noc1: -98dBm/15kHz Noc2: -98dBm/15kHz Ês1 / Noc1: 0dB Ês2 / Noc2: +7dB	During T1: 0dB 0dB 0dB 0dB During T2: 0dB 0dB 0dB 0dB	During T1: Noc1: -98dBm/15kHz Noc2: -98dBm/15kHz Ês1 / Noc1: 0dB Ês2 / Noc2: -infinity During T2: Noc1: -98dBm/15kHz Noc2: -98dBm/15kHz Ês1 / Noc1: 0dB Ês2 / Noc2: +7dB
6.3.1.6 NR SA FR1 – UTRAN FDD handover with known target cell	During T1: Noc: -100dBm/15kHz Ês / Noc: 12dB Ioc: -70dBm/3.84MHz Îor / Ioc: -infinity CPICH Ec / Ior: -10dB SCH Ec / Ior: -12dB During T2: Noc: -100dBm/15kHz Ês / Noc: -4dB Ioc: -70dBm/3.84MHz Îor / Ioc: -infinity CPICH Ec / Ior: -10dB SCH Ec / Ior: -12dB During T3: Noc: -100dBm/15kHz Ês / Noc: -4dB Ioc: -70dBm/3.84MHz Îor / Ioc: -infinity CPICH Ec / Ior: -10dB SCH Ec / Ior: -12dB	During T1: -1.54dB 0dB 0dB 0dB 0dB 0dB During T2: -1.54dB 0dB 0dB 0dB 0dB 0dB During T3: -1.54dB 0dB 0dB 0dB 0dB 0dB	During T1: Noc: -101.54dBm/15kHz Ês / Noc: 12dB Ioc: -70dBm/3.84MHz Îor / Ioc: -infinity CPICH Ec / Ior: -10dB SCH Ec / Ior: -12dB During T2: Noc: -101.54dBm/15kHz Ês / Noc: -4dB Ioc: -70dBm/3.84MHz Îor / Ioc: -infinity CPICH Ec / Ior: -10dB SCH Ec / Ior: -12dB During T3: Noc: -101.54dBm/15kHz Ês / Noc: -4dB Ioc: -70dBm/3.84MHz Îor / Ioc: -infinity CPICH Ec / Ior: -10dB SCH Ec / Ior: -12dB
6.3.1.7 NR SA FR1 synchronous DAPS handover	During T1: Noc: -98dBm/15kHz Ês1 / Noc: +8dB Ês2 / Noc: -infinity	During T1: 0dB 0dB 0dB	During T1: Noc: -98dBm/15kHz Ês1 / Noc: +8dB Ês2 / Noc: -infinity

	During T2: Noc: -98dBm/15kHz Ês1 / Noc: +8dB Ês2 / Noc: +9dB During T3: Noc: -98dBm/15kHz Ês1 / Noc: +8dB Ês2 / Noc: +9dB During T4: Noc: -98dBm/15kHz Ês1 / Noc: +8dB Ês2 / Noc: +9dB During T5: Noc: -98dBm/15kHz Ês1 / Noc: +8dB Ês2 / Noc: +9dB In signaling: A3-offset: 0dB	During T2: 0dB 0dB 1dB During T3: 0dB 0dB 1dB During T4: 0dB 0dB 1dB During T5: 0dB 0dB 1dB In signaling: -1dB	During T2: Noc: -98dBm/15kHz Ês1 / Noc: +8dB Ês2 / Noc: +10dB During T3: Noc: -98dBm/15kHz Ês1 / Noc: +8dB Ês2 / Noc: +10dB During T4: Noc: -98dBm/15kHz Ês1 / Noc: +8dB Ês2 / Noc: +10dB During T5: Noc: -98dBm/15kHz Ês1 / Noc: +8dB Ês2 / Noc: +10dB In signaling: A3-offset: -1dB
6.3.1.8 NR SA FR1 asynchronous DAPS handover	During T1: Noc: -98dBm/15kHz Ês1 / Noc: +8dB Ês2 / Noc: -infinity During T2: Noc: -98dBm/15kHz Ês1 / Noc: +8dB Ês2 / Noc: +9dB During T3: Noc: -98dBm/15kHz Ês1 / Noc: +8dB Ês2 / Noc: +9dB During T4: Noc: -98dBm/15kHz Ês1 / Noc: +8dB Ês2 / Noc: +9dB During T5: Noc: -98dBm/15kHz Ês1 / Noc: +8dB Ês2 / Noc: +9dB In signaling: A3-offset: 0dB	During T1: 0dB 0dB 0dB During T2: 0dB 0dB 1dB During T3: 0dB 0dB 1dB During T4: 0dB 0dB 1dB During T5: 0dB 0dB 1dB In signaling: -1dB	During T1: Noc: -98dBm/15kHz Ês1 / Noc: +8dB Ês2 / Noc: -infinity During T2: Noc: -98dBm/15kHz Ês1 / Noc: +8dB Ês2 / Noc: +10dB During T3: Noc: -98dBm/15kHz Ês1 / Noc: +8dB Ês2 / Noc: +10dB During T4: Noc: -98dBm/15kHz Ês1 / Noc: +8dB Ês2 / Noc: +10dB During T5: Noc: -98dBm/15kHz Ês1 / Noc: +8dB Ês2 / Noc: +10dB In signaling: A3-offset: -1dB
6.3.1.9 NR SA FR1 Intra-band inter-frequency synchronous DAPS handover	During T1: Noc: -98dBm/15kHz Ês1 / Noc: +8dB Ês2 / Noc: -infinity During T2: Noc: -98dBm/15kHz Ês1 / Noc: +8dB Ês2 / Noc: +8dB During T3: Noc: -98dBm/15kHz Ês1 / Noc: +8dB Ês2 / Noc: +8dB During T4: Noc: -98dBm/15kHz Ês1 / Noc: +8dB	During T1: 0dB 0dB 0dB During T2: 0dB 0dB 3.7dB During T3: 0dB 0dB 3.7dB During T4: 0dB 0dB	During T1: Noc: -98dBm/15kHz Ês1 / Noc: +8dB Ês2 / Noc: -infinity During T2: Noc: -98dBm/15kHz Ês1 / Noc: +8dB Ês2 / Noc: +11.7dB During T3: Noc: -98dBm/15kHz Ês1 / Noc: +8dB Ês2 / Noc: +11.7dB During T4: Noc: -98dBm/15kHz Ês1 / Noc: +8dB

	Ês2 / Noc: +8dB During T5: Noc: -98dBm/15kHz Ês1 / Noc: +8dB Ês2 / Noc: +8dB In signaling: A3-offset: 0dB	3.7dB During T5: 0dB 0dB 3.7dB In signaling: -3dB	Ês2 / Noc: +11.7dB During T5: Noc: -98dBm/15kHz Ês1 / Noc: +8dB Ês2 / Noc: +11.7dB In signaling: A3-offset: -3dB
6.3.1.10 NR SA FR1 Intra-band inter-frequency asynchronous DAPS handover	During T1: Noc: -98dBm/15kHz Ês1 / Noc: +8dB Ês2 / Noc: -infinity During T2: Noc: -98dBm/15kHz Ês1 / Noc: +8dB Ês2 / Noc: +8dB During T3: Noc: -98dBm/15kHz Ês1 / Noc: +8dB Ês2 / Noc: +8dB During T4: Noc: -98dBm/15kHz Ês1 / Noc: +8dB Ês2 / Noc: +8dB During T5: Noc: -98dBm/15kHz Ês1 / Noc: +8dB Ês2 / Noc: +8dB In signaling: A3-offset: 0dB	During T1: 0dB 0dB 0dB During T2: 0dB 0dB 3.7dB During T3: 0dB 0dB 3.7dB During T4: 0dB 0dB 3.7dB During T5: 0dB 0dB 3.7dB In signaling: -3dB	During T1: Noc: -98dBm/15kHz Ês1 / Noc: +8dB Ês2 / Noc: -infinity During T2: Noc: -98dBm/15kHz Ês1 / Noc: +8dB Ês2 / Noc: +11.7dB During T3: Noc: -98dBm/15kHz Ês1 / Noc: +8dB Ês2 / Noc: +11.7dB During T4: Noc: -98dBm/15kHz Ês1 / Noc: +8dB Ês2 / Noc: +11.7dB During T5: Noc: -98dBm/15kHz Ês1 / Noc: +8dB Ês2 / Noc: +11.7dB In signaling: A3-offset: -3dB
6.3.1.11 NR SA FR1 Inter-band inter-frequency synchronous DAPS handover	During T1: Noc: -98dBm/15kHz Ês1 / Noc: +4dB Ês2 / Noc: -infinity During T2: Noc: -98dBm/15kHz Ês1 / Noc: +4dB Ês2 / Noc: +4dB During T3: Noc: -98dBm/15kHz Ês1 / Noc: +4dB Ês2 / Noc: +4dB During T4: Noc: -98dBm/15kHz Ês1 / Noc: +4dB Ês2 / Noc: +4dB During T5: Noc: -98dBm/15kHz Ês1 / Noc: +4dB Ês2 / Noc: +4dB In signaling: A3-offset: -6dB	During T1: 0dB 0dB 0dB During T2: 0dB 0dB 0dB During T3: 0dB 0dB 0dB During T4: 0dB 0dB 0dB During T5: 0dB 0dB 0dB In signaling: -1dB for config 1,2,4,5,9 In signaling: -4dB for config 3,6	During T1: Noc: -98dBm/15kHz Ês1 / Noc: +4dB Ês2 / Noc: -infinity During T2: Noc: -98dBm/15kHz Ês1 / Noc: +4dB Ês2 / Noc: +4dB During T3: Noc: -98dBm/15kHz Ês1 / Noc: +4dB Ês2 / Noc: +4dB During T4: Noc: -98dBm/15kHz Ês1 / Noc: +4dB Ês2 / Noc: +4dB During T5: Noc: -98dBm/15kHz Ês1 / Noc: +4dB Ês2 / Noc: +4dB In signaling: -7dB for config 1,2,4,5,9 In signaling: -10dB for config 3,6 In signaling:

		In signaling: 2dB for config 7,8	-4dB for config 7,8
6.3.1.12 NR SA FR1 Inter-band inter-frequency asynchronous DAPS handover	During T1: Noc: -98dBm/15kHz Ês1 / Noc: +4dB Ês2 / Noc: -infinity During T2: Noc: -98dBm/15kHz Ês1 / Noc: +4dB Ês2 / Noc: +4dB During T3: Noc: -98dBm/15kHz Ês1 / Noc: +4dB Ês2 / Noc: +4dB During T4: Noc: -98dBm/15kHz Ês1 / Noc: +4dB Ês2 / Noc: +4dB During T5: Noc: -98dBm/15kHz Ês1 / Noc: +4dB Ês2 / Noc: +4dB In signaling: A3-offset: -4dB	During T1: 0dB 0dB 0dB During T2: 0dB 0dB 0dB During T3: 0dB 0dB 0dB During T4: 0dB 0dB 0dB During T5: 0dB 0dB 0dB In signaling: -3dB for config 1,2,4,5,9 In signaling: -6dB for config 3,6 In signaling: 0dB for config 7,8	During T1: Noc: -98dBm/15kHz Ês1 / Noc: +4dB Ês2 / Noc: -infinity During T2: Noc: -98dBm/15kHz Ês1 / Noc: +4dB Ês2 / Noc: +4dB During T3: Noc: -98dBm/15kHz Ês1 / Noc: +4dB Ês2 / Noc: +4dB During T4: Noc: -98dBm/15kHz Ês1 / Noc: +4dB Ês2 / Noc: +4dB During T5: Noc: -98dBm/15kHz Ês1 / Noc: +4dB Ês2 / Noc: +4dB In signaling: -7dB for config 1,2,4,5,9 In signaling: -10dB for config 3,6 In signaling: -4dB for config 7,8
6.3.2.1.1 NR SA FR1 RRC re-establishment	During T1: Noc: -98dBm/15kHz Ês1 / Noc: +7dB Ês2 / Noc: +4dB During T2: Noc: -98dBm/15kHz Ês1 / Noc: -infinity Ês2 / Noc: +4dB During T3: Noc: -98dBm/15kHz Ês1 / Noc: -infinity Ês2 / Noc: +4dB	During T1: 0dB 0dB 0dB During T2: 0dB 0dB 0dB During T3: 0dB 0dB 0dB	During T1: Noc: -98dBm/15kHz Ês1 / Noc: +7dB Ês2 / Noc: +4dB During T2: Noc: -98dBm/15kHz Ês1 / Noc: -infinity Ês2 / Noc: +4dB During T3: Noc: -98dBm/15kHz Ês1 / Noc: -infinity Ês2 / Noc: +4dB
6.3.2.1.2 NR SA FR1 - FR1 RRC re-establishment	During T1: Noc1: -98dBm/15kHz Noc2: -98dBm/15kHz Ês1 / Noc1: +4dB Ês2 / Noc2: -infinity During T2: Noc1: -98dBm/15kHz Noc2: -98dBm/15kHz Ês1 / Noc1: -infinity Ês2 / Noc2: -infinity During T3: Noc1: -98dBm/15kHz Noc2: -98dBm/15kHz Ês1 / Noc1: -infinity Ês2 / Noc2: +7dB	During T1: 0dB 0dB 0dB 0dB During T2: 0dB 0dB 0dB 0dB During T3: 0dB 0dB 0dB 0dB	During T1: Noc1: -98dBm/15kHz Noc2: -98dBm/15kHz Ês1 / Noc1: +4dB Ês2 / Noc2: -infinity During T2: Noc1: -98dBm/15kHz Noc2: -98dBm/15kHz Ês1 / Noc1: -infinity Ês2 / Noc2: -infinity During T3: Noc1: -98dBm/15kHz Noc2: -98dBm/15kHz Ês1 / Noc1: -infinity Ês2 / Noc2: +7dB
6.3.2.1.3 NR SA FR1 RRC re-	During T1:	During T1:	During T1:

establishment without serving cell timing	Noc: -98dBm/15kHz Ês$_1$ / Noc: +4dB Ês$_2$ / Noc: -infinity During T2: Noc: -98dBm/15kHz Ês$_1$ / Noc: -infinity Ês$_2$ / Noc: -infinity During T3: Noc: -98dBm/15kHz Ês$_1$ / Noc: -infinity Ês$_2$ / Noc: +4dB	0dB 0dB 0dB During T2: 0dB 0dB 0dB During T3: 0dB 0dB 0dB	Noc: -98dBm/15kHz Ês$_1$ / Noc: +4dB Ês$_2$ / Noc: -infinity During T2: Noc: -98dBm/15kHz Ês$_1$ / Noc: -infinity Ês$_2$ / Noc: -infinity During T3: Noc: -98dBm/15kHz Ês$_1$ / Noc: -infinity Ês$_2$ / Noc: +4dB
6.3.2.2.1	Absolute uplink power: Normal conditions ±9dB Relative uplink power step: Normal conditions ±2.5dB Uplink timing: 15kHz SCS T_e ±12*64*T_c 30kHz SCS T_e ±8*64*T_c	 2.1dB 0.7dB 112T_c 112T_c	Absolute uplink power: Normal conditions ±11.1dB Relative uplink power step: Normal conditions ±3.2dB Uplink timing: 15kHz SCS T_e ±880*T_c 30kHz SCS T_e ±624*T_c
6.3.2.2.2	Same as 6.3.2.2.1	Same as 6.3.2.2.1	Same as 6.3.2.2.1
6.3.2.2.3	Same as 6.3.2.2.1	Same as 6.3.2.2.1	Same as 6.3.2.2.1
6.3.2.2.4	Same as 6.3.2.2.1	Same as 6.3.2.2.1	Same as 6.3.2.2.1
6.3.2.3.1 NR SA FR1 RRC connection release with redirection	During T1: Noc1: -98dBm/15kHz Noc2: -98dBm/15kHz Ês1 / Noc1: +4dB Ês2 / Noc2: -infinity During T2: Noc1: -98dBm/15kHz Noc2: -98dBm/15kHz Ês1 / Noc1: +4dB Ês2 / Noc2: +4dB	During T1: 0dB 0dB 0dB 0dB During T2: 0dB 0dB 0dB 0dB	During T1: Noc1: -98dBm/15kHz Noc2: -98dBm/15kHz Ês1 / Noc1: +4dB Ês2 / Noc2: -infinity During T2: Noc1: -98dBm/15kHz Noc2: -98dBm/15kHz Ês1 / Noc1: +4dB Ês2 / Noc2: +4dB
6.3.2.3.2 NR SA FR1 – E-UTRA RRC connection release with redirection	During T1: Noc1: -98dBm/15kHz Noc2: -98dBm/15kHz Ês1 / Noc1: +4dB Ês2 / Noc2: -infinity During T2: Noc1: -98dBm/15kHz Noc2: -98dBm/15kHz Ês1 / Noc1: +4dB Ês2 / Noc2: +4dB	During T1: 0dB 0dB 0dB 0dB During T2: 0dB 0dB 0dB 0dB	During T1: Noc1: -98dBm/15kHz Noc2: -98dBm/15kHz Ês1 / Noc1: +4dB Ês2 / Noc2: -infinity During T2: Noc1: -98dBm/15kHz Noc2: -98dBm/15kHz Ês1 / Noc1: +4dB Ês2 / Noc2: +4dB
6.3.3.1 NR SA FR1 conditional handover	During T1: Noc: -98dBm/15kHz Ês1 / Noc: +8dB Ês2 / Noc: -infinity During T2: Noc: -98dBm/15kHz Ês1 / Noc: +8dB Ês2 / Noc: +11dB In signaling: A3-offset: 0dB	During T1: 0dB 0dB 0dB During T2: 0dB 0dB -1dB In signaling: -1dB	During T1: Noc: -98dBm/15kHz Ês1 / Noc: +8dB Ês2 / Noc: -infinity During T2: Noc: -98dBm/15kHz Ês1 / Noc: +8dB Ês2 / Noc: +10dB In signaling: A3-offset: -1dB
6.3.3.2 NR SA FR1-FR1 conditional handover	During T1: Noc1: -98dBm/15kHz Noc2: -98dBm/15kHz Ês1 / Noc1: +4dB Ês2 / Noc2: -infinity During T2: Noc1: -98dBm/15kHz Noc2: -98dBm/15kHz	During T1: 0dB 0dB 0dB 0dB During T2: 0dB 0dB	During T1: Noc1: -98dBm/15kHz Noc2: -98dBm/15kHz Ês1 / Noc1: +4dB Ês2 / Noc2: -infinity During T2: Noc1: -98dBm/15kHz Noc2: -98dBm/15kHz

	$\hat{E}s1$ / Noc1: +4dB $\hat{E}s2$ / Noc2: +5dB	0dB 1.7dB	$\hat{E}s1$ / Noc1: +4dB $\hat{E}s2$ / Noc2: +6.7dB
6.4.1.1 EN-DC FR1 UE transmit timing accuracy	Test 1 (no DRX): Uplink timing: ±12*64 T_c for 15 KHz SSB SCS,15 kHz UL SCS ±10*64 T_c for 15 KHz SSB SCS,30 kHz UL SCS ±10*64 T_c for 15 KHz SSB SCS,60 kHz UL SCS ±8*64 T_c for 30 KHz SSB SCS,15 kHz UL SCS ±8*64 T_c for 30 KHz SSB SCS,30 kHz UL SCS ±7*64 T_c for 30 KHz SSB SCS,60 kHz UL SCS Max step size T_q: 5.5*64*T_c Min adjust rate T_p: 5.5*64*T_c Max adjust rate: 5.5*64*T_c $\hat{E}s_2$ / N_{oc}: +3.00dB N_{oc} = -98 dBm/15 kHz (Config 1,2,3) Test 2 (with DRX): ±12*64 T_c for 15 KHz SSB SCS,15 kHz UL SCS ±10*64 T_c for 15 KHz SSB SCS,30 kHz UL SCS ±10*64 T_c for 15 KHz SSB SCS,60 kHz UL SCS ±8*64 T_c for 30 KHz SSB SCS,15 kHz UL SCS ±8*64 T_c for 30 KHz SSB SCS,30 kHz UL SCS ±7*64 T_c for 30 KHz SSB SCS,60 kHz UL SCS $\hat{E}s_1$ / N_{oc}: +3.00dB	 ±1.75*64*T_c ±1.75*64*T_c ±1.75*64*T_c ±1.75*64*T_c ±1.75*64*T_c ±1.75*64*T_c +0.5*64T_c -3.6*64*T_c +1.1*64*T_c +0.3 dB +1.5 dB ±1.75*64*T_c ±1.75*64*T_c ±1.75*64*T_c ±1.75*64*T_c ±1.75*64*T_c ±1.75*64*T_c +0.3dB	 Test 1 (10MHz Ch BW): Uplink timing: ±13.75*64*T_c Uplink timing: ±11.75*64*T_c Uplink timing: ±11.75*64*T_c Uplink timing: ±9.75*64*T_c Uplink timing: ±9.75*64*T_c Uplink timing: ±8.75*64*T_c Max step size T_q: 6.0*64*T_c Min adjust rate: 1.9*64*T_c Max adjust rate: 6.6*64*T_c $\hat{E}s_1$ / N_{oc}: +3.30dB N_{oc} = -98 dBm/15 kHz (Config 1,2,3) +1.5 dB Test 2 (with DRX): Uplink timing: ±13.75*64*T_c Uplink timing: ±11.75*64*T_c Uplink timing: ±11.75*64*T_c Uplink timing: ±9.75*64*T_c Uplink timing: ±9.75*64*T_c Uplink timing: ±8.75*64*T_c $\hat{E}s_1$ / N_{oc}: +3.30dB
6.4.3.1 NR SA FR1 timing advance adjustment accuracy	N_{oc} = -98 dBm/15 kHz (Config 1, 2, 4, 5) N_{oc} = -95 dBm/15 kHz (Config 3, 6) $\hat{E}s_x$ / N_{oc} = 3 dB UE Timing Advance Adjustment Accuracy for 15kHz SCS = ±256 T_c+ TT UE Timing Advance Adjustment Accuracy for 30kHz SCS = ±256 T_c+ TT	0 0 0 +/- 88 Tc +/- 88 Tc	N_{oc} = -98 dBm/15 kHz (Config 1, 2) N_{oc} = -95 dBm/15 kHz (Config 3) $\hat{E}s_x$ / N_{oc} = 3 dB UE TAAA for 15kHz SCS = ±344 T_c UE TAAA for 30kHz SCS = ±344 T_c
6.5.1.1 NR SA FR1 radio link monitoring out-of-sync test for PCell configured with SSB-based RLM RS in non-DRX mode	SNR during T1: 1dB T2: -7dB T3: -15dB	Offset during T1: +0.8dB T2: +0.8dB T3: -0.8dB	SNR during T1: 1.8dB T2: -6.2dB T3: -15.8dB
6.5.1.2 NR SA FR1 radio link monitoring in-sync test for PCell configured with SSB-based RLM RS in non-DRX mode	SNR during T1: 1dB T2: -7dB T3: -15dB T4: -4.5dB T5: 1dB	Offset during T1: +0.8dB T2: +0.8dB T3: -0.8dB T4: -0.8dB T5: +0.8dB	SNR during T1: 1.8dB T2: -6.2dB T3: -15.8dB T4: -5.3dB T5: 1.8dB For testing of a UE which supports 4RX on all bands, the SNR during T3 and T4 is modified as specified in clause D.4.1.1
6.5.1.3 NR SA FR1 radio link monitoring out-of-sync test for	Same as 6.5.1.1	Same as 6.5.1.1	Same as 6.5.1.1

PCell configured with SSB-based RLM RS in DRX mode			
6.5.1.4 NR SA FR1 radio link monitoring in-sync test for PCell configured with SSB-based RLM RS in DRX mode	Same as 6.5.1.2	Same as 6.5.1.2	Same as 6.5.1.2
6.5.1.5 NR SA FR1 radio link monitoring out-of-sync test for PCell configured with CSI-RS-based RLM RS in non-DRX mode	Same as 6.5.1.1	Same as 6.5.1.1	Same as 6.5.1.1
6.5.1.6 NR SA FR1 radio link monitoring in-sync test for PCell configured with CSI-RS-based RLM RS in non-DRX mode	Same as 6.5.1.2	Same as 6.5.1.2	Same as 6.5.1.2
6.5.1.7 NR SA FR1 radio link monitoring out-of-sync test for PCell configured with CSI-RS-based RLM RS in DRX mode	Same as 6.5.1.1	Same as 6.5.1.1	Same as 6.5.1.1
6.5.1.8 NR SA FR1 radio link monitoring in-sync test for PCell configured with CSI-RS-based RLM RS in DRX mode	Same as 6.5.1.2	Same as 6.5.1.2	Same as 6.5.1.2
6.5.2.1 NR SA FR1 interruptions during measurements on deactivated NR SCC	During T1: Noc_1: -104dBm/15kHz Noc_2: -104dBm/15kHz $\hat{E}s_1$ / Noc_1: +17dB $\hat{E}s_2$ / Noc_2: +17dB	During T1: 0dB 0dB 0dB 0dB	During T1: Noc_1: -104dBm/15kHz Noc_2: -104dBm/15kHz $\hat{E}s_1$ / Noc_1: +17dB $\hat{E}s_2$ / Noc_2: +17dB
6.5.3.1 NR SA FR1 SCell activation and deactivation of known SCell in non-DRX for 160ms SCell measurement cycle	During T1: Noc_1: -104dBm/15kHz Noc_2: -104dBm/15kHz $\hat{E}s_1$ / Noc_1: +17dB $\hat{E}s_2$ / Noc_2: +17dB During T2: Noc_1: -104dBm/15kHz Noc_2: -104dBm/15kHz $\hat{E}s_1$ / Noc_1: +17dB $\hat{E}s_2$ / Noc_2: +17dB During T3: Noc_1: -104dBm/15kHz Noc_2: -104dBm/15kHz $\hat{E}s_1$ / Noc_1: +17dB $\hat{E}s_2$ / Noc_2: +17dB	During T1: 0dB 0dB 0dB 0dB During T2: 0dB 0dB 0dB 0dB During T3: 0dB 0dB 0dB 0dB	During T1: Noc_1: -104dBm/15kHz Noc_2: -104dBm/15kHz $\hat{E}s_1$ / Noc_1: +17dB $\hat{E}s_2$ / Noc_2: +17dB During T2: Noc_1: -104dBm/15kHz Noc_2: -104dBm/15kHz $\hat{E}s_1$ / Noc_1: +17dB $\hat{E}s_2$ / Noc_2: +17dB During T3: Noc_1: -104dBm/15kHz Noc_2: -104dBm/15kHz $\hat{E}s_1$ / Noc_1: +17dB $\hat{E}s_2$ / Noc_2: +17dB
6.5.3.2 NR SA FR1 SCell activation and deactivation of known SCell in non-DRX for 640ms SCell measurement cycle	Same as 6.5.3.1	Same as 6.5.3.1	Same as 6.5.3.1
6.5.3.3 NR SA FR1 SCell activation and deactivation of unknown SCell in non-DRX	Same as 6.5.3.1	Same as 6.5.3.1	Same as 6.5.3.1
6.5.5.1 NR SA FR1 SSB-based beam failure detection and link recovery in non-DRX	q0 SSB SNR during: T1: 5dB T2: -3dB T3: -12dB T4: -12dB T5: -12dB q1 SSB during T1: Noc_1: -98dBm/15kHz $\hat{E}s_1$ / Noc_1: -10dB q1 SSB during T2:	Offset during: T1: +0.8dB T2: +0.8dB T3: -0.8dB T4: -0.8dB T5: -0.8dB q1 SSB during T1: 0dB -0.2dB q1 SSB during T2:	SNR during: T1: +5.8dB T2: -2.2dB T3: -12.8dB T4: -12.8dB T5: -12.8dB For testing of a UE which supports 4RX on all bands, the SNR during T3, T4 and T5 is modified as specified in clause D.4.1.1 q1 SSB during T1: Noc_1: -98dBm/15kHz $\hat{E}s_1$ / Noc_1: -10.2dB q1 SSB during T2:

	Noc_1: -98dBm/15kHz $\hat{E}s_1$ / Noc_1: -10dB q1 SSB during T3, T4 and T5: Noc_1: -98dBm/15kHz $\hat{E}s_1$ / Noc_1: +10dB	0dB -0.2dB q1 SSB during T3, T4 and T5: 0dB +0.2dB	Noc_1: -98dBm/15kHz $\hat{E}s_1$ / Noc_1: -10.2dB q1 SSB during T3, T4 and T5: Noc_1: -98dBm/15kHz $\hat{E}s_1$ / Noc_1: +10.2dB
6.5.5.2 NR SA FR1 SSB-based beam failure detection and link recovery in DRX	Same as 6.5.5.1	Same as 6.5.5.1	Same as 6.5.5.1
6.5.5.3 NR SA FR1 CSI-RS-based beam failure detection and link recovery in non-DRX	q0 CSI-RS SNR during: T1: 5dB T2: -3dB T3: -12dB T4: -12dB T5: -12dB q1 CSI-RS during T1: Noc_1: -98dBm/15kHz $\hat{E}s_1$ / Noc_1: -10dB q1 CSI-RS during T2: Noc_2: -98dBm/15kHz $\hat{E}s_1$ / Noc_1: -10dB q1 CSI-RS during T3, T4 and T5: Noc_2: -98dBm/15kHz $\hat{E}s_1$ / Noc_1: +10dB	Offset during: T1: +0.8dB T2: +0.8dB T3: -0.8dB T4: -0.8dB T5: -0.8dB q1 CSI-RS during T1: 0dB -0.2dB q1 CSI-RS during T2: 0dB -0.2dB q1 CSI-RS during T3, T4 and T5: 0dB +0.2dB	SNR during: T1: +5.8dB T2: -2.2dB T3: -12.8dB T4: -12.8dB T5: -12.8dB For testing of a UE which supports 4RX on all bands, the SNR during T3, T4 and T5 is modified as specified in clause D.4.1.1 q1 CSI-RS during T1: Noc_1: -98dBm/15kHz $\hat{E}s_1$ / Noc_1: -10.2dB q1 CSI-RS during T2: Noc_1: -98dBm/15kHz $\hat{E}s_1$ / Noc_1: -10.2dB q1 CSI-RS during T3, T4 and T5: Noc_1: -98dBm/15kHz $\hat{E}s_1$ / Noc_1: +10.2dB
6.5.5.4 NR SA FR1 CSI-RS-based beam failure detection and link recovery in DRX	Same as 6.5.5.3	Same as 6.5.5.3	Same as 6.5.5.3
6.5.5.5 NR SA FR1 Scell CSI-RS-based beam failure detection and SSB-based link recovery in non-DRX	On the SCell: q0 CSI-RS SNR during: T1: 5dB T2: -3dB T3: -12dB T4: -12dB T5: -12dB q1 SSB during T1: Noc_1: -98dBm/15kHz $\hat{E}s_1$ / Noc_1: -10dB q1 SSB during T2: Noc_1: -98dBm/15kHz $\hat{E}s_1$ / Noc_1: -10dB q1 SSB during T3, T4 and T5: Noc_1: -98dBm/15kHz $\hat{E}s_1$ / Noc_1: +10dB	On the SCell: Offset during: T1: +0.8dB T2: +0.8dB T3: -0.8dB T4: -0.8dB T5: -0.8dB q1 SSB during T1: 0dB -0.2dB q1 SSB during T2: 0dB -0.2dB q1 SSB during T3, T4 and T5: 0dB +0.2dB	On the SCell: T1: +5.8dB T2: -2.2dB T3: -12.8dB T4: -12.8dB T5: -12.8dB For testing of a UE which supports 4RX on all bands, the SNR during T3, T4 and T5 is modified as specified in clause D.4.1.1 q1 SSB during T1: Noc_1: -98dBm/15kHz $\hat{E}s_1$ / Noc_1: -10.2dB q1 SSB during T2: Noc_1: -98dBm/15kHz $\hat{E}s_1$ / Noc_1: -10.2dB q1 SSB during T3, T4 and T5: Noc_1: -98dBm/15kHz $\hat{E}s_1$ / Noc_1: +10.2dB
6.5.5.6 NR SA FR1 Scell CSI-RS-based beam failure detection and SSB-based link recovery in DRX	Same as 6.5.5.5	Same as 6.5.5.5	Same as 6.5.5.5
6.5.6.1.1 NR SA FR1-FR1 DCI-based DL active BWP switch in	During T1: Noc_1: -104dBm/15kHz	During T1: 0dB	During T1: Noc_1: -104dBm/15kHz

non-DRX	Noc_2: -104dBm/15kHz $\hat{E}s_1$ / Noc_1: +17dB $\hat{E}s_2$ / Noc_2: +17dB During T2: Noc_1: -104dBm/15kHz Noc_2: -104dBm/15kHz $\hat{E}s_1$ / Noc_1: +17dB $\hat{E}s_2$ / Noc_2: +17dB During T3: Noc_1: -104dBm/15kHz Noc_2: -104dBm/15kHz $\hat{E}s_1$ / Noc_1: +17dB $\hat{E}s_2$ / Noc_2: +17dB	0dB 0dB 0dB During T2: 0dB 0dB 0dB 0dB During T3: 0dB 0dB 0dB 0dB	Noc_2: -104dBm/15kHz $\hat{E}s_1$ / Noc_1: +17dB $\hat{E}s_2$ / Noc_2: +17dB During T2: Noc_1: -104dBm/15kHz Noc_2: -104dBm/15kHz $\hat{E}s_1$ / Noc_1: +17dB $\hat{E}s_2$ / Noc_2: +17dB During T3: Noc_1: -104dBm/15kHz Noc_2: -104dBm/15kHz $\hat{E}s_1$ / Noc_1: +17dB $\hat{E}s_2$ / Noc_2: +17dB
6.5.6.1.2 NR SA FR1 DCI-based DL active BWP switch in non-DRX	During T1: Noc_1: -104dBm/15kHz $\hat{E}s_1$ / Noc_1: +17dB During T2: Noc_1: -104dBm/15kHz $\hat{E}s_1$ / Noc_1: +17dB During T3: Noc_1: -104dBm/15kHz $\hat{E}s_1$ / Noc_1: +17dB	During T1: 0dB 0dB During T2: 0dB 0dB During T3: 0dB 0dB	During T1: Noc_1: -104dBm/15kHz $\hat{E}s_1$ / Noc_1: +17dB During T2: Noc_1: -104dBm/15kHz $\hat{E}s_1$ / Noc_1: +17dB During T3: Noc_1: -104dBm/15kHz $\hat{E}s_1$ / Noc_1: +17dB
6.5.6.2.1 NR SA FR1 RRC-based DL active BWP switch in non-DRX	During T1: Noc_1: -104dBm/15kHz $\hat{E}s_1$ / Noc_1: +17dB	During T1: 0dB 0dB	During T1: Noc_1: -104dBm/15kHz $\hat{E}s_1$ / Noc_1: +17dB
6.6.1.1 SA event triggered reporting tests without gap under non-DRX	During T1: Noc: -98dBm/15kHz $\hat{E}s_1$ / Noc: +4.00dB $\hat{E}s_2$ / Noc: -infinity During T2: Noc: -98dBm/15kHz $\hat{E}s_1$ / Noc: +4.00dB $\hat{E}s_2$ / Noc: +4.00dB	During T1: 0dB 0dB 0dB During T2: 0dB 0dB 0dB	During T1: Noc: -98dBm/15kHz $\hat{E}s_1$ / Noc: +4.00dB $\hat{E}s_2$ / Noc: -infinity During T2: Noc: -98dBm/15kHz $\hat{E}s_1$ / Noc: +4.00dB $\hat{E}s_2$ / Noc: +4.00dB
6.6.1.2 SA event triggered reporting tests without gap under DRX	Same as 6.6.1.1	Same as 6.6.1.1	Same as 6.6.1.1
6.6.1.3 SA event triggered reporting tests with per-UE gaps under non-DRX	Same as 64.6.1.1	Same as 6.6.1.1	Same as 6.6.1.1
6.6.1.4 SA event triggered reporting tests with per-UE gaps under DRX	Same as 6.6.1.1	Same as 6.6.1.1	Same as 6.6.1.1
6.6.1.5 SA event triggered reporting tests without gap under non-DRX with SSB index reading	Same as 6.6.1.1	Same as 6.6.1.1	Same as 6.6.1.1
6.6.1.6 SA event triggered reporting tests with per-UE gaps under non-DRX with SSB index reading	Same as 6.6.1.1	Same as 6.6.1.1	Same as 6.6.1.1
6.6.1.7 NR SA FR1 event-triggered reporting without gap in DRX for UE configured with highSpeedMeasFlag-r16	Same as 6.6.1.1	Same as 6.6.1.1	Same as 6.6.1.1
6.5.3.1	During T1: Noc_1: -104dBm/15kHz Noc_2: -104dBm/15kHz $\hat{E}s_1$ / Noc_1: +17dB $\hat{E}s_2$ / Noc_2: +17dB During T2: Noc_1: -104dBm/15kHz Noc_2: -104dBm/15kHz $\hat{E}s_1$ / Noc_1: +17dB	During T1: 0dB 0dB 0dB 0dB During T2: 0dB 0dB 0dB	During T1: Noc_1: -104dBm/15kHz Noc_2: -104dBm/15kHz $\hat{E}s_1$ / Noc_1: +17dB $\hat{E}s_2$ / Noc_2: +17dB During T2: Noc_1: -104dBm/15kHz Noc_2: -104dBm/15kHz $\hat{E}s_1$ / Noc_1: +17dB

	$\hat{E}s_2$ / Noc_2: +17dB During T3: Noc_1: -104dBm/15kHz Noc_2: -104dBm/15kHz $\hat{E}s_1$ / Noc_1: +17dB $\hat{E}s_2$ / Noc_2: +17dB	0dB During T3: 0dB 0dB 0dB 0dB	$\hat{E}s_2$ / Noc_2: +17dB During T3: Noc_1: -104dBm/15kHz Noc_2: -104dBm/15kHz $\hat{E}s_1$ / Noc_1: +17dB $\hat{E}s_2$ / Noc_2: +17dB
6.5.3.2	Same as 6.5.3.1	Same as 6.5.3.1	Same as 6.5.3.1
6.5.3.3	Same as 6.5.3.1	Same as 6.5.3.1	Same as 6.5.3.1
6.5.7.1 NR SA FR1 DL Interruptions at switching between two uplink carriers in FDD-TDD CA	Noc1: -104dBm/15kHz Noc2: -104dBm/15kHz Ês1 / Noc: +17dB Ês2 / Noc: +17dB Reported CSI-RSRP values ± 10dB	-1.10dB -1.10dB 0dB 0dB Via mapping	Noc1: -105.10dBm/15kHz Noc2: -105.10dBm/15kHz Ês1 / Noc: +17dB Ês2 / Noc: +17dB CSI-RS#0: RSRP_64 to RSRP_84 CSI-RS#1: RSRP_67 to RSRP_87
6.5.7.2 NR SA FR1 DL Interruptions at switching between two uplink carriers in TDD-TDD CA	Same as 6.5.7.1	Same as 6.5.7.1	Noc1: -105.10dBm/15kHz Noc2: -105.10dBm/15kHz Ês1 / Noc: +17dB Ês2 / Noc: +17dB CSI-RS#0: RSRP_67 to RSRP_87 CSI-RS#1: RSRP_67 to RSRP_87
6.5.8.1 UE specific CBW change on PCell in FR1 in non-DRX	During T1: Noc1: -104dBm/15kHz Ês1 / Noc1: +17dB	During T1: 0dB 0dB	During T1: Noc1: -104dBm/15kHz Ês1 / Noc1: +17dB
6.6.2.1 NR SA FR1-FR1 event-triggered reporting in non-DRX	During T1: Freq 1 Noc: -98dBm/15kHz Freq 2 Noc: -98dBm/15kHz $\hat{E}s_1$ / Noc: +4.00dB $\hat{E}s_2$ / Noc: -infinity During T2: Freq 1 Noc: -98dBm/15kHz Freq 2 Noc: -98dBm/15kHz $\hat{E}s_1$ / Noc: +4.00dB $\hat{E}s_2$ / Noc: +7.00dB	During T1: 0dB 0dB 0dB 0dB During T2: 0dB 0dB 0dB 0dB	During T1: Freq 1 Noc: -98dBm/15kHz Freq 2 Noc: -98dBm/15kHz $\hat{E}s_1$ / Noc: +4.00dB $\hat{E}s_2$ / Noc: -infinity During T2: Freq 1 Noc: -98dBm/15kHz Freq 2 Noc: -98dBm/15kHz $\hat{E}s_1$ / Noc: +4.00dB $\hat{E}s_2$ / Noc: +7.00dB
6.6.2.2 NR SA FR1-FR1 event-triggered reporting in DRX	Same as 6.6.2.1	Same as 6.6.2.1	Same as 6.6.2.1
6.6.2.5 NR SA FR1-FR1 event-triggered reporting in non-DRX with SSB time index detection	Same as 6.6.2.1	Same as 6.6.2.1	Same as 6.6.2.1
6.6.2.6 NR SA FR1-FR1 event-triggered reporting in DRX with SSB time index detection	Same as 6.6.2.1	Same as 6.6.2.1	Same as 6.6.2.1
6.6.3.1 NR SA FR1 – E-UTRAN event-triggered reporting in non-DRX	During T1: Freq 1 Noc: -104dBm/15kHz Freq 2 Noc: -104dBm/15kHz Ês1 / Noc: +16.00dB Ês2 / Noc: -infinity During T2: Freq 1 Noc: -104dBm/15kHz Freq 2 Noc: -104dBm/15kHz Ês1 / Noc: 0dB Ês2 / Noc: +17.00dB	During T1: FFSdB FFSdB FFSdB FFSdB During T2: FFSdB FFSdB FFSdB FFSdB	During T1: Freq 1 Noc: -104+TT dBm/15kHz Freq 2 Noc: -104+TTdBm/15kHz Ês1 / Noc: +16+TTdB Ês2 / Noc: -infinity During T2: Freq 1 Noc: -104+TTdBm/15kHz Freq 2 Noc: -104+TTdBm/15kHz Ês1 / Noc: 0+TTdB Ês2 / Noc: +17+TTdB
6.6.3.2 NR SA FR1 – E-UTRAN event-triggered reporting in DRX	Same as 6.6.3.1	Same as 6.6.3.1	Same as 6.6.3.1
6.6.3.3 NR SA FR1 – E-UTRAN event-triggered reporting in DRX for UE configured with	During T1: Freq 1 Noc: -106dBm/15kHz Freq 2 Noc: -106dBm/15kHz	During T1: 0dB 0dB	During T1: Freq 1 Noc: -106dBm/15kHz Freq 2 Noc: -106dBm/15kHz

highSpeedMeasFlag-r16	Ês1 / Noc: +18.00dB Ês2 / Noc: -infinity During T2: Freq 1 Noc: -106dBm/15kHz Freq 2 Noc: -106dBm/15kHz Ês1 / Noc: -2dB Ês2 / Noc: +19.00dB	0dB 0dB During T2: 0dB 0dB 0dB 0dB	Ês1 / Noc: +18.00dB Ês2 / Noc: -infinity During T2: Freq 1 Noc: -106dBm/15kHz Freq 2 Noc: -106dBm/15kHz Ês1 / Noc: -2dB Ês2 / Noc: +19.00dB
6.6.4.1 NR SA FR1 SSB-based L1-RSRP measurement in non-DRX	During T1: Noc: -98dBm/15kHz $\hat{E}s_0$ / Noc: +0.00dB $\hat{E}s_1$ / Noc: -infinity During T2: Noc: -98dBm/15kHz $\hat{E}s_0$ / Noc: 0.00dB $\hat{E}s_1$ / Noc: +3.00dB Reported SSB#0 SS-RSRP values ± 10dB Reported SSB#1 SS-RSRP values ± 10dB Reported Differential SS-RSRP values ± 3dB	During T1: 0dB 0dB 0dB During T2: 0dB 0dB 0.5dB Via mapping	During T1: Noc: -94.65dBm/15kHz $\hat{E}s_0$ / Noc: +0.00dB $\hat{E}s_1$ / Noc: -infinity During T2: Noc: -94.65dBm/15kHz $\hat{E}s_0$ / Noc: 0.00dB $\hat{E}s_1$ / Noc: +3.50dB **For configuration 1,2,4,5** SSB#1: RSRP_55 to RSRP_75 SSB#0: DIFFRSRP_0 to DIFFRSRP_3 **For configuration 3,6** SSB#1: RSRP_58 to RSRP_78 SSB#0: DIFFRSRP_0 to DIFFRSRP_3
6.6.4.2 NR SA FR1 SSB-based L1-RSRP measurement in DRX	Same as 6.6.4.1	Same as 6.6.4.1	Same as 6.6.4.1
6.6.4.3 NR SA FR1 CSI-RS-based L1-RSRP measurement in non-DRX	Noc: -98dBm/15kHz $\hat{E}s_0$ / Noc: 0.00dB $\hat{E}s_1$ / Noc: +3.00dB Reported CSI-RSRP values ± 10dB Reported Differential CSI-RSRP values ± 3dB	0dB 0dB 0.5dB Via mapping	Noc: -94.65dBm/15kHz $\hat{E}s_0$ / Noc: 0.00dB $\hat{E}s_1$ / Noc: +3.50dB **For configuration 1,2,4,5** CSI-RS#1: RSRP_55 to RSRP_75 CSI-RS#0: DIFFRSRP_0 to DIFFRSRP_3 **For configuration 3,6** CSI-RS#1: RSRP_58 to RSRP_78 CSI-RS#0: DIFFRSRP_0 to DIFFRSRP_3
6.6.4.4 NR SA FR1 CSI-RS-based L1-RSRP measurement in DRX	Same as 6.6.4.3	Same as 6.6.4.3	Same as 6.6.4.3
6.6.4.5 NR SA FR1 SSB-based L1-RSRP measurement in DRX for UE configured with highSpeedMeasFlag-r16	Same as 6.6.4.1	Same as 6.6.4.1	Same as 6.6.4.1
6.6.5.1 NR SA FR1 – UTRAN event-triggered reporting in non-DRX	During T1: Noc: -106dBm/15kHz Ês / Noc: 18dB Ioc: -70dBm/3.84MHz Îor / Ioc: -infinity CPICH Ec / Ior: -10dB SCH Ec / Ior: -12dB During T2: Noc: -106dBm/15kHz Ês / Noc: -2dB Ioc: -70dBm/3.84MHz Îor / Ioc: -1.8dB CPICH Ec / Ior: -10dB SCH Ec / Ior: -12dB	During T1: 0dB 0dB 0dB 0dB 0dB 0dB During T2: 0dB 0dB 0dB 0dB 0dB 0dB	During T1: Noc: -106dBm/15kHz Ês / Noc: 18dB Ioc: -70dBm/3.84MHz Îor / Ioc: -infinity CPICH Ec / Ior: -10dB SCH Ec / Ior: -12dB During T2: Noc: -106dBm/15kHz Ês / Noc: -2dB Ioc: -70dBm/3.84MHz Îor / Ioc: -1.8dB CPICH Ec / Ior: -10dB SCH Ec / Ior: -12dB
6.6.8.1 NR SA FR1 CSI-RS based CMR and no dedicated	Noc: -94.65dBm/15kHz $\hat{E}s_0$ / Noc: 0.00dB	0dB 0dB	Noc: -94.65dBm/15kHz $\hat{E}s_0$ / Noc: 0.00dB

IMR L1-SINR measurement in DRX	$\hat{E}s_1$ / Noc: +3.00dB Reported CSI-SINR values ±5.5dB Reported Differential CSI-SINR values ±4.5dB	0dB Via mapping	$\hat{E}s_1$ / Noc: +3.00dB **For configuration 1,2,3,4,5,6** CSI-RS#1: SINR_41 to SINR_64 CSI-RS#0: DIFFSINR_0 to DIFFSINR_7
6.6.8.2 NR SA FR1 SSB based CMR and dedicated IMR L1-SINR measurement in non-DRX	Noc: -94.65dBm/15kHz $\hat{E}s_0$ / Noc: 0.00dB $\hat{E}s_1$ / Noc: +3.00dB Reported SS-SINR values ±4dB Reported Differential SS-SINR values ±3dB	0dB 0.5dB 0dB Via mapping	Noc: -94.65dBm/15kHz $\hat{E}s_0$ / Noc: 0.50dB $\hat{E}s_1$ / Noc: +3.00dB **For configuration 1,2,3,4,5,6** SSB#1: SINR_44 to SINR_61 SSB#0: DIFFSINR_0 to DIFFSINR_5
6.6.8.3 NR SA FR1 CSI-RS based CMR and dedicated IMR L1-SINR measurement in non-DRX	Noc: -94.65dBm/15kHz $\hat{E}s_0$ / Noc: 0.00dB $\hat{E}s_1$ / Noc: +3.00dB Reported CSI-SINR values ±4.5dB Reported Differential CSI-SINR values ±3.5dB	0dB 0dB 0dB Via mapping	Noc: -94.65dBm/15kHz $\hat{E}s_0$ / Noc: 0.00dB $\hat{E}s_1$ / Noc: +3.00dB **For configuration 1,2,3,4,5,6** CSI-RS#1: SINR_43 to SINR_62 CSI-RS#0: DIFFSINR_0 to DIFFSINR_6
6.6.9.1 NR SA FR1 Idle mode CA/DC measurement for FR1	During T1: Noc_1: -98dBm/15kHz Noc_2: -98dBm/15kHz $\hat{E}s_1$ / Noc_1: +7dB $\hat{E}s_2$ / Noc_2: -infinity During T2: Noc_1: -98dBm/15kHz Noc_2: -98dBm/15kHz $\hat{E}s_1$ / Noc_1: +7dB $\hat{E}s_2$ / Noc_2: 0dB During T3: Noc_1: -98dBm/15kHz Noc_2: -98dBm/15kHz $\hat{E}s_1$ / Noc_1: +7dB $\hat{E}s_2$ / Noc_2: 0dB Reported SS-RSRP and SS-RSRQ	During T1: 0dB 0dB 0dB 0dB During T2: 0dB 0dB 0dB 0dB During T3: 0dB 0dB 0dB 0dB Via mapping	During T1: Noc_1: -98dBm/15kHz Noc_2: -98dBm/15kHz $\hat{E}s_1$ / Noc_1: +7dB $\hat{E}s_2$ / Noc_2: -infinity During T2: Noc_1: -98dBm/15kHz Noc_2: -98dBm/15kHz $\hat{E}s_1$ / Noc_1: +7dB $\hat{E}s_2$ / Noc_2: 0dB During T3: Noc_1: -98dBm/15kHz Noc_2: -98dBm/15kHz $\hat{E}s_1$ / Noc_1: +7dB $\hat{E}s_2$ / Noc_2: 0dB **Configuration 1 and 2:** Cell 1: RSRP_54 to RSRP_77 RSRQ_55 to RSRQ_72 Cell 2: RSRP_47 to RSRP_70 RSRQ_51 to RSRQ_67 **Configuration 3:** Cell 1: RSRP_57 to RSRP_80 RSRQ_55 to RSRQ_72 Cell 2: RSRP_50 to RSRP_73 RSRQ_51 to RSRQ_67
6.6.15.1 NR SA FR1 Idle Mode measurements of inter-RAT CA candidate cells for early reporting	During T1: Noc_1: -98dBm/15kHz Noc_2: -98dBm/15kHz $\hat{E}s_1$ / Noc_1: +5dB $\hat{E}s_2$ / Noc_2: +5dB During T2:	During T1: 0dB 0dB 0dB 0dB During T2:	During T1: Noc_1: -98dBm/15kHz Noc_2: -98dBm/15kHz $\hat{E}s_1$ / Noc_1: +5dB $\hat{E}s_2$ / Noc_2: +5dB During T2:

	Noc_1: -98dBm/15kHz Noc_2: -98dBm/15kHz $\hat{E}s_1$ / Noc_1: +5dB $\hat{E}s_2$ / Noc_2: +5dB During T3: Noc_1: -98dBm/15kHz Noc_2: -98dBm/15kHz $\hat{E}s_1$ / Noc_1: +5dB $\hat{E}s_2$ / Noc_2: -3dB During T4: Noc_1: -98dBm/15kHz Noc_2: -98dBm/15kHz $\hat{E}s_1$ / Noc_1: +5dB $\hat{E}s_2$ / Noc_2: +8dB During T5: Noc_1: -98dBm/15kHz Noc_2: -98dBm/15kHz $\hat{E}s_1$ / Noc_1: +5dB $\hat{E}s_2$ / Noc_2: +5dB Thresh_X_HighP 48dB Reported SS-RSRP and SS-RSRQ	0dB 0dB 0dB 0dB During T3: 0dB 0dB 0dB 0dB During T4: 0dB 0dB 0dB 0dB During T5: 0dB 0dB 0dB 0dB +4dB Via Mapping	Noc_1: -98dBm/15kHz Noc_2: -98dBm/15kHz $\hat{E}s_1$ / Noc_1: +5dB $\hat{E}s_2$ / Noc_2: +5dB During T3: Noc_1: -98dBm/15kHz Noc_2: -98dBm/15kHz $\hat{E}s_1$ / Noc_1: +5dB $\hat{E}s_2$ / Noc_2: -3dB During T4: Noc_1: -98dBm/15kHz Noc_2: -98dBm/15kHz $\hat{E}s_1$ / Noc_1: +5dB $\hat{E}s_2$ / Noc_2: +8dB During T5: Noc_1: -98dBm/15kHz Noc_2: -98dBm/15kHz $\hat{E}s_1$ / Noc_1: +5dB $\hat{E}s_2$ / Noc_2: +5dB 52dB **Configuration 1 and 2:** Cell 1: RSRP_52 to RSRP_75 RSRQ_54 to RSRQ_71 Cell 2: RSRP_39 to RSRP_62 RSRQ_6 to RSRQ_27 **Configuration 3:** Cell 1: RSRP_55 to RSRP_78 RSRQ_54 to RSRQ_71 Cell 2: RSRP_39 to RSRP_62 RSRQ_6 to RSRQ_27
6.7.1.1.1 NR SA FR1 SS-RSRP absolute measurement accuracy	TEST CONFIGURATION 1, 2,		
	Test 1: Noc: -106dBm/15kHz Ês1 / Noc: +6.0dB Ês2 / Noc: +1.0dB Reported RSRP values: ±4.5dB Test 2: Noc: -88dBm/15kHz Ês1 / Noc: +6.0dB Ês2 / Noc: +1.0dB Reported RSRP values: ±8dB Test 3: Noc: -116dBm/15kHz + ΔBG_offset Ês1 / Noc: +3.0dB Ês2 / Noc: -1.0dB Reported RSRP values: ±6dB	Test 1: -1.5dB 0dB +0.4dB Via mapping Test 2: 0dB 0dB +0.4dB Via mapping Test 3: 0dB 0dB +0.2dB Via mapping	Test 1: Noc: -107.5dBm/15kHz Ês1 / Noc: +6.0dB Ês2 / Noc: +1.4dB RSRP_44 to RSRP_56 Test 2: Noc: -88dBm/15kHz Ês1 / Noc: +6.0dB Ês2 / Noc: +1.4dB RSRP_60 to RSRP_79 Test 3: Noc: -116dBm/15kHz + ΔBG_offset Ês1 / Noc: +3.0dB Ês2 / Noc: -0.8dB RSRP_34 to RSRP_46 RSRP_34 to RSRP_46 RSRP_35 to RSRP_47 RSRP_35 to RSRP_47

			RSRP_36 to RSRP_48 RSRP_37 to RSRP_49 RSRP_37 to RSRP_49 depending on operating band
	TEST CONFIGURATION 3		
	Test 1: Noc: -110dBm/30kHz Ês1 / Noc: +6.0dB Ês2 / Noc: +1.0dB Reported RSRP values: ±4.5dB Test 2: Noc: -91dBm/30kHz Ês1 / Noc: +6.0dB Ês2 / Noc: +1.0dB Reported RSRP values: ±8dB Test 3: Noc: -113dBm/30kHz + ΔBG_offset Ês1 / Noc: +3.0dB Ês2 / Noc: -1.0dB Reported RSRP values: ±6dB	Test 1: -0.8dB 0dB +0.4dB Via mapping Test 2: 0dB 0dB +0.4dB Via mapping Test 3: 0dB 0dB +0.2dB Via mapping	Test 1: Noc: -110.8dBm/30kHz Ês1 / Noc: +6.0dB Ês2 / Noc: +1.4dB RSRP_41 to RSRP_53 Test 2: Noc: -91dBm/30kHz Ês1 / Noc: +6.0dB Ês2 / Noc: +1.4dB RSRP_57 to RSRP_76 Test 3: Noc: -113dBm/30kHz + ΔBG_offset Ês1 / Noc: +3.0dB Ês2 / Noc: -0.8dB RSRP_37 to RSRP_49 RSRP_37 to RSRP_49 RSRP_38 to RSRP_50 RSRP_38 to RSRP_50 RSRP_39 to RSRP_51 RSRP_40 to RSRP_52 RSRP_40 to RSRP_52 depending on operating band
The derivation of the RSRP values takes into account the uncertainty in Cell 2 SS-RSRP from N_{oc} and $\hat{E}s_2 / N_{oc}$, the allowed UE reporting accuracy, and the UE mapping function. The SS-RSRP values given above are for normal conditions. In all cases the RSRP values are 4.5dB wider at each end for extreme conditions.			
6.7.1.1.2 NR SA FR1 SS-RSRP relative measurement accuracy	Test 1: Noc: Test configuration 1, 2:-106dBm/15kHz Test configuration 3:-110dBm/30kHz Ês1 / Noc: +6.0dB Ês2 / Noc: +1.0dB Reported rel. SS-RSRP values: ±3dB Test 2: Noc: -88dBm/15kHz Ês1 / Noc: +6.0dB Ês2 / Noc: +1.0dB Reported rel. SS-RSRP values: ±3dB Test 3: Noc: -116dBm/15kHz + ΔBG_offset Ês1 / Noc: +3.0dB Ês2 / Noc: -1.0dB Reported re. SS-RSRP values: ±3dB	Test 1: 0 dB 0 dB 0 dB +1.0dB Via mapping Test 2: 0dB 0dB +1.0dB Via mapping Test 3: 0dB 0dB +1.0dB Via mapping	Test 1: Noc: -106 dBm/15kHz Noc: -110 dBm/30kHz Ês1 / Noc: +6.0dB Ês2 / Noc: +2.0dB RSRP_x-8 to RSRP_x-1 Test 2: Noc: -88dBm/15kHz Ês1 / Noc: +6.0dB Ês2 / Noc: +2.0dB RSRP_x-8 to RSRP_x-1 Test 3: Noc: -116dBm/15kHz + ΔBG_offset Ês1 / Noc: +3.0dB Ês2 / Noc: 0dB RSRP_x-7 to RSRP_x+1
The derivation of the SS-RSRP values takes into account the uncertainty in Cell 1 and Cell 2 RSRP from N_{oc}, $\hat{E}s_1 / N_{oc}$ and $\hat{E}s_2 / N_{oc}$, the allowed UE reporting accuracy, and the UE mapping function. The RSRP values given above are for both normal and extreme conditions.			
6.7.1.2.1 NR SA FR1-FR1 SS-RSRP absolute measurement accuracy	**TEST CONFIGURATION 1, 2, 4, 5**		
	Test 1: N_{oc1}: -94.65 dBm/15kHz N_{oc2}: -94.65 dBm/15kHz $\hat{E}s1 / N_{oc1}$: +10.0dB $\hat{E}s2 / N_{oc2}$: +10.0dB Reported RSRP values: ±8dB	Test 1: 0dB 0dB 0dB 0dB Via mapping	Test 1: N_{oc1}: -94.65dBm/15kHz N_{oc2}: -94.65dBm/15kHz $\hat{E}s1 / N_{oc1}$: +10.0dB $\hat{E}s2 / N_{oc2}$: +10.0dB RSRP_62 to RSRP_81

	Test 2: N_{oc1}: -107dBm/15kHz + Δ_{BG_offset} N_{oc2}: -118dBm/15kHz + Δ_{BG_offset} $\hat{E}s1$ / N_{oc1}: +13.0dB $\hat{E}s2$ / N_{oc2}: -3.0dB Reported RSRP values: ±4.5dB	Test 2: 0dB 0dB 0dB 0dB Via mapping	Test 2: N_{oc1}: -107dBm/15kHz + Δ_{BG_offset} N_{oc2}: -118dBm/15kHz + Δ_{BG_offset} $\hat{E}s1$ / N_{oc1}: +13.0dB $\hat{E}s2$ / N_{oc2}: -3.0dB RSRP_32 to RSRP_45 RSRP_33 to RSRP_45 RSRP_33 to RSRP_46 RSRP_34 to RSRP_46 RSRP_34 to RSRP_47 RSRP_35 to RSRP_48 RSRP_36 to RSRP_48 depending on operating band
	TEST CONFIGURATION 3, 6		
	Test 1: N_{oc1}: -94.65 dBm/15kHz N_{oc2}: -94.65 dBm/15kHz $\hat{E}s1$ / N_{oc1}: +10.0dB $\hat{E}s2$ / N_{oc2}: +10.0dB Reported RSRP values: ±8dB Test 2: N_{oc1}: -107dBm/15kHz + Δ_{BG_offset} N_{oc1}: -118dBm/15kHz + Δ_{BG_offset} $\hat{E}s1$ / N_{oc1}: +13.0dB $\hat{E}s2$ / N_{oc2}: -3.0dB Reported RSRP values: ±4.5dB	Test 1: -1.35dB -1.35dB 0dB 0dB Via mapping Test 2: 0dB 0dB 0dB 0dB Via mapping	Test 1: N_{oc1}: -96dBm/15kHz N_{oc2}: -96dBm/15kHz $\hat{E}s1$ / N_{oc1}: +10.0dB $\hat{E}s2$ / N_{oc2}: +10.0dB RSRP_64 to RSRP_83 Test 2: N_{oc}: -107dBm/15kHz + Δ_{BG_offset} N_{oc1}: -118dBm/15kHz + Δ_{BG_offset} $\hat{E}s1$ / N_{oc1}: +13.0dB $\hat{E}s2$ / N_{oc2}: -3.0dB RSRP_35 to RSRP_48 RSRP_36 to RSRP_48 RSRP_36 to RSRP_49 RSRP_37 to RSRP_49 RSRP_37 to RSRP_50 RSRP_38 to RSRP_51 RSRP_39 to RSRP_51 depending on operating band
The derivation of the RSRP values takes into account the uncertainty in Cell 2 SS-RSRP from N_{oc2} and $\hat{E}s2$ / N_{oc2}, the allowed UE reporting accuracy, and the UE mapping function. The SS-RSRP values given above are for normal conditions. For extreme conditions, the RSRP values are 3.0 dB wider at each end for Test 1, and 4.5 dB wider at each for Test 2.			
6.7.1.2.2 NR SA FR1-FR1 SS-RSRP relative measurement accuracy	Test 1: N_{oc1}: -94.65 dBm/15kHz N_{oc2}: -94.65 dBm/15kHz $\hat{E}s1$ / N_{oc1}: +10.0dB $\hat{E}s2$ / N_{oc2}: +10.0dB Reported relative RSRP values: ±4.5dB Test 2: N_{oc1}: -107dBm/15kHz + Δ_{BG_offset} N_{oc1}: -118dBm/15kHz + Δ_{BG_offset} $\hat{E}s1$ / N_{oc1}: +13.0dB $\hat{E}s2$ / N_{oc2}: -3.0dB Reported relative RSRP values: ±4.5dB	Test 1: 0dB 0dB 0dB 0dB Via mapping Test 2: 0dB 0dB 0dB 0dB Via mapping	Test 1: N_{oc1}: -94.65dBm/15kHz N_{oc2}: -94.65dBm/15kHz $\hat{E}s1$ / N_{oc1}: +10.0dB $\hat{E}s2$ / N_{oc2}: +10.0dB RSRP_x-7 to RSRP_x+7 Test 2: N_{oc}: -107dBm/15kHz + Δ_{BG_offset} N_{oc1}: -118dBm/15kHz + Δ_{BG_offset} $\hat{E}s1$ / N_{oc1}: +13.0dB $\hat{E}s2$ / N_{oc2}: -3.0dB RSRP_x-31 to RSRP_x-18
The derivation of the SS-RSRP values takes into account the uncertainty in Cell 1 and Cell 2 RSRP from N_{oc}, $\hat{E}s1$ / N_{oc} and $\hat{E}s2$ / N_{oc}, the allowed UE reporting accuracy, and the UE mapping function. The SS-RSRP values given above are for normal conditions. For extreme conditions, the RSRP values are 1.5dB wider at each end.			
6.7.2.1 NR SA FR1 SS-RSRQ measurement accuracy	**TEST CONFIGURATION 1, 2, 4, 5**		
	Test 1: N_{oc}: -85dBm/15kHz $\hat{E}s1$ / N_{oc}: +3.0dB $\hat{E}s2$ / N_{oc}: +3.0dB Reported RSRQ values: ±2.5dB	Test 1: -1.5dB 0dB 0dB Via mapping	Test 1: N_{oc}: -86.5dBm/15kHz $\hat{E}s1$ / N_{oc}: +3.0dB $\hat{E}s2$ / N_{oc}: +3.0dB RSRQ_52 to RSRQ_62

	Test 2: N_{oc}: -101dBm/15kHz $\hat{E}s1 / N_{oc}$: -2.9dB $\hat{E}s2 / N_{oc}$: -2.9dB Reported RSRQ values: ±3.5dB Test 3: N_{oc}: -114dBm/15kHz + Δ_{BG_offset} $\hat{E}s1 / N_{oc}$: -4.0dB $\hat{E}s2 / N_{oc}$: -4.0dB Reported RSRQ values: ±3.5dB	Test 2: 0dB 0dB 0dB Via mapping Test 3: 0dB 0dB 0dB Via mapping	Test 2: N_{oc}: -101dBm/15kHz $\hat{E}s1 / N_{oc}$: -2.9dB $\hat{E}s2 / N_{oc}$: -2.9dB RSRQ_46 to RSRQ_60 Test 3: N_{oc}: -114dBm/15kHz + Δ_{BG_offset} $\hat{E}s1 / N_{oc}$: -3.5dB $\hat{E}s2 / N_{oc}$: -3.5dB RSRQ_44 to RSRQ_59
	TEST CONFIGURATION 3, 6		
	Test 1: N_{oc}: -91dBm/15kHz $\hat{E}s1 / N_{oc}$: +3.0dB $\hat{E}s2 / N_{oc}$: +3.0dB Reported RSRQ values: ±2.5dB Test 2: N/A Test 3: N_{oc}: -114dBm/15kHz + Δ_{BG_offset} $\hat{E}s1 / N_{oc}$: -4.0dB $\hat{E}s2 / N_{oc}$: -4.0dB Reported RSRQ values: ±3.5dB	Test 1: -1.6dB 0dB 0dB Via mapping Test 2: N/A Test 3: 0dB 0dB 0dB Via mapping	Test 1: N_{oc}: -92.6dBm/15kHz $\hat{E}s1 / N_{oc}$: +3.0dB $\hat{E}s2 / N_{oc}$: +3.0dB RSRQ_52 to RSRQ_62 Test 2: N/A Test 3: N_{oc}: -114dBm/15kHz + Δ_{BG_offset} $\hat{E}s1 / N_{oc}$: -3.5dB $\hat{E}s2 / N_{oc}$: -3.5dB RSRQ_44 to RSRQ_59
The derivation of the RSRQ values takes into account the uncertainty in Cell 2 SS-RSRQ from N_{oc} and $\hat{E}s2 / N_{oc}$, the allowed UE reporting accuracy, and the UE mapping function. The SS-RSRQ values given above are for normal conditions. For extreme conditions, the SS-RSRQ values are 1.5dB wider at each end for Test 1, and 0.5 dB wider at each for Tests 2 and 3.			
6.7.2.2.1 NR SA FR1-FR1 SS-RSRQ absolute measurement accuracy	**TEST CONFIGURATION 1, 2, 4, 5**		
	Test 1: N_{oc1}: -80.18 dBm/15kHz N_{oc2}: -80.18 dBm/15kHz $\hat{E}s1 / N_{oc1}$: -1.75dB $\hat{E}s2 / N_{oc2}$: -1.75dB Reported RSRQ values: ±2.5dB Test 2: N_{oc1}: -106dBm/15kHz N_{oc2}: -106dBm/15kHz $\hat{E}s1 / N_{oc1}$: -1.75dB $\hat{E}s2 / N_{oc2}$: -1.75dB Reported RSRQ values: ±2.5dB Test 3: N_{oc1}: -116dBm/15kHz + Δ_{BG_offset} N_{oc2}: -116dBm/15kHz + Δ_{BG_offset} $\hat{E}s1 / N_{oc1}$: 3dB $\hat{E}s2 / N_{oc2}$: -1.75dB Reported RSRQ values: ±2.5dB	Test 1: -1.5dB -1.5dB 0dB 0dB Via mapping Test 2: 0dB 0dB 0dB 0dB Via mapping Test 3: 0dB 0dB 0dB 0dB Via mapping	Test 1: N_{oc1}: -81.68dBm/15kHz N_{oc2}: -81.68dBm/15kHz $\hat{E}s1 / N_{oc1}$: -1.75dB $\hat{E}s2 / N_{oc2}$: -1.75dB RSRQ_52 to RSRQ_62 Test 2: N_{oc1}: -106dBm/15kHz N_{oc2}: -106dBm/15kHz $\hat{E}s1 / N_{oc1}$: -1.75dB $\hat{E}s2 / N_{oc2}$: -1.75dB RSRQ_52 to RSRQ_62 Test 3: N_{oc1}: -116dBm/15kHz + Δ_{BG_offset} N_{oc2}: -116dBm/15kHz + Δ_{BG_offset} $\hat{E}s1 / N_{oc1}$: 3dB $\hat{E}s2 / N_{oc2}$: -1.75dB RSRQ_52 to RSRQ_62
	TEST CONFIGURATION 3, 6		
	Test 1: N_{oc1}: -86.27 dBm/15kHz N_{oc2}: -86.27 dBm/15kHz $\hat{E}s1 / N_{oc1}$: -1.75dB $\hat{E}s2 / N_{oc2}$: -1.75dB Reported RSRQ values: ±2.5dB Test 2:	Test 1: -1.53dB -1.53dB 0dB 0dB Via mapping Test 2:	Test 1: N_{oc1}: -87.8dBm/15kHz N_{oc2}: -87.8dBm/15kHz $\hat{E}s1 / N_{oc1}$: -1.75dB $\hat{E}s2 / N_{oc2}$: -1.75dB RSRQ_52 to RSRQ_62 Test 2:

	N_{oc1}: -106dBm/15kHz N_{oc2}: -106dBm/15kHz Ês1 / N_{oc1}: -1.75dB Ês2 / N_{oc2}: -1.75dB Reported RSRQ values: ±2.5dB Test 3: N_{oc1}: -116dBm/15kHz + Δ_{BG_offset} N_{oc2}: -116dBm/15kHz + Δ_{BG_offset} Ês1 / N_{oc1}: 3dB Ês2 / N_{oc2}: -1.75dB Reported RSRQ values: ±2.5dB	0dB 0dB 0dB 0dB Via mapping Test 3: 0dB 0dB 0dB 0dB Via mapping	N_{oc1}: -106dBm/15kHz N_{oc2}: -106dBm/15kHz Ês1 / N_{oc1}: -1.75dB Ês2 / N_{oc2}: -1.75dB RSRQ_52 to RSRQ_62 Test 3: N_{oc1}: -116dBm/15kHz + Δ_{BG_offset} N_{oc2}: -116dBm/15kHz + Δ_{BG_offset} Ês1 / N_{oc1}: 3dB Ês2 / N_{oc2}: -1.75dB RSRQ_52 to RSRQ_62
The derivation of the RSRQ values takes into account the uncertainty in Cell 2 SS-RSRQ from N_{oc2} and Ês2 / N_{oc2}, the allowed UE reporting accuracy, and the UE mapping function. The SS-RSRQ values given above are for normal conditions. For extreme conditions, the RSRQ values are 1.5dB wider at each end.			
6.7.2.2.2 NR SA FR1-FR1 SS-RSRQ relative measurement accuracy	**TEST CONFIGURATION 1, 2, 4, 5**		
	Test 1: N_{oc1}: -80.18 dBm/15kHz N_{oc2}: -80.18 dBm/15kHz Ês1 / N_{oc1}: -1.75dB Ês2 / N_{oc2}: -1.75dB Reported RSRQ values: ±3dB Test 2: N_{oc1}: -106dBm/15kHz N_{oc2}: -106dBm/15kHz Ês1 / N_{oc1}: -1.75dB Ês2 / N_{oc2}: -1.75dB Reported RSRQ values: ±3dB Test 3: N_{oc1}: -116dBm/15kHz + Δ_{BG_offset} N_{oc2}: -116dBm/15kHz + Δ_{BG_offset} Ês1 / N_{oc1}: 3dB Ês2 / N_{oc2}: -1.75dB Reported RSRQ values: ±3dB	Test 1: -1.5dB -1.5dB 0dB 0dB Via mapping Test 2: 0dB 0dB 0dB 0dB Via mapping Test 3: 0dB 0dB 0dB 0dB Via mapping	Test 1: N_{oc1}: -81.68dBm/15kHz N_{oc2}: -81.68dBm/15kHz Ês1 / N_{oc1}: -1.75dB Ês2 / N_{oc2}: -1.75dB RSRQ_x-7 to RSRQ_x+7 Test 2: N_{oc1}: -106dBm/15kHz N_{oc2}: -106dBm/15kHz Ês1 / N_{oc1}: -1.75dB Ês2 / N_{oc2}: -1.75dB RSRQ_x-7 to RSRQ_x+7 Test 3: N_{oc1}: -116dBm/15kHz + Δ_{BG_offset} N_{oc2}: -116dBm/15kHz + Δ_{BG_offset} Ês1 / N_{oc1}: 3dB Ês2 / N_{oc2}: -1.75dB RSRQ_x-11 to RSRQ_x+2
	TEST CONFIGURATION 3, 6		
	Test 1: N_{oc1}: -86.27 dBm/15kHz N_{oc2}: -86.27 dBm/15kHz Ês1 / N_{oc1}: -1.75dB Ês2 / N_{oc2}: -1.75dB Reported RSRQ values: ±2.5dB Test 2: N_{oc1}: -106dBm/15kHz N_{oc2}: -106dBm/15kHz Ês1 / N_{oc1}: -1.75dB Ês2 / N_{oc2}: -1.75dB Reported RSRQ values: ±3dB Test 3: N_{oc1}: -116dBm/15kHz + Δ_{BG_offset} N_{oc2}: -116dBm/15kHz + Δ_{BG_offset} Ês1 / N_{oc1}: 3dB Ês2 / N_{oc2}: -1.75dB Reported RSRQ values: ±3dB	Test 1: -1.53dB -1.53dB 0dB 0dB Via mapping Test 2: 0dB 0dB 0dB 0dB Via mapping Test 3: 0dB 0dB 0dB 0dB Via mapping	Test 1: N_{oc1}: -87.8dBm/15kHz N_{oc2}: -87.8dBm/15kHz Ês1 / N_{oc1}: -1.75dB Ês2 / N_{oc2}: -1.75dB RSRQ_x-7 to RSRQ_x+7 Test 2: N_{oc1}: -106dBm/15kHz N_{oc2}: -106dBm/15kHz Ês1 / N_{oc1}: -1.75dB Ês2 / N_{oc2}: -1.75dB RSRQ_x-7 to RSRQ_x+7 Test 3: N_{oc1}: -116dBm/15kHz + Δ_{BG_offset} N_{oc2}: -116dBm/15kHz + Δ_{BG_offset} Ês1 / N_{oc1}: 3dB Ês2 / N_{oc2}: -1.75dB RSRQ_x-11 to RSRQ_x+2
The derivation of the RSRQ values takes into account the uncertainty in Cell 1 and Cell 2 SS-RSRQ from N_{oc2} and Ês2 / N_{oc2}, the allowed UE reporting accuracy, and the UE mapping function.			

The SS-RSRQ values given above are for normal conditions. For extreme conditions, the RSRQ values are 1dB wider at each end.			
6.7.3.1 NR SA FR1 SS-SINR measurement accuracy	**TEST CONFIGURATION 1, 2, 4, 5**		
	Test 1: N_{oc}: -93dBm/15kHz $\hat{E}s1 / N_{oc}$: +4.54dB $\hat{E}s2 / N_{oc}$: +4.54dB Reported SINR values: ±3.5dB Test 2: N_{oc}: -116dBm/15kHz+ Δ_{BG_offset} $\hat{E}s1 / N_{oc}$: -4dB $\hat{E}s2 / N_{oc}$: -4dB Reported SINR values: ±3.5dB	Test 1: 0dB 0dB 0dB Via mapping Test 2: 0dB 0.5dB 0.5dB Via mapping	Test 1: N_{oc}: -93dBm/15kHz $\hat{E}s1 / N_{oc}$: +4.54dB $\hat{E}s2 / N_{oc}$: +4.54dB SINR_31 to SINR_49 Test 2: N_{oc}: -116dBm/15kHz+ Δ_{BG_offset} $\hat{E}s1 / N_{oc}$: -3.5dB $\hat{E}s2 / N_{oc}$: -3.5dB SINR_28 to SINR_45
	TEST CONFIGURATION 3, 6		
	Test 1: N_{oc}: -93dBm/15kHz $\hat{E}s1 / N_{oc}$: +4.54dB $\hat{E}s2 / N_{oc}$: +4.54dB Reported SINR values: ±3.5dB Test 2: N_{oc}: -116dBm/15kHz+ Δ_{BG_offset} $\hat{E}s1 / N_{oc}$: -4dB $\hat{E}s2 / N_{oc}$: -4dB Reported SINR values: ±3.5dB	Test 1: -0.2dB 0dB 0dB Via mapping Test 2: 0dB 0.5dB 0.5dB Via mapping	Test 1: N_{oc}: -93.2dBm/15kHz $\hat{E}s1 / N_{oc}$: +4.54dB $\hat{E}s2 / N_{oc}$: +4.54dB SINR_31 to SINR_49 Test 2: N_{oc}: -116dBm/15kHz+ Δ_{BG_offset} $\hat{E}s1 / N_{oc}$: -3.5dB $\hat{E}s2 / N_{oc}$: -3.5dB SINR_28 to SINR_45
The derivation of the SINR values takes into account the uncertainty in Cell 2 SS- SINR from N_{oc} and $\hat{E}s2 / N_{oc}$, the allowed UE reporting accuracy, and the UE mapping function. The SS- SINR values given above are for normal conditions. For extreme conditions, the SS- SINR values are 0.5dB wider at each end.			
6.7.3.2.1 NR SA FR1-FR1 SS-SINR absolute measurement accuracy	**TEST CONFIGURATION 1, 2, 3, 4, 5, 6**		
	Test 1: N_{oc1}: -88 dBm/15kHz N_{oc2}: -88 dBm/15kHz $\hat{E}s1 / N_{oc1}$: -1.75dB $\hat{E}s2 / N_{oc2}$: -1.75dB Reported SINR values: ±3dB Test 2: N_{oc1}: -108.5dBm/15kHz N_{oc2}: -108.5dBm/15kHz $\hat{E}s1 / N_{oc1}$: 20dB $\hat{E}s2 / N_{oc2}$: 20dB Reported SINR values: ±3dB Test 3: N_{oc1}: -119.5dBm/15kHz + Δ_{BG_offset} N_{oc2}: -119.5dBm/15kHz + Δ_{BG_offset} $\hat{E}s1 / N_{oc1}$: -4dB $\hat{E}s2 / N_{oc2}$: -4dB Reported SINR values: ±3.5dB	Test 1: 0dB 0dB 0dB 0dB Via mapping Test 2: 0dB 0dB 0dB 0dB Via mapping Test 3: 0dB 0dB 0.8dB 0.8dB Via mapping	Test 1: N_{oc1}: -88 dBm/15kHz N_{oc2}: -88 dBm/15kHz $\hat{E}s1 / N_{oc1}$: -1.75dB $\hat{E}s2 / N_{oc2}$: -1.75dB SINR_35 to SINR_51 Test 2: N_{oc1}: -108.5dBm/15kHz N_{oc2}: -108.5dBm/15kHz $\hat{E}s1 / N_{oc1}$: 20dB $\hat{E}s2 / N_{oc2}$: 20dB SINR_79 to SINR_94 Test 3: N_{oc1}: -119.5dBm/15kHz + Δ_{BG_offset} N_{oc2}: -119.5dBm/15kHz + Δ_{BG_offset} $\hat{E}s1 / N_{oc1}$: -3.2dB $\hat{E}s2 / N_{oc2}$: -3.2dB SINR_32 to SINR_49
The derivation of the SINR values takes into account the uncertainty in Cell 2 SS- SINR from N_{oc} and $\hat{E}s2 / N_{oc}$, the allowed UE reporting accuracy, and the UE mapping function. The SS- SINR values given above are for normal conditions. For extreme conditions, the SS- SINR values are 1dB wider at each for Tests 1 and 2 and 0.5dB wider at each end for Test 3.			
6.7.3.2.2 NR SA FR1-FR1 SS-SINR relative measurement accuracy	**TEST CONFIGURATION 1, 2, 3, 4, 5, 6**		
	Test 1: N_{oc1}: -88 dBm/15kHz N_{oc2}: -88 dBm/15kHz	Test 1: 0dB 0dB	Test 1: N_{oc1}: -88 dBm/15kHz N_{oc2}: -88 dBm/15kHz

	$\hat{E}s1 / N_{oc1}$: -1.75dB $\hat{E}s2 / N_{oc2}$: -1.75dB Reported SINR values: ±3.5dB Test 2: N_{oc1}: -108.5dBm/15kHz N_{oc2}: -108.5dBm/15kHz $\hat{E}s1 / N_{oc1}$: 20dB $\hat{E}s2 / N_{oc2}$: 20dB Reported SINR values: ±3.5dB Test 3: N_{oc1}: -119.5dBm/15kHz + Δ_{BG_offset} N_{oc2}: -119.5dBm/15kHz + Δ_{BG_offset} $\hat{E}s1 / N_{oc1}$: -4dB $\hat{E}s2 / N_{oc2}$: -4dB Reported SINR values: ±4dB	0dB 0dB Via mapping Test 2: 0dB 0dB 0dB 0dB Via mapping Test 3: 0dB 0dB 0.8dB 0.8dB Via mapping	$\hat{E}s1 / N_{oc1}$: -1.75dB $\hat{E}s2 / N_{oc2}$: -1.75dB SINR_x-10 to SINR_x+10 Test 2: N_{oc1}: -108.5dBm/15kHz N_{oc2}: -108.5dBm/15kHz $\hat{E}s1 / N_{oc1}$: 20dB $\hat{E}s2 / N_{oc2}$: 20dB SINR_x-10 to SINR_x+10 Test 3: N_{oc1}: -119.5dBm/15kHz + Δ_{BG_offset} N_{oc2}: -119.5dBm/15kHz + Δ_{BG_offset} $\hat{E}s1 / N_{oc1}$: -3.2dB $\hat{E}s2 / N_{oc2}$: -3.2dB SINR_x-11 to SINR_x+11
The derivation of the SINR values takes into account the uncertainty in Cell 1 and Cell 2 SS- SINR from N_{oc} and $\hat{E}s2 / N_{oc}$, the allowed UE reporting accuracy, and the UE mapping function. The SS- SINR values given above are for normal conditions. For extreme conditions, the SS- SINR values are 0.5dB wider at each for Tests 1 and 2 and 0dB wider at each end for Test 3.			
6.7.4.1.1 NR SA FR1 SSB based L1-RSRP absolute measurement accuracy			
Test Configuration 1,2,4,5	Test 1: N_{oc1}: -94.65 dBm/15kHz $\hat{E}s_1 / N_{oc1}$: 10dB Reported L1-RSRP values: ±8.5dB (±4.5dB additionally for extreme conditions) Test 2: N_{oc1}: -119.5dBm/15kHz + Δ_{BG_offset} $\hat{E}s_1 / N_{oc1}$: -3dB Reported L1-RSRP values: ±5dB (±3dB additionally for extreme conditions)	Test 1: 0dB 0dB Via mapping Test 2: 0dB 0.8dB Via mapping	Test 1: N_{oc1}: -94.65dBm/15kHz $\hat{E}s_1 / N_{oc1}$: 10dB RSRP_62 to RSRP_82 Test 2: N_{oc1}: -119.2dBm/15kHz + Δ_{BG_offset} $\hat{E}s_1 / N_{oc1}$: -2.2dB RSRP_31 to RSRP_44 RSRP_31 to RSRP_45 RSRP_32 to RSRP_45 RSRP_32 to RSRP_46 RSRP_33 to RSRP_46 RSRP_34 to RSRP_47 RSRP_34 to RSRP_48 depending on operating band
Test Configuration 3,6	Test 1: N_{oc1}: -94.65 dBm/15kHz $\hat{E}s_1 / N_{oc1}$: 10dB Reported L1-RSRP values: ±8.5dB (±4.5dB additionally for extreme conditions) Test 2: N_{oc1}: -119.5dBm/15kHz + Δ_{BG_offset} $\hat{E}s_1 / N_{oc1}$: -3dB Reported L1-RSRP values: ±5dB (±3dB additionally for extreme conditions)	Test 1: -1.35dB 0dB Via mapping Test 2: 0dB 0.8dB Via mapping	Test 1: N_{oc1}: -96dBm/15kHz $\hat{E}s_1 / N_{oc1}$: 10dB RSRP_63 to RSRP_84 Test 2: N_{oc1}: -116.2dBm/15kHz + Δ_{BG_offset} $\hat{E}s_1 / N_{oc1}$: -2.2dB RSRP_34 to RSRP_47 RSRP_34 to RSRP_48 RSRP_35 to RSRP_48 RSRP_35 to RSRP_49 RSRP_36 to RSRP_49 RSRP_37 to RSRP_50 RSRP_37 to RSRP_51 depending on operating band
6.7.4.1.2 NR SA FR1 SSB based L1-RSRP relative measurement accuracy			
Test Configuration 1,2,4,5	Test 1: N_{oc1}: -94.65 dBm/15kHz $\hat{E}s_1 / N_{oc1}$: 10dB	Test 1: 0dB 0dB	Test 1: N_{oc1}: -94.65dBm/15kHz $\hat{E}s_1 / N_{oc1}$: 10dB

	Reported L1-RSRP values: ±8.5dB (±1dB additionally for extreme conditions) Test 2: N_{oc1}: -119.5dBm/15kHz + Δ_{BG_offset} $\hat{E}s_1$ / N_{oc1}: -3dB Reported L1-RSRP values: ±5dB (±1dB additionally for extreme conditions)	Via mapping Test 2: 0dB 0.8dB Via mapping	RSRP_x-3 to RSRP_x+3 Test 2: N_{oc1}: -119.2dBm/15kHz + Δ_{BG_offset} $\hat{E}s_1$ / N_{oc1}: -2.2dB RSRP_x-3 to RSRP_x+3
Test Configuration 3,6	Test 1: N_{oc1}: -94.65 dBm/15kHz $\hat{E}s_1$ / N_{oc1}: 10dB Reported L1-RSRP values: ±8.5dB (±1dB additionally for extreme conditions) Test 2: N_{oc1}: -119.5dBm/15kHz + Δ_{BG_offset} $\hat{E}s_1$ / N_{oc1}: -3dB Reported L1-RSRP values: ±5dB (±1dB additionally for extreme conditions)	Test 1: -1.35dB 0dB Via mapping Test 2: 0dB 0.8dB Via mapping	Test 1: N_{oc1}: -96dBm/15kHz $\hat{E}s_1$ / N_{oc1}: 10dB RSRP_x-3 to RSRP_x+3 Test 2: N_{oc1}: -116.2dBm/15kHz + Δ_{BG_offset} $\hat{E}s_1$ / N_{oc1}: -2.2dB RSRP_x-3 to RSRP_x+3
6.7.4.2.1 NR SA FR1 CSI-RS based L1-RSRP absolute measurement accuracy	Same as 6.7.4.1.1	Same as 6.7.4.1.1	Same as 6.7.4.1.1
6.7.4.2.2 NR SA FR1 CSI-RS based L1-RSRP relative measurement accuracy	Same as 6.7.4.1.2	Same as 6.7.4.1.2	Same as 6.7.4.1.2
6.7.5.1 NR SA FR1 – E-UTRAN RSRP absolute measurement accuracy	Test 1: N_{oc}: -91.65dBm/15kHz $\hat{E}_s$ / N_{oc}: +10.0dB Reported RSRP values: ±9dB (±2dB additionally for extreme conditions) Test 2: N_{oc}: -117dBm/15kHz+ Δ_{BG_offset} $\hat{E}_s$ / N_{oc}: -4.0dB Reported RSRP values: ±4.5dB (±3.5dB additionally for extreme conditions)	Test 1: 0dB 0dB Via mapping Test 2: 0dB 0.8dB Via mapping	Test 1: N_{oc}: -91.65dBm/15kHz $\hat{E}s$ / N_{oc}: 10dB RSRP_48 to RSRP_70 Test 2: N_{oc}: -117dBm/15kHz+ Δ_{BG_offset} $\hat{E}s$ / N_{oc}: -3.2dB RSRP_14 to RSRP_27 RSRP_15 to RSRP_27 RSRP_15 to RSRP_28 RSRP_16 to RSRP_28 RSRP_16 to RSRP_29 RSRP_17 to RSRP_30 RSRP_18 to RSRP_30 Depending on operating band
6.7.6.1 NR SA FR1 – E-UTRAN RSRQ absolute measurement accuracy	Test 1: N_{oc}: -83dBm/15kHz $\hat{E}_s$ / N_{oc}: -1.75dB Reported RSRQ values: ±2.5dB (±1.5dB additionally for extreme conditions) Test 2: N_{oc}: -104.7dBm/15kHz $\hat{E}_s$ / N_{oc}: -4.0dB Reported RSRQ values: ±3.5dB (±0.5dB additionally for extreme conditions) Test 3: N_{oc}: -119.5dBm/15kHz+ Δ_{BG_offset} $\hat{E}_s$ / N_{oc}: -4.0dB Reported RSRQ values: ±3.5dB (±0.5dB additionally for extreme conditions)	Test 1: 0dB 0dB Via mapping Test 2: 0dB 0.8dB Via mapping Test 3: 0dB 0.8dB Via mapping	Test 1: N_{oc}: -83dBm/15kHz $\hat{E}s$ / N_{oc}: -1.75dB RSRQ_4 to RSRQ_16 Test 2: N_{oc}: -104.7dBm/15kHz $\hat{E}s$ / N_{oc}: -3.2dB RSRQ_0 to RSRQ_16 Test 3: N_{oc}: -119.5dBm/15kHz+ Δ_{BG_offset} $\hat{E}s$ / N_{oc}: -3.2dB RSRQ_0 to RSRQ_16
6.7.7.1 NR SA FR1 – E-UTRAN RS-SINR absolute measurement	Test 1: N_{oc}: -88dBm/15kHz $\hat{E}_s$ / N_{oc}: -1.75dB	Test 1: 0dB 0dB	Test 1: N_{oc}: -88dBm/15kHz $\hat{E}s$ / N_{oc}: -1.75dB

accuracy	Reported RS-SINR values: ±3.0dB (±1.0dB additionally for extreme conditions) Test 2: N_{oc}: -108.5dBm/15kHz $\hat{E}_s$ / N_{oc}: 20.0dB Reported RS-SINR values: ±3.0dB (±1.0dB additionally for extreme conditions) Test 3: N_{oc}: -119.5dBm/15kHz+ Δ_{BG_offset} $\hat{E}_s$ / N_{oc}: -4.0dB Reported RS-SINR values: ±3.5dB (±0.5dB additionally for extreme conditions)	Via mapping Test 2: 0dB 0dB Via mapping Test 3: 0dB 0.8dB Via mapping	SINR_35 to SINR_51 Test 2: N_{oc}: -108.5dBm/15kHz $\hat{E}s$ / N_{oc}: 20.0dB SINR_79 to SINR_94 Test 3: N_{oc}: -119.5dBm/15kHz+ Δ_{BG_offset} $\hat{E}s$ / N_{oc}: -3.2dB SINR_32 to SINR_49
6.7.9.1.1 NR SA FR1 CSI-RS based CMR and no dedicated IMR configured and CSI-RS resource set with repetition off L1-SINR absolute measurement accuracy			
Test Configuration 1,2,4,5	Same as 4.7.7.1	Same as 4.7.7.1	Same as 4.7.7.1
Test Configuration 3,6	Same as 4.7.7.1	Same as 4.7.7.1	Same as 4.7.7.1
6.7.9.2 NR SA FR1 SSB based CMR and dedicated IMR L1-SINR absolute measurement accuracy			
Test Configuration 1,2,4,5	Same as 4.7.7.2	Same as 4.7.7.2	Same as 4.7.7.2
Test Configuration 3,6	Same as 4.7.7.2	Same as 4.7.7.2	Same as 4.7.7.2
6.7.9.3 NR SA FR1 CSI-RS based CMR and dedicated IMR L1-SINR measurement accuracy			
Test Configuration 1,2,4,5	Same as 4.7.7.3	Same as 4.7.7.3	Same as 4.7.7.3
Test Configuration 3,6	Same as 4.7.7.3	Same as 4.7.7.3	Same as 4.7.7.3

Table F.1.3.2-3: Derivation of test requirements for EN-DC FR2 RRM tests

Test	Minimum requirement in TS 38.133 [6]	Test tolerance (TT)	Test requirement in TS 38.533
5.3.2.2.1 EN-DC FR2 contention based random access	Absolute uplink power: $P_{int} \geq P \geq P_{min}$ ±14.0dB $P_{UMAX} \geq P > P_{int}$ ±12.0dB Relative uplink power step: $P_{int} \geq P \geq P_{min}$ ±6.0dB $P_{UMAX} \geq P > P_{int}$ ±4.0dB Uplink timing: 120kHz SCS T_e ±3.5*64*T_c	Not applicable due to UL calibration FFS dB FFS dB [48]T_c	Absolute uplink power: ±FFSdB Relative uplink power step: ±(6+FFS)dB, either PRACH being compared ≤ (P_{max} – 6dB) ±(4+FFS)dB, both PRACHs being compared > (P_{max} – 6dB) Uplink timing: 120kHz SCS T_e ±224±[48]*T_c
5.3.2.2.2 EN-DC FR2 non-contention based random access	Same as 5.3.2.2.1	Same as 5.3.2.2.1	Same as 5.3.2.2.1
5.4.1.1 EN-DC FR2 UE transmit timing accuracy	Test 1 (no DRX): Uplink timing: ±3*64*T_c for 240 kHz SSB SCS Max step size T_q: 2.5*64*T_c Min adjust rate T_p: 2.5*64*T_c Max adjust rate: 2.5*64*T_c N_{oc} = -112 dBm/15 kHz $\hat{E}s_2$ / N_{oc}: +4.0dB Test 2 (with DRX): Uplink timing: ±3*64*T_c for 240 kHz SSB SCS N_{oc} = -112 dBm/15 kHz $\hat{E}s_2$ / N_{oc}: +4.0dB	±0.75*64*T_c +0.625*64T_c -3.725*64*T_c +1.225*64*T_c 0dB 0dB ±0.75*64*T_c 0dB 0dB	Test 1 (no DRX): Uplink timing: ±3.75*64*T_c Max step size T_q: 3.125*64*T_c Min adjust rate: -1.225*64*T_c Max adjust rate: 3.725*64*T_c N_{oc} = -112 dBm/15 kHz $\hat{E}s_2$ / N_{oc}: +4.0dB Test 2 (with DRX): Uplink timing: ±3.75*64*T_c N_{oc} = -112 dBm/15 kHz $\hat{E}s_2$ / N_{oc}: +4.0dB
5.4.3.1 EN-DC FR2 UE timing advance adjustment accuracy	Noc = -112 dBm/15 kHz Ês1 / Noc = 4 dB UE Timing Advance Adjustment Accuracy for 120kHz SCS = ±32 Tc	0dB 0dB +/- 40 Tc	Noc = -112 dBm/15 kHz Ês1 / Noc = 4 dB UE TAAA for 120kHz SCS = ±72 Tc
5.5.1.1 EN-DC FR2 radio link monitoring out-of-sync test for PSCell configured with SSB-	During T1: Noc: -92.1 dBm/15kHz Ês1 / Noc: +2 dB Ês2 / Noc: +2 dB	During T1: -2.7 dB 2.1 dB 2.1 dB	During T1: Noc: -94.8 dBm/15kHz Ês1 / Noc: +4.1 dB Ês2 / Noc: +4.1 dB

based RLM RS in non-DRX mode	During T2: Noc: -92.1dBm/15kHz Ês1 / Noc: -6 dB Ês2 / Noc: -15 dB During T3: Noc: -92.1dBm/15kHz Ês1 / Noc: -15 dB Ês2 / Noc: -15 dB	During T2: -2.7 dB 2.1 dB 0 dB During T3: -2.7 dB 0 dB 0 dB	During T2: Noc: -94.8 dBm/15kHz Ês1 / Noc: -3.9 dB Ês2 / Noc: -15 dB During T3: Noc: -94.8 dBm/15kHz Ês1 / Noc: -15 dB Ês2 / Noc: -15 dB
5.5.1.2 EN-DC FR2 radio link monitoring in-sync test for PSCell configured with SSB-based RLM RS in non-DRX mode	During T1: Noc: -92.1 dBm/15kHz Ês1 / Noc: +2 dB Ês2 / Noc: +2 dB During T2: Noc: -92.1dBm/15kHz Ês1 / Noc: -6 dB Ês2 / Noc: -15 dB During T3: Noc: -92.1dBm/15kHz Ês1 / Noc: -15 dB Ês2 / Noc: -15 dB During T4: Noc: -92.1dBm/15kHz Ês1 / Noc: -4.5 dB Ês2 / Noc: -15 dB During T5: Noc: -92.1dBm/15kHz Ês1 / Noc: +2 dB Ês2 / Noc: -15 dB	During T1: -2.7 dB 2.1 dB 2.1 dB During T2: -2.7 dB 2.1 dB 0 dB During T3: -2.7 dB 0 dB 0 dB During T4: -2.7 dB 0 dB 0 dB During T5: -2.7 dB 2.1 dB 0 dB	During T1: Noc: -94.8 dBm/15kHz Ês1 / Noc: +4.1 dB Ês2 / Noc: +4.1 dB During T2: Noc: -94.8 dBm/15kHz Ês1 / Noc: -3.9 dB Ês2 / Noc: -15 dB During T3: Noc: -94.8 dBm/15kHz Ês1 / Noc: -15 dB Ês2 / Noc: -15 dB During T4: Noc: -94.8 dBm/15kHz Ês1 / Noc: -4.5 dB Ês2 / Noc: -15 dB During T5: Noc: -94.8 dBm/15kHz Ês1 / Noc: 4.1 dB Ês2 / Noc: -15 dB
5.5.1.3 EN-DC FR2 radio link monitoring out-of-sync test for PSCell configured with SSB-based RLM RS in DRX mode	During T1: Noc: -104.7 dBm/15kHz Ês1 / Noc: +2 dB Ês2 / Noc: +2 dB During T2: Noc: -104.7 dBm/15kHz Ês1 / Noc: -6 dB Ês2 / Noc: -15 dB During T3: Noc: -104.7 dBm/15kHz Ês1 / Noc: -15 dB Ês2 / Noc: -15 dB	During T1: 0 dB 1.3 dB 1.3 dB During T2: 0 dB 1.3 dB -0.4 dB During T3: 0 dB -0.4 dB -0.4 dB	During T1: Noc: -104.7 dBm/15kHz Ês1 / Noc: +3.3 dB Ês2 / Noc: +3.3 dB During T2: Noc: -104.7 dBm/15kHz Ês1 / Noc: -4.7 dB Ês2 / Noc: -15.4 dB During T3: Noc: -104.7 dBm/15kHz Ês1 / Noc: -15.4 dB Ês2 / Noc: -15.4 dB
5.5.1.4 EN-DC FR2 radio link monitoring in-sync test for PSCell configured with SSB-based RLM RS in DRX mode	During T1: Noc: -104.7 dBm/15kHz Ês1 / Noc: +2 dB Ês2 / Noc: +2 dB During T2: Noc: -104.7 dBm/15kHz Ês1 / Noc: -6 dB Ês2 / Noc: -15 dB During T3: Noc: -104.7 dBm/15kHz Ês1 / Noc: -15 dB Ês2 / Noc: -15 dB During T4: Noc: -104.7 dBm/15kHz Ês1 / Noc: -4.5 dB Ês2 / Noc: -15 dB	During T1: 0 dB 1.3 dB 1.3 dB During T2: 0 dB 1.3 dB -0.4 dB During T3: 0 dB -0.4 dB -0.4 dB During T4: 0 dB -0.4 dB -0.4 dB	During T1: Noc: -104.7 dBm/15kHz Ês1 / Noc: +3.3 dB Ês2 / Noc: +3.3 dB During T2: Noc: -104.7 dBm/15kHz Ês1 / Noc: -4.7 dB Ês2 / Noc: -15.4 dB During T3: Noc: -104.7 dBm/15kHz Ês1 / Noc: -15.4 dB Ês2 / Noc: -15.4 dB During T4: Noc: -104.7 dBm/15kHz Ês1 / Noc: -4.9 dB Ês2 / Noc: -15.4 dB

	During T5: Noc: -104.7 dBm/15kHz Ês1 / Noc: +2 dB Ês2 / Noc: -14 dB	During T5: 0 dB 1.3 dB -0.4 dB	During T5: Noc: -104.7 dBm/15kHz Ês1 / Noc: 3.3 dB Ês2 / Noc: -15.4 dB
5.5.1.5 EN-DC FR2 radio link monitoring out-of-sync test for PSCell configured with CSI-RS-based RLM RS in non-DRX mode	During T1: Noc: -92.1 dBm/15kHz Ês1 / Noc: +2 dB Ês2 / Noc: +2 dB During T2: Noc: -92.1dBm/15kHz Ês1 / Noc: -6 dB Ês2 / Noc: -14 dB During T3: Noc: -92.1dBm/15kHz Ês1 / Noc: -15 dB Ês2 / Noc: -15 dB	During T1: -2.7 dB 2.1 dB 2.1 dB During T2: -2.7 dB 2.1 dB 0 dB During T3: -2.7 dB 0 dB 0 dB	During T1: Noc: -94.8 dBm/15kHz Ês1 / Noc: +4.1 dB Ês2 / Noc: +4.1 dB During T2: Noc: -94.8 dBm/15kHz Ês1 / Noc: -3.9 dB Ês2 / Noc: -14 dB During T3: Noc: -94.8 dBm/15kHz Ês1 / Noc: -15 dB Ês2 / Noc: -15 dB
5.5.1.6 EN-DC FR2 radio link monitoring in-sync test for PSCell configured with CSI-RS-based RLM RS in non-DRX mode	During T1: Noc: -92.1 dBm/15kHz Ês1 / Noc: +2 dB Ês2 / Noc: +2 dB During T2: Noc: -92.1dBm/15kHz Ês1 / Noc: -6 dB Ês2 / Noc: -14 dB During T3: Noc: -92.1dBm/15kHz Ês1 / Noc: -15 dB Ês2 / Noc: -15 dB During T4: Noc: -92.1dBm/15kHz Ês1 / Noc: -4.5 dB Ês2 / Noc: -15 dB During T5: Noc: -92.1dBm/15kHz Ês1 / Noc: +2 dB Ês2 / Noc: -14 dB	During T1: -2.7 dB 2.1 dB 2.1 dB During T2: -2.7 dB 2.1 dB 0 dB During T3: -2.7 dB 0 dB 0 dB During T4: -2.7 dB 0 dB 0 dB During T5: -2.7 dB 2.1 dB 0 dB	During T1: Noc: -94.8 dBm/15kHz Ês1 / Noc: +4.1 dB Ês2 / Noc: +4.1 dB During T2: Noc: -94.8 dBm/15kHz Ês1 / Noc: -3.9 dB Ês2 / Noc: -14 dB During T3: Noc: -94.8 dBm/15kHz Ês1 / Noc: -15 dB Ês2 / Noc: -15 dB During T4: Noc: -94.8 dBm/15kHz Ês1 / Noc: -4.5 dB Ês2 / Noc: -15 dB During T5: Noc: -94.8 dBm/15kHz Ês1 / Noc: 4.1 dB Ês2 / Noc: -14 dB
5.5.1.7 EN-DC FR2 radio link monitoring out-of-sync test for PSCell configured with CSI-RS-based RLM RS in DRX mode	During T1: Noc: -104.7 dBm/15kHz Ês1 / Noc: +2 dB Ês2 / Noc: +2 dB During T2: Noc: -104.7dBm/15kHz Ês1 / Noc: -6 dB Ês2 / Noc: -14 dB During T3: Noc: -104.7dBm/15kHz Ês1 / Noc: -15 dB Ês2 / Noc: -15 dB	During T1: 0 dB 1.3 dB 1.3 dB During T2: 0 dB 1.3 dB -0.4 dB During T3: 0 dB -0.4 dB -0.4 dB	During T1: Noc: -104.7 dBm/15kHz Ês1 / Noc: +3.3 dB Ês2 / Noc: +3.3 dB During T2: Noc: -104.7 dBm/15kHz Ês1 / Noc: -4.7 dB Ês2 / Noc: -14.4 dB During T3: Noc: -104.7 dBm/15kHz Ês1 / Noc: -15.4 dB Ês2 / Noc: -15.4 dB
5.5.1.8 EN-DC FR2 radio link monitoring in-sync test for PSCell configured with CSI-RS-based RLM RS in DRX mode	During T1: Noc: -104.7 dBm/15kHz Ês1 / Noc: +2 dB Ês2 / Noc: +2 dB During T2: Noc: -104.7dBm/15kHz Ês1 / Noc: -6 dB Ês2 / Noc: -14 dB	During T1: 0 dB 1.3 dB 1.3 dB During T2: 0 dB 1.3 dB -0.4 dB	During T1: Noc: -104.7 dBm/15kHz Ês1 / Noc: +3.3 dB Ês2 / Noc: +3.3 dB During T2: Noc: -104.7 dBm/15kHz Ês1 / Noc: -4.7 dB Ês2 / Noc: -14.4 dB

	During T3: Noc: -104.7dBm/15kHz Ês1 / Noc: -15 dB Ês2 / Noc: -15 dB During T4: Noc: -104.7dBm/15kHz Ês1 / Noc: -4.5 dB Ês2 / Noc: -15 dB During T5: Noc: -104.7dBm/15kHz Ês1 / Noc: +2 dB Ês2 / Noc: -14 dB	During T3: 0 dB -0.4 dB -0.4 dB During T4: 0 dB -0.4 dB -0.4 dB During T5: 0 dB 1.3 dB -0.4 dB	During T3: Noc: -104.7 dBm/15kHz Ês1 / Noc: -15.4 dB Ês2 / Noc: -15.4 dB During T4: Noc: -104.7 dBm/15kHz Ês1 / Noc: -4.9 dB Ês2 / Noc: -15.4 dB During T5: Noc: -104.7 dBm/15kHz Ês1 / Noc: 3.3 dB Ês2 / Noc: -14.4 dB
5.5.2.3 EN-DC FR2 interruptions during measurements on deactivated NR SCC in synchronous EN-DC	During T1: Noc1: -111.7 dBm/15kHz Noc2: -104.7 dBm/15kHz Ês1 / Noc: +12 dB Ês2 / Noc: +5 dB	During T1: 0 dB 0 dB 0 dB 0 dB	During T1: Noc1: -111.7 dBm/15kHz Noc2: -104.7 dBm/15kHz Ês1 / Noc: +12 dB Ês2 / Noc: +5 dB
5.5.2.3 EN-DC FR2 interruptions during measurements on deactivated NR SCC in asynchronous EN-DC	During T1: Noc1: -111.7 dBm/15kHz Noc2: -104.7 dBm/15kHz Ês1 / Noc: +12 dB Ês2 / Noc: +5 dB	During T1: 0 dB 0 dB 0 dB 0 dB	During T1: Noc1: -111.7 dBm/15kHz Noc2: -104.7 dBm/15kHz Ês1 / Noc: +12 dB Ês2 / Noc: +5 dB
5.5.5.1 EN-DC FR2 SSB-based beam failure detection and link recovery in non-DRX	During T1: SNR_SSB q_0: 5 dB SNR_SSB q_1: 0.2 dB During T2: SNR_SSB q_0: -3 dB SNR_SSB q_1: 0.2 dB During T3-T5: SNR_SSB q_0: -12 dB SNR_SSB q_1: 20.2 dB In signaling: rsrp-ThresholdSSB: -95 dBm/120kHz for Config 1,2 rsrp-ThresholdSSB: -92 dBm/240kHz for Config 3,4	+8.70 dB 0 dB +8.70 dB 0 dB 0 dB -0.2 dB -14 dB -14 dB	During T1: SNR_SSB q_0: 13.7 dB SNR_SSB q_1: 0.2 dB During T2: SNR_SSB q_0: 5.7 dB SNR_SSB q_1: 0.2 dB During T3-T5: SNR_SSB q_0: -12 dB SNR_SSB q_1: 20 dB In signaling: rsrp-ThresholdSSB: -109 dBm/120kHz for Config 1,2 srp-ThresholdSSB: -106 dBm/240kHz for Config 3,4
5.5.5.2 EN-DC FR2 SSB-based beam failure detection and link recovery in DRX	Same as 5.5.5.1	Same as 5.5.5.1	Same as 5.5.5.1
5.5.5.3 EN-DC FR2 CSI-RS-based beam failure detection and link recovery in non-DRX	Noc = -104.7 dBm/120 kHz $\hat{E}s_2$ / N_{oc} for CSI-RS set q0 T1: 5 dB T2: -3 dB T3: -12 dB T4: -12 dB T5: -12 dB $\hat{E}s_2$ / N_{oc} for CSI-RS set q1 T1: 0.2 dB T2: 0.2 dB T3: 20.2 dB T4: 20.2 dB T5: 20.2 dB rsrp-ThresholdSSB: -95 dBm/SCS kHz	0 dB 8.7 dB 8.7 dB 0 dB 0 dB 0 dB 0 dB 0 dB -0.2 dB -0.2 dB -0.2 dB -14 dB	Noc = -104.7 dBm/120 kHz $\hat{E}s_2$ / N_{oc} for CSI-RS set q0 T1: 13.7 dB T2: 5.7 dB T3: -12 dB T4: -12 dB T5: -12 dB $\hat{E}s_2$ / N_{oc} for CSI-RS set q1 T1: 0.2 dB T2: 0.2 dB T3: 20 dB T4: 20 dB T5: 20 dB rsrp-ThresholdSSB: -109.0 dBm/SCS kHz
5.5.5.4 EN-DC FR2 CSI-RS-based beam failure	Same as 5.5.5.3	Same as 5.5.5.3	Same as 5.5.5.3

detection and link recovery in DRX			
5.5.5.5 EN-DC FR2 scheduling available restriction during SSB-based beam failure detection and link recovery in non-DRX	Same as 5.5.5.1	Same as 5.5.5.1	Same as 5.5.5.1
5.5.5.6 EN-DC FR2 SCell CSI-RS-based beam failure detection and link recovery in non-DRX	Noc = -104.7 dBm/120 kHz $\hat{E}_{s3}$ / N_{oc} for CSI-RS set q0 T1: 5 dB T2: -3 dB T3: -12 dB T4: -12 dB T5: -12 dB $\hat{E}_{s3}$ / N_{oc} for CSI-RS set q1 T1: 0.2 dB T2: 0.2 dB T3: 20.2 dB T4: 20.2 dB T5: 20.2 dB rsrp-ThresholdBFR: -95 dBm/SCS kHz	0 dB 8.7 dB 8.7 dB 0 dB 0 dB 0 dB 0 dB 0 dB -0.2 dB -0.2 dB -0.2 dB -14 dB	Noc = -104.7 dBm/120 kHz $\hat{E}_{s3}$ / N_{oc} for CSI-RS set q0 T1: 13.7 dB T2: 5.7 dB T3: -12 dB T4: -12 dB T5: -12 dB $\hat{E}_{s3}$ / N_{oc} for CSI-RS set q1 T1: 0.2 dB T2: 0.2 dB T3: 20 dB T4: 20 dB T5: 20 dB rsrp-ThresholdBFR: -109.0 dBm/SCS kHz
5.5.5.7 EN-DC FR2 SCell CSI-RS-based beam failure detection and link recovery in DRX	Same as 5.5.5.6	Same as 5.5.5.6	Same as 5.5.5.6
5.5.6.2.1 EN-DC FR2 RRC-based DL active BWP switch in non-DRX in synchronous EN-DC	During T1: Noc2: -112dBm/15kHz $\hat{E}_{s2}$ / Iot2: +18dB	During T1: 0dB 0dB	During T1: Noc2: -112dBm/15kHz $\hat{E}_{s2}$ / Iot2: +18dB
5.6.1.1 EN-DC FR2 event-triggered reporting without gap in non-DRX	During T1: $\hat{E}_{s2}$: -86dBm/120kHz $\hat{E}_{s3}$: -infinity During T2: $\hat{E}_{s2}$: -86dBm/120kHz $\hat{E}_{s3}$: -86dBm/120kHz	During T1: 0dB 0dB During T2: 0dB 0dB	During T1: $\hat{E}_{s2}$: -86dBm/120kHz $\hat{E}_{s3}$: -infinity During T2: $\hat{E}_{s2}$: -86dBm/120kHz $\hat{E}_{s3}$: -86dBm/120kHz
5.6.1.2 EN-DC FR2 event-triggered reporting without gap in DRX	During T1: Noc: -98dBm/15kHz $\hat{E}_{s2}$ / Noc: +4.00dB $\hat{E}_{s3}$ / Noc: -infinity During T2: Noc: -98dBm/15kHz $\hat{E}_{s2}$ / Noc: +4.00dB $\hat{E}_{s3}$ / Noc: +4.00dB Signalled A3-offset: -6.0	During T1: -3.5dB 0dB 0dB During T2: -3.5dB 0dB 0dB Signalled A3-offset: -1.0	During T1: Noc: -101.5dBm/15kHz $\hat{E}_{s2}$ / Noc: +4.00dB $\hat{E}_{s3}$ / Noc: -infinity During T2: Noc: -101.5dBm/15kHz $\hat{E}_{s2}$ / Noc: +4.00dB $\hat{E}_{s3}$ / Noc: +4.00dB Signalled A3-offset: -7.0
5.6.1.3 EN-DC FR2 event-triggered reporting with gap in non-DRX	Same as 5.6.1.1	Same as 5.6.1.1	Same as 5.6.1.1
5.6.1.4 EN-DC FR2 event-triggered reporting with gap in DRX	Same as 5.6.1.2	Same as 5.6.1.2	Same as 5.6.1.2
5.6.2.1 EN-DC FR2-FR2 event-triggered reporting in non-DRX	During T1: $\hat{E}_{s1}$: -87 dBm/120kHz $\hat{E}_{s2}$: - infinity During T2: $\hat{E}_{s1}$: -87 dBm/120kHz $\hat{E}_{s2}$: -87 dBm/120kHz	During T1: 0dB 0dB During T2: 0dB 0dB	During T1: $\hat{E}_{s1}$: -87 dBm/120kHz $\hat{E}_{s2}$: -- infinity During T2: $\hat{E}_{s1}$: -87 dBm/120kHz $\hat{E}_{s2}$: -87 dBm/120kHz
5.6.2.2 EN-DC FR2-FR2	During T1:	During T1:	During T1:

event-triggered reporting in DRX	Noc: -104.70dBm/15kHz Ês1 / Noc: +6.00dB Ês2 / Noc: -infinity During T2: Noc: -104.70dBm/15kHz Ês1 / Noc: +6.00dB Ês2 / Noc: +9.00dB Signalled A3-offset: -6.0	0dB 0dB 0dB During T2: 0dB 0dB 0dB Signalled A3-offset: -6.0	Noc: -104.70dBm/15kHz Ês1 / Noc: +6.00dB Ês2 / Noc: -infinity During T2: Noc: -104.70dBm/15kHz Ês1 / Noc: +6.00dB Ês2 / Noc: +9.00dB Signalled A3-offset: -12.0
5.6.2.3 EN-DC FR2-FR2 event-triggered reporting in non-DRX with SSB time index detection	Same as 5.6.2.1	Same as 5.6.2.1	Same as 5.6.2.1
5.6.2.4 EN-DC FR2-FR2 event-triggered reporting in DRX with SSB time index detection	Same as 5.6.2.2	Same as 5.6.2.2	Same as 5.6.2.2
5.6.2.5 EN-DC FR1-FR2 event-triggered reporting in non-DRX	During T1: Ês2: - Infinity During T2: Ês2: -87 dBm/120kHz	During T1: 0dB During T2: 0dB	During T1: Ês2: - Infinity During T2: Ês2: -87 dBm/120kHz
5.6.2.6 EN-DC FR1-FR2 event-triggered reporting in DRX	During T1: Noc = -104.7 dBm/15 kHz Ês2 / Noc = - Infinity During T2: Noc = -104.7 dBm/15 kHz Ês2 / Noc = 9 dB	During T1: 0dB 0dB During T2: 0dB 0dB	During T1: Noc = -104.7 dBm/15 kHz Ês2 / Noc = - Infinity During T2: Noc = -104.7 dBm/15 kHz Ês2 / Noc = 9 dB
5.6.2.7 EN-DC FR1-FR2 event-triggered reporting in non-DRX with SSB time index detection	Same as 5.6.2.5	Same as 5.6.2.5	Same as 5.6.2.5
5.6.2.8 EN-DC FR1-FR2 event-triggered reporting in DRX with SSB time index detection	Same as 5.6.2.6	Same as 5.6.2.6	Same as 5.6.2.6
5.6.3.1 EN-DC FR2 SSB-based L1-RSRP measurement in non-DRX	During T1: Noc: -105dBm/15kHz Ês0 / Noc: 0.00dB Ês1 / Noc: -infinity During T2: Noc: -105dBm/15kHz Ês0 / Noc: 0.00dB Ês1 / Noc: +9.00dB	During T1: 0dB 0dB 0dB During T2: 0dB 0dB 0dB	During T1: Noc: -105dBm/15kHz Ês0 / Noc: 0.00dB Ês1 / Noc: -infinity During T2: Noc: -105dBm/15kHz Ês0 / Noc: 0.00dB Ês1 / Noc: +9.00dB
5.6.3.2 EN-DC FR2 SSB-based L1-RSRP measurement in DRX	Same as 5.6.3.1	Same as 5.6.3.1	Same as 5.6.3.1
5.6.3.3 EN-DC FR2 CSI-RS-based L1-RSRP measurement in non-DRX	Noc: -105dBm/15kHz $Ês_0$ / Noc: 0.00dB $Ês_1$ / Noc: +9.00dB Reported CSI-RSRP values ± 29dB Reported Differential CSI-RSRP values ± 7dB	0dB 0dB 0dB Via mapping	Noc: -105dBm/15kHz $Ês_0$ / Noc: 0.00dB $Ês_1$ / Noc: +9.00dB CSI-RS#1: RSRP_40 to RSRP_99 CSI-RS#0: DIFFRSRP_1 to DIFFRSRP_7
5.6.3.4 EN-DC FR2 CSI-RS-based L1-RSRP measurement in DRX	Same as 5.6.3.3	Same as 5.6.3.3	Same as 5.6.3.3
5.6.4.1 EN-DC FR2 SRS-RSRP measurement in non-DRX	During T1: Noc: -98 dBm/15kHz Neighbour cell UE Es/Noc: -infinity ~~Io: -70.01 dBm/ 95.04 MHz~~	During T1: -2.5dB 3dB ~~0dB~~	During T1: Noc: -100.5 dBm/15kHz Neighbour cell UE Es/Noc: -infinity

	During T2: Noc: -98 dBm/15kHz Neighbour cell UE Es/Noc: 4dB ~~Io: -68.82 dBm/ 95.04 MHz~~ In signalling: i1-threshold: -103dBm/SCS	During T2: -2.5dB 3dB ~~0dB~~ -9dB	~~Io: -70.01 dBm/ 95.04 MHz~~ During T2: Noc: -100.5 dBm/15kHz Neighbour cell UE Es/Noc: 7dB ~~Io: -68.82 dBm/ 95.04 MHz~~ i1-threshold: -112dBm/SCS
5.6.6.1 EN-DC FR2 CSI-RS based CMR and no dedicated IMR L1-SINR measurement in DRX	Noc: -105dBm/15kHz $\hat{E}s_0$ / Noc: 0.00dB $\hat{E}s_1$ / Noc: +9.00dB Reported CSI-SINR values ± 5.5dB Reported Differential CSI-SINR values ± 4.5dB	0dB 0dB 0dB Via mapping	Noc: -105dBm/15kHz $\hat{E}s_0$ / Noc: 0.00dB $\hat{E}s_1$ / Noc: +9.00dB CSI-RS#1: SINR_51 to SINR_74 CSI-RS#0: DIFFSINR_4 to DIFFSINR_13
5.6.6.2 EN-DC FR2 SSB based CMR and dedicated IMR L1-SINR measurement in non-DRX	During T1: Noc: -105dBm/15kHz Ês0 / Noc: 0.00dB Ês1 / Noc: -infinity During T2: Noc: -105dBm/15kHz Ês0 / Noc: 0.00dB Ês1 / Noc: +9.00dB Reported SS-SINR values ± 4.0dB Reported Differential SS-SINR values ± 3.0dB	During T1: 0dB 1.5dB 0dB During T2: 0dB 1.5dB 0dB Via mapping	During T1: Noc: -105dBm/15kHz Ês0 / Noc: +1.50dB Ês1 / Noc: -infinity During T2: Noc: -105dBm/15kHz Ês0 / Noc: +1.50dB Ês1 / Noc: +9.00dB SSB#1: SINR_54 to SINR_71 SSB#0: DIFFSINR_4 to DIFFSINR_10
5.6.6.3 EN-DC FR2 CSI-RS based CMR and dedicated IMR L1-SINR measurement in non-DRX	Noc: -105dBm/15kHz $\hat{E}s_0$ / Noc: 0.00dB $\hat{E}s_1$ / Noc: +9.00dB Reported CSI-SINR values ± 4.5dB Reported Differential CSI-SINR values ± 3.5dB	0dB 0dB 0dB Via mapping	Noc: -105dBm/15kHz $\hat{E}s_0$ / Noc: 0.00dB $\hat{E}s_1$ / Noc: +9.00dB CSI-RS#1: SINR_53 to SINR_72 CSI-RS#0: DIFFSINR_5 to DIFFSINR_12
5.7.1.1 EN-DC FR2 SS-RSRP measurement accuracy	Test 1: Noc: -91.60dBm/15kHz Ês2 / Noc: +6.0dB Ês3 / Noc: +1.0dB Reported absolute RSRP values: ±8dB Reported relative RSRP values: ±6dB For extreme conditions allow ±3dB + FFS MU additionally Test 2: n257 Ês2: -110.0dBm/120kHz n257 Ês3: -110.0dBm/120kHz n260 Ês2: -107.4dBm/120kHz n260 Ês3: -107.4dBm/120kHz Reported absolute RSRP values: ±8dB Reported relative RSRP values: ±6dB For extreme conditions allow ±3dB+ FFS MU additionally	Test 1: -5.80dB 0dB 0.4dB Via Mapping Test 2: 7.70dB 7.70dB 7.70dB 7.70dB Via Mapping	Test 1: Noc: -97.40dBm/15kHz Ês2 / Noc: +6.0dB Ês3 / Noc: +1.4dB Cell 2: RSRP_50 to RSRP_108 Cell 3: RSRP_46 to RSRP_103 Cell 3: RSRP_x-12 to RSRP_X+2 Test 2: n257 Ês2: -102.3dBm/120kHz n257 Ês3: -102.3dBm/120kHz n260 Ês2: -99.7dBm/120kHz n260 Ês3: -99.7dBm/120kHz Band dependent. See test case tables in clause 5.7.1.1.5
5.7.1.2 EN-DC FR2-FR2 SS-RSRP measurement accuracy	Test 1 Config 1: Noc1: -90.60dBm/15kHz Noc2: -90.60dBm/15kHz Ês1 / Noc1: +6.0dB Ês2 / Noc2: +6.0dB Reported absolute RSRP values: ±8.0dB For extreme conditions allow ±3dB+ FFS MU additionally	Test 1 Config 1: -5.70dB -5.70dB 0dB 0dB Via Mapping	Test 1 Config 1: Noc1: -96.30dBm/15kHz Noc2: -96.30dBm /15kHz Ês1 / Noc1: +6.0dB Ês2 / Noc2: +6.0dB Cell 2 n257: RSRP_41 to RSRP_109 n260: RSRP_39 to RSRP_109 Cell 3: RSRP_52 to RSRP_109

	Reported relative RSRP values: ±6.0dB For extreme conditions allow ±3dB+ FFS MU additionally	Via Mapping	Cell 3: n257: RSRP_x-15 to RSRP_x+25 n260: RSRP_x-15 to RSRP_x+27
	Test 2 Config 1: n257 Noc1: -108.13dBm/15kHz n257 Noc2: -113.13dBm/15kHz n260 Noc1: -105.53dBm/15kHz n260 Noc2: -110.53dBm/15kHz Ês1 / Noc1: 17.0dB Ês2 / Noc2: -1.0dB Reported absolute RSRP values: ±8.0dB For extreme conditions allow ±3dB+ FFS MU additionally	Test 2 Config 1: -6.60dB 0dB -6.60dB 0dB 0dB 2dB Via Mapping	Test 2 Config 1: -114.73dBm/15kHz -113.13dBm/15kHz -112.13dBm/15kHz -110.53dBm/15kHz Ês1 / Noc1: 17.0dB Ês2 / Noc2: 1.0dB Cell 2 n257: RSRP_33 to RSRP_101 n260: RSRP_34 to RSRP_104 Cell 3: n257: RSRP_32 to RSRP_87 n260: RSRP_34 to RSRP_90
	Reported relative RSRP values: ±6.0dB For extreme conditions allow ±3dB+ FFS MU additionally	Via Mapping	Cell 3: n257: RSRP_x-29 to RSRP_x+11 n260: RSRP_x-29 to RSRP_x+13
	Test 1 Config 2: Noc1: -93.70dBm/15kHz Noc2: -93.70dBm/15kHz Ês1 / Noc1: +6.0dB Ês2 / Noc2: +6.0dB Reported absolute RSRP values: ±8.0dB For extreme conditions allow ±3dB+ FFS MU additionally	Test 1 Config 2: -5.60dB -5.60dB 0dB 0dB Via Mapping	Test 1 Config 2: Noc1: -99.30dBm/15kHz Noc2: -99.30dBm /15kHz Ês1 / Noc1: +6.0dB Ês2 / Noc2: +6.0dB Cell 12 n257: RSRP_41 to RSRP_109 n260: RSRP_39 to RSRP_109 Cell 3: RSRP_52 to RSRP_109
	Reported relative RSRP values: ±6.0dB For extreme conditions allow ±3dB+ FFS MU additionally	Via Mapping	Cell 3: n257: RSRP_x-15 to RSRP_x+25 n260: RSRP_x-15 to RSRP_x+27
	Test 2 Config 2: n257 Noc1: -108.13dBm/15kHz n257 Noc2: -113.13dBm/15kHz n260 Noc1: -105.53dBm/15kHz n260 Noc2: -110.53dBm/15kHz Ês1 / Noc1: 17.0dB Ês2 / Noc2: -1.0dB Reported absolute RSRP values: ±8.0dB For extreme conditions allow ±3dB+ FFS MU additionally	Test 2 Config 2: -6.60dB 0dB -6.60dB 0dB 0dB 2dB Via Mapping	Test 2 Config 2: -114.73dBm/15kHz -113.13dBm/15kHz -112.13dBm/15kHz -110.53dBm/15kHz Ês1 / Noc1: 17.0dB Ês2 / Noc2: 1.0dB Cell 2 n257: RSRP_36 to RSRP_104 n260: RSRP_37 to RSRP_107 Cell 3: n257: RSRP_35 to RSRP_90 n260: RSRP_37 to RSRP_93
	Reported relative RSRP values: ±6.0dB For extreme conditions allow ±3dB+ FFS MU additionally	Via Mapping	Cell 3: n257: RSRP_x-29 to RSRP_x+11 n260: RSRP_x-29 to RSRP_x+13
5.7.1.3 EN-DC FR1-FR2 SS-RSRP measurement accuracy	Test 1: Noc: -90dBm/15kHz Ês3 / Noc: +5.0dB Reported absolute RSRP values: ±8dB For extreme conditions allow ±3dB + FFS MU	Test 1: -5.50dB 0dB Via Mapping	Test 1: Noc: -95.50dBm/15kHz Ês3 / Noc: +5dB Band dependent. See test case tables in clause 5.7.1.3.5

	additionally Test 2: n257 Ês3: -98.2dBm/120kHz n260 Ês3: -93.9dBm/120kHz Reported absolute RSRP values: ±8dBFor extreme conditions allow ±3dB+ FFS MU additionally	 Test 2: 5.50dB 5.50dB Via Mapping	 Test 2: n257 Ês3: -92.7dBm/120kHz n260 Ês3: -88.4dBm/120kHz Band dependent. See test case tables in clause 5.7.1.3.5
5.7.2.1 EN-DC FR2 SS-RSRQ measurement accuracy	Test 1: Noc: -95.0dBm/15kHz Ês2 / Noc: +3.0dB Ês3 / Noc: +3.0dB Reported absolute RSRQ values: ±2.5dB For extreme conditions allow ±1.5dB+ FFS MU additionally Test 2: Noc: -95.0dBm/15kHz Ês2 / Noc: -3.0dB Ês3 / Noc: -3.0dB Reported absolute RSRQ values: ±3.5dB For extreme conditions allow ±0.5dB+ FFS MU additionally	Test 1: -5.70dB 0dB 0dB Via Mapping Test 2: -1.70dB 0dB 0dB Via Mapping	Test 1: Noc: -100.70dBm/15kHz Ês2 / Noc: +3.0dB Ês3 / Noc: +3.0dB Cell 3: All bands: RSRQ_41 to RSRQ_73 Test 2: Noc: -96.70dBm/15kHz Ês2 / Noc: -3.0dB Ês3 / Noc: -3.0dB Cell 3: n257, n258, n261: RSRQ_35 to RSRQ_71 n260: RSRQ_34 to RSRQ_71
5.7.2.2 EN-DC FR2-FR2 SS-RSRQ measurement accuracy	Test 1: Noc1: -94.03dBm/15kHz Noc2: -94.03dBm/15kHz Ês1 / Noc1: -1.75dB Ês2 / Noc2: -1.75dB Reported absolute RSRQ values: ±2.5dB For extreme conditions allow ±1.5dB+ FFS MU additionally Reported relative RSRQ values: ±3.0dB For extreme conditions allow ±1.0dB+ FFS MU additionally Test 2: Noc1: -94.03dBm/15kHz Noc2: -94.03dBm/15kHz Ês1 / Noc1: -3.0dB Ês2 / Noc2: -3.0dB Reported absolute RSRQ values: ±3.5dB For extreme conditions allow ±0.5dB+ FFS MU additionally Reported relative RSRQ values: ±4.0dB For extreme conditions allow ±0.0dB+ FFS MU additionally	Test 1: -1.90dB -1.90dB 0dB 0dB Via Mapping Via Mapping Test 2: -1.41dB -1.41dB 0dB 0dB Via Mapping Via Mapping	Test 1: Noc1: -95.93dBm/15kHz Noc2: -95.93dBm /15kHz Ês1 / Noc1: -1.75dB Ês2 / Noc2: -1.75dB Cell 2 and Cell 3: RSRQ_41 to RSRQ_73 Cell 3: RSRQ_x-7 to RSRQ_x+7 Test 2: Noc1: -95.44dBm/15kHz Noc2: -95.44dBm /15kHz Ês1 / Noc1: -3.0dB Ês2 / Noc2: -3.0dB Cell 2 and Cell 3: RSRQ_37 to RSRQ_74 Cell 3: RSRQ_x-9 to RSRQ_x+9
5.7.3.1 EN-DC FR2 SS-SINR measurement accuracy	Test 1: Noc: -105.0dBm/15kHz Ês2 / Noc: +4.54dB Ês3 / Noc: +2.66dB Reported absolute SINR values: ±3.5dB For extreme conditions allow ±0.5dB+ FFS MU additionally Test 2: Noc: -105.0dBm/15kHz Ês2 / Noc: -3.0dB Ês3 / Noc: -3.0dB Reported absolute SINR values: ±3.5dB For extreme conditions allow ±0.5dB+ FFS MU additionally	Test 1: 0dB 0dB 0dB Via Mapping Test 2: 0dB 0.2dB 0.2dB Via Mapping	Test 1: Noc: -105.0dBm/15kHz Ês2 / Noc: +4.54dB Ês3 / Noc: +2.66dB Cell 3: n257, n258, n261: SINR_22 to RSRQ_58 n260: SINR_21 to RSRQ_58 Test 2: Noc: -105.0dBm/15kHz Ês2 / Noc: -2.8dB Ês3 / Noc: -2.8dB Cell 3: n257, n258, n261: SINR_18 to RSRQ_55 n260: SINR_18 to RSRQ_54
5.7.3.2 EN-DC FR2-FR2 SS-SINR measurement	Test 1: Noc1: -105.0dBm/15kHz	Test 1: 0dB	Test 1: Noc1: -105.0dBm/15kHz

accuracy	Noc2: -105.0dBm/15kHz Ês1 / Noc1: -0.5dB Ês2 / Noc2: -0.5dB Reported absolute SINR values: ±3.0dB For extreme conditions allow ±1.0dB+ FFS MU additionally Reported absolute SINR values: ±3.5dB For extreme conditions allow ±0.5dB+ FFS MU additionally Test 2: Noc1: -105.0dBm/15kHz Noc2: -105.0dBm/15kHz Ês1 / Noc1: +11.0dB Ês2 / Noc2: +11.0dB Reported absolute SINR values: ±3.0dB For extreme conditions allow ±1.0dB+ FFS MU additionally Reported absolute SINR values: ±3.5dB For extreme conditions allow ±0.5dB+ FFS MU additionally Test 3: Noc1: -105.0dBm/15kHz Noc2: -105.0dBm/15kHz Ês1 / Noc1: -3.0dB Ês2 / Noc2: -3.0dB Reported absolute SINR values: ±3.5dB For extreme conditions allow ±0.5dB+ FFS MU additionally Reported absolute SINR values: ±4.0dB For extreme conditions allow ±0.0dB+ FFS MU additionally	0dB 0dB 0dB Via Mapping Via Mapping Test 2: -0.1dB -0.1dB 0dB 0dB Via Mapping Via Mapping Test 3: 0dB 0dB 0.9dB 0.9dB Via Mapping Via Mapping	Noc2: -105.0dBm/15kHz Ês1 / Noc1: -0.5dB Ês2 / Noc2: -0.5dB Cell 2 and Cell 3: n257, n258, n261: SINR_27 to SINR_62 n260: SINR_27 to SINR_61 Cell 3: SINR_x-8 to SINR_x+8 Test 2: Noc1: -105.1dBm/15kHz Noc2: -105.1dBm/15kHz Ês1 / Noc1: +11.0dB Ês2 / Noc2: +11.0dB Cell 2 and Cell 3: n257, n258, n261: SINR_48 to SINR_87 n260: SINR_48 to SINR_86 Cell 3: SINR_x-17 to SINR_x+17 Test 3: Noc1: -105.0dBm/15kHz Noc2: -105.0dBm/15kHz Ês1 / Noc1: -2.1dB Ês2 / Noc2: -2.1dB Cell 2 and Cell 3: n257, n258, n261: SINR_23 to SINR_60 n260: SINR_22 to SINR_59 Cell 3: SINR_x-9 to SINR_x+9
5.7.4.1 EN-DC FR2 SSB based L1-RSRP measurement accuracy	Test 1: Noc: -100dBm/15kHz SSB#0 Ês / Noc: +10.0dB SSB#1 Ês / Noc: -2.0dB Reported absolute RSRP values: ±8.5dB Reported relative RSRP values: ±6.5dB For extreme conditions allow ±3dB + FFS MU additionally Test 2: n257 SSB#0 Ês: -108.1dBm/120kHz n257 SSB#1 Ês: -105.5dBm/120kHz n260 SSB#0 Ês: -108.1dBm/120kHz n260 SSB#1 Ês: -105.5dBm/120kHz Reported absolute RSRP values: -6.5 +8.5dB Reported relative RSRP values: ±6.5dB For extreme conditions allow ±3dB+ FFS MU additionally	Test 1: -4.1dB 0dB 0.4dB Test 2: 5.7dB	Test 1: Noc: -104.1dBm/15kHz SSB#0 Ês / Noc: +10.0dB SSB#1 Ês / Noc: -1.6dB SSB#0: RSRP_42 to RSRP_101 SSB#1: RSRP_31 to RSRP_89 SSB#1-SSB#0: -9 to -2 Test 2: n257 SSB#0 Ês: -102.4dBm/120kHz n257 SSB#1 Ês: -99.8dBm/120kHz n260 SSB#0 Ês: -102.4dBm/120kHz n260 SSB#1 Ês: -99.8dBm/120kHz SSB#0 and SSB#1 n257: RSRP_27 to RSRP_83 n260: RSRP_30 to RSRP_86 SSB#1-SSB#0: -4 to +4
5.7.4.2 EN-DC FR2 CSI-RS based L1-RSRP measurement accuracy	Test 1: Noc: -100dBm/15kHz CSI-RS#0 Ês / Noc: +10.0dB CSI-RS#1 Ês / Noc: -2.0dB	Test 1: -4.1dB 0dB 0.2dB	Test 1: Noc: -104.1dBm/15kHz CSI-RS#0 Ês / Noc: +10.0dB CSI-RS#1 Ês / Noc: -1.8dB

	Reported absolute RSRP values: ±8.5dB Reported relative RSRP values: ±6.5dB For extreme conditions allow ±3dB + FFS MU additionally Test 2: n257 CSI-RS#0 Ês: -108.1dBm/120kHz n257 CSI-RS#1 Ês: -105.5dBm/120kHz n260 CSI-RS#0 Ês: -108.1dBm/120kHz n260 CSI-RS#1 Ês: -105.5dBm/120kHz Reported absolute RSRP values: -6.5 +8.5dB Reported relative RSRP values: ±6.5dB For extreme conditions allow ±3dB+ FFS MU additionally	Test 2: 5.7dB	CSI-RS#0: RSRP_42 to RSRP_101 CSI-RS#1: RSRP_30 to RSRP_89 CSI-RS#1-CSI-RS#0: -9 to -2 Test 2: n257 CSI-RS#0 Ês: -102.4dBm/120kHz n257 CSI-RS#1 Ês: -99.8dBm/120kHz n260 CSI-RS#0 Ês: -102.4dBm/120kHz n260 CSI-RS#1 Ês: -99.8dBm/120kHz CSI-RS#0 and CSI-RS#1 n257: RSRP_27 to RSRP_83 n260: RSRP_30 to RSRP_86 CSI-RS#1-CSI-RS#0: -4 to +4
5.7.5.1 EN-DC FR2 SRS-RSRP measurement accuracy	During T1: Noc: -100 dBm/15kHz SRS Es/Noc: 2dB ~~Io: -70.01 dBm/ 95.04 MHz~~ During T2: Noc: -100 dBm/15kHz ~~Io: -68.82 dBm/ 95.04 MHz~~ Reported absolute SRS-RSRP values: -89 ± 11.5dB	During T1: 0dB 0dB During T2: 0dB Via mapping	During T1: Noc: -100 dBm/15kHz SRS Es/Noc: 2dB ~~Io: -70.01 dBm/ 95.04 MHz~~ During T2: Noc: -100 dBm/15kHz ~~Io: -68.82 dBm/ 95.04 MHz~~ Reported SRS-RSRP range n257: SRS_RSRP_50 to SRS_RSRP_85 n260: SRS_RSRP_50 to SRS_RSRP_85
5.7.6.1 EN-DC FR2 CSI-RS based CMR and no dedicated IMR configured and CSI-RS resource set with repetition off L1-SINR measurement accuracy	Test 1: Noc: -100dBm/15kHz CSI-RS#0 Ês / Noc: +10.0dB CSI-RS#1 Ês / Noc: -2.0dB Reported absolute SINR values: ±5.5dB Reported relative SINR values: ±4.5dB For extreme conditions allow ±1dB + FFS MU additionally	Test 1: -4.1dB 0dB 0.2dB	Test 1: Noc: -104.1dBm/15kHz CSI-RS#0 Ês / Noc: +10.0dB CSI-RS#1 Ês / Noc: -1.8dB CSI-RS#0: SINR_53 to SINR_76 CSI-RS#1-CSI-RS#0: 6 to 15
5.7.6.2 EN-DC FR2 SSB based CMR and dedicated IMR L1-SINR absolute measurement accuracy	Test 1: Noc: -100dBm/15kHz SSB#0 Ês / Noc: +10.0dB SSB#1 Ês / Noc: 0.0dB CSI-RS#0 Ês / Noc: +10.0dB CSI-RS#1 Ês / Noc: 0.0dB Reported absolute SINR values: ±4dB Reported relative SINR values: ±3dB For extreme conditions allow ±1dB + FFS MU additionally	Test 1: -4.1dB 0dB 0.2dB 0dB 0.2dB	Test 1: Noc: -104.1dBm/15kHz SSB#0 Ês / Noc: +10.0dB SSB#1 Ês / Noc: 1.2dB CSI-RS#0 Ês / Noc: +10.0dB CSI-RS#1 Ês / Noc: 1.2dB SSB#0: SINR_56 to SINR_73 SSB#1-SSB#0: 5 to 12
5.7.6.3 EN-DC FR2 CSI-RS based CMR and dedicated IMR L1-SINR measurement accuracy	Test 1: Noc: -100dBm/15kHz CSI-RS#0 Ês / Noc: +10.0dB CSI-RS#1 Ês / Noc: -2.0dB Reported absolute SINR values: ±4.5dB Reported relative SINR values: ±3.5dB For extreme conditions allow ±1dB + FFS MU additionally	Test 1: -4.1dB 0dB 0.2dB	Test 1: Noc: -104.1dBm/15kHz CSI-RS#0 Ês / Noc: +10.0dB CSI-RS#1 Ês / Noc: -1.8dB CSI-RS#0: SINR_55 to SINR_74 CSI-RS#1-CSI-RS#0: 7 to 15

Table F.1.3.2-4: Derivation of test requirements for NR SA FR2 RRM tests

Test	Minimum requirement in TS 38.133 [6]	Test tolerance (TT)	Test requirement in TS 38.533
7.1.1.1 NR SA FR2 cell re-selection	During T1: Noc = -102 dBm/15kHz Es_1/Noc = 8dB Es_2/Noc = -infinity During T2: Noc = -102 dBm/15kHz Es_1/Noc = -3dB Es_2/Noc = 1.5dB During T3: Noc = -102 dBm/15kHz Es_1/Noc = 1.5dB Es_2/Noc = -3dB In signalling: Qrxlevmin = -138dBm/SCS for config. 1 Qrxlevmin = -135dBm/SCS for config. 2	During T1: 0dB 0dB N/A During T2: 0dB 0.1dB 0.55dB During T3: 0dB 0.55dB 0.1dB In signalling: 18 dB 18 dB	During T1: Noc = -102 dBm/15kHz Es_1/Noc = 8dB Es_2/Noc = -infinity During T2: Noc = -102 dBm/15kHz Es_1/Noc = -2.90dB Es_2/Noc = 2.05dB During T3: Noc = -102 dBm/15kHz Es_1/Noc = 2.05dB Es_2/Noc = -2.90dB In signalling: Qrxlevmin = -120dBm/SCS for config. 1 Qrxlevmin = -117dBm/SCS for config. 2
7.1.1.2 NR SA FR2-FR2 cell re-selection	During T1: Noc_1 = -102 dBm/15kHz Noc_2 = -102 dBm/15kHz Es_1/Noc_1 = 10.5dB Es_2/Noc_2 = -10.5dB During T2: Noc_1 = -102 dBm/15kHz Noc_2 = -102 dBm/15kHz Es_1/Noc_1 = 10.5dB Es_2/Noc_2 = -infinity During T3: Noc_1 = -102 dBm/15kHz Noc_2 = -102 dBm/15kHz Es_1/Noc_1 = 8dB Es_2/Noc_2 = 8.5dB In signalling: Cell 2 Qrxlevmin = -138dBm/SCS for config. 1 Cell 2 Qrxlevmin = -135dBm/SCS for config. 2 Cell 2 SnonintraSearchP = 50dB Cell 1 Threshx, highP = 48dB Cell 2 Threshserving, lowP = 44dB Cell 2 Threshx, lowP = 50dB	During T1: 0dB 0dB 0dB 7.6dB During T2: 0dB 0dB 0dB N/A During T3: 0dB 0dB 0dB 0dB In signalling: 16 dB 16 dB 12dB -16dB 18dB -32dB	During T1: Noc_1 = -102 dBm/15kHz Noc_2 = -102 dBm/15kHz Es_1/Noc_1 = 10.5dB Es_2/Noc_2 = -2.9dB During T2: Noc_1 = -102 dBm/15kHz Noc_2 = -102 dBm/15kHz Es_1/Noc_1 = 10.5dB Es_2/Noc_2 = -infinity During T3: Noc_1 = -102 dBm/15kHz Noc_2 = -102 dBm/15kHz Es_1/Noc_1 = 8dB Es_2/Noc_2 = 8.5dB In signalling: Qrxlevmin = -124dBm/SCS for config. 1 Qrxlevmin = -121dBm/SCS for config. 2 Cell 2 SnonintraSearchP = 62dB Cell 1 Threshx, highP = 32dB Cell 2 Threshserving, lowP = 62dB Cell 2 Threshx, lowP = 18dB
7.1.1.3 NR SA FR2 cell re-selection for UE fulfilling low mobility relaxed measurement criterion	During T1: Noc = -102 dBm/15kHz Es_1/Noc = -3dB Es_2/Noc = 1.5dB During T2: Noc = -102 dBm/15kHz Es_1/Noc = 1.5dB Es_2/Noc = -3dB In signalling: Qrxlevmin = -140dBm/SCS for config. 1 Qrxlevmin = -137dBm/SCS for config. 2	During T1: 0dB 0.1dB 0.55dB During T2: 0dB 0.55dB 0.1dB In signalling: 20dB 20dB	During T1: Noc = -102 dBm/15kHz Es_1/Noc = -2.90dB Es_2/Noc = 2.05dB During T2: Noc = -102 dBm/15kHz Es_1/Noc = 2.05dB Es_2/Noc = -2.90dB In signalling: Qrxlevmin = -120dBm/SCS for config. 1 Qrxlevmin = -117dBm/SCS for config. 2

7.1.1.4 NR SA FR2 cell re-selection for UE fulfilling not-at-cell edge relaxed measurement criterion	During T1: Noc = -102 dBm/15kHz Es_1/Noc = -3dB Es_2/Noc = 1.5dB During T2: Noc = -102 dBm/15kHz Es_1/Noc = 1.5dB Es_2/Noc = -3dB In signalling: Qrxlevmin = -140dBm/SCS for config. 1 Qrxlevmin = -137dBm/SCS for config. 2 SsearchThresholdP = 35dB	During T1: 0dB 0.1dB 0.55dB During T2: 0dB 0.55dB 0.1dB In signalling: 20dB 20dB -27dB	During T1: Noc = -102 dBm/15kHz Es_1/Noc = -2.90dB Es_2/Noc = 2.05dB During T2: Noc = -102 dBm/15kHz Es_1/Noc = 2.05dB Es_2/Noc = -2.90dB In signalling: Qrxlevmin = -120dBm/SCS for config. 1 Qrxlevmin = -117dBm/SCS for config. 2 SsearchThresholdP = 8dB
7.1.1.5 NR SA FR2-FR2 cell re-selection for UE fulfilling low mobility relaxed measurement criterion	During T1: Noc_1 = -102 dBm/15kHz Noc_2 = -102 dBm/15kHz Es_1/Noc_1 = 10.5dB Es_2/Noc_2 = -10.5dB During T2: Noc_1 = -102 dBm/15kHz Noc_2 = -102 dBm/15kHz Es_1/Noc_1 = 8dB Es_2/Noc_2 = 8.5dB In signalling: Cell 2 Qrxlevmin = -138dBm/SCS for config. 1 Cell 2 Qrxlevmin = -135dBm/SCS for config. 2 Cell 2 SnonintraSearchP = 50dB Cell 1 Threshx, highP = 48dB Cell 2 Threshserving, lowP = 44dB Cell 2 Threshx, lowP = 50dB SSearchDeltaP = 6dB	During T1: 0dB 0dB 0dB 7.6dB During T2: 0dB 0dB 0dB 0dB In signalling: 16 dB 16 dB 12dB -16dB 18dB -32dB 6dB	During T1: Noc_1 = -102 dBm/15kHz Noc_2 = -102 dBm/15kHz Es_1/Noc_1 = 10.5dB Es_2/Noc_2 = -2.9dB During T2: Noc_1 = -102 dBm/15kHz Noc_2 = -102 dBm/15kHz Es_1/Noc_1 = 8dB Es_2/Noc_2 = 8.5dB In signalling: Qrxlevmin = -124dBm/SCS for config. 1 Qrxlevmin = -121dBm/SCS for config. 2 Cell 2 SnonintraSearchP = 62dB Cell 1 Threshx, highP = 32dB Cell 2 Threshserving, lowP = 62dB Cell 2 Threshx, lowP = 18dB SSearchDeltaP = 12dB
7.1.1.6 NR SA FR2-FR2 cell re-selection for UE fulfilling not-at-cell edge relaxed measurement criterion	During T1: Noc_1 = -102 dBm/15kHz Noc_2 = -102 dBm/15kHz Es_1/Noc_1 = 10.5dB Es_2/Noc_2 = -10.5dB During T2: Noc_1 = -102 dBm/15kHz Noc_2 = -102 dBm/15kHz Es_1/Noc_1 = 8dB Es_2/Noc_2 = 8.5dB In signalling: Cell 2 Qrxlevmin = -138dBm/SCS for config. 1 Cell 2 Qrxlevmin = -135dBm/SCS for config. 2 Cell 2 SnonintraSearchP = 50dB Cell 1 Threshx, highP = 48dB Cell 2 Threshserving, lowP = 44dB Cell 2 Threshx, lowP = 50dB Cell 2 SsearchThresholdP = 29dB	During T1: 0dB 0dB 0dB 7.6dB During T2: 0dB 0dB 0dB 0dB In signalling: 16 dB 16 dB 12dB -16dB 18dB -32dB -17dB	During T1: Noc_1 = -102 dBm/15kHz Noc_2 = -102 dBm/15kHz Es_1/Noc_1 = 10.5dB Es_2/Noc_2 = -2.9dB During T2: Noc_1 = -102 dBm/15kHz Noc_2 = -102 dBm/15kHz Es_1/Noc_1 = 8dB Es_2/Noc_2 = 8.5dB In signalling: Qrxlevmin = -124dBm/SCS for config. 1 Qrxlevmin = -121dBm/SCS for config. 2 Cell 2 SnonintraSearchP = 62dB Cell 1 Threshx, highP = 32dB Cell 2 Threshserving, lowP = 62dB Cell 2 Threshx, lowP = 18dB Cell 2 SsearchThresholdP = 12dB
7.3.1.2 NR SA FR2 Intra-frequency handover; unknown	During T1: Noc: -104.7dBm/15kHz Ês1 / Noc: +6.00dB	During T1: 0dB 0dB	During T1: Noc: -104.7dBm/15kHz Ês1 / Noc: +6.00dB

target cell	Ês2 / Noc: -infinity During T2: Noc: -104.7dBm/15kHz Ês1 / Noc: +6.00dB Ês2 / Noc: +7.00dB	0dB During T2: 0dB 0dB 0dB	Ês2 / Noc: -infinity During T2: Noc: -104.7dBm/15kHz Ês1 / Noc: +6.00dB Ês2 / Noc: +7.00dB
7.3.1.3 NR SA FR2-FR2 Inter-frequency handover; unknown target cell	During T1: Noc1: -104.7dBm/15kHz Noc2: -104.7dBm/15kHz Ês1 / Noc1: +5.00dB Ês2 / Noc2: -infinity During T2: Noc1: -104.7dBm/15kHz Noc2: -104.7dBm/15kHz Ês1 / Noc1: +5.00dB Ês2 / Noc2: +5.00dB	During T1: 0dB 0dB 0dB 0dB During T2: 0dB 0dB 0dB 0dB	During T1: Noc1: -104.7dBm/15kHz Noc2: -104.7dBm/15kHz Ês1 / Noc1: +5.00dB Ês2 / Noc2: -infinity During T2: Noc1: -104.7dBm/15kHz Noc2: -104.7dBm/15kHz Ês1 / Noc1: +5.00dB Ês2 / Noc2: +5.00dB
7.3.1.4 NR SA FR1-FR2 synchronous DAPS handover	During T1: Noc -104.7dBm/15kHz Es_2/Noc -infinity During T2-T5: Noc -104.7 dBm/15kHz Es_2/Noc 10 dB	During T1: 0 dB 0 dB During T2-T5: 0 dB 0 dB	During T1: Noc -104.7dBm/15kHz Es_2/Noc -infinity During T2-T5: Noc -104.7 dBm/15kHz Es_2/Noc 10 dB
7.3.1.5 NR SA FR1-FR2 asynchronous DAPS handover	Same as 7.3.1.4	Same as 7.3.1.4	Same as 7.3.1.4
7.3.2.1.1 NR SA FR2 RRC re-establishment	During T1: Noc = -104.7 dBm/15 kHz Ês1 / Noc = 4 dB Ês2 / Noc = 2 dB During T2: Noc = -104.7 dBm/15 kHz Ês1 / Noc = - Infinity Ês2 / Noc = 2 dB During T3: Noc = -104.7 dBm/15 kHz Ês1 / Noc = - Infinity Ês2 / Noc = 2 dB	During T1: 0dB 0dB 0dB During T2: 0dB 0dB 0dB During T3: 0dB 0dB 0dB	During T1: Noc = -104.7 dBm/15 kHz Ês1 / Noc = 4 dB Ês2 / Noc = 2 dB During T2: Noc = -104.7 dBm/15 kHz Ês1 / Noc = - Infinity Ês2 / Noc = 2 dB During T3: Noc = -104.7 dBm/15 kHz Ês1 / Noc = - Infinity Ês2 / Noc = 2 dB
7.3.2.1.2 NR SA FR2 - FR2 RRC re-establishment	During T1: Noc1 = -92.1 dBm/15 kHz Noc2 = -92.1 dBm/15 kHz Ês1 / Noc1 = 0 dB Ês2 / Noc 2= - Infinity During T2: Noc1 = -92.1 dBm/15 kHz Noc2 = -92.1 dBm/15 kHz Ês1 / Noc1 = - Infinity Ês2 / Noc2 = - Infinity During T3: Noc1 = -92.1 dBm/15 kHz Noc2 = -92.1 dBm/15 kHz Ês1 / Noc1 = - Infinity Ês2 / Noc2 = 0 dB	During T1: -0.2dB -0.2dB 0dB 0dB During T2: -0.2dB -0.2dB 0dB 0dB During T3: -0.2dB -0.2dB 0dB 0dB	During T1: Noc1 = -92.3 dBm/15 kHz Noc2 = -92.3 dBm/15 kHz Ês1 / Noc1 = 0 dB Ês2 / Noc 2= - Infinity During T2: Noc1 = -92.3 dBm/15 kHz Noc2 = -92.3 dBm/15 kHz Ês1 / Noc1 = - Infinity Ês2 / Noc2 = - Infinity During T3: Noc1 = -92.3 dBm/15 kHz Noc2 = -92.3 dBm/15 kHz Ês1 / Noc1 = - Infinity Ês2 / Noc2 = 0 dB
7.3.2.2.1 NR SA FR2 contention based random access	Absolute uplink power: $P_{int} \geq P \geq P_{min}$ ±14.0dB $P_{UMAX} \geq P > P_{int}$ ±12.0dB Relative uplink power step: $P_{int} \geq P \geq P_{min}$ ±6.0dB $P_{UMAX} \geq P > P_{int}$ ±4.0dB Uplink timing:	Not applicable due to UL calibration FFS dB FFS dB	Absolute uplink power: ±FFSdB Relative uplink power step: ±(6+FFS)dB, either PRACH being compared ≤ (P_{max} – 6dB) ±(4+FFS)dB, both PRACHs being compared > (P_{max} –

	120kHz SCS T_e ±3.5*64*T_c	[48]T_c	6dB) Uplink timing: 120kHz SCS T_e ±224±[48]*T_c
7.3.2.2.2 NR SA FR2 non-contention based random access	Same as 7.3.2.2.1	Same as 7.3.2.2.1	Same as 7.3.2.2.1
7.3.2.3.1 NR SA FR2-FR2 RRC connection release with redirection	Same as 7.3.1.3	Same as 7.3.1.3	Same as 7.3.1.3
7.3.3.1 NR SA FR2 conditional handover	During T1: Noc -104.7dBm/15kHz Es_1/Noc 6 dB Es_2/Noc -infinity During T2: Noc -104.7dBm/15kHz Es_1/Noc 6 dB Es_2/Noc 11dB In signaling: A3-offset = -1dB	During T1 -1.5dB 0dB 0dB During T2 -1.5dB 0dB 0dB In signaling: -1dB	During T1: Noc -106.2 dBm/15kHz Es_1/Noc 6 dB Es_2/Noc -infinity During T2: Noc -106.2 dBm/15kHz Es_1/Noc 6 dB Es_2/Noc 11dB In signaling: A3-offset = -2dB
7.4.1.1 SA FR2 UE transmit timing accuracy	Test 1 (no DRX): Uplink timing: ±3*64*T_c for 240 kHz SSB SCS Max step size T_q: 2.5*64*T_c Min adjust rate T_p: 2.5*64*T_c Max adjust rate: 2.5*64*T_c N_{oc} = -112 dBm/15 kHz $\hat{E}s_1$ / N_{oc}: +4.0dB Test 2 (with DRX): Uplink timing: ±3*64*T_c for 240 kHz SSB SCS N_{oc} = -112 dBm/15 kHz $\hat{E}s_1$ / N_{oc}: +4.0dB	 ±0.75*64*T_c +0.625*64T_c -3.725*64*T_c +1.225*64*T_c 0dB 0dB ±0.75*64*T_c 0dB 0dB	Test 1 (no DRX): Uplink timing: ±3.75*64*T_c Max step size T_q: 3.125*64*T_c Min adjust rate: -1.225*64*T_c Max adjust rate: 3.725*64*T_c N_{oc} = -112 dBm/15 kHz $\hat{E}s_1$ / N_{oc}: +4.0dB Test 2 (with DRX): Uplink timing: ±3.75*64*T_c N_{oc} = -112 dBm/15 kHz $\hat{E}s_1$ / N_{oc}: +4.0dB
7.4.3.1 NR SA FR2 UE timing advance adjustment accuracy	Noc = -112 dBm/15 kHz Ês1 / Noc = 4 dB UE Timing Advance Adjustment Accuracy for 120kHz SCS = ±32 Tc	0dB 0dB +/- 40 Tc	Noc = -112 dBm/15 kHz Ês1 / Noc = 4 dB UE TAAA for 120kHz SCS = ±72 Tc
7.5.1.1 Radio Link Monitoring Out-of-sync Test for FR2 PCell configured with SSB-based RLM RS in non-DRX mode	During T1: Noc: -92.1 dBm/15kHz Ês1 / Noc: +2 dB Ês2 / Noc: +2 dB During T2: Noc: -92.1dBm/15kHz Ês1 / Noc: -6 dB Ês2 / Noc: -15 dB During T3: Noc: -92.1dBm/15kHz Ês1 / Noc: -15 dB Ês2 / Noc: -15 dB	During T1: -2.7 dB 2.1 dB 2.1 dB During T2: -2.7 dB 2.1 dB 0 dB During T3: -2.7 dB 0 dB 0 dB	During T1: Noc: -94.8 dBm/15kHz Ês1 / Noc: +4.1 dB Ês2 / Noc: +4.1 dB During T2: Noc: -94.8 dBm/15kHz Ês1 / Noc: -3.9 dB Ês2 / Noc: -15 dB During T3: Noc: -94.8 dBm/15kHz Ês1 / Noc: -15 dB Ês2 / Noc: -15 dB
7.5.1.2 Radio Link Monitoring In-sync Test for FR2 PCell configured with SSB-based RLM RS in non-DRX mode	During T1: Noc: -92.1 dBm/15kHz Ês1 / Noc: +2 dB Ês2 / Noc: +2 dB During T2: Noc: -92.1dBm/15kHz Ês1 / Noc: -6 dB Ês2 / Noc: -15 dB During T3: Noc: -92.1dBm/15kHz Ês1 / Noc: -15 dB Ês2 / Noc: -15 dB	During T1: -2.7 dB 2.1 dB 2.1 dB During T2: -2.7 dB 2.1 dB 0 dB During T3: -2.7 dB 0 dB 0 dB	During T1: Noc: -94.8 dBm/15kHz Ês1 / Noc: +4.1 dB Ês2 / Noc: +4.1 dB During T2: Noc: -94.8 dBm/15kHz Ês1 / Noc: -3.9 dB Ês2 / Noc: -15 dB During T3: Noc: -94.8 dBm/15kHz Ês1 / Noc: -15 dB Ês2 / Noc: -15 dB

	During T4: Noc: -92.1dBm/15kHz Ês1 / Noc: -4.5 dB Ês2 / Noc: -15 dB During T5: Noc: -92.1dBm/15kHz Ês1 / Noc: +2 dB Ês2 / Noc: -15 dB	During T4: -2.7 dB 0 dB 0 dB During T5: -2.7 dB 2.1 dB 0 dB	During T4: Noc: -94.8 dBm/15kHz Ês1 / Noc: -4.5 dB Ês2 / Noc: -15 dB During T5: Noc: -94.8 dBm/15kHz Ês1 / Noc: 4.1 dB Ês2 / Noc: -15 dB
7.5.1.3 Radio Link Monitoring Out-of-sync Test for FR2 PCell configured with SSB-based RLM RS in DRX mode	During T1: Noc: -104.7 dBm/15kHz Ês1 / Noc: +2 dB Ês2 / Noc: +2 dB During T2: Noc: -104.7 dBm/15kHz Ês1 / Noc: -6 dB Ês2 / Noc: -15 dB During T3: Noc: -104.7 dBm/15kHz Ês1 / Noc: -15 dB Ês2 / Noc: -15 dB	During T1: 0 dB 1.3 dB 1.3 dB During T2: 0 dB 1.3 dB -0.4 dB During T3: 0 dB -0.4 dB -0.4 dB	During T1: Noc: -104.7 dBm/15kHz Ês1 / Noc: +3.3 dB Ês2 / Noc: +3.3 dB During T2: Noc: -104.7 dBm/15kHz Ês1 / Noc: -4.7 dB Ês2 / Noc: -15.4 dB During T3: Noc: -104.7 dBm/15kHz Ês1 / Noc: -15.4 dB Ês2 / Noc: -15.4 dB
7.5.1.4 Radio Link Monitoring In-sync Test for FR2 PCell configured with SSB-based RLM RS in DRX mode	During T1: Noc: -104.7 dBm/15kHz Ês1 / Noc: +2 dB Ês2 / Noc: +2 dB During T2: Noc: -104.7 dBm/15kHz Ês1 / Noc: -6 dB Ês2 / Noc: -15 dB During T3: Noc: -104.7 dBm/15kHz Ês1 / Noc: -15 dB Ês2 / Noc: -15 dB During T4: Noc: -104.7 dBm/15kHz Ês1 / Noc: -4.5 dB Ês2 / Noc: -15 dB During T5: Noc: -104.7 dBm/15kHz Ês1 / Noc: +2 dB Ês2 / Noc: -14 dB	During T1: 0 dB 1.3 dB 1.3 dB During T2: 0 dB 1.3 dB -0.4 dB During T3: 0 dB -0.4 dB -0.4 dB During T4: 0 dB -0.4 dB -0.4 dB During T5: 0 dB 1.3 dB -0.4 dB	During T1: Noc: -104.7 dBm/15kHz Ês1 / Noc: +3.3 dB Ês2 / Noc: +3.3 dB During T2: Noc: -104.7 dBm/15kHz Ês1 / Noc: -4.7 dB Ês2 / Noc: -15.4 dB During T3: Noc: -104.7 dBm/15kHz Ês1 / Noc: -15.4 dB Ês2 / Noc: -15.4 dB During T4: Noc: -104.7 dBm/15kHz Ês1 / Noc: -4.9 dB Ês2 / Noc: -15.4 dB During T5: Noc: -104.7 dBm/15kHz Ês1 / Noc: 3.3 dB Ês2 / Noc: -15.4 dB
7.5.5.1 NR SA FR2 SSB-based beam failure detection and link recovery in non-DRX	During T1: SNR_SSB q_0: 5 dB SNR_SSB q_1: 0.2 dB During T2: SNR_SSB q_0: -3 dB SNR_SSB q_1: 0.2 dB During T3-T5: SNR_SSB q_0: -12 dB SNR_SSB q_1: 20.2 dB In signaling: rsrp-ThresholdSSB: -95 dBm/120kHz for Config 1 rsrp-ThresholdSSB: -92 dBm/240kHz for Config 2	 +8.70 dB 0 dB +8.70 dB 0 dB 0 dB -0.2 dB -14 dB -14 dB	During T1: SNR_SSB q_0: 13.7 dB SNR_SSB q_1: 0.2 dB During T2: SNR_SSB q_0: 5.7 dB SNR_SSB q_1: 0.2 dB During T3-T5: SNR_SSB q_0: -12 dB SNR_SSB q_1: 20 dB In signaling: rsrp-ThresholdSSB: -109 dBm/120kHz for Config 1 srp-ThresholdSSB: -106 dBm/240kHz for Config 2
7.5.5.2 NR SA FR2	Same as 7.5.5.1	Same as 7.5.5.1	Same as 7.5.5.1

SSB-based beam failure detection and link recovery in DRX			
7.5.5.3 NR SA FR2 CSI-RS-based beam failure detection and link recovery in non-DRX	Noc = -104.7 dBm/120 kHz $\hat{E}s_1 / N_{oc}$ for CSI-RS set q0 T1: 5 dB T2: -3 dB T3: -12 dB T4: -12 dB T5: -12 dB $\hat{E}s_1 / N_{oc}$ for CSI-RS set q1 T1: 0.2 dB T2: 0.2 dB T3: 20.2 dB T4: 20.2 dB T5: 20.2 dB rsrp-ThresholdSSB: -95 dBm/SCS kHz	0 dB 8.7 dB 8.7 dB 0 dB 0 dB 0 dB 0 dB 0 dB -0.2 dB -0.2 dB -0.2 dB -14 dB	Noc = -104.7 dBm/120 kHz $\hat{E}s_1 / N_{oc}$ for CSI-RS set q0 T1: 13.7 dB T2: 5.7 dB T3: -12 dB T4: -12 dB T5: -12 dB $\hat{E}s_1 / N_{oc}$ for CSI-RS set q1 T1: 0.2 dB T2: 0.2 dB T3: 20 dB T4: 20 dB T5: 20 dB rsrp-ThresholdSSB: -109.0 dBm/SCS kHz
7.5.5.4 NR SA FR2 CSI-RS-based beam failure detection and link recovery in DRX	Same as 7.5.5.3	Same as 7.5.5.3	Same as 7.5.5.3
7.5.5.5 NR SA FR2 scheduling available restriction during SSB-based beam failure detection and link recovery in non-DRX	Same as 7.5.5.1	Same as 7.5.5.1	Same as 7.5.5.1
7.5.5.6 NR SA FR2 SCell CSI-RS-based beam failure detection and link recovery in non-DRX	Noc = -104.7 dBm/120 kHz $\hat{E}s_2 / N_{oc}$ for CSI-RS set q0 T1: 5 dB T2: -3 dB T3: -12 dB T4: -12 dB T5: -12 dB $\hat{E}s_2 / N_{oc}$ for CSI-RS set q1 T1: 0.2 dB T2: 0.2 dB T3: 20.2 dB T4: 20.2 dB T5: 20.2 dB rsrp-ThresholdBFR: -95 dBm/SCS kHz	0 dB 8.7 dB 8.7 dB 0 dB 0 dB 0 dB 0 dB 0 dB -0.2 dB -0.2 dB -0.2 dB -14 dB	Noc = -104.7 dBm/120 kHz $\hat{E}s_2 / N_{oc}$ for CSI-RS set q0 T1: 13.7 dB T2: 5.7 dB T3: -12 dB T4: -12 dB T5: -12 dB $\hat{E}s_2 / N_{oc}$ for CSI-RS set q1 T1: 0.2 dB T2: 0.2 dB T3: 20 dB T4: 20 dB T5: 20 dB rsrp-ThresholdBFR: -109.0 dBm/SCS kHz
7.5.5.7 NR SA FR2 SCell CSI-RS-based beam failure detection and link recovery in DRX	Same as 7.5.5.6	Same as 7.5.5.6	Same as 7.5.5.6
7.5.6.2.1 NR SA FR2 RRC-based DL active BWP switch in non-DRX	During T1: Noc2: -112dBm/15kHz Ês2 / Iot2: +18dB	During T1: 0dB 0dB	During T1: Noc2: -112dBm/15kHz Ês2 / Iot2: +18dB
7.6.1.1 NR SA FR2 event-triggered reporting without gap in non-DRX	During T1: Ês1: -86dBm/120kHz Ês2: -infinity During T2: Ês1: -86dBm/120kHz Ês2: -86dBm/120kHz	During T1: 0dB 0dB During T2: 0dB 0dB	During T1: Ês1: -86dBm/120kHz Ês2: -infinity During T2: Ês1: -86dBm/120kHz Ês2: -86dBm/120kHz
7.6.1.2 NR SA FR2 event-triggered reporting without gap in DRX	During T1: Noc: -98dBm/15kHz Ês1 / Noc: +4.00dB Ês2 / Noc: -infinity	During T1: -3.5dB 0dB 0dB	During T1: Noc: -101.5dBm/15kHz Ês1 / Noc: +4.00dB Ês2 / Noc: -infinity

	During T2: Noc: -98dBm/15kHz Ês1 / Noc: +4.00dB Ês2 / Noc: +4.00dB Signalled A3-offset: -6.0	During T2: -3.5dB 0dB 0dB Signalled A3-offset: -1.0	During T2: Noc: -101.5dBm/15kHz Ês1 / Noc: +4.00dB Ês2 / Noc: +4.00dB Signalled A3-offset: -7.0
7.6.1.3 NR SA FR2 event-triggered reporting with gap in non-DRX	Same as 7.6.1.1	Same as 7.6.1.1	Same as 7.6.1.1
7.6.1.4 NR SA FR2 event-triggered reporting with gap in DRX	Same as 7.6.1.2	Same as 7.6.1.2	Same as 7.6.1.2
7.6.2.1 NR SA FR2-FR2 event-triggered reporting in non-DRX	During T1: Ês1: -87 dBm/120kHz Ês2: - infinity During T2: Ês1: -87 dBm/120kHz Ês2: -87 dBm/120kHz	During T1: 0dB 0dB During T2: 0dB 0dB	During T1: Ês1: -87 dBm/120kHz Ês2: - infinity During T2: Ês1: -87 dBm/120kHz Ês2: -87 dBm/120kHz
7.6.2.3 NR SA FR2-FR2 event-triggered reporting in non-DRX with SSB time index detection	Same as 7.6.2.1	Same as 7.6.2.1	Same as 7.6.2.1
7.6.2.5 SA event triggered reporting tests for FR2 without SSB time index detection when DRX is not used (PCell in FR1)	During T1: Ês2: - Infinity During T2: Ês2: -87 dBm/120kHz	During T1: 0dB During T2: 0dB	During T1: Ês2: - Infinity During T2: Ês2: -87 dBm/120kHz
7.6.2.6 SA event triggered reporting tests for FR2 without SSB time index detection when DRX is used (PCell in FR1)	During T1: Noc = -104.7 dBm/15 kHz Ês2 / Noc = - Infinity During T2: Noc = -104.7 dBm/15 kHz Ês2 / Noc = 9 dB	During T1: 0dB 0dB During T2: 0dB 0dB	During T1: Noc = -104.7 dBm/15 kHz Ês2 / Noc = - Infinity During T2: Noc = -104.7 dBm/15 kHz Ês2 / Noc = 9 dB
7.6.2.7 SA event triggered reporting tests for FR2 with SSB time index detection when DRX is not used (PCell in FR1)	Same as 5.6.2.5	Same as 5.6.2.5	Same as 5.6.2.5
7.6.2.8 SA event triggered reporting tests for FR2 with SSB time index detection when DRX is used (PCell in FR1)	Same as 5.6.2.6	Same as 5.6.2.6	Same as 5.6.2.6
7.6.3.1 NR SA FR2 SSB-based L1-RSRP measurement in non-DRX	Same as 5.6.3.1	Same as 5.6.3.1	Same as 5.6.3.1
7.6.3.2 NR SA FR2 SSB-based L1-RSRP measurement in DRX	Same as 5.6.3.1	Same as 5.6.3.1	Same as 5.6.3.1
7.6.3.3 NR SA FR2 CSI-RS-based L1-RSRP measurement in non-DRX	Noc: -105dBm/15kHz $\hat{E}s_0$ / Noc: 0.00dB $\hat{E}s_1$ / Noc: +9.00dB Reported CSI-RSRP values ± 29dB	0dB 0dB 0dB Via mapping	Noc: -105dBm/15kHz $\hat{E}s_0$ / Noc: 0.00dB $\hat{E}s_1$ / Noc: +9.00dB CSI-RS#1: RSRP_40 to

	Reported Differential CSI-RSRP values ± 7dB		RSRP_99 CSI-RS#0: DIFFRSRP_1 to DIFFRSRP_7
7.6.3.4 NR SA FR2 CSI-RS-based L1-RSRP measurement in DRX	Same as 7.6.3.3	Same as 7.6.3.3	Same as 7.6.3.3
7.6.4.1 NR SA FR2 SRS-RSRP measurement in non-DRX	Same as 5.6.4.1	Same as 5.6.4.1	Same as 5.6.4.1
7.6.6.1 NR SA FR2 CSI-RS based CMR and no dedicated IMR configured and CSI-RS resource set with repetition off L1-SINR measurement accuracy	Same as 5.6.6.1	Same as 5.6.6.1	Same as 5.6.6.1
7.6.6.2 NR SA FR2 SSB based CMR and dedicated IMR L1-SINR measurement accuracy	During T1: Noc: -105dBm/15kHz Ês0 / Noc: 0.00dB Ês1 / Noc: -infinity During T2: Noc: -105dBm/15kHz Ês0 / Noc: 0.00dB Ês1 / Noc: +9.00dB Reported SS-SINR values ± 4.5dB Reported Differential SS-SINR values ± 3.5dB	During T1: 0dB 0dB 0dB During T2: 0dB 0dB 0dB Via mapping	During T1: Noc: -105dBm/15kHz Ês0 / Noc: 0.00dB Ês1 / Noc: -infinity During T2: Noc: -105dBm/15kHz Ês0 / Noc: 0.00dB Ês1 / Noc: +9.00dB SSB#1: SINR_53 to SINR_72 SSB#0: DIFFSINR_5 to DIFFSINR_12
7.6.6.3 NR SA FR2 CSI-RS based CMR and dedicated IMR L1-SINR measurement accuracy	Noc: -105dBm/15kHz $\hat{E}s_0$ / Noc: 0.00dB $\hat{E}s_1$ / Noc: +9.00dB Reported CSI-SINR values ± 4.0dB Reported Differential CSI-SINR values ± 3.0dB	0dB 1.5dB 0dB Via mapping	Noc: -105dBm/15kHz $\hat{E}s_0$ / Noc: +1.50dB $\hat{E}s_1$ / Noc: +9.00dB CSI-RS#1: SINR_54 to SINR_71 CSI-RS#0: DIFFSINR_4 to DIFFSINR_10
7.7.1.1 NR SA FR2 SS-RSRP measurement accuracy	Test 1: Noc: -91.60dBm/15kHz Ês1 / Noc: +6.0dB Ês2 / Noc: +1.0dB Reported absolute RSRP values: ±8dB Reported relative RSRP values: ±6dB For extreme conditions allow ±3dB + FFS MU additionally Test 2: n257 Ês1: -110.0dBm/120kHz n257 Ês2: -110.0dBm/120kHz n260 Ês1: -107.4dBm/120kHz n260 Ês2: -107.4dBm/120kHz Reported absolute RSRP values: ±8dB Reported relative RSRP values: ±6dB For extreme conditions allow ±3dB+ FFS MU additionally	Test 1: -5.80dB 0dB 0.4dB Via Mapping Test 2: 7.70dB 7.70dB 7.70dB 7.70dB Via Mapping	Test 1: Noc: -97.40dBm/15kHz Ês1 / Noc: +6.0dB Ês2 / Noc: +1.4dB Cell 1: RSRP_50 to RSRP_108 Cell 2: RSRP_46 to RSRP_103 Cell 2: RSRP_x-12 to RSRP_X+2 Test 2: n257 Ês1: -102.3dBm/120kHz n257 Ês2: -102.3dBm/120kHz n260 Ês1: -99.7dBm/120kHz n260 Ês2: -99.7dBm/120kHz Band dependent. See test case tables in clause 5.7.1.1.5
7.7.1.2 NR SA FR2-FR2 SS-RSRP measurement accuracy	Test 1 Config 1: Noc1: -90.60dBm/15kHz Noc2: -90.60dBm/15kHz Ês1 / Noc1: +6.0dB Ês2 / Noc2: +6.0dB Reported absolute RSRP values: ±8.0dB For extreme conditions allow ±3dB+ FFS MU additionally	Test 1 Config 1: -5.70dB -5.70dB 0dB 0dB Via Mapping	Test 1 Config 1: Noc1: -96.30dBm/15kHz Noc2: -96.30dBm /15kHz Ês1 / Noc1: +6.0dB Ês2 / Noc2: +6.0dB Cell 1 n257: RSRP_41 to RSRP_109 n260: RSRP_39 to RSRP_109 Cell 2: RSRP_52 to RSRP_109

	Reported relative RSRP values: ±6.0dB For extreme conditions allow ±3dB+ FFS MU additionally	Via Mapping	Cell 2: n257: RSRP_x-15 to RSRP_x+25 n260: RSRP_x-15 to RSRP_x+27
	Test 2 Config 1: n257 Noc1: -108.13dBm/15kHz n257 Noc2: -113.13dBm/15kHz n260 Noc1: -105.53dBm/15kHz n260 Noc2: -110.53dBm/15kHz Ês1 / Noc1: 17.0dB Ês2 / Noc2: -1.0dB Reported absolute RSRP values: ±8.0dB For extreme conditions allow ±3dB+ FFS MU additionally	Test 2 Config 1: -6.60dB 0dB -6.60dB 0dB 0dB 2dB Via Mapping	Test 2 Config 1: -114.73dBm/15kHz -113.13dBm/15kHz -112.13dBm/15kHz -110.53dBm/15kHz Ês1 / Noc1: 17.0dB Ês2 / Noc2: 1.0dB Cell 1 n257: RSRP_33 to RSRP_101 n260: RSRP_34 to RSRP_104 Cell 2: n257: RSRP_32 to RSRP_87 n260: RSRP_34 to RSRP_90
	Reported relative RSRP values: ±6.0dB For extreme conditions allow ±3dB+ FFS MU additionally	Via Mapping	Cell 2: n257: RSRP_x-29 to RSRP_x+11 n260: RSRP_x-29 to RSRP_x+13
	Test 1 Config 2: Noc1: -93.70dBm/15kHz Noc2: -93.70dBm/15kHz Ês1 / Noc1: +6.0dB Ês2 / Noc2: +6.0dB Reported absolute RSRP values: ±8.0dB For extreme conditions allow ±3dB+ FFS MU additionally	Test 1 Config 2: -5.60dB -5.60dB 0dB 0dB Via Mapping	Test 1 Config 2: Noc1: -99.30dBm/15kHz Noc2: -99.30dBm /15kHz Ês1 / Noc1: +6.0dB Ês2 / Noc2: +6.0dB Cell 1 n257: RSRP_41 to RSRP_109 n260: RSRP_39 to RSRP_109 Cell 2: RSRP_52 to RSRP_109
	Reported relative RSRP values: ±6.0dB For extreme conditions allow ±3dB+ FFS MU additionally	Via Mapping	Cell 2: n257: RSRP_x-15 to RSRP_x+25 n260: RSRP_x-15 to RSRP_x+27
	Test 2 Config 2: n257 Noc1: -108.13dBm/15kHz n257 Noc2: -113.13dBm/15kHz n260 Noc1: -105.53dBm/15kHz n260 Noc2: -110.53dBm/15kHz Ês1 / Noc1: 17.0dB Ês2 / Noc2: -1.0dB Reported absolute RSRP values: ±8.0dB For extreme conditions allow ±3dB+ FFS MU additionally	Test 2 Config 2: -6.60dB 0dB -6.60dB 0dB 0dB 2dB Via Mapping	Test 2 Config 2: -114.73dBm/15kHz -113.13dBm/15kHz -112.13dBm/15kHz -110.53dBm/15kHz Ês1 / Noc1: 17.0dB Ês2 / Noc2: 1.0dB Cell 1 n257: RSRP_36 to RSRP_104 n260: RSRP_37 to RSRP_107 Cell 2: n257: RSRP_35 to RSRP_90 n260: RSRP_37 to RSRP_93
	Reported relative RSRP values: ±6.0dB For extreme conditions allow ±3dB+ FFS MU additionally	Via Mapping	Cell 2: n257: RSRP_x-29 to RSRP_x+11 n260: RSRP_x-29 to RSRP_x+13
7.7.1.3 NR SA FR1-FR2 SS-RSRP measurement accuracy	Test 1: Noc: -90dBm/15kHz Ês2 / Noc: +5.0dB Reported absolute RSRP values: ±8dB For extreme conditions allow ±3dB + FFS MU	Test 1: -5.50dB 0dB Via Mapping	Test 1: Noc: -95.50dBm/15kHz Ês2 / Noc: +5dB Band dependent. See test case tables in clause 7.7.1.3.5

	additionally Test 2: n257 Ês2: -98.2dBm/120kHz n260 Ês2: -93.9dBm/120kHz Reported absolute RSRP values: ±8dBFor extreme conditions allow ±3dB+ FFS MU additionally	 Test 2: 5.50dB 5.50dB Via Mapping	 Test 2: n257 Ês2: -92.7dBm/120kHz n260 Ês2: -88.4dBm/120kHz Band dependent. See test case tables in clause 7.7.1.3.5
7.7.2.1 NR SA FR2 SS-RSRQ measurement accuracy	Test 1: Noc: -95.0dBm/15kHz Ês1 / Noc: +3.0dB Ês2 / Noc: +3.0dB Reported absolute RSRQ values: ±2.5dB For extreme conditions allow ±1.5dB+ FFS MU additionally Test 2: Noc: -95.0dBm/15kHz Ês1 / Noc: -3.0dB Ês2 / Noc: -3.0dB Reported absolute RSRQ values: ±3.5dB For extreme conditions allow ±0.5dB+ FFS MU additionally	Test 1: -5.70dB 0dB 0dB Via Mapping Test 2: -1.70dB 0dB 0dB Via Mapping	Test 1: Noc: -100.70dBm/15kHz Ês1 / Noc: +3.0dB Ês2 / Noc: +3.0dB Cell 2: All bands: RSRQ_41 to RSRQ_73 Test 2: Noc: -96.70dBm/15kHz Ês1 / Noc: -3.0dB Ês2 / Noc: -3.0dB Cell 2: n257, n258, n261: RSRQ_35 to RSRQ_71 n260: RSRQ_34 to RSRQ_71
7.7.2.2 NR SA FR2-FR2 SS-RSRQ measurement accuracy	Test 1: Noc1: -94.03dBm/15kHz Noc2: -94.03dBm/15kHz Ês1 / Noc1: -1.75dB Ês2 / Noc2: -1.75dB Reported absolute RSRQ values: ±2.5dB For extreme conditions allow ±1.5dB+ FFS MU additionally Reported relative RSRQ values: ±3.0dB For extreme conditions allow ±1.0dB+ FFS MU additionally Test 2: Noc1: -94.03dBm/15kHz Noc2: -94.03dBm/15kHz Ês1 / Noc1: -3.0dB Ês2 / Noc2: -3.0dB Reported absolute RSRQ values: ±3.5dB For extreme conditions allow ±0.5dB+ FFS MU additionally Reported relative RSRQ values: ±4.0dB For extreme conditions allow ±0.0dB+ FFS MU additionally	Test 1: -1.90dB -1.90dB 0dB 0dB Via Mapping Via Mapping Test 2: -1.41dB -1.41dB 0dB 0dB Via Mapping Via Mapping	Test 1: Noc1: -95.93dBm/15kHz Noc2: -95.93dBm /15kHz Ês1 / Noc1: -1.75dB Ês2 / Noc2: -1.75dB Cell 1 and Cell 2: RSRQ_41 to RSRQ_73 Cell 2: RSRQ_x-7 to RSRQ_x+7 Test 2: Noc1: -95.44dBm/15kHz Noc2: -95.44dBm /15kHz Ês1 / Noc1: -3.0dB Ês2 / Noc2: -3.0dB Cell 1 and Cell 2: RSRQ_37 to RSRQ_74 Cell 2: RSRQ_x-9 to RSRQ_x+9
7.7.3.1 NR SA FR2 SS-SINR measurement accuracy	Test 1: Noc: -105.0dBm/15kHz Ês1 / Noc: +4.54dB Ês2 / Noc: +2.66dB Reported absolute SINR values: ±3.5dB For extreme conditions allow ±0.5dB+ FFS MU additionally Test 2: Noc: -105.0dBm/15kHz Ês1 / Noc: -3.0dB Ês2 / Noc: -3.0dB Reported absolute SINR values: ±3.5dB For extreme conditions allow ±0.5dB+ FFS MU additionally	Test 1: 0dB 0dB 0dB Via Mapping Test 2: 0dB 0.2dB 0.2dB Via Mapping	Test 1: Noc: -105.0dBm/15kHz Ês1 / Noc: +4.54dB Ês2 / Noc: +2.66dB Cell 2: n257, n258, n261: SINR_22 to RSRQ_58 n260: SINR_21 to RSRQ_58 Test 2: Noc: -105.0dBm/15kHz Ês1 / Noc: -2.8dB Ês2 / Noc: -2.8dB Cell 2: n257, n258, n261: SINR_18 to RSRQ_55 n260: SINR_18 to RSRQ_54
7.7.3.2 NR SA FR2-FR2	Test 1:	Test 1:	Test 1:

SS-SINR measurement accuracy	Noc1: -105.0dBm/15kHz Noc2: -105.0dBm/15kHz Ês1 / Noc1: -0.5dB Ês2 / Noc2: -0.5dB Reported absolute SINR values: ±3.0dB For extreme conditions allow ±1.0dB+ FFS MU additionally Reported absolute SINR values: ±3.5dB For extreme conditions allow ±0.5dB+ FFS MU additionally Test 2: Noc1: -105.0dBm/15kHz Noc2: -105.0dBm/15kHz Ês1 / Noc1: +11.0dB Ês2 / Noc2: +11.0dB Reported absolute SINR values: ±3.0dB For extreme conditions allow ±1.0dB+ FFS MU additionally Reported absolute SINR values: ±3.5dB For extreme conditions allow ±0.5dB+ FFS MU additionally Test 3: Noc1: -105.0dBm/15kHz Noc2: -105.0dBm/15kHz Ês1 / Noc1: -3.0dB Ês2 / Noc2: -3.0dB Reported absolute SINR values: ±3.5dB For extreme conditions allow ±0.5dB+ FFS MU additionally Reported absolute SINR values: ±4.0dB For extreme conditions allow ±0.0dB+ FFS MU additionally	0dB 0dB 0dB 0dB Via Mapping Via Mapping Test 2: -0.1dB -0.1dB 0dB 0dB Via Mapping Via Mapping Test 3: 0dB 0dB 0.9dB 0.9dB Via Mapping Via Mapping	Noc1: -105.0dBm/15kHz Noc2: -105.0dBm/15kHz Ês1 / Noc1: -0.5dB Ês2 / Noc2: -0.5dB Cell 1 and Cell 2: n257, n258, n261: SINR_27 to SINR_62 n260: SINR_27 to SINR_61 Cell 2: SINR_x-8 to SINR_x+8 Test 2: Noc1: -105.1dBm/15kHz Noc2: -105.1dBm/15kHz Ês1 / Noc1: +11.0dB Ês2 / Noc2: +11.0dB Cell 1 and Cell 2: n257, n258, n261: SINR_48 to SINR_87 n260: SINR_48 to SINR_86 Cell 2: SINR_x-17 to SINR_x+17 Test 3: Noc1: -105.0dBm/15kHz Noc2: -105.0dBm/15kHz Ês1 / Noc1: -2.1dB Ês2 / Noc2: -2.1dB Cell 1 and Cell 2: n257, n258, n261: SINR_23 to SINR_60 n260: SINR_22 to SINR_59 Cell 2: SINR_x-9 to SINR_x+9
7.7.4.1 NR SA FR2 SSB based L1-RSRP measurement accuracy	Test 1: Noc: -100dBm/15kHz SSB#0 Ês / Noc: +10.0dB SSB#1 Ês / Noc: -2.0dB Reported absolute RSRP values: ±8.5dB Reported relative RSRP values: ±6.5dB For extreme conditions allow ±3dB + FFS MU additionally Test 2: n257 SSB#0 Ês: -108.1dBm/120kHz n257 SSB#1 Ês: -105.5dBm/120kHz n260 SSB#0 Ês: -108.1dBm/120kHz n260 SSB#1 Ês: -105.5dBm/120kHz Reported absolute RSRP values: -6.5 +8.5dB Reported relative RSRP values: ±6.5dB For extreme conditions allow ±3dB+ FFS MU additionally	Test 1: -4.1dB 0dB 0.4dB Test 2: 5.7dB	Test 1: Noc: -104.1dBm/15kHz SSB#0 Ês / Noc: +10.0dB SSB#1 Ês / Noc: -1.6dB SSB#0: RSRP_42 to RSRP_101 SSB#1: RSRP_31 to RSRP_89 SSB#1-SSB#0: -9 to -2 Test 2: n257 SSB#0 Ês: -102.4dBm/120kHz n257 SSB#1 Ês: -99.8dBm/120kHz n260 SSB#0 Ês: -102.4dBm/120kHz n260 SSB#1 Ês: -99.8dBm/120kHz SSB#0 and SSB#1 n257: RSRP_27 to RSRP_83 n260: RSRP_30 to RSRP_86 SSB#1-SSB#0: -4 to +4
7.7.4.2 NR SA FR2 CSI-RS based L1-RSRP measurement accuracy	Test 1: Noc: -100dBm/15kHz CSI-RS#0 Ês / Noc: +10.0dB	Test 1: -4.1dB 0dB	Test 1: Noc: -104.1dBm/15kHz CSI-RS#0 Ês / Noc: +10.0dB

	CSI-RS#1 Ês / Noc: -2.0dB Reported absolute RSRP values: ±8.5dB Reported relative RSRP values: ±6.5dB For extreme conditions allow ±3dB + FFS MU additionally Test 2: n257 CSI-RS#0 Ês: -108.1dBm/120kHz n257 CSI-RS#1 Ês: -105.5dBm/120kHz n260 CSI-RS#0 Ês: -108.1dBm/120kHz n260 CSI-RS#1 Ês: -105.5dBm/120kHz Reported absolute RSRP values: -6.5 +8.5dB Reported relative RSRP values: ±6.5dB For extreme conditions allow ±3dB+ FFS MU additionally	0.2dB Test 2: 5.7dB	CSI-RS#1 Ês / Noc: -1.8dB CSI-RS#0: RSRP_42 to RSRP_101 CSI-RS#1: RSRP_30 to RSRP_89 CSI-RS#1-CSI-RS#0: -9 to -2 Test 2: n257 CSI-RS#0 Ês: -102.4dBm/120kHz n257 CSI-RS#1 Ês: -99.8dBm/120kHz n260 CSI-RS#0 Ês: -102.4dBm/120kHz n260 CSI-RS#1 Ês: -99.8dBm/120kHz CSI-RS#0 and CSI-RS#1 n257: RSRP_27 to RSRP_83 n260: RSRP_30 to RSRP_86 CSI-RS#1-CSI-RS#0: -4 to +4
7.7.5.1 NR SA FR2 SRS-RSRP measurement accuracy	Same as 5.7.5.1	Same as 5.7.5.1	Same as 5.7.5.1
7.7.6.1 NR SA FR2 CSI-RS based CMR and no dedicated IMR configured and CSI-RS resource set with repetition off L1-SINR measurement accuracy	Noc: -100dBm/15kHz Ês0 / Noc: 10.00dB Ês1 / Noc: -2.00dB Reported CSI-SINR values ± 5.5dB Reported Differential CSI-SINR values ± 4.5dB	-4.1dB 0dB 0.2dB Via mapping	Noc: -104.1dBm/15kHz Ês0 / Noc: 10.00dB Ês1 / Noc: -1.8dB CSI-RS#0: SINR_53 to SINR_76 CSI-RS#0: DIFFSINR_6 to DIFFSINR_15
7.7.6.2 NR SA FR2 SSB based CMR and dedicated IMR L1-SINR measurement accuracy	Noc: -100dBm/15kHz Ês0 / Noc: 10.00dB Ês1 / Noc: -2.00dB Reported SS-SINR values ± 4.5dB Reported Differential SS-SINR values ± 3.5dB	-4.1dB 0dB 0.2dB Via mapping	Noc: -104.1dBm/15kHz Ês0 / Noc: 10.00dB Ês1 / Noc: -1.8dB SSB#0: SINR_55 to SINR_74 SSB#0: DIFFSINR_7 to DIFFSINR_15
7.7.6.3 NR SA FR2 CSI-RS based CMR and dedicated IMR L1-SINR measurement accuracy	Noc: -100dBm/15kHz Ês0 / Noc: 10.00dB Ês1 / Noc: 0.00dB Reported CSI-SINR values ± 4.5dB Reported Differential CSI-SINR values ± 3.5dB	-4.1dB 0dB 0.2dB Via mapping	Noc: -104.1dBm/15kHz Ês0 / Noc: 10.00dB Ês1 / Noc: 0.2dB CSI-RS#0: SINR_55 to SINR_74 CSI-RS#0: DIFFSINR_5 to DIFFSINR_13

Table F.1.3.2-5: Derivation of test requirements for E-UTRA – NR inter-RAT test cases with E-UTRA serving cell RRM tests

Test	Minimum requirement in TS 38.133 [6]	Test tolerance (TT)	Test requirement in TS 38.533
8.2.1.1 E-UTRA – NR FR1 cell re-selection to higher priority NR target cell	During T1: Noc1: -98dBm/15kHz Noc2: -98dBm/15kHz Ês1 / Noc1: +14dB Ês2 / Noc2: -4dB During T2: Noc1: -98dBm/15kHz Noc2: -98dBm/15kHz Ês1 / Noc1: +14dB Ês2 / Noc2: -infinity During T3: Noc1: -98dBm/15kHz	During T1: 0dB -1.90dB 0dB 0.35dB During T2: 0dB 0dB 0dB 0dB During T3: 0dB	During T1: Noc1: -98dBm/15kHz Noc2: -99.90dBm/15kHz Ês1 / Noc1: +14dB Ês2 / Noc2: -3.65dB During T2: Noc1: -98dBm/15kHz Noc2: -98dBm/15kHz Ês1 / Noc1: +14dB Ês2 / Noc2: -infinity During T3: Noc1: -98dBm/15kHz

	Noc2: -98dBm/15kHz Ês1 / Noc1: +14dB Ês2 / Noc2: +12dB	0dB 1.55dB 1.55dB	Noc2: -98dBm/15kHz Ês1 / Noc1: +15.55dB Ês2 / Noc2: +13.55dB
8.2.1.2 E-UTRA – NR FR1 Cell reselection to lower priority NR target Cell in FR1 for UE configured with highSpeedInterRAT-NR-r16	During T1: Noc1: -98dBm/15kHz Noc2: -98dBm/15kHz Ês1 / Noc1: -4dB Ês2 / Noc2: 14dB During T2: Noc1: -98dBm/15kHz Noc2: -98dBm/15kHz Ês1 / Noc1: +12dB Ês2 / Noc2: +14dB	During T1: -1.90dB -1.90dB 0.35dB 3.45dB During T2: -1.90dB -1.90dB 3.45dB 0dB	During T1: Noc1: -99.9dBm/15kHz Noc2: -99.9dBm/15kHz Ês1 / Noc1: -3.65dB Ês2 / Noc2: 17.45dB During T2: Noc1: -99.9dBm/15kHz Noc2: -99.9dBm/15kHz Ês1 / Noc1: +15.45dB Ês2 / Noc2: +14dB
8.2.2.1 E-UTRA – NR FR1 Early Measurement Reporting	During T1: Noc_1: -98dBm/15kHz Noc_2: -98dBm/15kHz $Ês_1$ / Noc_1: +14dB $Ês_2$ / Noc_2: -infinity During T2: Noc_1: -98dBm/15kHz Noc_2: -98dBm/15kHz $Ês_1$ / Noc_1: +14dB $Ês_2$ / Noc_2: -4dB During T3: Noc_1: -98dBm/15kHz Noc_2: -98dBm/15kHz $Ês_1$ / Noc_1: +14dB $Ês_2$ / Noc_2: -4dB Reported SS-RSRP and SS-RSRQ for NR Cell 2	During T1: 0dB 0dB 0dB 0dB During T2: 0dB 0dB 0dB +0.3dB During T3: 0dB 0dB 0dB +0.3dB Via mapping	During T1: Noc_1: -98dBm/15kHz Noc_2: -98dBm/15kHz $Ês_1$ / Noc_1: +14dB $Ês_2$ / Noc_2: -infinity During T2: Noc_1: -98dBm/15kHz Noc_2: -98dBm/15kHz $Ês_1$ / Noc_1: +14dB $Ês_2$ / Noc_2: -3.7dB During T3: Noc_1: -98dBm/15kHz Noc_2: -98dBm/15kHz $Ês_1$ / Noc_1: +14dB $Ês_2$ / Noc_2: -3.7dB **Configuration 1 and 2:** RSRP_44 to RSRP_66 RSRQ_44 to RSRQ_65 **Configuration 3:** RSRP_47 to RSRP_69 RSRQ_44 to RSRQ_65
8.2.2.2 E-UTRA – NR FR2 Early Measurement Reporting	During T1: Noc_1: -98dBm/15kHz Noc_2: -107dBm/15kHz $Ês_1$ / Noc_1: +14dB $Ês_2$ / Noc_2: -infinity During T2: Noc_1: -98dBm/15kHz Noc_2: -98dBm/15kHz $Ês_1$ / Noc_1: +14dB $Ês_2$ / Noc_2: -4dB During T3: Noc_1: -98dBm/15kHz Noc_2: -98dBm/15kHz $Ês_1$ / Noc_1: +14dB $Ês_2$ / Noc_2: -4dB Signalled Thresh_X_HighP: 48dB Reported SS-RSRP and SS-RSRQ for NR Cell 2	During T1: 0dB 0dB 0dB 0dB During T2: 0dB 0dB 0dB +2.6dB During T3: 0dB 0dB 0dB +2.6dB +3dB Via mapping	During T1: Noc_1: -98dBm/15kHz Noc_2: -107dBm/15kHz $Ês_1$ / Noc_1: +14dB $Ês_2$ / Noc_2: -infinity During T2: Noc_1: -98dBm/15kHz Noc_2: -98dBm/15kHz $Ês_1$ / Noc_1: +14dB $Ês_2$ / Noc_2: -1.4dB During T3: Noc_1: -98dBm/15kHz Noc_2: -98dBm/15kHz $Ês_1$ / Noc_1: +14dB $Ês_2$ / Noc_2: -1.4dB 51dB RSRP_28 to RSRP_86 RSRQ_44 to RSRQ_65
8.3.1.1 E-UTRA – NR FR1 handover with	During T1: Noc1: -98dBm/15kHz	During T1: 0dB	During T1: Noc1: -98dBm/15kHz

known target cell	Noc2: -98dBm/15kHz Ês1 / Noc1: +7dB Ês2 / Noc2: -infinity During T2: Noc1: -98dBm/15kHz Noc2: -98dBm/15kHz Ês1 / Noc1: +7dB Ês2 / Noc2: 0dB During T3: Noc1: -98dBm/15kHz Noc2: -98dBm/15kHz Ês1 / Noc1: +7dB Ês2 / Noc2: 0dB	0dB 0dB 0dB During T2: 0dB 0dB -1.55dB +1.55dB During T3: 0dB 0dB -1.55dB +1.55dB	Noc2: -98dBm/15kHz Ês1 / Noc1: +7dB Ês2 / Noc2: -infinity During T2: Noc1: -98dBm/15kHz Noc2: -98dBm/15kHz Ês1 / Noc1: +5.45dB Ês2 / Noc2: +1.55dB During T3: Noc1: -98dBm/15kHz Noc2: -98dBm/15kHz Ês1 / Noc1: +5.45dB Ês2 / Noc2: +1.55dB
8.4.1.1 E-UTRA – NR FR1 SFTD measurement delay in non-DRX	During T1: Noc1: -104dBm/15kHz Noc2: -98dBm/15kHz Ês1 / Noc1: +17dB Ês2 / Noc2: +4dB	During T1: 0dB 0dB 0dB 0dB	During T1: Noc1: -104dBm/15kHz Noc2: -98dBm/15kHz Ês1 / Noc1: +17dB Ês2 / Noc2: +4dB
8.4.1.2 E-UTRA – NR FR1 SFTD measurement delay in DRX	Same as 8.4.1.1	Same as 8.4.1.1	Same as 8.4.1.1
8.4.2.1 E-UTRA event-triggered reporting of a NR FR1 neighbour cell without SSB time index detection in non-DRX	During T1: Noc1: -104dBm/15kHz Noc2: -98dBm/15kHz Ês1 / Noc1: +17dB Ês2 / Noc2: -infinity During T2: Noc1: -104dBm/15kHz Noc2: -98dBm/15kHz Ês1 / Noc1: +17dB Ês2 / Noc2: +7dB	During T1: 0dB 0dB 0dB 0dB During T2: 0dB 0dB -1.65dB +1.65dB	During T1: Noc1: -104dBm/15kHz Noc2: -98dBm/15kHz Ês1 / Noc1: +17dB Ês2 / Noc2: -infinity During T2: Noc1: -98dBm/15kHz Noc2: -98dBm/15kHz Ês1 / Noc1: +15.35dB Ês2 / Noc2: +8.65dB
8.4.2.2 E-UTRA event-triggered reporting of a NR FR1 neighbour cell without SSB time index detection in DRX	Same as 8.4.2.1	Same as 8.4.2.1	Same as 8.4.2.1
8.4.2.3 E-UTRA event-triggered reporting of a NR FR1 neighbour cell with SSB time index detection in non-DRX	Same as 8.4.2.1	Same as 8.4.2.1	Same as 8.4.2.1
8.4.2.4 E-UTRA event-triggered reporting of a NR FR1 neighbour cell with SSB time index detection in DRX	Same as 8.4.2.1	Same as 8.4.2.1	Same as 8.4.2.1
8.4.2.5 E-UTRA event-triggered reporting of a NR FR2 neighbour cell without SSB time index detection in non-DRX	During T1: Ês2: - Infinity During T2: Ês2: -80.6 dBm/120kHz	During T1: 0dB During T2: 0dB	During T1: Ês2: - Infinity During T2: Ês2: -80.6 dBm/120kHz
8.4.2.6 E-UTRA event-triggered reporting of a NR FR2 neighbour cell without SSB time index detection in DRX	During T1: Noc: -104.7dBm/15kHz Ês / Noc: -infinity During T2: Noc: -104.7dBm/15kHz Ês / Noc: +8dB	During T1: 0dB 0dB During T2: 0dB 0dB	During T1: Noc: -104.7dBm/15kHz Ês / Noc: -infinity During T2: Noc: -104.7dBm/15kHz Ês / Noc: +8dB
8.4.2.7 E-UTRA event-triggered reporting of a NR FR2 neighbour cell with SSB time index detection in non-DRX	Same as 8.4.2.6	Same as 8.4.2.6	Same as 8.4.2.6

8.4.2.8 E-UTRA event-triggered reporting of a NR FR2 neighbour cell with SSB time index detection in DRX	Same as 8.4.2.6	Same as 8.4.2.6	Same as 8.4.2.6
8.4.2.9 E-UTRA – NR Inter-RAT event triggered reporting tests for FR1 with SSB time index detection in DRX for UE configured with highSpeedInterRAT-NR-r16	During T1: Noc1: -104dBm/15kHz Noc2: -98dBm/15kHz Ês1 / Noc1: +17dB Ês2 / Noc2: -infinity During T2: Noc1: -104dBm/15kHz Noc2: -98dBm/15kHz Ês1 / Noc1: +17dB Ês2 / Noc2: +7dB	During T1: 0dB 0dB 0dB 0dB During T2: 0dB 0dB 0dB 0dB	During T1: Noc1: -104dBm/15kHz Noc2: -98dBm/15kHz Ês1 / Noc1: +17dB Ês2 / Noc2: -infinity During T2: Noc1: -104dBm/15kHz Noc2: -98dBm/15kHz Ês1 / Noc1: +17dB Ês2 / Noc2: +7dB
8.5.1.1 E-UTRA – NR FR1 SFTD measurement accuracy	Test 1 Ês1 / Noc1: -3dB Ês2 / Noc2: -3dB	Test 1: +0.8dB +0.3dB	Test 1: Ês1 / Noc1: -2.2dB Ês2 / Noc2: -2.7dB
8.5.2.1.1.1 E-UTRA SS-RSRP absolute measurement accuracy of a NR FR1 neighbour cell			
Test Configuration 1,2,4,5	Test 1: N_{oc1}: -94.65 dBm/15kHz Ês1 / N_{oc1}: +10.0dB Reported RSRP values: ±8dB (±3.0dB additionally for extreme conditions) Test 2: N_{oc1}: -117dBm/15kHz + Δ_{BG_offset} Ês1 / N_{oc1}: -4.0dB Reported RSRP values: ±4.5dB (±4.5dB additionally for extreme conditions)	Test 1: 0dB 0dB Via mapping Test 2: 0dB 0.8dB Via mapping	Test 1: N_{oc1}: -94.65dBm/15kHz Ês1 / N_{oc1}: +10.0dB RSRP_62 to RSRP_82 Test 2: N_{oc1}: -117dBm/15kHz + Δ_{BG_offset} Ês1 / N_{oc1}: -3.2dB RSRP_30 to RSRP_43 RSRP_31 to RSRP_43 RSRP_31 to RSRP_44 RSRP_32 to RSRP_44 RSRP_32 to RSRP_45 RSRP_33 to RSRP_45 RSRP_33 to RSRP_46 RSRP_34 to RSRP_46 depending on operating band
Test Configuration 3,6	Test 1: N_{oc1}: -94.65 dBm/15kHz Ês1 / N_{oc1}: +10.0dB Reported RSRP values: ±8dB (±3.0dB additionally for extreme conditions) Test 2: N_{oc1}: -117dBm/15kHz + Δ_{BG_offset} Ês1 / N_{oc1}: -4.0dB Reported RSRP values: ±4.5dB (±4.5dB additionally for extreme conditions)	Test 1: -1.35dB 0dB Via mapping Test 2: 0dB 0.8dB Via mapping	Test 1: N_{oc1}: -96.00dBm/15kHz Ês1 / N_{oc1}: +10.0dB RSRP_64 to RSRP_83 Test 2: N_{oc1}: -117dBm/15kHz + Δ_{BG_offset} Ês1 / N_{oc1}: -3.2dB RSRP_33 to RSRP_46 RSRP_34 to RSRP_46 RSRP_34 to RSRP_47 RSRP_35 to RSRP_47 RSRP_35 to RSRP_48 RSRP_36 to RSRP_48 RSRP_36 to RSRP_49 RSRP_37 to RSRP_49 depending on operating band
8.5.2.1.2 E-UTRA SS-RSRP absolute measurement accuracy of a NR FR2 neighbour cell	Test 1: N_{oc}: -105dBm/15kHz Ês / N_{oc} 11dB Reported RSRP values: ±8dB (±3dB additionally for extreme conditions) Test 2: Ês FR2a PC3: -109.1dBm/SCS Reported RSRP values: ±8dB	Test 1: -0.1dB 0dB Via mapping Test 2: +5.65dB Via mapping	Test 1: N_{oc}: -105.1dBm/15kHz Ês / N_{oc}: +11.0dB RSRP_48 to RSRP_105 Test 2: Ês: -103.45dBm/SCS RSRP_29 to RSRP_87

	Ês FR2b PC3: -106.5dBm/SCS Reported RSRP values: ±8dB Ês FR2c PC3: -105.5dBm/SCS Reported RSRP values: ±8dB (±3dB additionally for extreme conditions in all frequency ranges)	+5.65dB Via mapping +5.65dB Via mapping	Ês: -100.85dBm/SCS RSRP_32 to RSRP_89 Ês: -99.85dBm/SCS RSRP_33 to RSRP_90
8.5.2.2.1 E-UTRA SS-RSRQ absolute measurement accuracy of a NR FR1 neighbour cell			
Test Configuration 1,2,4,5	Test 1: N_{oc1}: -80.18 dBm/15kHz Ês1 / N_{oc1}: -1.75dB Reported RSRQ values: ±2.5dB (±1.5dB additionally for extreme conditions) Test 2: N_{oc1}: -106dBm/15kHz Ês1 / N_{oc1}: -1.75dB Reported RSRQ values: ±2.5dB (±1.5dB additionally for extreme conditions) Test 3: N_{oc1}: -116dBm/15kHz + Δ_{BG_offset} Ês1 / N_{oc1}: -1.75dB Reported RSRQ values: ±2.5dB (±1.5dB additionally for extreme conditions)	Test 1: -1.5dB 0dB Via mapping Test 2: 0dB 0dB Via mapping Test 3: 0dB 0dB Via mapping	Test 1: N_{oc1}: -81.68dBm/15kHz Ês1 / N_{oc1}: -1.75dB RSRQ_51 to RSRQ_63 Test 2: N_{oc1}: -106dBm/15kHz Ês1 / N_{oc1}: -1.75dB RSRQ_51 to RSRQ_63 Test 3: N_{oc1}: -116dBm/15kHz + Δ_{BG_offset} Ês1 / N_{oc1}: -1.75dB RSRQ_51 to RSRQ_63
Test Configuration 3,6	Test 1: N_{oc1}: -86.27 dBm/15kHz Ês1 / N_{oc1}: -1.75dB Reported RSRQ values: ±2.5dB (±1.5dB additionally for extreme conditions) Test 2: N_{oc1}: -113dBm/15kHz Ês1 / N_{oc1}: -1.75dB Reported RSRQ values: ±2.5dB (±1.5dB additionally for extreme conditions) Test 3: N_{oc1}: -116dBm/15kHz + Δ_{BG_offset} Ês1 / N_{oc1}: -1.75dB Reported RSRQ values: ±2.5dB (±1.5dB additionally for extreme conditions)	Test 1: -1.53dB 0dB Via mapping Test 2: 0dB 0dB Via mapping Test 3: 0dB 0dB Via mapping	Test 1: N_{oc1}: -87.80dBm/15kHz Ês1 / N_{oc1}: -1.75dB RSRQ_51 to RSRQ_63 Test 2: N_{oc1}: -113dBm/15kHz Ês1 / N_{oc1}: -1.75dB RSRQ_51 to RSRQ_63 Test 3: N_{oc1}: -116dBm/15kHz + Δ_{BG_offset} Ês1 / N_{oc1}: -1.75dB RSRQ_51 to RSRQ_63
8.5.2.2.2 E-UTRA SS-RSRQ absolute measurement accuracy of a NR FR2 neighbour cell	Test 1: N_{oc1}: -105dBm/15kHz Ês1 / N_{oc1}: -0.5dB Reported RSRQ values: ±2.5dB (±1.5dB additionally for extreme conditions) Test 2: N_{oc1} FR2a PC3: -115.1dBm/15kHz N_{oc1} FR2b PC3: -112.5dBm/15kHz N_{oc1} FR2c PC3: -111.5dBm/15kHz Ês1 / N_{oc1}: -1.75dB Reported RSRQ values: ±2.5dB (±1.5dB additionally for extreme conditions in all frequency ranges)	Test 1: 0dB 0dB Via mapping Test 2: 0dB 0dB 0dB 5.3dB Via mapping	Test 1: N_{oc1}: -105dBm/15kHz Ês1 / N_{oc1}: -0.5dB RSRQ_23 to RSRQ_95 Test 2: N_{oc1}: -115.1dBm/15kHz N_{oc1}: -112.5dBm/15kHz N_{oc1}: -111.5dBm/SCS Ês1 / N_{oc1}: 3.55dB RSRQ_26 to RSRQ_98

8.5.2.3.1 E-UTRA SS-SINR absolute measurement accuracy of a NR FR1 neighbour cell	Test 1: N_{oc1}: -88 dBm/15kHz $\hat{E}s1 / N_{oc1}$: -1.75dB Reported SINR values: ±3dB Test 2: N_{oc1}: -108.5dBm/15kHz $\hat{E}s1 / N_{oc1}$: 20dB Reported SINR values: ±3dB Test 3: N_{oc1}: -119.5dBm/15kHz + Δ_{BG_offset} $\hat{E}s1 / N_{oc1}$: -4dB Reported SINR values: ±3.5dB	Test 1: 0dB 0dB Via mapping Test 2: 0dB 0dB Via mapping Test 3: 0dB 0.8dB Via mapping	Test 1: N_{oc1}: -88 dBm/15kHz $\hat{E}s1 / N_{oc1}$: -1.75dB SINR_35 to SINR_51 Test 2: N_{oc1}: -108.5dBm/15kHz $\hat{E}s1 / N_{oc1}$: 20dB SINR_79 to SINR_94 Test 3: N_{oc1}: -119.5dBm/15kHz + Δ_{BG_offset} $\hat{E}s1 / N_{oc1}$: -3.2dB SINR_32 to SINR_49
8.5.2.3.2 E-UTRA SS-SINR absolute measurement accuracy of a NR FR2 neighbour cell	Test 1: N_{oc1}: -105dBm/15kHz $\hat{E}s1 / N_{oc1}$: -0.5dB Reported SINR values: ±3dB (±1dB additionally for extreme conditions) Test 2: N_{oc1}: -105dBm/15kHz $\hat{E}s1 / N_{oc1}$: 11dB Reported SINR values: ±3dB (±1dB additionally for extreme conditions) Test 3: N_{oc1} FR2a PC3: -115.1dBm/15kHz N_{oc1} FR2b PC3: -112.5dBm/15kHz N_{oc1} FR2c PC3: -111.5dBm/15kHz $\hat{E}s1 / N_{oc1}$: -1dB Reported SINR values: ±3dB (±1dB additionally for extreme conditions in all frequency ranges)	Test 1: 0dB 0dB Via mapping Test 2: -0.1dB 0dB Via mapping Test 3: 0dB 0dB 0dB 4.6dB Via mapping	Test 1: N_{oc1}: -105dBm/15kHz $\hat{E}s1 / N_{oc1}$: -0.5dB SINR_9 to SINR_82 Test 2: N_{oc1}: -105.1dBm/15kHz $\hat{E}s1 / N_{oc1}$: 11dB SINR_32 to SINR_105 Test 3: N_{oc1}: -115.1dBm/15kHz N_{oc1}: -112.5dBm/15kHz N_{oc1}: -111.5dBm/SCS $\hat{E}s1 / N_{oc1}$: 3.6dB SINR_17 to SINR_90

Table F.1.3.2-6: Derivation of test requirements for FR1 NR sidelink RRM tests

Test	Minimum requirement in TS 38.133 [6]	Test tolerance (TT)	Test requirement in TS 38.533
9.1.1.1 NR SA FR1 UE transmit timing accuracy for GNSS as synchronization reference source	Sidelink transmit timing error limit: ±12*64 Tc	±3*64 Tc	±15*64 Tc
9.1.1.2 NR SA FR1 UE transmit timing accuracy for SyncRef UE as synchronization reference source	Sidelink transmit timing error limit: ±8*64 Tc Noc = -95 dBm/30 kHz Es_1/Noc = 3 dB	±2*64 Tc 0dB 0dB	±10*64 Tc Noc = -95 dBm/30 kHz Es_1/Noc = 3 dB
9.1.1.3 NR SA FR1 UE transmit timing accuracy for FR1 NR cell as synchronization reference source	**Uu Test Configuration 1, 2**		
	Sidelink transmit timing error limit: ±12*64 Tc Noc = -98 dBm/15 kHz Es_1/Noc = 3 dB	±3*64 Tc 0dB 0dB	±15*64 Tc Noc = -98 dBm/15 kHz Es_1/Noc = 3 dB
	Uu Test Configuration 3		
	Sidelink transmit timing error limit: ±10*64 Tc	±3*64 Tc	±13*64 Tc

	Noc = -98 dBm/15 kHz Es_1/Noc = 3 dB	0dB 0dB	Noc = -98 dBm/15 kHz Es_1/Noc = 3 dB
9.1.2.1 NR SA FR1 initiation/cease of S-SSB transmission for FR1 NR cell as synchronization reference source	**Uu Test Configuration 1, 2**		
	During T1: Noc = -110 dBm/15 kHz Es_1/Noc = 4.50 dB During T2: Noc = -110 dBm/15 kHz Es_1/Noc = -4.50 dB During T3: Noc = -110 dBm/15 kHz Es_1/Noc = 4.50 dB In signaling: syncTxThreshIC = -110.00 dBm/SCS	 -1.55dB 3.10dB -1.55dB 0dB -1.55dB 3.10dB 0dB	During T1: Noc = -111.55 dBm/15 kHz Es_1/Noc = 7.60 dB During T2: Noc = -111.55 dBm/15 kHz Es_1/Noc = -4.50 dB During T3: Noc = -111.55 dBm/15 kHz Es_1/Noc = 7.60 dB syncTxThreshIC = -110.00 dBm/SCS
	Uu Test Configuration 3		
	During T1: Noc = -110 dBm/15 kHz Es_1/Noc = 4.50 dB During T2: Noc = -110 dBm/15 kHz Es_1/Noc = -4.50 dB During T3: Noc = -110 dBm/15 kHz Es_1/Noc = 4.50 dB In signaling: syncTxThreshIC = -110.00 dBm/SCS	 -4.55dB 3.10dB -4.55dB 0dB -4.55dB 3.10dB 0dB	During T1: Noc = -114.55 dBm/15 kHz Es_1/Noc = 7.60 dB During T2: Noc = -114.55 dBm/15 kHz Es_1/Noc = -4.50 dB During T3: Noc = -114.55 dBm/15 kHz Es_1/Noc = 7.60 dB syncTxThreshIC = -110.00 dBm/SCS
9.1.2.2 NR SA FR1 initiation/cease of S-SSB transmission for SyncRef UE as synchronization reference source	During T1: Noc = -98 dBm/30 kHz Es_1/Noc = 5.50 dB During T2: Noc = -98 dBm/30 kHz Es_1/Noc = -3.50 dB During T3: Noc = -98 dBm/30 kHz Es_1/Noc = 5.50 dB In signaling: syncTxThreshOoC = -100.00 dBm/SCS	 -1.35dB 0dB -4.55dB 0dB -1.35dB 0dB 0dB	During T1: Noc = -99.35 dBm/30 kHz Es_1/Noc = 5.50 dB During T2: Noc = -102.55 dBm/30 kHz Es_1/Noc = -3.50 dB During T3: Noc = -99.35 dBm/30 kHz Es_1/Noc = 5.50 dB syncTxThreshOoC = -100.00 dBm/SCS
9.1.3.1 NR SA FR1 synchronization reference selection/reselection for GNSS configured as the highest priority synchronization reference source	During T1: Noc = -95 dBm/30 kHz Es_1/Noc = 0 dB Es_2/Noc = -infinity Es_3/Noc = -infinity During T2: Noc = -95 dBm/30 kHz Es_1/Noc = 0 dB Es_2/Noc = 0 dB Es_3/Noc = -infinity During T3: Noc = -95 dBm/30 kHz Es_1/Noc = 0 dB Es_2/Noc = 0 dB Es_3/Noc = 3 dB	 0dB 0.35dB N/A N/A 0dB 0dB 0.35dB N/A 0dB 0dB 0dB 0.35dB	During T1: Noc = -95 dBm/30 kHz Es_1/Noc = 0.35 dB Es_2/Noc = -infinity Es_3/Noc = -infinity During T2: Noc = -95 dBm/30 kHz Es_1/Noc = 0 dB Es_2/Noc = 0.35 dB Es_3/Noc = -infinity During T3: Noc = -95 dBm/30 kHz Es_1/Noc = 0 dB Es_2/Noc = 0 dB Es_3/Noc = 3.35 dB
9.1.3.2 NR SA FR1 synchronization	During T1: Noc = -95 dBm/30 kHz	 0dB	During T1: Noc = -95 dBm/30 kHz

reference selection/reselection for FR1 NR Cell configured as the highest priority synchronization reference source	Es_1/Noc = -infinity Es_2/Noc = -infinity During T2: Noc = -95 dBm/30 kHz Es_1/Noc = 0 dB Es_2/Noc = -infinity During T3: Noc = -95 dBm/30 kHz Es_1/Noc = 0 dB Es_2/Noc = 0 dB	N/A N/A 0dB 0.35dB N/A 0dB 0dB 0.35dB	Es_1/Noc = -infinity Es_2/Noc = -infinity During T2: Noc = -95 dBm/30 kHz Es_1/Noc = 0.35 dB Es_2/Noc = -infinity During T3: Noc = -95 dBm/30 kHz Es_1/Noc = 0 dB Es_2/Noc = 0.35 dB
9.1.4.1 NR SA FR1 L1 SL-RSRP measurement for autonomous resource selection/reselection	During T1: Noc = -110 dBm/30 kHz Es_i/Noc = 10 dB, i = 20~29 Es_i/Noc = 0 dB, i = 0~19, 30~49 During T2: Noc = -121 dBm/30 kHz Es_i/Noc = 10 dB, i = 20~29 Es_i/Noc = 20 dB, i = 0~19, 30~49 In signaling: SL-Thres-RSRP = -106 dBm/SCS	 0dB 10.55dB 0.35dB 0dB 0dB 10.55dB 6dB	During T1: Noc = -110 dBm/30 kHz Es_i/Noc = 20.55 dB, i = 20~29 Es_i/Noc = 0.35 dB, i = 0~19, 30~49 During T2: Noc = -121 dBm/30 kHz Es_i/Noc = 10 dB, i = 20~29 Es_i/Noc = 30.55 dB, i = 0~19, 30~49 In signaling: SL-Thres-RSRP = -100 dBm/SCS
9.1.4.2 NR SA FR1 L1 SL-RSRP measurement for resource pre-emption	During T1: Noc = -infinity Es_1/Noc = -infinity During T2: Noc = -100 dBm/30 kHz Es_1/Noc = 5 dB In signaling: SL-Thres-RSRP = -106 dBm/SCS	 N/A N/A 0dB 0dB 0dB	During T1: Noc = -infinity Es_1/Noc = -infinity During T2: Noc = -100 dBm/30 kHz Es_1/Noc = 5 dB In signaling: SL-Thres-RSRP = -106 dBm/SCS
9.1.4.3 NR SA FR1 L1 SL-RSRP measurement for resource re-evaluation	During T1: Noc = -103 dBm/30 kHz Es_i/Noc = 12dB, i = 0~29 Es_i/Noc = 2 dB, i = 30~49 Es_i/Noc = 25.50 dB, i = 50~64, 85~99 Es_i/Noc = 12 dB, i = 65~84 Es_i/Noc = -infinity, i = 100~129 During T2: Noc = -103 dBm/30 kHz Es_i/Noc = -infinity, i = 0~29 Es_i/Noc = 2 dB, i = 30~49 Es_i/Noc = 25.5 dB, i = 50~64, 85~99 Es_i/Noc = 12 dB, i = 65~84 Es_i/Noc = 25.5dB, i = 100~129 In signaling: SL-Thres-RSRP = -96 dBm/SCS	 -7.05dB 2.1dB 0dB 7.1dB 2.1dB N/A -7.05dB N/A 0dB 7.1dB 2.1dB 7.55dB -6dB	During T1: Noc = -110.05 dBm/30 kHz Es_i/Noc = 14.1 dB, i = 0~29 Es_i/Noc = 2 dB, i = 30~49 Es_i/Noc = 32.60 dB, i = 50~64, 85~99 Es_i/Noc = 14.1 dB, i = 65~84 Es_i/Noc = -infinity, i = 100~129 During T2: Noc = -110.05 dBm/30 kHz Es_i/Noc = -infinity, i = 0~29 Es_i/Noc = 2 dB, i = 30~49 Es_i/Noc = 32.60 dB, i = 50~64, 85~99 Es_i/Noc = 14.1 dB, i = 65~84 Es_i/Noc = 33.05dB, i = 100~129 In signaling: SL-Thres-RSRP = -102 dBm/SCS
9.1.5.1 NR SA FR1 congestion control measurement for concurrent operation	During T1: Noc = -103 dBm/30kHz Es_i/Noc = 4.35 dB, i = 0,1,2,3	 -1.55dB 0dB	During T1: Noc = -104.55 dBm/30kHz Es_i/Noc = 4.35 dB, i = 0,1,2,3

	During T2: Noc = -103 dBm/30kHz Es_i/Noc = 10.32 dB, i = 0,1,2,3 In signaling: threshS-RSSI-CBR = -74 dBm/subchannel	-1.55dB 3.30dB 0dB	During T2: Noc = -104.55 dBm/30kHz Es_i/Noc = 13.62 dB, i = 0,1,2,3 In signaling: threshS-RSSI-CBR = -74 dBm/subchannel
9.1.5.2 NR SA FR1 congestion control measurement for PC5-only operation	Same as 9.1.5.1	Same as 9.1.5.1	Same as 9.1.5.1
9.1.6.1 NR SA FR1 interruption to WAN due to NR sidelink communication	N/A	N/A	N/A

Table F.1.3.2-7: Derivation of test requirements for NR SA FR1 RRM tests for RedCap

Test	Minimum requirement in TS 38.133 [6]	Test tolerance (TT)	Test requirement in TS 38.533
16.1.1.1 NR SA FR1 Cell reselection for 1 Rx UE	TBD	TBD	TBD
16.1.1.2 NR SA FR1 Cell reselection for 2 Rx UE	Same as 6.1.1.1	Same as 6.1.1.1	Same as 6.1.1.1
16.1.1.3 NR SA FR1-FR1 Cell reselection for 1 Rx UE	TBD	TBD	TBD
16.1.1.4 NR SA FR1-FR1 Cell reselection for 2 Rx UE	Same as 6.1.1.2	Same as 6.1.1.2	Same as 6.1.1.2
16.1.1.5 NR SA FR1 Cell reselection for UE fulfilling stationary relaxed measurement criterion for 1 Rx UE	TBD	TBD	TBD
16.1.1.6 NR SA FR1 Cell reselection for UE fulfilling stationary relaxed measurement criterion for 2 Rx UE	Same as 6.1.1.4	Same as 6.1.1.4	Same as 6.1.1.4
16.1.1.7 NR SA FR1-FR1 Cell reselection for UE fulfilling stationary relaxed measurement criterion for 1 Rx UE	TBD	TBD	TBD
16.1.1.8 NR SA FR1-FR1 Cell reselection for UE fulfilling stationary relaxed measurement criterion for 2 Rx UE	Same as 6.1.1.5	Same as 6.1.1.5	Same as 6.1.1.5
16.3.1.2 NR SA FR1 Intra-frequency handover from FR1 to FR1 with known target cell for 2 Rx UE	Same as 6.3.1.1	Same as 6.3.1.1	Same as 6.3.1.1
16.3.1.4 NR SA FR1 Intra-frequency handover from FR1 to FR1 with unknown target cell for 2 Rx UE	Same as 6.3.1.2	Same as 6.3.1.2	Same as 6.3.1.2
16.3.1.6 NR SA FR1-FR1 Inter-frequency handover from FR1 to FR1 with unknown target cell for 2 Rx UE	Same as 6.3.1.3	Same as 6.3.1.3	Same as 6.3.1.3
16.3.1.8 NR - E-UTRA handover for 2Rx UE	Same as 6.3.1.4	Same as 6.3.1.4	Same as 6.3.1.4
16.3.1.10 NR - E-UTRA handover with unknown target cell for 2 Rx UE	Same as 6.3.1.5	Same as 6.3.1.5	Same as 6.3.1.5
16.3.2.1.2 NR SA FR1	Same as 6.3.2.1.1	Same as	Same as 6.3.2.1.1

Intra-frequency RRC Re-establishment in FR1 for 2 Rx UE		6.3.2.1.1	
16.3.2.1.4 NR SA FR1-FR1 Inter-frequency RRC Re-establishment in FR1 for 2 Rx UE	Same as 6.3.2.1.2	Same as 6.3.2.1.2	Same as 6.3.2.1.2
16.3.2.1.6 NR SA FR1 Intra-frequency RRC Re-establishment in FR1 for 2 Rx UE without serving cell timing	Same as 6.3.2.1.3	Same as 6.3.2.1.3	Same as 6.3.2.1.3
16.3.2.2.2 NR SA FR1 4-step RA type contention based random access test in FR1 for NR standalone for 2 Rx UE	Same as 6.3.2.2.1	Same as 6.3.2.2.1	Same as 6.3.2.2.1
16.3.2.2.4 NR SA FR1 4-step RA type non-contention based random access test in FR1 for NR standalone for 2 Rx UE	Same as 6.3.2.2.1	Same as 6.3.2.2.1	Same as 6.3.2.2.1
16.3.2.2.6 NR SA FR1 2-step RA type contention based random access test in FR1 for NR standalone for 2 Rx UE	Same as 6.3.2.2.1	Same as 6.3.2.2.1	Same as 6.3.2.2.1
16.3.2.2.8 NR SA FR1 2-step RA type non-contention based test in FR1 for NR standalone for 2 RX UE	Same as 6.3.2.2.1	Same as 6.3.2.2.1	Same as 6.3.2.2.1
16.3.2.3.2 NR SA FR1-FR1 Redirection from NR in FR1 to NR in FR1 for 2 Rx UE	Same as 6.3.2.3.1	Same as 6.3.2.3.1	Same as 6.3.2.3.1
16.3.2.3.4 NR SA FR1-FR1 Redirection from NR in FR1 to E-UTRAN for 2 Rx UE	Same as 6.3.2.3.2	Same as 6.3.2.3.2	Same as 6.3.2.3.2
16.4.1.1 NR SA FR1 NR UE Transmit Timing Test for FR1 for 1Rx RedCap UE	Same as 6.4.1.1	Same as 6.4.1.1	Same as 6.4.1.1
16.4.1.2 NR SA FR1 NR UE Transmit Timing Test for FR1 for 2Rx RedCap UE	Same as 6.4.1.1	Same as 6.4.1.1	Same as 6.4.1.1
16.4.3.1 NR SA FR1 SA FR1 timing advance adjustment accuracy for 1 Rx UE	Same as 6.4.3.1	Same as 6.4.3.1	Same as 6.4.3.1
16.4.3.2 NR SA FR1 SA FR1 timing advance adjustment accuracy for 2 Rx UE	Same as 6.4.3.1	Same as 6.4.3.1	Same as 6.4.3.1
16.5.1.2 NR SA FR1 Radio Link Monitoring Out-of-sync Test for FR1 PCell configured with SSB-based RLM RS in non-DRX mode for 2 Rx UE	Same as 6.5.1.1 with the exception : - 4Rx is not considered	Same as 6.5.1.1 with the exception : - 4Rx is not considered	Same as 6.5.1.1 with the exception : - 4Rx is not considered
16.5.1.4 NR SA FR1 Radio Link Monitoring In-sync Test for FR1 PCell configured with SSB-based RLM RS in non-DRX mode for 2 Rx UE	Same as 6.5.1.2 with the exception : - 4Rx is not considered	Same as 6.5.1.2 with the exception : - 4Rx is not considered	Same as 6.5.1.2 with the exception : - 4Rx is not considered
16.5.1.8 NR SA FR1 Radio Link Monitoring In-sync Test for FR1 PCell configured with SSB-based RLM RS in DRX mode for 2 Rx UE	Same as 6.5.1.2 with the exception : - 4Rx is not considered	Same as 6.5.1.2 with the exception : - 4Rx is not considered	Same as 6.5.1.2 with the exception : - 4Rx is not considered
16.5.1.10 NR SA FR1 Radio Link Monitoring Out-of-sync	Same as 6.5.1.1 with the exception: - 4Rx is not considered	Same as 6.5.1.1 with the	Same as 6.5.1.1 with the exception:

Test for FR1 PCell configured with CSI-RS-based RLM in non-DRX mode for 2 Rx UE		exception: - 4Rx is not considered	- 4Rx is not considered
16.5.1.12 NR SA FR1 Radio Link Monitoring In-sync Test for FR1 PCell configured with CSI-RS-based RLM in non-DRX mode for 2 Rx UE	Same as 6.5.1.2 with the exception: - 4Rx is not considered	Same as 6.5.1.2 with the exception: - 4Rx is not considered	Same as 6.5.1.2 with the exception: - 4Rx is not considered
16.5.1.14 NR SA FR1 Radio Link Monitoring Out-of-sync Test for FR1 PCell configured with CSI-RS-based RLM in DRX mode for 2 Rx UE	Same as 6.5.1.1 with the exception: - 4Rx is not considered	Same as 6.5.1.1 with the exception: - 4Rx is not considered	Same as 6.5.1.1 with the exception: - 4Rx is not considered
16.5.1.16 NR SA FR1 Radio Link Monitoring In-sync Test for FR1 PCell configured with CSI-RS-based RLM in DRX mode for 2 Rx UE	Same as 6.5.1.2 with the exception: - 4Rx is not considered	Same as 6.5.1.2 with the exception: - 4Rx is not considered	Same as 6.5.1.2 with the exception: - 4Rx is not considered
16.5.2.2 NR SA FR1 Beam Failure Detection and Link Recovery Test for FR1 PCell configured with SSB-based BFD and LR in non-DRX mode for 2 Rx UE	Same as 6.5.5.1 with the exception : - 4Rx is not considered	Same as 6.5.5.1 with the exception : - 4Rx is not considered	Same as 6.5.5.1 with the exception : - 4Rx is not considered
16.5.2.6 NR SA FR1 Beam Failure Detection and Link Recovery Test for FR1 PCell configured with CSI-RS-based BFD and LR in non-DRX mode for 2 Rx UE	Same as 6.5.5.3 with the exception : - 4Rx is not considered	Same as 6.5.5.3 with the exception : - 4Rx is not considered	Same as 6.5.5.3 with the exception : - 4Rx is not considered
16.5.2.8 NR SA FR1 Beam Failure Detection and Link Recovery Test for FR1 PCell configured with CSI-RS-based BFD and LR in DRX mode for 2 Rx UE	Same as 6.5.5.3 with the exception : - 4Rx is not considered	Same as 6.5.5.3 with the exception : - 4Rx is not considered	Same as 6.5.5.3 with the exception : - 4Rx is not considered
16.5.4.1 NR SA FR1 UE specific CBW change on PCell in non-DRX for 1 Rx UE	Same as 6.5.8.1	Same as 6.5.8.1	Same as 6.5.8.1
16.5.4.2 NR SA FR1 UE specific CBW change on PCell in non-DRX for 2 Rx UE	Same as 6.5.8.1	Same as 6.5.8.1	Same as 6.5.8.1
16.6.1.2 NR SA FR1 Event triggered reporting tests without gap under non-DRX for 2 Rx UE	Same as 6.6.1.1	Same as 6.6.1.1	Same as 6.6.1.1
16.6.1.4 NR SA FR1 Event triggered reporting tests without gap under DRX for 2 Rx UE	Same as 6.6.1.1	Same as 6.6.1.1	Same as 6.6.1.1
16.6.1.6 NR SA FR1 Event triggered reporting tests with per-UE gaps under non-DRX for 2 Rx UE	Same as 6.6.1.1	Same as 6.6.1.1	Same as 6.6.1.1
16.6.1.8 NR SA FR1 Event triggered reporting tests with per-UE gaps under DRX for 2 Rx UE	Same as 6.6.1.1	Same as 6.6.1.1	Same as 6.6.1.1
16.6.1.10 NR SA FR1 Event triggered reporting tests without gap under non-DRX with SSB index reading for 2 Rx UE	Same as 6.6.1.1	Same as 6.6.1.1	Same as 6.6.1.1
16.6.1.12 NR SA FR1	Same as 6.6.1.1	Same as 6.6.1.1	Same as 6.6.1.1

Event triggered reporting tests with per-UE gaps under non-DRX with SSB index reading for 2 Rx UE			
16.6.4.2 NR SA FR1 SSB based L1-RSRP measurement when DRX is not used for 2 Rx UE	Same as 6.6.4.1	Same as 6.6.4.1	Same as 6.6.4.1 with following excpetions: - Test requirements for configuration 1,2 also apply to configuration 4
16.6.4.4 NR SA FR1 SSB based L1-RSRP measurement when DRX is used for 2 Rx UE	Same as 6.6.4.1	Same as 6.6.4.1	Same as 6.6.4.1 with following excpetions: - Test requirements for configuration 1,2 also apply to configuration 4
16.6.4.6 NR SA FR1 CSI-RS based L1-RSRP measurement when DRX is not used for 2 Rx UE	Same as 6.6.4.3	Same as 6.6.4.3	Same as 6.6.4.3 with following exceptions: - Test requirements for configuration 1,2 also apply to configuration 4
16.6.4.8 NR SA FR1 CSI-RS based L1-RSRP measurement when DRX is used for 2 Rx UE	Same as 6.6.4.3	Same as 6.6.4.3	Same as 6.6.4.3 with following exceptions: - Test requirements for configuration 1,2 also apply to configuration 4

Table F.1.3.2-8: Derivation of test requirements for NR SA FR2 RRM tests for RedCap

Test	Minimum requirement in TS 38.133 [6]	Test tolerance (TT)	Test requirement in TS 38.533
17.3.2.1.1 NR SA FR2 Intra-frequency RRC Re-establishment in FR2	Same as 7.3.2.1.1	Same as 7.3.2.1.1	Same as 7.3.2.1.1
17.3.2.1.2 NR SA FR2-FR2 Inter-frequency RRC Re-establishment in FR2	Same as 7.3.2.1.2	Same as 7.3.2.1.2	Same as 7.3.2.1.2
17.5.1.1 NR SA FR2 Radio Link Monitoring Out-of-sync Test for FR2 PCell configured with SSB-based RLM RS in non-DRX mode	Same as 7.5.1.1	Same as 7.5.1.1	Same as 7.5.1.1
17.5.1.2 NR SA FR2 Radio Link Monitoring In-sync Test for FR2 PCell configured with SSB-based RLM RS in non-DRX mode	Same as 7.5.1.2	Same as 7.5.1.2	Same as 7.5.1.2
17.5.1.4 NR SA FR2 Radio Link Monitoring In-sync Test for FR2 PCell configured with SSB-based RLM RS in DRX mode	Same as 7.5.1.4	Same as 7.5.1.4	Same as 7.5.1.4
17.6.1.1 NR SA FR2 Event triggered reporting test without gap under non-DRX	Same as 7.6.1.1	Same as 7.6.1.1	Same as 7.6.1.1

Table F.1.3.2-9: Derivation of test requirements for E-UTRA – NR inter-RAT test cases with E-UTRA serving cell RRM tests for RedCap

Test	Minimum requirement in TS 38.133 [6]	Test tolerance (TT)	Test requirement in TS 38.533
18.2.1.1 E-UTRA - NR	Same as 8.3.1.1	Same as 8.3.1.1	Same as 8.3.1.1

SA FR1 E-UTRAN - NR handover in FR1			
18.2.2.1 E-UTRA - NR SA FR1 Redirection from E-UTRA to NR SA FR1 for redcap UE	For 1Rx RedCap: Same as 6.3.2.3.1 For 2Rx RedCap: Same as 6.3.2.3.1	For 1Rx RedCap: FFS For 2Rx RedCap: Same as 6.3.2.3.1	For 1Rx RedCap: FFS For 2Rx RedCap: Same as 6.3.2.3.1
18.3.1.1 E-UTRA - NR SA FR1 Event triggered reporting tests for FR1 without SSB time index detection when DRX is not used	Same as 8.4.2.1	Same as 8.4.2.1	Same as 8.4.2.1
18.3.1.2 E-UTRA - NR SA FR1 Event triggered reporting tests for FR1 without SSB time index detection when DRX is used	Same as 8.4.2.1	Same as 8.4.2.1	Same as 8.4.2.1
18.3.1.3 E-UTRA - NR SA FR1 Event triggered reporting tests for FR1 with SSB time index detection when DRX is not used	Same as 8.4.2.1	Same as 8.4.2.1	Same as 8.4.2.1
18.3.1.4 E-UTRA - NR SA FR1 Event triggered reporting tests for FR1 with SSB time index detection when DRX is used	Same as 8.4.2.1	Same as 8.4.2.1	Same as 8.4.2.1

Annex G (normative): Statistical testing

G.1 General

The test requirements are expressed as absolute requirements with a single value stating the requirement or expressed as a success rate. The statistical nature depends on the type of test requirement. Some have large statistical variations, while others are not statistical in nature at all. When testing a parameter with a statistical nature, a confidence level is set. This establishes the probability that a Device Under Test (DUT) passing the test actually meets the test requirement and determines how many times a test have to be repeated and what the pass and fail criteria is. This Annex describes how to set the statistical significance.

G.2 Statistical testing of delay and UE measurement performance in RRM tests

G.2.1 General

The RRM tests are either of deterministic or of statistical nature. The pass fail limits in tests of statistical nature are expressed as a limit (e.g. delay limit) and a success ratio applicable for the limit. The success ratio is 90% uniform (the complement is the error ratio ER = 10%).

G.2.2 Design of the test

The test is defined by the following design principles (see TS 36.521-1 clause G.X, Theory):

1) The early decision concept is applied.

2) A second limit is introduced: bad DUT factor M>1

To decide the test pass:

Supplier risk is applied based on the bad DUT quality

To decide the test fails

Customer risk is applied based on the specified DUT quality

The test is defined by the following parameters:

1) Limit ER = 0.1 (success ratio = 90%)

2) Bad DUT factor M=1.5 (selectivity)

3) Confidence level CL = 95% (for specified DUT and bad DUT-quality)

G.2.3 Numerical definition of the pass fail limits

Editor's Note:

- Further investigate the technical details behind this statistical method to ensure that this is applicable for FR2 radiated test cases.

Table G.2.3-1: pass fail limits

ne	ns_p	ns_f	ne	ns_p	ns_f	ne	ns_p	ns_f	ne	ns_p	ns_f
0	33	NA	43	408	283	86	737	644	129	1056	1021
1	46	NA	44	416	291	87	745	653	130	1064	1030
2	58	NA	45	424	299	88	752	661	131	1071	1039
3	69	NA	46	432	307	89	760	670	132	1078	1048

4	79	NA	47	440	315	90	767	679	133	1086	1057
5	89	NA	48	447	324	91	775	687	134	1093	1066
6	99	NA	49	455	332	92	782	696	135	1100	1074
7	109	NA	50	463	340	93	790	705	136	1108	1083
8	118	NA	51	471	348	94	797	713	137	1115	1092
9	127	NA	52	478	356	95	804	722	138	1122	1101
10	136	39	53	486	365	96	812	731	139	1130	1110
11	145	45	54	494	373	97	819	739	140	1137	1119
12	154	51	55	502	381	98	827	748	141	1144	1128
13	163	58	56	509	389	99	834	757	142	1152	1137
14	172	64	57	517	398	100	842	766	143	1159	1147
15	180	71	58	525	406	101	849	774	144	1166	1155
16	189	78	59	532	414	102	857	783	145	1174	1164
17	197	85	60	540	423	103	864	792	146	1181	1173
18	206	92	61	548	431	104	871	801	147	NA	1182
19	214	99	62	555	440	105	879	809	148		
20	223	106	63	563	448	106	886	818	149		
21	231	113	64	571	456	107	894	827	150		
22	239	120	65	578	465	108	901	836	151		
23	248	128	66	586	473	109	909	844	152		
24	256	135	67	594	482	110	916	853	153		
25	264	142	68	601	490	111	923	862	154		
26	272	150	69	609	499	112	931	871	155		
27	281	157	70	616	507	113	938	880	156		
28	289	165	71	624	516	114	946	888	157		
29	297	173	72	632	524	115	953	897	158		
30	305	180	73	639	533	116	960	906	159		
31	313	188	74	647	541	117	968	915	160		
32	321	196	75	654	550	118	975	924	161		
33	329	204	76	662	558	119	983	933	162		
34	337	211	77	669	567	120	990	941	163		
35	345	219	78	677	575	121	997	950	164		
36	353	227	79	684	584	122	1005	959	165		
37	361	235	80	692	592	123	1012	968	166		
38	369	243	81	700	601	124	1019	977	167		
39	377	251	82	707	610	125	1027	986	168		
40	385	259	83	715	618	126	1034	994	169		
41	393	267	84	722	627	127	1042	1003			
42	400	275	85	730	635	128	1049	1012			

The first column is the number of errors (ne = number of exceeded delays or number of wrong reports)

The second column is the number of samples for the pass limit (ns_p , ns=Number of samples= number of successes + number of exceedings or number of reports)

The third column is the number of samples for the fail limit (ns_f)

G.2.4 Pass fail decision rules

The pass fail decision rules apply for a single test, comprising one component in the test vector. The over all Pass /Fail conditions are defined in clause G.2.6

Having observed 0 errors, pass the test at 33+ samples, otherwise continue

Having observed 1 error, pass the test at 46+ samples, otherwise continue

Having observed 2 errors, pass the test at 58+ samples, otherwise continue

Having observed 10 errors, pass the test at 136+ samples, fail the test at 39 samples, otherwise continue

Having observed 146 errors, pass the test at 1181+ samples, fail the test at 1173- samples, otherwise continue

Having observed 147 errors, fail the test at 1182- samples,

Where x+ means: x or more, x- means x or less

NOTE 1: an ideal DUT passes after 33 samples. The maximum test time is 1181 samples.

G.2.5 Void

G.2.6 Test conditions for delay tests and UE measurement performance

Table G.2.6-1: test conditions

Test	Statistical independence	Number of components in the test vector, as specified in the test requirements and initial conditions of the applicable test	Over all Pass/Fail condition
All tests in clauses 4.4.3, 4.5, 4.6, 5.4.3, 5.5, 5.6, 6.1, 6.2, 6.3.1, 6.3.2.1, 6.3.2.3, 6.4.3, 6.5, 6.6, 7.1, 7.2, 7.3.1, 7.3.2.1, 7.3.2.3, 7.4.3, 7.5, 7.6, 16.1, 16.2, 16.3.1, 16.3.2.1, 16.3.2.3, 16.5, 16.6, 17.1, 17.2, 17.3.1, 17.3.2.1, 17.3.2.3, 17.4.3, 17.5, 17.6, 18.1, 18.2, 18.3 are delay tests of statistical nature while 4.3.2.2, 4.4.1, 5.3.2.2, 5.4.1, 6.3.2.2, 6.4.1, 7.3.2.2, 7.4.1,16.3.2.2, 16.4.1, 17.3.2.2, 17.4.1 are not applicable, since they are deterministic.	Test procedure in all statistical tests ensures independency	1 per operating band (if tested, see 3A.3)	Full set of environmental conditions (5) per operating band
All tests in clauses 4.7, 5.7, 6.7 and 7.7, 16.7, 17.7 are UE level reports of statistical nature	Independency is assumed, although Layer 1 filtering is applied to the reported results	Full set of environmental conditions (5) per operating band	Full set of environmental conditions (5) per operating band

G.3 Statistical testing of NR sidelink CBR measurement tests

G.3.1 General

The CBR measurement tests are of statistical nature. The pass fail limits in tests of statistical nature are expressed as a limit (e.g. delay limit) and a success ratio applicable for the limit. The success ratio is 98% (the complement is the error ratio ER = 2%).

G.3.2 Design of the test

The test is defined by the following design principles (see TS 36.521-1 clause G.7, Theory):

1) The early decision concept is applied.

2) A second limit is introduced: bad DUT factor M>1

To decide the test pass:

- Supplier risk is applied based on the bad DUT quality

To decide the test fails

- Customer risk is applied based on the specified DUT quality

The test is defined by the following parameters:

1) Limit ER = 0.02 (success ratio = 98%)

2) Bad DUT factor M=1.5 (selectivity)

3) Confidence level CL = 95% (for specified DUT and bad DUT-quality)

G.3.3 Numerical definition of the pass fail limits

Table G.3.3-1: pass fail limits for ER = 0.02

ne	ns_p	ns_f	ne	ns_p	ns_f	ne	ns_p	ns_f	ne	ns_p	ns_f
0	206	N/A	43	1970	1389	86	6370	3300	129	6413	5409
1	287	N/A	44	2005	1431	87	6371	3348	130	6414	5459
2	345	N/A	45	2041	1468	88	6372	3396	131	6415	5511
3	398	10	46	2078	1511	89	6373	3443	132	6416	5560
4	447	23	47	2113	1555	90	6374	3492	133	6417	5613
5	494	39	48	2149	1600	91	6375	3537	134	6418	5660
6	540	57	49	6333	1637	92	6376	3585	135	6419	5712
7	585	78	50	6334	1683	93	6377	3631	136	6420	5765
8	629	102	51	6335	1728	94	6378	3683	137	6421	5811
9	671	130	52	6336	1768	95	6379	3728	138	6422	5866
10	714	155	53	6337	1813	96	6380	3778	139	6423	5915
11	756	182	54	6338	1857	97	6381	3828	140	6424	5970
12	797	212	55	6339	1900	98	6382	3874	141	6425	6020
13	838	243	56	6340	1938	99	6383	3922	142	6426	6069
14	879	276	57	6341	1982	100	6384	3971	143	6427	6124
15	918	306	58	6342	2028	101	6385	4018	144	N/A	6427
16	959	342	59	6343	2072	102	6386	4070	145		
17	998	375	60	6344	2116	103	6387	4118	146		
18	1037	408	61	6345	2161	104	6388	4169	147		
19	1077	442	62	6346	2203	105	6389	4216	148		
20	1115	480	63	6347	2246	106	6390	4264	149		
21	1154	517	64	6348	2292	107	6391	4314	150		
22	1192	553	65	6349	2338	108	6392	4358	151		
23	1230	591	66	6350	2382	109	6393	4413	152		
24	1269	629	67	6351	2427	110	6394	4462	153		
25	1306	666	68	6352	2473	111	6395	4506	154		
26	1344	706	69	6353	2516	112	6396	4561	155		
27	1382	741	70	6354	2559	113	6397	4611	156		
28	1420	777	71	6355	2608	114	6398	4661	157		
29	1457	815	72	6356	2652	115	6399	4712	158		
30	1494	855	73	6357	2694	116	6400	4760	159		
31	1531	898	74	6358	2741	117	6401	4807	160		
32	1568	936	75	6359	2789	118	6402	4854	161		
33	1605	976	76	6360	2836	119	6403	4909	162		
34	1642	1015	77	6361	2883	120	6404	4960	163		
35	1679	1059	78	6362	2928	121	6405	5010	164		
36	1715	1098	79	6363	2971	122	6406	5062	165		
37	1752	1138	80	6364	3018	123	6407	5110	166		
38	1788	1180	81	6365	3068	124	6408	5158	167		
39	1825	1220	82	6366	3115	125	6409	5204	168		
40	1861	1263	83	6367	3162	126	6410	5256	169		
41	1897	1302	84	6368	3203	127	6411	5305			
42	1933	1344	85	6369	3251	128	6412	5358			

The first column is the number of errors (ne = number of exceeded delays or number of wrong reports)

The second column is the number of samples for the pass limit (ns_p , ns=Number of samples= number of successes + number of wrong reports)

The third column is the number of samples for the fail limit (ns_f)

G.3.4 Pass fail decision rules

The pass/fail decision rules apply for a single test, comprising one component in the test vector. The over all pass/fail conditions are defined in clause G.2.6:

Having observed 0 error, pass the test at 206+ samples, otherwise continue,

Having observed 1 error, pass the test at 287+ samples, otherwise continue,

Having observed 2 errors, pass the test at 345+ samples, otherwise continue,

Having observed 3 errors, pass the test at 398+ samples, fail the test at 10- samples, otherwise continue,

…

Having observed 143 errors, pass the test at 6427+ samples, fail the test at 6124- samples, otherwise continue,

Having observed 144 errors, fail the test at 6427- samples,

Where x+ means: x or more, x- means x or less.

NOTE 1: an ideal DUT passes after 206 samples. The maximum test time is 6427 samples.

G.4 Theory to derive the numbers in Table G.2.3-1 (informative)

TS 36.521-1 Anne4 G.X applies.

G.5 Theory to derive the numbers in Table G.3.3-1 (informative)

TS 36.521-1 Annex G.7 applies except that:

- 36.521-1 Annex G.7.9 is replaced by G.5.1 and G.5.2.

G.5.1 Algorithm to calculate pass and fail probabilities

Following basic assumptions for statistical testing are introduced in this clause:

- Result of single iteration of test procedure loop obeys Bernoulli distribution with error ratio p, i.e. the probability that the TE observes expected UE behaviour in single iteration (counted as a success) is $1 - p$ and the probability that the TE doesn't observe expected UE behaviour in single iteration (counted as a fail) is p.
- Results of different iterations are independent and identically distributed (i.i.d).
- Early decision concept is applied, i.e., the TE repeats multiple iterations of the test procedure loop. For each iteration the TE records its result (count as a success if the TE observes the expected behavior, count as a fail otherwise) and its index in all iterations. When the i-th fail is observed in e_i-th iteration, the TE compares e_i with corresponding pass limit $N_{p,i}$ and fail limit $N_{f,i}$. The TE shall:
  - terminate the test and decide the DUT passes the test if $e_i > N_{p,i}$
  - terminate the test and decide the DUT fails the test if $e_i \leq N_{f,i}$,
  - continue the test and make no decision if $N_{f,i} < e_i \leq N_{p,i}$.

For a more intuitive understanding, we use the state transition diagram shown in Figure G.5.1-1 to describe the entire process of statistical testing. In Figure 1, X-axis and Y-axis denote the success count and fail count in iterations already executed respectively. And the point with coordinate (i, j) (referred as *state* (i, j) thereafter) is used to indicates that the DUT has executed $i + j$ iterations which includes i successes and j fails, where $i, j \geq 0$.

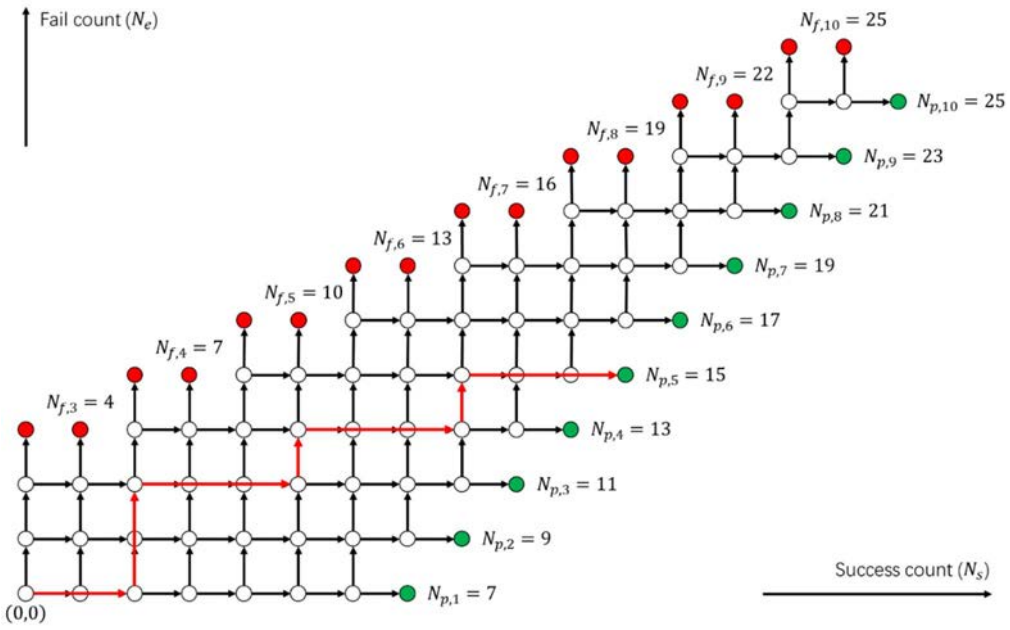

Figure G.5.1-1: Visualization of early decision statistical testing process. In this example, the TE verdicts that the DUT passes the test after executing 15 iterations of test procedure loop. The results of these 15 iterations are "s", "f", "f", "s", "s", "s", "f", "s", "s", "s", "f", "s", "s" and "s" in order ("s" = "success" and "f" = "fail")

From Figure G.5.1-1 it's straightforward to get following observations:

- The DUT is always in state $(0,0)$ at the beginning of statistical test since no iteration is executed at that moment.
- Assume the DUT is in state (i,j) after executing $i+j$ iterations. Then,
  - if the $i+j+1$-th iteration counts a success (with probability $1-p$), the success count shall increase 1 and fail count shall remain unchanged after the $i+j+1$-th iteration. As a result, the DUT will be in state $(i+1,j)$ after the $i+j+1$-th iteration. We call that the DUT moves from state (i,j) to state $(i+1,j)$, depicted as moving right by one in the diagram.
  - if the $i+j+1$-th iteration counts a fail (with probability p), the success count remains unchanged and the fail count increases 1 after the $i+j+1$-th iteration. Then the DUT will be in state $(i,j+1)$ after the $i+j+1$-th iteration. We call that the DUT moves from state (i,j) to state $(i,j+1)$, depicted as moving up by one in the diagram.
- The TE shall evaluate whether pass criteria or fail criteria is satisfied every time the DUT has executed a new iteration, i.e. the DUT moves to a new state. Specifically speaking,
  - If pass criterion is satisfied when DUT is in state (i,j), the TE makes the decision that the DUT passes the test. Correspondingly, state (i,j) is referred as a passing state (depicted as green points in Figure G.5.1-1);
  - If fail criterion is satisfied when DUT is in state (i,j), the TE makes the decision that the DUT fails the test. Correspondingly, state (i,j) is referred as a failure state (depicted as red points in Figure G.5.1-1).
  - If neither pass criterion nor fail criterion is satisfied when DUT is in state (i,j), the TE makes no decision and continues the test. Correspondingly, state (i,j) is referred as a non-decidable state (depicted as hollow points in Figure G.5.1-1).

In this way, the statistical testing is represented as a process in which the DUT starts from state $(0,0)$, moves along certain path in the diagram, and finally stops in certain passing state or failure state.

Obviously, there must be a close relationship between the pass/fail states and the pass/fail limits used for the test. The following two conclusions precisely describes the mapping between pass/fail limits and pass/fail states.

Conclusion 1: The DUT is decided to pass the test if and only if the DUT moves from state $(0,0)$ to a state belongs to passing state set $\mathcal{P} = \{(N_{p,i+1} - i, i): i = 0,1,2, \cdots\}$.

Proof: We prove sufficiency first, and then necessity.

- **Sufficiency**: If the DUT is in state $(N_{p,i+1} - i, i)$, it means that the DUT has executed $N_{p,i+1}$ iterations which includes i success and $N_{p,i+1} - i$ fails. Clearly, the TE can only get the i+1-th fail as early as the $N_{p,i+1} + 1$-th iteration, then we have $e_{i+1} > N_{p,i+1}$. This is just the pass criterion when the TE collecting the i+1-th fail.

- **Necessity**: If the TE verdicts the DUT to pass when it collects the i+1-th fail, following inequations must have been satisfied according to the pass criterion:

$$e_1 \le N_{p,1}, e_2 \le N_{p,2}, \cdots, e_i \le N_{p,i}, e_{i+1} > N_{p,i+1}.$$

  The DUT is in state $(e_i - i, i)$ when the i-th fail happens in the e_i-th iteration. Then the next $N_{p,i+1} - e_i$ iterations after the e_i-th iteration must be counted as success since $e_{i+1} > N_{p,i+1}$. Then the DUT will be in state $(N_{p,i+1} - i, i)$ after executing these $N_{p,i+1} - e_i$ iterations.

Conclusion 2: The DUT is decided to fail the test if and only if the DUT moves from state $(0,0)$ to a state belongs to failure set $\mathcal{F} = \{(j, i+1): N_{f,i} - i < j \le N_{f,i+1} - (i+1), i = 0,1,2, \cdots\}$, where $N_{f,0} \triangleq -1$ for sake of simplify.

Proof of conclusion 2 is quite similar as the proof of conclusion 1 and is omitted here. Conclusion 1 and 2 have shown the equivalence between pass/fail limits and pass/fail state sets. As a result, the probability that the DUT pass the test for given error ratio p, passing state set $\mathcal{P}$ and failure state set $\mathcal{F}$, denoted as $\mathbb{P}_p(\mathcal{P}, \mathcal{F})$, is given by

$$\mathbb{P}_p(\mathcal{P}, \mathcal{F}) = \text{Prob}\{\text{DUT moves from state}(0,0) \text{ to state } (i,j) \text{ which belongs to } \mathcal{P}\}.$$

Furthermore, it's easy to prove that any path from state$(0,0)$ to passing state (i,j) won't pass through any passing state or failure state except the ending state. This is because if the path contains a passing state or failure state (i', j') which is not the ending state, the test will be terminated immediately when the DUT is in state (i', j'). Then (i', j') shall be the ending state, i.e. $(i', j') = (i, j)$. This contradicts the assumption that state (i', j') is not the ending state. This also means that two events "DUT moves from state $(0,0)$ to passing state (i,j)" and "DUT moves from state $(0,0)$ to passing state (i', j')" are disjoint if $(i', j') \neq (i, j)$. Then we have,

$$\mathbb{P}_p(\mathcal{P}, \mathcal{F}) = \sum_{(i,j)\in\mathcal{P}} \text{Prob}\{\text{DUT moves from state}(0,0) \text{ to passing state } (i,j)\} = \sum_{(i,j)\in\mathcal{P}} T^p_{(i,j)}(\mathcal{P}, \mathcal{F}),$$

where $T^p_{(i,j)}(\mathcal{P}, \mathcal{F})$ is defined as the transition probability from state $(0,0)$ to state (i,j), i.e.

$$T^p_{(i,j)}(\mathcal{P}, \mathcal{F}) \triangleq \text{Prob}\{\text{DUT moves from state}(0,0) \text{ to state } (i,j)\}.$$

Similarly, the probability that the DUT fail the test for given error ratio p, passing state set $\mathcal{P}$ and failure state set $\mathcal{F}$, denoted as $\mathbb{F}_p(\mathcal{P}, \mathcal{F})$, is derived as

$$\mathbb{F}_p(\mathcal{P}, \mathcal{F}) = \sum_{(i,j)\in\mathcal{F}} T^p_{(i,j)}(\mathcal{P}, \mathcal{F})$$

From the discussion above we can observe that the calculation of the $\mathbb{P}_p(\mathcal{P}, \mathcal{F})$ and $\mathbb{F}_p(\mathcal{P}, \mathcal{F})$ is finally transformed into the calculation of the transition probability $T^p_{(i,j)}(\mathcal{P}, \mathcal{F})$. Assuming DUT is in state (i,j) after the $i+j$-th iteration, $i, j \ge 0$. Considering that the $i+j$-th iteration can only have two possible results: success or fail, we can derive that the DUT can only be in state $(i-1, j)$ or state $(i, j-1)$ after executing $i+j-1$ iterations. Then we have:

$$\begin{aligned} T^p_{(i,j)}(\mathcal{P}, \mathcal{F}) &= \text{Prob}\{\text{DUT moves from state}(0,0) \text{ to state } (i,j), \text{passing } (i-1,j)\} \\ &\quad + \text{Prob}\{\text{DUT moves from state}(0,0) \text{ to state } (i,j), \text{passing state } (i,j-1)\} \\ &= \text{Prob}\{\text{DUT moves from state}(0,0) \text{ to } (i-1,j)\}\text{Prob}\{\text{DUT moves from state } (i-1,j) \text{ to } (i,j)\} \\ &\quad + \text{Prob}\{\text{DUT moves from state}(0,0) \text{ to } (i,j-1)\}\text{Prob}\{\text{DUT moves from state } (i,j-1) \text{ to } (i,j)\} \end{aligned}$$

The first equation above holds because the event "DUT moves from state $(0,0)$ to state (i,j), passing state $(i,j-1)$" and event "DUT moves from state $(0,0)$ to state (i,j), passing state $(i-1,j)$" are disjoint. And the second equation above holds because results of different iterations are independent.

Furthermore, we have following obvious observations:

If $i = 0$, obviously the event "DUT moves from state $(0,0)$ to state $(i-1, j)$" won't happen since state $(i-1, j)$ doesn't exist in this case. Otherwise, the probability that this event occurs equals to $T^{p}_{(i-1,j)}(\mathcal{P}, \mathcal{F})$ according to the definition of transition probability. Then we have

$$\text{Prob}\{\text{DUT moves from state}(0,0) \text{ to } (i-1, j)\} = T^{p}_{(i-1,j)}(\mathcal{P}, \mathcal{F})\mathbb{I}_{i>0},$$

Similarly, we can also derive that

$$\text{Prob}\{\text{DUT moves from state}(0,0) \text{ to } (i, j-1)\} = T^{p}_{(i,j-1)}(\mathcal{P}, \mathcal{F})\mathbb{I}_{j>0},$$

Where, $\mathbb{I}_{i>0}$ and $\mathbb{I}_{j>0}$ are indicator functions,

$$\mathbb{I}_{i>0} = \begin{cases} 1, & \text{if } i > 0 \\ 0, & \text{otherwise} \end{cases}, \qquad \mathbb{I}_{j>0} = \begin{cases} 1, & \text{if } j > 0 \\ 0, & \text{otherwise} \end{cases}$$

If $(i-1, j) \in \mathcal{P} \cup \mathcal{F}$, the event "DUT moves from state $(i-1, j)$ to state (i, j)" won't happen since the test will be terminated when DUT reaches state $(i-1, j)$. Otherwise, this event is equivalent to the event "result of the $(i+j)$-th iteration is a success". Then we have

$$\text{Prob}\{\text{DUT moves from state } (i-1, j) \text{ to } (i, j)\} = (1-p)\mathbb{I}_{(i-1,j)\notin \mathcal{P}\cup\mathcal{F}}$$

Similarly, we can also derive that

$$\text{Prob}\{\text{DUT moves from state } (i, j-1) \text{ to } (i, j)\} = p\mathbb{I}_{(i,j-1)\notin \mathcal{P}\cup\mathcal{F}}.$$

where,

$$\mathbb{I}_{(i-1,j)\notin \mathcal{P}\cup\mathcal{F}} = \begin{cases} 1, & (i-1, j) \notin \mathcal{P} \cup \mathcal{F} \\ 0, & \text{otherwise} \end{cases}, \qquad \mathbb{I}_{(i,j-1)\notin \mathcal{P}\cup\mathcal{F}} = \begin{cases} 1, & \text{if } (i, j-1) \notin \mathcal{P} \cup \mathcal{F} \\ 0, & \text{otherwise} \end{cases}$$

Finally, we have shown that following conclusion holds.

Conclusion 3: Transition probability $T^{p}_{(i,j)}(\mathcal{P}, \mathcal{F})$ can be calculated by

$$T^{p}_{(i,j)}(\mathcal{P}, \mathcal{F}) = T^{p}_{(i-1,j)}(\mathcal{P}, \mathcal{F})(1-p)\mathbb{I}_{i>0}\mathbb{I}_{(i-1,j)\notin \mathcal{P}\cup\mathcal{F}} + T^{p}_{(i,j-1)}(\mathcal{P}, \mathcal{F})p\mathbb{I}_{j>0}\mathbb{I}_{(i,j-1)\notin \mathcal{P}\cup\mathcal{F}}.$$

The conclusion above shows that $T^{p}_{(i,j)}(\mathcal{P}, \mathcal{F})$ can be calculated in a dynamic programming manner: Clearly, we can calculate $T^{p}_{(i,j)}(\mathcal{P}, \mathcal{F})$ using the above equation if we know the value of $T^{p}_{(i-1,j)}(\mathcal{P}, \mathcal{F})$ and $T^{p}_{(i,j-1)}(\mathcal{P}, \mathcal{F})$; For the same reason, we can calculate $T^{p}_{(i-1,j)}(\mathcal{P}, \mathcal{F})$ and $T^{p}_{(i,j-1)}(\mathcal{P}, \mathcal{F})$ using the equation above if we know the value of $T^{p}_{(i-2,j)}(\mathcal{P}, \mathcal{F})$, $T^{p}_{(i-1,j-1)}(\mathcal{P}, \mathcal{F})$ and $T^{p}_{(i,j-2)}(\mathcal{P}, \mathcal{F})$; Repeating the recursion above, at last all we need to know is only $T^{p}_{(0,0)}(\mathcal{P}, \mathcal{F})$. And we know $T^{p}_{(0,0)}(\mathcal{P}, \mathcal{F}) = 1$ since UE always is in state $(0,0)$ when test starts.

Using the recursion above, we can finally obtain $T^{p}_{(i,j)}(\mathcal{P}, \mathcal{F})$ and further $\mathbb{P}_p(\mathcal{P}, \mathcal{F})$ and $\mathbb{F}_p(\mathcal{P}, \mathcal{F})$ for given p, $\mathcal{P}$ and $\mathcal{F}$.

Assume the limit-risk mapping given in 36.521-1 is still used. Then the customer risk R_c and supplier risk R_s for given passing state set $\mathcal{P}$ and failure state set $\mathcal{F}$ is the probability that baseline bad DUT (error ratio = Mp, where M is the bad DUT factor) passes the test and the probability that baseline good DUT (error ratio = mp, where m is the bad DUT factor) fails the test respectively. Then we have

$$R_c = \sum_{(i,j)\in\mathcal{P}} T^{Mp}_{(i,j)}(\mathcal{P}, \mathcal{F}), \quad R_s = \sum_{(i,j)\in\mathcal{F}} T^{mp}_{(i,j)}(\mathcal{P}, \mathcal{F}).$$

G.5.2 Method of designing pass/fail limit to approach given risk probability

For given error ratio p, confidence level P_{CL}, good DUT factor m and bad DUT factor M, pass limit $\{N_{p,i}, i = 1,2,\cdots\}$ and fail limit $\{N_{f,i}: i = 1,2,\cdots\}$ can be obtained by using the method listed below. Note that the limit-risk mapping in 36.521-1 is assumed.

Step 1: Initialize as follows:

- Set $\mathcal{P}$ and $\mathcal{F}$, passing state set and failure state set respectively, as $\mathcal{P}, \mathcal{F} = \emptyset$.
- Set R_c and R_s, customer risk and supplier risk respectively, as $R_c, R_s = 0$;
- Set n, number of executed iterations, as $n = 0$;
- Set $\mathcal{S}$, non-decidable state set after n-th iteration, as $\mathcal{S} = \{(0,0)\}$;
- Set $T^{mp}_{(i,j)}(\mathcal{P}, \mathcal{F})$ and $T^{Mp}_{(0,0)}(\mathcal{P}, \mathcal{F})$, transition probability to state $(0,0)$ for baseline good DUT and for baseline bad DUT respectively, as $T^{mp}_{(i,j)}(\mathcal{P}, \mathcal{F}) = 1$, $T^{Mp}_{(0,0)}(\mathcal{P}, \mathcal{F}) = 1$.
- Select Δ_c and Δ_s, step size for customer risk and supplier risk respectively, as $\Delta_c \leq 1 - P_{CL}$, $\Delta_s \leq 1 - P_{CL}$.

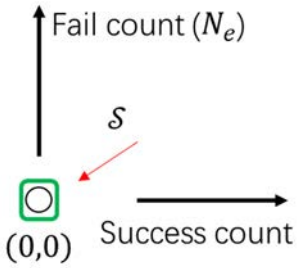

Figure G.5.2-1: Demonstration of step 1

Figure G.5.2-1 is the demonstration of step 1. The reason to initialize $= \{(0,0)\}$, $T^{mp}_{(i,j)}(\mathcal{P}, \mathcal{F}) = 1$, $T^{Mp}_{(0,0)}(\mathcal{P}, \mathcal{F}) = 1$ is because the DUT is always in state $(0,0)$ before executing any iteration. And we have $\mathcal{P}, \mathcal{F} = \emptyset$ since no passing state or failure state is selected yet.

Step 2: Calculate set $\mathcal{S}'$, the set of the state can be reached after the n+1-th iteration, as $\mathcal{S}' = \{(i,j): (i-1,j) \in \mathcal{S} \text{ or } (i,j-1) \in \mathcal{S}\}$. Then for all state $(i,j) \in \mathcal{S}'$, calculate $T^{Mp}_{(i,j)}(\mathcal{P}, \mathcal{F})$ and $T^{mp}_{(i,j)}(\mathcal{P}, \mathcal{F})$ as follows:

$$T^{Mp}_{(i,j)}(\mathcal{P}, \mathcal{F}) = T^{Mp}_{(i-1,j)}(\mathcal{P}, \mathcal{F})(1 - Mp)\mathbb{I}_{i>0}\mathbb{I}_{(i-1,j)\notin \mathcal{P}\cup\mathcal{F}} + T^{Mp}_{(i,j-1)}(\mathcal{P}, \mathcal{F})Mp\mathbb{I}_{j>0}\mathbb{I}_{(i,j-1)\notin \mathcal{P}\cup\mathcal{F}},$$

$$T^{mp}_{(i,j)}(\mathcal{P}, \mathcal{F}) = T^{mp}_{(i-1,j)}(\mathcal{P}, \mathcal{F})(1 - mp)\mathbb{I}_{i>0}\mathbb{I}_{(i-1,j)\notin \mathcal{P}\cup\mathcal{F}} + T^{mp}_{(i,j-1)}(\mathcal{P}, \mathcal{F})mp\mathbb{I}_{j>0}\mathbb{I}_{(i,j-1)\notin \mathcal{P}\cup\mathcal{F}}.$$

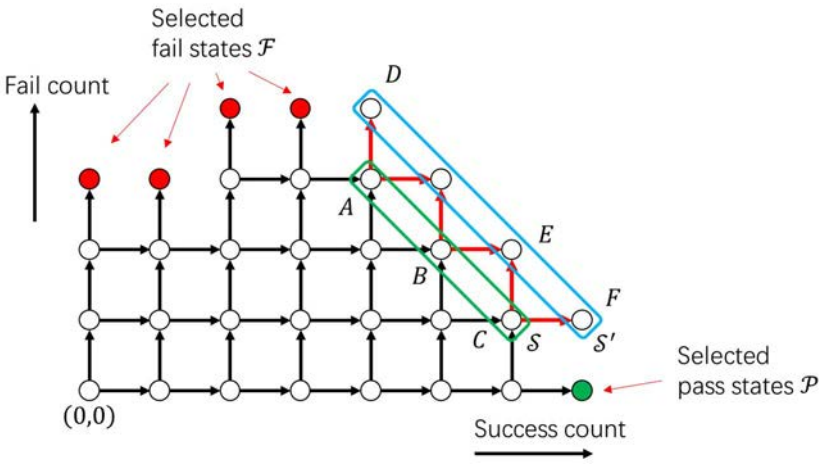

Figure G.5.2-2: Demonstration of step 2

See Figure G.5.2-2 for better understanding of step 2. If DUT doesn't pass or fail the test after the n-th iteration then DUT must be in one state in $\mathcal{S}$. It's easy to observe that the DUT must be in one state in $\mathcal{S}'$. Then the transition

probability to state in $\mathcal{S}'$ can be calculated by using Conclusion 3. For example, the only way to move to state D in Figure 2 is to first move to state A then count a fail in the n+1-th iteration, then we have $T_D^p = T_A^p p$. On the other hand, to move to state E, the DUT can first move to state B then count a success in the n+1-th iteration or first move to state C then count a fail in the n+1-the iteration, i.e. $T_E^p = T_B^p(1-p) + T_C^p p$.

Step 3: First, try finding an integer n_e which satisfies $(n+1-n_e, n_e) \in \mathcal{S}'$, $R_c + \sum_{\substack{(i,j)\in\mathcal{S}' \\ j\le n_e}} T_{(i,j)}^{Mp}(\mathcal{P},\mathcal{F}) \le 1 - P_{CL}$ and $R_s + \sum_{\substack{(i,j)\in\mathcal{S}' \\ j> n_e}} T_{(i,j)}^{mp}(\mathcal{P},\mathcal{F}) \le 1 - P_{CL}$. If such a n_e exists, let

$$R_c = R_c + \sum_{(i,j)\in\mathcal{S}', j\le n_e} T_{(i,j)}^{Mp}(\mathcal{P},\mathcal{F}), \quad R_s = R_s + \sum_{(i,j)\in\mathcal{S}', j> n_e} T_{(i,j)}^{mp}(\mathcal{P},\mathcal{F}),$$

$$\mathcal{P} = \mathcal{P} \cup \{(i,j): (i,j) \in \mathcal{S}', j \le n_e\}, \quad \mathcal{F} = \mathcal{F} \cup \{(i,j): (i,j) \in \mathcal{S}', j > n_e\},$$

If such a n_e doesn't exist, instead try finding integers n_p and n_f which satisfy

$$(n+1-n_p, n_p) \in \mathcal{S}', \quad (n+1-n_f, n_f) \in \mathcal{S}',$$

$$min(i_c\Delta_c, 1-P_{CL}) < R_c + \sum_{(i,j)\in\mathcal{S}', j\le n_p} T_{(i,j)}^{Mp}(\mathcal{P},\mathcal{F}) \le min\big((i_c+1)\Delta_c, 1-P_{CL}\big),$$

$$min(i_s\Delta_s, 1-P_{CL}) < R_s + \sum_{(i,j)\in\mathcal{S}', j\ge n_f} T_{(i,j)}^{mp}(\mathcal{P},\mathcal{F}) \le min\big((i_s+1)\Delta_s, 1-P_{CL}\big).$$

Then,

- if such a n_p exists, set

$$R_c = R_c + \sum_{(i,j)\in\mathcal{S}', j\le n_p} T_{(i,j)}^{Mp}(\mathcal{P},\mathcal{F}), \quad \mathcal{P} = \mathcal{P} \cup \{(i,j): (i,j) \in \mathcal{S}', j \le n_p\}, \quad i_c = i_c + 1.$$

- if such a n_f exists, set

$$R_s = R_s + \sum_{(i,j)\in\mathcal{S}', j\ge n_f} T_{(i,j)}^{mp}(\mathcal{P},\mathcal{F}), \quad \mathcal{F} = \mathcal{F} \cup \{(i,j): (i,j) \in \mathcal{S}', j \ge n_f\}, \quad i_s = i_s + 1.$$

Two possible cases in step 3 are depicted in figure G.5.2-3 and figure G.5.2-4 respectively. If n_e exists, even we add all states $(i,j) \in \mathcal{S}'$ with $j \le n_e$ to $\mathcal{P}$ and all states $(i,j) \in \mathcal{S}'$ with $j > n_e$ to $\mathcal{F}$, the customer risk and supplier risk are still no larger than $1 - P_{CL}$ (the increment of the customer risk and supplier risk, are denoted as blue and green triangle in figure 4 respectively).

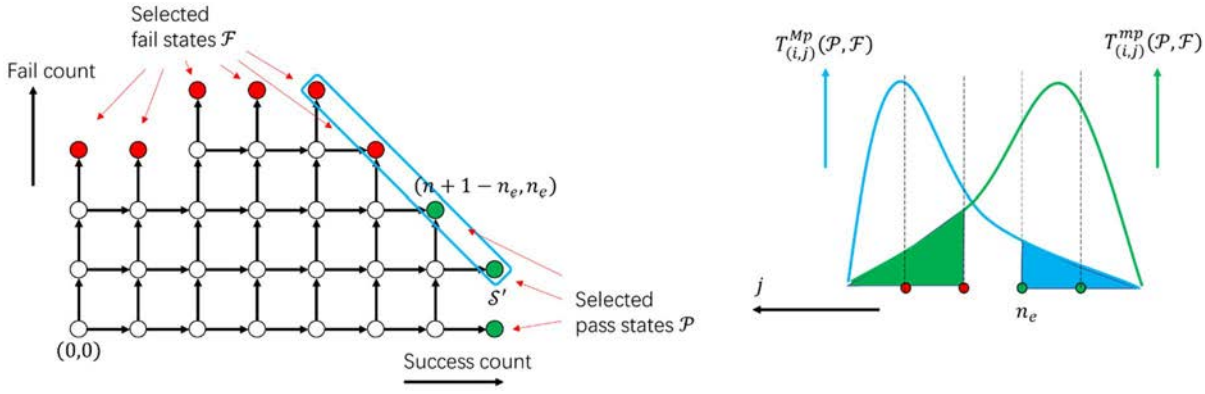

Figure G.5.2-3: Demonstration of step 3 (n_e exists)

If n_e doesn't exist, instead we try to find state set $\{(i,j): (i,j) \in \mathcal{S}', j \leq n_p\}$ which satisfies that the total transition probability to any state in the set is approximately Δ_c. If such a set exists we can add states in this set to $\mathcal{P}$ without breaking customer risk threshold. Similarly, we can also try to a state set$\{(i,j): (i,j) \in \mathcal{S}', j \geq n_f\}$ which satisfies that the total transition probability to any state in the set is approximately Δ_s and add states in this set to $\mathcal{F}$.

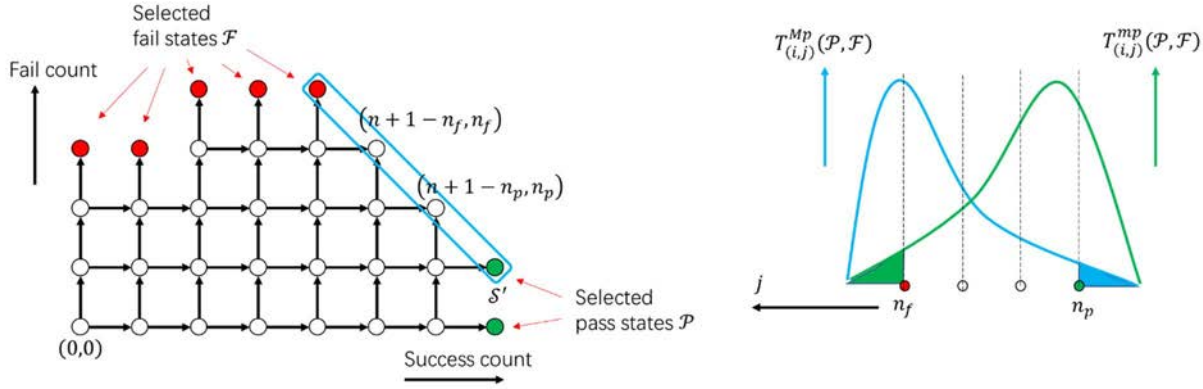

Figure G.5.2-4: Demonstration of step 3 (n_e doesn't exist)

Step 4: Let $\mathcal{S} = \mathcal{S}' \backslash (\mathcal{P} \cup \mathcal{F})$, $n = n + 1$. Then go back to Step 2 if $\mathcal{S} \neq \emptyset$, otherwise go to Step 5.

If a state $(i,j) \in \mathcal{S}'$ is selected as a passing state or failing state then it's no longer a non-decidable state. Then we need to exclude it from non-decidable state set after n+1-the iteration. If all states in $\mathcal{S}'$ are excluded, clearly the test surely will terminate after the n+1-the iteration and the designing is finished. Otherwise, we need to go back to step 2 and repeat procedures above.

Step 5: Sort all states (i,j) in $\mathcal{P}$ in the ascending order of j and all states (i,j) in $\mathcal{F}$ in the ascending order of i, i.e. we denote

$$\mathcal{P} = (A_0, 0), (A_1, 1), (A_2, 2), (A_3, 3) \cdots, \qquad \mathcal{F} = (0, B_0), (1, B_1), (2, B_2), (3, B_3), \cdots$$

Then construct passing state set $\mathcal{P}'$ and failure state set $\mathcal{F}'$ as

$$\mathcal{P}' = \{(A'_j, j): j = 0,1,2, \cdots\}, \qquad \mathcal{F}' = \{(i, B'_i): i = 0,1,2 \cdots\}$$

Where $A'_j = \min_{k \geq j} A_k$, $B'_i = \min_{k \geq i} B_i$

Purpose of step 5 is to further optimize the passing state and failure state obtained in step 2 to 4. To understand step 5, we only need to note that all path to passing state A, B must also pass state C, D. On the other hand, if a path passes state D or E, it must eventually reach one passing state in A, B and C. Then one can derive that

$$\sum_{(i,j) \in \{A,B,C\}} T^{p}_{(i,j)}(\mathcal{P},\mathcal{F}) = \sum_{(i,j) \in \{A,D,E\}} T^{p}_{(i,j)}(\mathcal{P},\mathcal{F})$$

In other words, if $\mathcal{P} = \{A, B, C\}$ is a passing set which satisfies customer risk requirements, then $\mathcal{P}' = \{A, D, E\}$ is also a passing set satisfying customer risk requirements since it has exactly the same customer risk as $\mathcal{P}$. But $\mathcal{P}'$ is a better choice than $\mathcal{P}$ since it requires fewer iterations to make decision.

For the same reason, we can also derive that failure set $\mathcal{F}' = \{F, G, L, M, N, K\}$ has same supplier risk with $\mathcal{F} = \{F, G, H, I, J, K\}$ but requires fewer iterations to fail the test.

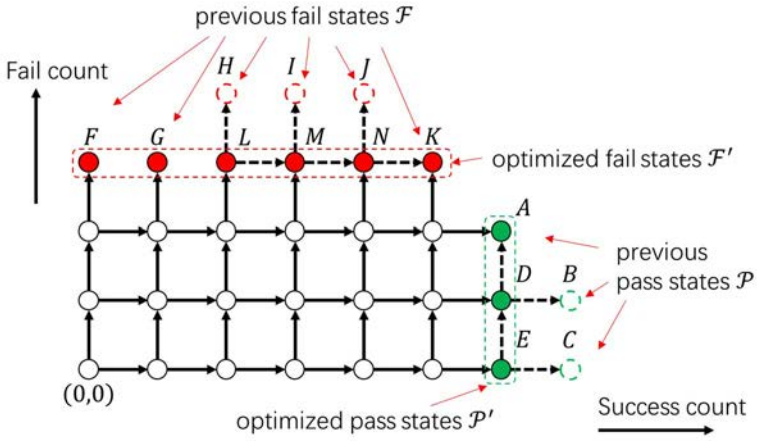

Figure G.5.2-5: Demonstration of step 3 (n_e doesn't exist).

Step 6: Construct pass limit $\{N_{p,i}\}$ and fail limit $\{N_{f,i}\}$ as follows:

$$N_{f,1} = \max_{B_i=1}(i + B_i), \quad N_{f,2} = \max_{B_i=2}(i + B_i), \quad N_{f,3} = \max_{B_i=3}(i + B_i), \quad \cdots$$

At last, we can convert pass/fail state sets to pass/fail limits by using conclusion 3 in Annex G.5.1.

Annex H (normative): Default message contents for RRM

H.1 Void

H.2 System information blocks message content exceptions

H.2.1 System information blocks message contents exceptions for NR intra frequency cell re-selection

SIB2: for NR intra-frequency cell re-selection

Table H.2.1-1: *SIB2*: NR intra frequency cell re-selection

Derivation Path: TS 38.508-1 [14], Table 4.6.2-1			
Information Element	**Value/remark**	**Comment**	**Condition**
SIB2 ::= SEQUENCE {			
cellReselectionInfoCommon SEQUENCE {			
rangeToBestCell	Not present		
}			
intraFreqCellReselectionInfo SEQUENCE {			
q-RxLevMin	-70	-140 is actual value in dBm (-70 * 2 dBm)	SCS15
	-69	-138 is actual value in dBm (-69 * 2 dBm)	SCS30
	-69	-138 is actual value in dBm (-69 * 2 dBm)	SCS120
	-68	-136 is actual value in dBm (-68 * 2 dBm)	SCS240
s-IntraSearchP	30	60 is actual value in dB (30 * 2 dB)	
smtc	SSB-MTC specified in TS 38.508-1 [14] Table 7.3.1-3 with condition SMTC.n		SMTC.n
deriveSSB-IndexFromCell	false		Asynchronous cells
	true		Synchronous cells
}			
}			

Condition	Explanation
SMTC.n	SMTC pattern n according to TS 38.133 [6] A.3.11
Synchronous cells	SSB indices of neigibour cells can be derived from timing of serving cell
Asynchronous cells	SSB indices of neigibour cells cannot be derived from timing of serving cell

SIB3: for NR intra-frequency cell re-selection

Table H.2.1-2: *SIB3*: NR intra frequency cell re-selection

Derivation Path: TS 38.508-1 [14], Table 4.6.2-2			
Information Element	**Value/remark**	**Comment**	**Condition**
SIB3 ::= SEQUENCE {			
intraFreqNeighCellList SEQUENCE (SIZE (1..maxCellIntra)) OF SEQUENCE {			
IntraFreqNeighCellInfo ::= SEQUENCE{			
physCellId	Set according to the		

	neighbour cell PCI		
q-OffsetCell	dB0	0 is actual value in dB (0 * 2 dB)	
}			
}			
}			

SIB1: for NR intra frequency cell re-selection

Table H.2.1-3: *SIB1*: NR intra frequency cell re-selection

Derivation Path: TS 38.508-1 [14], Table 4.6.1-28			
Information Element	**Value/remark**	**Comment**	**Condition**
SIB1 ::= SEQUENCE {			
cellSelectionInfo SEQUENCE {			
q-RxLevMin	-70	-140 is actual value in dBm (-70 * 2 dBm)	SCS15
	-69	-138 is actual value in dBm (-69 * 2 +1 dBm)	SCS30
	-69	-138 is actual value in dBm (-69 * 2 dBm)	SCS120
	-68	-136 is actual value in dBm (-68 * 2 dBm)	SCS240
}			
servingCellConfigCommon SEQUENCE {			
highSpeedConfig-r16 SEQUENCE {			
highSpeedMeasFlag-r16	true		HighSpeedMeas
}			
}			
}			

Condition	Explanation
HighSpeedMeas	highSpeedMeasFlag-r16 is configured. UE shall apply the enhanced measurement requirements to support high speed up to 500 km/h as specified in TS 38.133 [14]

H.2.2 System information blocks message contents exceptions for NR inter frequency cell re-selection

SIB2: for NR inter-frequency cell re-selection

Table H.2.2-1: *SIB2*: NR inter frequency cell re-selection

Derivation Path: TS 38.508-1 [14], Table 4.6.2-1			
Information Element	**Value/remark**	**Comment**	**Condition**
SIB2 ::= SEQUENCE {			
cellReselectionInfoCommon SEQUENCE {			
rangeToBestCell	Not present		
}			
cellReselectionServingFreqInfo SEQUENCE {			
s-NonIntraSearchP	25	50 is actual value in dB (25 * 2 dB)	
threshServingLowP	22	44 is actual value in dB (22 * 2 dB)	
cellReselectionPriority	4		NR Cell 1
	5		NR Cell 2
}			
}			

SIB4: for NR inter-frequency cell re-selection

Table H.2.2-2: *SIB4*: NR inter frequency cell re-selection

Derivation Path: TS 38.508-1 [14], Table 4.6.2-3			
Information Element	**Value/remark**	**Comment**	**Condition**
SIB4 ::= SEQUENCE {			
interFreqCarrierFreqList SEQUENCE (SIZE (1..maxFreq)) OF SEQUENCE {	1 Entry		
dl-CarrierFreq[1]	Downlink NR SSB ARFCN of NR Cell 2		NR Cell 1
	Downlink NR SSB ARFCN of NR Cell 1		NR Cell 2
smtc	SSB-MTC specified in TS 38.508-1 [14] Table 7.3.1-3 with condition SMTC.n		SMTC.n
deriveSSB-IndexFromCell[1]	false		Asynchronous cells
	true		Synchronous cells
q-RxLevMin[1]	-70	-140 is actual value in dBm (-70 * 2 dBm)	dBm/15kHz
	-69	-137 is actual value in dBm (-69 * 2 +1 dBm)	dBm/30kHz
threshX-HighP[1]	24	48 is actual value in dB (24 * 2 dB)	
threshX-LowP[1]	25	50 is actual value in dB (25 * 2 dB)	
cellReselectionPriority[1]	5		NR Cell 1
	4		NR Cell 2
q-OffsetFreq[1]	dB0	0 is actual value in dB (0 * 2 dB).	
}			
}			

Condition	Explanation
SSB.n FRm	SSB pattern n in FRm according to TS 38.133 [6] A.3.10
Synchronous cells	SSB indices of neighbour cells can be derived from timing of serving cell
Asynchronous cells	SSB indices of neighbour cells cannot be derived from timing of serving cell

SIB1: for NR inter frequency cell re-selection

Table H.2.2-3: *SIB1*: NR inter frequency cell re-selection

Derivation Path: TS 38.508-1 [14], Table 4.6.1-28			
Information Element	**Value/remark**	**Comment**	**Condition**
SIB1 ::= SEQUENCE {			
cellSelectionInfo SEQUENCE {			
q-RxLevMin	-70	-140 is actual value in dBm (-70 * 2 dBm)	dBm/15kHz
	-69	-137 is actual value in dBm (-69 * 2 +1 dBm)	dBm/30kHz
}			
}			

H.2.3 System information blocks message contents exceptions for NR inter-RAT cell re-selection

SIB1: for inter-RAT NR – E-UTRA cell re-selection

Table H.2.3-1: *SIB1*: Inter-RAT NR – E-UTRA cell re-selection

Derivation Path: TS 38.508-1 [14], Table 4.6.1-28			
Information Element	**Value/remark**	**Comment**	**Condition**
SIB1 ::= SEQUENCE {			
cellSelectionInfo SEQUENCE {			
q-RxLevMin	-70	-140 is actual value in dBm (-70 * 2 dBm)	SCS15
	-69	-137 is actual value in dBm (-69 * 2 +1 dBm)	SCS30
}			
}			

SIB2: for inter-RAT NR – E-UTRA cell re-selection

Table H.2.3-2: *SIB2*: Inter-RAT NR – E-UTRA cell re-selection

Derivation Path: TS 38.508-1 [14], Table 4.6.2-1			
Information Element	**Value/remark**	**Comment**	**Condition**
SIB2 ::= SEQUENCE {			
cellReselectionServingFreqInfo SEQUENCE {			
s-NonIntraSearchP	25	50 is actual value in dB (25 * 2 dB)	
threshServingLowP	22	44 is actual value in dB (22 * 2 dB)	
cellReselectionPriority	4		higher priority
	5		lower priority
}			
intraFreqCellReselectionInfo SEQUENCE {			
smtc	SSB-MTC specified in TS 38.508-1 [14] Table 7.3.1-3 with condition SMTC.n		SMTC.n
}			
}			

Condition	Explanation
SMTC.n	SMTC pattern n according to TS 38.133 [6] A.3.11
higher priority	NR cell re-selection to higher priority E-UTRA
lower priority	NR cell re-selection to lower priority E-UTRA

SIB5: for inter-RAT NR – E-UTRA cell re-selection

Table H.2.3-3: *SIB5*: Inter-RAT NR – E-UTRA cell re-selection

Derivation Path: TS 38.508-1 [14], Table 4.6.2-4			
Information Element	**Value/remark**	**Comment**	**Condition**
SIB5 ::= SEQUENCE {			
carrierFreqListEUTRA SEQUENCE (SIZE (1..maxEUTRA-Carrier)) OF SEQUENCE {	1 Entry		
carrierFreq[1]	Downlink EUTRA ARFCN of E-UTRA Cell 1		
eutra-FreqNeighCellList[1] SEQUENCE (SIZE (1..maxCellEUTRA)) OF SEQUENCE {			
physCellId	E-UTRA physical cell		

	identity		
dummy	dB0		
}			
presenceAntennaPort1[1]	FALSE		
cellReselectionPriority[1]	5		higher priority
	4		lower priority
threshX-High	24	48 is actual value in dB (24 * 2 dB)	
threshX-Low	25	50 is actual value in dB (25 * 2 dB)	
q-RxLevMin	-70	-140 is actual value in dBm (-70 * 2 dBm)	
}			
}			

Condition	Explanation
higher priority	NR cell re-selection to higher priority E-UTRA
lower priority	NR cell re-selection to lower priority E-UTRA

H.3 RRC message content exceptions

H.3.1 RRC messages and information elements contents exceptions for NR measurement configuration

RRCReconfiguration

To setup NR Measurement Configuration.

Table H.3.1-1: *RRCReconfiguration*: NR measurement Configuration

Derivation Path: TS 38.508-1 [14], Table 4.6.1-13 with condition NR_MEAS			
Information Element	**Value/remark**	**Comment**	**Condition**
RRCReconfiguration ::= SEQUENCE {			
criticalExtensions CHOICE {			
rrcReconfiguration ::= SEQUENCE {			
measConfig	MeasConfig-DEFAULT	Measurements configuration	
}			
}			
}			

MeasConfig-DEFAULT

Configuration for NR measurement.

Table H.3.1-2: MeasConfig-DEFAULT: Configuration of NR measurement

Derivation path: 38.508-1 [14] table 4.6.3-69			
Information Element	**Value/Remark**	**Comment**	**Condition**
measConfig ::= SEQUENCE {			
measObjectToAddModList SEQUENCE (SIZE (1..maxNrofMeasId)) OF SEQUENCE {	n entries	n=1 without condition n=2 for INTER-FREQ OR INTER-RAT OR Deactivated SCell	
measObjectId[1]	1		
measObject[1] CHOICE {			
measObjectNR	MeasObjectNR-DEFAULT with		

	Condition INTRA-FREQ MO		
}			
measObjectId[2]	2		INTER-FREQ OR INTER-RAT OR Deactivated SCell
measObject[2] CHOICE {			
measObjectNR	MeasObjectNR-DEFAULT with Condition INTER-FREQ MO		INTER-FREQ
measObjectNR	MeasObjectNR-DEFAULT with Condition Deactivated SCell		Deactivated SCell
measObjectEUTRA	MeasObjectEUTRA-DEFAULT		INTER-RAT
}			
}			
reportConfigToAddModList SEQUENCE(SIZE (1..maxReportConfigId)) OF SEQUENCE {	1 entry		
reportConfigId[1]	ReportConfigId		
reportConfig[1] CHOICE {			
reportConfigNR	ReportConfigNR-DEFAULT		
	ReportConfigNR-DEFAULT		INTER-FREQ OR Deactivated SCell
reportConfigInterRAT	ReportConfigInterRAT-DEFAULT		INTER-RAT
}			
}			
measIdToAddModList SEQUENCE (SIZE (1..maxNrofMeasId)) OF SEQUENCE {	1 entry		
measId[1]	MeasId		
measObjectId[1]	1		
	2		INTER-FREQ OR INTER-RAT OR Deactivated SCell
reportConfigId[1]	ReportConfigId		
}			
quantityConfig	QuantityConfig-DEFAULT		
	QuantityConfig	TS 38.508-1 Table 4.6.3-127	L3 FILTERING NEEDED
measGapConfig	MeasGapConfig-DEFAULT		GAP NEEDED
}			

Condition	Explanation
GAP NEEDED	Measurement gap on the NR Cell is needed for measurement
INTER-FREQ	Configuration for inter-frequency NR measurement tests
INTER-RAT	Configuration for inter-RAT EUTRA measurement tests
Deactivated SCell	Configuration for measurement on deactivated SCell tests
L3 FILTERING NEEDED	L3 filtering is needed for measurement

MeasObjectNR-DEFAULT

NR measurement object configuration.

Table H.3.1-3: MeasObjectNR-DEFAULT: NR intra-frequency measurement object configuration

Derivation Path: TS 38.508-1 [14], Table 4.6.3-76			
Information Element	**Value/remark**	**Comment**	**Condition**
MeasObjectNR::= SEQUENCE {			
ssbFrequency	ARFCN-ValueNR of the SSB associated to serving cell	frequency of the serving cell	INTRA-FREQ MO
	ARFCN-ValueNR of the SSB associated to SCell		Deactivated SCell
	ARFCN-ValueNR of the SSB associated to inter-frequency neighbour cell		INTER-FREQ MO
referenceSignalConfig SEQUENCE {			
ssb-ConfigMobility SEQUENCE {			
ssb-ToMeasure	Not present		
	SSB-ToMeasure specified in 38.508-1 [14] Table 7.3.1-31 with condition SSB.7 FR2 OR SSB.8 FR2		SSB.7 FR2 OR SSB.8 FR2
deriveSSB-IndexFromCell	false		
	true		Synchronous cells OR RLM
}			
}			
absThreshSS-BlocksConsolidation SEQUENCE {			
thresholdRSRP	0	SS-RSRP < -156dB	NOT SS-SINR
thresholdSINR	0	SS-SINR<-23	SS-SINR
}			
measCycleSCell-v1530	sf640		Deactivated SCell
}			

Condition	Explanation
INTRA-FREQ MO	Configuration for NR MO associated to intra-frequency carrier
INTER-FREQ MO	Configuration for NR MO associated to inter-frequency carrier
Synchronous cells	SSB indices of neighbourcells can be derived from timing of serving cell
RLM	Configuration for RLM tests
Deactivated SCell	Configuration for SCell activation and deactivation tests
SS-SINR	Configuration for SS-SINR tests

MeasObjectEUTRA-DEFAULT

EUTRA measurement object configuration for NR FR1 to E-UTRAN handover.

Table H.3.1-3A: MeasObjectEUTRA-DEFAULT: InterRAT EUTRA measurement object configuration for FR1 to E-UTRAN handover

Derivation Path: TS 38.508-1 [14], Table 4.6.3-74			
Information Element	**Value/remark**	**Comment**	**Condition**
MeasObjectEUTRA ::= SEQUENCE {			
cellsToAddModListEUTRAN SEQUENCE (SIZE (1..maxCellMeasEUTRA)) OF SEQUENCE{			
cellIndexEUTRA	1		
physCellId	Physical Cell ID of the E-UTRA cell	Annex E	
cellIndividualOffset	dB0		
}			
eutra-PresenceAntennaPort1	false		
}			

ReportConfigNR-DEFAULT

NR Report Configuration

Table H.3.1-4: ReportConfigNR-DEFAULT(a3-offset): NR report configuration for event A3

Derivation Path: 38.508-1 [14] Table 4.6.3-142 with condition EVENT_A3			
Information Element	**Value/remark**	**Comment**	**Condition**
ReportConfigNR::= SEQUENCE {			
reportType CHOICE {			
eventTriggered SEQUENCE {			
eventId CHOICE {			
eventA3 SEQUENCE {			
a3-Offset CHOICE {			
rsrp	A3-offset*2	The actual value is field value * 0.5 dB	
}			
hysteresis	0	0 dB	
timeToTrigger	ms0		
}			
}			
reportQuantity-RsIndexes SEQUENCE {			SSB Index
rsrp	true		
rsrq	false		
sinr	false		
}			
maxReportCells	2		
maxNrofRS-IndexesToReport	2		SSB Index
}			
}			
}			

Condition	Explanation
SSB Index	To include SSB Index

Table H.3.1-4AA: ReportConfigNR-DEFAULT(a4-threshold): NR report configuration for event A4

Derivation Path: 38.508-1 [14] Table 4.6.3-142 with condition EVENT_A4			
Information Element	**Value/remark**	**Comment**	**Condition**
ReportConfigNR::= SEQUENCE {			
reportType CHOICE {			
eventTriggered SEQUENCE {			
eventId CHOICE {			
eventA4 SEQUENCE {			
a4-Threshold CHOICE {			
rsrp	a4-threshold+156	For thresholds, the actual value is (IE value – 156) dBm	
}			
hysteresis	0		
timeToTrigger	ms0		
}			
}			
reportQuantity-RsIndexes SEQUENCE {			SSB Index
rsrp	true		
rsrq	false		
sinr	false		
}			
maxReportCells	2		
maxNrofRS-IndexesToReport	2		SSB Index
}			
}			

}			

Condition	Explanation
SSB Index	To include SSB Index

ReportConfigInterRAT-DEFAULT

InterRAT NR Report Configuration for NR FR1 to E-UTRAN handover.

Table H.3.1-4A: ReportConfigInterRAT- DEFAULT (b2-Thres1, b2-Thres2): InterRAT NR report configuration for FR1 to E-UTRAN handover with b2-Threshold1 = b2-Thres1 and b2-Threshold2EUTRA = b2-Thres2 dBm

Derivation Path: 38.508-1 [4] Table 4.6.3-141			
Information Element	**Value/remark**	**Comment**	**Condition**
ReportConfigInterRAT ::= SEQUENCE {			
reportType CHOICE {			
eventTriggered SEQUENCE {			
eventId CHOICE {			
eventB2 SEQUENCE {			
b2-Threshold1 CHOICE {			
rsrp	b2-Thres1	b2-Thres1 – 156 dBm	
}			
b2-Threshold2EUTRA CHOICE {			
rsrp	b2-Thres2	b2-Thres2 – 140 dBm	
}			
hysteresis	0	0 dB	
timeToTrigger	ms0		
}			
}			
reportQuantityCell SEQUENCE {			
rsrp	true		
rsrq	false		
sinr	false		
}			
}			
}			
}			

QuantityConfig-DEFAULT

NR quantity configuration when L3 filtering is not used.

Table H.3.1-5: QuantityConfig-DEFAULT: NR quantity configuration when L3 filtering is not used

Derivation Path: TS 38.508-1 [14], Table 4.6.3-127			
Information Element	**Value/remark**	**Comment**	**Condition**
QuantityConfig::= SEQUENCE {			
quantityConfigNR-List SEQUENCE (SIZE (1..maxNrofQuantityConfig)) OF SEQUENCE {	1 entry		
quantityConfigCell[1] SEQUENCE {			
ssb-FilterConfig SEQUENCE {			
filterCoefficientRSRP	fc0	No L3 filtering	
filterCoefficientRSRQ	fc0	No L3 filtering	
filterCoefficientRS-SINR	fc0	No L3 filtering	
}			
csi-RS-FilterConfig SEQUENCE {			
filterCoefficientRSRP	fc0	No L3 filtering	
filterCoefficientRSRQ	fc0	No L3 filtering	
filterCoefficientRS-SINR	fc0	No L3 filtering	
}			
}			
}			

quantityConfigEUTRA	Not present		
quantityConfigEUTRA SEQUENCE {			INTER-RAT
filterCoefficientRSRP	fc0		
filterCoefficientRSRQ	fc0		
filterCoefficientRS-SINR	fc0		

Condition	Explanation
INTER-RAT	Configuration for inter-RAT EUTRA measurement tests

MeasGapConfig-DEFAULT

Measurement gap configuration.

Table H.3.1-6: MeasGapConfig: measurement gap configuration

Derivation Path: TS 38.508-1 [14], Table 4.6.3-70			
Information Element	**Value/remark**	**Comment**	**Condition**
MeasGapConfig ::= SEQUENCE {			
gapFR2 CHOICE {			gapFR2
setup SEQUENCE {			
gapOffset	39		Pattern #13
mgl	ms5dot5		Pattern #13
mgrp	ms40		Pattern #13
mgta	ms0		
}			
}			
gapFR1 CHOICE {			gapFR1
setup SEQUENCE {			
gapOffset	39		Pattern #2
	19		Pattern #4
mgl	ms3		Pattern #2
	ms6		Pattern #4
mgrp	ms40		Pattern #2
	ms20		Pattern #4
mgta	ms0		
}			
}			
gapUE CHOICE {			gapUE
setup SEQUENCE {			
gapOffset	39		Pattern #0 OR Pattern #2 OR Pattern #13
	0		RLM OR BFD
mgl	ms6		Pattern #0 OR RLM OR BFD
	ms3		Pattern #2
	ms5dot5		Pattern #13
mgrp	ms40		Pattern #0 OR Pattern #2 OR Pattern #13 OR RLM OR BFD
mgta	ms0		
}			
}			
}			

Condition	Explanation
Pattern #0	Measurement gap pattern #0 defined in TS 38.133 [6] Table 9.1.2-1 is used for measurement tests
Pattern #2	Measurement gap pattern #2 defined in TS 38.133 [6] Table 9.1.2-1 is used for measurement tests
Pattern #4	Measurement gap pattern #4 defined in TS 38.133 [6] Table 9.1.2-1 is used for measurement tests
Pattern #13	Measurement gap pattern #13 defined in TS 38.133 [6] Table 9.1.2-1 is used for measurement tests
RLM	Measurement gap pattern for RLM tests

BFD	Measurement gap pattern for Beam Failure Dectection tests
gapFR2	Indicates measurement gap configuration that applies to FR2 only. gapFR2 cannot be configured together with gapUE. In (NG)EN-DC or NE-DC, gapFR2 can only be set up by NR RRC
gapFR1	Indicates measurement gap configuration that applies to FR1 only. gapFR1 cannot be configured together with gapUE. In (NG)EN-DC, gapFR1 cannot be set up by NR RRC
gapUE	Indicates measurement gap configuration that applies to all frequencies (FR1 and FR2). If gapUE is configured, then neither gapFR1 nor gapFR2 can be configured. In (NG)EN-DC, gapUE cannot be set up by NR RRC.

MeasResults-DEFAULT

measurement result for NR measurements.

Table H.3.1-7: MeasResults: measurement result for NR measurements

Derivation Path: TS 38.508-1 [14], Table 4.6.3-79 with condition A3			
Information Element	**Value/remark**	**Comment**	**Condition**
measResults SEQUENCE {			
measId	MeasId		
measResultServingMOList SEQUENCE (SIZE (1..maxNrofServingCells)) OF SEQUENCE {	2 entries		
servCellId[1]	ServCellIndex of NR SpCell		
measResultServingCell[1] SEQUENCE {			
physCellId	PhysCellId of NR SpCell		
measResult SEQUENCE {			
cellResults SEQUENCE {			
resultsSSB-Cell SEQUENCE {			
rsrp	(0..127)		
rsrq	(0..127)		
}			
}			
}			
}			
}			
servCellId[2]	ServCellIndex of NR SCell		Deactivated SCell
measResultServingCell[2] SEQUENCE {			Deactivated SCell
physCellId	PhysCellId of NR SCell		
measResult SEQUENCE {			
cellResults SEQUENCE {			
resultsSSB-Cell SEQUENCE {			
rsrp	(0..127)		
rsrq	(0..127)		
}			
}			
}			
}			
measResultNeighCells CHOICE {			
measResultListNR SEQUENCE (SIZE(1..maxCellReport)) OF SEQUENCE {	1 entry		INTRA-FREQ OR INTER-FREQ
physCellId[1]	PhysCellId of NR neighbour Cell		
measResult[1] SEQUENCE {			
cellResults SEQUENCE {			
resultsSSB-Cell SEQUENCE {			
rsrp	(0..127)		
}			
}			
rsIndexResults SEQUENCE {	*n* entires of ResultsPerSSB-Index	*ResultsPerSSB-IndexList*	SSB Index

resultsPerSSB-Index SEQUENCE {	entry [1]		
ssb-Index	SSB-Index	an SS-Block within an SS-Burst	
}			
}			
}			
}			
measResultListEUTRA SEQUENCE (SIZE (1..maxCellReport)) OF SEQUENCE {	1 entry		INTER-RAT
eutra-PhysCellId [1]	PhysCellId of E-UTRA neighbour Cell		
measResult[1] SEQUENCE {			
rsrp	(0..97)		
rsrq	(0..34)		
}			
cgi-Info	Not present		
}			
}			
}			

Condition	Explanation
SSB Index	To include SSB Index
INTRA-FREQ	Configuration for intra-frequency NR measurement tests
INTER-FREQ	Configuration for inter-frequency NR measurement tests
INTER-RAT	Configuration for inter-RAT EUTRA measurement tests
Deactivated SCell	Configuration for measurement on Deactivated SCell tests

RadioLinkMonitoringConfig -DEFAULT

Default configuration for RLM resources.

Table H.3.1-8: RadioLinkMonitoringConfig-DEFAULT: Default configuration for RLM and BFD resources

Derivation Path: TS 38.508-1 [14], Table 4.6.3-133			
Information Element	**Value/remark**	**Comment**	**Condition**
RadioLinkMonitoringConfig ::= SEQUENCE {			
failureDetectionResourcesToAddModList SEQUENCE (SIZE(1..maxNrofFailureDetectionResources)) OF {	n entries	n = 1 for FR1, n = 2 for FR2	SSB RLM OR CSI-RS RLM
RadioLinkMonitoringRS[1] SEQUENCE {			
radioLinkMonitoringRS-Id	0		
purpose	rlf		
detectionResource CHOICE {			
ssb-Index	0	Index of SSB #0	SSB RLM
csi-RS-Index	NZP-CSI-RS-ResourceId for TRS(4)	TS 38.508-1[14], table 7.3.1-7C	CSI-RS RLM
}			
}			
RadioLinkMonitoringRS[2] SEQUENCE {			FR2
radioLinkMonitoringRS-Id	1		
purpose	rlf		
detectionResource CHOICE {			
ssb-Index	1	Index of SSB #1	SSB RLM
csi-RS-Index	NZP-CSI-RS-ResourceId for TRS(4) with condition SECOND_SET	TS 38.508-1[14], table 7.3.1-7C	CSI-RS RLM
}			
}			
}			
failureDetectionResourcesToAddModList SEQUENCE (SIZE(1..maxNrofFailureDetectionResources)) OF {	2 entries		SSB BFD OR CSI-RS BFD

RadioLinkMonitoringRS[1] SEQUENCE {			
radioLinkMonitoringRS-Id	0		
purpose	both		
detectionResource CHOICE {			
ssb-Index	0	Index of SSB #0	SSB BFD
csi-RS-Index	NZP-CSI-RS-ResourceId for BM(0)	TS 38.508-1[14], Table 7.3.1-7E	CSI-RS BFD
}			
}			
RadioLinkMonitoringRS[2] SEQUENCE {			
radioLinkMonitoringRS-Id	1		
purpose	rlf		
detectionResource CHOICE {			
ssb-Index	1	Index of SSB #1	SSB BFD
csi-RS-Index	NZP-CSI-RS-ResourceId for BM(1)	TS 38.508-1[14], Table 7.3.1-7E	CSI-RS BFD
}			
}			
}			
beamFailureInstanceMaxCount	n1		SSB BFD OR CSI-RS BFD
beamFailureDetectionTimer	pbfd4		SSB BFD OR CSI-RS BFD
}			

Condition	Explanation
SSB RLM	Used when SSB based RLM is configured in test case
CSI-RS RLM	Used when CSI-RS based RLM is configured in test case
SSB BFD	Used when SSB based BFD is configured in test case
CSI-RS BFD	Used when CSI-RS based BFD is configured in test case

Table H.3.1-8A: RadioLinkMonitoringConfig-Release 17: Release 17 configuration for TRP specific RLM and BFD resources

Derivation Path: TS 38.508-1 [14], Table 4.6.3-133			
Information Element	**Value/remark**	**Comment**	**Condition**
RadioLinkMonitoringConfig ::= SEQUENCE {			
BeamFailureDetection-r17::= SEQUENCE {			
failureDetectionSet1-r17::= SEQUENCE {			
bfdResourcesToAddModList-r17 (SIZE(1..maxNrofFailureDetectionResources)) OF {	n entries	n = 1 for FR1, n = 2 for FR2	SSB RLM OR CSI-RS RLM
BeamLinkMonitoringRS[1]-r17 ::= SEQUENCE {			
beamLinkMonitoringRS-Id-r17	0		
detectionResource-r17 CHOICE {			
ssb-Index	0	Index of SSB #0	SSB RLM
csi-RS-Index	NZP-CSI-RS-ResourceId for TRS(4)	TS 38.508-1[14], table 7.3.1-7C	CSI-RS RLM
}			
}			
BeamLinkMonitoringRS[2]-r17 ::= SEQUENCE {			
beamLinkMonitoringRS-Id-r17	1		
detectionResource-r17 CHOICE {			
ssb-Index	1	Index of SSB #1	SSB RLM
csi-RS-Index	NZP-CSI-RS-ResourceId for TRS(4) with condition SECOND_SET	TS 38.508-1[14], table 7.3.1-7C	CSI-RS RLM
}			
}			
}			
bfdResourcesToReleaseList-r17 SEQUENCE (SIZE(1..maxNrofFailureDetectionResources)) OF {	2 entries		SSB BFD OR CSI-RS BFD

BeamLinkMonitoringRS[1]-r17 ::= SEQUENCE {			
beamLinkMonitoringRS-Id-r17	0		
detectionResource-r17 CHOICE {			
ssb-Index	0	Index of SSB #0	SSB BFD
csi-RS-Index	NZP-CSI-RS-ResourceId for BM(0)	TS 38.508-1[14], Table 7.3.1-7E	CSI-RS BFD
}			
}			
BeamLinkMonitoringRS[2]-r17 ::= SEQUENCE {			
beamLinkMonitoringRS-Id-r17	1		
detectionResource-r17 CHOICE {			
ssb-Index	1	Index of SSB #1	SSB BFD
csi-RS-Index	NZP-CSI-RS-ResourceId for BM(1)	TS 38.508-1[14], Table 7.3.1-7E	CSI-RS BFD
}			
}			
}			
beamFailureInstanceMaxCount-r17	n1		SSB BFD OR CSI-RS BFD
beamFailureDetectionTimer-r17	pbfd4		SSB BFD OR CSI-RS BFD
}			
failureDetectionSet2-r17::= SEQUENCE {			
bfdResourcesToAddModList-r17 (SIZE(1..maxNrofFailureDetectionResources)) OF {	n entries	n = 1 for FR1, n = 2 for FR2	SSB RLM OR CSI-RS RLM
BeamLinkMonitoringRS[3]-r17 ::= SEQUENCE {			
beamLinkMonitoringRS-Id-r17	2		
detectionResource-r17 CHOICE {			
ssb-Index	2	Index of SSB #2	SSB RLM
csi-RS-Index	NZP-CSI-RS-ResourceId for TRS(4)	TS 38.508-1[14], table 7.3.1-7C	CSI-RS RLM
}			
}			
BeamLinkMonitoringRS[4]-r17 ::= SEQUENCE {			
beamLinkMonitoringRS-Id-r17	3		
detectionResource-r17 CHOICE {			
ssb-Index	3	Index of SSB #3	SSB RLM
csi-RS-Index	NZP-CSI-RS-ResourceId for TRS(4) with condition SECOND_SET	TS 38.508-1[14], table 7.3.1-7C	CSI-RS RLM
}			
}			
}			
bfdResourcesToReleaseList-r17 SEQUENCE (SIZE(1..maxNrofFailureDetectionResources)) OF {	2 entries		SSB BFD OR CSI-RS BFD
BeamLinkMonitoringRS[3]-r17 ::= SEQUENCE {			
beamLinkMonitoringRS-Id-r17	2		
detectionResource-r17 CHOICE {			
ssb-Index	2	Index of SSB #2	SSB BFD
csi-RS-Index	NZP-CSI-RS-ResourceId for BM(0)	TS 38.508-1[14], Table 7.3.1-7E	CSI-RS BFD
}			
}			
BeamLinkMonitoringRS[4]-r17 ::= SEQUENCE {			
beamLinkMonitoringRS-Id-r17	3		
detectionResource-r17 CHOICE {			
ssb-Index	3	Index of SSB #3	SSB BFD
csi-RS-Index	NZP-CSI-RS-ResourceId for BM(1)	TS 38.508-1[14], Table 7.3.1-7E	CSI-RS BFD
}			
}			
}			
beamFailureInstanceMaxCount-r17	n1		SSB BFD OR CSI-RS BFD

beamFailureDetectionTimer-r17	pbfd4		SSB BFD OR CSI-RS BFD
}			
additionalPCI-r17	not present		
}			
}			

Condition	Explanation
SSB RLM	Used when SSB based RLM is configured in test case
CSI-RS RLM	Used when CSI-RS based RLM is configured in test case
SSB BFD	Used when SSB based BFD is configured in test case
CSI-RS BFD	Used when CSI-RS based BFD is configured in test case

RLF-TimersAndConstants-DEFAULT

Default parameters for RLM related timers and counters.

Table H.3.1-9: RLF-TimersAndConstants-DEFAULT

Derivation Path: TS 38.508-1 [14], Table 4.6.3-150			
Information Element	**Value/remark**	**Comment**	**Condition**
RLF-TimersAndConstants ::= SEQUENCE {			
t310	ms0		
}			

BeamFailureRecoveryConfig-DEFAULT

Default configuration for CBD and contention-free RACH in link recovery.

Table H.3.1-10: BeamFailureRecoveryConfig-DEFAULT

Derivation Path: TS 38.508-1 [14], Table 4.6.3-6			
Information Element	**Value/remark**	**Comment**	**Condition**
BeamFailureRecoveryConfig ::= SEQUENCE {			
rootSequenceIndex-BFR	0		
rach-ConfigBFR	RACH-ConfigGeneric specified in 38.508-1 [14] Table 7.3.1-14		SSB
	RACH-ConfigGeneric specified in 38.508-1 [14] Table 7.3.1-14 with condition PRACH.4 FR1		CSI-RS and FR1
	RACH-ConfigGeneric specified in 38.508-1 [14] Table 7.3.1-14 with condition PRACH.4 FR2		CSI-RS and FR1
rsrp-ThresholdSSB	58	Actual value is 58 - 156 = -98 dBm	SCS15
	61	Actual value is 61 - 156 = -95 dBm	SCS30
	47	Actual value is 47 - 156 = -109 dBm	SCS120
	50	Actual value is 50 - 156 = -106 dBm	SCS240
candidateBeamRSList SEQUENCE (SIZE(1..maxNrofCandidateBeams)) OF CHOICE {	1 entry		
ssb[1] SEQUENCE {			SSB
ssb	1		
ra-PreambleIndex	50		
}			
csi-RS[1] SEQUENCE {			CSI-RS
csi-RS	NZP-CSI-RS-ResourceId of the CSI-RS resource used for CBD		

ra-OccasionList	1		
ra-PreambleIndex	50		
}			
}			
ssb-perRACH-Occasion	oneFourth		
ra-ssb-OccasionMaskIndex	Not present		
	1		PRACH.2 FR1 OR PRACH.2 FR2
recoverySearchSpaceId	SearchSpaceId of the search space used for BFD RAR in DL active BWP		
ra-Prioritization	Not present		
beamFailureRecoveryTimer	Not present		
}			

Condition	Explanation
SSB	Configuration for SSB based CBD
CSI-RS	Configuration for CSI-RS based CBD

BWP-UplinkDedicated

Default BWP configuration for Beam Failure Recovery

Table H.3.1-10A: *BWP-UplinkDedicated*

Derivation Path: TS 38.508-1 [14], Table 4.6.3-15			
Information Element	**Value/remark**	**Comment**	**Condition**
BWP-UplinkDedicated ::= SEQUENCE {			
beamFailureRecoveryConfig	BeamFailureRecoveryConfig-DEFAULT		
}			

Table H.3.1-11: Void

BeamFailureRecoverySCellConfig-DEFAULT

Default configuration for CBD and contention-free RACH in link recovery.

Table H.3.1-12: BeamFailureRecoverySCellConfig-DEFAULT

Derivation Path: TS 38.508-1 [14], Table 4.6.3-6AA			
Information Element	**Value/remark**	**Comment**	**Condition**
BeamFailureRecoverySCellConfig ::= SEQUENCE {			
rsrp-ThresholdBFR-r16	58	-98dBm	SCS15
	61	-95dBm	SCS30
	47	-109dBm	SCS120
candidateBeamRSSCellList-r16 SEQUENCE (SIZE(1..maxNrofCandidateBeams-r16)) OF SEQUENCE {			
CandidateBeamRS-r16[1] SEQUENCE {			
candidateBeamConfig-r16 CHOICE {			
ssb-r16	1		SSB
csi-RS-r16	NZP-CSI-RS-ResourceId of the CSI-RS resource used for CBD		CSI-RS
}			
servingCellId	ServCellIndex of the SCell		
}			
}			

}			

Table H.3.1-12A: BeamFailureRecoverySpCellConfig-DEFAULT

Derivation Path: TS 38.331 [6], clause 6.3.2			
Information Element	**Value/remark**	**Comment**	**Condition**
BeamFailureRecoverySpCellConfig ::= SEQUENCE {			
rsrp-ThresholdBFR-r16	58	-98dBm	SCS15
	61	-95dBm	SCS30
	47	-109dBm	SCS120
candidateBeamRSSpCellList2-r17 SEQUENCE (SIZE(1..maxNrofCandidateBeams-r16)) OF SEQUENCE {			
CandidateBeamRS-r16[1] SEQUENCE {			
candidateBeamConfig-r16 CHOICE {			
ssb-r16	1		SSB
csi-RS-r16	NZP-CSI-RS-ResourceId of the CSI-RS resource used for CBD		CSI-RS
}			
servingCellId	ServCellIndex of the SpCell		
}			
}			
}			

BWP-DownlinkDedicated

Table H.3.1-13: *BWP-DownlinkDedicated*

Derivation Path: TS 38.331 [6], clause 6.3.2			
Information Element	**Value/remark**	**Comment**	**Condition**
BWP-DownlinkDedicated ::= SEQUENCE {			
beamFailureRecoverySCellConfig-r16 CHOICE {			
setup	BeamFailureRecoverySCellConfig-DEFAULT		SCell
}			
}			
beamFailureRecoverySpCellConfig-r17 CHOICE {			
setup	BeamFailureRecoverySpCellConfig-DEFAULT		SpCell
}			
}			

H.3.2 RRC messages and information elements contents exceptions for and handover

Table H.3.2-1: *Void*

Table H.3.2-2: RRCReconfiguration-HO

Derivation Path: TS 38.508-1, Table 4.8.1-1A			
Information Element	**Value/remark**	**Comment**	**Condition**
RRCReconfiguration::= SEQUENCE {			
criticalExtensions CHOICE {			
rrcReconfiguration SEQUENCE {			
radioBearerConfig	RadioBearerConfig with conditions SRB_NR_PDCP and DRBn and Re-		RBConfig_KeyChange

	establish_PDCP		
	RadioBearerConfig with conditions DRBn and Recover_PDCP		RBConfig_NoKeyChange
secondaryCellGroup	Not present		
nonCriticalExtension SEQUENCE {			
masterCellGroup	CellGroupConfig	Table H.3.2-3	
}			
}			
}			
}			

Condition	Explanation
RBConfig_KeyChange	RadioBearerConfig to perform Intra-NR handover with security key change
RBConfig _NoKeyChange	RadioBearerConfig to perform Intra-NR handover without security key change

Table H.3.2-3: CellGroupConfig

Derivation Path: TS 38.508-1 [14] Table 4.6.3-19 with condition PCell_change			
Information Element	**Value/remark**	**Comment**	**Condition**
CellGroupConfig ::= SEQUENCE {			
spCellConfig SEQUENCE {			
reconfigurationWithSync SEQUENCE {			
smtc	SMTC specified in 38.508-1 [14] Table 7.3.1-3 with condition SMTC.n	SMTC.n is the SMTC reference configuration used in test case	
}			
}			

H.3.3 RRC messages and information elements contents exceptions for NR inter-RAT handover

MobilityFromNRCommand

For Inter-RAT NR handover.

Table H.3.3-1: *MobilityFromNRCommand*: InterRAT NR handover

Derivation Path: TS 38.508-1 [14], Table 4.6.1-8			
Information Element	**Value/remark**	**Comment**	**Condition**
MobilityFromNRCommand::= SEQUENCE {			
rrc-TransactionIdentifier	RRC-TransactionIdentifier		
criticalExtensions CHOICE {			
mobilityFromNRCommand SEQUENCE {			
targetRAT-Type	eutra		
targetRAT-MessageContainer	OCTET STRING including the RRCConnectionReconfiguration message according TS 36.508 [2], table 4.6.1-8 with condition HO-TO-EUTRA		
nas-SecurityParamFromNR	The 4 LSB of the downlink NAS COUNT		
lateNonCriticalExtension	Not present		
nonCriticalExtension SEQUENCE {}	Not present		
}			
}			
}			

MobilityFromEUTRACommand

Table H.3.3-2: *MobilityFromEUTRACommand*: inter-RAT handover to NR Cell

Derivation Path:TS 36.508 [25] Table 4.6.1-6			
Information Element	**Value/remark**	**Comment**	**Condition**
MobilityFromEUTRACommand ::= SEQUENCE {			
criticalExtensions CHOICE {			
c1 CHOICE {			
mobilityFromEUTRACommand-r9 SEQUENCE {			
purpose CHOICE {			
handover SEQUENCE {			
targetRAT-Type	nr		
targetRAT-MessageContainer	OCTET STRING containing RRCReconfiguration according to TS 38.508-1 [14] with Condition NR		
nas-SecurityParamFromEUTRA	Not present		
systemInformation	Not present		
}			
}			
}			
}			
}			
}			

H.3.4 E-UTRA RRC messages and information elements contents exceptions

RRCConnectionReconfiguration

Includes the nr-SecondaryCellGroupConfig-r15 to convey NR *RRCReconfiguration* message as specified in TS 38.331 [13].

Table H.3.4-1: RRCConnectionReconfiguration: NR RRC Reconfiguration in EN-DC

Derivation Path: 36.508 [25], Table 4.6.1-8 with condition MCG_and_SCG			
Information Element	**Value/remark**	**Comment**	**Condition**
RRCConnectionReconfiguration ::= SEQUENCE {			
criticalExtensions CHOICE {			
c1 CHOICE{			
rrcConnectionReconfiguration-r8 ::= SEQUENCE {			
nonCriticalExtensions::= SEQUENCE {			
nonCriticalExtensions::= SEQUENCE {			
nonCriticalExtensions::= SEQUENCE {			
nonCriticalExtensions::= SEQUENCE {			
nonCriticalExtensions::= SEQUENCE {			
nonCriticalExtensions::= SEQUENCE {			
nonCriticalExtensions::= SEQUENCE {			
nonCriticalExtensions::= SEQUENCE {			
setup SEQUENCE {			
nr-SecondaryCellGroupConfig-r15	*RRCReconfiguration*		
}			
}			
}			
}			
}			
}			
}			
}			

}			
}			
}			
}			

Table H.3.4-1a: RRCConnectionReconfiguration for measurement configuration

For measurement configuration provided by NR PSCell under EN-DC.

Derivation Path: 36.508 [25], Table 4.6.1-8 with condition MEAS			
Information Element	**Value/remark**	**Comment**	**Condition**
RRCConnectionReconfiguration ::= SEQUENCE {			
criticalExtensions CHOICE {			
c1 CHOICE{			
rrcConnectionReconfiguration-r8 ::= SEQUENCE {			
measConfig	Not present		
	MeasConfig-DEFAULT	Table H.3.4-4	GAP_NEEDED
nonCriticalExtensions::= SEQUENCE {			
nonCriticalExtensions::= SEQUENCE {			
nonCriticalExtensions::= SEQUENCE {			
nonCriticalExtensions::= SEQUENCE {			
nonCriticalExtensions::= SEQUENCE {			
nonCriticalExtensions::= SEQUENCE {			
nonCriticalExtensions::= SEQUENCE {			
nonCriticalExtensions::= SEQUENCE {			
setup SEQUENCE {			
nr-SecondaryCellGroupConfig-r15	*RRCReconfiguration*	Table H.3.1-1	
}			
}			
}			
}			
}			
}			
}			
}			
}			
}			
}			
}			

Condition	Explanation
GAP_NEEDED	Measurement gap is needed in Test

ULInformationTransferMRDC

uplink transfer of MR DC information for transferring the NR RRC Measurement Report message in EN-DC.

Table H.3.4-2: ULInformationTransferMRDC: uplink transfer of MR DC information

Derivation Path: 36.508 [25], Table 4.6.1-27			
Information Element	**Value/remark**	**Comment**	**Condition**
ULInformationTransferMRDC ::= SEQUENCE {			
ul-DCCH-MessageNR-r15	OCTET STRING including the MeasurementReport		
}			

RRCConnectionReconfigurationComplete

Includes the scg-ConfigResponseNR to convey NR *RRCReconfigurationComplete* message as specified in TS 38.331 [13].

Table H.3.4-3: *RRCConnectionReconfigurationComplete*: NR RRC Reconfiguration Complete in EN-DC

Derivation Path: 36.508 [25], Table 4.6.1-9: with condition MCG_and_SCG			
Information Element	**Value/remark**	**Comment**	**Condition**
RRCConnectionReconfigurationComplete ::= SEQUENCE {			
rrc-TransactionIdentifier	RRC-TransactionIdentifier-UL		
criticalExtensions CHOICE {			
rrcConnectionReconfigurationComplete-r8 SEQUENCE {			
nonCriticalExtension SEQUENCE {			
scg-ConfigResponseNR-r15	OCTET STRING including the RRCReconfigurationComplete message according TS 38.508-1, table 4.6.1-14.		
}			
}			
}			
}			

MeasConfig-DEFAULT

Configures measurement gap that applies to FR1 only in EN-DC as specified in TS 38.331 [13].

Table H.3.4-4: MeasConfig-DEFAULT

Derivation Path: 36.508 [25],Table 4.6.6-1			
Information Element	**Value/remark**	**Comment**	**Condition**
MeasConfig-DEFAULT ::= SEQUENCE {			
measObjectToAddModList SEQUENCE (SIZE (1..maxObjectId)) OF SEQUENCE {	1 entry		
measObjectId[1]	1		
measObject[1] CHOICE {			
measObjectEUTRA	MeasObjectEUTRA-GENERIC(Freq)	Freq is the frequency of E-UTRA PCell	
}			
}			
measObjectToAddModList SEQUENCE (SIZE (1..maxObjectId)) OF SEQUENCE {	2 entries		INTER-RAT NR
measObjectId[1]	1		
measObject[1] CHOICE {			
measObjectEUTRA	MeasObjectEUTRA-GENERIC(Freq)	Freq is the frequency of E-UTRA PCell	
}			
measObjectId[2]	2		
measObject[2] CHOICE {			
measObjectNR-r15	MeasObjectNR	Table H.3.4-6	
}			
}			
measObjectToAddModList SEQUENCE (SIZE (1..maxObjectId)) OF SEQUENCE {	3 entries		E-UTRA_Deactivated_SCell
measObjectId[1]	1		
measObject[1] CHOICE {			
measObjectEUTRA	MeasObjectEUTRA-GENERIC(Freq)	Freq is the frequency of E-UTRA PCell Table H.3.4-9	
}			

measObjectId[2]	2		
measObject[2] CHOICE {			
measObjectEUTRA	MeasObjectEUTRA-GENERIC(Freq)	Freq is the frequency of E-UTRA SCell Table H.3.4-9	E-UTRA_Deactivated_SCell
}			
measObjectId[3]	3		
measObject[3] CHOICE {			
measObjectNR-r15	MeasObjectNR	Table H.3.4-6	
}			
}			
reportConfigToAddModList SEQUENCE (SIZE (1..maxReportConfigId)) OF SEQUENCE {	1 entry		INTER-RAT NR OR E-UTRAN_Deactivated_SCell
reportConfigId[1]	1		
reportConfig[1] CHOICE {			
reportConfigEUTRA	ReportConfigEUTRA-A4(Thres)	Set Thres according to test parameters specified in test cases	EVENT A4
	ReportConfigEUTRA-A3(A3-offset)	Table H.3.4-10	E-UTRA_Deactivated_SCell
reportConfigInterRAT	ReportConfigInterRAT-B2-NR(EUTRA-Thres, NR-Thres)	Set EUTRA-Thres and NR-Thres according to test parameters specified in test cases	EVENT B2
	ReportConfigInterRAT-B1-NR(EUTRA-Thres, NR-Thres)	Set EUTRA-Thres and NR-Thres according to test parameters specified in test cases	EVENT B1
	ReportConfigInterRAT-SFTD with Condition INTER-RAT	TS 36.508 [25] Table 4.6.6-8B	SFTD
	ReportConfigInterRAT-PERIODICAL	Table 4.6.6-9 in TS 36.508 [25]	PERIODICAL
}			
}			
measIdToAddModList SEQUENCE (SIZE (1..maxMeasId)) OF SEQUENCE {	1 entry		INTER-RAT NR OR E-UTRA_Deactivated_SCell
measId[1]	1		
measObjectId[1]	2		
reportConfigId[1]	1		
}			
measGapConfig	MeasGapConfig-FR1	Table H.3.4-5	
	Not present		GAPLESS
fr1-Gap-r15	false		gapUE
	true		gapFR1
	Not present		E-UTRA_Deactivated_SCell
quantityConfig	QuantityConfig-DEFAULT	Table H.3.4-11	E-UTRA_Dea

			ctivated_SCell
}			

Condition	Explanation
gapUE	fr1-Gap-r15 set to false indicates the gap is applicable for measurements on FR1 and FR2. E-UTRAN includes this field only when the UE is configured with (NG)EN-DC.
gapFR1	fr1-Gap-r15 set to true indicates the gap is only applicable for measurements on FR1. E-UTRAN includes this field only when the UE is configured with (NG)EN-DC.
INTER-RAT NR	Measurement configuration for inter-RAT NR measurements
EVENT B2	For event B2 triggered measurement reporting test cases
EVENT B1	For event B1 triggered measurement reporting test cases
EVENT A4	For event A4 triggered measurement reporting
SFTD	For inter-RAT SFTD measurement test cases
GAPLESS	MG is not needed in test
PERIODICAL	For periodic measurement reporting test cases
E-UTRA_Deactivated_SCell	For test cases with an LTE deactivated SCell

MeasGapConfig

Configures measurement gap by LTE RRC in EN-DC as specified in TS 38.331 [13].

Table H.3.4-5: MeasGapConfig

Derivation Path: 36.508 [25],Table 4.6.6-1A			
Information Element	**Value/remark**	**Comment**	**Condition**
MeasGapConfig ::= CHOICE {			
setup SEQUENCE {			
gapOffset CHOICE {			
gp0	39	TGRP = 40 ms	Pattern #0
	0		BFD
gp4-r15	19	TGRP = 20 ms	Pattern #4
}			
}			
}			

Condition	Explanation
Pattern #0	*gp0* corresponds to gap offset of Gap Pattern Id "0" with MGRP = 40ms
Pattern #4	*gp4-r15* corresponds to gap offset of Gap Pattern Id "4" with MGRP = 40ms (see TS 38.133, Table 9.1.2-1). It can be applied for (NG)EN-DC, see TS 38.133, Table 9.1.2-2.
BFD	Measurement gap pattern for Beam Failure Dectection tests

Table H.3.4-6: MeasObjectNR

Derivation Path: TS 36.508 [25] Table 4.6.6-2B			
Information Element	**Value/remark**	**Comment**	**Condition**
MeasObjectNR-GENERIC(Freq) ::= SEQUENCE {			
rs-ConfigSSB-r15 ::= SEQUENCE {			
measTimingConfig-r15 ::= SEQUENCE {			
periodicityAndOffset-r15 CHOICE {			
sf20-r15	0		SMTC.1 or SMTC.2
	10		SMTC.4 or SMTC.5
	17		SMTC.6
sf160-r15	0		SMTC.3
}			
ssb-Duration-r15	sf1		SMTC.1, SMTC.3 or SMTC.4
	sf5		SMTC.2, SMTC.5 or SMTC.6
}			

subcarrierSpacingSSB-r15	kHz15		SSB.1 FR1, SSB.3 FR1 or SSB.5 FR1
	kHz30		SSB.2 FR1, SSB.4 FR1 or SSB.6 FR1
	kHz120		SSB.1 FR2, SSB.3 FR2, SSB.5 FR2 or SSB.7 FR2
	KHz240		SSB.2 FR2, SSB.4 FR2, SSB.6 FR2 or SSB.8 FR2
}			
deriveSSB-IndexFromCell-r15	Not present		
	true		Synchronous cells
	false		Asynchronous cells
}			

Table H.3.4-7: RRCConnectionReconfiguration for iRAT measurement configuration

Derivation Path: 36.508 [25], Table 4.6.1-8 with condition MEAS			
Information Element	**Value/remark**	**Comment**	**Condition**
RRCConnectionReconfiguration ::= SEQUENCE {			
criticalExtensions CHOICE {			
c1 CHOICE{			
rrcConnectionReconfiguration-r8 ::= SEQUENCE {			
measConfig	MeasConfig-DEFAULT with Conditions INTER RAT NR and PERIODICAL	Table H.3.4-4	
	MeasConfig-DEFAULT with Conditions INTER RAT NR and SFTD	Table H.3.4-4	INTER-RAT and SFTD
	MeasConfig-DEFAULT with Conditions INTER RAT NR and EVENT B2	Table H.3.4-4	INTER-RAT and EVENT B2
	MeasConfig-DEFAULT with Conditions INTER RAT NR and EVENT B1	Table H.3.4-4	INTER-RAT and EVENT B1
}			
}			
}			
}			

Table H.3.4-8: ReportConfigInterRAT-B2-NR(EUTRA-Thres, NR-Thres)

Derivation Path: 36.508 [25], Table 4.6.6-8A			
Information Element	**Value/remark**	**Comment**	**Condition**
ReportConfigInterRAT-B2-NR ::= SEQUENCE {			
maxReportRS-Index-r15	2		SSB-Index
reportQuantityRS-IndexNR-r15 SEQUENCE {			SSB-Index
ss-rsrp	TRUE		
ss-rsrq	FALSE		
ss-sinr	FALSE		
}			
reportRS-IndexResultsNR	TRUE		SSB-Index
}			

Condition	Explanation
SSB-Index	To include SSB Index

Table H.3.4-9: MeasObjectEUTRA-GENERIC(Freq)

Derivation Path: 36.508 [25],Table 7.3.3-1			
Information Element	**Value/remark**	**Comment**	**Condition**
MeasObjectEUTRA-GENERIC(Freq) ::= SEQUENCE {			
measCycleSCell-r10	sf640		E-UTRA_Deactivated_SCell
}			

Table H.3.4-10: ReportConfigEUTRA-A3(a3-offset)

Derivation Path: 36.508 [25],Table 4.6.6-6			
Information Element	**Value/remark**	**Comment**	**Condition**
ReportConfigEUTRA-A3 ::= SEQUENCE {			
triggerType CHOICE {			
event SEQUENCE {			
eventId CHOICE {			
eventA3 SEQUENCE {			
a3-Offset	A3-offset *2	The actual value is field value * 0.5 dB	
}			
}			
timeToTrigger	ms0		
}			
}			
reportQuantity	sameAsTriggerQUantity		
maxReportCells	2		
reportInterval	ms1480		
reportAmount	r2		
}			

Table H.3.4-11: QuantityConfig-DEFAULT

Derivation Path: 36.508 [25],Table 4.6.6-3A			
Information Element	**Value/remark**	**Comment**	**Condition**
QuantityConfig-DEFAULT ::= SEQUENCE {			
quantityConfigEUTRA SEQUENCE {			
filterCoefficientRSRP	fc0		
filterCoefficientRSRQ	fc0		
}			
quantityConfigNRList-r15 (SIZE (1..maxQuantSetsNR-r15)) OF SEQUENCE {	1 entries		
measQuantityCellNR-r15[1] SEQUENCE {			
filterCoeff-RSRP-r15	fc0		
filterCoeff-RSRQ-r15	fc0		
filterCoefficient-SINR-r13	fc0		
}			
}			
}			

H.3.5 RRC messages and information elements contents exceptions for NR radio link monitoring (RLM)

CSI-RS information elements contents exception for NR RLM SSB-Based test cases

Table H.3.5-1 to H.3.5-3: Void

Table H.3.5-4: CSI-ReportConfig

Derivation Path: TS 38.508[14] Table 7.3.1-12F			
Information Element	**Value/remark**	**Comment**	**Condition**
CSI-ReportConfig ::= SEQUENCE {			
reportConfigType CHOICE {			
periodic SEQUENCE {			
reportSlotConfig ::= CHOICE {			
slots5	0		SCS15kHz_FDD
slots5	2		SCS15kHz_TDD
slots10	4		SCS30kHz
slots40	16		SCS120kHz
}			
pucch-CSI-ResourceList SEQUENCE (SIZE (1..maxNrofBWPs)) OF{			
PUCCH_CSI_Resource[0] SEQUENCE {			
uplinkBandwidthPartId	BWP-Id		
pucch_Resource	9		
}			
}			
}			
}			
}			

Table H.3.5-5 to H.3.5-7: Void

BWP-DownlinkDedicated: to setup radioLinkMonitoringConfig Configuration

Table H.3.5-8: Void

RadioLinkMonitoringConfig: Configuration for RLM RS

Table H.3.5-9: *RadioLinkMonitoringConfig*

Derivation Path: TS 38.508-1 [4], Table 4.6.3-133			
Information Element	**Value/remark**	**Comment**	**Condition**
RadioLinkMonitoringConfig ::= SEQUENCE {			
failureDetectionResourcesToAddModList SEQUENCE (SIZE(1..maxNrofFailureDetectionResources)) OF SEQUENCE {	n entries	n = 1 for FR1, n = 2 for FR2	
radioLinkMonitoringRS-Id[1]	0		
purpose[1]	rlf		
detectionResource[1] CHOICE {			
ssb-Index	0	Index of SSB #0	SSB RLM
csi-RS-Index	NZP-CSI-RS-ResourceId for TRS(4)	TS 38.508-1[14], table 7.3.1-7C	CSI-RS RLM
}			
RadioLinkMonitoringRS[2] SEQUENCE {			FR2
radioLinkMonitoringRS-Id	1		
purpose	rlf		
detectionResource CHOICE {			
ssb-Index	1	Index of SSB #1	SSB RLM

csi-RS-Index	NZP-CSI-RS-ResourceId for TRS(4) with condition SECOND_SET	TS 38.508-1[14], table 7.3.1-7C	CSI-RS RLM
}			
failureDetectionResourcesToReleaseList	Not present		
beamFailureInstanceMaxCount	Not present		
beamFailureDetectionTimer	Not present		
}			

Condition	Explanation
SSB RLM	Configuration for SSB based RLM test cases
CSI-RS RLM	Configuration for CSI-RS based RLM test cases

Table H.3.5-10: Void

H.3.6 RRC messages and IE content exceptions for L1-RSRP measurement for beam reporting

ServingCellConfig: Default generic configuration for enabling CSI measurements and reporting

Table H.3.6-1: Void

CSI-ReportConfig: Default generic configuration for L1-RSRP measurements

Table H.3.6-2: CSI-ReportConfig

Derivation Path: TS 38.508-1 [14], Table 7.3.1-12G			
Information Element	**Value/remark**	**Comment**	**Condition**
CSI-ReportConfig ::= SEQUENCE {			
csi-IM-ResourcesForInterference	Not present		
nzp-CSI-RS-ResourcesForInterference	Not present		
reportConfigType CHOICE {			
periodic SEQUENCE {			PERIODIC
reportSlotConfig CHOICE {			
slot80	7	Periodicity 80 slots and offset 7	SCS30
	2	Periodicity 80 slots and offset 2	SCS15
slot320	4	Periodicity 320 slots and offset 4	FR2
pucch-CSI-ResourceList SEQUENCE {	1 entry		
(SIZE (1..maxNrofBWPs)) OF SEQUENCE {			
uplinkBandwidthPartId	BWP-Id of active BWP		
pucch-Resource	8	PUCCH-format2 as configured in TS 38.508-1 [14], Table 4.6.3-112	
}			
}			
}			
}			
reportQuantity CHOICE {			
ssb-Index-RSRP	NULL		SS-RSRP
cri-RSRP	NULL		CSI-RSRP
}			
timeRestrictionForChannelMeasurements	configured		
groupBasedBeamReporting CHOICE {			
disabled SEQUENCE {			
nrofReportedRS	n2		

}			
}			
}			

Condition	Explanation
PERIODIC	Configuration for periodic reporting
SS-RSRP	L1-RSRP measurement based on SSB
CSI-RSRP	L1-RSRP measurement based on CSI-RS

CSI-ResourceConfig: Default generic resource configuration for L1-RSRP measurements

Table H.3.6-3: CSI-ResourceConfig

Derivation Path: TS 38.508-1 [14], Table 7.3.1-12B			
Information Element	**Value/remark**	**Comment**	**Condition**
CSI-ResourceConfig ::= SEQUENCE {			
csi-RS-ResourceSetList CHOICE {			
nzp-CSI-RS-SSB SEQUENCE {			
nzp-CSI-RS-ResourceSetList SEQUENCE (SIZE (1..maxNrofNZP-CSI-RS-ResourceSetsPerConfig)) OF {	1 entry		CSI-RS
NZP-CSI-RS-ResourceSetId[0]	0		
}			
csi-SSB-ResourceSetList SEQUENCE (SIZE (1..maxNrofCSI-SSB-ResourceSetsPerConfig)) OF {	1 entry		SSB
CSI-SSB-ResourceSetId[0]	0		
}			
}			
}			
}			

Condition	Explanation
SSB	Configuration for SSB based CSI
CSI-RS	Configuration for CSI-RS based CSI

Table H.3.6-4 to H.3.6-9: Void

H.3.6A RRC messages and IE content exceptions for L1-SINR measurement for beam reporting

ServingCellConfig: Default generic configuration for enabling CSI measurements and reporting.

CSI-ReportConfig: Default generic configuration for L1-SINR measurements.

Table H.3.6A-1: CSI-ReportConfig

Derivation Path: TS 38.508-1 [14], Table 7.3.1-12G			
Information Element	**Value/remark**	**Comment**	**Condition**
CSI-ReportConfig ::= SEQUENCE {			
csi-IM-ResourcesForInterference	CSI-IM-ResourceConfigId-IMR		CSI-IM_IMR
	CSI-IM-ResourceConfigId-IMR with condition APERIODIC		CSI-IM_IMR AND APERIODIC
nzp-CSI-RS-ResourcesForInterference	CSI-ResourceConfigId-IMR		CSI-RS_IMR
	CSI-ResourceConfigId-IMR with condition APERIODIC		CSI-RS_IMR AND

			APERIODIC
reportConfigType CHOICE {			
periodic SEQUENCE {			PERIODIC
reportSlotConfig CHOICE {			
slot80	7	Periodicity 80 slots and offset 7	SCS30
	2	Periodicity 80 slots and offset 2	SCS15
	4	Periodicity 80 slots and offset 4	FR2
pucch-CSI-ResourceList SEQUENCE {	1 entry		
(SIZE (1..maxNrofBWPs)) OF SEQUENCE {			
uplinkBandwidthPartId	BWP-Id of active BWP		
pucch-Resource	8	PUCCH-format2 as configured in TS 38.508-1 [14], Table 4.6.3-112	
}			
}			
}			
}			
aperiodic SEQUENCE {			APERIODIC
reportSlotOffsetList SEQUENCE (SIZE (1..maxNrofUL-Allocations)) OF {	1 entry		
INTEGER[1]	26		
}			
}			
}			
timeRestrictionForChannelMeasurements	configured		
groupBasedBeamReporting CHOICE {			
disabled SEQUENCE {			
nrofReportedRS	n2		
}			
}			
reportQuantity-r16 CHOICE {			
cri-SINR-r16	NULL		CSI-SINR
ssb-Index- SINR-r16	NULL		SS-SINR
}			
}			

Condition	Explanation
PERIODIC	Configuration for periodic reporting
APERIODIC	Configuration for aperiodic reporting
SS-SINR	L1-SINR measurement based on SSB
CSI- SINR	L1-SINR measurement based on CSI-RS
CSI-RS_IMR	Configuration for NZP-CSI-RS based IMR
CSI-IM_IMR	Configuration for CSI-IM based IMR

CSI-ResourceConfig for CMR: Default generic resource configuration for L1-SINR measurements.

Table H.3A.6-2: CSI-ResourceConfig for CMR

Derivation Path: TS 38.508-1 [14], Table 7.3.1-12B			
Information Element	**Value/remark**	**Comment**	**Condition**
CSI-ResourceConfig ::= SEQUENCE {			
csi-RS-ResourceSetList CHOICE {			
nzp-CSI-RS-SSB SEQUENCE {			
nzp-CSI-RS-ResourceSetList SEQUENCE (SIZE (1..maxNrofNZP-CSI-RS-ResourceSetsPerConfig)) OF {	1 entry		CSI-RS
NZP-CSI-RS-ResourceSetId[1]	0		
}			
csi-SSB-ResourceSetList SEQUENCE (SIZE (1..maxNrofCSI-SSB-ResourceSetsPerConfig)) OF {	1 entry		SSB

CSI-SSB-ResourceSetId[1]	0		
}			
}			
}			
bwp-Id	BWP-Id of active BWP		
resourceType	aperiodic		APERIODIC
	periodic		PERIODIC
}			

Condition	Explanation
SSB	Configuration for SSB based CMR
CSI-RS	Configuration for CSI-RS based CMR

CSI-ResourceConfig for IMR: For NZP-CSI-RS resource configured as dedicated IMR, refer to Table H.3A.6-3; For CSI-IM resource configured as dedicated IMR, refer to Table H.3A.6-4.

Table H.3A.6-3: CSI-ResourceConfig for NZP-CSI-RS as IMR

Derivation Path: TS 38.508-1 [14], Table 7.3.1-12B			
Information Element	**Value/remark**	**Comment**	**Condition**
CSI-ResourceConfig ::= SEQUENCE {			
csi-ResourceConfigId	CSI-ResourceConfigId-IMR		
	CSI-ResourceConfigId-IMR with condition APERIODIC		APERIODIC
csi-RS-ResourceSetList CHOICE {			
nzp-CSI-RS-SSB SEQUENCE {			
nzp-CSI-RS-ResourceSetList SEQUENCE (SIZE (1..maxNrofNZP-CSI-RS-ResourceSetsPerConfig)) OF {	1 entry		
NZP-CSI-RS-ResourceSetId[1]	NZP-CSI-RS-ResourceSetId-IMR		
	NZP-CSI-RS-ResourceSetId-IMR with condition APERIODIC		APERIODIC
}			
}			
}			
bwp-Id	BWP-Id of active BWP		
resourceType	aperiodic		APERIODIC
	periodic		PERIODIC
}			

Table H.3A.6-3a: NZP-CSI-RS-ResourceSet for IMR

Derivation Path: TS 38.508-1 [14], Table 7.3.1-11B			
Information Element	**Value/remark**	**Comment**	**Condition**
NZP-CSI-RS-ResourceSet ::= SEQUENCE {			
nzp-CSI-ResourceSetId	NZP-CSI-RS-ResourceSetId-IMR		
	NZP-CSI-RS-ResourceSetId-IMR with condition APERIODIC		APERIODIC
nzp-CSI-RS-Resources SEQUENCE (SIZE (1..maxNrofNZP-CSI-RS-ResourcesPerSet)) OF NZP-CSI-RS-ResourceId {	2 entries		
NZP-CSI-RS-ResourceId[1]	NZP-CSI-RS-ResourceId for IMR(0)	INTEGER 12	
	NZP-CSI-RS-ResourceId for IMR(0) with condition APERIODIC	INTEGER 22	APERIODIC
NZP-CSI-RS-ResourceId[2]	NZP-CSI-RS-ResourceId for IMR(1)	INTEGER 13	

	NZP-CSI-RS-ResourceId for IMR(1) with condition APERIODIC	INTEGER 23	APERIODIC
}			
aperiodicTriggeringOffset	6		APERIODIC
}			

Table H.3A.6-3b: NZP-CSI-RS-Resource for IMR(Id)

Derivation Path: TS 38.508-1 [14], Table 7.3.1-7B			
Information Element	**Value/remark**	**Comment**	**Condition**
NZP-CSI-RS-Resource ::= SEQUENCE {			
nzp-CSI-RS-ResourceId	NZP-CSI-RS-ResourceId for IMR(Id)		
	NZP-CSI-RS-ResourceId for IMR(Id) with condition APERIODIC		APERIODIC
resourceMapping SEQUENCE {			
frequencyDomainAllocation CHOICE {			
row1	0001		
}			
nrofPorts	p1		
firstOFDMSymbolInTimeDomain	6		Id = 0
	10		Id = 1
	7		Id = 0 AND APERIODIC
	11		Id = 1 AND APERIODIC
cdm-Type	noCDM		
density CHOICE {			
three	NULL		
}			
freqBand	CSI-FrequencyOccupation-RRM		See TS 38.508-1 [14], Table 7.3.1-10
}			
powerControlOffset	0		
powerControlOffsetSS	db0		
scramblingID	0		
periodicityAndOffset {			
slots20	1		SCS15
slots40	2		SCS30
}			
periodicityAndOffset	Not present		APERIODIC
qcl-InfoPeriodicCSI-RS	Not present		
}			

Table H.3A.6-3c: NZP-CSI-RS-ResourceSetId-IMR

Derivation Path: TS 38.331 [6], clause 6.3.2			
Information Element	**Value/remark**	**Comment**	**Condition**
NZP-CSI-RS-ResourceSetId	1		

Table H.3A.6-4: CSI-ResourceConfig for CSI-IM as IMR

Derivation Path: TS 38.508-1 [14], Table 7.3.1-12B			
Information Element	**Value/remark**	**Comment**	**Condition**
CSI-ResourceConfig ::= SEQUENCE {			
csi-ResourceConfigId	CSI-IM-ResourceConfigId-IMR		
	CSI-IM-ResourceConfigId-IMR		APERIODIC

	with condition APERIODIC		
csi-RS-ResourceSetList CHOICE {			
csi-IM-ResourceSetList SEQUENCE (SIZE (1..maxNrofCSI-IM-ResourceSetsPerConfig) OF {	1 entry		
CSI-IM-ResourceSetId[1]	CSI-IM-ResourceSetId-IMR		
	CSI-IM-ResourceSetId-IMR with condition APERIODIC		APERIODIC
}			
}			
bwp-Id	BWP-Id of active BWP		
resourceType	aperiodic		APERIODIC
	periodic		PERIODIC
}			

Table H.3A.6-4a: CSI-IM-ResourceSet for IMR

Derivation Path: TS 38.508-1 [14], Table 7.3.1-26			
Information Element	**Value/remark**	**Comment**	**Condition**
CSI-IM-ResourceSet ::= SEQUENCE {			
csi-IM-ResourceSetId	CSI-IM-ResourceSetId-IMR		
	CSI-IM-ResourceSetId-IMR with condition APERIODIC		APERIODIC
csi-IM-Resources SEQUENCE (SIZE (1..maxNrofCSI-IM-ResourcesPerSet)) OF CSI-IM-ResourceId {	2 entries		
CSI-IM-ResourceId[1]	CSI-IM-ResourceId for IMR(0)	INTEGER 0	
	CSI-IM-ResourceId for IMR(0) with condition APERIODIC	INTEGER 10	APERIODIC
CSI-IM-ResourceId[2]	CSI-IM-ResourceId for IMR(1)	INTEGER 1	
	CSI-IM-ResourceId for IMR(1) with condition APERIODIC	INTEGER 11	APERIODIC
}			
}			

Table H.3A.6-4b: CSI-IM-Resource for IMR(Id)

Derivation Path: TS 38.508-1 [14], Table 7.3.1-24			
Information Element	**Value/remark**	**Comment**	**Condition**
CSI-IM-Resource ::= SEQUENCE {			
csi-IM-ResourceId	CSI-IM-ResourceId for IMR(Id)		
	CSI-IM-ResourceId for IMR(Id) with condition APERIODIC		APERIODIC
csi-IM-ResourceElementPattern CHOICE {			
pattern1 SEQUENCE {			
subcarrierLocation-p1	s0		
symbolLocation-p1	6		Id = 0
	10		Id = 1
	7		Id = 0 AND APERIODIC
	11		Id = 1 AND APERIODIC
}			
}			
freqBand	CSI-		See TS

	FrequencyOccupation-RRM		38.508-1 [14], Table 7.3.1-10
periodicityAndOffset	CSI-ResourcePeriodicityAndOffset for CSI		
slots20	1		SCS15
slots40	2		SCS30
}			
periodicityAndOffset	Not present		APERIODIC
}			

Table H.3A.6-4c: CSI-IM-ResourceSetId-IMR

Derivation Path: TS 38.331 [6], clause 6.3.2			
Information Element	**Value/remark**	**Comment**	**Condition**
CSI-IM-ResourceSetId	0		

H.3.7 RRC messages and information elements contents exceptions for NR cell search when DRX is used

MAC-CellGroupConfig: DRX configuration for NR serving cell

Table H.3.7-1: *MAC-CellGroupConfig:* NR intra-frequency cell search when DRX is used

Derivation Path: TS 38.508-1, Table 4.6.3-68			
Information Element	**Value/remark**	**Comment**	**Condition**
MAC-CellGroupConfig ::= SEQUENCE {			
drx-Config CHOICE {			
setup SEQUENCE {			
drx-onDurationTimer CHOICE {			
milliSeconds	ms1		DRX.1 OR DRX.2 OR DRX.6
	ms6		DRX.3 OR DRX.7 OR DRX.8 OR DRX.11
}			
drx-InactivityTimer	ms1		
drx-RetransmissionTimerDL	sl1		
drx-RetransmissionTimerUL	sl1		
drx-LongCycleStartOffset CHOICE {			
ms20	0		DRX.11
ms40	0		DRX.1 or DRX.3
	10		(DRX.1 and Gap) OR (DRX.1 and Offset) OR (DRX.3 and Offset)
	15		DRX.1 and Gap and INTER-FREQ
	20		DRX.3 and Gap
ms320	0		DRX.6 OR DRX.8
	10		DRX.6 and Gap
ms640	0		DRX.2 OR DRX.7
	10		(DRX.2 and

			Gap) OR (DRX.7 and Offset)
	15		(DRX.2 OR DRX.7) and Gap and INTER-FREQ
}			
shortDRX	not present		
drx-SlotOffset	0		
}			
}			
tag-Config SEQUENCE {			
tag-ToReleaseList	Not present		
tag-ToAddModList SEQUENCE (SIZE (1..maxNrofTAGs)) OF SEQUENCE {	1 entry		
tag-Id[1]	0		
timeAlignmentTimer[1]	ms500		DRX.1 OR DRX.2 OR DRX.6
	infinity		DRX.3 OR DRX.7 OR DRX.8 OR DRX.11
}			
}			

Condition	Explanation
DRX.1	DRX Configuration 1 according to TS 38.133 [6] A.3.3.1
DRX.2	DRX Configuration 2 according to TS 38.133 [6] A.3.3.2
DRX.3	DRX Configuration 3 according to TS 38.133 [6] A.3.3.3
DRX.6	DRX Configuration 6 according to TS 38.133 [6] A.3.3.6
DRX.7	DRX Configuration 7 according to TS 38.133 [6] A.3.3.7
DRX.8	DRX Configuration 8 according to TS 38.133 [6] A.3.3.8
INTER-FREQ	Configuration for inter-frequency NR measurement tests
Gap	Configuration for tests with measurement gap
Offset	Tests that requires offset for DRX to eliminate overlap of DRX and SMTC

MAC-MainConfig: DRX configuration for E-UTRAN serving cell

Table H.3.7-2: MAC-MainConfig

Derivation Path: 36.508, Table 4.8.2.1.5-1			
Information Element	**Value/remark**	**Comment**	**Condition**
MAC-MainConfig ::= SEQUENCE {			
drx-Config CHOICE {			
setup SEQUENCE {			
onDurationTimer	psf2		DRX.4 OR DRX.9
	psf6		DRX.5 OR DRX.10 OR DRX.12
drx-InactivityTimer	psf2		DRX.4 OR DRX.12
	psf1920		DRX.5 OR DRX.10
	psf100		DRX.9
longDRX-CycleStartOffset CHOICE {			
sf160	0		DRX.4
sf320	0		DRX.5
	10		DRX.5 and Gap
sf40	0		DRX.9
	10		DRX.9 and

			Gap
sf640	0		DRX.10 OR DRX.12
	10		DRX.12 and Gap
}			
}			
}			
timeAlignmentTimerDedicated	infinity		DRX.4 OR DRX.5 OR DRX.12
	sf500		DRX.9 OR DRX.10
}			

Condition	Explanation
DRX.4	DRX Configuration 4 according to TS 38.133 [6] A.3.3.4
DRX.5	DRX Configuration 5 according to TS 38.133 [6] A.3.3.5
DRX.9	DRX Configuration 9 according to TS 38.133 [6] A.3.3.9
DRX.10	DRX Configuration 10 according to TS 38.133 [6] A.3.3.10
DRX.12	DRX Configuration 12 according to TS 38.133 [6] A.3.3.12

H.3.8 RRC messages and information elements contents exceptions for NR RRC reconfiguration delay

ServingCellConfigCommonSIB: information elements content exception for RRC reconfiguration delay test cases to specific both NR uplink and supplementary uplink for SCell.

Table H.3.8-1: ServingCellConfigCommonSIB-Procedure Delay

Derivation Path: TS 38.508-1, table 4.6.3-169			
Information Element	**Value/remark**	**Comment**	**Condition**
ServingCellConfigCommonSIB ::= SEQUENCE {			
downlinkConfigCommon	DownlinkConfigCommonSIB		
uplinkConfigCommon	UplinkConfigCommonSIB	NR uplink	
	UplinkConfigCommonSIB with condition SUL_NUL		SUL
supplementaryUplink	UplinkConfigCommonSIB with condition SUL_SUL		SUL
n-TimingAdvanceOffset	Not present		
ssb-PositionsInBurst SEQUENCE {			
inOneGroup	'0100 0000'B	When carrier frequency is smaller than or equal to 3 GHz, only the 4 leftmost bits are valid;	
groupPresence	Not present		
}			
ssb-PeriodicityServingCell	ms20		
tdd-UL-DL-ConfigurationCommon	TDD-UL-DL-ConfigCommon		FR1_TDD
ss-PBCH-BlockPower	0		
}			

RRCReconfiguration: information elements contents exception for RRC reconfiguration delay test cases to specific radio bearers and cell groups.

Table H.3.8-2: RRCReconfiguration-Procedure Delay

Derivation Path: TS 38.508-1, table 4.6.1-13			
Information Element	**Value/remark**	**Comment**	**Condition**
RRCReconfiguration::= SEQUENCE {			
criticalExtensions CHOICE {			
c1 CHOICE {			
rrcReconfiguration ::= SEQUENCE {			
radioBearerConfig	RadioBearerConfig with conditions SRB2 and DRB1		
}			
secondaryCellGroup	CellGroupConfig with condition EN-DC_SCell_add	OCTET STRING (CONTAINING CellGroupConfig)	
nonCriticalExtension SEQUENCE {			
masterCellGroup	CellGroupConfig with conditions EN-DC	OCTET STRING (CONTAINING CellGroupConfig)	
}			
}			
}			
}			

H.3.9 RRC messages and information elements contents exceptions for UL timing

Table H.3.9-1: *PUSCH-TimeDomainResourceAllocationList*

Derivation Path: TS 38.508-1, Table 4.6.3-122			
Information Element	**Value/remark**	**Comment**	**Condition**
PUSCH-TimeDomainResourceAllocationList ::= SEQUENCE (SIZE(1..maxNrofUL-Allocations)) OF {	2 entries		
PUSCH-TimeDomainResourceAllocation[1] SEQUENCE {			
startSymbolAndLength	41	Start symbol(S)=0, Length(L)=13	
}			
PUSCH-TimeDomainResourceAllocation[2] SEQUENCE {		addressed by Msg3 PUSCH time resource allocation field of the Random Access Response acc. to TS 38.213 [22] Table 8.2-1.	
startSymbolAndLength	41	Start symbol(S)=0, Length(L)=13	
}			
}			

Annex I (normative): RRM OTA procedures

Annex I defines the RRM OTA procedures for the permitted testing methodologies defined in [32].

I.0 Test applicability per permitted test method

The applicability of each permitted test method for the different RRM Angle of Arrival (AoA) setups as defined in Clause A.9 is defined in Table I.0-1.

Table I.0-1 AoA Test Setup applicability per permitted test method

AoA Test Setup	D > 5cm or No declaration	D ≤ 5cm
Setup 1	IFF, Enhanced IFF	DFF, IFF, Enhanced IFF, IFF+DFF
Setup 2a	IFF, Enhanced IFF	DFF, IFF, Enhanced IFF, IFF+DFF
Setup 2b	IFF, Enhanced IFF	DFF, IFF, Enhanced IFF, IFF+DFF
Setup 3	Enhanced IFF	DFF, Enhanced IFF, IFF+DFF
Setup 4a	Enhanced IFF	DFF, Enhanced IFF, IFF+DFF
Setup 4b	Enhanced IFF	DFF, Enhanced IFF, IFF+DFF
NOTE1: D =The diameter of the smallest sphere that encloses the radiating parts of the phase coherent array antenna(s) active at any one time during the test., declared by UE vendor as per Table 4.3.9-9 in TS 38.508-2 NOTE2: DFF indicates both DFF and DFF simplification in TR 38.810. NOTE3: For DFF and DFF part of IFF+DFF, minimum range length needs to meet the requirement as specified in 38.508-1 Annex B.2.2-4 with the declared D		

I.1 Direct far field (DFF)

I.1.1 RX beam peak direction search

The Rx beam peak direction search can be found using any of the following options:

- Same measurement procedure as in clause Annex K.1.2 of TS 38.521-2 [18].
- Any of the procedures described in Annex I.4.

I.1.2 Search for directions corresponding to the EIS spherical coverage percentile

The test directions corresponding to the EIS spherical coverage percentile can be found using any of the following options:

- EIS spherical coverage scan procedure as described in Annex K.1.6 of TS 38.521-2 [18].
- Any of the procedures described in Annex I.4.

I.2 Direct far field (DFF) simplification

I.2.1 RX beam peak direction search

The Rx beam peak direction search can be found using any of the following options:

- Same measurement procedure as in clause Annex K.2.2 of TS 38.521-2 [18].

- Any of the procedures described in Annex I.4.

I.2.2 Search for directions corresponding to the EIS spherical coverage percentile

The test directions corresponding to the EIS spherical coverage percentile can be found using any of the following options:

- EIS spherical coverage scan procedure as described in Annex K.1.6 of TS 38.521-2 [18].
- Any of the procedures described in Annex I.4.

I.3 Indirect far field (IFF)

I.3.1 RX beam peak direction search

The Rx beam peak direction search can be found using any of the following options:

- Same measurement procedure as in clause Annex K.3.2 of TS 38.521-2 [18].
- Any of the procedures described in Annex I.4.

I.3.2 Search for directions corresponding to the EIS spherical coverage percentile

The test directions corresponding to the EIS spherical coverage percentile can be found using any of the following options:

- EIS spherical coverage scan procedure as described in Annex K.1.6 of TS 38.521-2 [18].
- Any of the procedures described in Annex I.4.

I.3A Enhanced indirect far field (Enhanced IFF)

I.3A.1 RX beam peak direction search

Same as in clause I.3.1 for IFF.

I.3A.2 Search for directions corresponding to the EIS spherical coverage percentile

Same as in clause I.3.2 for IFF.

I.4 Procedures to search test directions for RRM FR2

I.4.1 RSRPB-based scan with fallback option to Rx beam peak direction search

This clause provides RSRPB-based scan to find the Rx beam peak of the UE for Setup 1, single AoA cases and one of the test directions for Setup 4. It also provides a method to find test directions fulfilling the EIS Spherical Coverage (TS 38.521-2 [18] clause 7.3.4.3) for Setup 2, 3 and 4. Other approaches are not precluded. RSRPB-based peak beam scan greatly reduces the time to find the peak beam position compared to traditional EIS scan using either constant step size or constant density. The procedure can be used with DFF as well as IFF methodology. The procedure is achieved implementing the following steps:

1. Enable periodic RSRPB reporting from the UE

2. Set of grid points for the UE scan can be user defined set or entire sphere.
3. Set the DL SSB_RP (at the centre of the QZ) to -95 dBm / SCS. For each grid point, record RSRPB first by connecting SS to the DUT through the measurement antenna with Pol_{Link}= θ polarization to form the Rx beam towards the measurement antenna.
4. Wait for BEAM_SELECT_WAIT_TIME before recording the RSRPB reports.

4a For each of the grid points, calculate the RSRPB result for Pol_{Link}= θ as the linear sum of the 2 RSRPB reports (one per receiver branch).

4b Repeat Steps 3, 4 and 4a with Pol_{Link}= ϕ.

5. Once the grid points scan is completed, sort the grid points based on the linear sum of the RSRPB results for Pol_{Link}= θ and Pol_{Link}= ϕ.
6. For the top 10 grid points, run the REFSENS throughput test as per the test condition defined in TS 38.521-2 [18] clause 7.3.2
7. Select the grid point with the best REFSENS result among the 10 points from Step 6 as the Rx beam peak for RRM test cases using AoA Setup 1 or 4.

.

8. Use the EIS result for the RRM beam peak to offset the RSRPB results to obtain an estimate of the EIS Spherical coverage (SC) map.
9. From the EIS map in Step 8, select all the points meeting the EIS SC criteria (as defined in TS 38.521-2 [18] Clause 7.3.4.3) as potential test directions for AoA Setup 2a, 2b, 3 and 4. In order to confirm that the grid point is suitable, run the REFSENS throughput test as per the test condition defined in TS 38.521-2 [18] clause 7.3.2 and verify that the EIS SC criteria is met. .

If not enough grid points are found using this method, fallback to using the method in Annex I.1, I.2, I.3 or I.3A as applicable.

Annex J (informative): Change history

Change history							
Date	Meeting	TDoc	CR	Rev	Cat	Subject/Comment	New version
2017-08	RAN5#76	R5-175205	-	-	-	Introduction of TS 38.533	0.0.1
2018-08	RAN5#80	R5-184115	-	-	-	Added specification structure including headers up to third level	0.0.2
2018-11	RAN5#81	R5-186706	-	-	-	Added references and common sections	0.1.0
2018-11	RAN5#81	R5-187847	-	-	-	Added RMCs, OCGN, SMTC and SSB configurations to Annex A	0.1.0
2018-11	RAN5#81	R5-187996	-	-	-	Added test cases 6.7.1.1.1 to 6.7.1.2.2	0.1.0
2018-11	RAN5#81	R5-187997	-	-	-	Added test cases 4.6.2.1 to 4.6.2.8	0.1.0
2018-11	RAN5#81	R5-187998	-	-	-	Added test cases 5.6.2.1 to 5.6.2.4	0.1.0
2018-11	RAN5#81	R5-187999	-	-	-	Added test cases 6.6.2.1 to 6.6.2.8	0.1.0
2018-11	RAN5#81	R5-188000	-	-	-	Added test cases 7.6.2.1 to 7.6.2.4	0.1.0
2018-11	RAN5#81	R5-188001	-	-	-	Added test case 4.4.1.1	0.1.0
2018-11	RAN5#81	R5-188002	-	-	-	Added test cases 4.7.1.1.1 to 4.7.1.2.2	0.1.0
2018-11	RAN5#81	R5-188005	-	-	-	Added Annexes B to H	0.1.0
2018-11	RAN5#81	R5-188011	-	-	-	Added test case 4.4.3.1	0.1.0
2019-01	RAN5#4 5G-NR AH	R5-190448	-	-	-	Updating FR1 MU for timing measurements	0.2.0
2019-01	RAN5#4 5G-NR AH	R5-190476	-	-	-	Addition of band group power offsets	0.2.0
2019-01	RAN5#4 5G-NR AH	R5-190477	-	-	-	Update of the annexes	0.2.0
2019-01	RAN5#4 5G-NR AH	R5-190478	-	-	-	Changes to 4.7.1.x tests	0.2.0
2019-01	RAN5#4 5G-NR AH	R5-190479	-	-	-	Addition of 4.7.2.x tests	0.2.0
2019-01	RAN5#4 5G-NR AH	R5-190480	-	-	-	Addition of 4.7.4.x tests	0.2.0
2019-01	RAN5#4 5G-NR AH	R5-190481	-	-	-	Changes to 6.7.1.x tests	0.2.0
2019-01	RAN5#4 5G-NR AH	R5-190482	-	-	-	Addition of 6.7.2.x tests	0.2.0
2019-01	RAN5#4 5G-NR AH	R5-190483	-	-	-	Addition of 6.7.4.x tests	0.2.0
2019-01	RAN5#4 5G-NR AH	R5-190512	-	-	-	Addition of EN-DC FR1 radio link monitoring out-of-sync test for PSCell configured with CSI-RS-based RLM RS in non-DRX mode test case 4.5.1.5	0.2.0
2019-01	RAN5#4 5G-NR AH	R5-190513	-	-	-	Addition of EN-DC FR1 radio link monitoring in-sync test for PSCell configured with CSI-RS-based RLM RS in non-DRX mode test case 4.5.1.6	0.2.0
2019-01	RAN5#4 5G-NR AH	R5-190514	-	-	-	Addition of EN-DC FR1 radio link monitoring out-of-sync test for PSCell configured with CSI-RS-based RLM RS in DRX mode test case 4.5.1.7	0.2.0
2019-01	RAN5#4 5G-NR AH	R5-190515	-	-	-	Addition of EN-DC FR1 radio link monitoring in-sync test for PSCell configured with CSI-RS-based RLM RS in DRX mode test case 4.5.1.8	0.2.0

Change history							
Date	Meeting	TDoc	CR	Rev	Cat	Subject/Comment	New version
2019-01	RAN5#4 5G-NR AH	R5-190516	-	-	-	Addition of EN-DC FR1 interruptions at transitions between active and non-active during DRX in synchronous EN-DC test case 4.5.2.1	0.2.0
2019-01	RAN5#4 5G-NR AH	R5-190517	-	-	-	Addition of EN-DC FR1 interruptions at transitions between active and non-active during DRX in asynchronous EN-DC test case 4.5.2.2	0.2.0
2019-01	RAN5#4 5G-NR AH	R5-190518	-	-	-	Addition of EN-DC FR1 interruptions during measurements on deactivated NR SCC in synchronous EN-DC test case 4.5.2.3	0.2.0
2019-01	RAN5#4 5G-NR AH	R5-190519	-	-	-	Addition of EN-DC FR1 interruptions during measurements on deactivated NR SCC in asynchronous EN-DC test case 4.5.2.4	0.2.0
2019-01	RAN5#4 5G-NR AH	R5-190520	-	-	-	Addition of EN-DC FR1 interruptions during measurements on deactivated E-UTRAN SCC in synchronous EN-DC test case 4.5.2.5	0.2.0
2019-01	RAN5#4 5G-NR AH	R5-190582	-	-	-	Annex F correction	0.2.0
2019-01	RAN5#4 5G-NR AH	R5-190803	-	-	-	Update Annex G in TS 38.533	0.2.0
2019-01	RAN5#4 5G-NR AH	R5-190874	-	-	-	Addition of NR test case 6.6.1.1-reporting without gap non-DRX	0.2.0
2019-01	RAN5#4 5G-NR AH	R5-190875	-	-	-	Addition of NR test case 6.6.1.2-reporting without gap DRX	0.2.0
2019-01	RAN5#4 5G-NR AH	R5-190876	-	-	-	Addition of NR test case 6.6.1.3-with gap non DRX	0.2.0
2019-01	RAN5#4 5G-NR AH	R5-190877	-	-	-	Addition of NR test case 6.6.1.4-with gap DRX	0.2.0
2019-01	RAN5#4 5G-NR AH	R5-190878	-	-	-	Addition of NR test case 6.6.1.5-without gap non DRX SBI reading	0.2.0
2019-01	RAN5#4 5G-NR AH	R5-190879	-	-	-	Addition of NR test case 6.6.1.6-with gap non DRX SBI reading	0.2.0
2019-01	RAN5#4 5G-NR AH	R5-190880	-	-	-	CR to 38.533 annex for event triggered reporting test cases	0.2.0
2019-01	RAN5#4 5G-NR AH	R5-190881	-	-	-	Addition of EN-DC FR1 event triggered reporting test case 4.6.1.5	0.2.0
2019-01	RAN5#4 5G-NR AH	R5-190882	-	-	-	Addition of EN-DC FR1 event triggered reporting test case 4.6.1.6	0.2.0
2019-01	RAN5#4 5G-NR AH	R5-190883	-	-	-	Addition of EN-DC FR1 event triggered reporting test case 4.6.1.3	0.2.0
2019-01	RAN5#4 5G-NR AH	R5-190884	-	-	-	Addition of EN-DC FR1 event triggered reporting test case 4.6.1.4	0.2.0
2019-01	RAN5#4 5G-NR AH	R5-190885	-	-	-	Addition of default config for event triggered test cases	0.2.0
2019-01	RAN5#4 5G-NR AH	R5-190886	-	-	-	Introduction of 5G RRM TC 4.5.3.1	0.2.0
2019-01	RAN5#4 5G-NR AH	R5-190887	-	-	-	Introduction of 5G RRM TC 4.5.3.2	0.2.0
2019-01	RAN5#4 5G-NR AH	R5-190888	-	-	-	Introduction of 5G RRM TC 4.5.3.3	0.2.0
2019-01	RAN5#4 5G-NR AH	R5-190889	-	-	-	Introduction of 5G RRM TC 4.6.1.1	0.2.0
2019-01	RAN5#4 5G-NR AH	R5-190890	-	-	-	Introduction of 5G RRM TC 4.6.1.2	0.2.0

Change history							
Date	Meeting	TDoc	CR	Rev	Cat	Subject/Comment	New version
2019-01	RAN5#4 5G-NR AH	R5-190891	-	-	-	Introduction of 5G RRM TC 5.5.3.1	0.2.0
2019-01	RAN5#4 5G-NR AH	R5-190892	-	-	-	Introduction of 5G RRM TC 6.6.3.1	0.2.0
2019-01	RAN5#4 5G-NR AH	R5-190893	-	-	-	pCR for Addition of TC 6.5.1.3 NR SA FR1 RLM OOS in DRX	0.2.0
2019-01	RAN5#4 5G-NR AH	R5-190894	-	-	-	pCR for Addition of TC 6.4.3.1 NR SA FR1 TAA Accuracy	0.2.0
2019-01	RAN5#4 5G-NR AH	R5-190895	-	-	-	pCR for Modification of TC 4.4.3.1 EN-DC FR1 TAA accuracy	0.2.0
2019-01	RAN5#4 5G-NR AH	R5-190896	-	-	-	pCR for Addition of TC 6.5.1.1 NR SA FR1 RLM OOS	0.2.0
2019-01	RAN5#4 5G-NR AH	R5-190897	-	-	-	pCR for Addition of TC 4.5.1.1 EN-DC FR1 RLM OOS	0.2.0
2019-01	RAN5#4 5G-NR AH	R5-190898	-	-	-	pCR for Addition of TC 4.5.1.3 EN-DC FR1 RLM OOS in DRX	0.2.0
2019-01	RAN5#4 5G-NR AH	R5-190899	-	-	-	Update to EN-DC FR1 transmit timing accuracy test	0.2.0
2019-01	RAN5#4 5G-NR AH	R5-190900	-	-	-	Addition of EN-DC FR1 RLM IS non-DRX test with SSB-based RLM RS	0.2.0
2019-01	RAN5#4 5G-NR AH	R5-190901	-	-	-	Addition of EN-DC FR1 RLM IS DRX test with SSB-based RLM RS	0.2.0
2019-01	RAN5#4 5G-NR AH	R5-190902	-	-	-	Addition of NR SA FR1 RLM IS non-DRX test with SSB-based RLM RS	0.2.0
2019-01	RAN5#4 5G-NR AH	R5-190903	-	-	-	Addition of NR SA FR1 RLM IS DRX test with SSB-based RLM RS	0.2.0
2019-01	RAN5#4 5G-NR AH	R5-190904	-	-	-	Correction of RRM 5G Test Cases 4.6.2 - EN-DC FR1-FR1 Inter-frequency measurements	0.2.0
2019-01	RAN5#4 5G-NR AH	R5-190905	-	-	-	Correction of RRM 5G Test Cases 6.6.2 - NR SA FR1-FR1 Inter-frequency measurements	0.2.0
2019-01	RAN5#4 5G-NR AH	R5-190906	-	-	-	Correction of RRM 5G Test Cases 7.6.2 - NR SA FR2-FR2 Inter-frequency measurements	0.2.0
2019-01	RAN5#4 5G-NR AH	R5-190907	-	-	-	Addition of RRM Test Cases 4.5.2.6: EN-DC FR1 interruptions during measurements on deactivated E-UTRAN SCC in asynchronous EN-DC	0.2.0
2019-01	RAN5#4 5G-NR AH	R5-190908	-	-	-	Addition of RRM Test Cases 5.5.2.1: EN-DC FR2 interruptions at transitions between active and non-active during DRX in synchronous EN-DC	0.2.0
2019-01	RAN5#4 5G-NR AH	R5-190909	-	-	-	Addition of RRM Test Cases 5.5.2.2: EN-DC FR2 interruptions at transitions between active and non-active during DRX in asynchronous EN-DC	0.2.0
2019-01	RAN5#4 5G-NR AH	R5-190910	-	-	-	Addition of RRM Test Cases 5.5.2.3: EN-DC FR2 interruptions during measurements on deactivated NR SCC in synchronous EN-DC	0.2.0
2019-01	RAN5#4 5G-NR AH	R5-190911	-	-	-	Addition of RRM Test Cases 5.5.2.4: EN-DC FR2 interruptions during measurements on deactivated NR SCC in asynchronous EN-DC	0.2.0
2019-01	RAN5#4 5G-NR AH	R5-190912	-	-	-	Addition of RRM Test Cases 5.5.2.5: EN-DC FR2 interruptions during measurements on deactivated E-UTRAN SCC in synchronous EN-DC	0.2.0
2019-01	RAN5#4 5G-NR AH	R5-190913	-	-	-	Addition of RRM Test Cases 5.5.2.6: EN-DC FR2 interruptions during measurements on deactivated E-UTRAN SCC in asynchronous EN-DC	0.2.0
2019-01	RAN5#4 5G-NR AH	R5-190914	-	-	-	Addition of RRM Test Cases 6.1.1.1: NR SA FR1 cell re-selection	0.2.0

Change history							
Date	Meeting	TDoc	CR	Rev	Cat	Subject/Comment	New version
2019-01	RAN5#4 5G-NR AH	R5-190915	-	-	-	Addition of RRM Test Cases 6.1.1.2: NR SA FR1-FR1 cell re-selection	0.2.0
2019-01	RAN5#4 5G-NR AH	R5-190916	-	-	-	Addition of cell re-selection to higher priority E-UTRAN test case 6.1.2.1	0.2.0
2019-01	RAN5#4 5G-NR AH	R5-190917	-	-	-	Addition of cell re-selection to lower priority E-UTRAN test case 6.1.2.2	0.2.0
2019-01	RAN5#4 5G-NR AH	R5-190918	-	-	-	Addition of SA NR to E-UTRAN handover test case 6.3.1.4	0.2.0
2019-01	RAN5#4 5G-NR AH	R5-190919	-	-	-	Addition of SA NR to E-UTRAN handover test case 6.3.1.5	0.2.0
2019-01	RAN5#4 5G-NR AH	R5-190920	-	-	-	Addition of NR SA FR1 UE UL carrier RRC reconfiguration delay test case 6.5.4.1	0.2.0
2019-01	RAN5#4 5G-NR AH	R5-190921	-	-	-	Addition of NR SA FR1 CSI-RS based RLM out-of-sync non-DRX test case 6.5.1.5	0.2.0
2019-01	RAN5#4 5G-NR AH	R5-190922	-	-	-	Addition of NR SA FR1 CSI-RS based RLM in-sync non-DRX test case 6.5.1.6	0.2.0
2019-01	RAN5#4 5G-NR AH	R5-190923	-	-	-	Addition of NR SA FR1 CSI-RS based RLM out-of-sync in DRX test case 6.5.1.7	0.2.0
2019-01	RAN5#4 5G-NR AH	R5-190924	-	-	-	Addition of NR SA FR1 CSI-RS based RLM in-sync in DRX test case 6.5.1.8	0.2.0
2019-01	RAN5#4 5G-NR AH	R5-190987	-	-	-	38.533 Common Section updates to clarify leverage across architecture options	0.2.0
2019-03	RAN5#8 2	R5-191484	-	-	-	Correction Annex G	0.3.0
2019-03	RAN5#8 2	R5-191485	-	-	-	Correction NSA Options	0.3.0
2019-03	RAN5#8 2	R5-191486	-	-	-	Modifications NSA FR1 SS-RSRP tests	0.3.0
2019-03	RAN5#8 2	R5-191487	-	-	-	Modifications NSA FR1 SS-RSRQ tests	0.3.0
2019-03	RAN5#8 2	R5-191488	-	-	-	Modifications NSA FR1 L1-RSRP tests	0.3.0
2019-03	RAN5#8 2	R5-191489	-	-	-	Modifications SA FR1 SS-RSRP tests	0.3.0
2019-03	RAN5#8 2	R5-191490	-	-	-	Modifications SA FR1 SS-RSRQ tests	0.3.0
2019-03	RAN5#8 2	R5-191491	-	-	-	Modifications SA FR1 L1-RSRP tests	0.3.0
2019-03	RAN5#8 2	R5-191492	-	-	-	Addition NSA FR1 BWP switch tests	0.3.0
2019-03	RAN5#8 2	R5-191493	-	-	-	Addition SA FR1 BWP switch tests	0.3.0
2019-03	RAN5#8 2	R5-191494	-	-	-	Addition NSA FR2 BWP switch tests	0.3.0
2019-03	RAN5#8 2	R5-191495	-	-	-	Addition SA FR2 BWP switch tests	0.3.0
2019-03	RAN5#8 2	R5-191720	-	-	-	addition of cell mapping for BFD and measurement	0.3.0
2019-03	RAN5#8 2	R5-191924	-	-	-	Correction of default message contents for RRM	0.3.0
2019-03	RAN5#8 2	R5-191926	-	-	-	Addition of event-triggered reporting Test Cases to Cell configuration mapping in Annex E	0.3.0
2019-03	RAN5#8 2	R5-191930	-	-	-	Correction of 5G RRM Test Case 4.6.2.3	0.3.0
2019-03	RAN5#8 2	R5-191931	-	-	-	Correction of 5G RRM Test Case 4.6.2.4	0.3.0
2019-03	RAN5#8 2	R5-191934	-	-	-	Correction of 5G RRM Test Case 4.6.2.7	0.3.0
2019-03	RAN5#8 2	R5-191935	-	-	-	Correction of 5G RRM Test Case 4.6.2.8	0.3.0

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Date	Meeting	TDoc	CR	Rev	Cat	Subject/Comment	New version
2019-03	RAN5#82	R5-191936	-	-	-	Addition of Minimum conformance requirements 5.6.2.0	0.3.0
2019-03	RAN5#82	R5-191937	-	-	-	Correction of 5G RRM Test Case 5.6.2.1	0.3.0
2019-03	RAN5#82	R5-191938	-	-	-	Correction of 5G RRM Test Case 5.6.2.2	0.3.0
2019-03	RAN5#82	R5-191939	-	-	-	Correction of 5G RRM Test Case 5.6.2.3	0.3.0
2019-03	RAN5#82	R5-191940	-	-	-	Correction of 5G RRM Test Case 5.6.2.4	0.3.0
2019-03	RAN5#82	R5-191945	-	-	-	Addition of Minimum conformance requirements 7.6.2.0	0.3.0
2019-03	RAN5#82	R5-191946	-	-	-	Correction of 5G RRM Test Case 7.6.2.1	0.3.0
2019-03	RAN5#82	R5-191947	-	-	-	Correction of 5G RRM Test Case 7.6.2.2	0.3.0
2019-03	RAN5#82	R5-191948	-	-	-	Correction of 5G RRM Test Case 7.6.2.3	0.3.0
2019-03	RAN5#82	R5-191949	-	-	-	Correction of 5G RRM Test Case 7.6.2.4	0.3.0
2019-03	RAN5#82	R5-191950	-	-	-	Correction of 5G RRM Test Case 7.6.2.5	0.3.0
2019-03	RAN5#82	R5-191951	-	-	-	Correction of 5G RRM Test Case 7.6.2.6	0.3.0
2019-03	RAN5#82	R5-191952	-	-	-	Correction of 5G RRM Test Case 7.6.2.7	0.3.0
2019-03	RAN5#82	R5-191953	-	-	-	Correction of 5G RRM Test Case 7.6.2.8	0.3.0
2019-03	RAN5#82	R5-192062	-	-	-	Update of EN-DC FR1 event triggered reporting test case 4.6.1.6	0.3.0
2019-03	RAN5#82	R5-192063	-	-	-	Update of EN-DC FR1 event triggered reporting test case 4.6.1.3	0.3.0
2019-03	RAN5#82	R5-192064	-	-	-	Update of EN-DC FR1 event triggered reporting test case 4.6.1.4	0.3.0
2019-03	RAN5#82	R5-192221	-	-	-	Update on RRC_Connected generic procedure within RRM tests	0.3.0
2019-03	RAN5#82	R5-192477	-	-	-	Introduction of FR1 EN-DC Contention based random access Test case	0.3.0
2019-03	RAN5#82	R5-192478	-	-	-	Introduction of FR1 EN-DC non-Contention based random access Test case	0.3.0
2019-03	RAN5#82	R5-192479	-	-	-	Introduction of FR1 standalone Contention based random access Test case	0.3.0
2019-03	RAN5#82	R5-192480	-	-	-	Introduction of FR1 standalone Non-contention based random access Test case	0.3.0
2019-03	RAN5#82	R5-192481	-	-	-	Updated to 5G RRM TC 4.6.1.1	0.3.0
2019-03	RAN5#82	R5-192482	-	-	-	Updated to 5G RRM TC 4.6.1.2	0.3.0
2019-03	RAN5#82	R5-192483	-	-	-	Addition of NR test case 6.7.1.3.1-absolute RSRP	0.3.0
2019-03	RAN5#82	R5-192484	-	-	-	Addition of NR test case 6.7.1.3.2-relative RSRP	0.3.0
2019-03	RAN5#82	R5-192485	-	-	-	Addition of NR test case 6.5.5.3 FR1 CSI-RS BFD nonDRX	0.3.0
2019-03	RAN5#82	R5-192486	-	-	-	Addition of NR test case 6.5.5.4 FR1 CSI-RS BFD DRX	0.3.0
2019-03	RAN5#82	R5-192487	-	-	-	Addition of NR test case 7.5.5.1 FR2 SSB BFD nonDRX	0.3.0
2019-03	RAN5#82	R5-192488	-	-	-	Addition of NR test case 7.5.5.2 FR2 SSB BFD DRX	0.3.0
2019-03	RAN5#82	R5-192489	-	-	-	Addition of NR test case 7.5.5.3 FR2 CSI-RS BFD nonDRX	0.3.0
2019-03	RAN5#82	R5-192490	-	-	-	Addition of NR test case 7.5.5.4 FR2 CSI-RS BFD DRX	0.3.0
2019-03	RAN5#82	R5-192492	-	-	-	Correction of 5G RRM Test Case 4.6.2.1	0.3.0
2019-03	RAN5#82	R5-192493	-	-	-	Correction of 5G RRM Test Case 4.6.2.2	0.3.0
2019-03	RAN5#82	R5-192494	-	-	-	Correction of 5G RRM Test Case 4.6.2.5	0.3.0
2019-03	RAN5#8	R5-192495	-	-	-	Correction of 5G RRM Test Case 4.6.2.6	0.3.0

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Date	Meeting	TDoc	CR	Rev	Cat	Subject/Comment	New version
	2						
2019-03	RAN5#82	R5-192496	-	-	-	Correction of 5G RRM Test Case 6.6.2.1	0.3.0
2019-03	RAN5#82	R5-192497	-	-	-	Correction of 5G RRM Test Case 6.6.2.2	0.3.0
2019-03	RAN5#82	R5-192498	-	-	-	Correction of 5G RRM Test Case 6.6.2.3	0.3.0
2019-03	RAN5#82	R5-192499	-	-	-	Correction of 5G RRM Test Case 6.6.2.4	0.3.0
2019-03	RAN5#82	R5-192500	-	-	-	Update of EN-DC FR1 event triggered reporting test case 4.6.1.5	0.3.0
2019-03	RAN5#82	R5-192503	-	-	-	Update to EN-DC FR1 transmit timing accuracy test	0.3.0
2019-03	RAN5#82	R5-192674	-	-	-	Update to EN-DC FR1 RLM IS non-DRX test with SSB-based RLM RS	0.3.0
2019-03	RAN5#82	R5-192675	-	-	-	Update to EN-DC FR1 RLM IS DRX test with SSB-based RLM RS	0.3.0
2019-03	RAN5#82	R5-192676	-	-	-	Update to NR SA FR1 RLM IS non-DRX test with SSB-based RLM RS	0.3.0
2019-03	RAN5#82	R5-192677	-	-	-	Update to NR SA FR1 RLM IS DRX test with SSB-based RLM RS	0.3.0
2019-03	RAN5#82	R5-192678	-	-	-	pCR for modification of TAAA TC for EN-DC FR1	0.3.0
2019-03	RAN#83	RP-190161	-	-	-	Presented to the RAN#83 plenary for 1-step approval	1.0.0
2019-03	RAN#83	-	-	-	-	Upgraded to Rel-15 with small editorial changes	15.0.0
2019-06	RAN#84	R5-193578	0100	-	F	Update the test case number of TC 4.3.2.2.2	15.1.0
2019-06	RAN#84	R5-193755	0102	-	F	Update of Minimum conformance requirements 6.6.1.0	15.1.0
2019-06	RAN#84	R5-193758	0104	-	F	Update of EN-DC RLM in-sync in non-DRX test case 4.5.1.6	15.1.0
2019-06	RAN#84	R5-193759	0105	-	F	Update of EN-DC RLM out-of-sync in DRX test case 4.5.1.7	15.1.0
2019-06	RAN#84	R5-193760	0106	-	F	Update of EN-DC RLM in-sync in DRX test case 4.5.1.8	15.1.0
2019-06	RAN#84	R5-193761	0107	-	F	Addition of Minimum conformance requirements 6.3.2	15.1.0
2019-06	RAN#84	R5-193762	0108	-	F	Addition of NR RRM TC 6.3.2.1.1-Intra Freq RRC Re-establishment	15.1.0
2019-06	RAN#84	R5-193763	0109	-	F	Addition of FR1-FR1 re-establishment test case 6.3.2.1.2	15.1.0
2019-06	RAN#84	R5-193764	0110	-	F	Addition of FR1 RRC connection release with redirection test case 6.3.2.3.1	15.1.0
2019-06	RAN#84	R5-193765	0111	-	F	Addition of FR1-E-UTRA RRC connection release with redirection test case 6.3.2.3.2	15.1.0
2019-06	RAN#84	R5-193766	0112	-	F	Update of TC 6.5.1.5 SA FR1 CSI-RS RLM OOS non-DRX	15.1.0
2019-06	RAN#84	R5-193767	0113	-	F	Update of TC 6.5.1.6 SA FR1 CSI-RS RLM IS non-DRX	15.1.0
2019-06	RAN#84	R5-193768	0114	-	F	Update of TC 6.5.1.7 SA FR1 CSI-RS RLM OOS DRX	15.1.0
2019-06	RAN#84	R5-193769	0115	-	F	Update of TC 6.5.1.8 SA FR1 CSI-RS RLM IS DRX	15.1.0
2019-06	RAN#84	R5-193770	0116	-	F	Addition of Minimum conformance requirements 6.5.5.0	15.1.0
2019-06	RAN#84	R5-193771	0117	-	F	Update of TC 6.5.5.3 SA FR1 CSI-RS BFD non-DRX	15.1.0
2019-06	RAN#84	R5-193772	0118	-	F	Update of TC 6.5.5.4 SA FR1 CSI-RS BFD DRX	15.1.0
2019-06	RAN#84	R5-193773	0119	-	F	Addition of Minimum conformance requirements 7.5.5.0	15.1.0
2019-06	RAN#84	R5-193774	0120	-	F	Update of TC 7.5.5.1 SA FR2 SSB BFD non-DRX	15.1.0
2019-06	RAN#84	R5-193775	0121	-	F	Update of TC 7.5.5.2 SA FR2 SSB BFD DRX	15.1.0
2019-06	RAN#84	R5-193776	0122	-	F	Update of TC 7.5.5.3 SA FR2 CSI-RS BFD non-DRX	15.1.0
2019-06	RAN#84	R5-193777	0123	-	F	Update of TC 7.5.5.4 SA FR2 CSI-RS BFD DRX	15.1.0
2019-06	RAN#84	R5-193778	0124	-	F	Addition of Minimum conformance requirements 7.6.1.0	15.1.0
2019-06	RAN#84	R5-193779	0125	-	F	Addition of 7.6.1.1 SA FR2 RRM measurement no-gap non-DRX	15.1.0
2019-06	RAN#84	R5-193780	0126	-	F	Addition of 7.6.1.2 SA FR2 RRM measurement no-gap DRX	15.1.0
2019-06	RAN#84	R5-193781	0127	-	F	Addition of 7.6.1.3 SA FR2 RRM measurement gap non-DRX	15.1.0
2019-06	RAN#84	R5-193782	0128	-	F	Addition of 7.6.1.4 SA FR2 RRM measurement gap DRX	15.1.0
2019-06	RAN#84	R5-193784	0130	-	F	Update of FR1 cell re-selection test case 6.1.1.1	15.1.0
2019-06	RAN#84	R5-193785	0131	-	F	Update of FR1-FR1 cell re-selection test case 6.1.1.2	15.1.0
2019-06	RAN#84	R5-193786	0132	-	F	Update of FR1-EUTRA higher priority cell re-selection test case 6.1.2.1	15.1.0
2019-06	RAN#84	R5-193787	0133	-	F	Update of FR1-EUTRA lower priority cell re-selection test case 6.1.2.2	15.1.0
2019-06	RAN#84	R5-193788	0134	-	F	Update of FR1-EUTRA handover known cell test case 6.3.1.4	15.1.0
2019-06	RAN#84	R5-193790	0136	-	F	Update of 6.6.1.1 SA FR1 RRM measurement no-gap non-DRX	15.1.0
2019-06	RAN#84	R5-193791	0137	-	F	Update of 6.6.1.2 SA FR1 RRM measurement no-gap DRX	15.1.0
2019-06	RAN#84	R5-193792	0138	-	F	Update of 6.6.1.3 SA FR1 RRM measurement gap non-DRX	15.1.0
2019-06	RAN#84	R5-193793	0139	-	F	Update of 6.6.1.4 SA FR1 RRM measurement gap DRX	15.1.0
2019-06	RAN#84	R5-193794	0140	-	F	Update of FR1 event-triggered without gap with SSB index test case 6.6.1.5	15.1.0
2019-06	RAN#84	R5-193795	0141	-	F	Update of FR1 event-triggered with gap with SSB index test case 6.6.1.6	15.1.0
2019-06	RAN#84	R5-193812	0145	-	F	Addition of 6.3.2.2 minimum conformance requirements	15.1.0

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Date	Meeting	TDoc	CR	Rev	Cat	Subject/Comment	New version
2019-06	RAN#84	R5-193872	0146	-	F	Introduction of TC 4.5.5.4 EN-DC FR1 CSI-RS-based beam failure detection and link recovery in DRX	15.1.0
2019-06	RAN#84	R5-193949	0148	-	F	Correction of PRACH Configurations	15.1.0
2019-06	RAN#84	R5-194328	0153	-	F	Additional of new reference used in RRM test spec	15.1.0
2019-06	RAN#84	R5-194329	0154	-	F	Correction of reference spec number in RRM spec	15.1.0
2019-06	RAN#84	R5-194494	0165	-	F	Addition missing Editor's note 4.5.2.5	15.1.0
2019-06	RAN#84	R5-194549	0173	-	F	Correction of 5G RRM Test Case 5.6.2.1	15.1.0
2019-06	RAN#84	R5-194550	0174	-	F	Correction of 5G RRM Test Case 5.6.2.2	15.1.0
2019-06	RAN#84	R5-194551	0175	-	F	Correction of 5G RRM Test Case 5.6.2.3	15.1.0
2019-06	RAN#84	R5-194552	0176	-	F	Correction of 5G RRM Test Case 5.6.2.4	15.1.0
2019-06	RAN#84	R5-194553	0177	-	F	Correction of 5G RRM Test Case 5.6.2.5	15.1.0
2019-06	RAN#84	R5-194555	0179	-	F	Correction of 5G RRM Test Case 5.6.2.7	15.1.0
2019-06	RAN#84	R5-194556	0180	-	F	Correction of 5G RRM Test Case 5.6.2.8	15.1.0
2019-06	RAN#84	R5-194557	0181	-	F	Correction of Minimum conformance requirements 6.6.2.0	15.1.0
2019-06	RAN#84	R5-194562	0186	-	F	Correction of Minimum conformance requirements 7.6.2.0	15.1.0
2019-06	RAN#84	R5-194564	0188	-	F	Correction of 5G RRM Test Case 7.6.2.2	15.1.0
2019-06	RAN#84	R5-194565	0189	-	F	Correction of 5G RRM Test Case 7.6.2.3	15.1.0
2019-06	RAN#84	R5-194566	0190	-	F	Correction of 5G RRM Test Case 7.6.2.4	15.1.0
2019-06	RAN#84	R5-194567	0191	-	F	Correction of 5G RRM Test Case 7.6.2.5	15.1.0
2019-06	RAN#84	R5-194568	0192	-	F	Correction of 5G RRM Test Case 7.6.2.6	15.1.0
2019-06	RAN#84	R5-194569	0193	-	F	Correction of 5G RRM Test Case 7.6.2.7	15.1.0
2019-06	RAN#84	R5-194570	0194	-	F	Correction of 5G RRM Test Case 7.6.2.8	15.1.0
2019-06	RAN#84	R5-194571	0195	-	F	Correction of Minimum conformance requirements 7.3.2.1.0	15.1.0
2019-06	RAN#84	R5-194572	0196	-	F	Correction of 5G RRM Test Case 7.3.2.1.1	15.1.0
2019-06	RAN#84	R5-194573	0197	-	F	Correction of 5G RRM Test Case 7.3.2.1.2	15.1.0
2019-06	RAN#84	R5-194700	0208	-	F	Clean-up in EN-DC FR1 transmit timing accuracy test	15.1.0
2019-06	RAN#84	R5-194702	0210	-	F	Update to EN-DC FR1 RLM IS DRX test with SSB-based RLM RS	15.1.0
2019-06	RAN#84	R5-194703	0211	-	F	Update to NR SA FR1 RLM IS non-DRX test with SSB-based RLM RS	15.1.0
2019-06	RAN#84	R5-194704	0212	-	F	Update to NR SA FR1 RLM IS DRX test with SSB-based RLM RS	15.1.0
2019-06	RAN#84	R5-194710	0214	-	F	Update to E-UTRA configuration for RRM EN-DC tests to align with core spec update	15.1.0
2019-06	RAN#84	R5-194713	0216	-	F	Update to EN-DC FR1 RLM IS DRX test with SSB-based RLM RS	15.1.0
2019-06	RAN#84	R5-195013	0156	1	F	Updated to EN-DC FR1 RRM tests in clause 4.5.3	15.1.0
2019-06	RAN#84	R5-195016	0198	1	F	Test tolerance and measurement uncertainty in Annex F for Inter-Freq measurement test cases	15.1.0
2019-06	RAN#84	R5-195017	0129	1	F	Addition of default configuration in Annex H	15.1.0
2019-06	RAN#84	R5-195018	0143	1	F	Update of 6.3.2.2.1 random access	15.1.0
2019-06	RAN#84	R5-195019	0144	1	F	Update of 6.3.2.2.2 non-contention random access	15.1.0
2019-06	RAN#84	R5-195020	0151	1	F	Updated to EN-DC FR1 RRM tests in clause 4.6.1	15.1.0
2019-06	RAN#84	R5-195021	0207	1	F	Modification of EN-DC FR1 TAAA	15.1.0
2019-06	RAN#84	R5-195024	0199	1	F	Modification of EN-DC FR1 SSB RLM OOS in non-DRX	15.1.0
2019-06	RAN#84	R5-195025	0200	1	F	Modification of EN-DC FR1 SSB RLM OOS in DRX	15.1.0
2019-06	RAN#84	R5-195026	0201	1	F	Modification of NR SA FR1 TAAA	15.1.0
2019-06	RAN#84	R5-195027	0202	1	F	Modification of SA FR1 SSB RLM OOS in non-DRX	15.1.0
2019-06	RAN#84	R5-195028	0203	1	F	Modification of SA FR1 SSB RLM OOS in DRX	15.1.0
2019-06	RAN#84	R5-195029	0204	1	F	Modification of EN-DC FR2 TAAA	15.1.0
2019-06	RAN#84	R5-195030	0205	1	F	Modification of EN-DC FR2 SSB RLM OOS in non-DRX	15.1.0
2019-06	RAN#84	R5-195031	0206	1	F	Modification of EN-DC FR2 SSB RLM OOS in DRX	15.1.0
2019-06	RAN#84	R5-195032	0219	1	F	Update to EN-DC FR2 RLM IS non-DRX test with SSB-based RLM RS	15.1.0
2019-06	RAN#84	R5-195033	0220	1	F	Update to EN-DC FR2 RLM IS DRX test with SSB-based RLM RS	15.1.0
2019-06	RAN#84	R5-195034	0221	1	F	Addition of EN-DC FR2 Transmit Timing Accuracy tests	15.1.0
2019-06	RAN#84	R5-195035	0209	1	F	Update to EN-DC FR1 RLM IS non-DRX test with SSB-based RLM RS	15.1.0
2019-06	RAN#84	R5-195036	0150	1	F	Correction to EN-DC FR1 UE transmit timing accuracy TC 4.4.1.1	15.1.0
2019-06	RAN#84	R5-195037	0155	1	F	Updated to cell configuration mapping table for RRM tests	15.1.0
2019-06	RAN#84	R5-195038	0147	1	F	Introduction of TC 6.5.2.1 NR SA FR1 interruptions during measurements on deactivated NR SCC	15.1.0
2019-06	RAN#84	R5-195039	0178	1	F	Correction of 5G RRM Test Case 5.6.2.6	15.1.0
2019-06	RAN#84	R5-195040	0166	1	F	Correction of default message content for RRM in Annex H	15.1.0
2019-06	RAN#84	R5-195041	0217	1	F	Update to NR SA FR1 RLM IS non-DRX test with SSB-based RLM RS	15.1.0
2019-06	RAN#84	R5-195042	0218	1	F	Update to NR SA FR1 RLM IS DRX test with SSB-based RLM RS	15.1.0
2019-06	RAN#84	R5-195043	0215	1	F	Update to EN-DC FR1 RLM IS non-DRX test with SSB-based RLM RS	15.1.0
2019-06	RAN#84	R5-195044	0187	1	F	Correction of 5G RRM Test Case 7.6.2.1	15.1.0
2019-06	RAN#84	R5-195045	0103	1	F	Update of EN-DC RLM out-of-sync in non-DRX test case 4.5.1.5	15.1.0
2019-06	RAN#84	R5-195099	0223	-	F	RRM implementation of FR2 UL demod OTA tests using single pol	15.1.0

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						Rx TE	
2019-06	RAN#84	R5-195173	0167	1	F	Correction of Minimum conformance requirements 4.6.2.0	15.1.0
2019-06	RAN#84	R5-195174	0168	1	F	Correction of 5G RRM Test Case 4.6.2.1 with FR1 Test tolerance	15.1.0
2019-06	RAN#84	R5-195175	0169	1	F	Correction of 5G RRM Test Case 4.6.2.2 with FR1 Test tolerance	15.1.0
2019-06	RAN#84	R5-195176	0170	1	F	Correction of 5G RRM Test Case 4.6.2.3 with FR1 Test tolerance	15.1.0
2019-06	RAN#84	R5-195177	0171	1	F	Correction of 5G RRM Test Case 4.6.2.4 with FR1 Test tolerance	15.1.0
2019-06	RAN#84	R5-195179	0172	1	F	Correction of Minimum conformance requirements 5.6.2.0	15.1.0
2019-06	RAN#84	R5-195182	0142	1	F	Addition of FR1-E-UTRAN event-triggered reporting in DRX test case 6.6.3.2	15.1.0
2019-06	RAN#84	R5-195185	0158	1	F	Update of FR1 Test tolerance and uncertainties in AnnexF	15.1.0
2019-06	RAN#84	R5-195186	0182	1	F	Correction of 5G RRM Test Case 6.6.2.1 with FR1 Test tolerance	15.1.0
2019-06	RAN#84	R5-195187	0183	1	F	Correction of 5G RRM Test Case 6.6.2.2 with FR1 Test tolerance	15.1.0
2019-06	RAN#84	R5-195188	0184	1	F	Correction of 5G RRM Test Case 6.6.2.3 with FR1 Test tolerance	15.1.0
2019-06	RAN#84	R5-195189	0185	1	F	Correction of 5G RRM Test Case 6.6.2.4 with FR1 Test tolerance	15.1.0
2019-06	RAN#84	R5-195445	0152	2	F	Updated to SA FR1 RRM tests in clause 6.6.3	15.1.0
2019-06	RAN#84	-	-	-	-	Administrative release upgrade to match the release of 3GPP TS 38.508-1 and TS 38.521-1 which were upgraded at RAN#84 to Rel-16 due to Rel-16 relevant CR(s)	16.0.0
2019-09	RAN#85	R5-195563	0228	-	F	Addition of 5.6.1.0 minimum requirements	16.1.0
2019-09	RAN#85	R5-195568	0233	-	F	Update of 6.1.1.2 inter-freq cell re-selection	16.1.0
2019-09	RAN#85	R5-195569	0234	-	F	Update of 6.1.2.1 inter-RAT cell re-selection to higher priority	16.1.0
2019-09	RAN#85	R5-195571	0236	-	F	Update of 6.3.1.4 inter-RAT handover to known cell	16.1.0
2019-09	RAN#85	R5-195573	0238	-	F	Update Test Tolerance of 6.3.2.1.1 intra-freq RRC re-establishment	16.1.0
2019-09	RAN#85	R5-195574	0239	-	F	Update Test Tolerance of 6.3.2.1.2 inter-freq RRC re-establishment	16.1.0
2019-09	RAN#85	R5-195575	0240	-	F	Update Test Tolerance of 6.3.2.3.1 NR RRC redirection	16.1.0
2019-09	RAN#85	R5-195576	0241	-	F	Update Test Tolerance of 6.3.2.3.2 inter-RAT RRC redirection	16.1.0
2019-09	RAN#85	R5-195577	0242	-	F	Update of 6.5.1.5 RLM out-of-sync non-DRX	16.1.0
2019-09	RAN#85	R5-195578	0243	-	F	Update of 6.5.1.6 RLM in-sync non-DRX	16.1.0
2019-09	RAN#85	R5-195579	0244	-	F	Update of 6.5.1.7 RLM out-of-sync in DRX	16.1.0
2019-09	RAN#85	R5-195580	0245	-	F	Update of 6.5.1.8 RLM in-sync in DRX	16.1.0
2019-09	RAN#85	R5-195581	0246	-	F	Update of 6.5.5.3 CSI-RS-based BFD non-DRX	16.1.0
2019-09	RAN#85	R5-195582	0247	-	F	Update of 6.5.5.4 CSI-RS-based BFD in DRX	16.1.0
2019-09	RAN#85	R5-195596	0248	-	F	Addition of minimum conformance requirements for FR2 EN-DC CSI-RS based RLM	16.1.0
2019-09	RAN#85	R5-195601	0253	-	F	Addition of minimum conformance requirements for FR2 EN-DC CSI-RS based BFD	16.1.0
2019-09	RAN#85	R5-195604	0256	-	F	Addition of minimum conformance requirements for SA FR2 reselection	16.1.0
2019-09	RAN#85	R5-195605	0257	-	F	Addition of NR test case 7.1.1.1-intra freq reselection	16.1.0
2019-09	RAN#85	R5-195606	0258	-	F	Addition of NR test case 7.1.1.2-inter freq reselection	16.1.0
2019-09	RAN#85	R5-195608	0260	-	F	Addition of NR test case 8.4.2.1-without SBI non-DRX	16.1.0
2019-09	RAN#85	R5-195609	0261	-	F	Addition of NR test case 8.4.2.2-without SBI DRX	16.1.0
2019-09	RAN#85	R5-195610	0262	-	F	Addition of NR test case 8.4.2.3-with SBI non-DRX	16.1.0
2019-09	RAN#85	R5-195611	0263	-	F	Addition of NR test case 8.4.2.4-with SBI DRX	16.1.0
2019-09	RAN#85	R5-195612	0264	-	F	Addition of minimum conformance requirements for FR1 EN-DC CSI-RS based RLM	16.1.0

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2019-09	RAN#85	R5-195623	0275	-	F	Correction of NR test case 5.5.2.1-interruption transition DRX sync	16.1.0
2019-09	RAN#85	R5-195624	0276	-	F	Correction of NR test case 5.5.2.2-interruption transition DRX async	16.1.0
2019-09	RAN#85	R5-195625	0277	-	F	Correction of NR test case 5.5.2.3-interruption NR deactivated SCell sync	16.1.0
2019-09	RAN#85	R5-195626	0278	-	F	Correction of NR test case 5.5.2.4-interruption NR deactivated SCell async	16.1.0
2019-09	RAN#85	R5-195627	0279	-	F	Correction of NR test case 5.5.2.5-interruption LTE deactivated SCell sync	16.1.0
2019-09	RAN#85	R5-195628	0280	-	F	Correction of NR test case 5.5.2.6-interruption LTE deactivated SCell async	16.1.0
2019-09	RAN#85	R5-195629	0281	-	F	Correction of NR test case 7.5.5.1-SSB BFD non-DRX	16.1.0
2019-09	RAN#85	R5-195630	0282	-	F	Correction of NR test case 7.5.5.2-SSB BFD DRX	16.1.0
2019-09	RAN#85	R5-195631	0283	-	F	Correction of NR test case 7.5.5.3-CSI-RS BFD non-DRX	16.1.0
2019-09	RAN#85	R5-195632	0284	-	F	Correction of NR test case 7.5.5.4-CSI-RS BFD DRX	16.1.0
2019-09	RAN#85	R5-195633	0285	-	F	Correction of NR test case 7.6.1.1-without gap non-DRX	16.1.0
2019-09	RAN#85	R5-195634	0286	-	F	Correction of NR test case 7.6.1.2-without gap DRX	16.1.0
2019-09	RAN#85	R5-195636	0288	-	F	Correction of NR test case 7.6.1.4-with gap DRX	16.1.0
2019-09	RAN#85	R5-196140	0295	-	F	Update NR operating band groups	16.1.0
2019-09	RAN#85	R5-196250	0296	-	F	Correction to EN-DC FR1 event-triggered reporting without gap TC 4.6.1.1 and 4.6.1.2	16.1.0
2019-09	RAN#85	R5-196503	0301	-	F	Updated to EN-DC FR1 RRM tests in clause 4.5.3	16.1.0
2019-09	RAN#85	R5-196504	0302	-	F	Updated to EN-DC FR2 RRM tests in clause 5.5.3	16.1.0
2019-09	RAN#85	R5-196547	0304	-	F	Update of FR1 Test tolerance and uncertainties in AnnexF	16.1.0
2019-09	RAN#85	R5-196601	0306	-	F	Correction of the reference for test frequencies and test mode - Chapter 4	16.1.0
2019-09	RAN#85	R5-196602	0307	-	F	Correction of the reference for test frequencies and test mode - Chapter 6	16.1.0
2019-09	RAN#85	R5-196603	0308	-	F	Editorial Corrections to section 5.5	16.1.0
2019-09	RAN#85	R5-196659	0309	-	F	Editorial corrections of Annex A	16.1.0
2019-09	RAN#85	R5-196660	0310	-	F	Correction of RRM Test Case 7.3.2.1.1	16.1.0
2019-09	RAN#85	R5-196661	0311	-	F	Correction of RRM Test Case 7.3.2.1.2	16.1.0
2019-09	RAN#85	R5-196662	0312	-	F	Correction of cell configuration mapping for RRM Test Cases in Annex E.3	16.1.0
2019-09	RAN#85	R5-196666	0316	-	F	Correction of RRM Test Case 5.6.2.1	16.1.0
2019-09	RAN#85	R5-196667	0317	-	F	Correction of RRM Test Case 5.6.2.2	16.1.0
2019-09	RAN#85	R5-196668	0318	-	F	Correction of RRM Test Case 5.6.2.3	16.1.0
2019-09	RAN#85	R5-196669	0319	-	F	Correction of RRM Test Case 5.6.2.4	16.1.0
2019-09	RAN#85	R5-196670	0320	-	F	Correction of RRM Test Case 5.6.2.5	16.1.0
2019-09	RAN#85	R5-196671	0321	-	F	Correction of RRM Test Case 5.6.2.6	16.1.0
2019-09	RAN#85	R5-196672	0322	-	F	Correction of RRM Test Case 5.6.2.7	16.1.0

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2019-09	RAN#85	R5-196673	0323	-	F	Correction of RRM Test Case 5.6.2.8	16.1.0
2019-09	RAN#85	R5-196674	0324	-	F	Addition of minimum conformance requirements for L1-RSRP measurement RRM FR1 test cases	16.1.0
2019-09	RAN#85	R5-196675	0325	-	F	Addition of SSB based L1-RSRP measurement RRM test case 4.6.3.1	16.1.0
2019-09	RAN#85	R5-196676	0326	-	F	Addition of SSB based L1-RSRP measurement RRM test case 4.6.3.2	16.1.0
2019-09	RAN#85	R5-196677	0327	-	F	Addition of CSI-RS based L1-RSRP measurement RRM test case 4.6.3.3	16.1.0
2019-09	RAN#85	R5-196679	0329	-	F	Addition of minimum conformance requirements for L1-RSRP measurement RRM FR2 test cases	16.1.0
2019-09	RAN#85	R5-196680	0330	-	F	Addition of SSB based L1-RSRP measurement RRM test case 5.6.3.1	16.1.0
2019-09	RAN#85	R5-196681	0331	-	F	Addition of SSB based L1-RSRP measurement RRM test case 5.6.3.2	16.1.0
2019-09	RAN#85	R5-196682	0332	-	F	Addition of CSI-RS based L1-RSRP measurement RRM test case 5.6.3.3	16.1.0
2019-09	RAN#85	R5-196735	0334	-	F	Editorial to fix conversion issues with two equations	16.1.0
2019-09	RAN#85	R5-196736	0335	-	F	Adding Chapter 8	16.1.0
2019-09	RAN#85	R5-196737	0336	-	F	New test 4.5.7.1	16.1.0
2019-09	RAN#85	R5-196738	0337	-	F	New test 4.5.5.1	16.1.0
2019-09	RAN#85	R5-196739	0338	-	F	New test 4.5.5.2	16.1.0
2019-09	RAN#85	R5-196740	0339	-	F	New test 4.7.3.1	16.1.0
2019-09	RAN#85	R5-196741	0340	-	F	New test 4.7.3.2	16.1.0
2019-09	RAN#85	R5-196742	0341	-	F	New test 6.7.3.1	16.1.0
2019-09	RAN#85	R5-196743	0342	-	F	New test 6.7.3.2	16.1.0
2019-09	RAN#85	R5-196925	0351	-	F	Modification of EN-DC FR2 TAAA Section 5.4.3.1	16.1.0
2019-09	RAN#85	R5-196943	0360	-	F	Addition of CSI-RS based L1-RSRP measurement RRM test case 5.6.3.4	16.1.0
2019-09	RAN#85	R5-197361	0357	1	F	Modification of SA FR1 TAAA Section 6.4.3.1	16.1.0
2019-09	RAN#85	R5-197364	0290	1	F	Update of NR UE Tx Timing Accuracy Test	16.1.0
2019-09	RAN#85	R5-197366	0235	1	F	Update Test Tolerance of 6.1.2.2 inter-RAT cell re-selection to lower priority	16.1.0
2019-09	RAN#85	R5-197396	0346	1	F	Update NSA Event trigger reporting test case	16.1.0
2019-09	RAN#85	R5-197397	0352	1	F	Modification of EN-DC FR2 SSB-RLM OOS Section 5.5.1.1	16.1.0
2019-09	RAN#85	R5-197398	0353	1	F	Modification of EN-DC FR2 SSB-RLM OOS in DRX Section 5.5.1.3	16.1.0
2019-09	RAN#85	R5-197399	0354	1	F	Modification of Synchronous EN-DC FR2 RRC DL BWP Switch in non-DRX Section 5.5.6.2.1	16.1.0
2019-09	RAN#85	R5-197400	0355	1	F	Modification of SA FR1 Handover with unknown Target Cell Section 6.3.1.2	16.1.0
2019-09	RAN#85	R5-197401	0356	1	F	Modification of SA FR1-FR1 Handover with unknown Target Cell Section 6.3.1.3	16.1.0

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2019-09	RAN#85	R5-197402	0224	1	F	Update of 4.6.1.3 event with gap non-DRX	16.1.0
2019-09	RAN#85	R5-197403	0225	1	F	Update of 4.6.1.4 event with gap in DRX	16.1.0
2019-09	RAN#85	R5-197404	0226	1	F	Update of 4.6.1.5 event without gap with ssb index	16.1.0
2019-09	RAN#85	R5-197405	0227	1	F	Update of 4.6.1.6 event with gap with ssb index	16.1.0
2019-09	RAN#85	R5-197406	0314	1	F	Correction of 5G RRM Inter Frequency measurements EN-DC test cases	16.1.0
2019-09	RAN#85	R5-197407	0229	1	F	Addition of 5.6.1.1 event without gap non-DRX	16.1.0
2019-09	RAN#85	R5-197408	0230	1	F	Addition of 5.6.1.2 event without gap in DRX	16.1.0
2019-09	RAN#85	R5-197409	0231	1	F	Addition of 5.6.1.3 event with gap non-DRX	16.1.0
2019-09	RAN#85	R5-197410	0232	1	F	Addition of 5.6.1.4 event with gap in DRX	16.1.0
2019-09	RAN#85	R5-197411	0249	1	F	Addition of NR test case 5.5.1.5-CSI-RS RLM OOS non-DRX	16.1.0
2019-09	RAN#85	R5-197412	0250	1	F	Addition of NR test case 5.5.1.6-CSI-RS RLM IS non-DRX	16.1.0
2019-09	RAN#85	R5-197413	0251	1	F	Addition of NR test case 5.5.1.7-CSI-RS RLM OOS DRX	16.1.0
2019-09	RAN#85	R5-197414	0252	1	F	Addition of NR test case 5.5.1.8-CSI-RS RLM IS DRX	16.1.0
2019-09	RAN#85	R5-197415	0254	1	F	Addition of NR test case 5.5.5.3-CSI-RS BFD non-DRX	16.1.0
2019-09	RAN#85	R5-197416	0255	1	F	Addition of NR test case 5.5.5.4-CSI-RS BFD DRX	16.1.0
2019-09	RAN#85	R5-197417	0259	1	F	Addition of minimum conformance requirements for inter-RAT NR measurements	16.1.0
2019-09	RAN#85	R5-197418	0289	1	F	Correction of default configuration in annex H	16.1.0
2019-09	RAN#85	R5-197419	0303	1	F	Updated to cell configuration mapping table for RRM tests	16.1.0
2019-09	RAN#85	R5-197420	0313	1	F	Correction of default message content for RRM in Annex H	16.1.0
2019-09	RAN#85	R5-197422	0305	1	F	Clarification on NE-DC tests for RRM	16.1.0
2019-09	RAN#85	R5-197423	0343	1	F	Addition RRM FR2 test setups into TS 38.533	16.1.0
2019-09	RAN#85	R5-197424	0345	1	F	Update TDD UL-DL Config based on TS 38.133	16.1.0
2019-09	RAN#85	R5-197425	0347	1	F	Modification of EN-DC FR1 UE Transmit Timing Section 4.4.1.1	16.1.0
2019-09	RAN#85	R5-197426	0265	1	F	Correction of NR test case 4.5.1.5-CSI-RS RLM OOS non-DRX	16.1.0
2019-09	RAN#85	R5-197427	0266	1	F	Correction of NR test case 4.5.1.6-CSI-RS RLM IS non-DRX	16.1.0
2019-09	RAN#85	R5-197428	0267	1	F	Correction of NR test case 4.5.1.7-CSI-RS RLM OOS DRX	16.1.0
2019-09	RAN#85	R5-197429	0268	1	F	Correction of NR test case 4.5.1.8-CSI-RS RLM IS DRX	16.1.0
2019-09	RAN#85	R5-197430	0269	1	F	Correction of NR test case 4.5.2.1-interruption transition DRX sync	16.1.0
2019-09	RAN#85	R5-197431	0270	1	F	Correction of NR test case 4.5.2.2-interruption transition DRX async	16.1.0
2019-09	RAN#85	R5-197432	0271	1	F	Correction of NR test case 4.5.2.3-interruption NR deactivated SCell sync	16.1.0
2019-09	RAN#85	R5-197433	0272	1	F	Correction of NR test case 4.5.2.4-interruption NR deactivated SCell async	16.1.0
2019-09	RAN#85	R5-197434	0273	1	F	Correction of NR test case 4.5.2.5-interruption LTE deactivated SCell sync	16.1.0
2019-09	RAN#85	R5-197435	0274	1	F	Correction of NR test case 4.5.2.6-interruption LTE deactivated SCell async	16.1.0

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2019-09	RAN#85	R5-197436	0328	1	F	Addition of CSI-RS based L1-RSRP measurement RRM test case 4.6.3.4	16.1.0
2019-09	RAN#85	R5-197437	0315	1	F	Correction of 5G RRM Inter Frequency measurements SA test cases	16.1.0
2019-09	RAN#85	R5-197570	0294	1	F	Annex E and F FR1 Test tolerance update for SS-RSRP	16.1.0
2019-09	RAN#85	R5-197584	0344	1	F	Addition Annex for RRM OTA procedures in TS 38.533	16.1.0
2019-09	RAN#85	R5-197607	0287	1	F	Correction of NR test case 7.6.1.3-with gap non-DRX.	16.1.0
2019-09	RAN#85	R5-197611	0237	1	F	Update of 6.3.1.5 inter-RAT handover to unknown cell	16.1.0
2019-09	RAN#85	R5-197612	0291	1	F	Update of SSB-based RLM in-sync test cases	16.1.0
2019-09	RAN#85	R5-197624	0297	1	F	Correction to PRACH configurations for FR1	16.1.0
2019-09	RAN#85	R5-197651	0348	2	F	Modification of EN-DC FR1 TAAA Section 4.4.3.1	16.1.0
2019-09	RAN#85	R5-197652	0349	2	F	Modification of EN-DC FR1 SSB-RLM OOS Section 4.5.1.1	16.1.0
2019-09	RAN#85	R5-197653	0350	2	F	Modification of EN-DC FR1 SSB-RLM OOS DRX Section 4.5.1.3	16.1.0
2019-09	RAN#85	R5-197654	0358	2	F	Modification of SA FR1 SSB RLM OOS in non-DRX Section 6.5.1.1	16.1.0
2019-09	RAN#85	R5-197655	0359	2	F	Modification of SA FR1 SSB RLM OOS in DRX Section 6.5.1.3	16.1.0
2019-09	RAN#85	R5-197656	0292	2	F	FR1 Test tolerance update for SS-RSRP NSA FR1 test cases	16.1.0
2019-09	RAN#85	R5-197657	0300	2	F	Correction to EN-DC FR1 radio link monitoring TC 4.5.1.1 and 4.5.1.2	16.1.0
2019-09	RAN#85	R5-197658	0293	2	F	FR1 Test tolerance update for SS-RSRP SA FR1 test cases	16.1.0
2019-12	RAN#86	R5-197794	0369	-	F	Update Test Tolerance of 4.5.2.1 interruptions active and non-active in sync	16.2.0
2019-12	RAN#86	R5-197795	0370	-	F	Update Test Tolerance of 4.5.2.2 interruptions active and non-active in async	16.2.0
2019-12	RAN#86	R5-197804	0379	-	F	Update Test Tolerance of 6.6.3.1 inter-RAT measurement non-DRX	16.2.0
2019-12	RAN#86	R5-197805	0380	-	F	Update Test Tolerance of 6.6.3.2 inter-RAT measurement DRX	16.2.0
2019-12	RAN#86	R5-197813	0382	-	F	Addition of minimum conformance requirements 5.5.5.0.1-SSB based BFD	16.2.0
2019-12	RAN#86	R5-197814	0383	-	F	Addition of minimum conformance requirements 8.2.1.0-inter-RAT reselection	16.2.0
2019-12	RAN#86	R5-197815	0384	-	F	Addition of minimum conformance requirements 8.3.1.0-inter-RAT handover	16.2.0
2019-12	RAN#86	R5-197816	0385	-	F	Addition of minimum conformance requirements 8.4.1.0-inter-RAT SFTD delay	16.2.0
2019-12	RAN#86	R5-197817	0386	-	F	Addition of minimum conformance requirements 8.5.1.0-inter-RAT SFTD accuracy	16.2.0
2019-12	RAN#86	R5-197820	0389	-	F	Addition of NR test case 8.2.1.1-high priority NR reselection	16.2.0
2019-12	RAN#86	R5-198029	0394	-	F	Update NSA SS-RSRP tests for 4Rx connection diagram	16.2.0
2019-12	RAN#86	R5-198032	0397	-	F	Align Annex D to TS 38.133	16.2.0
2019-12	RAN#86	R5-198289	0400	-	F	Correction of PRACH index in 6.1.1.1, 6.3.2.2.1 and 6.3.2.2.2	16.2.0
2019-12	RAN#86	R5-198415	0404	-	F	Correction to NR SA FR1 timing advance adjustment accuracy TC 6.4.3.1	16.2.0

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2019-12	RAN#86	R5-198416	0405	-	F	Correction to intra-frequency event-triggered reporting TC 6.6.1.1, 6.6.1.2, 6.6.1.3	16.2.0
2019-12	RAN#86	R5-198421	0410	-	F	Correction to FR1 SA random access test cases	16.2.0
2019-12	RAN#86	R5-198472	0412	-	F	Correct message contents for 5.6.2.x tests	16.2.0
2019-12	RAN#86	R5-198477	0416	-	F	Correction to Annex E	16.2.0
2019-12	RAN#86	R5-198518	0418	-	F	Update PUSCH symbol length as message exception in 6.4.1.1 in TS 38.533	16.2.0
2019-12	RAN#86	R5-198519	0419	-	F	Update 4.4.3.1 test requirements	16.2.0
2019-12	RAN#86	R5-198545	0420	-	F	Update 4.7.1.1.1 test requirements in TS 38.533	16.2.0
2019-12	RAN#86	R5-198549	0421	-	F	Updated to cell configuration mapping table for RRM tests	16.2.0
2019-12	RAN#86	R5-198550	0422	-	F	Minimum conformance requirements updated for 5G RRM Inter-RAT measurements tests	16.2.0
2019-12	RAN#86	R5-198551	0423	-	F	Minimum conformance requirements updated for 5G RRM SCell activation and deactivation delay tests	16.2.0
2019-12	RAN#86	R5-198558	0428	-	F	5G RRM Spec 3GPP style correction in clause 4 and 5	16.2.0
2019-12	RAN#86	R5-198572	0429	-	F	Correction of minimum conformance requirements 4.6.2.0	16.2.0
2019-12	RAN#86	R5-198575	0432	-	F	Correction of minimum conformance requirements 5.6.3.0	16.2.0
2019-12	RAN#86	R5-198577	0434	-	F	Correction of clause 3 definitions, symbols and abbreviations	16.2.0
2019-12	RAN#86	R5-198578	0435	-	F	Correction of RRM Test Case 4.6.3.1	16.2.0
2019-12	RAN#86	R5-198581	0438	-	F	Correction of RRM Test Case 4.6.3.4	16.2.0
2019-12	RAN#86	R5-198582	0439	-	F	Correction of RRM Test Case 5.6.2.1	16.2.0
2019-12	RAN#86	R5-198583	0440	-	F	Correction of RRM Test Case 5.6.2.2	16.2.0
2019-12	RAN#86	R5-198584	0441	-	F	Correction of RRM Test Case 5.6.2.3	16.2.0
2019-12	RAN#86	R5-198585	0442	-	F	Correction of RRM Test Case 5.6.2.4	16.2.0
2019-12	RAN#86	R5-198586	0443	-	F	Correction of RRM Test Case 5.6.2.5	16.2.0
2019-12	RAN#86	R5-198587	0444	-	F	Correction of RRM Test Case 5.6.2.6	16.2.0
2019-12	RAN#86	R5-198588	0445	-	F	Correction of RRM Test Case 5.6.2.7	16.2.0
2019-12	RAN#86	R5-198589	0446	-	F	Correction of RRM Test Case 5.6.2.8	16.2.0
2019-12	RAN#86	R5-198594	0451	-	F	Correction of RRM Test Case 7.6.2.1	16.2.0
2019-12	RAN#86	R5-198595	0452	-	F	Correction of RRM Test Case 7.6.2.2	16.2.0
2019-12	RAN#86	R5-198596	0453	-	F	Correction of RRM Test Case 7.6.2.3	16.2.0
2019-12	RAN#86	R5-198597	0454	-	F	Correction of RRM Test Case 7.6.2.4	16.2.0
2019-12	RAN#86	R5-198598	0455	-	F	Correction of RRM Test Case 7.6.2.5	16.2.0
2019-12	RAN#86	R5-198599	0456	-	F	Correction of RRM Test Case 7.6.2.6	16.2.0
2019-12	RAN#86	R5-198601	0458	-	F	Correction of RRM Test Case 7.6.2.8	16.2.0
2019-12	RAN#86	R5-198692	0471	-	F	Addition of RRM Test Case 6.6.4.1	16.2.0
2019-12	RAN#86	R5-198693	0472	-	F	Addition of RRM Test Case 6.6.4.2	16.2.0
2019-12	RAN#86	R5-198694	0473	-	F	Addition of RRM Test Case 6.6.4.3	16.2.0

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2019-12	RAN#86	R5-198695	0474	-	F	Addition of RRM Test Case 6.6.4.4	16.2.0
2019-12	RAN#86	R5-198696	0475	-	F	Addition of RRM Test Case 7.6.3.1	16.2.0
2019-12	RAN#86	R5-198697	0476	-	F	Addition of RRM Test Case 7.6.3.2	16.2.0
2019-12	RAN#86	R5-198698	0477	-	F	Addition of RRM Test Case 7.6.3.3	16.2.0
2019-12	RAN#86	R5-198699	0478	-	F	Addition of RRM Test Case 7.6.3.4	16.2.0
2019-12	RAN#86	R5-199364	0365	1	F	Update Test Tolerance of 4.5.1.5 RLM OOS non-DRX	16.2.0
2019-12	RAN#86	R5-199365	0367	1	F	Update Test Tolerance of 4.5.1.7 RLM OOS DRX	16.2.0
2019-12	RAN#86	R5-199366	0375	1	F	Update Test Tolerance of 6.5.1.5 SA RLM OOS non-DRX	16.2.0
2019-12	RAN#86	R5-199367	0377	1	F	Update Test Tolerance of 6.5.1.7 SA RLM OOS DRX	16.2.0
2019-12	RAN#86	R5-199368	0366	1	F	Update Test Tolerance of 4.5.1.6 RLM in-sync non-DRX	16.2.0
2019-12	RAN#86	R5-199369	0368	1	F	Update Test Tolerance of 4.5.1.8 RLM in-sync DRX	16.2.0
2019-12	RAN#86	R5-199370	0376	1	F	Update Test Tolerance of 6.5.1.6 SA RLM in-sync non-DRX	16.2.0
2019-12	RAN#86	R5-199371	0378	1	F	Update Test Tolerance of 6.5.1.8 SA RLM in-sync DRX	16.2.0
2019-12	RAN#86	R5-199379	0417	1	F	Update 4.4.1.1 test procedure in TS 38.533	16.2.0
2019-12	RAN#86	R5-199380	0479	1	F	Update 4.5.1.1 and 4.5.1.2 in TS 38.533	16.2.0
2019-12	RAN#86	R5-199381	0406	1	F	Correction to NR SA FR1 SS-RSRP absolute and relative measurement accuracy Intra-frequency measurements	16.2.0
2019-12	RAN#86	R5-199389	0402	1	F	Correction to NR SA Cell re-selection tests	16.2.0
2019-12	RAN#86	R5-199390	0436	1	F	Correction of RRM Test Case 4.6.3.2	16.2.0
2019-12	RAN#86	R5-199391	0437	1	F	Correction of RRM Test Case 4.6.3.3	16.2.0
2019-12	RAN#86	R5-199392	0387	1	F	Addition of NR test case 5.5.5.1-ENDC FR2 SSB BFD no-DRX	16.2.0
2019-12	RAN#86	R5-199393	0388	1	F	Addition of NR test case 5.5.5.2-ENDC FR2 SSB BFD DRX	16.2.0
2019-12	RAN#86	R5-199394	0431	1	F	Correction of minimum conformance requirements 5.6.2.0	16.2.0
2019-12	RAN#86	R5-199395	0395	1	F	Update SA SS-RSRP tests for 4Rx connection diagram	16.2.0
2019-12	RAN#86	R5-199396	0403	1	F	Correction to NR SA FR1 UE transmit timing accuracy TC 6.4.1.1	16.2.0
2019-12	RAN#86	R5-199397	0457	1	F	Correction of RRM Test Case 7.6.2.7	16.2.0
2019-12	RAN#86	R5-199398	0361	1	F	Add AoA Setup 4 for FR2 RRM Test cases	16.2.0
2019-12	RAN#86	R5-199399	0390	1	F	Addition of NR test case 8.3.1.1-known handover	16.2.0
2019-12	RAN#86	R5-199400	0391	1	F	Addition of NR test case 8.4.1.1-SFTD delay non-DRX	16.2.0
2019-12	RAN#86	R5-199401	0392	1	F	Addition of NR test case 8.4.1.2-SFTD delay DRX	16.2.0
2019-12	RAN#86	R5-199402	0393	1	F	Addition of NR test case 8.5.1.1-SFTD accuracy	16.2.0
2019-12	RAN#86	R5-199403	0396	1	F	Align Annex A to TS 38.133	16.2.0
2019-12	RAN#86	R5-199404	0413	1	F	Clean up RRM message contents in Annex H	16.2.0
2019-12	RAN#86	R5-199405	0424	1	F	New 5G RRM Inter-RAT measurement TC 8.4.2.5	16.2.0
2019-12	RAN#86	R5-199406	0425	1	F	New 5G RRM Inter-RAT measurement TC 8.4.2.6	16.2.0
2019-12	RAN#86	R5-199407	0426	1	F	New 5G RRM Inter-RAT measurement TC 8.4.2.7	16.2.0

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2019-12	RAN#86	R5-199408	0427	1	F	New 5G RRM Inter-RAT measurement TC 8.4.2.8	16.2.0
2019-12	RAN#86	R5-199409	0433	1	F	Correction of message content in Annex H	16.2.0
2019-12	RAN#86	R5-199436	0470	1	F	Introduction of n29 and n65 to 38.533	16.2.0
2019-12	RAN#86	R5-199499	0401	1	F	Correction to EN-DC FR1 UE transmit timing accuracy TC 4.4.1.1	16.2.0
2019-12	RAN#86	R5-199515	0381	1	F	Update Test Tolerance in Annex F	16.2.0
2019-12	RAN#86	R5-199517	0481	1	F	Update General parameters in test case 4.5.1.2	16.2.0
2019-12	RAN#86	R5-199533	0482	1	F	Update NSA FR2 RLM IS non-DRX test	16.2.0
2019-12	RAN#86	R5-199534	0483	1	F	Update NSA FR2 RLM IS test with DRX	16.2.0
2019-12	RAN#86	R5-199535	0484	1	F	Update NSA FR2 Timing Accuracy Test	16.2.0
2019-12	RAN#86	R5-199544	0399	1	F	Add applicable test methods for RRM FR2	16.2.0
2019-12	RAN#86	R5-199550	0463	1	F	Addition of NR SA FR1 Handover with known Target Cell Section 6.3.1.1	16.2.0
2019-12	RAN#86	R5-199551	0464	1	F	Modification of NR SA FR1 Handover with unknown Target Cell Section 6.3.1.2	16.2.0
2019-12	RAN#86	R5-199552	0465	1	F	Modification of NR SA FR1-FR1 Handover with unknown Target Cell Section 6.3.1.3	16.2.0
2019-12	RAN#86	R5-199583	0409	1	F	Correction to FR1 NSA random access test cases	16.2.0
2020-03	RAN#87	R5-200822	0544	-	F	Correction to Test Applicability for 4.3.2.2.2 Non-contention based random access test in FR1 for PSCell in EN-DC	16.3.0
2020-03	RAN#87	R5-200823	0545	-	F	Correction to SRS Configuration for 4.4.3.1 EN-DC FR1 timing advance adjustment accuracy	16.3.0
2020-03	RAN#87	R5-200829	0551	-	F	Correction to Message Exception for 4.6.1.5 EN-DC FR1 event-triggered reporting without gap in non-DRX with SSB time index detection	16.3.0
2020-03	RAN#87	R5-200833	0555	-	F	Correction to Test Applicability for 6.3.2.2.2 Non-Contention based random access test in FR1 for NR standalone	16.3.0
2020-03	RAN#87	R5-200834	0556	-	F	Correction to SRS Configuration for 6.4.3.1 NR SA FR1 timing advance adjustment accuracy	16.3.0
2020-03	RAN#87	R5-200839	0561	-	F	Correction to Message Exception for 6.6.1.5 NR SA FR1 event-triggered reporting without gap in non-DRX with SSB time index detection	16.3.0
2020-03	RAN#87	R5-200277	0488	-	F	Test tolerance update intra-frequency SS-SINR NSA	16.3.0
2020-03	RAN#87	R5-200278	0489	-	F	Test tolerance update inter-frequency SS-SINR NSA	16.3.0
2020-03	RAN#87	R5-200279	0490	-	F	Test tolerance update inter-frequency SS-RSRP SA	16.3.0
2020-03	RAN#87	R5-200281	0492	-	F	Test tolerance update inter-frequency SS-RSRQ SA	16.3.0
2020-03	RAN#87	R5-200282	0493	-	F	Test tolerance update intra-frequency SS-SINR SA	16.3.0
2020-03	RAN#87	R5-200283	0494	-	F	Test tolerance update inter-frequency SS-SINR SA	16.3.0
2020-03	RAN#87	R5-200306	0497	-	F	Reference SSB configuration correction	16.3.0
2020-03	RAN#87	R5-200421	0508	-	F	Correction to Active UL BWP for intra-frequency event triggered reporting with gap	16.3.0
2020-03	RAN#87	R5-200422	0509	-	F	Correction to EN-DC FR1 event-triggered reporting test cases	16.3.0
2020-03	RAN#87	R5-200423	0510	-	F	Correction to FR1 NR SA E-UTRA cell re-selection test cases	16.3.0

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2020-03	RAN#87	R5-200425	0512	-	F	Correction to NR SA FR1 SS-RSRP measurement accuracy tests	16.3.0
2020-03	RAN#87	R5-200427	0514	-	F	Correction to the simulated cell for cell-reselection test cases	16.3.0
2020-03	RAN#87	R5-200428	0515	-	F	Correction to UE transmit timing accuracy test case	16.3.0
2020-03	RAN#87	R5-200564	0524	-	F	Correction to Statistical testing of delay and UE measurement performance in RRM tests	16.3.0
2020-03	RAN#87	R5-200606	0526	-	F	Cell mapping update measurement tests Annex E	16.3.0
2020-03	RAN#87	R5-200607	0527	-	F	Re-submission R5-197804 not implemented	16.3.0
2020-03	RAN#87	R5-200608	0528	-	F	Corrections to SS-RSRP meas accuracy NSA tests	16.3.0
2020-03	RAN#87	R5-200610	0530	-	F	Correct message contents measurement tests	16.3.0
2020-03	RAN#87	R5-200705	0533	-	F	Correction to TC 6.1.1.2 FR1 inter-freq re-selection	16.3.0
2020-03	RAN#87	R5-200708	0536	-	F	Update of TC 6.3.2.3.1 FR1 RRC redirection	16.3.0
2020-03	RAN#87	R5-200709	0537	-	F	Update of TC 6.3.2.3.2 inter-freq RRC redirection	16.3.0
2020-03	RAN#87	R5-200785	0539	-	F	Update of EN-DC SSB-based RLM TC 4.5.1.1, 4.5.1.2, 4.5.1.3 and 4.5.1.4	16.3.0
2020-03	RAN#87	R5-200786	0540	-	F	Update of EN-DC CSI-RS-based RLM TC 4.5.1.5, 4.5.1.6, 4.5.1.7 and 4.5.1.8	16.3.0
2020-03	RAN#87	R5-200787	0541	-	F	Update of NR CSI-RS-based RLM TC 6.5.1.5, 6.5.1.6, 6.5.1.7 and 6.5.1.8	16.3.0
2020-03	RAN#87	R5-200818	0543	-	F	Correction to cell mapping Annex E	16.3.0
2020-03	RAN#87	R5-200858	0569	-	F	Corrections to Table H.3.1-8	16.3.0
2020-03	RAN#87	R5-200916	0538	1	F	Update to test applicability per permitted test method	16.3.0
2020-03	RAN#87	R5-200986	0507	1	F	Core alignment for event-triggered reporting test cases	16.3.0
2020-03	RAN#87	R5-200987	0534	1	F	Update of TC 6.3.2.1.1 FR1 RRC re-establishment	16.3.0
2020-03	RAN#87	R5-200988	0535	1	F	Update of TC 6.3.2.1.2 inter-freq RRC re-establishment	16.3.0
2020-03	RAN#87	R5-201030	0529	1	F	Corrections to SS-RSRP meas accuracy SA tests	16.3.0
2020-03	RAN#87	R5-201039	0485	1	F	Test tolerance update inter-frequency SS-RSRP NSA	16.3.0
2020-03	RAN#87	R5-201040	0486	1	F	Test tolerance update intra-frequency SS-RSRQ NSA	16.3.0
2020-03	RAN#87	R5-201041	0491	1	F	Test tolerance update intra-frequency SS-RSRQ SA	16.3.0
2020-03	RAN#87	R5-201056	0511	1	F	Correction to message contents in 6.6.1.5 and 6.6.1.6	16.3.0
2020-03	RAN#87	R5-201057	0513	1	F	Correction to test description of RRM TC 4.6.1.3 and 4.6.1.6	16.3.0
2020-03	RAN#87	R5-201058	0516	1	F	Update of maximum test system uncertainty for FR1 RRM Test	16.3.0
2020-03	RAN#87	R5-201063	0517	1	F	Update FR1 Test Tolerance of 4.5.2.3 interruptions on NR SCC in sync	16.3.0
2020-03	RAN#87	R5-201064	0518	1	F	Update FR1 Test Tolerance of 4.5.2.4 interruptions on NR SCC in async	16.3.0
2020-03	RAN#87	R5-201071	0552	1	F	Correction to Test Applicability for 4.6.2.2 EN-DC FR1-FR1 event-triggered reporting in DRX	16.3.0
2020-03	RAN#87	R5-201072	0553	1	F	Correction to Test Applicability for 4.6.2.5 EN-DC FR1-FR1 event-triggered reporting in non-DRX with SSB time index detection	16.3.0
2020-03	RAN#87	R5-201073	0554	1	F	Correction to Test Applicability for 4.6.2.6 EN-DC FR1-FR1 event-	16.3.0

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						triggered reporting in DRX with SSB time index detection	
2020-03	RAN#87	R5-201078	0562	1	F	Correction to Test Applicability for 6.6.2.1 NR SA FR1-FR1 event-triggered reporting in non-DRX	16.3.0
2020-03	RAN#87	R5-201080	0564	1	F	Correction to Test Applicability for 6.6.2.5 NR SA FR1-FR1 event-triggered reporting in non-DRX with SSB time index detection	16.3.0
2020-03	RAN#87	R5-201081	0565	1	F	Correction to Test Applicability for 6.6.2.6 NR SA FR1-FR1 event-triggered reporting in DRX with SSB time index detection	16.3.0
2020-03	RAN#87	R5-201082	0571	1	F	Correction to Test Parameters for 4.6.1.1	16.3.0
2020-03	RAN#87	R5-201083	0572	1	F	Correction to Test Parameters for 4.6.1.2	16.3.0
2020-03	RAN#87	R5-201160	0531	1	F	Correct message contents event triggered measurement tests	16.3.0
2020-03	RAN#87	R5-201166	0567	1	F	Update RLM non DRX test cases	16.3.0
2020-03	RAN#87	R5-201167	0568	1	F	Update 4.5.1.4 test case	16.3.0
2020-03	RAN#87	R5-201168	0570	1	F	Clarification 4.4.1.1 test procedure	16.3.0
2020-03	RAN#87	R5-201169	0521	1	F	Update of FR1 Test Tolerance in Annex F	16.3.0
2020-03	RAN#87	R5-201190	0542	1	F	Update of NR SSB-based RLM TC 6.5.1.1, 6.5.1.2, 6.5.1.3 and 6.5.1.4	16.3.0
2020-03	RAN#87	R5-201240	0563	2	F	Correction to Test Applicability for 6.6.2.2 NA SA FR1-FR1 event-triggered reporting in DRX	16.3.0
2020-03	RAN#87	R5-201242	0532	2	F	Correction to Test Applicability for 4.6.2.1 EN-DC FR1-FR1 event-triggered reporting in non-DRX	16.3.0
2020-03	RAN#87	R5-200276	0487	-	F	Test tolerance update inter-frequency SS-RSRQ NSA	16.3.0
2020-03	RAN#87	R5-200284	0495	-	F	Test tolerance update measurement tests Annex F	16.3.0
2020-03	RAN#87	R5-201044	0496	-	F	Test Tolerance and Measurement Uncertainty in Annex F for L1-RSRP measurement test cases	16.3.0
2020-03	RAN#87	R5-201045	0499	1	F	Correction of RRM Test Case 4.6.3.1 including FR1 Test Tolerance	16.3.0
2020-03	RAN#87	R5-201046	0500	1	F	Correction of RRM Test Case 4.6.3.2 including FR1 Test Tolerance	16.3.0
2020-03	RAN#87	R5-201047	0501	1	F	Correction of RRM Test Case 4.6.3.3 including FR1 Test Tolerance	16.3.0
2020-03	RAN#87	R5-201048	0502	1	F	Correction of RRM Test Case 4.6.3.4 including FR1 Test Tolerance	16.3.0
2020-03	RAN#87	R5-201049	0503	1	F	Correction of RRM Test Case 6.6.4.1 including FR1 Test Tolerance	16.3.0
2020-03	RAN#87	R5-201050	0504	1	F	Correction of RRM Test Case 6.6.4.2 including FR1 Test Tolerance	16.3.0
2020-03	RAN#87	R5-201051	0505	1	F	Correction of RRM Test Case 6.6.4.3 including FR1 Test Tolerance	16.3.0
2020-03	RAN#87	R5-201052	0506	1	F	Correction of RRM Test Case 6.6.4.4 including FR1 Test Tolerance	16.3.0
2020-03	RAN#87	R5-201070	0548	1	F	Correction to Message Exception for 4.5.1.3 EN-DC FR1 radio link monitoring Out-of-sync test for PSCell configured with SSB-based RLM RS in DRX mode	16.3.0
2020-03	RAN#87	R5-201074	0557	1	F	Correction to Test Parameter for 6.5.1.1 NR SA FR1 radio link monitoring Out-of-sync test for PSCell configured with SSB-based RLM RS in non-DRX mode	16.3.0
2020-03	RAN#87	R5-201075	0558	1	F	Correction to Test Procedure for 6.5.1.2 NR SA FR1 radio link monitoring in-sync test for PCell configured with SSB-based RLM RS in non-DRX mode	16.3.0
2020-03	RAN#87	R5-201076	0559	1	F	Correction to Message Exception for 6.5.1.3 NR SA FR1 radio link monitoring Out-of-sync test for PSCell configured with SSB-based	16.3.0

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						RLM RS in DRX mode	
2020-03	RAN#87	R5-201077	0560	1	F	Correction to Message Exception for 6.5.1.4 NR SA FR1 radio link monitoring In-sync test for PSCell configured with SSB-based RLM RS in DRX mode	16.3.0
2020-03	RAN#87	R5-201105	0546	1	F	Correction to Test Parameters for 4.5.1.1 EN-DC FR1 radio link monitoring Out-of-sync test for PSCell configured with SSB-based RLM RS in non-DRX mode	16.3.0
2020-03	RAN#87	R5-201106	0547	1	F	Correction to Test Procedure for 4.5.1.2 EN-DC FR1 radio link monitoring in-sync test for PSCell configured with SSB-based RLM RS in non-DRX mode	16.3.0
2020-06	RAN#88	R5-201395	0576	-	F	Correction to NR test case 7.7.1.3.2 SS-RSRP relative accuracy	16.4.0
2020-06	RAN#88	R5-201396	0577	-	F	Correction to NR test case 8.2.1.1 higher priority NR cell reselection	16.4.0
2020-06	RAN#88	R5-201398	0579	-	F	Correction to NR test case 8.4.1.1 SFTD non-DRX	16.4.0
2020-06	RAN#88	R5-201399	0580	-	F	Correction to NR test case 8.4.1.2 SFTD DRX	16.4.0
2020-06	RAN#88	R5-201400	0581	-	F	Correction to NR test case 8.4.2.1 event-triggered without SSB index non-DRX	16.4.0
2020-06	RAN#88	R5-201401	0582	-	F	Correction to NR test case 8.4.2.2 event-triggered without SSB index DRX	16.4.0
2020-06	RAN#88	R5-201402	0583	-	F	Correction to NR test case 8.4.2.3 event-triggered with SSB index non-DRX	16.4.0
2020-06	RAN#88	R5-201403	0584	-	F	Correction to NR test case 8.4.2.4 event-triggered with SSB index DRX	16.4.0
2020-06	RAN#88	R5-201404	0585	-	F	Correction to NR test case 8.5.1.1 SFTD accuracy	16.4.0
2020-06	RAN#88	R5-201405	0586	-	F	Addition to minimum conformance requirement 5.5.5.0.3 - scheduling restriction for BFD and CBD	16.4.0
2020-06	RAN#88	R5-201407	0588	-	F	Addition to minimum conformance requirement 5.5.8.0 - TCI-state switch	16.4.0
2020-06	RAN#88	R5-201408	0589	-	F	Addition to NR test case 5.5.8.1 MAC-CE based TCI switch	16.4.0
2020-06	RAN#88	R5-201409	0590	-	F	Addition to NR test case 5.5.8.2 RRC based TCI switch	16.4.0
2020-06	RAN#88	R5-201412	0593	-	F	Addition to minimum conformance requirements 7.5.1.0.5 - Scheduling restriction for RLM	16.4.0
2020-06	RAN#88	R5-201414	0595	-	F	Addition to minimum Conformance Requirements 7.5.6.1.0 - DCI-based DL active BWP switch	16.4.0
2020-06	RAN#88	R5-201415	0596	-	F	Addition to NR test case 7.5.6.1.3 FR2 DCI-based DL active BWP switch non-DRX	16.4.0
2020-06	RAN#88	R5-201619	0603	-	F	Corrections to 6.7.1.1	16.4.0
2020-06	RAN#88	R5-201676	0614	-	F	Correction to inter-freq measurement TCs for SSB configuration	16.4.0
2020-06	RAN#88	R5-201677	0615	-	F	Correction to TC 6.3.2.3.1 for the test procedure	16.4.0
2020-06	RAN#88	R5-201679	0617	-	F	Update of TC 5.6.1.1 event-triggered without gap non-DRX	16.4.0
2020-06	RAN#88	R5-201680	0618	-	F	Update of TC 5.6.1.2 event-triggered without gap DRX	16.4.0
2020-06	RAN#88	R5-201681	0619	-	F	Update of TC 5.6.1.3 event-triggered with gap non-DRX	16.4.0
2020-06	RAN#88	R5-201682	0620	-	F	Update of TC 5.6.1.4 event-triggered with gap DRX	16.4.0
2020-06	RAN#88	R5-201686	0624	-	F	Update of TC 8.4.2.5 FR2 event-triggered without SSB index non-DRX	16.4.0

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2020-06	RAN#88	R5-201687	0625	-	F	Update of TC 8.4.2.6 FR2 event-triggered without SSB index DRX	16.4.0
2020-06	RAN#88	R5-201688	0626	-	F	Update of TC 8.4.2.7 FR2 event-triggered with SSB index non-DRX	16.4.0
2020-06	RAN#88	R5-201689	0627	-	F	Update of TC 8.4.2.8 FR2 event-triggered with SSB index DRX	16.4.0
2020-06	RAN#88	R5-201821	0634	-	F	Correction of SS-SINR applicability -NSA	16.4.0
2020-06	RAN#88	R5-201822	0635	-	F	Correction of SS-SINR applicability -SA	16.4.0
2020-06	RAN#88	R5-201824	0637	-	F	Corrections to 4.7.1.1	16.4.0
2020-06	RAN#88	R5-202054	0644	-	F	Minimum Requirements SS-RSRP iRAT	16.4.0
2020-06	RAN#88	R5-202055	0645	-	F	Addition 8.5.2.1.1	16.4.0
2020-06	RAN#88	R5-202056	0646	-	F	Addition 8.5.2.1.2	16.4.0
2020-06	RAN#88	R5-202057	0647	-	F	Minimum Requirements SS-RSRQ iRAT	16.4.0
2020-06	RAN#88	R5-202058	0648	-	F	Addition 8.5.2.2.1	16.4.0
2020-06	RAN#88	R5-202059	0649	-	F	Addition 8.5.2.2.2	16.4.0
2020-06	RAN#88	R5-202060	0650	-	F	Minimum Requirements SS-SINR iRAT	16.4.0
2020-06	RAN#88	R5-202061	0651	-	F	Addition 8.5.2.3.1	16.4.0
2020-06	RAN#88	R5-202062	0652	-	F	Addition 8.5.2.3.2	16.4.0
2020-06	RAN#88	R5-202063	0653	-	F	Minimum requirements SS-RSRP NSA FR2	16.4.0
2020-06	RAN#88	R5-202064	0654	-	F	Addition 5.7.1.1	16.4.0
2020-06	RAN#88	R5-202065	0655	-	F	Addition 5.7.1.2	16.4.0
2020-06	RAN#88	R5-202066	0656	-	F	Addition 5.7.1.3	16.4.0
2020-06	RAN#88	R5-202067	0657	-	F	Minimum requirements SS-RSRQ NSA FR2	16.4.0
2020-06	RAN#88	R5-202068	0658	-	F	Addition 5.7.2.1	16.4.0
2020-06	RAN#88	R5-202069	0659	-	F	Addition 5.7.2.2	16.4.0
2020-06	RAN#88	R5-202070	0660	-	F	Minimum requirements SS-SINR NSA FR2	16.4.0
2020-06	RAN#88	R5-202071	0661	-	F	Addition 5.7.3.1	16.4.0
2020-06	RAN#88	R5-202072	0662	-	F	Addition 5.7.3.2	16.4.0
2020-06	RAN#88	R5-202073	0663	-	F	Minimum requirements SS-RSRP SA FR2	16.4.0
2020-06	RAN#88	R5-202074	0664	-	F	Addition 7.7.1.1	16.4.0
2020-06	RAN#88	R5-202075	0665	-	F	Addition 7.7.1.2	16.4.0
2020-06	RAN#88	R5-202076	0666	-	F	Minimum requirements SS-RSRQ SA FR2	16.4.0
2020-06	RAN#88	R5-202077	0667	-	F	Addition 7.7.2.1	16.4.0
2020-06	RAN#88	R5-202078	0668	-	F	Addition 7.7.2.2	16.4.0
2020-06	RAN#88	R5-202079	0669	-	F	Minimum requirements SS-SINR SA FR2	16.4.0
2020-06	RAN#88	R5-202080	0670	-	F	Addition 7.7.3.1	16.4.0
2020-06	RAN#88	R5-202081	0671	-	F	Addition 7.7.3.2	16.4.0
2020-06	RAN#88	R5-202091	0672	-	F	Correction of OCNG configurations and CSI-RS for tracking in Annex A	16.4.0

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2020-06	RAN#88	R5-202092	0673	-	F	Cell configuration for SA FR2 event-triggered reporting test cases	16.4.0
2020-06	RAN#88	R5-202093	0674	-	F	Correction of MeasGapConfig in Annex H	16.4.0
2020-06	RAN#88	R5-202095	0676	-	F	Correction of AoA configuration for FR2 SA Inter-freq measurement test cases in clause 5.6.2	16.4.0
2020-06	RAN#88	R5-202096	0677	-	F	Correction of RRM Test Case 7.6.2.1	16.4.0
2020-06	RAN#88	R5-202097	0678	-	F	Correction of RRM Test Case 7.6.2.2	16.4.0
2020-06	RAN#88	R5-202098	0679	-	F	Correction of RRM Test Case 7.6.2.3	16.4.0
2020-06	RAN#88	R5-202099	0680	-	F	Correction of RRM Test Case 7.6.2.4	16.4.0
2020-06	RAN#88	R5-202100	0681	-	F	Correction of RRM Test Case 7.6.2.5	16.4.0
2020-06	RAN#88	R5-202101	0682	-	F	Correction of RRM Test Case 7.6.2.6	16.4.0
2020-06	RAN#88	R5-202102	0683	-	F	Correction of RRM Test Case 7.6.2.7	16.4.0
2020-06	RAN#88	R5-202103	0684	-	F	Correction of RRM Test Case 7.6.2.8	16.4.0
2020-06	RAN#88	R5-202263	0704	-	F	Core alignment in 4.6.1.5 and 4.6.1.6 Event Triggered Reporting with SSB time index detection	16.4.0
2020-06	RAN#88	R5-202265	0706	-	F	Correction on EN-DC FR1 radio link monitoring out-of-sync test	16.4.0
2020-06	RAN#88	R5-202273	0714	-	F	Correction to NR SA FR1 - E-UTRA RRC Connection release with redirection	16.4.0
2020-06	RAN#88	R5-202277	0718	-	F	Editorial Correction to FR2 Interruption test cases	16.4.0
2020-06	RAN#88	R5-202385	0720	-	F	Addition of RRM Cell configuration mapping table for EN-DC FR1 Test Case 4.5.4.1	16.4.0
2020-06	RAN#88	R5-202387	0721	-	F	Addition of RRC message content exceptions for UE UL Carrier Reconfiguration Delay	16.4.0
2020-06	RAN#88	R5-202389	0722	-	F	Addition of RRM Test Case 4.5.4.1 in Annex F	16.4.0
2020-06	RAN#88	R5-202415	0728	-	F	Alignment 5.4.1.1 test procedure with 4.4.1.1	16.4.0
2020-06	RAN#88	R5-202418	0730	-	F	Update 6.5.1.1 and CSI-ReportConfig in Annex H	16.4.0
2020-06	RAN#88	R5-202488	0736	-	F	Correction to the simulated cell for cell-reselection test cases	16.4.0
2020-06	RAN#88	R5-202496	0744	-	F	Correction of RRM Test Case 6.4.1.1	16.4.0
2020-06	RAN#88	R5-202497	0745	-	F	Title Correction of Annex D.4.2.4	16.4.0
2020-06	RAN#88	R5-202700	0723	1	F	Addition of new RRM Test Case 4.5.4.1	16.4.0
2020-06	RAN#88	R5-202701	0675	1	F	Editorial correction of RRM TT in Annex F	16.4.0
2020-06	RAN#88	R5-202744	0708	1	F	Correction to EN-DC FR1 radio link monitoring tests	16.4.0
2020-06	RAN#88	R5-202745	0727	1	F	Clarification cell2 SS-RSRP in 4.7.1.2.1	16.4.0
2020-06	RAN#88	R5-202746	0587	1	F	Addition to NR test case 5.5.5.5 scheduling available restriction	16.4.0
2020-06	RAN#88	R5-202747	0707	1	F	Correction on NR SA FR1 - E-UTRAN event-triggered reporting tests	16.4.0
2020-06	RAN#88	R5-202748	0731	1	F	Update 6.5.1.2 message content exception and test procedure	16.4.0
2020-06	RAN#88	R5-202749	0737	1	F	Correction of RRM Test Case 6.1.1.1	16.4.0
2020-06	RAN#88	R5-202750	0738	1	F	Correction of RRM Test Case 6.1.1.2	16.4.0
2020-06	RAN#88	R5-202751	0621	1	F	Update of TC 7.1.1.1 intra-freq cell re-selection	16.4.0

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2020-06	RAN#88	R5-202752	0622	1	F	Update of TC 7.1.1.2 inter-freq cell re-selection	16.4.0
2020-06	RAN#88	R5-202753	0724	1	F	Addition of new RRM Test Cases in clause 7.5.3	16.4.0
2020-06	RAN#88	R5-202754	0725	1	F	Addition of new RRM Test Cases in clause 7.5.7	16.4.0
2020-06	RAN#88	R5-202812	0685	1	F	Correction to Test Applicability for 4.6.1.3 EN-DC FR1 event-triggered reporting with gap in non-DRX	16.4.0
2020-06	RAN#88	R5-202813	0686	1	F	Correction to Test Applicability for 4.6.1.4 EN-DC FR1 event-triggered reporting with gap in DRX	16.4.0
2020-06	RAN#88	R5-202814	0687	1	F	Correction to Test Applicability & Message Exception for 4.6.1.6 EN-DC FR1 event-triggered reporting with gap in non-DRX with SSB time index detection	16.4.0
2020-06	RAN#88	R5-202815	0688	1	F	Correction to Test Applicability for 6.6.1.3 NR SA FR1 event-triggered reporting with gap in non-DRX	16.4.0
2020-06	RAN#88	R5-202816	0689	1	F	Correction to Test Applicability for 6.6.1.4 NR SA FR1 event-triggered reporting with gap in DRX	16.4.0
2020-06	RAN#88	R5-202817	0732	1	F	Correction to Test Requirement for 4.4.3.1 by updating TT values from Annex F	16.4.0
2020-06	RAN#88	R5-202833	0591	1	F	Addition to NR test case 6.3.2.1.3 FR1-FR1 RRC re-establishment without serving cell timing	16.4.0
2020-06	RAN#88	R5-202834	0575	1	F	Correction to NR test case 7.7.1.3.1 SA FR2 SS-RSRP absolute accuracy	16.4.0
2020-06	RAN#88	R5-202835	0592	1	F	Addition to NR test case 7.3.2.1.3 FR2-FR2 RRC re-establishment without serving cell timing	16.4.0
2020-06	RAN#88	R5-202836	0594	1	F	Addition to NR test case 7.5.1.9 FR2 RLM scheduling restrictions	16.4.0
2020-06	RAN#88	R5-202837	0578	1	F	Correction to NR test case 8.3.1.1 handover to known cell	16.4.0
2020-06	RAN#88	R5-202838	0597	1	F	Addition of Default Configuration in Annex H	16.4.0
2020-06	RAN#88	R5-202839	0628	1	F	Update of Annex D.4.1.1 for parameters of BFD with 4RX	16.4.0
2020-06	RAN#88	R5-202840	0630	1	F	Update of Cell mapping in Annex E	16.4.0
2020-06	RAN#88	R5-202841	0633	1	F	Add auxiliary bands for RRM inter-frequency SA tests	16.4.0
2020-06	RAN#88	R5-202909	0697	1	F	Correction to Test Requirements in 4.4.1.1, Table 4.4.1.1.5-5 to include TT values from Annex F	16.4.0
2020-06	RAN#88	R5-202910	0698	1	F	Correction to Test Requirements in 6.4.1.1, Table 6.4.1.1.5-5 to include TT values from Annex F	16.4.0
2020-06	RAN#88	R5-202911	0734	1	F	Correction to Test Requirement for 6.4.3.1 by updating TT values from Annex F	16.4.0
2020-06	RAN#88	R5-202912	0735	1	F	Annex I RRM OTA procedures update to add RSRPB based UE Positioning Method for FR2	16.4.0
2020-06	RAN#88	R5-202913	0703	1	F	Clarification of disabling Tx diversity for FR2 UE for FR2 RRM testing	16.4.0
2020-06	RAN#88	R5-202914	0719	1	F	Updates of FR2 MU and TT in TS 38.533	16.4.0
2020-06	RAN#88	R5-202950	0693	1	F	Correction to Message Exception for 4.6.2.5 EN-DC FR1-FR1 event-triggered reporting in non-DRX with SSB time index detection	16.4.0
2020-06	RAN#88	R5-202951	0694	1	F	Correction to Message Exception for 4.6.2.6 EN-DC FR1-FR1 event-triggered reporting in DRX with SSB time index detection	16.4.0
2020-06	RAN#88	R5-202961	0690	1	F	Correction to Test Applicability and Message Exception for 6.6.1.6 NR SA FR1 event-triggered reporting with gap in non-DRX with	16.4.0

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						SSB index reading	
2020-06	RAN#88	R5-202969	0639	1	F	Corrections to 4.7.2.1	16.4.0
2020-06	RAN#88	R5-202970	0641	1	F	Corrections to 4.7.3.1	16.4.0
2020-06	RAN#88	R5-202971	0642	1	F	Corrections to 4.7.3.2	16.4.0
2020-06	RAN#88	R5-202972	0598	1	F	Corrections to 6.7.1.2 and core spec alignment	16.4.0
2020-06	RAN#88	R5-202973	0599	1	F	Corrections to 6.7.2.1 and core spec alignment	16.4.0
2020-06	RAN#88	R5-202974	0600	1	F	Corrections to 6.7.2.2 and core spec alignment	16.4.0
2020-06	RAN#88	R5-202975	0601	1	F	Corrections to 6.7.3.1 and core spec alignment	16.4.0
2020-06	RAN#88	R5-202976	0602	1	F	Corrections to 6.7.3.2 and core spec alignment	16.4.0
2020-06	RAN#88	R5-202977	0638	1	F	Corrections to 4.7.1.2	16.4.0
2020-06	RAN#88	R5-202978	0640	1	F	Corrections to 4.7.2.2	16.4.0
2020-06	RAN#88	R5-202982	0710	1	F	Correction to FR1 UE transmit timing accuracy	16.4.0
2020-06	RAN#88	R5-202983	0709	1	F	Correction to EN-DC FR2 RRC-based DL active BWP switch in non-DRX in synchronous ENDC	16.4.0
2020-06	RAN#88	R5-202984	0711	1	F	Correction to FR2 UE transmit timing accuracy	16.4.0
2020-06	RAN#88	R5-202985	0705	1	F	Core alignment in 6.6.1.2 NR SA FR1 event-triggered reporting without gap in DRX	16.4.0
2020-06	RAN#88	R5-202986	0713	1	F	Correction to NR E-UTRA reselection tests	16.4.0
2020-06	RAN#88	R5-202987	0715	1	F	Correction to NR SA FR1 handover test cases	16.4.0
2020-06	RAN#88	R5-202996	0604	1	F	Update FR1 Test Tolerance of 4.5.2.5 E-UTRAN SCC in sync	16.4.0
2020-06	RAN#88	R5-202997	0605	1	F	Update FR1 Test Tolerance of 4.5.2.6 E-UTRAN SCC in async	16.4.0
2020-06	RAN#88	R5-202998	0606	1	F	Update FR1 Test Tolerance of 4.5.3.1 SCell activation 160ms	16.4.0
2020-06	RAN#88	R5-202999	0607	1	F	Update FR1 Test Tolerance of 4.5.3.2 SCell activation 320ms	16.4.0
2020-06	RAN#88	R5-203000	0608	1	F	Update FR1 Test Tolerance of 4.5.3.3 unknown SCell activation	16.4.0
2020-06	RAN#88	R5-203091	0623	1	F	Update of 4.5.3.0 minimum requirements for Scell activation	16.4.0
2020-06	RAN#88	R5-203092	0613	1	F	Update FR1 Test Tolerance of 6.5.4.1 UL carrier RRC reconfiguration delay	16.4.0
2020-06	RAN#88	R5-203093	0629	1	F	Update of FR1 Test Tolerance in Annex F	16.4.0
2020-06	RAN#88	R5-203095	0609	1	F	Addition FR1 Test Tolerance of 6.5.5.1 SSB BFD non-DRX	16.4.0
2020-06	RAN#88	R5-203096	0610	1	F	Addition FR1 Test Tolerance of 6.5.5.2 SSB BFD DRX	16.4.0
2020-06	RAN#88	R5-203097	0611	1	F	Update FR1 Test Tolerance of 6.5.5.3 CSI-RS BFD non-DRX	16.4.0
2020-06	RAN#88	R5-203098	0612	1	F	Update FR1 Test Tolerance of 6.5.5.4 CSI-RS BFD DRX	16.4.0
2020-09	RAN#89	R5-203234	0747	-	F	Update TC 8.5.2.1.1.1 with TT results and message contents	16.5.0
2020-09	RAN#89	R5-203235	0748	-	F	Update TC 8.5.2.2.1 with TT results and message contents	16.5.0
2020-09	RAN#89	R5-203249	0758	-	F	Annex E and F update with TT results for 8.5.2.x.x iRAT periodic reporting test cases	16.5.0
2020-09	RAN#89	R5-203250	0759	-	F	Annex E and F update with TT results for 4.7.4.x.x EN-DC L1-RSRP periodic reporting test cases	16.5.0

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2020-09	RAN#89	R5-203252	0761	-	F	Void unnecessary TC 8.5.2.1.1.2	16.5.0
2020-09	RAN#89	R5-203267	0765	-	F	[EDITORIAL] Fix formatting issues throwing DOCX conversion errors in TS 38.533	16.5.0
2020-09	RAN#89	R5-203268	0766	-	F	Correction of test applicability for EN-DC event-triggered tests	16.5.0
2020-09	RAN#89	R5-203269	0767	-	F	Correction of test applicability for NR SA event-triggered tests	16.5.0
2020-09	RAN#89	R5-203270	0768	-	F	Adding annex table for iRAT measurement configuration	16.5.0
2020-09	RAN#89	R5-203271	0769	-	F	Clarification on the usage of auxiliary bands	16.5.0
2020-09	RAN#89	R5-203272	0770	-	F	Remove IE includeBeamMeasurements from 6.6.1.5 and 6.6.1.6	16.5.0
2020-09	RAN#89	R5-203280	0772	-	F	n26 addition to group of bands in 38.533	16.5.0
2020-09	RAN#89	R5-203299	0773	-	F	Corrected test description in non-DRX test case 6.5.1.2	16.5.0
2020-09	RAN#89	R5-203300	0774	-	F	Correction of comment for monitoringSymbolsWithinSlot	16.5.0
2020-09	RAN#89	R5-203301	0775	-	F	Correction of delta offset application for Cell 2 in test case 4.7.1.2.1	16.5.0
2020-09	RAN#89	R5-203303	0777	-	F	PUSCH allocation correction in test case 6.4.3.1	16.5.0
2020-09	RAN#89	R5-203304	0778	-	F	Correction to the RRC Reconfiguration message for measurements	16.5.0
2020-09	RAN#89	R5-203306	0779	-	F	Update extreme conditions limits in TC 4.7.1.2.1	16.5.0
2020-09	RAN#89	R5-203307	0780	-	F	Update extreme conditions limits in TC 6.7.1.2.1	16.5.0
2020-09	RAN#89	R5-203308	0781	-	F	Update extreme conditions limits in TC 4.7.1.2.1 and TC 6.7.1.2.1 - Annex F	16.5.0
2020-09	RAN#89	R5-203309	0782	-	F	Correction power offset for Band Group F	16.5.0
2020-09	RAN#89	R5-203317	0786	-	F	Removing SearchSpaceId and ControlResourceSetId modification	16.5.0
2020-09	RAN#89	R5-203319	0788	-	F	Unification of cell frequency for FR1-FR1 test cases	16.5.0
2020-09	RAN#89	R5-203732	0790	-	F	Set ss-sinr request to false for EN-DC RRM measurement accuracy tests	16.5.0
2020-09	RAN#89	R5-203733	0791	-	F	Set ss-sinr request to false for NR SA RRM measurement accuracy tests	16.5.0
2020-09	RAN#89	R5-203832	0798	-	F	Update of 4.5.6.1.0 minimum requirement for DCI-based BWP switch	16.5.0
2020-09	RAN#89	R5-203835	0801	-	F	Update of 4.5.6.2.0 minimum requirement for RRC-based BWP switch	16.5.0
2020-09	RAN#89	R5-203837	0803	-	F	Update of FR1 Test Tolerance in 6.3.2.1.3 RRC re-establishment without serving cell timing	16.5.0
2020-09	RAN#89	R5-203838	0804	-	F	Addition of 6.5.2.0 minimum requirement for interruptions during measurements on NR SCC	16.5.0
2020-09	RAN#89	R5-203839	0805	-	F	Update of 6.5.2.1 interruptions during measurements on deactivated NR SCC	16.5.0
2020-09	RAN#89	R5-203840	0806	-	F	Addition of new Test Case 6.5.3.1 SCell activation and deactivation for 160ms cycle	16.5.0
2020-09	RAN#89	R5-203841	0807	-	F	Addition of new Test Case 6.5.3.2 SCell activation and deactivation for 320ms cycle	16.5.0
2020-09	RAN#89	R5-203842	0808	-	F	Addition of new Test Case 6.5.3.3 SCell activation and deactivation of unknown SCell	16.5.0
2020-09	RAN#89	R5-203847	0813	-	F	Update of 6.5.6.1.0 minimum requirement for DCI-based BWP	16.5.0

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						switch	
2020-09	RAN#89	R5-203850	0816	-	F	Update of 6.5.6.2.0 minimum requirement for RRC-based BWP switch	16.5.0
2020-09	RAN#89	R5-203853	0819	-	F	Correction to FR1 intra-frequency measurement with gap test cases	16.5.0
2020-09	RAN#89	R5-203855	0821	-	F	Update of Cell mapping in Annex E	16.5.0
2020-09	RAN#89	R5-204034	0827	-	F	CR to 38.533 on RRM Test Cases in clause 7.5.3	16.5.0
2020-09	RAN#89	R5-204036	0828	-	F	CR to 38.533 on RRM Test Cases in clause 7.5.7	16.5.0
2020-09	RAN#89	R5-204068	0829	-	F	Correction to FR2 timing advance adjustment accuracy	16.5.0
2020-09	RAN#89	R5-204069	0830	-	F	Correction to EN-DC FR2 interruptions at transitions between active and non-active during DRX	16.5.0
2020-09	RAN#89	R5-204070	0831	-	F	Addition of E-UTRA Test frequency selection rule for IRAT test cases	16.5.0
2020-09	RAN#89	R5-204071	0832	-	F	Correction on event-triggered reporting with gap in DRX and DRX configuration settings for NR serving cell	16.5.0
2020-09	RAN#89	R5-204072	0833	-	F	Correction to EN-DC and SA FR1-FR1 SS-RSRP and SS-RSRQ periodical measurement accuracy	16.5.0
2020-09	RAN#89	R5-204073	0834	-	F	Correction to SS-RSRQ periodical measurement accuracy	16.5.0
2020-09	RAN#89	R5-204075	0836	-	F	Correction to message configuration for radio link monitoring tests	16.5.0
2020-09	RAN#89	R5-204076	0837	-	F	Correction to NR SA FR1 E-UTRA RRC connection release with redirection	16.5.0
2020-09	RAN#89	R5-204077	0838	-	F	Correction to SRS PeriodicityAndOffset for Timing Advance tests	16.5.0
2020-09	RAN#89	R5-204079	0840	-	F	Correction to CSI-RS for tracking for TDD FR2	16.5.0
2020-09	RAN#89	R5-204116	0841	-	F	Correction of EN-DC FR2 SSB-based L1-RSRP measurement test case 5.6.3.1	16.5.0
2020-09	RAN#89	R5-204118	0843	-	F	Correction of EN-DC FR2 CSI-RS-based L1-RSRP measurement test case 5.6.3.3	16.5.0
2020-09	RAN#89	R5-204119	0844	-	F	Correction of EN-DC FR2 CSI-RS-based L1-RSRP measurement test case 5.6.3.4	16.5.0
2020-09	RAN#89	R5-204122	0847	-	F	Correction of NR SA FR2 SSB-based L1-RSRP measurement test case 7.6.3.1	16.5.0
2020-09	RAN#89	R5-204123	0848	-	F	Correction of NR SA FR2 SSB-based L1-RSRP measurement test case 7.6.3.2	16.5.0
2020-09	RAN#89	R5-204124	0849	-	F	Correction of NR SA FR2 CSI-RS-based L1-RSRP measurement test case 7.6.3.3	16.5.0
2020-09	RAN#89	R5-204125	0850	-	F	Correction of NR SA FR2 CSI-RS-based L1-RSRP measurement test case 7.6.3.4	16.5.0
2020-09	RAN#89	R5-204126	0851	-	F	Correction of minimum conformance requirements 4.6.4.0 for EN-DC FR1 L1-RSRP measurement test cases	16.5.0
2020-09	RAN#89	R5-204127	0852	-	F	Correction of minimum conformance requirements 5.6.3.0 for EN-DC FR2 L1-RSRP measurement test cases	16.5.0
2020-09	RAN#89	R5-204128	0853	-	F	Correction of minimum conformance requirements 7.6.3.0 for SA FR2 L1-RSRP measurement test cases	16.5.0
2020-09	RAN#89	R5-204220	0854	-	F	Update missing SMTC and SSB configurations in H.2	16.5.0
2020-09	RAN#89	R5-204221	0855	-	F	Update missing SMTC and SSB configurations in H.3	16.5.0

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2020-09	RAN#89	R5-204222	0856	-	F	Editorial: correct table placement in H.2	16.5.0
2020-09	RAN#89	R5-204285	0859	-	F	Correction to Message Exceptions for 4.6.2.5 EN-DC FR1-FR1 event-triggered reporting in non-DRX with SSB time index detection	16.5.0
2020-09	RAN#89	R5-204337	0874	-	F	Addition of 4.5.5.0 minimum requirement for BFR	16.5.0
2020-09	RAN#89	R5-204730	0792	1	F	Update of PDSCH RMC in Annex A.1.1	16.5.0
2020-09	RAN#89	R5-204733	0793	1	F	Correction of RRM Test Case 6.1.1.1	16.5.0
2020-09	RAN#89	R5-204734	0824	1	F	Correction of RRM Test Case 6.1.1.2	16.5.0
2020-09	RAN#89	R5-204735	0825	1	F	Correction of RRM Test Case 7.1.1.1	16.5.0
2020-09	RAN#89	R5-204736	0826	1	F	Correction of RRM Test Case 7.1.1.2	16.5.0
2020-09	RAN#89	R5-204775	0751	1	F	Update TC 4.7.4.1.2 with TT results and message contents	16.5.0
2020-09	RAN#89	R5-204776	0753	1	F	Update TC 4.7.4.2.2 with TT results and message contents	16.5.0
2020-09	RAN#89	R5-204777	0771	1	F	Correction of measurement gap configuration for intra-frequency even-triggered tests needing gap	16.5.0
2020-09	RAN#89	R5-204778	0755	1	F	Update TC 6.7.4.1.2 with TT results and message contents	16.5.0
2020-09	RAN#89	R5-204779	0757	1	F	Update TC 6.7.4.2.2 with TT results and message contents	16.5.0
2020-09	RAN#89	R5-204780	0762	1	F	Correction to the test procedure of NR SA event triggered tests	16.5.0
2020-09	RAN#89	R5-204781	0763	1	F	Correction to the test procedure of NR SA event triggered tests inter-freq	16.5.0
2020-09	RAN#89	R5-204782	0764	1	F	Correction to the test procedure of NR SA event triggered tests inter-RAT	16.5.0
2020-09	RAN#89	R5-204783	0749	1	F	Update TC 8.5.2.3.1 with TT results and message contents	16.5.0
2020-09	RAN#89	R5-204784	0760	1	F	Annex E and F update with TT results for 6.7.4.x.x NR SA L1-RSRP periodic reporting test cases	16.5.0
2020-09	RAN#89	R5-204785	0785	1	F	Correction in A.1.4 CSI-RS for nzp-CSI-RS-ResourceId values	16.5.0
2020-09	RAN#89	R5-204786	0820	1	F	Update of FR1 Test Tolerance in Annex F	16.5.0
2020-09	RAN#89	R5-204787	0823	1	F	Correction to default configurations in Annex H	16.5.0
2020-09	RAN#89	R5-204872	0857	1	F	Correction to Test Procedure and sync to latest RAN4 in 4.4.1.1 EN-DC FR1 UE transmit timing accuracy	16.5.0
2020-09	RAN#89	R5-204873	0858	1	F	Correction to Test Procedure and sync to latest RAN4 in 6.4.1.1 NR SA FR1 UE transmit timing accuracy	16.5.0
2020-09	RAN#89	R5-204874	0866	1	F	Correction to 6.5.1.1 NR SA FR1 RLM OOS test with SSB-based RLM RS in non-DRX mode, sync to latest RAN4 Core Spec	16.5.0
2020-09	RAN#89	R5-204875	0867	1	F	Correction to 6.5.1.2 NR SA FR1 RLM IS test with SSB-based RLM RS in non-DRX mode, sync to latest RAN4 Core Spec	16.5.0
2020-09	RAN#89	R5-204876	0868	1	F	Correction to 6.5.1.3 NR SA FR1 RLM OOS test with SSB-based RLM RS in DRX mode, sync to latest RAN4 Core Spec	16.5.0
2020-09	RAN#89	R5-204877	0869	1	F	Correction to 6.5.1.4 NR SA FR1 RLM IS test with SSB-based RLM RS in DRX mode, sync to latest RAN4 Core Spec	16.5.0
2020-09	RAN#89	R5-204878	0750	1	F	Update TC 4.7.4.1.1 with TT results and message contents	16.5.0
2020-09	RAN#89	R5-204879	0752	1	F	Update TC 4.7.4.2.1 with TT results and message contents	16.5.0
2020-09	RAN#89	R5-204880	0754	1	F	Update TC 6.7.4.1.1 with TT results and message contents	16.5.0

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2020-09	RAN#89	R5-204881	0756	1	F	Update TC 6.7.4.2.1 with TT results and message contents	16.5.0
2020-09	RAN#89	R5-204882	0776	1	F	Gap Pattern Id correction in section 6.6.2 to align to core spec 38.133	16.5.0
2020-09	RAN#89	R5-204883	0787	1	F	Test Procedure correction in test case 6.5.1.3 for definition of Point C	16.5.0
2020-09	RAN#89	R5-204884	0789	1	F	Addition of new RRM Test Cases in clause 7.5.5	16.5.0
2020-09	RAN#89	R5-204885	0783	1	F	CR to update the RRM FR2 MUs in Annex F	16.5.0
2020-09	RAN#89	R5-204886	0784	1	F	Add information on the AoA change during test for RRM FR2 tests	16.5.0
2020-09	RAN#89	R5-204941	0835	1	F	Correction to connection diagram for radio link monitoring tests	16.5.0
2020-09	RAN#89	R5-204942	0842	1	F	Correction of EN-DC FR2 SSB-based L1-RSRP measurement test case 5.6.3.2	16.5.0
2020-09	RAN#89	R5-204943	0845	1	F	Correction of FR2 condition tables in Annex B	16.5.0
2020-09	RAN#89	R5-204944	0846	1	F	Introduction of band n259 in clause 3	16.5.0
2020-09	RAN#89	R5-204985	0794	1	F	Update of FR1 Test Tolerance in 4.5.5.1 SSB based BFR in non-DRX	16.5.0
2020-09	RAN#89	R5-204986	0795	1	F	Update of FR1 Test Tolerance in 4.5.5.2 SSB based BFR in DRX	16.5.0
2020-09	RAN#89	R5-204987	0796	1	F	Addition of new Test Case 4.5.5.3 CSI-RS based BFR non-DRX with FR1 Test Tolerance	16.5.0
2020-09	RAN#89	R5-204988	0797	1	F	Update of FR1 Test Tolerance in 4.5.5.4 CSI-RS based BFR in DRX	16.5.0
2020-09	RAN#89	R5-204989	0799	1	F	Update of FR1 Test Tolerance in 4.5.6.1.1 DCI-based BWP switch	16.5.0
2020-09	RAN#89	R5-204990	0800	1	F	Update of FR1 Test Tolerance in 4.5.6.1.2 DCI-based BWP switch with SCell	16.5.0
2020-09	RAN#89	R5-204991	0802	1	F	Update of FR1 Test Tolerance in 4.5.6.2.1 RRC-based BWP switch	16.5.0
2020-09	RAN#89	R5-204992	0809	1	F	Update of FR1 Test Tolerance in 6.5.5.1 SSB based BFR in non-DRX	16.5.0
2020-09	RAN#89	R5-204993	0810	1	F	Update of FR1 Test Tolerance in 6.5.5.2 SSB based BFR in DRX	16.5.0
2020-09	RAN#89	R5-204994	0811	1	F	Update of FR1 Test Tolerance in 6.5.5.3 CSI-RS based BFR in non-DRX	16.5.0
2020-09	RAN#89	R5-204995	0812	1	F	Update of FR1 Test Tolerance in 6.5.5.4 CSI-RS based BFR in DRX	16.5.0
2020-09	RAN#89	R5-204996	0814	1	F	Update of FR1 Test Tolerance in 6.5.6.1.1 DCI-based BWP switch with SCell	16.5.0
2020-09	RAN#89	R5-204997	0815	1	F	Addition of new Test Case 6.5.6.1.2 DCI-based BWP switch with FR1 Test Tolerance	16.5.0
2020-09	RAN#89	R5-204998	0817	1	F	Update of FR1 Test Tolerance in 6.5.6.2.1 RRC-based BWP switch	16.5.0
2020-09	RAN#89	R5-204999	0818	1	F	Update of test parameters in 6.3.1.4 inter-RAT handover	16.5.0
2020-09	RAN#89	R5-205000	0822	1	F	Update of default configurations for RMC scheduling in Annex A	16.5.0
2020-12	RAN#90	R5-205051	0879	-	F	Message contents for RRM iRAT	16.6.0
2020-12	RAN#90	R5-205059	0884	-	F	Message contents for RRM PSCell addition	16.6.0
2020-12	RAN#90	R5-205063	0885	-	F	Update RRM 8.5.2.1.2 including TT analysis results	16.6.0
2020-12	RAN#90	R5-205068	0890	-	F	Correction of the measObjectID, measID and reportConfigID in	16.6.0

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						Annex H	
2020-12	RAN#90	R5-205070	0892	-	F	Remove includeBeamMeasurements requirement for TC4.6.1.5	16.6.0
2020-12	RAN#90	R5-205257	0907	-	F	NR Band n53 addition to RRM group of bands	16.6.0
2020-12	RAN#90	R5-205296	0914	-	F	Add FR2 Fading MU values	16.6.0
2020-12	RAN#90	R5-205813	0920	-	F	Correction of EN-DC FR2 Inter-frequency measurements test case 5.6.2.1	16.6.0
2020-12	RAN#90	R5-205814	0921	-	F	Correction of EN-DC FR2 Inter-frequency measurements test case 5.6.2.2	16.6.0
2020-12	RAN#90	R5-205815	0922	-	F	Correction of EN-DC FR2 Inter-frequency measurements test case 5.6.2.3	16.6.0
2020-12	RAN#90	R5-205816	0923	-	F	Correction of EN-DC FR2 Inter-frequency measurements test case 5.6.2.4	16.6.0
2020-12	RAN#90	R5-205817	0924	-	F	Correction of EN-DC FR2 Inter-frequency measurements test case 5.6.2.5	16.6.0
2020-12	RAN#90	R5-205818	0925	-	F	Correction of EN-DC FR2 Inter-frequency measurements test case 5.6.2.6	16.6.0
2020-12	RAN#90	R5-205819	0926	-	F	Correction of EN-DC FR2 Inter-frequency measurements test case 5.6.2.7	16.6.0
2020-12	RAN#90	R5-205820	0927	-	F	Correction of EN-DC FR2 Inter-frequency measurements test case 5.6.2.8	16.6.0
2020-12	RAN#90	R5-205821	0928	-	F	Correction of NR SA FR2 Inter-frequency measurements test case 7.6.2.1	16.6.0
2020-12	RAN#90	R5-205822	0929	-	F	Correction of NR SA FR2 Inter-frequency measurements test case 7.6.2.2	16.6.0
2020-12	RAN#90	R5-205823	0930	-	F	Correction of NR SA FR2 Inter-frequency measurements test case 7.6.2.3	16.6.0
2020-12	RAN#90	R5-205824	0931	-	F	Correction of NR SA FR2 Inter-frequency measurements test case 7.6.2.4	16.6.0
2020-12	RAN#90	R5-205826	0933	-	F	Correction of NR SA FR2 Inter-frequency measurements test case 7.6.2.6	16.6.0
2020-12	RAN#90	R5-205827	0934	-	F	Correction of NR SA FR2 Inter-frequency measurements test case 7.6.2.7	16.6.0
2020-12	RAN#90	R5-205828	0935	-	F	Correction of NR SA FR2 Inter-frequency measurements test case 7.6.2.8	16.6.0
2020-12	RAN#90	R5-205834	0939	-	F	Correction of message content exceptions in Annex H	16.6.0
2020-12	RAN#90	R5-205953	0946	-	F	Update of FR1 TT in 8.4.1.1 inter-RAT SFTD in non-DRX	16.6.0
2020-12	RAN#90	R5-205954	0947	-	F	Update of FR1 TT in 8.4.1.2 inter-RAT SFTD in DRX	16.6.0
2020-12	RAN#90	R5-205960	0953	-	F	Addition of test case 5.5.1.9 EN-DC FR2 radio link monitoring UE scheduling restrictions	16.6.0
2020-12	RAN#90	R5-205961	0954	-	F	Update of test case 5.5.3.1 EN-DC FR2 SCell activation and deactivation	16.6.0
2020-12	RAN#90	R5-205963	0956	-	F	Update of 7.3.2.1.3 SA FR2 RRC re-establishment without serving cell timing	16.6.0
2020-12	RAN#90	R5-205967	0960	-	F	Update of Annex E for cell mapping	16.6.0
2020-12	RAN#90	R5-205975	0964	-	F	Correction to default configuration in Annex H	16.6.0

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2020-12	RAN#90	R5-205976	0965	-	F	Correction to SSB reference configuration	16.6.0
2020-12	RAN#90	R5-206100	0968	-	F	Correction to EN-DC FR1 interruptions at transitions between active and non-active during DRX	16.6.0
2020-12	RAN#90	R5-206102	0970	-	F	Correction to FR1 NSA SS-SINR measurement TCs	16.6.0
2020-12	RAN#90	R5-206105	0973	-	F	Correction to message exception for inter-RAT reselection TCs	16.6.0
2020-12	RAN#90	R5-206106	0974	-	F	Editorial correction of RSRP tests	16.6.0
2020-12	RAN#90	R5-206111	0976	-	F	Update of Annex C.1.3 of default connection setup	16.6.0
2020-12	RAN#90	R5-206156	0977	-	F	Addition of missing PRACH configuration 4 for FR1 and FR2 applicability	16.6.0
2020-12	RAN#90	R5-206214	0979	-	F	Alignment test parameter table with TS 38.133 in SA cell reselection test case	16.6.0
2020-12	RAN#90	R5-206215	0980	-	F	Alignment test parameter table with TS 38.133 in SA handover test case	16.6.0
2020-12	RAN#90	R5-206216	0981	-	F	Addition RLM IE into event trigger reporting CSI-RS based RLM	16.6.0
2020-12	RAN#90	R5-206217	0982	-	F	Addition RLM IE into event trigger reporting SSB based	16.6.0
2020-12	RAN#90	R5-206219	0984	-	F	Update message content section in SS-SINR test cases	16.6.0
2020-12	RAN#90	R5-206221	0985	-	F	Update to Section 5.4.1.1 NSA FR2 Transmit Timing Accuracy	16.6.0
2020-12	RAN#90	R5-206222	0986	-	F	Update to Section 5.4.3.1 NSA FR2 Timing Advance Accuracy	16.6.0
2020-12	RAN#90	R5-206606	0998	-	F	Update of CSI-RS RMC configuration in Annex A	16.6.0
2020-12	RAN#90	R5-206672	0918	1	F	Editorial CR to clarify SS-RSRP dBm / 15 kHz for PRACH tests	16.6.0
2020-12	RAN#90	R5-206673	0941	1	F	Correction of RRM TC 4.7.2.1	16.6.0
2020-12	RAN#90	R5-206674	0943	1	F	Update of message contents for EN-DC RLM test case	16.6.0
2020-12	RAN#90	R5-206675	0969	1	F	Correction to FR1 Inter frequency Event triggered Reporting test cases	16.6.0
2020-12	RAN#90	R5-206677	0987	1	F	Update to Message Exceptions for 4.3.2.2.2 EN-DC Non Contention Based Random Access	16.6.0
2020-12	RAN#90	R5-206678	0989	1	F	Update to 4.5.1.1 NSA FR1 OOS RLM to reword the Note for proper application of SNR for 4Rx Vs 2Rx	16.6.0
2020-12	RAN#90	R5-206679	0990	1	F	Update to 4.5.1.2 NSA FR1 IS RLM to reword the Note for proper application of SNR for 4Rx Vs 2Rx	16.6.0
2020-12	RAN#90	R5-206680	0991	1	F	Update to 4.5.1.3 NSA FR1 OOS RLM in DRX to reword the Note for proper application of SNR for 4Rx Vs 2Rx	16.6.0
2020-12	RAN#90	R5-206681	0992	1	F	Update to 4.5.1.4 NSA FR1 IS RLM in DRX to reword the Note for proper application of SNR for 4Rx Vs 2Rx	16.6.0
2020-12	RAN#90	R5-206682	0993	1	F	Update to 6.5.1.1 SA FR1 OOS RLM to reword the Note for proper application of SNR for 4Rx Vs 2Rx	16.6.0
2020-12	RAN#90	R5-206683	0994	1	F	Update to 6.5.1.2 SA FR1 IS RLM to reword the Note for proper application of SNR for 4Rx Vs 2Rx	16.6.0
2020-12	RAN#90	R5-206684	0995	1	F	Update to 6.5.1.3 SA FR1 OOS RLM in DRX to reword the Note for proper application of SNR for 4Rx Vs 2Rx	16.6.0
2020-12	RAN#90	R5-206685	0996	1	F	Update to 6.5.1.4 SA FR1 IS RLM in DRX to reword the Note for proper application of SNR for 4Rx Vs 2Rx	16.6.0
2020-12	RAN#90	R5-206686	0952	1	F	Update of 5.5.1 EN-DC FR2 radio link monitoring	16.6.0

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2020-12	RAN#90	R5-206687	0955	1	F	Update of 5.5.5 EN-DC FR2 Beam failure detection	16.6.0
2020-12	RAN#90	R5-206688	0891	1	F	Corrections to re-selection test procedure	16.6.0
2020-12	RAN#90	R5-206689	0896	1	F	Correction of RRM TC 6.1.1.2	16.6.0
2020-12	RAN#90	R5-206690	0897	1	F	Correction of RRM TC 6.1.2.1	16.6.0
2020-12	RAN#90	R5-206691	0899	1	F	Correction of RRM TC 6.3.2.2.2	16.6.0
2020-12	RAN#90	R5-206692	0910	1	F	Correction of RRM TC 6.5.5.3	16.6.0
2020-12	RAN#90	R5-206693	0911	1	F	Correction of RRM TC 6.5.5.4	16.6.0
2020-12	RAN#90	R5-206694	0919	1	F	Editorial CR to clarify SS-RSRP dBm / 15 kHz for SA PRACH tests	16.6.0
2020-12	RAN#90	R5-206695	0942	1	F	Correction of RRM TC 6.7.2.1	16.6.0
2020-12	RAN#90	R5-206696	0961	1	F	Update of FR1 TT in 6.1.1.1 intra-freq re-selection	16.6.0
2020-12	RAN#90	R5-206697	0962	1	F	Correction of clause 6.1 cell re-selection	16.6.0
2020-12	RAN#90	R5-206698	0967	1	F	Correction to NR SA RLM out-of-sync test cases	16.6.0
2020-12	RAN#90	R5-206699	0983	1	F	Clarification in message exception for SA RLM out of synch test cases in non DRX	16.6.0
2020-12	RAN#90	R5-206700	0900	1	F	Correction of RRM TC 7.1.1.2	16.6.0
2020-12	RAN#90	R5-206701	0932	1	F	Correction of NR SA FR2 Inter-frequency measurements test case 7.6.2.5	16.6.0
2020-12	RAN#90	R5-206702	0936	1	F	Correction of NR SA FR2 RRC re-establishment test case 7.3.2.1.1	16.6.0
2020-12	RAN#90	R5-206703	0937	1	F	Correction of NR SA FR2-FR2 RRC re-establishment test case 7.3.2.1.2	16.6.0
2020-12	RAN#90	R5-206704	0957	1	F	Update of clause 7.5.5 SA FR2 Beam failure detection	16.6.0
2020-12	RAN#90	R5-206705	0958	1	F	Update of clause 7.6.1 SA FR2 Intra-frequency measurements	16.6.0
2020-12	RAN#90	R5-206706	0889	1	F	Correction of the message contents for RRM re-selection test cases	16.6.0
2020-12	RAN#90	R5-206707	0917	1	F	Correction to the aggregation level in the CORESET for RMC scheduling	16.6.0
2020-12	RAN#90	R5-206708	0938	1	F	Correction of clause 3.3 Abbreviations	16.6.0
2020-12	RAN#90	R5-206709	0963	1	F	Update of Annex H for cell re-selection	16.6.0
2020-12	RAN#90	R5-206797	0882	1	F	Complete RRM 4.5.7.1 including TT analysis results	16.6.0
2020-12	RAN#90	R5-206798	0875	1	F	Complete RRM 6.7.5.1 including TT analysis results	16.6.0
2020-12	RAN#90	R5-206799	0916	1	F	Add FR2 PRACH Test cases 7.3.2.2.1 and 7.3.2.2.2	16.6.0
2020-12	RAN#90	R5-206800	0944	1	F	Update of FR1 TT in 8.2.1.1 inter-RAT cell re-selection	16.6.0
2020-12	RAN#90	R5-206801	0945	1	F	Update of FR1 TT in 8.3.1.1 inter-RAT handover	16.6.0
2020-12	RAN#90	R5-206802	0948	1	F	Update of FR1 TT in 8.4.2.1 inter-RAT event-triggered reporting without SSB time index in non-DRX	16.6.0
2020-12	RAN#90	R5-206803	0949	1	F	Update of FR1 TT in 8.4.2.2 inter-RAT event-triggered reporting without SSB time index in DRX	16.6.0
2020-12	RAN#90	R5-206804	0950	1	F	Update of FR1 TT in 8.4.2.3 inter-RAT event-triggered reporting with SSB time index in non-DRX	16.6.0
2020-12	RAN#90	R5-206805	0951	1	F	Update of FR1 TT in 8.4.2.4 inter-RAT event-triggered reporting with SSB time index in DRX	16.6.0

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2020-12	RAN#90	R5-206806	0878	1	F	Annex E and F iRAT measurement accuracy tests	16.6.0
2020-12	RAN#90	R5-206807	0888	1	F	Annex E and F iRAT FR2 measurement accuracy tests	16.6.0
2020-12	RAN#90	R5-206808	0959	1	F	Update of Annex F for Test Tolerance	16.6.0
2020-12	RAN#90	R5-206834	0915	1	F	Update FR2 Downlink and Es/Noc MU values	16.6.0
2020-12	RAN#90	R5-206843	0876	1	F	Complete RRM 6.7.6.1 including TT analysis results	16.6.0
2020-12	RAN#90	R5-206844	0886	1	F	Update RRM 8.5.2.2.2 including TT analysis results	16.6.0
2020-12	RAN#90	R5-206871	0894	1	F	Correction of RRM TC 4.3.2.2.2	16.6.0
2020-12	RAN#90	R5-206872	0905	1	F	New DRX configuration for RLM TC	16.6.0
2020-12	RAN#90	R5-206895	0971	1	F	Correction to message configuration for NSA radio link monitoring CSI-RS Based in DRX mode tests	16.6.0
2020-12	RAN#90	R5-206906	0880	1	F	Complete RRM 4.7.5.1 including TT analysis results	16.6.0
2020-12	RAN#90	R5-206907	0877	1	F	Complete RRM 6.7.7.1 including TT analysis results	16.6.0
2020-12	RAN#90	R5-206908	0972	1	F	Correction to message configuration for SA radio link monitoring CSI RS Based RLM RS	16.6.0
2020-12	RAN#90	R5-206909	0887	1	F	Update RRM 8.5.2.3.2 including TT analysis results	16.6.0
2020-12	RAN#90	R5-206910	0881	1	F	Annex E and F 4.7.5.1 SFTD measurement accuracy test	16.6.0
2021-03	RAN#91	R5-210134	0999	-	F	Update of first preamble power for EN-DC TC 4.3.2.2.1 and 4.3.2.2.2	16.7.0
2021-03	RAN#91	R5-210135	1000	-	F	Update of first preamble power for SA TC 6.3.2.2.1 and 6.3.2.2.2	16.7.0
2021-03	RAN#91	R5-210136	1001	-	F	Update of UE initial state for SA RLM TC 6.5.1.x	16.7.0
2021-03	RAN#91	R5-210137	1002	-	F	Update of process delay for SFTD measurement TC 8.4.1.x	16.7.0
2021-03	RAN#91	R5-210138	1003	-	F	Update of cell frequency for TC 6.7.2.2.2	16.7.0
2021-03	RAN#91	R5-210171	1004	-	F	Editorial update of SS-RSRP for TC 6.7.1.2.1	16.7.0
2021-03	RAN#91	R5-210173	1006	-	F	Update of RRC message for TC 6.4.3.1 and 6.5.2.1	16.7.0
2021-03	RAN#91	R5-210176	1009	-	F	Update of Scell activation and CSI reporting time for EN-DC TC 5.5.3.1	16.7.0
2021-03	RAN#91	R5-210177	1010	-	F	Update of CSI reporting time for SA TC 7.5.3.1 and 7.5.3.2	16.7.0
2021-03	RAN#91	R5-210178	1011	-	F	Update of PRACH configuration for SA TC 7.3.2.2.2	16.7.0
2021-03	RAN#91	R5-210179	1012	-	F	Update of PRACH configuration for EN-DC TC 4.5.5.3 and 4.5.5.4	16.7.0
2021-03	RAN#91	R5-210180	1013	-	F	Update of PRACH configuration for EN-DC TC 5.5.5.x	16.7.0
2021-03	RAN#91	R5-210181	1014	-	F	Update of PRACH configuration for SA TC 6.5.5.3 and 6.5.5.4	16.7.0
2021-03	RAN#91	R5-210182	1015	-	F	Update of PRACH configuration for SA TC 7.5.5.x	16.7.0
2021-03	RAN#91	R5-210183	1016	-	F	Update of prach-ConfigurationIndex for FR1 PRACH configuration 4 in A.7	16.7.0
2021-03	RAN#91	R5-210279	1017	-	F	Addition of minimum conformance requirements for R16 NR HST cell re-selection in 6.1.1.0	16.7.0
2021-03	RAN#91	R5-210281	1019	-	F	Addition of minimum conformance requirements for R16 NR HST measurement in 6.6.1.0	16.7.0
2021-03	RAN#91	R5-210283	1021	-	F	Update of Annex H.2.1-3 for R16 NR HST	16.7.0

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2021-03	RAN#91	R5-210434	1025	-	F	Correct cell mapping for 5.4.3.1	16.7.0
2021-03	RAN#91	R5-210437	1027	-	F	Annex E and F 4.5.7.1 PSCell addition test	16.7.0
2021-03	RAN#91	R5-210440	1029	-	F	Update of TT analysis results in Annex F for FR2 iRAT test cases	16.7.0
2021-03	RAN#91	R5-210442	1030	-	F	Update TT results for SS-RSRP measurement accuracy test cases chapter 4	16.7.0
2021-03	RAN#91	R5-210443	1031	-	F	Update TT results for SS-RSRP measurement accuracy test cases chapter 6	16.7.0
2021-03	RAN#91	R5-210444	1032	-	F	Update TT results for SS-RSRP measurement accuracy test cases Annex F	16.7.0
2021-03	RAN#91	R5-210446	1033	-	F	Update TT results for SS-RSRQ measurement accuracy test cases chapter 4	16.7.0
2021-03	RAN#91	R5-210447	1034	-	F	Update TT results for SS-RSRQ measurement accuracy test cases chapter 6	16.7.0
2021-03	RAN#91	R5-210448	1035	-	F	Update TT results for SS-RSRQ measurement accuracy test cases Annex F	16.7.0
2021-03	RAN#91	R5-210456	1039	-	F	Update Annex I to TS 38.533	16.7.0
2021-03	RAN#91	R5-210457	1040	-	F	Update NR frequency band groups for FR1	16.7.0
2021-03	RAN#91	R5-210458	1041	-	F	Correction RLM config for event triggered test cases	16.7.0
2021-03	RAN#91	R5-210465	1046	-	F	Editorial correction of title of clause 6	16.7.0
2021-03	RAN#91	R5-210466	1047	-	F	Corrections to 6.3.2.2.1 and 6.3.2.2.2	16.7.0
2021-03	RAN#91	R5-210467	1048	-	F	Corrections to 4.3.2.2.2	16.7.0
2021-03	RAN#91	R5-210470	1049	-	F	Clarification on SSB Index to use in the PUxCH-PowerControl for RRM tests with more than one SSB	16.7.0
2021-03	RAN#91	R5-210471	1050	-	F	Clarification on SSB Index to use in the PUxCH-PowerControl for RRM tests with more than one SSB - EN-DC	16.7.0
2021-03	RAN#91	R5-210472	1051	-	F	Editorial: correct title of PRACH test cases to match RRM work plan - EN-DC FR1	16.7.0
2021-03	RAN#91	R5-210473	1052	-	F	Editorial: correct title of PRACH test cases to match RRM work plan - SA FR1	16.7.0
2021-03	RAN#91	R5-210474	1053	-	F	Editorial: correct title of PRACH test cases to match RRM work plan - SA FR2	16.7.0
2021-03	RAN#91	R5-210475	1054	-	F	Editorial: correct title of PRACH test cases to match RRM work plan - Annexes	16.7.0
2021-03	RAN#91	R5-210507	1056	-	F	Correction of test applicability for long DRX cycle related test cases in section 4	16.7.0
2021-03	RAN#91	R5-210508	1057	-	F	Correction of test applicability for long DRX cycle related test cases in section 5	16.7.0
2021-03	RAN#91	R5-210509	1058	-	F	Correction of test applicability for long DRX cycle related test cases in section 6	16.7.0
2021-03	RAN#91	R5-210510	1059	-	F	Correction of test applicability for long DRX cycle related test cases in section 7	16.7.0
2021-03	RAN#91	R5-210511	1060	-	F	Correction of test applicability for long DRX cycle related test cases in section 8	16.7.0
2021-03	RAN#91	R5-210528	1062	-	F	Correction to test procedure in test case 6.5.1.4	16.7.0

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2021-03	RAN#91	R5-210529	1063	-	F	Correction to Interruptions during measurements on deactivated NR SCC test cases	16.7.0
2021-03	RAN#91	R5-210530	1064	-	F	Correction to message configuration for NSA CSI-RS-based RLM RS test cases	16.7.0
2021-03	RAN#91	R5-210531	1065	-	F	Correction to NR SA RLM out-of-sync test cases	16.7.0
2021-03	RAN#91	R5-210532	1066	-	F	Correction to NR SA FR1 RRC Re-establishment test cases	16.7.0
2021-03	RAN#91	R5-210533	1067	-	F	Correction to 4.5.1.2 and 6.5.1.2 PDCCH Aggregation Level	16.7.0
2021-03	RAN#91	R5-210535	1069	-	F	Correction to FR1 NSA SS-SINR measurement test cases	16.7.0
2021-03	RAN#91	R5-210536	1070	-	F	Correction to L1-RSRP test cases	16.7.0
2021-03	RAN#91	R5-210537	1071	-	F	Correction to the procedure to add a step for establishing SRB2 and DRB	16.7.0
2021-03	RAN#91	R5-210538	1072	-	F	Update of DRX configuration in FR1 Event-triggered Test cases	16.7.0
2021-03	RAN#91	R5-210601	1073	-	F	Clarification of BWP1 and BWP2 in 6.6.1.3, 6.6.1.4, 6.6.1.6	16.7.0
2021-03	RAN#91	R5-210608	1077	-	F	Correction in 4.5.2.1 and 4.5.2.2 test procedure	16.7.0
2021-03	RAN#91	R5-210613	1079	-	F	Correction in SIB5 for iRAT cell reselection	16.7.0
2021-03	RAN#91	R5-210614	1080	-	F	Correction in 6.1.2.2 test procedure	16.7.0
2021-03	RAN#91	R5-210814	1085	-	F	Finalise FR2 Timing MU values	16.7.0
2021-03	RAN#91	R5-210816	1086	-	F	Update of FR2 Tx Timing Test case 5.4.1.1 Test Tolerances	16.7.0
2021-03	RAN#91	R5-210851	1089	-	F	Update of FR1 TT for 4.5.5.1 and 4.5.5.2 SSB based LR	16.7.0
2021-03	RAN#91	R5-210852	1090	-	F	Update of FR1 TT for 4.5.5.3 and 4.5.5.4 CSI-RS based LR	16.7.0
2021-03	RAN#91	R5-210853	1091	-	F	Correction to 4.6.4.3 and 4.6.4.4 L1-RSRP reporting delay	16.7.0
2021-03	RAN#91	R5-210857	1095	-	F	Update of FR1 TT for 6.5.5.1 and 6.5.5.2 SSB based LR	16.7.0
2021-03	RAN#91	R5-210858	1096	-	F	Update of FR1 TT for 6.5.5.3 and 6.5.5.4 CSI-RS based LR	16.7.0
2021-03	RAN#91	R5-210860	1098	-	F	Correction to 6.6.4.3 and 6.6.4.4 L1-RSRP reporting delay	16.7.0
2021-03	RAN#91	R5-210863	1101	-	F	Update of 6.5.3.1 SCell activation and deactivation	16.7.0
2021-03	RAN#91	R5-210864	1102	-	F	Update of D.4 antenna configuration	16.7.0
2021-03	RAN#91	R5-210866	1104	-	F	Correction to CSI-RS RMC	16.7.0
2021-03	RAN#91	R5-210867	1105	-	F	Correction to default configuration on L1-RSRP reporting in Annex H	16.7.0
2021-03	RAN#91	R5-210959	1113	-	F	Update to 6.5.4.1 NR SA FR1 UE UL carrier RRC reconfiguration delay	16.7.0
2021-03	RAN#91	R5-211049	1116	-	F	Additional of default downlink level for FR2	16.7.0
2021-03	RAN#91	R5-211219	1124	-	F	Correction of the minimum conformance requirements for Inter-RAT measurements 6.6.3.0	16.7.0
2021-03	RAN#91	R5-211220	1125	-	F	Addition of new RRM iRAT measurement Inter-RAT measurements test case 6.6.3.3	16.7.0
2021-03	RAN#91	R5-211255	1131	-	F	Clarification of BWP1 and BWP2 in 4.6.1.3, 4.6.1.4, 4.6.1.6	16.7.0
2021-03	RAN#91	R5-211614	1007	1	F	Update of Scell activation and CSI reporting time for EN-DC TC 4.5.3.1	16.7.0
2021-03	RAN#91	R5-211615	1026	1	F	Complete RRM 4.5.7.1 including TT analysis results	16.7.0

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2021-03	RAN#91	R5-211616	1087	1	F	Update Test Tolerance for FR1 RLM Test Cases	16.7.0
2021-03	RAN#91	R5-211617	1092	1	F	Correction to EN-DC radio link monitoring	16.7.0
2021-03	RAN#91	R5-211618	1093	1	F	Update of 4.5.3.1 SCell activation and deactivation	16.7.0
2021-03	RAN#91	R5-211619	1108	1	F	Update to 4.5.4.1 EN-DC FR1 UE UL carrier RRC reconfiguration delay	16.7.0
2021-03	RAN#91	R5-211620	1109	1	F	Update to 4.7.5.1 EN-DC FR1 SFTD measurement accuracy	16.7.0
2021-03	RAN#91	R5-211621	1117	1	F	Correction of applied TT for EN-DC FR1 L1-RSRP measurement test cases	16.7.0
2021-03	RAN#91	R5-211622	1023	1	F	Update 5.4.3.1 with TT analysis results	16.7.0
2021-03	RAN#91	R5-211623	1119	1	F	Correction of EN-DC FR2 inter-freq measurement test case 5.6.2.1 including TT	16.7.0
2021-03	RAN#91	R5-211624	1120	1	F	Correction of EN-DC FR2 inter-freq measurement test case 5.6.2.3 including TT	16.7.0
2021-03	RAN#91	R5-211625	1008	1	F	Update of CSI reporting time for SA TC 6.5.3.1	16.7.0
2021-03	RAN#91	R5-211626	1094	1	F	Correction to SA radio link monitoring	16.7.0
2021-03	RAN#91	R5-211627	1110	1	F	Update to 6.3.2.2.1 Contention based random access test in FR1 for NR standalone	16.7.0
2021-03	RAN#91	R5-211628	1111	1	F	Update to 6.3.2.2.2 Non-Contention based random access test in FR1 for NR standalone	16.7.0
2021-03	RAN#91	R5-211629	1112	1	F	Update to 6.5.2.1 NR SA FR1 interruptions during measurements on deactivated NR SCC	16.7.0
2021-03	RAN#91	R5-211630	1114	1	F	Update to 6.6.3.1 NR SA FR1 - E-UTRAN event-triggered reporting in non-DRX	16.7.0
2021-03	RAN#91	R5-211631	1115	1	F	Update to 6.6.3.2 NR SA FR1 - E-UTRAN event-triggered reporting in DRX	16.7.0
2021-03	RAN#91	R5-211632	1118	1	F	Correction of applied TT for SA FR1 L1-RSRP measurement test cases	16.7.0
2021-03	RAN#91	R5-211633	1121	1	F	Correction of SA FR2 inter-freq measurement test case 7.6.2.1 including TT	16.7.0
2021-03	RAN#91	R5-211634	1122	1	F	Correction of SA FR2 inter-freq measurement test case 7.6.2.3 including TT	16.7.0
2021-03	RAN#91	R5-211635	1028	1	F	Complete FR2 iRAT measurement accuracy test cases	16.7.0
2021-03	RAN#91	R5-211636	1024	1	F	Update Annex F for 5.4.3.1 and 7.4.3.1 with TT analysis results	16.7.0
2021-03	RAN#91	R5-211637	1038	1	F	Update DL AWGN MU for RRM FR2	16.7.0
2021-03	RAN#91	R5-211638	1084	1	F	Update FR2 Downlink and Uplink MU values	16.7.0
2021-03	RAN#91	R5-211639	1103	1	F	Update of Annex F for Test Tolerance	16.7.0
2021-03	RAN#91	R5-211640	1123	1	F	Correction of MTSU and applied TT in Annex F	16.7.0
2021-03	RAN#91	R5-211641	1130	1	F	Addition of new RMCs and OCNGs into Annex A	16.7.0
2021-03	RAN#91	R5-211722	1042	1	F	Correction EN-DC FR1 timing tests	16.7.0
2021-03	RAN#91	R5-211723	1043	1	F	Corrections to 5.4.1.1	16.7.0
2021-03	RAN#91	R5-211724	1061	1	F	Clarification of SNR for 4RX UE in RLM Test Cases	16.7.0
2021-03	RAN#91	R5-211725	1076	1	F	Correction in 4.7.3.2.1 test parameters	16.7.0

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2021-03	RAN#91	R5-211726	1005	1	F	Update of RRC message for TC 6.3.1.4, 6.3.1.5 and 6.3.2.3.2	16.7.0
2021-03	RAN#91	R5-211727	1045	1	F	Corrections NR SA FR1 timing test cases	16.7.0
2021-03	RAN#91	R5-211728	1097	1	F	Correction to NR TC 6.6.3.2-Inter-RAT DRX	16.7.0
2021-03	RAN#91	R5-211729	1099	1	F	Update of 6.5.1.2 and 6.5.1.4 SSB based RLM	16.7.0
2021-03	RAN#91	R5-211730	1083	1	F	Clarification of BWP1 and BWP2 in 7.6.1.3 and 7.6.1.4	16.7.0
2021-03	RAN#91	R5-211731	1044	1	F	Addition of Serving Cell Config for RRM timing test cases	16.7.0
2021-03	RAN#91	R5-211827	1018	1	F	Addition of new test case 6.1.1.7 for R16 NR HST	16.7.0
2021-03	RAN#91	R5-211828	1020	1	F	Addition of new test case 6.6.1.7 for R16 NR HST	16.7.0
2021-03	RAN#91	R5-211829	1022	1	F	Addition of cell configuration mapping in Annex E for R16 NR HST	16.7.0
2021-03	RAN#91	R5-211830	1126	1	F	Correction of the minimum conformance requirements for E-UTRA - NR FR1 Cell reselection 8.2.1.0	16.7.0
2021-03	RAN#91	R5-211831	1127	1	F	Addition of new RRM E-UTRA - NR FR1 Cell reselection test case 8.2.1.2	16.7.0
2021-03	RAN#91	R5-211832	1128	1	F	Correction of the minimum conformance requirements for E-UTRA - NR Inter-RAT event triggered reporting tests 8.4.2.0	16.7.0
2021-03	RAN#91	R5-211833	1129	1	F	Addition of new RRM E-UTRA - NR Inter-RAT event triggered reporting test case 8.4.2.9	16.7.0
2021-03	RAN#91	R5-211889	1036	1	F	Update TT results for 6.3.1.1	16.7.0
2021-03	RAN#91	R5-211890	1037	1	F	Update TT results for 6.3.1.1 Annex F	16.7.0
2021-06	RAN#92	R5-212024	1132	-	F	Complete 5.7.1.1 with TT analysis results	16.8.0
2021-06	RAN#92	R5-212025	1133	-	F	Complete 5.7.2.1 with TT analysis results	16.8.0
2021-06	RAN#92	R5-212026	1134	-	F	Complete 5.7.3.1 with TT analysis results	16.8.0
2021-06	RAN#92	R5-212256	1138	-	F	Core alignment of TCI state of CSI-RS for TRS	16.8.0
2021-06	RAN#92	R5-212257	1139	-	F	Introducing additional band for n38	16.8.0
2021-06	RAN#92	R5-212265	1147	-	F	Updates to DRX configuration in FR1 Event-triggered Test cases	16.8.0
2021-06	RAN#92	R5-212266	1148	-	F	Core alignment of BWP configuration parameter in 6.5.2.1	16.8.0
2021-06	RAN#92	R5-212267	1149	-	F	Correction to CSI-RS based L1-RSRP measurement tests	16.8.0
2021-06	RAN#92	R5-212612	1153	-	F	Addition of new test case 6.6.4.5 for R16 NR HST	16.8.0
2021-06	RAN#92	R5-212613	1154	-	F	Addition of cell configuration mapping in Annex E for TC 6.6.4.5	16.8.0
2021-06	RAN#92	R5-212712	1158	-	F	Remove obsolete message contents tables after Chapter 7 alignment	16.8.0
2021-06	RAN#92	R5-212715	1161	-	F	Correcting measurement accuracy iRAT test cases	16.8.0
2021-06	RAN#92	R5-212716	1162	-	F	Corrections to 5.4.1.1	16.8.0
2021-06	RAN#92	R5-212717	1163	-	F	Corrections to 5.4.3.1	16.8.0
2021-06	RAN#92	R5-212718	1164	-	F	Corrections to 4.4.1.1	16.8.0
2021-06	RAN#92	R5-212719	1165	-	F	Corrections to 4.4.3.1	16.8.0
2021-06	RAN#92	R5-212720	1166	-	F	Corrections to 6.4.1.1	16.8.0
2021-06	RAN#92	R5-212721	1167	-	F	Corrections to 6.4.3.1	16.8.0

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2021-06	RAN#92	R5-212726	1171	-	F	Correct applicability of Interruption EN-DC test cases with CA	16.8.0
2021-06	RAN#92	R5-212727	1172	-	F	Correct applicability of Scell activation EN-DC test cases with CA	16.8.0
2021-06	RAN#92	R5-212728	1173	-	F	Correct applicability of Interruption SA test cases with CA	16.8.0
2021-06	RAN#92	R5-212729	1174	-	F	Correct applicability of Scell activation SA test cases with CA	16.8.0
2021-06	RAN#92	R5-212731	1175	-	F	Addition of RRM FR2 EN-DC PRACH test case 5.3.2.2.1	16.8.0
2021-06	RAN#92	R5-212732	1176	-	F	Addition of RRM FR2 EN-DC PRACH test case 5.3.2.2.2	16.8.0
2021-06	RAN#92	R5-212737	1177	-	F	Update to test applicability of RRM TC6.5.4.1	16.8.0
2021-06	RAN#92	R5-212745	1178	-	F	Update to RRM Antenna connection for 4Rx capable Ues	16.8.0
2021-06	RAN#92	R5-212895	1180	-	F	Correction to FR1 EN-DC interruption during SCell measurement test cases	16.8.0
2021-06	RAN#92	R5-212896	1181	-	F	Correction to FR1 EN-DC beam failure recovery test cases	16.8.0
2021-06	RAN#92	R5-212900	1185	-	F	Correction to FR1 NR SA TC 6.5.3.1-SCell activation	16.8.0
2021-06	RAN#92	R5-212901	1186	-	F	Correction to FR1 NR SA beam failure recovery test cases	16.8.0
2021-06	RAN#92	R5-212904	1189	-	F	Correction to RMSI CORESET reference configuration in Annex A	16.8.0
2021-06	RAN#92	R5-212905	1190	-	F	Correction to CSI-RS reference configuration in annex A	16.8.0
2021-06	RAN#92	R5-212906	1191	-	F	Correction to TRS reference configuration in annex A	16.8.0
2021-06	RAN#92	R5-212909	1194	-	F	Correction to BWP reference configuration in Annex A	16.8.0
2021-06	RAN#92	R5-212910	1195	-	F	Correction of minimum requirements for L1-RSRP reporting test cases	16.8.0
2021-06	RAN#92	R5-212911	1196	-	F	Addition of FR1 EN-DC TC 4.6.4.5-HST L1-RSRP	16.8.0
2021-06	RAN#92	R5-213183	1205	-	F	Extension of Annex I for EIS spherical coverage points	16.8.0
2021-06	RAN#92	R5-213227	1212	-	F	Correction of SA FR2 inter-freq measurement test case 7.6.2.5 including TT	16.8.0
2021-06	RAN#92	R5-213228	1213	-	F	Correction of SA FR2 inter-freq measurement test case 7.6.2.6 including TT	16.8.0
2021-06	RAN#92	R5-213229	1214	-	F	Correction of SA FR2 inter-freq measurement test case 7.6.2.7 including TT	16.8.0
2021-06	RAN#92	R5-213230	1215	-	F	Correction of SA FR2 inter-freq measurement test case 7.6.2.8 including TT	16.8.0
2021-06	RAN#92	R5-213240	1219	-	F	Test frequency selection for Inter-frequency RRM test cases in Annex E	16.8.0
2021-06	RAN#92	R5-213345	1222	-	F	Update on iRAT measurement 6.6.3.2 test case	16.8.0
2021-06	RAN#92	R5-213346	1223	-	F	Update on Annex H.3.1 for iRAT measurement	16.8.0
2021-06	RAN#92	R5-213351	1224	-	F	Correction to Coreset and Search Space RMC for FR2 RRM	16.8.0
2021-06	RAN#92	R5-213352	1225	-	F	Correction to Message Exceptions for 6.3.2.2.2 Non-contention based random access test in FR1	16.8.0
2021-06	RAN#92	R5-213353	1226	-	F	Correction to PDSCH RMC when DRX is configured	16.8.0
2021-06	RAN#92	R5-213354	1227	-	F	Correction to intra and inter frequency reselection test cases with asynchronous cells	16.8.0
2021-06	RAN#92	R5-213847	1179	1	F	Addition of inter-frequency measurements configuration for FR1 EN-DC BFD and RLM test cases	16.8.0

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2021-06	RAN#92	R5-213848	1183	1	F	Addition of inter-frequency measurements configuration for FR1 NR SA BFD and RLM test cases	16.8.0
2021-06	RAN#92	R5-213849	1184	1	F	Correction to FR1 NR SA interruption during SCell measurement test cases	16.8.0
2021-06	RAN#92	R5-213850	1193	1	F	Correction to PRACH reference configuration in Annex H	16.8.0
2021-06	RAN#92	R5-213921	1145	1	F	Correction to test procedure for SSB-based L1-RSRP measurement reporting	16.8.0
2021-06	RAN#92	R5-213922	1159	1	F	Remove obsolete message contents tables after Chapter 7 alignment - EN-DC	16.8.0
2021-06	RAN#92	R5-213923	1168	1	F	Corrections to RLM test cases EN-DC	16.8.0
2021-06	RAN#92	R5-213924	1141	1	F	Correction to FR2 RRM test channel reference for Event triggered reporting test	16.8.0
2021-06	RAN#92	R5-213925	1142	1	F	Correction to FR2 RRM test channel reference for RLM and BFD tests	16.8.0
2021-06	RAN#92	R5-213926	1143	1	F	Correction to FR2 RRM test channel reference for UL timing test	16.8.0
2021-06	RAN#92	R5-213927	1208	1	F	Correction of EN-DC FR2 inter-freq measurement test case 5.6.2.5 including TT	16.8.0
2021-06	RAN#92	R5-213928	1209	1	F	Correction of EN-DC FR2 inter-freq measurement test case 5.6.2.6 including TT	16.8.0
2021-06	RAN#92	R5-213929	1210	1	F	Correction of EN-DC FR2 inter-freq measurement test case 5.6.2.7 including TT	16.8.0
2021-06	RAN#92	R5-213930	1211	1	F	Correction of EN-DC FR2 inter-freq measurement test case 5.6.2.8 including TT	16.8.0
2021-06	RAN#92	R5-213931	1156	1	F	Correct reference to cell mapping for SA test cases	16.8.0
2021-06	RAN#92	R5-213932	1160	1	F	Correcting typos in PRACH test case	16.8.0
2021-06	RAN#92	R5-213933	1169	1	F	Corrections to RLM test cases SA	16.8.0
2021-06	RAN#92	R5-213934	1135	1	F	Annex F for EN-DC and SA FR2 Measurement Accuracy	16.8.0
2021-06	RAN#92	R5-213935	1157	1	F	Align Annex H of TS 38.533 to Clause 7 of TS 38.508-1	16.8.0
2021-06	RAN#92	R5-213936	1202	1	F	Correction to AoA Test Setup applicability per permitted test method	16.8.0
2021-06	RAN#92	R5-213937	1204	1	F	Adapt Annex F to indicate applicability of the RRM FR2 TT analysis results	16.8.0
2021-06	RAN#92	R5-213938	1207	1	F	Correction of MTSU and applied TT in Annex F for FR2 inter-freq measurement test cases	16.8.0
2021-06	RAN#92	R5-214009	1151	1	F	Addition of 5G-SRVCC RRM TC 6.3.1.6-handover	16.8.0
2021-06	RAN#92	R5-214010	1152	1	F	Addition of 5G-SRVCC RRM TC 6.6.5.1-envent triggered reporting non-DRX	16.8.0
2021-06	RAN#92	R5-214060	1182	1	F	Correction to FR1 EN-DC BWP switching test cases	16.8.0
2021-06	RAN#92	R5-214061	1198	1	F	Update of CSI reporting time for EN-DC FR1 TC 4.5.3.1	16.8.0
2021-06	RAN#92	R5-214062	1199	1	F	Update of CSI reporting time for EN-DC FR2 TC 5.5.3.1	16.8.0
2021-06	RAN#92	R5-214063	1203	1	F	Adapt RRM FR2 test cases to indicate applicability of the TT analysis results	16.8.0
2021-06	RAN#92	R5-214064	1146	1	F	Corrections to NR SA FR1 RRC Re-establishment tests	16.8.0
2021-06	RAN#92	R5-214065	1187	1	F	Correction to FR1 NR SA BWP switch test cases	16.8.0

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2021-06	RAN#92	R5-214066	1200	1	F	Update of CSI reporting time for SA FR1 TC 6.5.3.1	16.8.0
2021-06	RAN#92	R5-214067	1201	1	F	Update of CSI reporting time for SA FR2 TC 7.5.3.1 and 7.5.3.2	16.8.0
2021-06	RAN#92	R5-214068	1188	1	F	Correction to NR inter-RAT measurement test cases	16.8.0
2021-06	RAN#92	R5-214090	1197	1	F	Correction to Annex A.9 on the selection of test direction	16.8.0
2021-06	RAN#92	R5-214091	1206	1	F	Extension of the RSRPB Rx Beak Peak Search method	16.8.0
2021-06	RAN#92	R5-214092	1221	1	F	Update on test frequencies selection for inter-frequency test cases	16.8.0
2021-06	RAN#92	R5-214108	1216	1	F	Correction of EN-DC FR2 inter-freq measurement test case 5.6.2.1 and 5.6.2.3	16.8.0
2021-06	RAN#92	R5-214109	1217	1	F	Correction of SA FR2 inter-freq measurement test case 7.6.2.1 and 7.6.2.3	16.8.0
2021-06	RAN#92	R5-214111	1144	1	F	Correction to Interruptions during measurements on deactivated NR SCC	16.8.0
2021-06	RAN#92	R5-214113	1140	1	F	Correction to FR2 event-triggered reporting of intra frequency cell	16.8.0
2021-09	RAN#93	R5-214195	1232	-	F	Completion 7.7.2.2 including TT analysis results	16.9.0
2021-09	RAN#93	R5-214197	1234	-	F	Annex E and F update for FR2 inter-frequency periodic measurements tests	16.9.0
2021-09	RAN#93	R5-214198	1235	-	F	Completion 7.7.1.1	16.9.0
2021-09	RAN#93	R5-214199	1236	-	F	Completion 7.7.2.1	16.9.0
2021-09	RAN#93	R5-214200	1237	-	F	Completion 7.7.3.1	16.9.0
2021-09	RAN#93	R5-214339	1239	-	F	Correction to 4.5.1.1 message contents and core spec alignment	16.9.0
2021-09	RAN#93	R5-214342	1242	-	F	Correction to 4.5.1.4 core spec alignment	16.9.0
2021-09	RAN#93	R5-214343	1243	-	F	Correction to 4.5.1.5 message contents and core spec alignment	16.9.0
2021-09	RAN#93	R5-214345	1245	-	F	Correction to 4.4.1.1 and core spec alignment	16.9.0
2021-09	RAN#93	R5-214347	1247	-	F	Editorial corrections and core spec alignment for 5.7.1.1	16.9.0
2021-09	RAN#93	R5-214348	1248	-	F	Editorial corrections and core spec alignment for 5.7.2.1	16.9.0
2021-09	RAN#93	R5-214349	1249	-	F	Editorial corrections and core spec alignment for 5.7.3.1	16.9.0
2021-09	RAN#93	R5-214350	1250	-	F	Core spec alignment for 5.6.1.1	16.9.0
2021-09	RAN#93	R5-214351	1251	-	F	Core spec alignment for 5.6.1.2	16.9.0
2021-09	RAN#93	R5-214352	1252	-	F	Core spec alignment for 5.6.1.3	16.9.0
2021-09	RAN#93	R5-214353	1253	-	F	Core spec alignment for 5.6.1.4	16.9.0
2021-09	RAN#93	R5-214354	1254	-	F	Correction to 5.6.2.1 message contents	16.9.0
2021-09	RAN#93	R5-214355	1255	-	F	Correction to 5.6.2.2 message contents	16.9.0
2021-09	RAN#93	R5-214356	1256	-	F	Correction to 5.6.2.3 message contents	16.9.0
2021-09	RAN#93	R5-214357	1257	-	F	Correction to 5.6.2.4 message contents	16.9.0
2021-09	RAN#93	R5-214358	1258	-	F	Correction to 5.6.2.5 message contents	16.9.0
2021-09	RAN#93	R5-214359	1259	-	F	Correction to 5.6.2.6 message contents	16.9.0
2021-09	RAN#93	R5-214360	1260	-	F	Correction to 5.6.2.7 message contents	16.9.0
2021-09	RAN#93	R5-214361	1261	-	F	Correction to 5.6.2.8 message contents	16.9.0

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2021-09	RAN#93	R5-214363	1263	-	F	Correction to 6.5.1.1 message contents and core spec alignment	16.9.0
2021-09	RAN#93	R5-214365	1265	-	F	Correction to 6.5.1.5 message contents and core spec alignment	16.9.0
2021-09	RAN#93	R5-214367	1267	-	F	Correction to 6.3.1.6 and core spec alignment	16.9.0
2021-09	RAN#93	R5-214368	1268	-	F	Correction to 6.5.2.1 and core spec alignment	16.9.0
2021-09	RAN#93	R5-214370	1270	-	F	Correction to 6.7.5.1 and core spec alignment	16.9.0
2021-09	RAN#93	R5-214371	1271	-	F	Correction to 6.7.6.1 and core spec alignment	16.9.0
2021-09	RAN#93	R5-214372	1272	-	F	Correction to 6.7.7.1 and core spec alignment	16.9.0
2021-09	RAN#93	R5-214373	1273	-	F	Core spec alignment for 7.6.1.1	16.9.0
2021-09	RAN#93	R5-214374	1274	-	F	Core spec alignment for 7.6.1.2	16.9.0
2021-09	RAN#93	R5-214375	1275	-	F	Core spec alignment for 7.6.1.3	16.9.0
2021-09	RAN#93	R5-214376	1276	-	F	Core spec alignment for 7.6.1.4	16.9.0
2021-09	RAN#93	R5-214378	1278	-	F	Correction to 8.3.1.1 and core spec alignment	16.9.0
2021-09	RAN#93	R5-214395	1280	-	F	Addition of FR1 mobility enhancement TC 6.3.1.9-Intra-band inter-frequency sync DAPS HO in SA for FR1	16.9.0
2021-09	RAN#93	R5-214407	1281	-	F	Clarification of test procedure for 4.3.2.2.1	16.9.0
2021-09	RAN#93	R5-214408	1282	-	F	Corrections to 4.7.1.x.y SS-RSRP test cases	16.9.0
2021-09	RAN#93	R5-214409	1283	-	F	Corrections to 4.7.2.x SS-RSRQ test cases	16.9.0
2021-09	RAN#93	R5-214410	1284	-	F	Corrections to 4.7.3.x SS-SINR test cases	16.9.0
2021-09	RAN#93	R5-214411	1285	-	F	Corrections to 4.5.1.6	16.9.0
2021-09	RAN#93	R5-214412	1286	-	F	Corrections to 4.5.1.8	16.9.0
2021-09	RAN#93	R5-214413	1287	-	F	Core spec alignment of EN-DC FR2 PRACH	16.9.0
2021-09	RAN#93	R5-214414	1288	-	F	Corrections to 6.5.1.2	16.9.0
2021-09	RAN#93	R5-214415	1289	-	F	Corrections to 6.5.1.4	16.9.0
2021-09	RAN#93	R5-214416	1290	-	F	Corrections to 6.7.1.x.y SS-RSRP test cases	16.9.0
2021-09	RAN#93	R5-214417	1291	-	F	Corrections to 6.7.2.x SS-RSRQ test cases	16.9.0
2021-09	RAN#93	R5-214418	1292	-	F	Corrections to 6.7.3.x SS-SINR test cases	16.9.0
2021-09	RAN#93	R5-214419	1293	-	F	Corrections to 6.5.1.6	16.9.0
2021-09	RAN#93	R5-214420	1294	-	F	Corrections to 6.5.1.8	16.9.0
2021-09	RAN#93	R5-214421	1295	-	F	Align 6.3.2.2.x to core spec	16.9.0
2021-09	RAN#93	R5-214422	1296	-	F	Align 6.4.3.1 to core spec	16.9.0
2021-09	RAN#93	R5-214423	1297	-	F	Align 6.6.2.x to core spec	16.9.0
2021-09	RAN#93	R5-214424	1298	-	F	Align 6.6.3.x to core spec	16.9.0
2021-09	RAN#93	R5-214426	1300	-	F	Correction to Table H.3.5-9	16.9.0
2021-09	RAN#93	R5-214427	1301	-	F	Clarification CSI-ReportConfig from Annex H	16.9.0
2021-09	RAN#93	R5-214519	1302	-	F	Addition of FR1 mobility enhancement TC 6.3.1.10-Intra-band inter-frequency asynchronous DAPS HO in SA for FR1	16.9.0
2021-09	RAN#93	R5-214520	1303	-	F	Addition of FR1 mobility enhancement TC 6.3.1.11-Inter-band inter-	16.9.0

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						frequency sync DAPS HO in SA for FR1	
2021-09	RAN#93	R5-214521	1304	-	F	Addition of FR1 mobility enhancement TC 6.3.1.12-Inter-band inter-frequency asynchronousDAPS HO in SA for FR1	16.9.0
2021-09	RAN#93	R5-214522	1305	-	F	Update of applicability for RLM TC 4.6.1.3 and 4.6.1.6	16.9.0
2021-09	RAN#93	R5-214525	1308	-	F	Update of applicability for RLM TC 6.6.1.3 and 6.6.1.6	16.9.0
2021-09	RAN#93	R5-214526	1309	-	F	Correction of cell configuration for SA FR1 TC 6.3.2.1.2 and 6.3.2.1.3	16.9.0
2021-09	RAN#93	R5-214527	1310	-	F	Correction of specific message content for SA FR2 TC 7.6.1.4	16.9.0
2021-09	RAN#93	R5-214528	1311	-	F	Correction of cell configuration for SA FR2 TC 7.3.2.1.1, 7.3.2.1.2 and 7.3.2.1.3	16.9.0
2021-09	RAN#93	R5-214529	1312	-	F	Update of TCI configuration for SA FR2 TC 7.6.2.1 and 7.6.2.3	16.9.0
2021-09	RAN#93	R5-214530	1313	-	F	Correction of non-existent config for SA FR2 TC 7.7.1.3.1	16.9.0
2021-09	RAN#93	R5-214681	1319	-	F	Core alignment for DRX configuration	16.9.0
2021-09	RAN#93	R5-214682	1320	-	F	Correction to FR2 event-triggered reporting in DRX test cases	16.9.0
2021-09	RAN#93	R5-214685	1323	-	F	Correction to Inter-RAT SFTD measurement delay and event triggered reporting tests	16.9.0
2021-09	RAN#93	R5-214687	1325	-	F	Correction to 4.5.7.1EN-DC FR1 addition and release delay of known PSCell	16.9.0
2021-09	RAN#93	R5-214688	1326	-	F	Correction to NR SA FR1 - E-UTRAN event-triggered reporting tests	16.9.0
2021-09	RAN#93	R5-214689	1327	-	F	Correction to the number of entries in the measObjectToAddModList	16.9.0
2021-09	RAN#93	R5-214693	1331	-	F	Clean up on editor notes for FR2 test cases	16.9.0
2021-09	RAN#93	R5-214711	1335	-	F	Add minimum conformance requirements for DAPS handover	16.9.0
2021-09	RAN#93	R5-214832	1337	-	F	Correction to 5G-SRVCC RRM TC 6.3.1.6-handover	16.9.0
2021-09	RAN#93	R5-214833	1338	-	F	Correction to 5G-SRVCC RRM TC 6.6.5.1-envent triggered reporting non-DRX	16.9.0
2021-09	RAN#93	R5-214921	1340	-	F	Alignment HO test case 6.3.1.2 with core requirements	16.9.0
2021-09	RAN#93	R5-214922	1341	-	F	Correction re-establishment test cases 6.3.2.1.x	16.9.0
2021-09	RAN#93	R5-214923	1342	-	F	Remove gapUE and gapFR1 from iRAT test cases	16.9.0
2021-09	RAN#93	R5-214924	1343	-	F	Annex A.6.1 for iRAT test cases	16.9.0
2021-09	RAN#93	R5-214948	1344	-	F	Addition of FR-1 NSA CLI Measurement test cases	16.9.0
2021-09	RAN#93	R5-214983	1349	-	F	Correction to FR1 EN-DC TCs-RLM	16.9.0
2021-09	RAN#93	R5-214985	1351	-	F	Correction to FR2 EN-DC TCs-RLM	16.9.0
2021-09	RAN#93	R5-214986	1352	-	F	Correction to FR2 EN-DC TCs-SCell activation	16.9.0
2021-09	RAN#93	R5-214987	1353	-	F	Correction to FR1 NR SA TC 6.5.2.1-SCell interruption	16.9.0
2021-09	RAN#93	R5-214989	1355	-	F	Correction to FR1 NR SA TCs-cell reselection	16.9.0
2021-09	RAN#93	R5-214991	1357	-	F	Correction to FR1 NR SA TCs-RLM	16.9.0
2021-09	RAN#93	R5-214993	1359	-	F	Correction to FR2 NR SA TCs-cell reselection	16.9.0
2021-09	RAN#93	R5-214994	1360	-	F	Correction to FR2 NR SA TCs-SCell activation	16.9.0

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2021-09	RAN#93	R5-214996	1362	-	F	Correction to LTE SA TCs-cell reselection	16.9.0
2021-09	RAN#93	R5-214997	1363	-	F	Correction to LTE SA TCs-inter-RAT delay	16.9.0
2021-09	RAN#93	R5-214999	1365	-	F	Correction to cell mapping for CA TCs	16.9.0
2021-09	RAN#93	R5-215005	1367	-	F	Addition of minimum requirements for FR1 CHO	16.9.0
2021-09	RAN#93	R5-215006	1368	-	F	Addition of minimum requirements for FR2 CHO	16.9.0
2021-09	RAN#93	R5-215007	1369	-	F	Addition of NR Mob_Enh RRM TC 6.3.1.7-intra freq sync DAPS HO	16.9.0
2021-09	RAN#93	R5-215008	1370	-	F	Addition of NR Mob_Enh RRM TC 6.3.1.8-intra freq async DAPS HO	16.9.0
2021-09	RAN#93	R5-215009	1371	-	F	Addition of NR Mob_Enh RRM TC 6.3.3.1-intra freq CHO	16.9.0
2021-09	RAN#93	R5-215010	1372	-	F	Addition of NR Mob_Enh RRM TC 6.3.3.2-inter freq CHO	16.9.0
2021-09	RAN#93	R5-215011	1373	-	F	Addition of NR Mob_Enh RRM TC 7.3.1.4-inter band sync DAPS HO	16.9.0
2021-09	RAN#93	R5-215012	1374	-	F	Addition of NR Mob_Enh RRM TC 7.3.1.5-inter band async DAPS HO	16.9.0
2021-09	RAN#93	R5-215013	1375	-	F	Addition of NR Mob_Enh RRM TC 7.3.3.1-intra freq CHO	16.9.0
2021-09	RAN#93	R5-215014	1376	-	F	Addition of NR Mob_Enh RRM TC 7.3.3.2-inter freq CHO	16.9.0
2021-09	RAN#93	R5-215020	1378	-	F	Addition of minimum requirements for inter-freq relaxed measurement	16.9.0
2021-09	RAN#93	R5-215022	1380	-	F	Addition of minimum requirements for intra-freq relaxed measurement	16.9.0
2021-09	RAN#93	R5-215023	1381	-	F	Addition of NR PS RRM TC 6.1.1.3 - intra-freq cell reselection low mobility	16.9.0
2021-09	RAN#93	R5-215024	1382	-	F	Addition of NR PS RRM TC 6.1.1.4 - intra-freq cell reselection non-cell-edge	16.9.0
2021-09	RAN#93	R5-215025	1383	-	F	Addition of NR PS RRM TC 6.1.1.5 - inter-freq cell reselection low mobility	16.9.0
2021-09	RAN#93	R5-215026	1384	-	F	Addition of NR PS RRM TC 6.1.1.6 - inter-freq cell reselection non-cell-edge	16.9.0
2021-09	RAN#93	R5-215036	1388	-	F	Correction to minimum requirements for inter-RAT cell reselection with highSpeedMeasFlag	16.9.0
2021-09	RAN#93	R5-215037	1389	-	F	Correction to minimum requirements for intra-frequency measurement with highSpeedMeasFlag	16.9.0
2021-09	RAN#93	R5-215038	1390	-	F	Correction to NR HST RRM TC 6.1.1.7-HST intra-freq cell reselection	16.9.0
2021-09	RAN#93	R5-215039	1391	-	F	Addition of cell mapping for NR HST RRM TCs	16.9.0
2021-09	RAN#93	R5-215243	1398	-	F	Update of test case 6.6.4.5 for R16 NR HST	16.9.0
2021-09	RAN#93	R5-215244	1399	-	F	Editorial change of RRM test case 6.6.1.7	16.9.0
2021-09	RAN#93	R5-215352	1401	-	F	Correction to test frequeny selection for intra-band EN-DC	16.9.0
2021-09	RAN#93	R5-215354	1403	-	F	Correction to test requirement for 8.4.2.4 and error in writing for 8.4.2.x	16.9.0
2021-09	RAN#93	R5-215355	1404	-	F	Correction to DRX configuration for eliminating overlap between DRX and SMTC	16.9.0
2021-09	RAN#93	R5-215360	1405	-	F	Correction to test case 6.3.1.1 and 6.3.1.3	16.9.0

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2021-09	RAN#93	R5-215365	1406	-	F	Core spec alignment to add CCR configuration for EN-DC PRACH	16.9.0
2021-09	RAN#93	R5-215366	1407	-	F	Core spec alignment to add CCR configuration for EN-DC Timing	16.9.0
2021-09	RAN#93	R5-215367	1408	-	F	Core spec alignment to add CCR configuration for EN-DC event triggered	16.9.0
2021-09	RAN#93	R5-215368	1409	-	F	Addition of minimum conformance requirements of cell re-selection with relaxed measurement criterion in FR2	16.9.0
2021-09	RAN#93	R5-215392	1410	-	F	Add test case 4.3.2.2.3 for EN-DC FR1 2-step PRACH	16.9.0
2021-09	RAN#93	R5-215393	1411	-	F	Add test case 4.3.2.2.4 for EN-DC FR1 2-step PRACH	16.9.0
2021-09	RAN#93	R5-215394	1412	-	F	Add test case 5.3.2.2.3 for EN-DC FR2 2-step PRACH	16.9.0
2021-09	RAN#93	R5-215395	1413	-	F	Add test case 5.3.2.2.4 for EN-DC FR2 2-step PRACH	16.9.0
2021-09	RAN#93	R5-215396	1414	-	F	Add test case 6.3.2.2.3 for SA FR1 2-step PRACH	16.9.0
2021-09	RAN#93	R5-215397	1415	-	F	Add test case 6.3.2.2.4 for SA FR1 2-step PRACH	16.9.0
2021-09	RAN#93	R5-215398	1416	-	F	Add 2-Step PRACH test cases to Annex E	16.9.0
2021-09	RAN#93	R5-215412	1417	-	F	Addition of cell configuration for RRM HST test cases in Annex E	16.9.0
2021-09	RAN#93	R5-215413	1418	-	F	Correction of RRM HST Inter-RAT measurements test case 6.6.3.3	16.9.0
2021-09	RAN#93	R5-215414	1419	-	F	Correction of RRM HST E-UTRA NR FR1 Cell reselection test case 8.2.1.2	16.9.0
2021-09	RAN#93	R5-215415	1420	-	F	Correction of RRM HST E-UTRA NR Inter-RAT event triggered reporting test case 8.4.2.9	16.9.0
2021-09	RAN#93	R5-215420	1425	-	F	Correction of RRM EN-DC FR2 CSI-RS-based L1-RSRP measurement in DRX test case 5.6.3.4	16.9.0
2021-09	RAN#93	R5-215425	1430	-	F	Correction of RRM EN-DC FR2-FR2 event-triggered reporting in DRX test case 5.6.2.2 including Test Tolerance	16.9.0
2021-09	RAN#93	R5-215426	1431	-	F	Correction of RRM EN-DC FR2-FR2 event-triggered reporting in DRX with SSB time index detection test case 5.6.2.4 including Test Tolerance	16.9.0
2021-09	RAN#93	R5-215427	1432	-	F	Correction of RRM SA FR2-FR2 event-triggered reporting in DRX test case 7.6.2.2 including Test Tolerance	16.9.0
2021-09	RAN#93	R5-215428	1433	-	F	Correction of RRM SA FR2-FR2 event-triggered reporting in DRX with SSB time index detection test case 7.6.2.4 including Test Tolerance	16.9.0
2021-09	RAN#93	R5-215429	1434	-	F	Editorial correction of RRM FR2 EN-DC event triggered measurement test cases	16.9.0
2021-09	RAN#93	R5-215430	1435	-	F	Editorial correction of RRM FR2 SA event triggered measurement test cases	16.9.0
2021-09	RAN#93	R5-215431	1436	-	F	Correction of Measurement Uncertainty and Test Tolerance in Annex F for RRM test cases	16.9.0
2021-09	RAN#93	R5-215436	1437	-	F	Add MsgA configuration to the TS 38.533 annexes	16.9.0
2021-09	RAN#93	R5-215614	1438	-	F	Update on 6.3.1.1 to be aligned with TS 38.133	16.9.0
2021-09	RAN#93	R5-215620	1439	-	F	MTSU and TT mapping related to Max Device Size in TS 38.533	16.9.0
2021-09	RAN#93	R5-215622	1441	-	F	Updates on 5.6.1.3 and 5.6.1.4 CSI-RS RLM test cases test applicability	16.9.0
2021-09	RAN#93	R5-215624	1443	-	F	Correction in 5.6.1.1, 5.6.1.3 test procedure to configure iterations	16.9.0

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2021-09	RAN#93	R5-215625	1444	-	F	Correction in 5.6.2.1, 5.6.2.2, 5.6.2.3, 5.6.2.4 test procedure to configure iterations	16.9.0
2021-09	RAN#93	R5-215655	1451	-	F	Update to applicability statement to include gap pattern id 13 for applicable NSA event triggered test cases	16.9.0
2021-09	RAN#93	R5-215656	1452	-	F	TRS configuration update to NSA FR1 TC 6.5.4.1.1	16.9.0
2021-09	RAN#93	R5-215903	1238	1	F	Change to EN-DC L1-RSRP test cases to add evaluation rules	16.9.0
2021-09	RAN#93	R5-215904	1240	1	F	Correction to 4.5.1.2 core spec alignment	16.9.0
2021-09	RAN#93	R5-215905	1241	1	F	Correction to 4.5.1.3 message contents and core spec alignment	16.9.0
2021-09	RAN#93	R5-215906	1244	1	F	Correction to 4.5.1.7 message contents and core spec alignment	16.9.0
2021-09	RAN#93	R5-215907	1329	1	F	Correction to FR1 and FR2 event-triggered reporting with gap tests	16.9.0
2021-09	RAN#93	R5-215908	1262	1	F	Change to SA L1-RSRP test cases to add evaluation rules	16.9.0
2021-09	RAN#93	R5-215909	1264	1	F	Correction to 6.5.1.3 message contents and core spec alignment	16.9.0
2021-09	RAN#93	R5-215910	1266	1	F	Correction to 6.5.1.7 message contents and core spec alignment	16.9.0
2021-09	RAN#93	R5-215911	1356	1	F	Correction to FR1 NR SA TCs-inter-RAT accuracy	16.9.0
2021-09	RAN#93	R5-215912	1402	1	F	Correction to test procedure for 6.1.2.2 IRAT ReSelection	16.9.0
2021-09	RAN#93	R5-215913	1277	1	F	Change title of iRAT test cases for clarity	16.9.0
2021-09	RAN#93	R5-215914	1361	1	F	Correction to LTE SA TC 8.5.1.1-SFTD accuracy	16.9.0
2021-09	RAN#93	R5-215915	1279	1	F	Change title of iRAT test cases for clarity - Annexes	16.9.0
2021-09	RAN#93	R5-215916	1333	1	F	Update to Annex H.3.4	16.9.0
2021-09	RAN#93	R5-215917	1366	1	F	Correction to default configuration-Annex H	16.9.0
2021-09	RAN#93	R5-215918	1421	1	F	Correction of CSI-ReportConfig in Annex H	16.9.0
2021-09	RAN#93	R5-215932	1377	1	F	Addition of cell mapping for Mob_Enh RRM TCs	16.9.0
2021-09	RAN#93	R5-215938	1316	1	F	Addition of NR SA FR2-FR2 cell re-selection for UE fulfilling low mobility relaxed measurement criterion	16.9.0
2021-09	RAN#93	R5-215939	1385	1	F	Addition of cell mapping for NR PS RRM TCs	16.9.0
2021-09	RAN#93	R5-215940	1392	1	F	Addition of minimum conformance requirements of inter-RAT cell re-selection with relaxed measurement criterion	16.9.0
2021-09	RAN#93	R5-215941	1395	1	F	Update of Annex E and Annex F for test cases with relaxed measurement criterion	16.9.0
2021-09	RAN#93	R5-215948	1386	1	F	Addition of NR HST RRM TC 4.6.1.7-intra-freq DRX highSpeedMeasFlag	16.9.0
2021-09	RAN#93	R5-215949	1387	1	F	Addition of NR HST RRM TC 6.1.2.5-intra-freq cell reselection highSpeedMeasFlag	16.9.0
2021-09	RAN#93	R5-216042	1328	1	F	Correction to FR1 Beam Failure Detection and Link Recovery tests	16.9.0
2021-09	RAN#93	R5-216043	1339	1	F	Correction message contents 4.3.2.2.2	16.9.0
2021-09	RAN#93	R5-216044	1345	1	F	Update to applicability of test cases on CSI-RS based RLM	16.9.0
2021-09	RAN#93	R5-216045	1445	1	F	Updates to DCI based BWP switch NSA FR1 TC 4.5.6.1.1	16.9.0
2021-09	RAN#93	R5-216046	1446	1	F	Updates to DCI based BWP switch NSA FR1 2DLCA TC 4.5.6.1.2	16.9.0
2021-09	RAN#93	R5-216047	1447	1	F	Updates to RRC based BWP switch NSA FR1 TC 4.5.6.2.1	16.9.0

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2021-09	RAN#93	R5-216048	1228	1	F	Completion 5.7.1.2 including TT analysis results	16.9.0
2021-09	RAN#93	R5-216049	1229	1	F	Completion 5.7.2.2 including TT analysis results	16.9.0
2021-09	RAN#93	R5-216050	1230	1	F	Completion 5.7.3.2 including TT analysis results	16.9.0
2021-09	RAN#93	R5-216051	1322	1	F	Correction to 6.5.3.1 NR SA FR1 SCell activation and deactivation of known SCell	16.9.0
2021-09	RAN#93	R5-216052	1231	1	F	Completion 7.7.1.2 including TT analysis results	16.9.0
2021-09	RAN#93	R5-216053	1233	1	F	Completion 7.7.3.2 including TT analysis results	16.9.0
2021-09	RAN#93	R5-216054	1346	1	F	Update to applicability of test cases requiring gap pattern ID 4	16.9.0
2021-09	RAN#93	R5-216055	1299	1	F	Completion Annex C.2.3	16.9.0
2021-09	RAN#93	R5-216098	1336	1	F	Correction to EN-DC FR2 interruptions at transitions between active and non-active during DRX	16.9.0
2021-09	RAN#93	R5-216099	1324	1	F	Correction to 6.5.2.1 NR SA FR1 interruptions during measurements on deactivated NR SCC	16.9.0
2021-09	RAN#93	R5-216100	1330	1	F	Correction to the propagation condition of NR cell for Inter RAT test cases	16.9.0
2021-09	RAN#93	R5-216101	1318	1	F	Addition of BWP definition for FR2 SSB SCS240kHz	16.9.0
2021-09	RAN#93	R5-216123	1448	1	F	Updates to DCI based BWP switch SA FR1 2DLCA TC 6.5.6.1.1	16.9.0
2021-09	RAN#93	R5-216124	1449	1	F	Updates to DCI based BWP switch SA FR1 TC 6.5.6.1.2	16.9.0
2021-09	RAN#93	R5-216125	1450	1	F	Updates to RRC based BWP switch SA FR1 TC 6.5.6.2.1	16.9.0
2021-09	RAN#93	R5-216132	1347	1	F	Correction to FR1 EN-DC TC 4.5.7.1-PSCell addition	16.9.0
2021-09	RAN#93	R5-216133	1348	1	F	Correction to FR1 EN-DC TCs-BWP switching	16.9.0
2021-09	RAN#93	R5-216134	1350	1	F	Correction to FR1 EN-DC TCs-SCell activation	16.9.0
2021-09	RAN#93	R5-216135	1354	1	F	Correction to FR1 NR SA TCs-BWP switching	16.9.0
2021-09	RAN#93	R5-216136	1358	1	F	Correction to FR1 NR SA TCs-SCell activation	16.9.0
2021-09	RAN#93	R5-216137	1454	1	F	Correction to UL BWP configuration for SA FR1 TC 6.5.2.1	16.9.0
2021-09	RAN#93	R5-216138	1364	1	F	Correction to LTE SA TCs-SFTD delay	16.9.0
2021-09	RAN#93	R5-216143	1393	1	F	Addition of 6.1.2.3 inter-RAT cell re-selection with relaxed measurement with low mobility	16.9.0
2021-09	RAN#93	R5-216144	1394	1	F	Addition of 6.1.2.4 inter-RAT cell re-selection with relaxed measurement with not at cell edge	16.9.0
2021-09	RAN#93	R5-216145	1422	1	F	Correction of RRM EN-DC FR2 SSB-based L1-RSRP measurement in non-DRX test case 5.6.3.1 including Test Tolerance	16.9.0
2021-09	RAN#93	R5-216146	1423	1	F	Correction of RRM EN-DC FR2 SSB-based L1-RSRP measurement in DRX test case 5.6.3.2 including Test Tolerance	16.9.0
2021-09	RAN#93	R5-216147	1424	1	F	Correction of RRM EN-DC FR2 CSI-RS-based L1-RSRP measurement in non-DRX test case 5.6.3.3	16.9.0
2021-09	RAN#93	R5-216148	1426	1	F	Correction of RRM NR SA FR2 SSB-based L1-RSRP measurement in non-DRX test case 7.6.3.1 including Test Tolerance	16.9.0
2021-09	RAN#93	R5-216149	1427	1	F	Correction of RRM NR SA FR2 SSB-based L1-RSRP measurement in DRX test case 7.6.3.2 including Test Tolerance	16.9.0
2021-09	RAN#93	R5-216360	1428	1	F	Correction of RRM NR SA FR2 CSI-RS-based L1-RSRP measurement in non-DRX test case 7.6.3.3	16.9.0

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2021-09	RAN#93	R5-216361	1429	1	F	Correction of RRM NR SA FR2 CSI-RS-based L1-RSRP measurement in DRX test case 7.6.3.4	16.9.0
2021-09	RAN#93	R5-216364	1314	1	F	Addition of NR SA FR2 cell re-selection for UE fulfilling low mobility relaxed measurement criterion	16.9.0
2021-09	RAN#93	R5-216365	1315	1	F	Addition of NR SA FR2 cell re-selection for UE fulfilling not-at-cell edge relaxed measurement criterion	16.9.0
2021-09	RAN#93	R5-216366	1317	1	F	Addition of NR SA FR2-FR2 cell re-selection for UE fulfilling not-at-cell edge relaxed measurement criterion	16.9.0
2021-09	RAN#93	R5-215968	1397	1	B	Introduction of n24	17.0.0
2021-12	RAN#94	R5-216602	1455	-	F	Update of TC 6.7.1.1.2	17.1.0
2021-12	RAN#94	R5-216839	1458	-	F	Correction to CSI-RS based beam failure detection test cases	17.1.0
2021-12	RAN#94	R5-216840	1459	-	F	Correction to Initial DL and UL BWP for test case 6.3.2.1.2	17.1.0
2021-12	RAN#94	R5-216841	1460	-	F	Correction to SRS configuration for FR1 timing test cases	17.1.0
2021-12	RAN#94	R5-216842	1461	-	F	Correction to SRS configuration for FR2 timing test cases	17.1.0
2021-12	RAN#94	R5-216843	1462	-	F	Correction to FR1 CA RRM tests for generic channel BW configurations	17.1.0
2021-12	RAN#94	R5-216844	1463	-	F	Correction to FR1 Active BWP Switch Delay TCs	17.1.0
2021-12	RAN#94	R5-216845	1464	-	F	Correction to FR1 Redirection test cases	17.1.0
2021-12	RAN#94	R5-216846	1465	-	F	Correction to message exceptions for CSI-RS based BFR tests	17.1.0
2021-12	RAN#94	R5-216857	1470	-	F	Correction to FR2 EN-DC RRM TCs - RLM	17.1.0
2021-12	RAN#94	R5-216860	1473	-	F	Correction to FR2 EN-DC RRM TCs using Table H.3.1-4 for event A4	17.1.0
2021-12	RAN#94	R5-216861	1474	-	F	Correction to FR1 NR SA RRM TC 6.1.1.1 - intra-freq reselection	17.1.0
2021-12	RAN#94	R5-216862	1475	-	F	Correction to FR1 NR SA RRM TC 6.7.6.1 - inter-RAT meas	17.1.0
2021-12	RAN#94	R5-216864	1477	-	F	Correction to FR1 NR SA RRM TCs 6.5.2.1 - interruption	17.1.0
2021-12	RAN#94	R5-216866	1479	-	F	Correction to FR2 NR SA RRM TCs using Table H.3.1-4 for event A4	17.1.0
2021-12	RAN#94	R5-216868	1481	-	F	Correction to SSB reference configurations	17.1.0
2021-12	RAN#94	R5-216869	1482	-	F	Correction to Annex H for RRM TCs	17.1.0
2021-12	RAN#94	R5-216873	1485	-	F	Correction to Mob_enh RRM TC 6.3.3.1 - FR1 intra CHO	17.1.0
2021-12	RAN#94	R5-216874	1486	-	F	Correction to Mob_enh RRM TC 6.3.3.2 - FR1 inter CHO	17.1.0
2021-12	RAN#94	R5-216876	1488	-	F	Correction to Mob_enh RRM TC 7.3.1.5 - inter-FR DAPS async	17.1.0
2021-12	RAN#94	R5-216886	1492	-	F	Correction to PS RRM TC 6.1.1.3 - intra low mobility	17.1.0
2021-12	RAN#94	R5-216887	1493	-	F	Correction to PS RRM TC 6.1.1.4 - intra not cell edge	17.1.0
2021-12	RAN#94	R5-216888	1494	-	F	Correction to PS RRM TC 6.1.1.5 - inter low mobility	17.1.0
2021-12	RAN#94	R5-216889	1495	-	F	Correction to PS RRM TC 6.1.1.6 - inter not cell edge	17.1.0
2021-12	RAN#94	R5-216890	1496	-	F	Correction to Annex F for PS RRM TCs	17.1.0
2021-12	RAN#94	R5-216900	1497	-	F	Correction to SRVCC RRM TC 6.3.1.6 - UTRA handover	17.1.0
2021-12	RAN#94	R5-216902	1499	-	F	Correction to Annex F for SRVCC RRM TCs	17.1.0

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2021-12	RAN#94	R5-216912	1500	-	F	Correction to HST RRM TC 4.6.1.7 - intra-freq meas	17.1.0
2021-12	RAN#94	R5-216913	1501	-	F	Correction to HST RRM TC 4.6.4.5 - L1-RSRP	17.1.0
2021-12	RAN#94	R5-216914	1502	-	F	Correction to HST RRM TC 6.1.2.5 - inter-RAT reselection	17.1.0
2021-12	RAN#94	R5-216915	1503	-	F	Correction to Annex F for HST RRM TCs	17.1.0
2021-12	RAN#94	R5-217070	1505	-	F	Correction of message configuration for EN-DC FR1 SFTD TC 4.7.5.1	17.1.0
2021-12	RAN#94	R5-217122	1510	-	F	Reinstate wrongly deleted Table H.3.5-4	17.1.0
2021-12	RAN#94	R5-217123	1511	-	F	Correct B2 Threshold in H.3.1-4A	17.1.0
2021-12	RAN#94	R5-217124	1512	-	F	Corrections to 4.3.2.2.1	17.1.0
2021-12	RAN#94	R5-217131	1515	-	F	Corrections to L1-RSRP EN-DC test cases	17.1.0
2021-12	RAN#94	R5-217132	1516	-	F	Corrections to L1-RSRP NR SA test cases	17.1.0
2021-12	RAN#94	R5-217145	1517	-	F	Correct reference to test frequencies	17.1.0
2021-12	RAN#94	R5-217203	1519	-	F	Addition of minimum requirements for EN-DC L1-SINR measurement for beam reporting	17.1.0
2021-12	RAN#94	R5-217207	1523	-	F	Addition of minimum requirements for NR SA FR1 L1-SINR measurement for beam reporting	17.1.0
2021-12	RAN#94	R5-217211	1527	-	F	Addition of the abbreviations for Rel-16 NR MIMO	17.1.0
2021-12	RAN#94	R5-217213	1529	-	F	Addition of Annex A.1.4B CSI-IM Reference Measurement Channels	17.1.0
2021-12	RAN#94	R5-217214	1530	-	F	Addition of Annex H.3.6A RRC messages and IE exceptions for L1-SINR measurement for beam reporting	17.1.0
2021-12	RAN#94	R5-217228	1539	-	F	Correct of RRM Test Cases for test applicability	17.1.0
2021-12	RAN#94	R5-217229	1540	-	F	Correct of RRM Test Cases	17.1.0
2021-12	RAN#94	R5-217255	1541	-	F	Addition of FR-1 NSA CLI accuracy test cases	17.1.0
2021-12	RAN#94	R5-217258	1542	-	F	Corrections to event-triggered iRAT	17.1.0
2021-12	RAN#94	R5-217395	1545	-	F	Update of 6.1.2.3 and 6.1.2.4 for MU and TT	17.1.0
2021-12	RAN#94	R5-217396	1546	-	F	Update of Annex F for test cases with relaxed measurement criterion	17.1.0
2021-12	RAN#94	R5-217436	1550	-	F	Correction to E-UTRA - NR FR1 cell re-selection to higher priority NR target cell	17.1.0
2021-12	RAN#94	R5-217438	1551	-	F	Correction to SIB4 exceptions in Annex H	17.1.0
2021-12	RAN#94	R5-217439	1552	-	F	Correction to FR2 event-triggered reporting with gap test	17.1.0
2021-12	RAN#94	R5-217441	1553	-	F	Correction to test procedure in 8.2.1.1	17.1.0
2021-12	RAN#94	R5-217443	1555	-	F	Correction to test requirement in 8.3.1.1	17.1.0
2021-12	RAN#94	R5-217520	1559	-	F	Addition of RMC CORESET to FR2 random access tests	17.1.0
2021-12	RAN#94	R5-217570	1561	-	F	Correction of RRM HST Inter-RAT measurements test case 6.6.3.3 including Test Tolerance	17.1.0
2021-12	RAN#94	R5-217572	1563	-	F	Correction of RRM HST E-UTRA NR Inter-RAT event triggered reporting test case 8.4.2.9 including Test Tolerance	17.1.0
2021-12	RAN#94	R5-217573	1564	-	F	Correction of RRM EN-DC FR2 CSI-RS-based L1-RSRP measurement in non-DRX test case 5.6.3.3 including Test	17.1.0

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						Tolerance	
2021-12	RAN#94	R5-217574	1565	-	F	Correction of RRM EN-DC FR2 CSI-RS-based L1-RSRP measurement in DRX test case 5.6.3.4 including Test Tolerance	17.1.0
2021-12	RAN#94	R5-217575	1566	-	F	Correction of RRM NR SA FR2 CSI-RS-based L1-RSRP measurement in non-DRX test case 7.6.3.3 including Test Tolerance	17.1.0
2021-12	RAN#94	R5-217576	1567	-	F	Correction of RRM NR SA FR2 CSI-RS-based L1-RSRP measurement in DRX test case 7.6.3.4 including Test Tolerance	17.1.0
2021-12	RAN#94	R5-217577	1568	-	F	Correction of SA FR2 RRC re-establishment test case 7.3.2.1.1	17.1.0
2021-12	RAN#94	R5-217580	1571	-	F	Correction of Measurement Uncertainty and Test Tolerance in Annex F for RRM test cases	17.1.0
2021-12	RAN#94	R5-217585	1572	-	F	Correction of Minimum conformance requirements for FR1 re-establishment test cases	17.1.0
2021-12	RAN#94	R5-217586	1573	-	F	Correction of Minimum conformance requirements for FR2 re-establishment test cases	17.1.0
2021-12	RAN#94	R5-217661	1574	-	F	Update on FR2 Radio Link monitoring SSB based RLM test cases	17.1.0
2021-12	RAN#94	R5-217663	1575	-	F	Update on FR2 radio link monitoring CSI-RS based RLM test cases	17.1.0
2021-12	RAN#94	R5-217736	1576	-	F	Update to SA Handover delay requirements	17.1.0
2021-12	RAN#94	R5-218207	1577	-	F	Correct 5.7.3.2 / 7.7.3.2 test case limits based on TT analysis results	17.1.0
2021-12	RAN#94	R5-218215	1457	1	F	Correction to Mob_enh RRM TC 6.3.1.9 - inter-freq sync DAPS HO	17.1.0
2021-12	RAN#94	R5-218216	1491	1	F	Correction to Annex F for Mob_enh RRM TCs	17.1.0
2021-12	RAN#94	R5-218217	1504	1	F	Correction to Mob_enh RRM TC 6.3.1.10 - inter-freq async DAPS HO	17.1.0
2021-12	RAN#94	R5-218250	1469	1	F	Correction to FR1 EN-DC RRM TCs 4.5.2.X - interruption	17.1.0
2021-12	RAN#94	R5-218251	1513	1	F	Corrections to RLM EN-DC test cases	17.1.0
2021-12	RAN#94	R5-218252	1548	1	F	Correction to EN-DC FR1 addition and release delay of known PSCell	17.1.0
2021-12	RAN#94	R5-218253	1471	1	F	Correction to FR2 EN-DC RRM TCs - RRC based	17.1.0
2021-12	RAN#94	R5-218254	1506	1	F	Correction of T2 timer value for SA FR1 TC 6.3.2.1.3	17.1.0
2021-12	RAN#94	R5-218255	1514	1	F	Corrections to RLM NR SA test cases	17.1.0
2021-12	RAN#94	R5-218256	1478	1	F	Correction to FR2 NR SA RRM TCs - RLM	17.1.0
2021-12	RAN#94	R5-218257	1507	1	F	Correction of RRC re-establishment delay for SA FR2 TC 7.3.2.1.1	17.1.0
2021-12	RAN#94	R5-218258	1508	1	F	Correction of T2 timer value for SA FR2 TC 7.3.2.1.2	17.1.0
2021-12	RAN#94	R5-218259	1509	1	F	Correction of T2 timer value for SA FR2 TC 7.3.2.1.3	17.1.0
2021-12	RAN#94	R5-218260	1569	1	F	Correction of SA FR2 - FR2 RRC re-establishment test case 7.3.2.1.2	17.1.0
2021-12	RAN#94	R5-218261	1480	1	F	Correction to LTE SA RRM TCs - NR inter-RAT accuracy	17.1.0
2021-12	RAN#94	R5-218294	1544	1	F	Update of Annex for 4.5.8.1 EN-DC FR1 DL interruptions at switching between two uplink carriers	17.1.0
2021-12	RAN#94	R5-218296	1483	1	F	Correction to Mob_enh RRM TC 6.3.1.7 - intra DAPS sync	17.1.0
2021-12	RAN#94	R5-218297	1484	1	F	Correction to Mob_enh RRM TC 6.3.1.8 - intra DAPS async	17.1.0

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2021-12	RAN#94	R5-218298	1487	1	F	Correction to Mob_enh RRM TC 7.3.1.4 - inter-FR DAPS sync	17.1.0
2021-12	RAN#94	R5-218299	1490	1	F	Correction to Mob_enh RRM TC 7.3.3.2 - FR2 inter CHO	17.1.0
2021-12	RAN#94	R5-218313	1520	1	F	Addition of 4.6.7.1 EN-DC FR1 CSI-RS based CMR and no dedicated IMR L1-SINR measurement in non-DRX	17.1.0
2021-12	RAN#94	R5-218314	1521	1	F	Addition of 4.6.7.2 EN-DC FR1 SSB based CMR and dedicated IMR L1-SINR measurement in DRX	17.1.0
2021-12	RAN#94	R5-218315	1522	1	F	Addition of 4.6.7.3 EN-DC FR1 CSI-RS based CMR and dedicated IMR L1-SINR measurement in DRX	17.1.0
2021-12	RAN#94	R5-218316	1524	1	F	Addition of 6.6.8.1 NR SA FR1 CSI-RS based CMR and no dedicated IMR L1-SINR measurement in DRX	17.1.0
2021-12	RAN#94	R5-218317	1525	1	F	Addition of 6.6.8.2 NR SA FR1 SSB based CMR and dedicated IMR L1-SINR measurement in non-DRX	17.1.0
2021-12	RAN#94	R5-218318	1526	1	F	Addition of 6.6.8.3 NR SA FR1 CSI-RS based CMR and dedicated IMR L1-SINR measurement in non-DRX	17.1.0
2021-12	RAN#94	R5-218319	1528	1	F	Addition of CSI-RS Reference Measurement Channels based on IMR	17.1.0
2021-12	RAN#94	R5-218320	1531	1	F	Addition of 4.5.5.5 EN-DC FR1 Scell CSI-RS-based beam failure detection and SSB-based link recovery in non-DRX	17.1.0
2021-12	RAN#94	R5-218321	1532	1	F	Addition of 4.5.5.6 EN-DC FR1 Scell CSI-RS-based beam failure detection and SSB-based link recovery in DRX	17.1.0
2021-12	RAN#94	R5-218322	1533	1	F	Addition of 4.7.7.1 EN-DC FR1 CSI-RS based CMR and no dedicated IMR configured and CSI-RS resource set with repetition off L1-SINR measurement accuracy	17.1.0
2021-12	RAN#94	R5-218323	1535	1	F	Addition of 4.7.7.3 EN-DC FR1 CSI-RS based CMR and dedicated IMR L1-SINR measurement accuracy	17.1.0
2021-12	RAN#94	R5-218324	1536	1	F	Addition of 6.7.9.1 NR SA FR1 CSI-RS based CMR and no dedicated IMR configured and CSI-RS resource set with repetition off L1-SINR measurement accuracy	17.1.0
2021-12	RAN#94	R5-218325	1537	1	F	Addition of 6.7.9.2 NR SA FR1 SSB based CMR and dedicated IMR L1-SINR absolute measurement accuracy	17.1.0
2021-12	RAN#94	R5-218326	1538	1	F	Addition of 6.7.9.3 NR SA FR1 CSI-RS based CMR and dedicated IMR L1-SINR measurement accuracy	17.1.0
2021-12	RAN#94	R5-218327	1547	1	F	Addition of cell configuration MU and TT for Enhancement on MIMO	17.1.0
2021-12	RAN#94	R5-218336	1498	1	F	Correction to SRVCC RRM TC 6.6.5.1 - UTRA meas	17.1.0
2021-12	RAN#94	R5-218351	1562	1	F	Correction of RRM HST E-UTRA NR FR1 Cell reselection test case 8.2.1.2 including Test Tolerance	17.1.0
2021-12	RAN#94	R5-218352	1570	1	F	Correction of Measurement Uncertainty and Test Tolerance in Annex F for RRM HST test cases	17.1.0
2021-12	RAN#94	R5-218372	1543	1	F	Addition of 4.5.8.1 EN-DC FR1 DL interruptions at switching between two uplink carriers	17.1.0
2021-12	RAN#94	R5-218439	1468	1	F	Correction to FR1 EN-DC RRM TCs - RRC based	17.1.0
2021-12	RAN#94	R5-218440	1560	1	F	Test Procedure update for FR1 Event Triggered test cases with CDRX	17.1.0
2021-12	RAN#94	R5-218441	1472	1	F	Correction to FR2 EN-DC RRM TCs 5.5.2.X - interruption	17.1.0
2021-12	RAN#94	R5-218442	1558	1	F	Update to FR2 interruption tests 5.5.2.1 and 5.5.2.2	17.1.0
2021-12	RAN#94	R5-218443	1456	1	F	Addition of clause 3A.6 for UE with Multiband Capability	17.1.0

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2021-12	RAN#94	R5-218444	1556	1	F	Clarification on cl 3A.1.1 test coverage across 5G NR architecture options for RRM	17.1.0
2021-12	RAN#94	R5-218461	1489	1	F	Correction to Mob_enh RRM TC 7.3.3.1 - FR2 intra CHO	17.1.0
2021-12	RAN#94	R5-218464	1534	1	F	Addition of 4.7.7.2 EN-DC FR1 SSB based CMR and dedicated IMR L1-SINR absolute measurement accuracy	17.1.0
2022-03	RAN#95	R5-220096	1578	-	F	Correction to Mob_enh RRM TC 6.3.1.11 - inter-band sync DAPS HO including test tolerance	17.2.0
2022-03	RAN#95	R5-220097	1579	-	F	Correction to Mob_enh RRM TC 6.3.1.12 - inter-band async DAPS HO including test tolerance	17.2.0
2022-03	RAN#95	R5-220109	1580	-	F	Update of SA FR1 TC 4.5.3.1 and 4.5.3.3	17.2.0
2022-03	RAN#95	R5-220110	1581	-	F	Update of SA FR1 TC 6.5.3.1 and 6.5.3.3	17.2.0
2022-03	RAN#95	R5-220136	1582	-	F	Correction to Annex F for Mob_enh RRM TCs	17.2.0
2022-03	RAN#95	R5-220160	1583	-	F	Add test case 7.3.2.2.4 for SA FR2 2-step PRACH	17.2.0
2022-03	RAN#95	R5-220167	1584	-	F	Updates to RRM HST Test Case 6.6.1.7	17.2.0
2022-03	RAN#95	R5-220168	1585	-	F	Updates to RRM HST Test Case 6.6.4.5	17.2.0
2022-03	RAN#95	R5-220196	1586	-	F	Update to table E.5-1 to add the cell configurations for one 2-step RACH test case	17.2.0
2022-03	RAN#95	R5-220278	1587	-	F	Clarifications on 5G NR connectivity options for RRM	17.2.0
2022-03	RAN#95	R5-220282	1588	-	F	Test case update for FR1 CLI-RSSI measurement with non-DRX	17.2.0
2022-03	RAN#95	R5-220283	1589	-	F	Annexure update for test tolerance for FR1 CLI-RSSI measurement with non-DRX	17.2.0
2022-03	RAN#95	R5-220689	1592	-	F	Correction to FR1 EN-DC RRM TCs - SCell activation	17.2.0
2022-03	RAN#95	R5-220697	1600	-	F	Correction to FR2 EN-DC RRM TC 5.6.1.2	17.2.0
2022-03	RAN#95	R5-220699	1602	-	F	Correction to FR2 EN-DC RRM TC 5.6.1.4	17.2.0
2022-03	RAN#95	R5-220701	1604	-	F	Correction to FR1 NR SA RRM TC 6.5.2.1 - interruption SCC	17.2.0
2022-03	RAN#95	R5-220702	1605	-	F	Correction to FR1 NR SA RRM TCs - SCell activation	17.2.0
2022-03	RAN#95	R5-220726	1623	-	F	Addition of band group for NR SL RRM test	17.2.0
2022-03	RAN#95	R5-220727	1624	-	F	Addition of minimum requirements for NR SL UE Tx timing TCs	17.2.0
2022-03	RAN#95	R5-220728	1625	-	F	Addition of NR SL RRM TC 9.1.1.1 - Tx Timing GNSS	17.2.0
2022-03	RAN#95	R5-220729	1626	-	F	Addition of NR SL RRM TC 9.1.1.2 - Tx Timing SyncRef UE	17.2.0
2022-03	RAN#95	R5-220730	1627	-	F	Addition of NR SL RRM TC 9.1.1.3 - Tx Timing NR Cell	17.2.0
2022-03	RAN#95	R5-220731	1628	-	F	Addition of minimum requirements for NR SL S-SSB Tx TCs	17.2.0
2022-03	RAN#95	R5-220734	1631	-	F	Addition of minimum requirements for NR SL SyncRef reselection TCs	17.2.0
2022-03	RAN#95	R5-220737	1634	-	F	Addition of minimum requirements for NR SL L1 SL-RSRP TCs	17.2.0
2022-03	RAN#95	R5-220738	1635	-	F	Addition of NR SL RRM TC 9.1.4.1 - Resource sensing	17.2.0
2022-03	RAN#95	R5-220741	1638	-	F	Addition of minimum requirements for NR SL Congestion control TCs	17.2.0
2022-03	RAN#95	R5-220742	1639	-	F	Addition of NR SL RRM TC 9.1.5.1 - SL-RSSI con-current	17.2.0
2022-03	RAN#95	R5-220744	1641	-	F	Addition of minimum requirements for NR SL interruption TCs	17.2.0

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2022-03	RAN#95	R5-220745	1642	-	F	Addition of NR SL RRM TC 9.1.6.1 - WAN interruption	17.2.0
2022-03	RAN#95	R5-220747	1644	-	F	Addition of side conditions for NR SL RRM test in Annex B	17.2.0
2022-03	RAN#95	R5-220748	1645	-	F	Correction to Annex E for NR SL RRM TCs	17.2.0
2022-03	RAN#95	R5-220749	1646	-	F	Correction to Annex G for NR SL RRM TCs	17.2.0
2022-03	RAN#95	R5-220798	1647	-	F	Update to 5.5.5.0 FR2 BFD minimum requirements	17.2.0
2022-03	RAN#95	R5-220801	1650	-	F	Update to 7.5.5.0 FR2 BFD minimum requirements	17.2.0
2022-03	RAN#95	R5-220804	1653	-	F	Update to Annex E for eMIMO test cases	17.2.0
2022-03	RAN#95	R5-220910	1657	-	F	Correction to TRS Configuration of 6.3.2.1.3	17.2.0
2022-03	RAN#95	R5-220911	1658	-	F	Correction to test procedure of 6.1.1.2	17.2.0
2022-03	RAN#95	R5-220912	1659	-	F	Correction to reference of test frequency in 6.3.1.x NR only test cases	17.2.0
2022-03	RAN#95	R5-220918	1661	-	F	Correction to SRS configuration condition for FR1 timing test cases	17.2.0
2022-03	RAN#95	R5-220920	1662	-	F	Correction to DRX setting of 8.4.2.9	17.2.0
2022-03	RAN#95	R5-220921	1663	-	F	Correction to message exception for handover test cases	17.2.0
2022-03	RAN#95	R5-220923	1665	-	F	Correction to BWP switch delay test cases	17.2.0
2022-03	RAN#95	R5-220924	1666	-	F	Correction to message exception for 4.7.5.1	17.2.0
2022-03	RAN#95	R5-220927	1668	-	F	Correction to 6.3.2.3.1 NR SA FR1 RRC connection release with redirection	17.2.0
2022-03	RAN#95	R5-220928	1669	-	F	Correction to NR-EUTRA and EUTRA-NR reselection with high speed	17.2.0
2022-03	RAN#95	R5-220929	1670	-	F	Correction to message exception for 8.5.1.1	17.2.0
2022-03	RAN#95	R5-220930	1671	-	F	Correction to ssb-ResourceList for 5.3.2.2.2	17.2.0
2022-03	RAN#95	R5-220931	1672	-	F	Correction to SMTC configuration in 6.1.1.7	17.2.0
2022-03	RAN#95	R5-220933	1674	-	F	Correction to T HARQ setting for 6.5.3.1	17.2.0
2022-03	RAN#95	R5-220938	1678	-	F	Correction to DRX setting of 6.6.1.7	17.2.0
2022-03	RAN#95	R5-220939	1679	-	F	Correction to message exception of 4.6.1.7	17.2.0
2022-03	RAN#95	R5-220940	1680	-	F	Correction to test procedure for 8.2.1.2	17.2.0
2022-03	RAN#95	R5-220941	1681	-	F	Correction to SIB1 message exceptions of 4.6.1.7 and 4.6.4.5	17.2.0
2022-03	RAN#95	R5-220942	1682	-	F	Addition of new test case 7.7.6.1 NR SA FR2 CSI-RS based CMR and no dedicated IMR configured and CSI-RS resource set with repetition off L1-SINR measurement accuracy	17.2.0
2022-03	RAN#95	R5-220943	1683	-	F	Addition of new test case 7.7.6.2 NR SA FR2 SSB based CMR and dedicated IMR L1-SINR measurement accuracy	17.2.0
2022-03	RAN#95	R5-220944	1684	-	F	Addition of new test case 7.7.6.3 NR SA FR2 CSI-RS based CMR and dedicated IMR L1-SINR measurement accuracy	17.2.0
2022-03	RAN#95	R5-220986	1688	-	F	Update of 4.6.7.1 EN-DC FR1 CSI-RS based CMR and no dedicated IMR L1-SINR measurement in non-DRX	17.2.0
2022-03	RAN#95	R5-220988	1690	-	F	Update of 4.6.7.3 EN-DC FR1 CSI-RS based CMR and dedicated IMR L1-SINR measurement in DRX	17.2.0
2022-03	RAN#95	R5-220989	1691	-	F	Update of 6.6.8.1 NR SA FR1 CSI-RS based CMR and no dedicated IMR L1-SINR measurement in DRX	17.2.0

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2022-03	RAN#95	R5-220991	1693	-	F	Update of 6.6.8.3 NR SA FR1 CSI-RS based CMR and dedicated IMR L1-SINR measurement in non-DRX	17.2.0
2022-03	RAN#95	R5-220992	1694	-	F	Update of Annex for EN-DC FR1 L1-SINR measurement test cases	17.2.0
2022-03	RAN#95	R5-220993	1695	-	F	Update of Annex for NR SA FR1 L1-SINR measurement test cases	17.2.0
2022-03	RAN#95	R5-221001	1696	-	F	Correction to Annex H.3.6A RRC messages for L1-SINR measurement	17.2.0
2022-03	RAN#95	R5-221008	1698	-	F	Editorial corrections for EditHelp comments s1 to s3	17.2.0
2022-03	RAN#95	R5-221009	1699	-	F	Editorial corrections for EditHelp comments s4	17.2.0
2022-03	RAN#95	R5-221010	1700	-	F	Editorial corrections to revert headers to h6 for s4	17.2.0
2022-03	RAN#95	R5-221011	1701	-	F	Editorial corrections for EditHelp comments s5	17.2.0
2022-03	RAN#95	R5-221012	1702	-	F	Editorial corrections to revert headers to h6 for s5	17.2.0
2022-03	RAN#95	R5-221013	1703	-	F	Editorial corrections for EditHelp comments s6.1 to s6.3	17.2.0
2022-03	RAN#95	R5-221014	1704	-	F	Editorial corrections for EditHelp comments s6.4 to s6.5	17.2.0
2022-03	RAN#95	R5-221015	1705	-	F	Editorial corrections for EditHelp comments s7	17.2.0
2022-03	RAN#95	R5-221016	1706	-	F	Editorial corrections for EditHelp comments s8	17.2.0
2022-03	RAN#95	R5-221017	1707	-	F	Editorial corrections to revert headers to h6 for s8	17.2.0
2022-03	RAN#95	R5-221018	1708	-	F	Editorial corrections for EditHelp comments Annexes	17.2.0
2022-03	RAN#95	R5-221019	1709	-	F	New section for NE-DC RRM test cases	17.2.0
2022-03	RAN#95	R5-221020	1710	-	F	Minimum requirements for EN-DC FR1 L1-RSRP test cases	17.2.0
2022-03	RAN#95	R5-221021	1711	-	F	Minimum requirements for EN-DC FR2 L1-RSRP test cases	17.2.0
2022-03	RAN#95	R5-221024	1714	-	F	Correct message contents reference iRAT	17.2.0
2022-03	RAN#95	R5-221025	1715	-	F	Add auxiliary band for n39	17.2.0
2022-03	RAN#95	R5-221026	1716	-	F	Corrections to 5.7.x.x	17.2.0
2022-03	RAN#95	R5-221027	1717	-	F	Corrections to 8.4.2.4	17.2.0
2022-03	RAN#95	R5-221028	1718	-	F	Corrections to 8.2.1.1	17.2.0
2022-03	RAN#95	R5-221029	1719	-	F	Corrections to 8.5.2.2.1	17.2.0
2022-03	RAN#95	R5-221031	1721	-	F	Correction reportAmount for B2 report	17.2.0
2022-03	RAN#95	R5-221033	1723	-	F	Corrections to message contents for 8.4.2.3 and 8.4.2.4	17.2.0
2022-03	RAN#95	R5-221187	1728	-	F	Correct message content for RLM-SSB Based FR2 5.5.1.1	17.2.0
2022-03	RAN#95	R5-221188	1729	-	F	Correct message content for RLM-SSB Based FR2 5.5.1.2	17.2.0
2022-03	RAN#95	R5-221189	1730	-	F	Correct message content for RLM-SSB Based FR2 5.5.1.3	17.2.0
2022-03	RAN#95	R5-221190	1731	-	F	Correct message content for RLM-SSB Based FR2 5.5.1.4	17.2.0
2022-03	RAN#95	R5-221191	1732	-	F	Correct message content for FR2 interruption	17.2.0
2022-03	RAN#95	R5-221254	1733	-	F	Update 4.5.7.1 test procedure	17.2.0
2022-03	RAN#95	R5-221256	1734	-	F	Update number of HARQ processes for FDD	17.2.0
2022-03	RAN#95	R5-221289	1736	-	F	Correction of RRM re-establishment test case 7.3.2.1.1 including Test Tolerance	17.2.0

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2022-03	RAN#95	R5-221290	1737	-	F	Correction of RRM re-establishment test case 7.3.2.1.2 including Test Tolerance	17.2.0
2022-03	RAN#95	R5-221291	1738	-	F	Test Tolerance addition in Annex F for RRM FR2 re-establishment test cases	17.2.0
2022-03	RAN#95	R5-221297	1739	-	F	Addition of Minimum conformance requirements for DL interruptions at switching between two uplink carriers	17.2.0
2022-03	RAN#95	R5-221298	1740	-	F	Addition of UL switching test case 6.5.7.1	17.2.0
2022-03	RAN#95	R5-221300	1742	-	F	Cell configuration mapping for UL switching test cases	17.2.0
2022-03	RAN#95	R5-221301	1743	-	F	Addition of Idle mode CA/DC measurement test case 6.6.9.1	17.2.0
2022-03	RAN#95	R5-221302	1744	-	F	Addition of Idle Mode measurements of inter-RAT CA candidate cells for early reporting test case 6.6.15.1	17.2.0
2022-03	RAN#95	R5-221370	1748	-	F	Update to PDSCH reference measurement channels for RRM test cases with DRX config	17.2.0
2022-03	RAN#95	R5-221637	1613	1	F	Correction to FR2 NR SA RRM TC 7.6.1.2 with TT	17.2.0
2022-03	RAN#95	R5-221638	1615	1	F	Correction to FR2 NR SA RRM TC 7.6.1.4 with TT	17.2.0
2022-03	RAN#95	R5-221645	1619	1	F	Correction to Mob_enh RRM TC 7.3.1.4 with TT	17.2.0
2022-03	RAN#95	R5-221646	1620	1	F	Correction to Mob_enh RRM TC 7.3.1.5 with TT	17.2.0
2022-03	RAN#95	R5-221650	1685	1	F	Completion 4.5.5.5 including TT analysis results	17.2.0
2022-03	RAN#95	R5-221651	1686	1	F	Completion 4.5.5.6 including TT analysis results	17.2.0
2022-03	RAN#95	R5-221652	1687	1	F	Addition of cell configuration MU and TT for Enhancement on MIMO	17.2.0
2022-03	RAN#95	R5-221653	1689	1	F	Update of 4.6.7.2 EN-DC FR1 SSB based CMR and dedicated IMR L1-SINR measurement in DRX	17.2.0
2022-03	RAN#95	R5-221654	1692	1	F	Update of 6.6.8.2 NR SA FR1 SSB based CMR and dedicated IMR L1-SINR measurement in non-DRX	17.2.0
2022-03	RAN#95	R5-221655	1656	1	F	Correction to NR SA FR1 cell re-selection for UE configured with highSpeedMeasFlag-r16	17.2.0
2022-03	RAN#95	R5-221713	1591	1	F	Correction to FR1 EN-DC RRM TCs - interruption SCC	17.2.0
2022-03	RAN#95	R5-221714	1746	1	F	Introduce Test case for LTE PSCell addition and release in NE-DC	17.2.0
2022-03	RAN#95	R5-221715	1593	1	F	Correction to FR2 EN-DC RRM TCs - RLM	17.2.0
2022-03	RAN#95	R5-221716	1594	1	F	Correction to FR2 EN-DC RRM TC 5.5.5.1 with TT	17.2.0
2022-03	RAN#95	R5-221717	1595	1	F	Correction to FR2 EN-DC RRM TC 5.5.5.2 with TT	17.2.0
2022-03	RAN#95	R5-221718	1596	1	F	Correction to FR2 EN-DC RRM TC 5.5.5.3 with TT	17.2.0
2022-03	RAN#95	R5-221719	1597	1	F	Correction to FR2 EN-DC RRM TC 5.5.5.4 with TT	17.2.0
2022-03	RAN#95	R5-221720	1598	1	F	Correction to FR2 EN-DC RRM TC 5.5.5.5 with TT	17.2.0
2022-03	RAN#95	R5-221721	1599	1	F	Correction to FR2 EN-DC RRM TC 5.6.1.1 with TT	17.2.0
2022-03	RAN#95	R5-221722	1601	1	F	Correction to FR2 EN-DC RRM TC 5.6.1.3 with TT	17.2.0
2022-03	RAN#95	R5-221723	1712	1	F	New test case 5.7.4.1	17.2.0
2022-03	RAN#95	R5-221724	1713	1	F	New test case 5.7.4.2	17.2.0
2022-03	RAN#95	R5-221725	1725	1	F	Update to RRM test case with CDRX	17.2.0
2022-03	RAN#95	R5-221726	1720	1	F	Corrections to 6.7.x.x	17.2.0

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2022-03	RAN#95	R5-221727	1607	1	F	Correction to FR2 NR SA RRM TC 7.5.5.1 with TT	17.2.0
2022-03	RAN#95	R5-221728	1608	1	F	Correction to FR2 NR SA RRM TC 7.5.5.2 with TT	17.2.0
2022-03	RAN#95	R5-221729	1609	1	F	Correction to FR2 NR SA RRM TC 7.5.5.3 with TT	17.2.0
2022-03	RAN#95	R5-221730	1610	1	F	Correction to FR2 NR SA RRM TC 7.5.5.4 with TT	17.2.0
2022-03	RAN#95	R5-221731	1611	1	F	Correction to FR2 NR SA RRM TC 7.5.5.5 with TT	17.2.0
2022-03	RAN#95	R5-221732	1612	1	F	Correction to FR2 NR SA RRM TC 7.6.1.1 with TT	17.2.0
2022-03	RAN#95	R5-221733	1614	1	F	Correction to FR2 NR SA RRM TC 7.6.1.3 with TT	17.2.0
2022-03	RAN#95	R5-221734	1667	1	F	Correction to message exception for 8.4.2.x with SSB index detection	17.2.0
2022-03	RAN#95	R5-221735	1726	1	F	Test procedure update to L2NR Cell reselection test case	17.2.0
2022-03	RAN#95	R5-221736	1616	1	F	Correction to Annex F for FR2 SSB based BFD TCs	17.2.0
2022-03	RAN#95	R5-221737	1617	1	F	Correction to Annex F for FR2 SSB based intra-freq measurement TCs	17.2.0
2022-03	RAN#95	R5-221738	1618	1	F	Correction to default configuration in Annex H	17.2.0
2022-03	RAN#95	R5-221739	1722	1	F	Updates to CSI-ReportConfig for FR2	17.2.0
2022-03	RAN#95	R5-221740	1724	1	F	Update report config for iRAT test cases	17.2.0
2022-03	RAN#95	R5-221741	1745	1	F	Correction of clause 3	17.2.0
2022-03	RAN#95	R5-221742	1749	1	F	Correction to test frequencies for intra-band contiguous CA	17.2.0
2022-03	RAN#95	R5-221798	1741	1	F	Addition of UL switching test case 6.5.7.2	17.2.0
2022-03	RAN#95	R5-221812	1621	1	F	Correction to Mob_enh RRM TC 7.3.3.1 with TT	17.2.0
2022-03	RAN#95	R5-221813	1622	1	F	Correction to Annex F for Mob_enh RRM TCs	17.2.0
2022-03	RAN#95	R5-221821	1629	1	F	Addition of NR SL RRM TC 9.1.2.1 - SLSS Tx NR Cell	17.2.0
2022-03	RAN#95	R5-221822	1630	1	F	Addition of NR SL RRM TC 9.1.2.2 - SLSS Tx SyncRef UE	17.2.0
2022-03	RAN#95	R5-221823	1632	1	F	Addition of NR SL RRM TC 9.1.3.1 - SyncRef reselection GNSS	17.2.0
2022-03	RAN#95	R5-221824	1633	1	F	Addition of NR SL RRM TC 9.1.3.2 - SyncRef reselection Cell	17.2.0
2022-03	RAN#95	R5-221825	1636	1	F	Addition of NR SL RRM TC 9.1.4.2 - Resource pre-emption	17.2.0
2022-03	RAN#95	R5-221826	1637	1	F	Addition of NR SL RRM TC 9.1.4.3 - Resource re-evaluation	17.2.0
2022-03	RAN#95	R5-221827	1640	1	F	Addition of NR SL RRM TC 9.1.5.2 - SL-RSSI PC5 only	17.2.0
2022-03	RAN#95	R5-221828	1643	1	F	Addition of RMC for NR SL RRM test in Annex A	17.2.0
2022-03	RAN#95	R5-221833	1648	1	F	Addition of 5.5.5.6 FR2 SCell BFD in non-DRX for NSA	17.2.0
2022-03	RAN#95	R5-221834	1649	1	F	Addition of 5.5.5.7 FR2 SCell BFD in DRX for NSA	17.2.0
2022-03	RAN#95	R5-221835	1651	1	F	Addition of 7.5.5.6 FR2 SCell BFD in non-DRX for SA	17.2.0
2022-03	RAN#95	R5-221836	1652	1	F	Addition of 7.5.5.7 FR2 SCell BFD in DRX for SA	17.2.0
2022-03	RAN#95	R5-221837	1654	1	F	Update to Annex F for eMIMO test cases	17.2.0
2022-03	RAN#95	R5-221838	1655	1	F	Update to Annex H for eMIMO test cases	17.2.0
2022-03	RAN#95	R5-221839	1697	1	F	Update of RRM Test Cases for UE Enhancements on MIMO	17.2.0
2022-03	RAN#95	R5-221859	1664	1	F	Correction to DRX setting of 4.6.4.5 and 6.6.4.5	17.2.0

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2022-03	RAN#95	R5-221893	1590	1	F	Add test case 7.3.2.2.3 for NR SA FR2 2-step RACH	17.2.0
2022-03	RAN#95	R5-221923	1660	1	F	Correction to test procedure of SFTD measurement accuracy	17.2.0
2022-03	RAN#95	R5-221924	1677	1	F	Correction to BWP configuration for 4.5.6.1.2	17.2.0
2022-03	RAN#95	R5-221925	1673	1	F	Correction to active BWP ID and TRS configuration in 6.5.6.1.1	17.2.0
2022-03	RAN#95	R5-221926	1675	1	F	Correction to CSI-RS offset for 6.5.3.1	17.2.0
2022-03	RAN#95	R5-221927	1676	1	F	Correction to CSI report offset for 6.5.3.1	17.2.0
2022-06	RAN#96	R5-222490	1752	-	F	Correction to test time in 6.1.1.7	17.3.0
2022-06	RAN#96	R5-222491	1753	-	F	Editorial correction in 6.1.2.5	17.3.0
2022-06	RAN#96	R5-222492	1754	-	F	Correction to physical cell identity in 6.6.3.2 and 6.6.3.3	17.3.0
2022-06	RAN#96	R5-222493	1755	-	F	Correction to test procedure in 8.2.1.2	17.3.0
2022-06	RAN#96	R5-222494	1756	-	F	Correction to test procedure in 8.5.1.1	17.3.0
2022-06	RAN#96	R5-222505	1758	-	F	Correction to test parameters in 5.6.1.x and 5.6.2.x	17.3.0
2022-06	RAN#96	R5-222507	1760	-	F	Correction to DRX offset setting in 6.6.1.7	17.3.0
2022-06	RAN#96	R5-222508	1761	-	F	Correction to DRX offset setting in 6.6.3.3	17.3.0
2022-06	RAN#96	R5-222509	1762	-	F	Correction to DRX offset setting in 8.4.2.x	17.3.0
2022-06	RAN#96	R5-222517	1765	-	F	Add minimum requirements for 7.7.4	17.3.0
2022-06	RAN#96	R5-222522	1769	-	F	Remove incorrect references - Chapter 4	17.3.0
2022-06	RAN#96	R5-222523	1770	-	F	Remove incorrect references - Chapter 5	17.3.0
2022-06	RAN#96	R5-222524	1771	-	F	Remove incorrect references - Chapter 6	17.3.0
2022-06	RAN#96	R5-222525	1772	-	F	Remove incorrect references - Chapter 7	17.3.0
2022-06	RAN#96	R5-222526	1773	-	F	Remove incorrect references - Chapter 8	17.3.0
2022-06	RAN#96	R5-222527	1774	-	F	Corrections to 6.6.3.1	17.3.0
2022-06	RAN#96	R5-222528	1775	-	F	Corrections to 8.4.1.2	17.3.0
2022-06	RAN#96	R5-222529	1776	-	F	Modification to the asynchronous / synchronous cells conditions	17.3.0
2022-06	RAN#96	R5-222531	1778	-	F	Clean-up asynchronous / synchronous cells conditions for IRAT	17.3.0
2022-06	RAN#96	R5-222532	1779	-	F	Editorial correction to H.3.4-5	17.3.0
2022-06	RAN#96	R5-222533	1780	-	F	Corrections to 5.6.1.3	17.3.0
2022-06	RAN#96	R5-222534	1781	-	F	Corrections to 5.6.1.4	17.3.0
2022-06	RAN#96	R5-222535	1782	-	F	Correction to H.3.4-7	17.3.0
2022-06	RAN#96	R5-222536	1783	-	F	Editorial correction 4.5.5.x	17.3.0
2022-06	RAN#96	R5-222633	1791	-	F	Correction to NR SL RRM TCs	17.3.0
2022-06	RAN#96	R5-222636	1792	-	F	Correction to FR1 EN-DC TC 4.7.5.1 - SFTD	17.3.0
2022-06	RAN#96	R5-222638	1794	-	F	Correction to FR1 NR SA TCs 6.1.2.2 - low priority reselection	17.3.0
2022-06	RAN#96	R5-222640	1796	-	F	Correction to inter-RAT TC 8.5.1.1 - SFTD	17.3.0
2022-06	RAN#96	R5-222882	1803	-	F	Editorial update to minimum requirement in 6.5.7.0	17.3.0
2022-06	RAN#96	R5-222887	1804	-	F	Update to minimum requirements for BFR	17.3.0

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2022-06	RAN#96	R5-222890	1807	-	F	Update to FR2 SCell BFD test cases	17.3.0
2022-06	RAN#96	R5-222962	1810	-	F	Corrections AoA setup references	17.3.0
2022-06	RAN#96	R5-222964	1812	-	F	Corrections 7.6.3.1	17.3.0
2022-06	RAN#96	R5-222965	1813	-	F	Corrections 7.6.3.2	17.3.0
2022-06	RAN#96	R5-222966	1814	-	F	Corrections 7.6.3.3	17.3.0
2022-06	RAN#96	R5-222967	1815	-	F	Corrections 7.6.3.4	17.3.0
2022-06	RAN#96	R5-222968	1816	-	F	Update to 4.3.2.2.3	17.3.0
2022-06	RAN#96	R5-222969	1817	-	F	Update to 4.3.2.2.4	17.3.0
2022-06	RAN#96	R5-222970	1818	-	F	Update to 6.3.2.2.3	17.3.0
2022-06	RAN#96	R5-222971	1819	-	F	Update to 6.3.2.2.4	17.3.0
2022-06	RAN#96	R5-222998	1821	-	F	Update of 4.6.7 EN-DC FR1 L1-SINR measurement procedure	17.3.0
2022-06	RAN#96	R5-222999	1822	-	F	Update of 6.6.8 NR SA FR1 L1-SINR measurement procedure	17.3.0
2022-06	RAN#96	R5-223001	1824	-	F	Addition of 5.6.6.1 EN-DC FR2 L1-SINR measurement including Test Tolerance	17.3.0
2022-06	RAN#96	R5-223002	1825	-	F	Addition of 5.6.6.2 EN-DC FR2 L1-SINR measurement including Test Tolerance	17.3.0
2022-06	RAN#96	R5-223004	1827	-	F	Addition of 7.6.6.1 NR SA FR2 L1-SINR measurement including Test Tolerance	17.3.0
2022-06	RAN#96	R5-223007	1830	-	F	Addition of Annex E and Annex F for FR2 L1-SINR measurement	17.3.0
2022-06	RAN#96	R5-223214	1835	-	F	Editorial correction to 5G RRM TCs	17.3.0
2022-06	RAN#96	R5-223246	1836	-	F	Correction to Annexes for RRM SCell activation test cases	17.3.0
2022-06	RAN#96	R5-223305	1837	-	F	Update to eMIMO test cases 4.5.5.5 and 4.5.5.6	17.3.0
2022-06	RAN#96	R5-223605	1826	1	F	Addition of 5.6.6.3 EN-DC FR2 L1-SINR measurement including Test Tolerance	17.3.0
2022-06	RAN#96	R5-223606	1829	1	F	Addition of 7.6.6.3 NR SA FR2 L1-SINR measurement including Test Tolerance	17.3.0
2022-06	RAN#96	R5-223607	1750	1	F	Correction to EN-DC FR2 RLM tests for PSCell configured with CSI-RS-based RLM RS in non-DRX including TT	17.3.0
2022-06	RAN#96	R5-223615	1763	1	F	Completing 5.7.4.1 including TT analysis	17.3.0
2022-06	RAN#96	R5-223616	1766	1	F	Completing 7.7.4.1 including TT analysis	17.3.0
2022-06	RAN#96	R5-223707	1823	1	F	Addition of minimum requirements for EN-DC FR2 L1-SINR measurement for beam reporting	17.3.0
2022-06	RAN#96	R5-223710	1786	1	F	Introduction of EN-DC FR2 SRS-RSRP measurement in non-DRX test case 5.6.4.1	17.3.0
2022-06	RAN#96	R5-223711	1787	1	F	Introduction of EN-DC FR2 SRS-RSRP measurement accuracy test case 5.7.5.1	17.3.0
2022-06	RAN#96	R5-223712	1797	1	F	Introduction of NR SA FR2 SRS-RSRP measurement in non-DRX test case 7.6.4.1	17.3.0
2022-06	RAN#96	R5-223713	1798	1	F	Introduction of NR SA FR2 SRS-RSRP measurement accuracy test case 7.7.5.1	17.3.0
2022-06	RAN#96	R5-223850	1777	1	F	Corrections to 4.7.5.1	17.3.0

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2022-06	RAN#96	R5-223851	1784	1	F	Corrections to 4.5.5.1	17.3.0
2022-06	RAN#96	R5-223853	1808	1	F	Remove condition asynchronous cells	17.3.0
2022-06	RAN#96	R5-223854	1757	1	F	Correction to CSI-RS for tracking in 5.6.1.2	17.3.0
2022-06	RAN#96	R5-223855	1764	1	F	Completing 5.7.4.2 including TT analysis	17.3.0
2022-06	RAN#96	R5-223856	1790	1	F	Update to FR2 interruption test case 5.5.2.1	17.3.0
2022-06	RAN#96	R5-223857	1793	1	F	Correction to FR2 EN-DC BFD TCs	17.3.0
2022-06	RAN#96	R5-223858	1809	1	F	Corrections to 6.6.3.2	17.3.0
2022-06	RAN#96	R5-223859	1751	1	F	Editorial reference correction to NR SA FR2 cell re-selection test requirements	17.3.0
2022-06	RAN#96	R5-223860	1767	1	F	Completing 7.7.4.2 including TT analysis	17.3.0
2022-06	RAN#96	R5-223861	1795	1	F	Correction to FR2 NR SA BFD TCs	17.3.0
2022-06	RAN#96	R5-223862	1831	1	F	Correction of RRM test case 7.7.1.1	17.3.0
2022-06	RAN#96	R5-223863	1768	1	F	Annex F for L1-RSRP meas accuracy test cases	17.3.0
2022-06	RAN#96	R5-223864	1788	1	F	Alignment of RMC note for DRX test cases	17.3.0
2022-06	RAN#96	R5-223870	1785	2	F	Corrections to 4.5.5.2	17.3.0
2022-06	RAN#96	R5-223874	1759	1	F	Correction to Active UL BWP-2 Configuration in 4.5.6.1.1 and 6.5.6.1.2	17.3.0
2022-06	RAN#96	R5-223878	1832	1	F	Correction of UL switching test case 6.5.7.1 including Test Tolerance	17.3.0
2022-06	RAN#96	R5-223879	1833	1	F	Correction of UL switching test case 6.5.7.2 including Test Tolerance	17.3.0
2022-06	RAN#96	R5-223880	1805	1	F	Addition of eMIMO test case 6.5.5.5	17.3.0
2022-06	RAN#96	R5-223881	1806	1	F	Addition of eMIMO test case 6.5.5.6	17.3.0
2022-06	RAN#96	R5-223882	1828	1	F	Addition of 7.6.6.2 NR SA FR2 L1-SINR measurement including Test Tolerance	17.3.0
2022-06	RAN#96	R5-223886	1789	1	F	Update to FR1 Scell activation and deactivation test cases	17.3.0
2022-07	RAN#96	R5-223615	1763	1	F	addition of missing changes from R5-223615 in Tables 5.7.4.1.5-2, /-3, /-4	17.3.1
2022-09	RAN#97	R5-223926	1838	-	F	Update to 2-step RACH RRM TC 7.3.2.2.4-FR2 non-contention based random access	17.4.0
2022-09	RAN#97	R5-223965	1841	-	F	Complete 5.7.1.3 including TT analysis results	17.4.0
2022-09	RAN#97	R5-223966	1842	-	F	Complete 7.7.1.3 including TT analysis results	17.4.0
2022-09	RAN#97	R5-223977	1844	-	F	Complete TC 4.3.2.2.3 including TT analysis results	17.4.0
2022-09	RAN#97	R5-223978	1845	-	F	Complete TC 4.3.2.2.4 including TT analysis results	17.4.0
2022-09	RAN#97	R5-223981	1848	-	F	Annexes for 2-step RACH test cases	17.4.0
2022-09	RAN#97	R5-224006	1851	-	F	Update of SA FR1 TC 6.3.2.1.1 and 6.3.2.1.2	17.4.0
2022-09	RAN#97	R5-224182	1854	-	F	Addition of new test case 4.7.7.1.2 EN-DC FR1 CSI-RS based CMR and no dedicated IMR configured and CSI-RS resource set with repetition off L1-SINR relative measurement accuracy	17.4.0
2022-09	RAN#97	R5-224186	1858	-	F	Addition of new test case 4.7.7.3.2 EN-DC FR1 CSI-RS based CMR and dedicated IMR L1-SINR relative measurement accuracy	17.4.0

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2022-09	RAN#97	R5-224468	1866	-	F	Corrections to 5.6.1.3 and 5.6.1.4	17.4.0
2022-09	RAN#97	R5-224469	1867	-	F	Corrections to 5.5.5.1	17.4.0
2022-09	RAN#97	R5-224470	1868	-	F	Corrections to 5.5.5.2	17.4.0
2022-09	RAN#97	R5-224471	1869	-	F	Corrections to 5.5.5.3	17.4.0
2022-09	RAN#97	R5-224472	1870	-	F	Corrections for BFD LR test cases	17.4.0
2022-09	RAN#97	R5-224474	1872	-	F	Core spec alignment 6.7.x.1 test cases	17.4.0
2022-09	RAN#97	R5-224476	1874	-	F	Correction to CSI-RS.3.2 TDD	17.4.0
2022-09	RAN#97	R5-224501	1877	-	F	Correction to Mob_enh RRM TCs 7.3.1.X - FR2 DAPS HO	17.4.0
2022-09	RAN#97	R5-224505	1878	-	F	Correction to minimum requirements in 9.1.1.0 - SL Tx timing error	17.4.0
2022-09	RAN#97	R5-224506	1879	-	F	Correction to NR SL RRM TC 9.1.1.1 - GNSS with TT	17.4.0
2022-09	RAN#97	R5-224507	1880	-	F	Correction to NR SL RRM TC 9.1.1.2 - SyncRef UE with TT	17.4.0
2022-09	RAN#97	R5-224508	1881	-	F	Correction to NR SL RRM TC 9.1.1.3 - gNB with TT	17.4.0
2022-09	RAN#97	R5-224509	1882	-	F	Correction to NR SL RRM TC 9.1.2.1 - S-SSB Tx gNB with TT	17.4.0
2022-09	RAN#97	R5-224510	1883	-	F	Correction to NR SL RRM TC 9.1.2.2 - S-SSB Tx SyncRef UE with TT	17.4.0
2022-09	RAN#97	R5-224511	1884	-	F	Correction to minimum requirements in 9.1.3.0 - SyncRef reselection	17.4.0
2022-09	RAN#97	R5-224512	1885	-	F	Correction to NR SL RRM TC 9.1.3.1 - GNSS highest priority with TT	17.4.0
2022-09	RAN#97	R5-224514	1887	-	F	Correction to NR SL RRM TC 9.1.4.1 - resource selection with TT	17.4.0
2022-09	RAN#97	R5-224515	1888	-	F	Correction to NR SL RRM TC 9.1.4.2 - resource pre-emption with TT	17.4.0
2022-09	RAN#97	R5-224517	1890	-	F	Correction to NR SL RRM TC 9.1.5.1 - CBR concurrent with TT	17.4.0
2022-09	RAN#97	R5-224518	1891	-	F	Correction to NR SL RRM TC 9.1.5.2 - CBR PC5 only with TT	17.4.0
2022-09	RAN#97	R5-224519	1892	-	F	Correction to NR SL RRM TC 9.1.6.1 - WAN interruption with TT	17.4.0
2022-09	RAN#97	R5-224546	1903	-	F	Correction to NR HST RRM TC 6.1.1.7 - intra-freq reselection	17.4.0
2022-09	RAN#97	R5-224553	1910	-	F	Correction to NR HST RRM TC 8.2.1.2 - intra-RAT reselection	17.4.0
2022-09	RAN#97	R5-224635	1912	-	F	Correction to condition DRX.7 in H.3.7	17.4.0
2022-09	RAN#97	R5-224637	1914	-	F	Correction to test requirement for SFTD measurement accuracy	17.4.0
2022-09	RAN#97	R5-224645	1915	-	F	Correction to measurement delay in 4.6.4.5	17.4.0
2022-09	RAN#97	R5-224646	1916	-	F	Correction to RMSI CORESET Reference Measurement Channels in A.1.2	17.4.0
2022-09	RAN#97	R5-224647	1917	-	F	Correction to SS-SINR condition in 5.7.3.x	17.4.0
2022-09	RAN#97	R5-224648	1918	-	F	Correction to Starting PRB index for ULBWP.1.3 in A.8.2	17.4.0
2022-09	RAN#97	R5-224768	1921	-	F	Addition of minimum requirement for L1-SINR measurement in 5.7.6.0	17.4.0
2022-09	RAN#97	R5-224801	1926	-	F	Update to FR2 L1-RSRP measurement test cases 5.6.3.x	17.4.0
2022-09	RAN#97	R5-224804	1928	-	F	Test Tolerances and test case introduction for FR2 RLM test cases 7.5.1.x	17.4.0

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2022-09	RAN#97	R5-225145	1935	-	F	Correction of the measurement accuracy test cases in Annex F	17.4.0
2022-09	RAN#97	R5-225146	1936	-	F	Correction of UL switching test case 6.5.7.1 including Test Tolerance	17.4.0
2022-09	RAN#97	R5-225147	1937	-	F	Correction of UL switching test case 6.5.7.2 including Test Tolerance	17.4.0
2022-09	RAN#97	R5-225148	1938	-	F	Addition of Test Tolerance for UL switching test cases in Annex F of TS 38.533	17.4.0
2022-09	RAN#97	R5-225149	1939	-	F	Correction of SA FR2-FR2 SS-RSRP measurement accuracy test case 7.7.1.2 including Test Tolerance	17.4.0
2022-09	RAN#97	R5-225152	1942	-	F	Correction of NR SA FR1 SA Idle mode CA/DC measurement for FR1 test case 6.6.9.1	17.4.0
2022-09	RAN#97	R5-225153	1943	-	F	Correction of Idle Mode inter-RAT CA/DC Measurements test case 6.6.15.1	17.4.0
2022-09	RAN#97	R5-225154	1944	-	F	Addition of E-UTRA - NR FR1 Early Measurement Reporting 8.2.2.1 test case	17.4.0
2022-09	RAN#97	R5-225213	1946	-	F	Update on number of HARQ processes for FDD RRM test cases	17.4.0
2022-09	RAN#97	R5-225230	1952	-	F	Update 6.1.1.3 test procedure	17.4.0
2022-09	RAN#97	R5-225617	1839	1	F	Correction to EN-DC FR2 RLM tests for PSCell configured with CSI-RS-based RLM RS in DRX including TT	17.4.0
2022-09	RAN#97	R5-225622	1859	1	F	Addition of new test case 6.7.9.3.2 NR SA FR1 CSI-RS based CMR and dedicated IMR L1-SINR relative measurement accuracy	17.4.0
2022-09	RAN#97	R5-225623	1861	1	F	Completion 7.7.6.2 including TT analysis results	17.4.0
2022-09	RAN#97	R5-225624	1862	1	F	Completion 7.7.6.3 including TT analysis results	17.4.0
2022-09	RAN#97	R5-225628	1846	1	F	Complete TC 6.3.2.2.3 including TT analysis results	17.4.0
2022-09	RAN#97	R5-225629	1847	1	F	Complete TC 6.3.2.2.4 including TT analysis results	17.4.0
2022-09	RAN#97	R5-225630	1927	1	F	Test Tolerances for FR2 RLM test cases 5.5.1.x	17.4.0
2022-09	RAN#97	R5-225631	1933	1	F	Correction of ENDC FR2 SSB based L1-RSRP measurement accuracy test case 5.7.4.1 including Test Tolerance	17.4.0
2022-09	RAN#97	R5-225632	1934	1	F	Correction of ENDC FR2 CSI-RS based L1-RSRP measurement accuracy test case 5.7.4.2 including Test Tolerance	17.4.0
2022-09	RAN#97	R5-225633	1940	1	F	Correction of SA FR2 SSB based L1-RSRP measurement accuracy test case 7.7.4.1 including Test Tolerance	17.4.0
2022-09	RAN#97	R5-225634	1941	1	F	Correction of SA FR2 CSI-RS based L1-RSRP measurement accuracy test case 7.7.4.2 including Test Tolerance	17.4.0
2022-09	RAN#97	R5-225635	1843	1	F	Annex F for 5.7.1.3 and 7.7.1.3	17.4.0
2022-09	RAN#97	R5-225690	1853	1	F	Completion 4.7.7.1.1 and 6.7.9.1.1 including TT analysis results	17.4.0
2022-09	RAN#97	R5-225691	1855	1	F	Addition of new test case 6.7.9.1.2 NR SA FR1 CSI-RS based CMR and no dedicated IMR configured and CSI-RS resource set with repetition off L1-SINR relative measurement accuracy	17.4.0
2022-09	RAN#97	R5-225692	1856	1	F	Completion 4.7.7.2 and 6.7.9.2 including TT analysis results	17.4.0
2022-09	RAN#97	R5-225693	1857	1	F	Completion 4.7.7.3.1 and 6.7.9.3.1 including TT analysis results	17.4.0
2022-09	RAN#97	R5-225725	1955	1	F	Update to Annex E and F for eMIMO test cases	17.4.0
2022-09	RAN#97	R5-225748	1945	1	F	Addition of E-UTRA - NR FR2 Early Measurement Reporting 8.2.2.2 test case	17.4.0

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2022-09	RAN#97	R5-225815	1863	1	F	Correction on test applicability of HST TCs	17.4.0
2022-09	RAN#97	R5-225816	1864	1	F	Correction message contents 4.6.4.3 and 4.6.4.4	17.4.0
2022-09	RAN#97	R5-225817	1947	1	F	Clarification on SFTD delay in 4.7.5.1	17.4.0
2022-09	RAN#97	R5-225818	1931	1	F	Correction of ENDC FR2 SS-RSRP measurement accuracy test case 5.7.1.1	17.4.0
2022-09	RAN#97	R5-225819	1949	1	F	Updates on 5.7.4.1 test procedure and test requirements	17.4.0
2022-09	RAN#97	R5-225820	1951	1	F	Updates on 5.7.4.2 test procedure and test requirements	17.4.0
2022-09	RAN#97	R5-225821	1871	1	F	Correction message contents 6.6.4.3 and 6.6.4.4	17.4.0
2022-09	RAN#97	R5-225822	1930	1	F	Editorial correction to 5G RRM test case 7.6.1.x	17.4.0
2022-09	RAN#97	R5-225823	1948	1	F	Clarification on SFTD delay in 8.5.1.1	17.4.0
2022-09	RAN#97	R5-225824	1950	1	F	Corrections to Interruptions at SCell addition/release RRM tests	17.4.0
2022-09	RAN#97	R5-225846	1860	1	F	Completion 7.7.6.1 including TT analysis results	17.4.0
2022-09	RAN#97	R5-225847	1922	1	F	Addition of new test case 5.7.6.1 EN-DC FR2 L1-SINR measurement	17.4.0
2022-09	RAN#97	R5-225848	1923	1	F	Addition of new test case 5.7.6.2 EN-DC FR2 L1-SINR measurement	17.4.0
2022-09	RAN#97	R5-225849	1924	1	F	Addition of new test case 5.7.6.3 EN-DC FR2 L1-SINR measurement	17.4.0
2022-09	RAN#97	R5-225850	1932	1	F	Correction of ENDC FR2-FR2 SS-RSRP measurement accuracy test case 5.7.1.2 including Test Tolerance	17.4.0
2022-09	RAN#97	R5-225851	1886	1	F	Correction to NR SL RRM TC 9.1.3.2 - Cell highest priority with TT	17.4.0
2022-09	RAN#97	R5-225852	1889	1	F	Correction to NR SL RRM TC 9.1.4.3 - resource re-evaluation with TT	17.4.0
2022-09	RAN#97	R5-225853	1893	1	F	Correction to Annex F for NR SL RRM TCs	17.4.0
2022-09	RAN#97	R5-225855	1894	1	F	Correction to NR PS RRM TC 7.1.1.3 - intra-freq reselection low mobility with TT	17.4.0
2022-09	RAN#97	R5-225856	1895	1	F	Correction to NR PS RRM TC 7.1.1.4 - intra-freq reselection not-at-cell-edge with TT	17.4.0
2022-09	RAN#97	R5-225857	1896	1	F	Correction to NR PS RRM TC 7.1.1.5 - inter-freq reselection low mobility with TT	17.4.0
2022-09	RAN#97	R5-225858	1897	1	F	Correction to NR PS RRM TC 7.1.1.6 - inter-freq reselection not-at-cell-edge with TT	17.4.0
2022-09	RAN#97	R5-225859	1898	1	F	Correction to Annex F for NR PS RRM TCs	17.4.0
2022-09	RAN#97	R5-225864	1908	1	F	Correction to NR SA FR2 RRM TC 7.1.1.1 - intra-freq reselection with TT	17.4.0
2022-09	RAN#97	R5-225865	1909	1	F	Correction to NR SA FR2 RRM TC 7.1.1.2 - inter-freq reselection with TT	17.4.0
2022-09	RAN#97	R5-225866	1911	1	F	Correction to Annex F for NR RRM TCs	17.4.0
2022-09	RAN#97	R5-225871	1919	1	F	Correction to test parameters in 5.6.3.x	17.4.0
2022-09	RAN#97	R5-225872	1925	1	F	Update of eMIMO test case 6.5.5.5 and 6.5.5.6	17.4.0
2022-09	RAN#97	R5-225876	1876	1	F	Correction to Mob_enh RRM TCs 6.3.1.X - FR1 DAPS HO	17.4.0
2022-09	RAN#97	R5-225884	1899	1	F	Correction to EN-DC FR1 RRM TC 4.5.2.X - interruption	17.4.0

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2022-09	RAN#97	R5-225885	1900	1	F	Correction to EN-DC FR1 RRM TC 4.5.3.X - SCell activation	17.4.0
2022-09	RAN#97	R5-225886	1901	1	F	Correction to EN-DC FR1 RRM TC 4.5.6.1.2 - BWP switching	17.4.0
2022-09	RAN#97	R5-225887	1904	1	F	Correction to NR SA FR1 RRM TC 6.5.2.1 - interruption	17.4.0
2022-09	RAN#97	R5-225888	1905	1	F	Correction to NR SA FR1 RRM TC 6.5.3.X - SCell activation	17.4.0
2022-09	RAN#97	R5-225889	1906	1	F	Correction to NR SA FR1 RRM TC 6.5.6.1.1 - BWP switching	17.4.0
2022-12	RAN#98	R5-225962	1956	-	F	Adding NR bands n91, n92, n93 and n94 to NR band group for FR1	17.5.0
2022-12	RAN#98	R5-226113	1959	-	F	Addition of minimum requirements for RedCap RRM TCs 16.3.1.0 - FR1 HO	17.5.0
2022-12	RAN#98	R5-226114	1960	-	F	Addition of RedCap RRM TC 16.3.1.7 - inter-RAT HO 1 Rx	17.5.0
2022-12	RAN#98	R5-226116	1962	-	F	Addition of RedCap RRM TC 16.3.1.9 - inter-RAT blind HO 1 Rx	17.5.0
2022-12	RAN#98	R5-226118	1964	-	F	Addition of minimum requirements for RedCap RRM TCs 16.3.2.1.0 - FR1 Reestablish	17.5.0
2022-12	RAN#98	R5-226119	1965	-	F	Addition of RedCap RRM TC 16.3.2.1.1 - intra reestablish 1 Rx	17.5.0
2022-12	RAN#98	R5-226120	1966	-	F	Addition of RedCap RRM TC 16.3.2.1.2 - intra reestablish 2 Rx with TT	17.5.0
2022-12	RAN#98	R5-226121	1967	-	F	Addition of RedCap RRM TC 16.3.2.1.3 - inter reestablish 1 Rx	17.5.0
2022-12	RAN#98	R5-226122	1968	-	F	Addition of RedCap RRM TC 16.3.2.1.4 - inter reestablish 2 Rx with TT	17.5.0
2022-12	RAN#98	R5-226123	1969	-	F	Addition of RedCap RRM TC 16.3.2.1.5 - no timing reestablish 1 Rx	17.5.0
2022-12	RAN#98	R5-226124	1970	-	F	Addition of RedCap RRM TC 16.3.2.1.6 - no timing reestablish 2 Rx with TT	17.5.0
2022-12	RAN#98	R5-226125	1971	-	F	Addition of minimum requirements for RedCap RRM TCs 16.3.2.2.0 - RACH	17.5.0
2022-12	RAN#98	R5-226126	1972	-	F	Addition of RedCap RRM TC 16.3.2.2.1 - 4 step CBRA 1 Rx	17.5.0
2022-12	RAN#98	R5-226127	1973	-	F	Addition of RedCap RRM TC 16.3.2.2.2 - 4 step CBRA 2 Rx with TT	17.5.0
2022-12	RAN#98	R5-226128	1974	-	F	Addition of RedCap RRM TC 16.3.2.2.3 - 4 step CFRA 1 Rx	17.5.0
2022-12	RAN#98	R5-226129	1975	-	F	Addition of RedCap RRM TC 16.3.2.2.4 - 4 step CFRA 2 Rx with TT	17.5.0
2022-12	RAN#98	R5-226134	1980	-	F	Addition of minimum requirements for RedCap RRM TCs 16.3.2.3.0 - Redirection	17.5.0
2022-12	RAN#98	R5-226135	1981	-	F	Addition of RedCap RRM TC 16.3.2.3.1 - NR redirection 1 Rx	17.5.0
2022-12	RAN#98	R5-226139	1985	-	F	Addition of minimum requirements for RedCap RRM TCs 16.4.1.0 - Tx timing	17.5.0
2022-12	RAN#98	R5-226142	1988	-	F	Addition of minimum requirements for RedCap RRM TCs 16.5.1.0 - RLM	17.5.0
2022-12	RAN#98	R5-226143	1989	-	F	Addition of RedCap RRM TC 16.5.1.1 - OOS non-DRX 1 Rx	17.5.0
2022-12	RAN#98	R5-226144	1990	-	F	Addition of RedCap RRM TC 16.5.1.2 - OOS non-DRX 2 Rx with TT	17.5.0
2022-12	RAN#98	R5-226145	1991	-	F	Addition of RedCap RRM TC 16.5.1.3 - IS non-DRX 1 Rx	17.5.0
2022-12	RAN#98	R5-226146	1992	-	F	Addition of RedCap RRM TC 16.5.1.4 - IS non-DRX 2 Rx with TT	17.5.0
2022-12	RAN#98	R5-226147	1993	-	F	Addition of RedCap RRM TC 16.5.1.7 - IS DRX 1 Rx	17.5.0
2022-12	RAN#98	R5-226148	1994	-	F	Addition of RedCap RRM TC 16.5.1.8 - IS DRX 2 Rx with TT	17.5.0

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2022-12	RAN#98	R5-226149	1995	-	F	Addition of minimum requirements for RedCap RRM TCs 16.5.2.0 - BFD	17.5.0
2022-12	RAN#98	R5-226150	1996	-	F	Addition of RedCap RRM TC 16.5.2.1 - SSB BFR 1 Rx	17.5.0
2022-12	RAN#98	R5-226152	1998	-	F	Addition of minimum requirements for RedCap RRM TCs 16.6.1.0 - Intra-freq measurement	17.5.0
2022-12	RAN#98	R5-226153	1999	-	F	Addition of RedCap RRM TC 16.6.1.3 - no gap DRX 1 Rx	17.5.0
2022-12	RAN#98	R5-226154	2000	-	F	Addition of RedCap RRM TC 16.6.1.4 - no gap DRX 2 Rx with TT	17.5.0
2022-12	RAN#98	R5-226155	2001	-	F	Addition of RedCap RRM TC 16.6.1.7 - gap DRX 1 Rx	17.5.0
2022-12	RAN#98	R5-226156	2002	-	F	Addition of RedCap RRM TC 16.6.1.8 - gap DRX 2 Rx with TT	17.5.0
2022-12	RAN#98	R5-226157	2003	-	F	Addition of RedCap RRM TC 16.6.1.11 - gap non-DRX SSB index 1 Rx	17.5.0
2022-12	RAN#98	R5-226158	2004	-	F	Addition of RedCap RRM TC 16.6.1.12 - gap non-DRX SSB index 2 Rx with TT	17.5.0
2022-12	RAN#98	R5-226159	2005	-	F	Addition of minimum requirements for RedCap RRM TCs 16.6.4.0 - L1-RSRP	17.5.0
2022-12	RAN#98	R5-226160	2006	-	F	Addition of RedCap RRM TC 16.6.4.1 - L1-RSRP non-DRX 1 Rx	17.5.0
2022-12	RAN#98	R5-226162	2008	-	F	Addition of RedCap RRM TC 16.6.4.3 - L1-RSRP DRX 1 Rx	17.5.0
2022-12	RAN#98	R5-226164	2010	-	F	Addition of minimum requirements for RedCap RRM TCs 17.3.2.1.0 - Reestablish	17.5.0
2022-12	RAN#98	R5-226165	2011	-	F	Addition of RedCap RRM TC 17.3.2.1.1 - intra reestablish with TT	17.5.0
2022-12	RAN#98	R5-226166	2012	-	F	Addition of RedCap RRM TC 17.3.2.1.2 - inter reestablish with TT	17.5.0
2022-12	RAN#98	R5-226167	2013	-	F	Addition of RedCap RRM TC 17.3.2.1.3 - no timing reestablish	17.5.0
2022-12	RAN#98	R5-226168	2014	-	F	Addition of minimum requirements for RedCap RRM TCs 17.5.1.0 - RLM	17.5.0
2022-12	RAN#98	R5-226169	2015	-	F	Addition of RedCap RRM TC 17.5.1.1 - OOS non-DRX with TT	17.5.0
2022-12	RAN#98	R5-226170	2016	-	F	Addition of RedCap RRM TC 17.5.1.2 - IS non-DRX with TT	17.5.0
2022-12	RAN#98	R5-226171	2017	-	F	Addition of RedCap RRM TC 17.5.1.4 - IS DRX with TT	17.5.0
2022-12	RAN#98	R5-226172	2018	-	F	Addition of minimum requirements for RedCap RRM TCs 17.6.1.0 - Intra-freq measurement	17.5.0
2022-12	RAN#98	R5-226173	2019	-	F	Addition of RedCap RRM TC 17.6.1.1 - no gap non-DRX with TT	17.5.0
2022-12	RAN#98	R5-226174	2020	-	F	Addition of minimum requirements for RedCap RRM TCs 18.2.1.0 - L2N HO	17.5.0
2022-12	RAN#98	R5-226175	2021	-	F	Addition of RedCap RRM TC 18.2.1.1 - L2N HO with TT	17.5.0
2022-12	RAN#98	R5-226176	2022	-	F	Addition of minimum requirements for RedCap RRM TCs 18.2.2.0 - L2N redirection	17.5.0
2022-12	RAN#98	R5-226177	2023	-	F	Addition of RedCap RRM TC 18.2.2.1 - L2N redirection with TT	17.5.0
2022-12	RAN#98	R5-226178	2024	-	F	Correction to Clause 3 for RedCap RRM TCs	17.5.0
2022-12	RAN#98	R5-226180	2026	-	F	Correction to Annex B for RedCap RRM TCs	17.5.0
2022-12	RAN#98	R5-226181	2027	-	F	Correction to Annex E for RedCap RRM TCs	17.5.0
2022-12	RAN#98	R5-226183	2029	-	F	Correction to Annex G for RedCap RRM TCs	17.5.0
2022-12	RAN#98	R5-226207	2030	-	F	Correction to NR RRM TCs 4.5.2.X and 6.5.2.X - interruption	17.5.0

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2022-12	RAN#98	R5-226208	2031	-	F	Correction to NR RRM TCs 4.5.3.X and 6.5.3.X - SCell activation	17.5.0
2022-12	RAN#98	R5-226209	2032	-	F	Correction to NR RRM TCs 4.5.6.1.2 and 6.5.6.1.1 - BWP switching	17.5.0
2022-12	RAN#98	R5-226212	2035	-	F	Correction to cell mapping for RRM TC 6.3.2.3.1 - redirection	17.5.0
2022-12	RAN#98	R5-226233	2039	-	F	Correction of Inter-RAT TC 8.2.1.1	17.5.0
2022-12	RAN#98	R5-226374	2041	-	F	Correction to FR2 RRC-based DL active BWP switch	17.5.0
2022-12	RAN#98	R5-226497	2044	-	F	Corrections to 4.6.4.4	17.5.0
2022-12	RAN#98	R5-226501	2048	-	F	Corrections to 5.6.3.3	17.5.0
2022-12	RAN#98	R5-226502	2049	-	F	Corrections to 6.6.4.1	17.5.0
2022-12	RAN#98	R5-226503	2050	-	F	Corrections to 6.6.4.2	17.5.0
2022-12	RAN#98	R5-226504	2051	-	F	Corrections to 6.6.4.3	17.5.0
2022-12	RAN#98	R5-226505	2052	-	F	Corrections to 6.6.4.4	17.5.0
2022-12	RAN#98	R5-226506	2053	-	F	Corrections to 6.5.5.3	17.5.0
2022-12	RAN#98	R5-226507	2054	-	F	Corrections to 6.5.5.4	17.5.0
2022-12	RAN#98	R5-226508	2055	-	F	Corrections to 6.5.6.2.1	17.5.0
2022-12	RAN#98	R5-226509	2056	-	F	Corrections to 8.4.2.9	17.5.0
2022-12	RAN#98	R5-226510	2057	-	F	Corrections to 8.2.1.1	17.5.0
2022-12	RAN#98	R5-226511	2058	-	F	Corrections to 8.2.1.2	17.5.0
2022-12	RAN#98	R5-226516	2060	-	F	Update to RRM TC 4A.1.1.1	17.5.0
2022-12	RAN#98	R5-226647	2063	-	F	Update to test case 6.6.3.1 and 6.6.3.2	17.5.0
2022-12	RAN#98	R5-226649	2065	-	F	Addition of test case 7.4.3.1	17.5.0
2022-12	RAN#98	R5-226650	2066	-	F	Addition of test case 7.5.2.1	17.5.0
2022-12	RAN#98	R5-226652	2067	-	F	Addition of test 7.3.1.1, 7.3.1.2, 7.3.1.3	17.5.0
2022-12	RAN#98	R5-226653	2068	-	F	Update to tests 5.5.2.3 and 5.5.2.4	17.5.0
2022-12	RAN#98	R5-226698	2076	-	F	Update on the delta(Max-Min) rules for 5.7.1.1	17.5.0
2022-12	RAN#98	R5-226699	2077	-	F	Update on the delta(Max-Min) rules for 5.7.1.2	17.5.0
2022-12	RAN#98	R5-226775	2078	-	F	Addition of CCA model, RMC into Annex for NR-U	17.5.0
2022-12	RAN#98	R5-227003	2085	-	F	Update on the delta(Max-Min) rules for 7.7.1.1	17.5.0
2022-12	RAN#98	R5-227004	2086	-	F	Update on the delta(Max-Min) rules for 7.7.1.2	17.5.0
2022-12	RAN#98	R5-227005	2087	-	F	Corrections to 7.5.1.1	17.5.0
2022-12	RAN#98	R5-227006	2088	-	F	Corrections to 7.5.1.2	17.5.0
2022-12	RAN#98	R5-227007	2089	-	F	Corrections to 7.5.1.3	17.5.0
2022-12	RAN#98	R5-227008	2090	-	F	Corrections to 7.5.1.4	17.5.0
2022-12	RAN#98	R5-227096	2094	-	F	Correction to RadioLinkMonitoringConfig	17.5.0
2022-12	RAN#98	R5-227097	2095	-	F	Correction to CSI-Report periodicity in procedure of 5.7.4.1	17.5.0
2022-12	RAN#98	R5-227098	2096	-	F	Correction to EUTRA PCell and NR PSCell interruption requirement in 4.5.6.1.2	17.5.0

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2022-12	RAN#98	R5-227100	2098	-	F	Correction to radioBearerConfig in RRCReconfiguration-HO	17.5.0
2022-12	RAN#98	R5-227182	2101	-	F	Correction of minimum conformance requirements for E-UTRA - NR Early Measurement Reporting test cases	17.5.0
2022-12	RAN#98	R5-227188	2105	-	F	Minimum conformance requirements for EN-DC FR1 interruptions at SRS carrier-based switching test cases	17.5.0
2022-12	RAN#98	R5-227189	2106	-	F	Addition of EN-DC FR1 interruptions at NR SRS carrier based switching test case 4.5.2.8	17.5.0
2022-12	RAN#98	R5-227190	2107	-	F	Addition of EN-DC FR1 interruptions at NR SRS carrier based switching test case 4.5.2.9	17.5.0
2022-12	RAN#98	R5-227191	2108	-	F	Minimum conformance requirements for EN-DC FR2 interruptions at SRS carrier-based switching test cases	17.5.0
2022-12	RAN#98	R5-227192	2109	-	F	Addition of EN-DC FR2 interruptions at E-UTRA SRS carrier-based switching test case 5.5.2.7	17.5.0
2022-12	RAN#98	R5-227193	2110	-	F	Addition of EN-DC FR2 interruptions at NR SRS carrier-based switching test case 5.5.2.8	17.5.0
2022-12	RAN#98	R5-227194	2111	-	F	Minimum conformance requirements for SA FR1 interruptions at SRS carrier-based switching test cases	17.5.0
2022-12	RAN#98	R5-227196	2113	-	F	Minimum conformance requirements for Inter-frequency measurement without measurement gaps	17.5.0
2022-12	RAN#98	R5-227197	2114	-	F	Addition of SA event triggered reporting with additional mandatory gap pattern test case 6.6.2.9	17.5.0
2022-12	RAN#98	R5-227198	2115	-	F	Addition of SA FR1 event triggered reporting without gap when DRX is used test case 6.6.2.10	17.5.0
2022-12	RAN#98	R5-227199	2116	-	F	Addition of SA event triggered reporting tests for FR1 without gap when DRX is not used test case 6.6.2.11	17.5.0
2022-12	RAN#98	R5-227207	2123	-	F	Correction of minimum conformance requirements for intra-freq measurement cases	17.5.0
2022-12	RAN#98	R5-227211	2127	-	F	Addition of NR SA FR1 Cell reselection RedCap test case 16.1.1.2	17.5.0
2022-12	RAN#98	R5-227212	2128	-	F	Addition of NR SA FR1 Cell reselection RedCap test case 16.1.1.3	17.5.0
2022-12	RAN#98	R5-227213	2129	-	F	Addition of NR SA FR1 Cell reselection RedCap test case 16.1.1.4	17.5.0
2022-12	RAN#98	R5-227214	2130	-	F	Addition of NR SA FR1 Cell reselection RedCap test case 16.1.1.5	17.5.0
2022-12	RAN#98	R5-227215	2131	-	F	Addition of NR SA FR1 Cell reselection RedCap test case 16.1.1.6	17.5.0
2022-12	RAN#98	R5-227216	2132	-	F	Addition of NR SA FR1 Cell reselection RedCap test case 16.1.1.7	17.5.0
2022-12	RAN#98	R5-227217	2133	-	F	Addition of NR SA FR1 Cell reselection RedCap test case 16.1.1.8	17.5.0
2022-12	RAN#98	R5-227335	2138	-	F	Correction in 6.1.1.4 test case	17.5.0
2022-12	RAN#98	R5-227337	2139	-	F	Correction in 6.1.2.4 test case	17.5.0
2022-12	RAN#98	R5-227340	2142	-	F	Correction on MU definition for BWP switch test cases	17.5.0
2022-12	RAN#98	R5-227342	2144	-	F	Updates to L1-RSRP NSA FR1 test cases	17.5.0
2022-12	RAN#98	R5-227347	2147	-	F	Updates to L1-RSRP SA FR2 test cases	17.5.0
2022-12	RAN#98	R5-227990	2135	1	F	Updates to CLI Measurement test case 5.6.4.1, 5.7.5.1, 7.6.4.1 and 7.7.5.1	17.5.0
2022-12	RAN#98	R5-227643	1957	2	F	Update of EN-DC FR1 TC 4.5.7.1	17.5.0
2022-12	RAN#98	R5-226817	2079	-	F	Update of RRM Test Case 5.5.3.1 EN-DC FR2 SCell activation and	17.5.0

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						deactivation intra-band in non-DRX	
2022-12	RAN#98	R5-227645	2093	1	F	Correction to FR2 NSA RLM test cases	17.5.0
2022-12	RAN#98	R5-227817	2071	1	F	Editorial update to RACH tests	17.5.0
2022-12	RAN#98	R5-227827	2025	1	F	Correction to Annex A for RedCap RRM TCs	17.5.0
2022-12	RAN#98	R5-227828	2126	1	F	Addition of NR SA FR1 Cell reselection RedCap test case 16.1.1.1	17.5.0
2022-12	RAN#98	R5-227829	2134	1	F	Addition of NR - E-UTRA cell re-selection test cases for RedCap	17.5.0
2022-12	RAN#98	R5-227830	2112	1	F	Addition of NR FR1 interruptions at SRS carrier-based switching test case 6.5.2.2	17.5.0
2022-12	RAN#98	R5-227831	2080	1	F	Modification of description of tables of test requirement for EN-DC FR2 eMIMO measurement	17.5.0
2022-12	RAN#98	R5-227832	2082	1	F	Modification of description of tables of test requirement for NR SA FR2 eMIMO measurement	17.5.0
2022-12	RAN#98	R5-227833	2059	1	F	Corrections to 6.1.2.5	17.5.0
2022-12	RAN#98	R5-227834	2141	1	F	Update on priority cell configuration in 8.2.1.2	17.5.0
2022-12	RAN#98	R5-227835	2061	1	F	Update to RRM TC 4A.1.2	17.5.0
2022-12	RAN#98	R5-227836	2062	1	F	Update to RRM TC 4A.2.1	17.5.0
2022-12	RAN#98	R5-227837	2081	1	F	Modification of description of tables of test requirement for EN-DC FR2 L1-RSRP measurement	17.5.0
2022-12	RAN#98	R5-227838	2083	1	F	Modification of description of tables of test requirement for NR SA FR2 L1-RSRP measurement	17.5.0
2022-12	RAN#98	R5-227839	2092	1	F	Correction to FR2 NSA BFR test cases	17.5.0
2022-12	RAN#98	R5-227844	2104	1	F	Addition of CADC enhancement test cases to Annex E and F including Test Tolerance	17.5.0
2022-12	RAN#98	R5-227845	2028	1	F	Correction to Annex F for RedCap RRM TCs	17.5.0
2022-12	RAN#98	R5-227861	2117	1	F	Correction of minimum conformance requirements for intra-freq measurement cases to include HST_enh	17.5.0
2022-12	RAN#98	R5-227862	2118	1	F	Addition of EN-DC FR1 intra-freq measurement HST_enh test case 4.6.1.8	17.5.0
2022-12	RAN#98	R5-227863	2119	1	F	Correction of minimum conformance requirements for inter-freq measurement cases to include HST_enh	17.5.0
2022-12	RAN#98	R5-227864	2120	1	F	Addition of EN-DC FR1 inter-freq measurement HST_enh test case 4.6.2.9	17.5.0
2022-12	RAN#98	R5-227865	2121	1	F	Correction of minimum conformance requirements for NR SA reselection cases	17.5.0
2022-12	RAN#98	R5-227866	2122	1	F	Addition of EN-DC FR1 Cell reselection in HST scenario test case 6.1.1.8	17.5.0
2022-12	RAN#98	R5-227867	2124	1	F	Addition of SA FR1 intra-freq measurement HST_enh test case 6.6.1.8	17.5.0
2022-12	RAN#98	R5-227868	2125	1	F	Addition of SA FR1 intra-freq measurement HST_enh test case 6.6.2.12	17.5.0
2022-12	RAN#98	R5-227977	2099	1	F	Correction of NR SA FR1 Idle mode CA/DC measurement for FR1 test case 6.6.9.1 including Test Tolerance	17.5.0
2022-12	RAN#98	R5-227978	2100	1	F	Correction of Idle Mode inter-RAT CA/DC Measurements test case 6.6.15.1 including Test Tolerance	17.5.0

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2022-12	RAN#98	R5-227979	2102	1	F	Correction of E-UTRA - NR FR1 Early Measurement Reporting 8.2.2.1 test case including Test Tolerance	17.5.0
2022-12	RAN#98	R5-227980	2103	1	F	Correction of E-UTRA - NR FR2 Early Measurement Reporting 8.2.2.2 test case including Test Tolerance	17.5.0
2022-12	RAN#98	R5-227992	2073	1	F	Addition of BFD and Link recovery test cases for NR-U	17.5.0
2022-12	RAN#98	R5-227993	2136	1	F	Addition of EN-DC FR1 RLM test cases under CCA configuration	17.5.0
2022-12	RAN#98	R5-227994	2072	1	F	Update to L1-RSRP measurement accuracy test cases	17.5.0
2022-12	RAN#98	R5-227995	2038	1	F	Correction of SA FR1 TC 6.3.2.2.1	17.5.0
2022-12	RAN#98	R5-227996	2064	1	F	Addition of test case 7.4.1.1	17.5.0
2022-12	RAN#98	R5-227998	2069	1	F	Update to tests 4.5.3.1 and 6.5.3.1	17.5.0
2022-12	RAN#98	R5-227999	2137	1	F	Update on message content for 5.6.1.1 and 5.6.1.3	17.5.0
2022-12	RAN#98	R5-228000	2143	1	F	Corrections to EN-DC FR2 radio link monitoring TCs 5.5.1.1, 5.1.2, 5.5.1.3 and 5.5.1.4	17.5.0
2022-12	RAN#98	R5-228001	2036	1	F	Correction to Mob_enh RRM TCs 6.3.1.x and 7.3.1.x - DAPS HO	17.5.0
2022-12	RAN#98	R5-228002	2070	1	F	Update to CSI-RS RRM tables	17.5.0
2022-12	RAN#98	R5-228003	1958	1	F	Update of SA FR2 TC 7.5.7.1	17.5.0
2022-12	RAN#98	R5-228004	2033	1	F	Correction to NR RRM TCs 4.6.4.X and 6.6.4.X - CSI-RS based L1-RSRP	17.5.0
2022-12	RAN#98	R5-228013	1961	1	F	Addition of RedCap RRM TC 16.3.1.8 - inter-RAT HO 2 Rx with TT	17.5.0
2022-12	RAN#98	R5-228014	1963	1	F	Addition of RedCap RRM TC 16.3.1.10 - inter-RAT blind HO 2 Rx with TT	17.5.0
2022-12	RAN#98	R5-228015	1976	1	F	Addition of RedCap RRM TC 16.3.2.2.5 - 2 step CBRA 1 Rx	17.5.0
2022-12	RAN#98	R5-228016	1977	1	F	Addition of RedCap RRM TC 16.3.2.2.6 - 2 step CBRA 2 Rx with TT	17.5.0
2022-12	RAN#98	R5-228017	1978	1	F	Addition of RedCap RRM TC 16.3.2.2.7 - 2 step CFRA 1 Rx	17.5.0
2022-12	RAN#98	R5-228018	1979	1	F	Addition of RedCap RRM TC 16.3.2.2.8 - 2 step CFRA 2 Rx with TT	17.5.0
2022-12	RAN#98	R5-228019	1982	1	F	Addition of RedCap RRM TC 16.3.2.3.2 - NR redirection 2 Rx with TT	17.5.0
2022-12	RAN#98	R5-228020	1983	1	F	Addition of RedCap RRM TC 16.3.2.3.3 - LTE redirection 1 Rx	17.5.0
2022-12	RAN#98	R5-228021	1984	1	F	Addition of RedCap RRM TC 16.3.2.3.4 - LTE redirection 2 Rx with TT	17.5.0
2022-12	RAN#98	R5-228022	1986	1	F	Addition of RedCap RRM TC 16.4.1.1 - Tx timing 1 Rx with TT	17.5.0
2022-12	RAN#98	R5-228023	1987	1	F	Addition of RedCap RRM TC 16.4.1.2 - Tx timing 2 Rx with TT	17.5.0
2022-12	RAN#98	R5-228024	1997	1	F	Addition of RedCap RRM TC 16.5.2.2 - SSB BFR 2 Rx with TT	17.5.0
2022-12	RAN#98	R5-228025	2007	1	F	Addition of RedCap RRM TC 16.6.4.2 - L1-RSRP non-DRX 2 Rx with TT	17.5.0
2022-12	RAN#98	R5-228026	2009	1	F	Addition of RedCap RRM TC 16.6.4.4 - L1-RSRP DRX 2 Rx with TT	17.5.0
2022-12	RAN#98	R5-228027	2140	1	F	Corrections to SA FR1 SCell activation and deactivation delay TCs 6.5.3.1, 6.5.3.2 and 6.5.3.3	17.5.0
2022-12	RAN#98	R5-228028	2146	1	F	Updates to L1-RSRP SA FR1 test cases	17.5.0
2022-12	RAN#98	R5-228029	2145	1	F	Updates to L1-RSRP NSA FR2 test cases	17.5.0

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2023-03	RAN#99	R5-230045	2148	-	F	Addition of minimum requirements for FR1 6.6.18.0 - concurrent gaps	17.6.0
2023-03	RAN#99	R5-230046	2149	-	F	Addition of test case 6.6.18.1 - non-overlapping scenario	17.6.0
2023-03	RAN#99	R5-230047	2150	-	F	Correction to table E.4-1 for concurrent gap TCs.	17.6.0
2023-03	RAN#99	R5-230076	2151	-	F	Adding NR bands n100, n101 to NR band group for FR1	17.6.0
2023-03	RAN#99	R5-230185	2154	-	F	Addition of test case 6.6.18.2 - partial-overlapping scenario	17.6.0
2023-03	RAN#99	R5-230431	2161	-	F	Update of NR Inter-RAT event triggered reporting tests for FR2 test cases 8.4.2.5 including Test tolerance	17.6.0
2023-03	RAN#99	R5-230433	2162	-	F	Update of NR Inter-RAT event triggered reporting tests for FR2 test cases including Test Tolerance	17.6.0
2023-03	RAN#99	R5-230459	2170	-	F	Addition of RedCap RRM TC 16.3.1.1 - intra known HO 1Rx	17.6.0
2023-03	RAN#99	R5-230465	2176	-	F	Addition of RedCap RRM TC 16.4.3.1 - TA accuracy 1Rx with TT	17.6.0
2023-03	RAN#99	R5-230466	2177	-	F	Addition of RedCap RRM TC 16.4.3.2 - TA accuracy 2Rx with TT	17.6.0
2023-03	RAN#99	R5-230467	2178	-	F	Addition of RedCap RRM TC 16.5.1.9 - OOS non-DRX 1Rx	17.6.0
2023-03	RAN#99	R5-230470	2181	-	F	Addition of RedCap RRM TC 16.5.1.12 - IS non-DRX 2Rx with TT	17.6.0
2023-03	RAN#99	R5-230471	2182	-	F	Addition of RedCap RRM TC 16.5.1.13 - OOS DRX 1Rx	17.6.0
2023-03	RAN#99	R5-230474	2185	-	F	Addition of RedCap RRM TC 16.5.1.16 - IS DRX 2Rx with TT	17.6.0
2023-03	RAN#99	R5-230475	2186	-	F	Addition of RedCap RRM TC 16.5.2.5 - BFR non-DRX 1Rx	17.6.0
2023-03	RAN#99	R5-230476	2187	-	F	Addition of RedCap RRM TC 16.5.2.6 - BFR non-DRX 2Rx with TT	17.6.0
2023-03	RAN#99	R5-230477	2188	-	F	Addition of RedCap RRM TC 16.5.2.7 - BFR DRX 1Rx	17.6.0
2023-03	RAN#99	R5-230478	2189	-	F	Addition of RedCap RRM TC 16.5.2.8 - BFR DRX 2Rx with TT	17.6.0
2023-03	RAN#99	R5-230483	2194	-	F	Addition of RedCap RRM TC 16.6.1.5 - intra gap based non-DRX 1Rx	17.6.0
2023-03	RAN#99	R5-230484	2195	-	F	Addition of RedCap RRM TC 16.6.1.6 - intra gap based non-DRX 2Rx with TT	17.6.0
2023-03	RAN#99	R5-230487	2198	-	F	Addition of RedCap RRM TC 16.6.4.5 - CSI-RS L1-RSRP 1Rx	17.6.0
2023-03	RAN#99	R5-230488	2199	-	F	Addition of RedCap RRM TC 16.6.4.6 - CSI-RS L1-RSRP 2Rx with TT	17.6.0
2023-03	RAN#99	R5-230489	2200	-	F	Addition of RedCap RRM TC 16.6.4.7 - CSI-RS L1-RSRP DRX 1Rx	17.6.0
2023-03	RAN#99	R5-230491	2202	-	F	Addition of RedCap RRM TC 17.3.2.2.1 - 4-step CBRA	17.6.0
2023-03	RAN#99	R5-230492	2203	-	F	Addition of RedCap RRM TC 17.3.2.2.2 - 4-step CFRA	17.6.0
2023-03	RAN#99	R5-230493	2204	-	F	Addition of RedCap RRM TC 17.3.2.2.3 - 2-step CBRA	17.6.0
2023-03	RAN#99	R5-230494	2205	-	F	Addition of RedCap RRM TC 17.3.2.2.4 - 2-step CFRA	17.6.0
2023-03	RAN#99	R5-230495	2206	-	F	Addition of RedCap RRM TC 17.5.1.9 - RLM scheduling restriction	17.6.0
2023-03	RAN#99	R5-230499	2210	-	F	Addition of RedCap RRM TC 17.6.1.3 - intra gap-based non-DRX	17.6.0
2023-03	RAN#99	R5-230500	2211	-	F	Addition of RedCap RRM TC 17.6.1.4 - intra gap-based DRX	17.6.0
2023-03	RAN#99	R5-230502	2213	-	F	Addition of RedCap RRM TC 17.6.3.2 - SSB L1-RSRP DRX	17.6.0
2023-03	RAN#99	R5-230503	2214	-	F	Addition of RedCap RRM TC 17.6.3.3 - CSI-RS L1-RSRP non-DRX	17.6.0
2023-03	RAN#99	R5-230504	2215	-	F	Addition of RedCap RRM TC 17.6.3.4 - CSI-RS L1-RSRP DRX	17.6.0

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2023-03	RAN#99	R5-230505	2216	-	F	Addition of RedCap RRM TC 18.3.1.1 - FR1 NR meas no-DRX with TT	17.6.0
2023-03	RAN#99	R5-230506	2217	-	F	Addition of RedCap RRM TC 18.3.1.2 - FR1 NR meas DRX with TT	17.6.0
2023-03	RAN#99	R5-230507	2218	-	F	Addition of RedCap RRM TC 18.3.1.3 - FR1 NR meas no-DRX SBI with TT	17.6.0
2023-03	RAN#99	R5-230508	2219	-	F	Addition of RedCap RRM TC 18.3.1.4 - FR1 NR meas DRX SBI with TT	17.6.0
2023-03	RAN#99	R5-230509	2220	-	F	Addition of RedCap RRM TC 18.3.1.5 - FR2 NR meas no-DRX	17.6.0
2023-03	RAN#99	R5-230510	2221	-	F	Addition of RedCap RRM TC 18.3.1.6 - FR2 NR meas DRX	17.6.0
2023-03	RAN#99	R5-230511	2222	-	F	Addition of RedCap RRM TC 18.3.1.7 - FR2 NR meas no-DRX SBI	17.6.0
2023-03	RAN#99	R5-230512	2223	-	F	Addition of RedCap RRM TC 18.3.1.8 - FR2 NR meas DRX SBI	17.6.0
2023-03	RAN#99	R5-230513	2224	-	F	Correction to Annex A for RedCap RRM TCs	17.6.0
2023-03	RAN#99	R5-230514	2225	-	F	Correction to Annex E for RedCap RRM TCs	17.6.0
2023-03	RAN#99	R5-230515	2226	-	F	Correction to Annex F for RedCap RRM TCs	17.6.0
2023-03	RAN#99	R5-230528	2228	-	F	Correction to Annex A for RRM enhancement TCs	17.6.0
2023-03	RAN#99	R5-230529	2229	-	F	Correction to Annex E for RRM enhancement TCs	17.6.0
2023-03	RAN#99	R5-230530	2230	-	F	Correction to Annex F for RRM enhancement TCs	17.6.0
2023-03	RAN#99	R5-230532	2231	-	F	Correction to FR1 NR SA RRM TC 6.3.1.3 - inter unknown HO	17.6.0
2023-03	RAN#99	R5-230725	2235	-	F	Correction to FR2 EN-DC test case 5.3.2.2.x	17.6.0
2023-03	RAN#99	R5-230774	2236	-	F	Update to RRC based BWP switch in FR2	17.6.0
2023-03	RAN#99	R5-230777	2237	-	F	Addition of TT for SA FR2 handover test cases	17.6.0
2023-03	RAN#99	R5-230780	2238	-	F	Addition of SA FR2-FR2 RRC Connection Release with Redirection test case	17.6.0
2023-03	RAN#99	R5-230782	2239	-	F	Addition of NR-U NSA intra-frequency event-triggered measurement reporting test cases	17.6.0
2023-03	RAN#99	R5-230783	2240	-	F	Addition of NR-U SA FR1 RLM and BFR test cases	17.6.0
2023-03	RAN#99	R5-230784	2241	-	F	Update to NR-U NSA RLM and BFR test cases	17.6.0
2023-03	RAN#99	R5-230867	2252	-	F	Correct Test procedure for RLM-SSB Based FR2 5.5.1.4	17.6.0
2023-03	RAN#99	R5-230929	2253	-	F	Update TC 4A.1.1.1 with TT analysis results	17.6.0
2023-03	RAN#99	R5-230930	2254	-	F	Update TC 4A.2.1.1 with TT analysis results	17.6.0
2023-03	RAN#99	R5-230931	2255	-	F	Minimum requirements for TC 4A.2.1.1	17.6.0
2023-03	RAN#99	R5-230932	2256	-	F	Update Annex F for NE-DC test cases	17.6.0
2023-03	RAN#99	R5-230938	2257	-	F	Removal of Editor Note for EN-DC FR2 L1-SINR measurement test cases	17.6.0
2023-03	RAN#99	R5-230939	2258	-	F	Removal of Editor Note for NR SA FR2 L1-SINR measurement test cases	17.6.0
2023-03	RAN#99	R5-230985	2260	-	F	Clarification on the test procedure of 5.7.1.2 and 7.7.1.2	17.6.0
2023-03	RAN#99	R5-230987	2262	-	F	Correction to message exceptions of 5.7.4.2	17.6.0
2023-03	RAN#99	R5-230988	2263	-	F	Correction to configuration number of 6.3.2.3.2	17.6.0

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2023-03	RAN#99	R5-230989	2264	-	F	Correction to Offset value in CSI-RS RMCs table	17.6.0
2023-03	RAN#99	R5-230990	2265	-	F	Correction to L1-RSRP report delay requirement	17.6.0
2023-03	RAN#99	R5-231005	2267	-	F	Correction to 4.5.2.6	17.6.0
2023-03	RAN#99	R5-231006	2268	-	F	Correction to 4.5.3.x	17.6.0
2023-03	RAN#99	R5-231007	2269	-	F	Correction to 4.5.5.3	17.6.0
2023-03	RAN#99	R5-231009	2271	-	F	Correction to 4.5.6.1.x	17.6.0
2023-03	RAN#99	R5-231010	2272	-	F	Correction to 4.5.7.1	17.6.0
2023-03	RAN#99	R5-231011	2273	-	F	Corrections to 5.6.1.x	17.6.0
2023-03	RAN#99	R5-231012	2274	-	F	Corrections 5.6.3.3 and 5.6.3.4	17.6.0
2023-03	RAN#99	R5-231013	2275	-	F	Correction to RLM test cases EN-DC FR2	17.6.0
2023-03	RAN#99	R5-231014	2276	-	F	Correction to RLM test cases NR FR1	17.6.0
2023-03	RAN#99	R5-231015	2277	-	F	Correction to 6.5.3.x	17.6.0
2023-03	RAN#99	R5-231016	2278	-	F	Correction to 6.5.6.1.x	17.6.0
2023-03	RAN#99	R5-231017	2279	-	F	Correction to RLM test cases NR FR2	17.6.0
2023-03	RAN#99	R5-231018	2280	-	F	Correction in Annex F for 5.6.3.4	17.6.0
2023-03	RAN#99	R5-231019	2281	-	F	Corrections to 16.3.2.3.2	17.6.0
2023-03	RAN#99	R5-231020	2282	-	F	Corrections to 16.6.1.8	17.6.0
2023-03	RAN#99	R5-231025	2284	-	F	Addition of eMG TC 6.6.18.3	17.6.0
2023-03	RAN#99	R5-231026	2285	-	F	Addition of eMG TC 6.6.18.4	17.6.0
2023-03	RAN#99	R5-231111	2286	-	F	Addition of the editors note regarding the principle of testing on mix of E-UTRA and NR FR2 carriers in clause 5	17.6.0
2023-03	RAN#99	R5-231112	2287	-	F	Addition of the editors note regarding the principle of testing on mix of E-UTRA and NR FR2 carriers in clause 7	17.6.0
2023-03	RAN#99	R5-231114	2289	-	F	Editorial corrections of RedCap test cases	17.6.0
2023-03	RAN#99	R5-231123	2298	-	F	Addition of NR - E-UTRA cell re-selection test case 16.1.2.1	17.6.0
2023-03	RAN#99	R5-231124	2299	-	F	Addition of NR - E-UTRA cell re-selection test case 16.1.2.2 including Test Tolerance	17.6.0
2023-03	RAN#99	R5-231125	2300	-	F	Addition of NR - E-UTRA cell re-selection test case 16.1.2.3	17.6.0
2023-03	RAN#99	R5-231126	2301	-	F	Addition of NR - E-UTRA cell re-selection test case 16.1.2.4 including Test Tolerance	17.6.0
2023-03	RAN#99	R5-231127	2302	-	F	Addition of NR - E-UTRA cell re-selection test case 16.1.2.5	17.6.0
2023-03	RAN#99	R5-231128	2303	-	F	Addition of NR - E-UTRA cell re-selection test case 16.1.2.6 including Test Tolerance	17.6.0
2023-03	RAN#99	R5-231129	2304	-	F	Addition of new NR SA FR1 Event triggered reporting RedCap test case	17.6.0
2023-03	RAN#99	R5-231130	2305	-	F	Addition of NR SA FR2 Cell reselection to FR2 intra-frequency NR case for 2 Rx 17.1.1.1	17.6.0
2023-03	RAN#99	R5-231131	2306	-	F	Addition of NR SA FR2-FR2 Cell reselection to FR2 inter-frequency NR for 2 Rx 17.1.1.2	17.6.0
2023-03	RAN#99	R5-231132	2307	-	F	Addition of NR SA FR2 Cell reselection to FR2 intra-frequency NR for UE fulfilling stationary relaxed measurement criterion for 2 Rx	17.6.0

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						UE 17.1.1.3	
2023-03	RAN#99	R5-231133	2308	-	F	Addition of NR SA FR2-FR2 Cell reselection to FR2 inter-frequency NR for UE fulfilling stationary mobility relaxed measurement criterion for 2 Rx UE 17.1.1.4	17.6.0
2023-03	RAN#99	R5-231134	2309	-	F	Addition of E-UTRA - NR SA FR1 E-UTRA Cell reselection to higher priority NR target Cell in FR1 18.1.1.1	17.6.0
2023-03	RAN#99	R5-231135	2310	-	F	Annex E and F correction for RedCap reselection test cases including Test Tolerance	17.6.0
2023-03	RAN#99	R5-231144	2312	-	F	Correction of E-UTRA - NR FR1 Early Measurement Reporting 8.2.2.1 test case including Test Tolerance	17.6.0
2023-03	RAN#99	R5-231150	2315	-	F	Correction of EN-DC FR1 HST event triggered reporting test case 4.6.1.8	17.6.0
2023-03	RAN#99	R5-231155	2320	-	F	Correction of cell mapping in Annex E for FR1 HST test cases	17.6.0
2023-03	RAN#99	R5-231223	2321	-	F	Correction of NR SA FR1 Idle mode CA/DC measurement for FR1 test case 6.6.9.1 - resubmission	17.6.0
2023-03	RAN#99	R5-231234	2323	-	F	Corrections in 7.6.2.2 and 7.6.2.4 Test Procedures	17.6.0
2023-03	RAN#99	R5-231239	2324	-	F	Update Message Contents 4.5.2.5 and 4.5.2.6 test cases	17.6.0
2023-03	RAN#99	R5-231240	2325	-	F	Update 5.6.2.4 test applicability	17.6.0
2023-03	RAN#99	R5-231271	2327	-	F	Update Message Contents 8.4.2.7 and 8.4.2.8 test cases	17.6.0
2023-03	RAN#99	R5-231272	2328	-	F	Correction to CSI RS based L1-measurement tests 4.6.4.3, 4.6.4.4,6.6.4.3 and 6.6.4.4	17.6.0
2023-03	RAN#99	R5-231274	2330	-	F	Updated correct Event A4 in test procedure for EN-DC FR1-FR2 event-triggered reporting	17.6.0
2023-03	RAN#99	R5-231275	2331	-	F	Update of SA FR1 TC 6.1.1.1 and 6.1.2.1	17.6.0
2023-03	RAN#99	R5-231276	2332	-	F	Correction in Measurement uncertainty table Annex F	17.6.0
2023-03	RAN#99	R5-231317	2334	-	F	Update to test case 6.6.3.1 and 6.6.3.2	17.6.0
2023-03	RAN#99	R5-231706	2270	1	F	Correction to 4.5.5.4	17.6.0
2023-03	RAN#99	R5-231707	2259	1	F	Correction to firstActiveUplinkBWP-Id in uplinkConfig for non-contention RA TCs	17.6.0
2023-03	RAN#99	R5-231708	2232	1	F	Correction to FR1 NR SA RRM TC 6.7.3.2.1 - SS-SINR	17.6.0
2023-03	RAN#99	R5-231709	2316	1	F	Correction of EN-DC FR1 HST event triggered reporting test case 4.6.2.9	17.6.0
2023-03	RAN#99	R5-231710	2319	1	F	Correction of SA FR1 HST event triggered reporting test case 6.6.2.12	17.6.0
2023-03	RAN#99	R5-231711	2243	1	F	Addition of CG-SDT test case	17.6.0
2023-03	RAN#99	R5-231712	2152	1	F	Addition of CG-SDT RRM test case for FR2	17.6.0
2023-03	RAN#99	R5-231713	2245	1	F	Add new RRC messages and information elements contents for TS38.533 Annex H.3	17.6.0
2023-03	RAN#99	R5-231714	2246	1	F	add test case for TS38.533 clause 4.5.5.7	17.6.0
2023-03	RAN#99	R5-231715	2247	1	F	add test case for TS38.533 clause 4.5.5.8	17.6.0
2023-03	RAN#99	R5-231716	2248	1	F	add test case for TS38.533 clause 5.5.5.8	17.6.0
2023-03	RAN#99	R5-231717	2249	1	F	add test case for TS38.533 clause 6.5.5.7	17.6.0

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2023-03	RAN#99	R5-231718	2250	1	F	add test case for TS38.533 clause 7.5.5.9	17.6.0
2023-03	RAN#99	R5-231719	2251	1	F	add test case for TS38.533 clause 7.5.5.10	17.6.0
2023-03	RAN#99	R5-231720	2169	1	F	Addition of pass fail limits for CBR test cases	17.6.0
2023-03	RAN#99	R5-231721	2207	1	F	Addition of RedCap RRM TC 17.5.2.3 - CSI-RS BFR non-DRX	17.6.0
2023-03	RAN#99	R5-231722	2208	1	F	Addition of RedCap RRM TC 17.5.2.4 - CSI-RS BFR DRX	17.6.0
2023-03	RAN#99	R5-231723	2209	1	F	Addition of RedCap RRM TC 17.5.2.5 - BFR scheduling restriction	17.6.0
2023-03	RAN#99	R5-231724	2212	1	F	Addition of RedCap RRM TC 17.6.3.1 - SSB L1-RSRP non-DRX	17.6.0
2023-03	RAN#99	R5-231725	2283	1	F	Corrections to 16.6.1.12	17.6.0
2023-03	RAN#99	R5-231726	2163	1	F	Addition of test case 4.5.3.5	17.6.0
2023-03	RAN#99	R5-231727	2164	1	F	Addition of test case 5.5.3.7	17.6.0
2023-03	RAN#99	R5-231728	2165	1	F	Addition of test case 6.5.3.4	17.6.0
2023-03	RAN#99	R5-231729	2166	1	F	Addition of test case 6.5.3.5	17.6.0
2023-03	RAN#99	R5-231730	2167	1	F	Addition of test case 7.5.3.4	17.6.0
2023-03	RAN#99	R5-231731	2168	1	F	Addition of test case 7.5.3.5	17.6.0
2023-03	RAN#99	R5-231732	2290	1	F	Correction of NR SA FR1 Cell reselection RedCap test case 16.1.1.1	17.6.0
2023-03	RAN#99	R5-231733	2292	1	F	Correction of NR SA FR1 Cell reselection RedCap test case 16.1.1.3	17.6.0
2023-03	RAN#99	R5-231734	2294	1	F	Correction of NR SA FR1 Cell reselection RedCap test case 16.1.1.5	17.6.0
2023-03	RAN#99	R5-231735	2296	1	F	Correction of NR SA FR1 Cell reselection RedCap test case 16.1.1.7	17.6.0
2023-03	RAN#99	R5-231736	2153	1	F	Adding test case 7.5.11 for UE UL carrier RRC reconfiguration delay	17.6.0
2023-03	RAN#99	R5-231743	2311	1	F	Correction of Idle Mode inter-RAT CA/DC Measurements test case 6.6.15.1 including Test Tolerance	17.6.0
2023-03	RAN#99	R5-231744	2313	1	F	Correction of E-UTRA - NR FR2 Early Measurement Reporting 8.2.2.2 test case including Test Tolerance	17.6.0
2023-03	RAN#99	R5-231746	2295	1	F	Correction of NR SA FR1 Cell reselection RedCap test case 16.1.1.6 including Test Tolerance	17.6.0
2023-03	RAN#99	R5-231747	2297	1	F	Correction of NR SA FR1 Cell reselection RedCap test case 16.1.1.8 including Test Tolerance	17.6.0
2023-03	RAN#99	R5-231748	2314	1	F	Correction of test tolerance for CADC enhancement test cases in Annex F	17.6.0
2023-03	RAN#99	R5-231759	2183	1	F	Addition of RedCap RRM TC 16.5.1.14 - OOS DRX 2Rx with TT	17.6.0
2023-03	RAN#99	R5-231760	2291	1	F	Correction of NR SA FR1 Cell reselection RedCap test case 16.1.1.2 including Test Tolerance	17.6.0
2023-03	RAN#99	R5-231761	2293	1	F	Correction of NR SA FR1 Cell reselection RedCap test case 16.1.1.4 including Test Tolerance	17.6.0
2023-03	RAN#99	R5-231764	2160	1	F	Update of RRM Test Case 5.5.3.1 EN-DC FR2 SCell activation and deactivation intra-band in non-DRX including Test Tolerance	17.6.0
2023-03	RAN#99	R5-231767	2233	1	F	Introduction of CLI Measurement test case 5.6.4.2, 5.7.5.2, 7.6.4.2, 7.7.5.2, 6.6.6.1 and 6.7.8.1	17.6.0

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2023-03	RAN#99	R5-231855	2155	1	F	Addition of PRS based UE Rx-Tx measurement FR1 SA test case	17.6.0
2023-03	RAN#99	R5-231856	2157	1	F	Addition of PRS based UE Rx-Tx measurement FR2 SA test case	17.6.0
2023-03	RAN#99	R5-231872	2335	1	F	Update to RRM applicability rules and test optimization - 38.533	17.6.0
2023-03	RAN#99	R5-231875	2261	1	F	Correction to NSA FR2 RLM test cases	17.6.0
2023-03	RAN#99	R5-231884	2227	1	F	Addition of RRM enh TC 6.5.8.1 - PCell CBW change with TT	17.6.0
2023-03	RAN#99	R5-231893	2156	2	F	Addition of TRS based UE Rx-Tx measurement SA FR1 test case	17.6.0
2023-03	RAN#99	R5-231896	2242	1	F	Update to HST RRM test cases	17.6.0
2023-03	RAN#99	R5-231950	2317	1	F	Correction of SA FR1 HST reselection test case 6.1.1.8	17.6.0
2023-03	RAN#99	R5-231951	2318	1	F	Correction of SA FR1 HST event triggered reporting test case 6.6.1.8	17.6.0
2023-03	RAN#99	R5-231954	2179	1	F	Addition of RedCap RRM TC 16.5.1.10 - OOS non-DRX 2Rx with TT	17.6.0
2023-03	RAN#99	R5-231955	2180	1	F	Addition of RedCap RRM TC 16.5.1.11 - IS non-DRX 1Rx	17.6.0
2023-03	RAN#99	R5-231956	2184	1	F	Addition of RedCap RRM TC 16.5.1.15 - IS DRX 1Rx	17.6.0
2023-03	RAN#99	R5-231957	2190	1	F	Addition of RedCap RRM TC 16.5.4.1 - CBW change 1Rx with TT	17.6.0
2023-03	RAN#99	R5-231958	2191	1	F	Addition of RedCap RRM TC 16.5.4.2 - CBW change 2Rx with TT	17.6.0
2023-03	RAN#99	R5-231963	2201	1	F	Addition of RedCap RRM TC 16.6.4.8 - CSI-RS L1-RSRP DRX 2Rx with TT	17.6.0
2023-03	RAN#99	R5-231976	2171	1	F	Addition of RedCap RRM TC 16.3.1.2 - intra known HO 2Rx with TT	17.6.0
2023-03	RAN#99	R5-231977	2172	1	F	Addition of RedCap RRM TC 16.3.1.3 - intra unknown HO 1Rx	17.6.0
2023-03	RAN#99	R5-231978	2173	1	F	Addition of RedCap RRM TC 16.3.1.4 - intra unknown HO 2Rx with TT	17.6.0
2023-03	RAN#99	R5-231979	2174	1	F	Addition of RedCap RRM TC 16.3.1.5 - inter unknown HO 1Rx	17.6.0
2023-03	RAN#99	R5-231980	2175	1	F	Addition of RedCap RRM TC 16.3.1.6 - inter unknown HO 2Rx with TT	17.6.0
2023-03	RAN#99	R5-231981	2192	2	F	Addition of RedCap RRM TC 16.6.1.1 - gapless non-DRX 1Rx	17.6.0
2023-03	RAN#99	R5-231982	2193	2	F	Addition of RedCap RRM TC 16.6.1.2 - gapless non-DRX 2Rx with TT	17.6.0
2023-03	RAN#99	R5-231983	2196	2	F	Addition of RedCap RRM TC 16.6.1.9 - intra gapless SBI 1Rx	17.6.0
2023-03	RAN#99	R5-231984	2197	2	F	Addition of RedCap RRM TC 16.6.1.10 - intra gapless SBI 2Rx with TT	17.6.0
2023-03	RAN#99	-	-	-	-	coversheet correction	17.6.1

History

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